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Jain et al.

(54) MEDICATION IDENTIFICATION, TRACKING AND ADHERENCE MANAGEMENT

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(73) Assignee: **RxAdvance Corporation**

(21) Appl. No.: **14/800,689**

(22) Filed: **Jul. 15, 2015**

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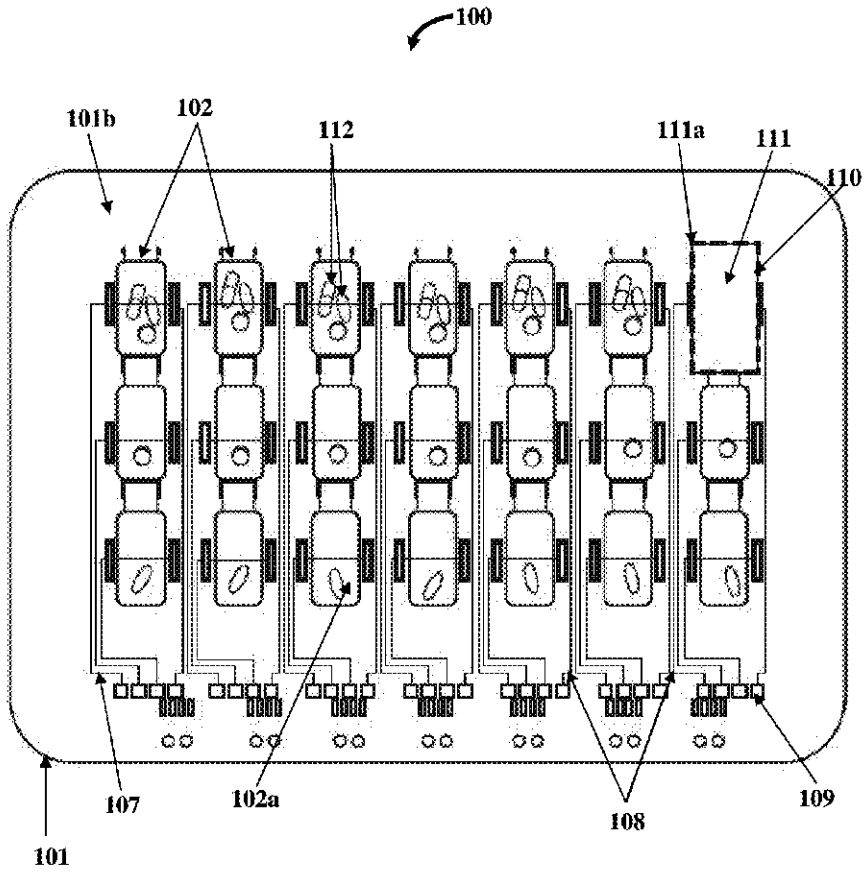
Publication Classification

(51) **Int. Cl.**
G06F 19/00 (2006.01)

(52) **U.S. Cl.**
CPC *G06F 19/3456* (2013.01); *G06F 19/322* (2013.01)

(57) **ABSTRACT**

A method and a wellness adherence tracking system (WATS) for tracking wellness adherence of a healthcare recipient are provided. An identifier code or an existing code is positioned on a medical implement, for example, a medication bin, a parenteral device, a fitness device, etc. The WATS accessible on a user device scans, decodes, and validates the identifier code, and obtains medical information associated with the medical implement and/or an activity, for example, an exercise activity, a diet activity, etc., associated with the medical implement from the decoded and validated identifier code. The WATS renders the medical information and multiple wellness adherence options on a graphical user interface and receives inputs for the wellness adherence options from the user device. The WATS logs the received inputs in association with the wellness adherence criteria in the user device and/or one or more databases to track the wellness adherence of the healthcare recipient.



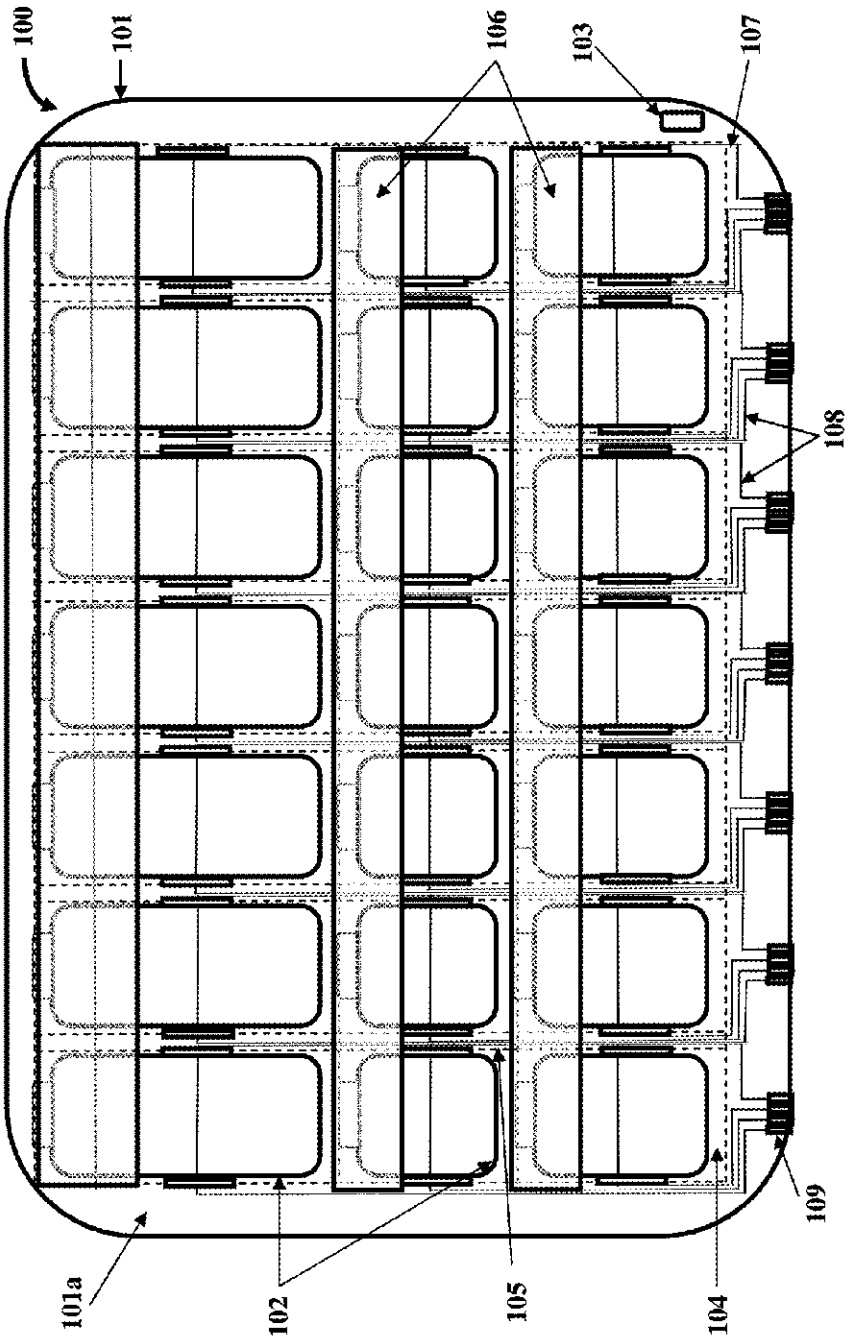


FIG. 1A

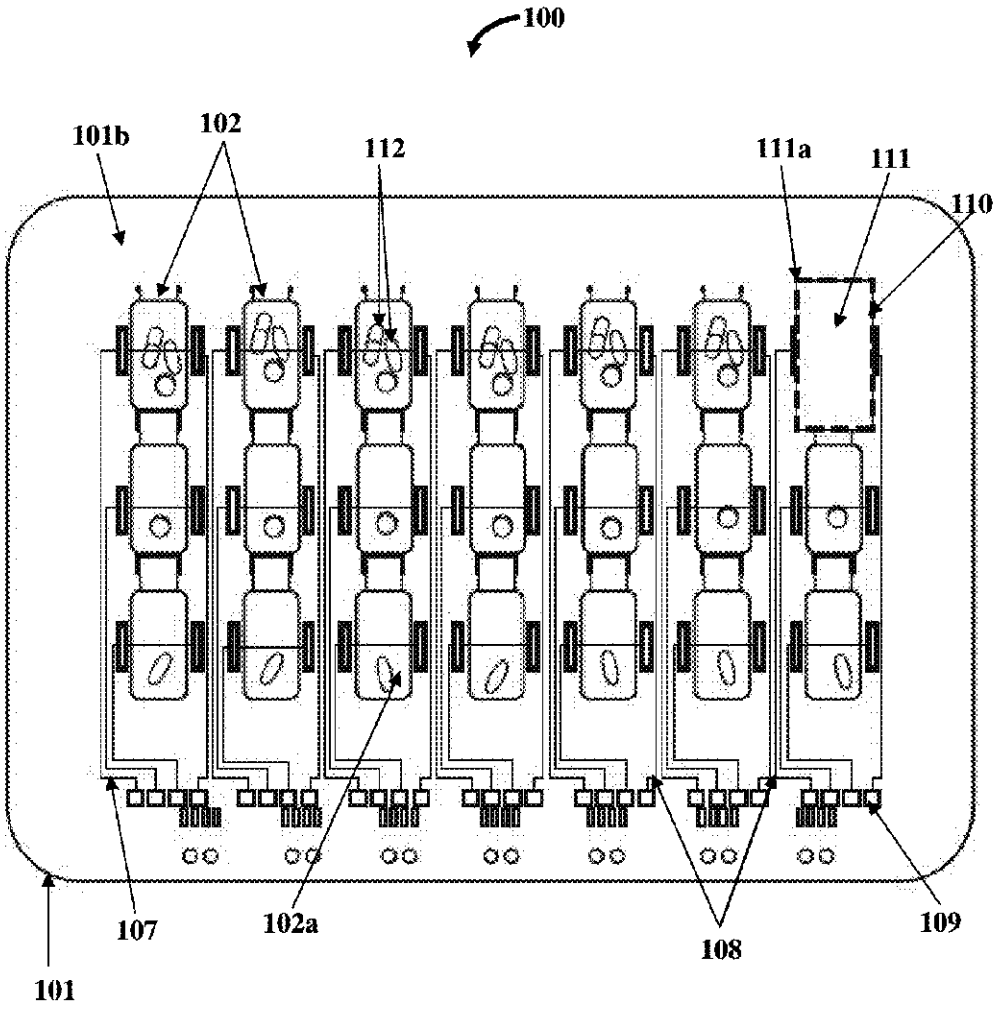


FIG. 1B

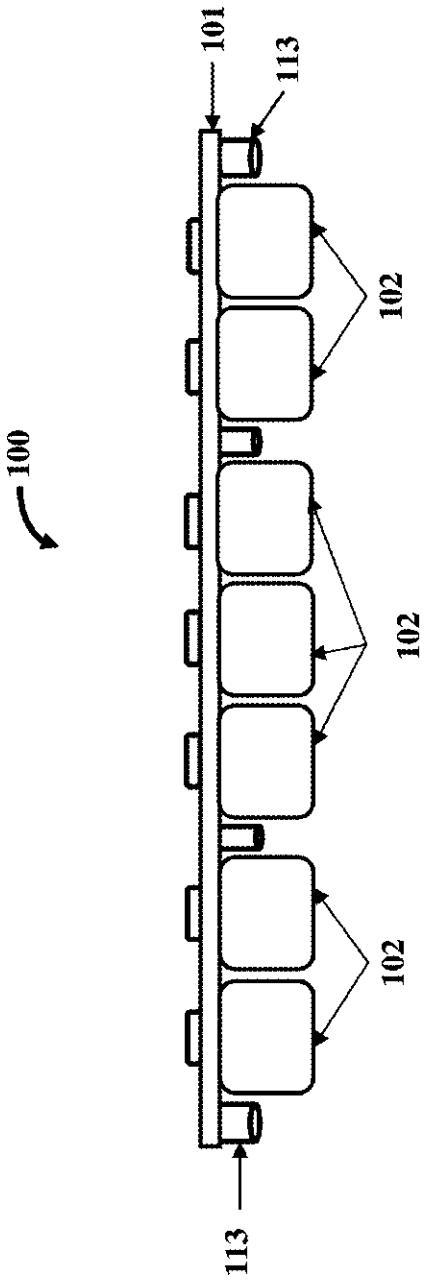
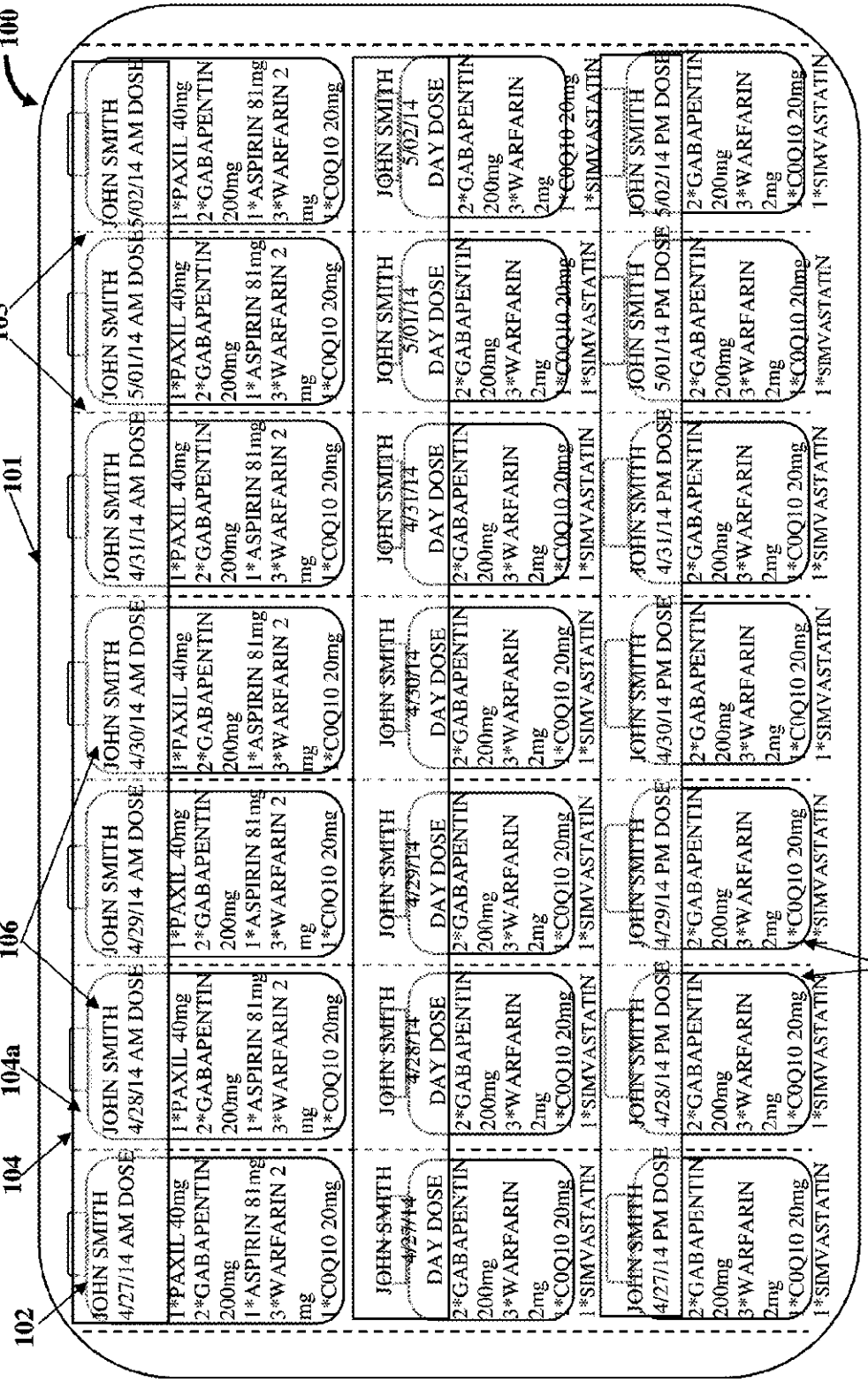


FIG. 1C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101
102
104
104a
105
106
JOHN SMITH
4/27/14 AM DOSE
1*PAXIL 40mg
2*GABAPENTIN
200mg
1*ASPIRIN 81mg
3*WARFARIN 2
mg
1*COQ10 20mg
1*SIMVASTATIN
JOHN SMITH
4/27/14 PM DOSE
2*GABAPENTIN
200mg
3*WARFARIN
2mg
1*COQ10 20mg
JOHN SMITH
4/28/14 AM DOSE
JOHN SMITH
4/28/14
DAY DOSE
JOHN SMITH
4/29/14 AM DOSE
JOHN SMITH
4/29/14
DAY DOSE
JOHN SMITH
4/30/14 AM DOSE
JOHN SMITH
4/30/14
DAY DOSE
JOHN SMITH
4/31/14 AM DOSE
JOHN SMITH
4/31/14
DAY DOSE
JOHN SMITH
5/01/14 AM DOSE
JOHN SMITH
5/01/14
DAY DOSE
JOHN SMITH
5/02/14 AM DOSE
JOHN SMITH
5/02/14
DAY DOSE
JOHN SMITH
4/28/14 PM DOSE
JOHN SMITH
4/29/14 PM DOSE
JOHN SMITH
4/30/14 PM DOSE
JOHN SMITH
4/31/14 PM DOSE
JOHN SMITH
5/01/14 PM DOSE
JOHN SMITH
5/02/14 PM DOSE

FIG. 2A

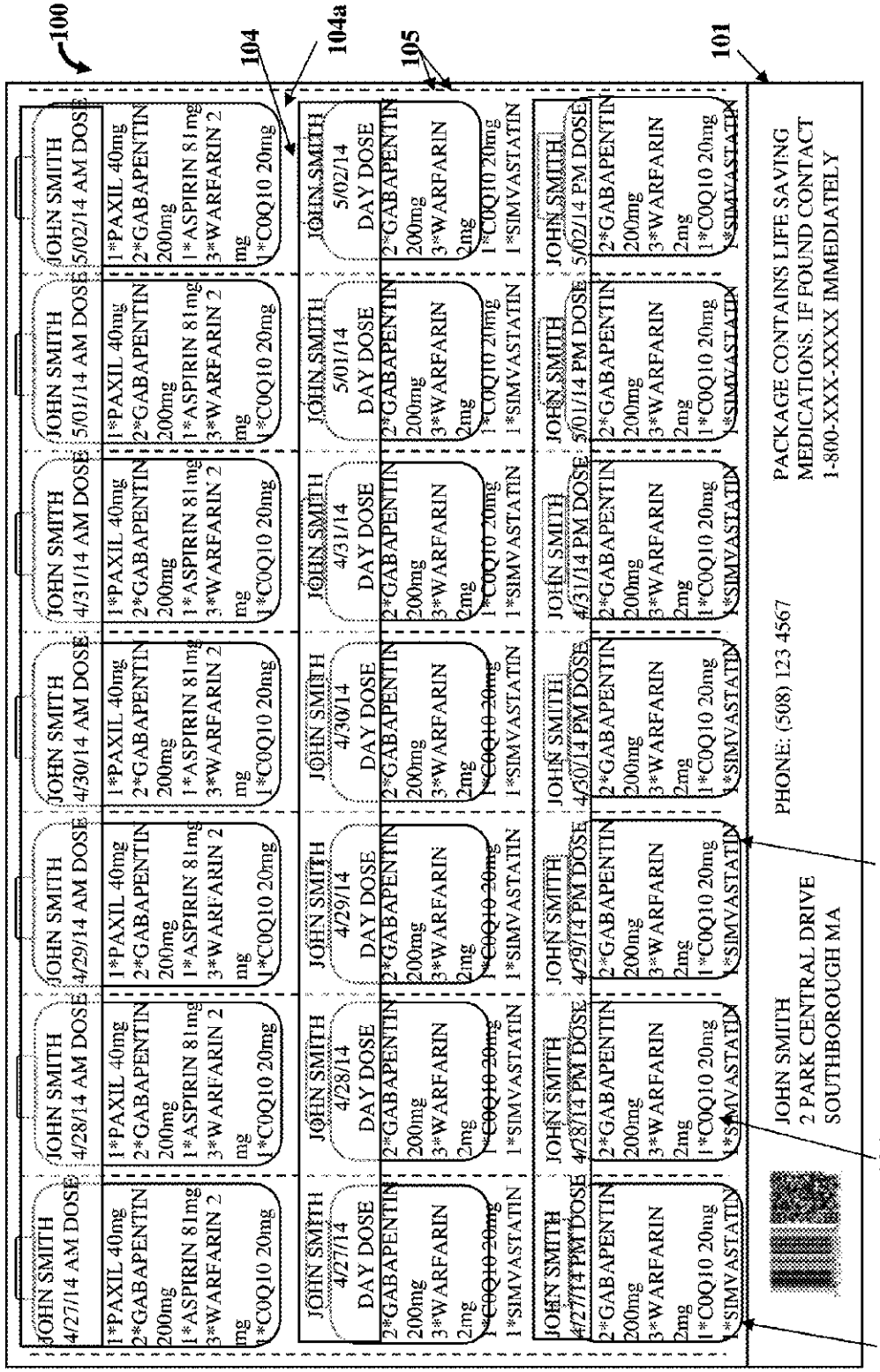
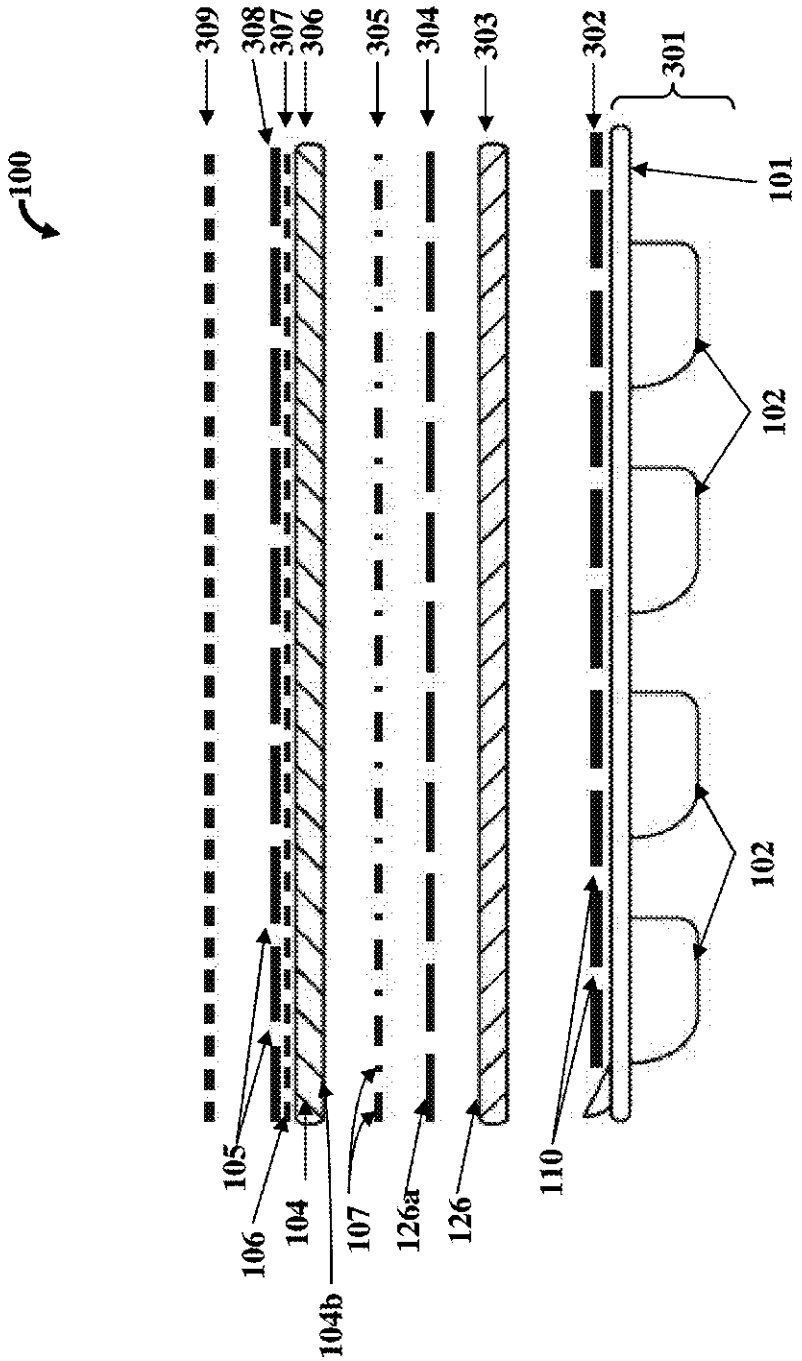

100
104
104a
105
101
102
106
JOHN SMITH
4/27/14 AM DOSE
1*PAXIL 40mg
2*GABAPENTIN 200mg
1*ASPIRIN 81mg
3*WARFARIN 2 mg
1*C0Q10 20mg
JOHN SMITH
4/28/14 AM DOSE
JOHN SMITH
4/29/14 AM DOSE
JOHN SMITH
4/30/14 AM DOSE
JOHN SMITH
4/31/14 AM DOSE
JOHN SMITH
5/01/14 AM DOSE
JOHN SMITH
5/02/14 AM DOSE
JOHN SMITH
4/27/14
DAY DOSE
2*GABAPENTIN 200mg
3*WARFARIN 2mg
1*C0Q10 20mg
1*SIMVASTATIN
JOHN SMITH
4/28/14
DAY DOSE
JOHN SMITH
4/29/14
DAY DOSE
JOHN SMITH
4/30/14
DAY DOSE
JOHN SMITH
4/31/14
DAY DOSE
JOHN SMITH
5/01/14
DAY DOSE
JOHN SMITH
5/02/14
DAY DOSE
JOHN SMITH
4/27/14 PM DOSE
JOHN SMITH
4/28/14 PM DOSE
JOHN SMITH
4/29/14 PM DOSE
JOHN SMITH
4/30/14 PM DOSE
JOHN SMITH
4/31/14 PM DOSE
JOHN SMITH
5/01/14 PM DOSE
JOHN SMITH
5/02/14 PM DOSE
JOHN SMITH
2 PARK CENTRAL DRIVE
SOUTHBOROUGH MA
PHONE: (508) 123 4567
PACKAGE CONTAINS LIFE SAVING MEDICATIONS. IF FOUND CONTACT 1-800-XXX-XXXX IMMEDIATELY

FIG. 2B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309
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303
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301
101
102
102
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106
104
104b
107
126a
126
110

FIG. 3

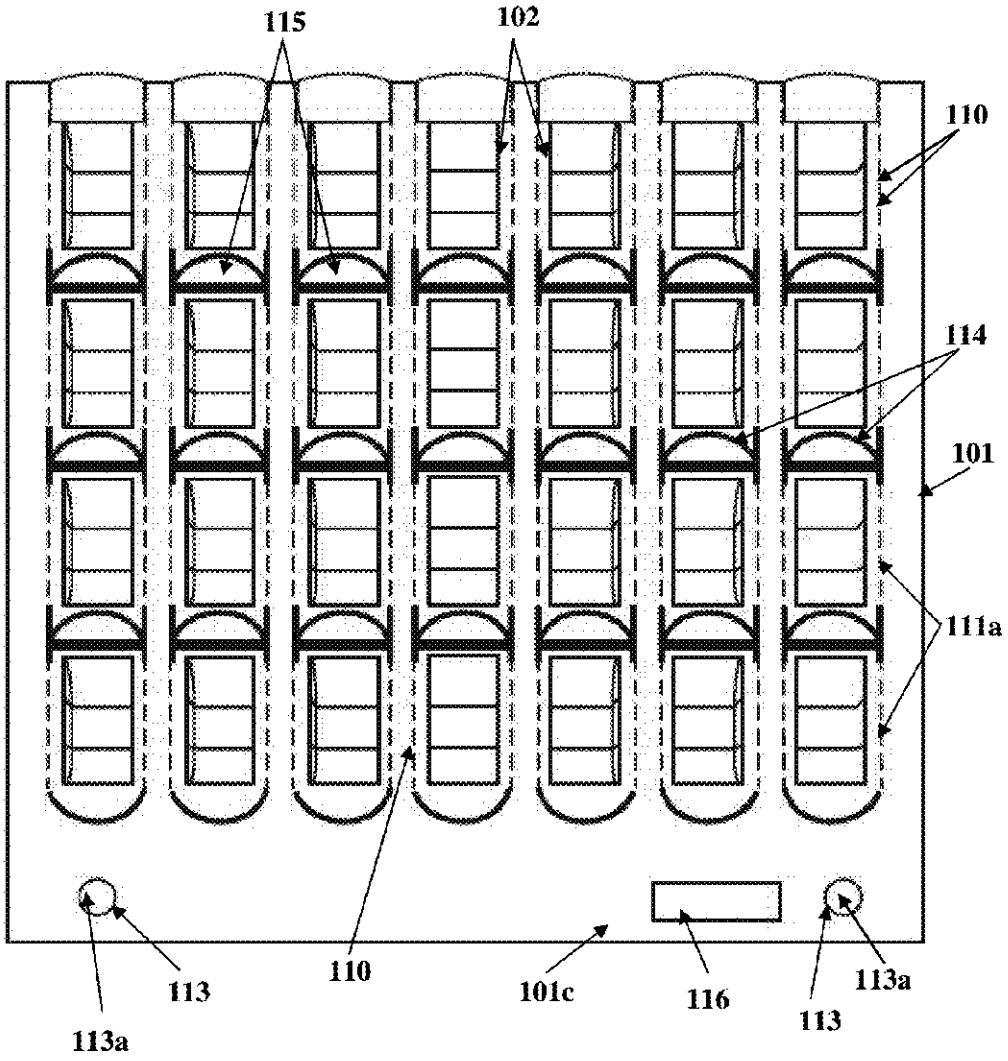


FIG. 4A

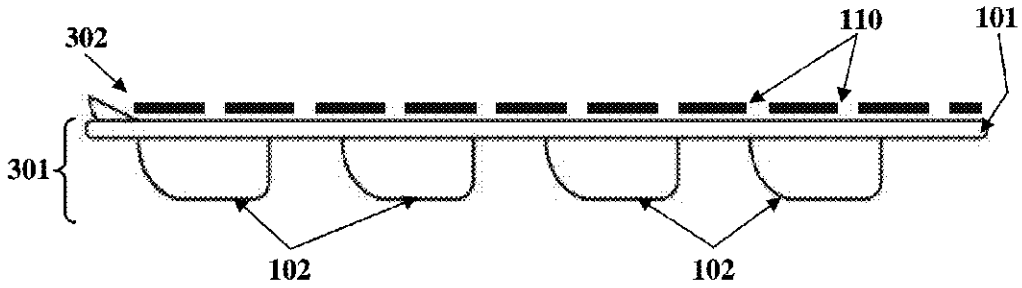


FIG. 4B

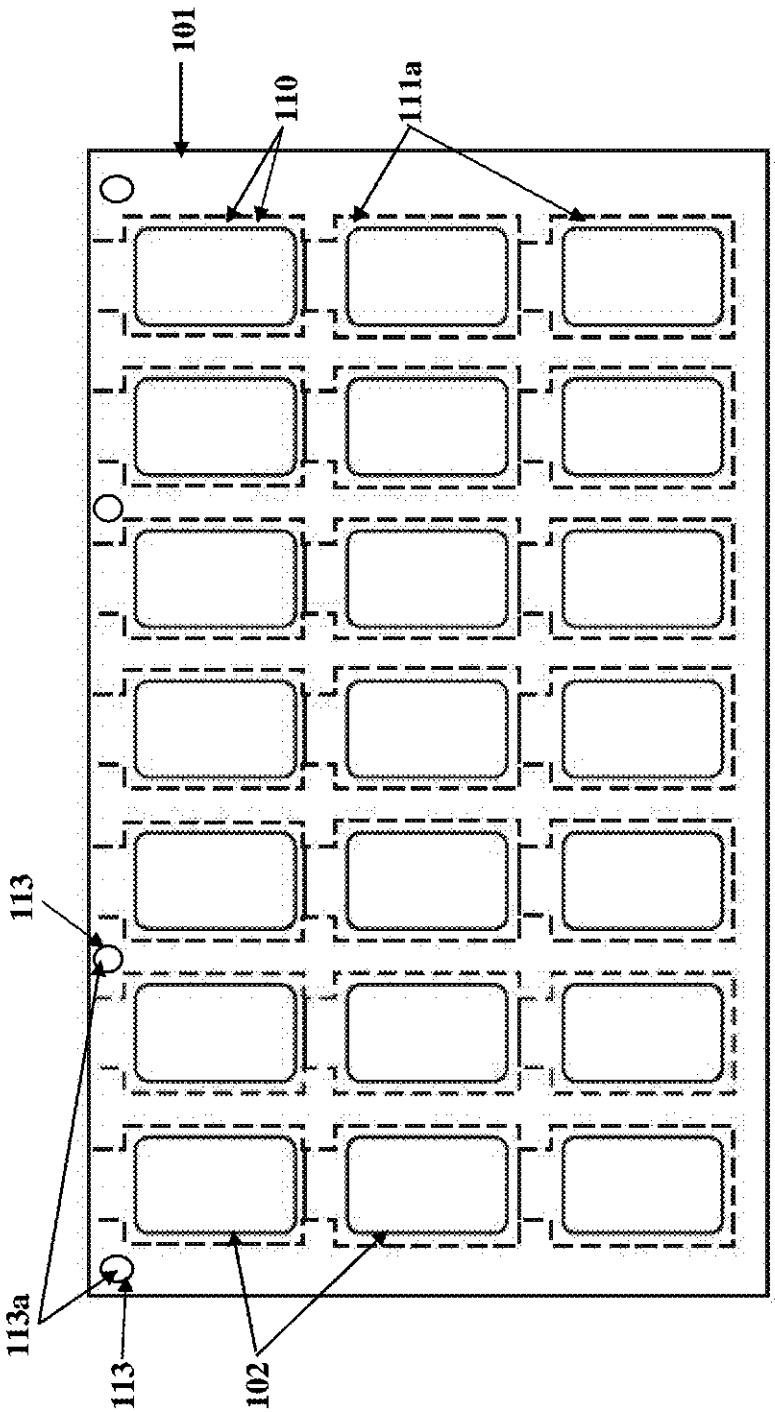


FIG. 5

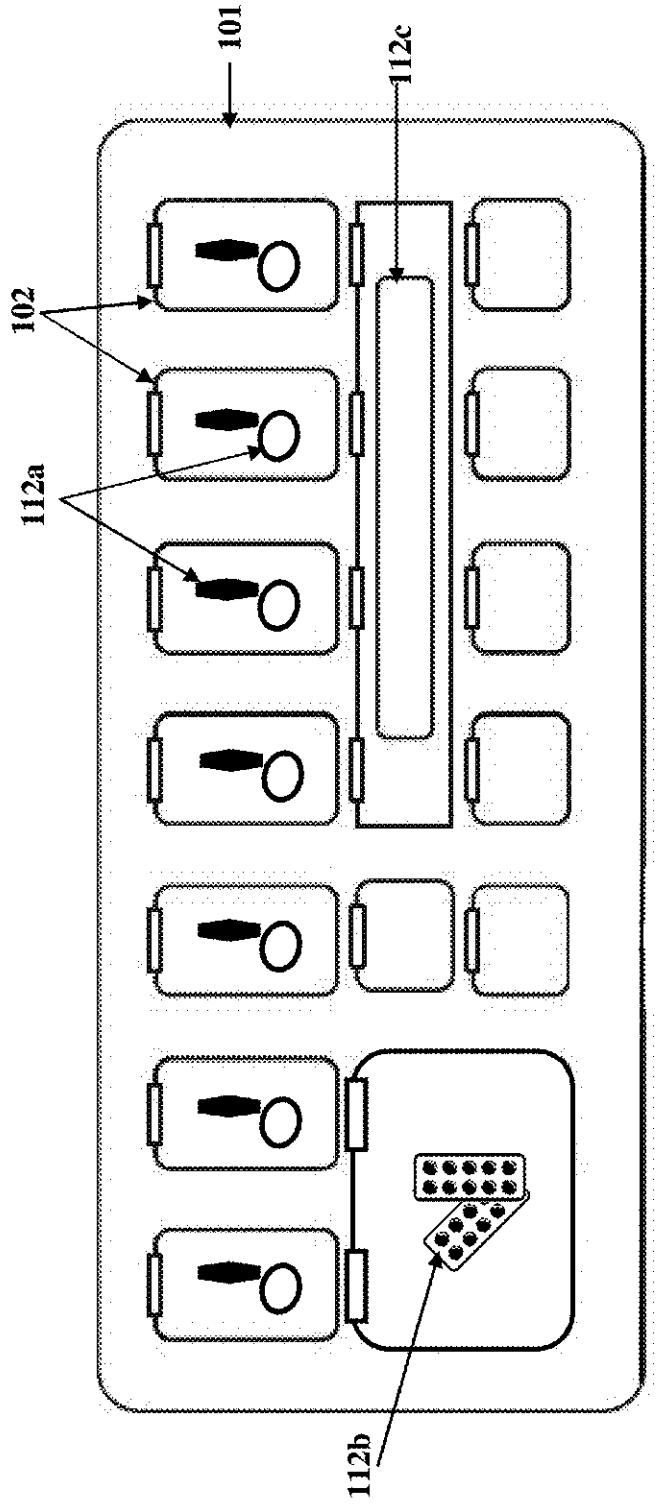


FIG. 6

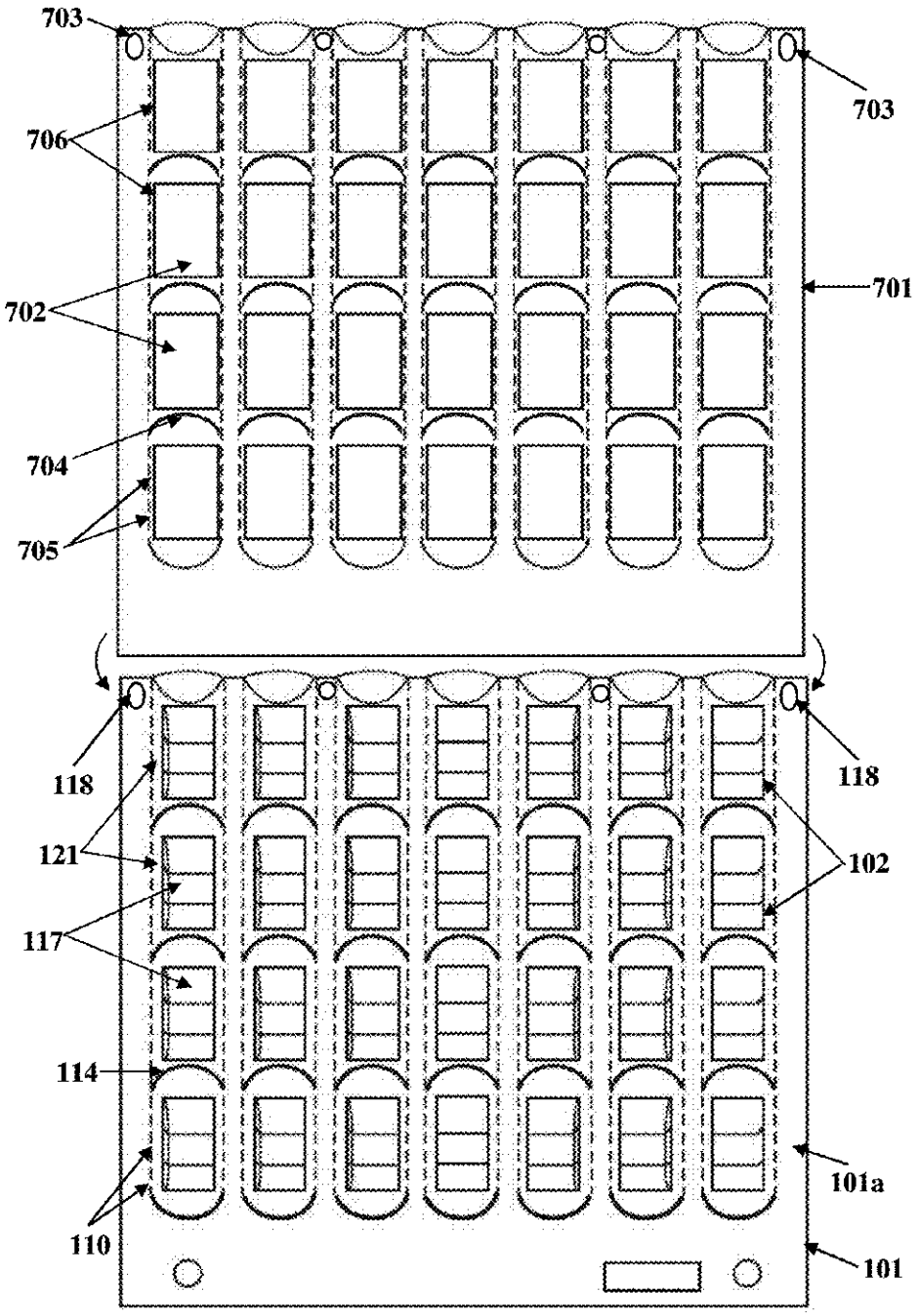


FIG. 7

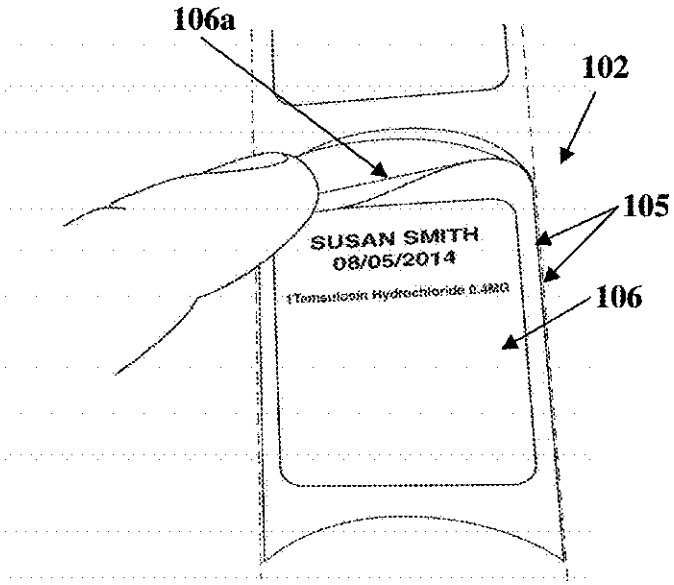

106a
102
105
106
SUSAN SMITH
08/05/2014

FIG. 8

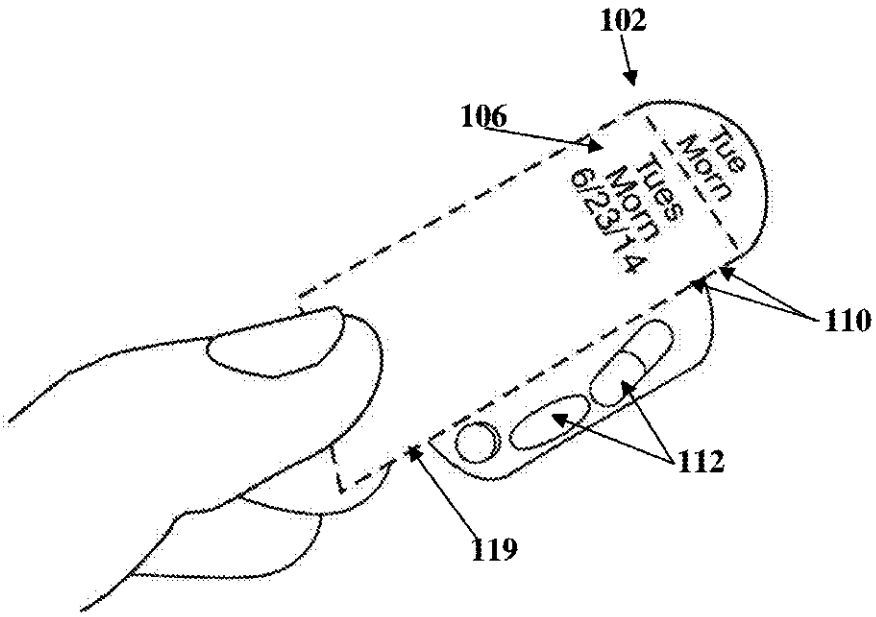

102
106
Tue Morn
Tues Morn 6/23/14
110
112
119

FIG. 9

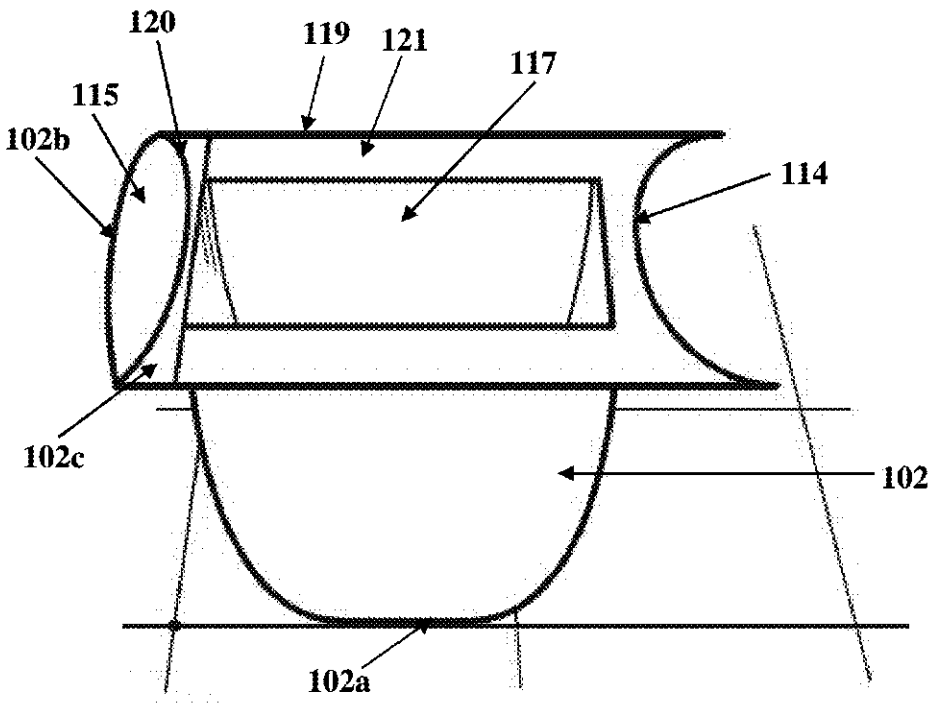


FIG. 10

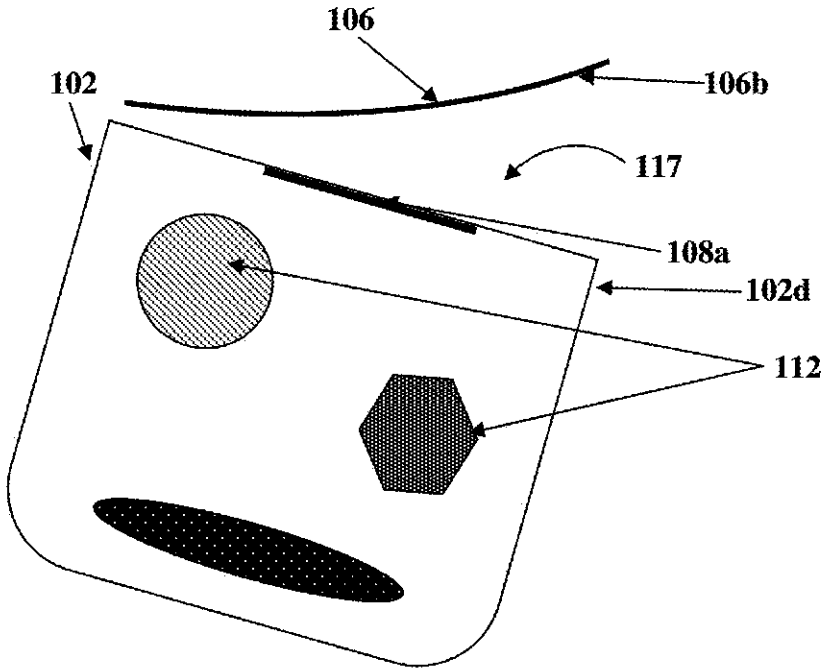


FIG. 11A

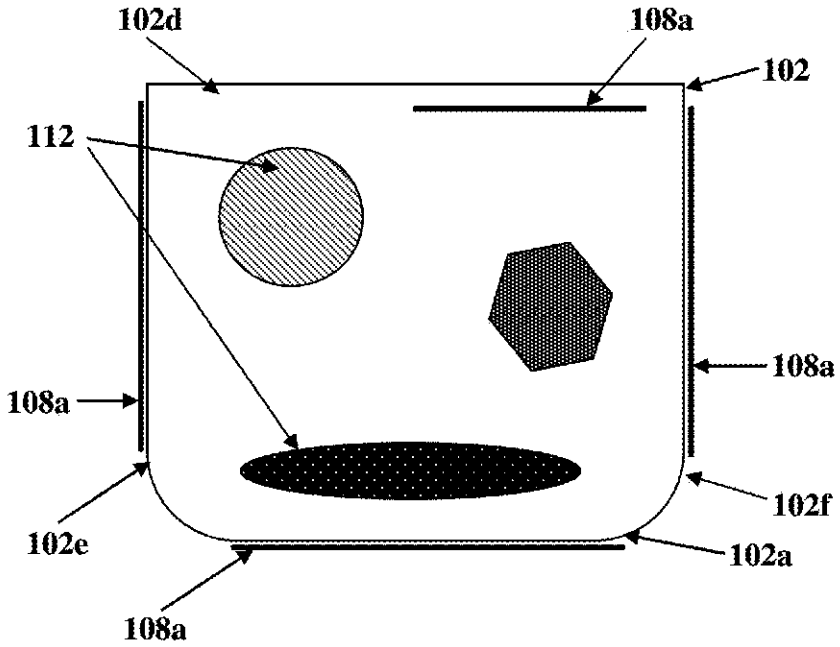


FIG. 11B

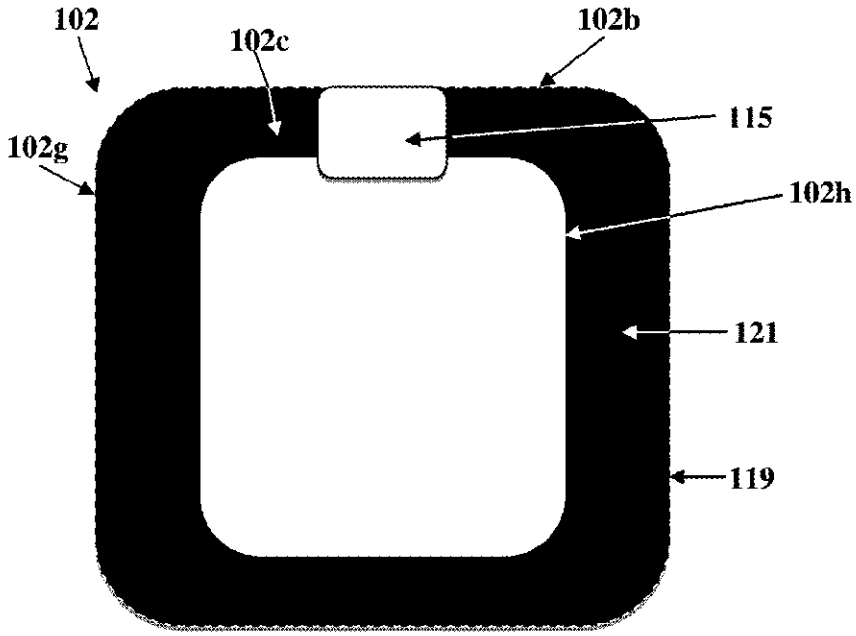
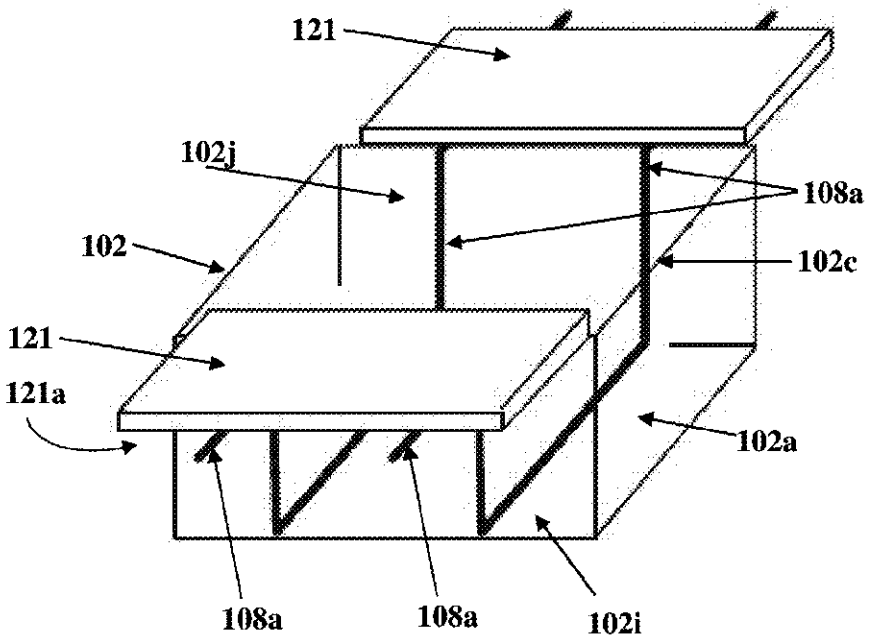

102
102c
102b
115
102g
102h
121
119

FIG. 12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102j
108a
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102c
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121a
102a
108a
108a
102i

FIG. 13

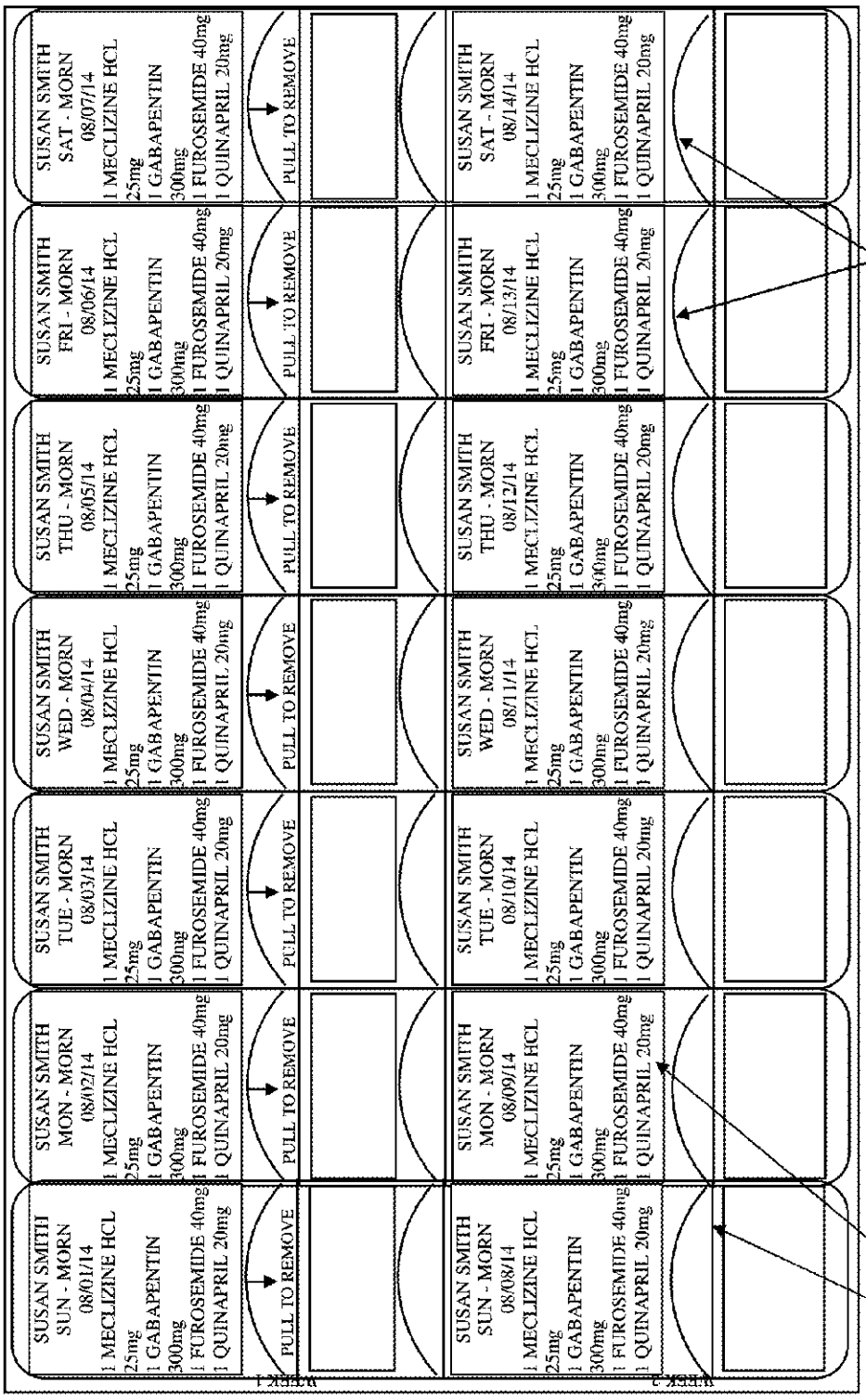
SUSAN SMITH
SUN - MORN
08/01/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
PULL TO REMOVE
SUSAN SMITH
MON - MORN
08/02/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
PULL TO REMOVE
SUSAN SMITH
TUE - MORN
08/03/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
PULL TO REMOVE
SUSAN SMITH
WED - MORN
08/04/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
PULL TO REMOVE
SUSAN SMITH
THU - MORN
08/05/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
PULL TO REMOVE
SUSAN SMITH
FRI - MORN
08/06/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
PULL TO REMOVE
SUSAN SMITH
SAT - MORN
08/07/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
PULL TO REMOVE
WEEK 1
SUSAN SMITH
SUN - MORN
08/08/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
SUSAN SMITH
MON - MORN
08/09/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
SUSAN SMITH
TUE - MORN
08/10/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
SUSAN SMITH
WED - MORN
08/11/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
SUSAN SMITH
THU - MORN
08/12/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
SUSAN SMITH
FRI - MORN
08/13/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
SUSAN SMITH
SAT - MORN
08/14/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
WEEK 2
104
106
122

FIG. 14A

DOUG JORDAN
BIRTH 07/21/1967
LOC: 12/15

85 HOLLY GROVE
WILLIAMSBURG, VA 23185 (757)-123-4567
USE BY: 12/31/2011

ABC PHARMACY
123 FILL RIGHT PKWY
SOUTHBOROUGH, MA 01172
(123)-456-7890

DATE: 10/31/2001
FILE: ABC012345

NDC CODE	R_X	DRUG NAME	FORM	DRUG DESCRIPTION	QTY	R	INSTRUCTIONS	PRESCRIBER	M	D	D	N
00000	1234567	TRAZODONE HCL 100 mg	TAB		30	5	1 TABLET EVERY NIGHT	DR. SMITH				1
11111	1523434	SUBOXONE 2 mg-0.5 mg	TAB		30	5	1 TABLET AT NOON	DR. SMITH		1		
22222	9876543	CYMBALTA 60 mg	CAP		30	5	1 CAPSULE EVERY NIGHT	DR. ROBERTSON				1
33333	6789123	NEXIUM 40 mg	CAP		30	5	1 CAPSULE EVERY MORNING	DR. ROBERTSON	1			

MORNING ABC PHARMACY DOUG JORDAN #ABC012345 1-NEXIUM 40mg 1-LISENOPRIL 10mg 1-ASPIRIN 250mg	**MORNING** ABC PHARMACY DOUG JORDAN #ABC012345 1-NEXIUM 40mg 1-LISENOPRIL 10mg 1-ASPIRIN 250mg	**MORNING** ABC PHARMACY DOUG JORDAN #ABC012345 1-NEXIUM 40mg 1-LISENOPRIL 10mg 1-ASPIRIN 250mg	**MORNING** ABC PHARMACY DOUG JORDAN #ABC012345 1-NEXIUM 40mg 1-LISENOPRIL 10mg 1-ASPIRIN 250mg	**MORNING** ABC PHARMACY DOUG JORDAN #ABC012345 1-NEXIUM 40mg 1-LISENOPRIL 10mg 1-ASPIRIN 250mg	**MORNING** ABC PHARMACY DOUG JORDAN #ABC012345 1-NEXIUM 40mg 1-LISENOPRIL 10mg 1-ASPIRIN 250mg	**MORNING** ABC PHARMACY DOUG JORDAN #ABC012345 1-NEXIUM 40mg 1-LISENOPRIL 10mg 1-ASPIRIN 250mg
DAY ABC PHARMACY DOUG JORDAN #ABC012345 1-SUBOXONE 2mg-0.5mg	**DAY** ABC PHARMACY DOUG JORDAN #ABC012345 1-SUBOXONE 2mg-0.5mg	**DAY** ABC PHARMACY DOUG JORDAN #ABC012345 1-SUBOXONE 2mg-0.5mg	**DAY** ABC PHARMACY DOUG JORDAN #ABC012345 1-SUBOXONE 2mg-0.5mg	**DAY** ABC PHARMACY DOUG JORDAN #ABC012345 1-SUBOXONE 2mg-0.5mg	**DAY** ABC PHARMACY DOUG JORDAN #ABC012345 1-SUBOXONE 2mg-0.5mg	**DAY** ABC PHARMACY DOUG JORDAN #ABC012345 1-SUBOXONE 2mg-0.5mg
NIGHT ABC PHARMACY DOUG JORDAN #ABC012345 1-TRANZODONE 100mg	**NIGHT** ABC PHARMACY DOUG JORDAN #ABC012345 1-TRANZODONE 100mg	**NIGHT** ABC PHARMACY DOUG JORDAN #ABC012345 1-TRANZODONE 100mg	**NIGHT** ABC PHARMACY DOUG JORDAN #ABC012345 1-TRANZODONE 100mg	**NIGHT** ABC PHARMACY DOUG JORDAN #ABC012345 1-TRANZODONE 100mg	**NIGHT** ABC PHARMACY DOUG JORDAN #ABC012345 1-TRANZODONE 100mg	**NIGHT** ABC PHARMACY DOUG JORDAN #ABC012345 1-TRANZODONE 100mg

104 106

FIG. 14B

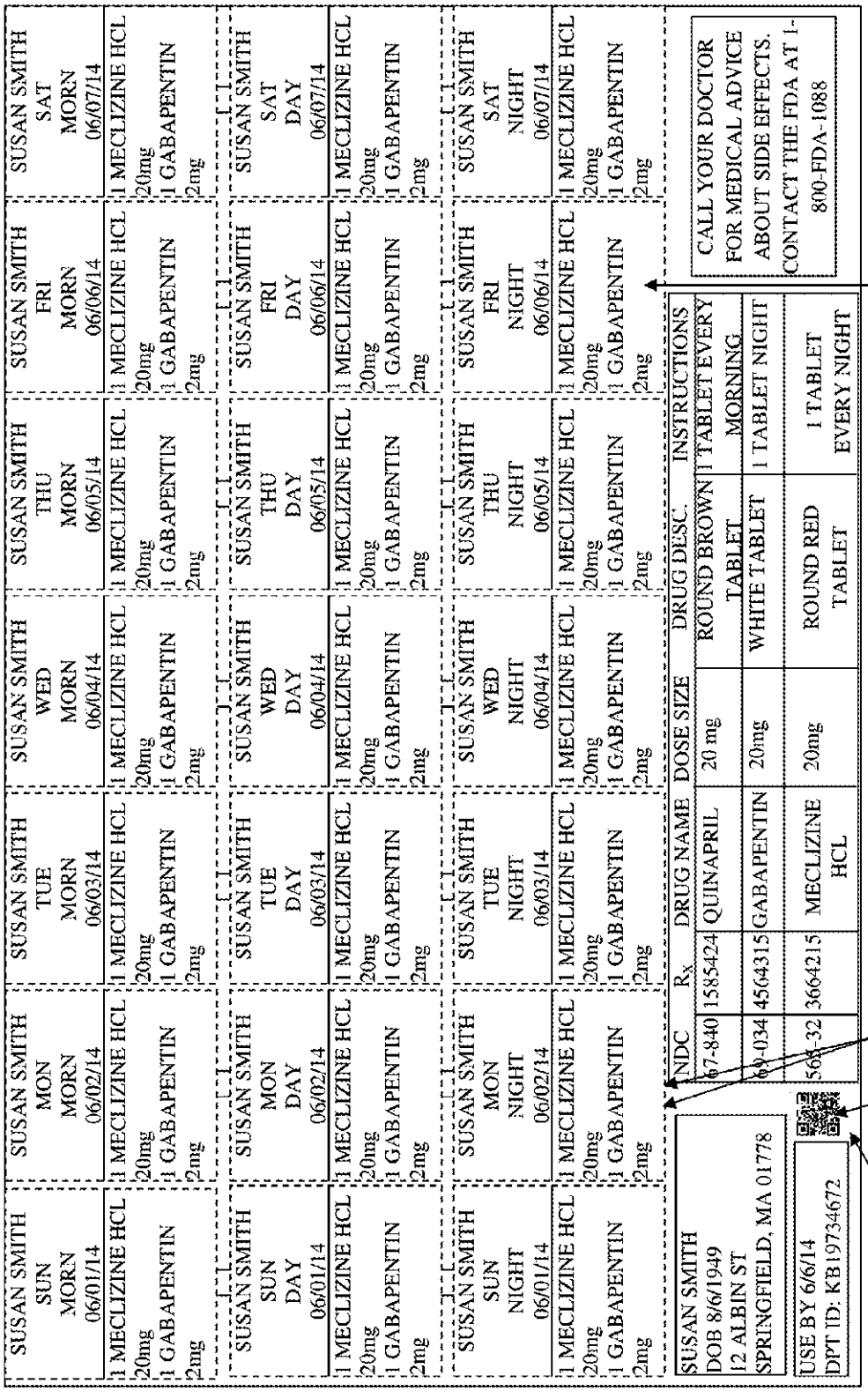
SUSAN SMITH SUN MORN 06/01/14
SUSAN SMITH MON MORN 06/02/14
SUSAN SMITH TUE MORN 06/03/14
SUSAN SMITH WED MORN 06/04/14
SUSAN SMITH THU MORN 06/05/14
SUSAN SMITH FRI MORN 06/06/14
SUSAN SMITH SAT MORN 06/07/14
1 MECLIZINE HCL 20mg
1 GABAPENTIN 2mg
SUSAN SMITH SUN DAY 06/01/14
SUSAN SMITH MON DAY 06/02/14
SUSAN SMITH TUE DAY 06/03/14
SUSAN SMITH WED DAY 06/04/14
SUSAN SMITH THU DAY 06/05/14
SUSAN SMITH FRI DAY 06/06/14
SUSAN SMITH SAT DAY 06/07/14
SUSAN SMITH SUN NIGHT 06/01/14
SUSAN SMITH MON NIGHT 06/02/14
SUSAN SMITH TUE NIGHT 06/03/14
SUSAN SMITH WED NIGHT 06/04/14
SUSAN SMITH THU NIGHT 06/05/14
SUSAN SMITH FRI NIGHT 06/06/14
SUSAN SMITH SAT NIGHT 06/07/14
NDC
Rx
DRUG NAME
DOSE SIZE
DRUG DESC.
INSTRUCTIONS
67-840 1585424 QUINAPRIL 20 mg ROUND BROWN TABLET 1 TABLET EVERY MORNING
69-034 4564315 GABAPENTIN 20mg WHITE TABLET 1 TABLET NIGHT
565-32 3664215 MECLIZINE HCL 20mg ROUND RED TABLET 1 TABLET EVERY NIGHT
SUSAN SMITH
DOB 8/6/1949
12 ALBIN ST
SPRINGFIELD, MA 01778
USE BY 6/6/14
DPT ID: KB19734672
CALL YOUR DOCTOR FOR MEDICAL ADVICE ABOUT SIDE EFFECTS.
CONTACT THE FDA AT 1-800-FDA-1088
104
123a
105
106

FIG. 14C

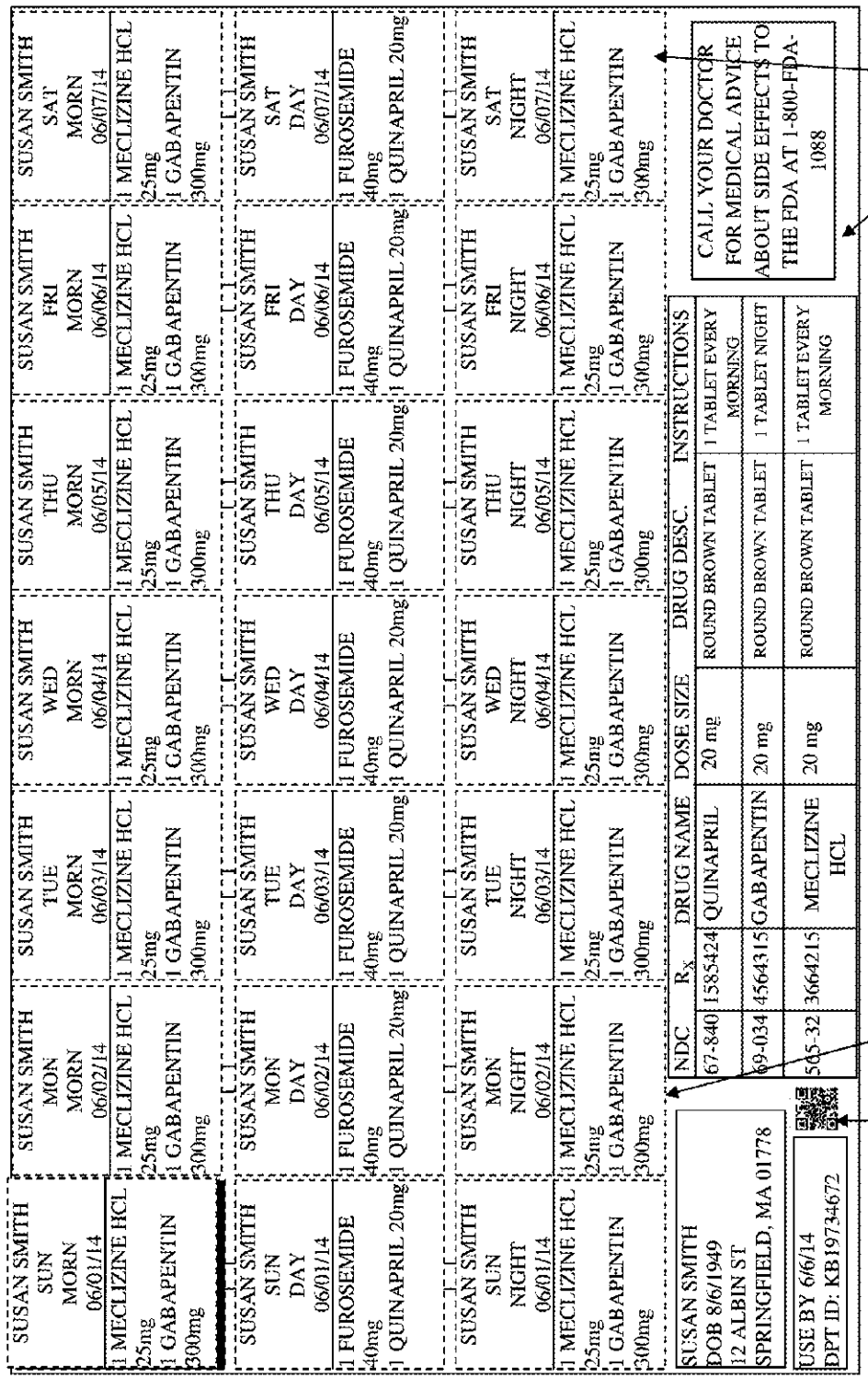
SUSAN SMITH SUN MORN 06/01/14
SUSAN SMITH MON MORN 06/02/14
SUSAN SMITH TUE MORN 06/03/14
SUSAN SMITH WED MORN 06/04/14
SUSAN SMITH THU MORN 06/05/14
SUSAN SMITH FRI MORN 06/06/14
SUSAN SMITH SAT MORN 06/07/14
1 MECLIZINE HCL 25mg
1 GABAPENTIN 300mg
1 FUROSEMIDE 40mg
1 QUINAPRIL 20mg
SUSAN SMITH SUN DAY 06/01/14
SUSAN SMITH MON DAY 06/02/14
SUSAN SMITH TUE DAY 06/03/14
SUSAN SMITH WED DAY 06/04/14
SUSAN SMITH THU DAY 06/05/14
SUSAN SMITH FRI DAY 06/06/14
SUSAN SMITH SAT DAY 06/07/14
SUSAN SMITH SUN NIGHT 06/01/14
SUSAN SMITH MON NIGHT 06/02/14
SUSAN SMITH TUE NIGHT 06/03/14
SUSAN SMITH WED NIGHT 06/04/14
SUSAN SMITH THU NIGHT 06/05/14
SUSAN SMITH FRI NIGHT 06/06/14
SUSAN SMITH SAT NIGHT 06/07/14
NDC
Rx
DRUG NAME
DOSE SIZE
DRUG DESC.
INSTRUCTIONS
67-840
1585424
QUINAPRIL
20 mg
ROUND BROWN TABLET
1 TABLET EVERY MORNING
69-034
4564315
GABAPENTIN
20 mg
ROUND BROWN TABLET
1 TABLET NIGHT
505-32
3664215
MECLIZINE HCL
20 mg
ROUND BROWN TABLET
1 TABLET EVERY MORNING
SUSAN SMITH
DOB 8/6/1949
12 ALBIN ST
SPRINGFIELD, MA 01778
USE BY 6/6/14
DPT ID: KB19734672
CALL YOUR DOCTOR FOR MEDICAL ADVICE ABOUT SIDE EFFECTS TO THE FDA AT 1-800-FDA-1088
123a
105
104
106

FIG. 14D

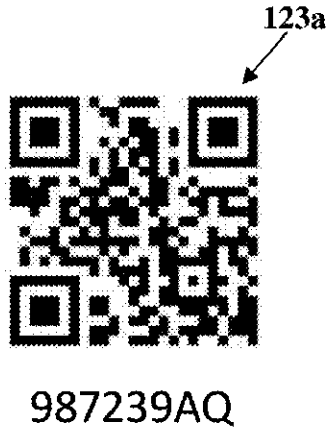

FIG. 15A

FIG. 15B

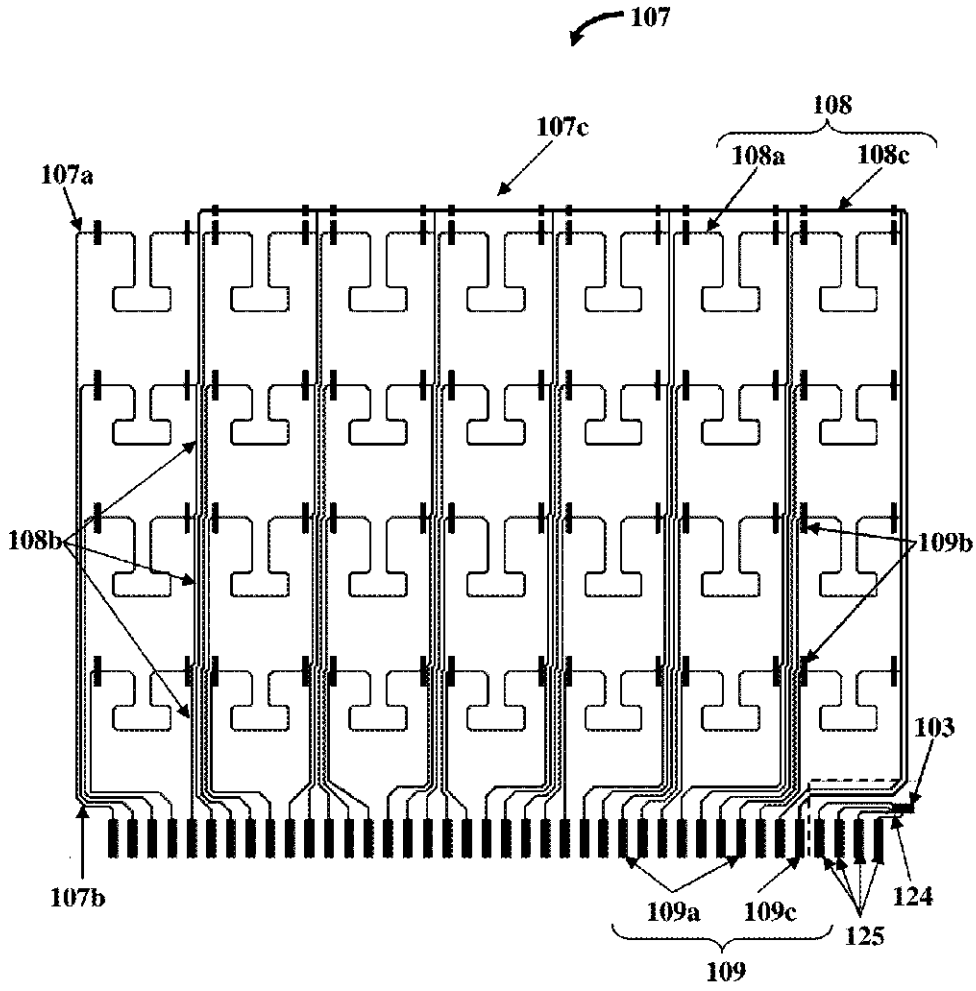
107
108
107c
108a
108c
107a
108b
109b
103
107b
109a
109c
124
125
109

FIG. 16A

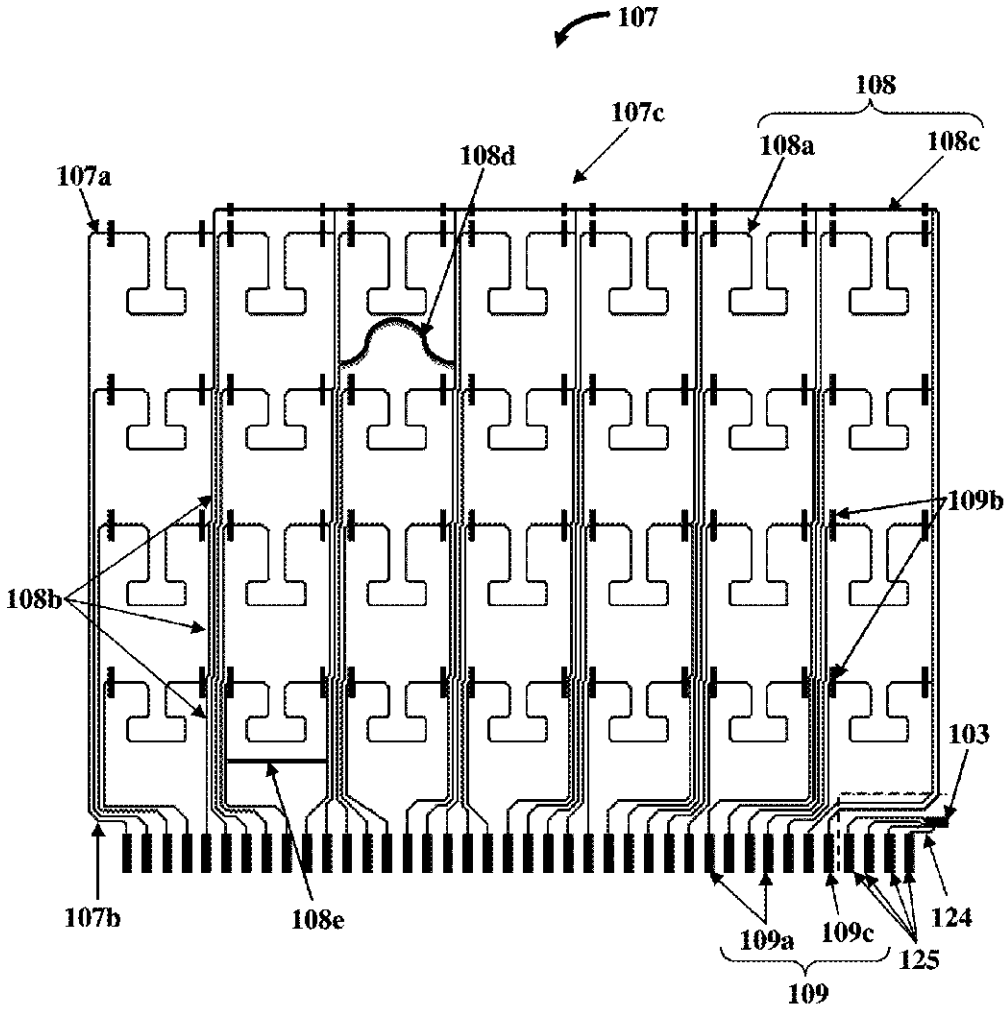
107
108
107c
108a
108c
108d
107a
109b
108b
103
107b
108e
109a
109c
125
124
109

FIG. 16B

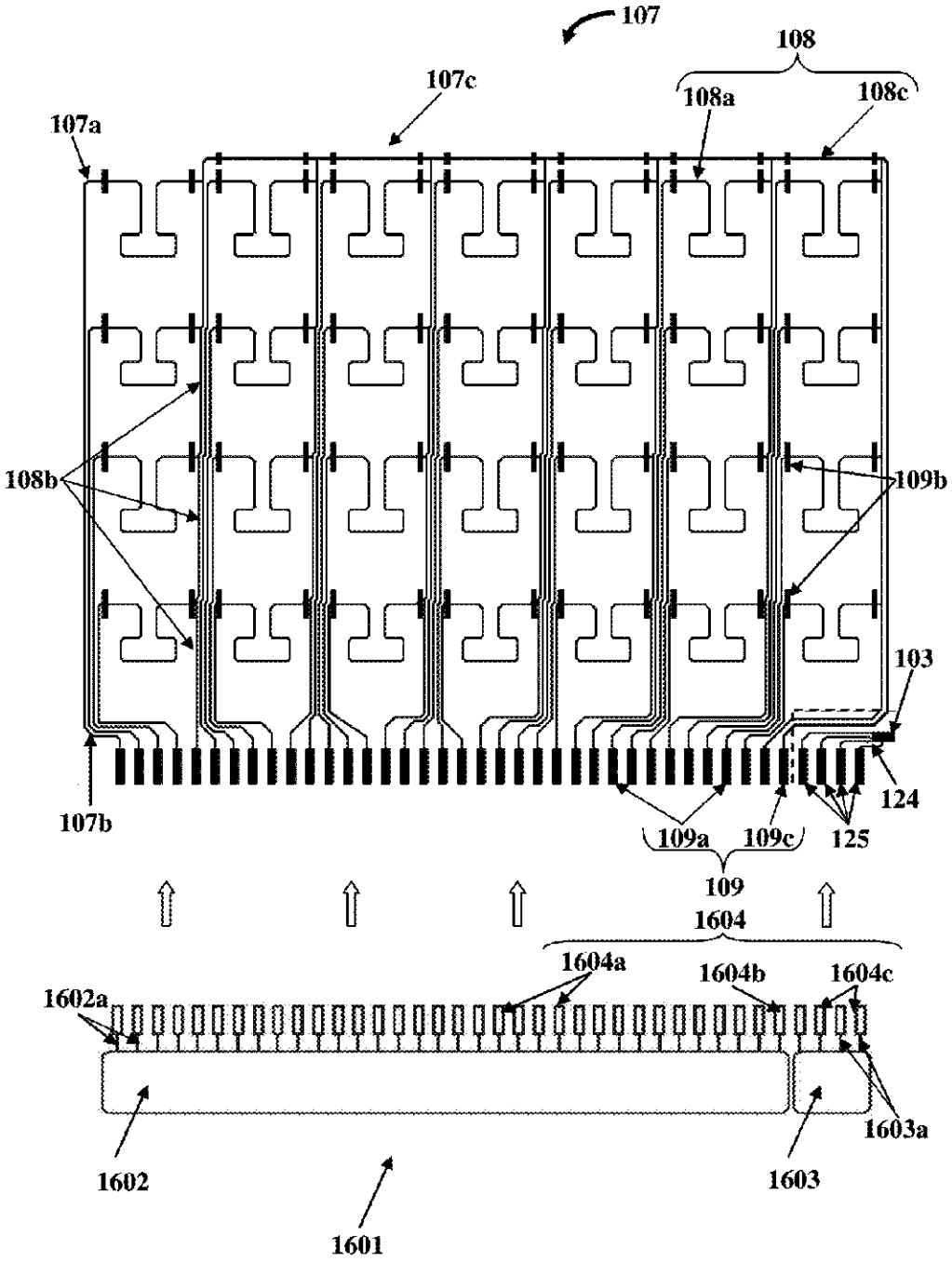
107
108
107c
108a
108c
107a
108b
109b
103
124
107b
109a
109c
125
109
1604
1604a
1604b
1604c
1602a
1603a
1602
1603
1601

FIG. 16C

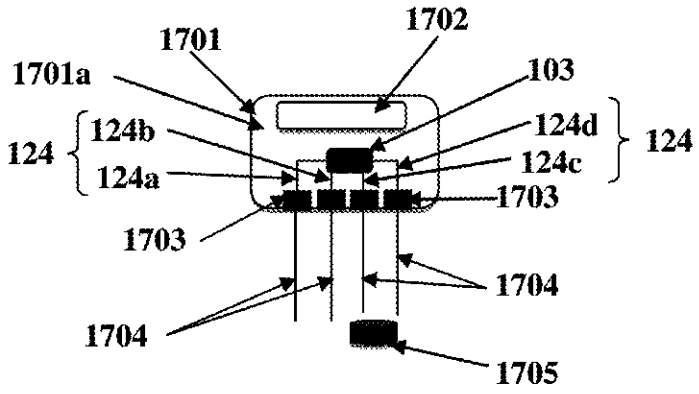

FIG. 17A

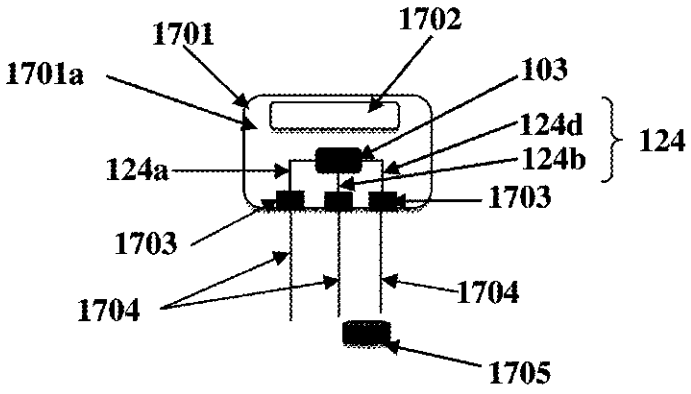

FIG. 17B

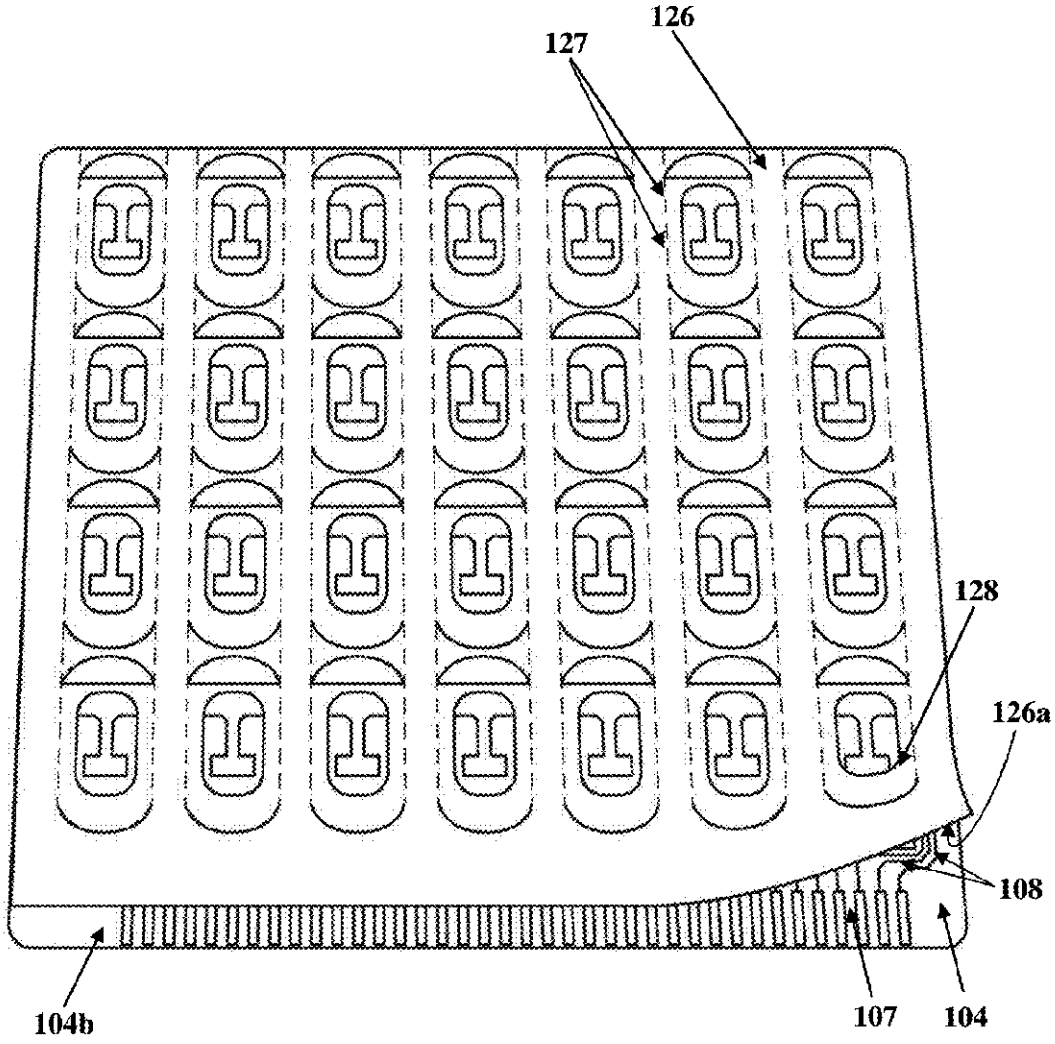

FIG. 18A

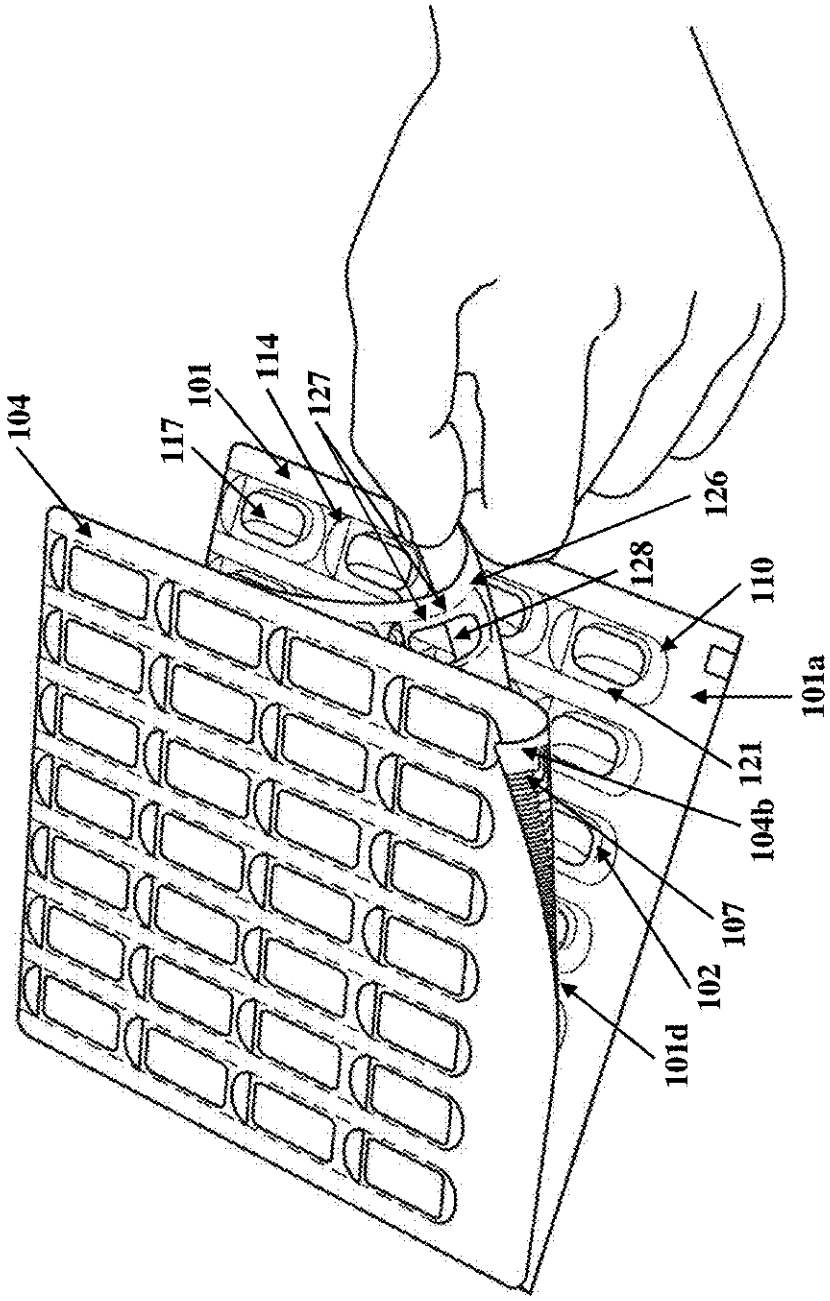

FIG. 18B

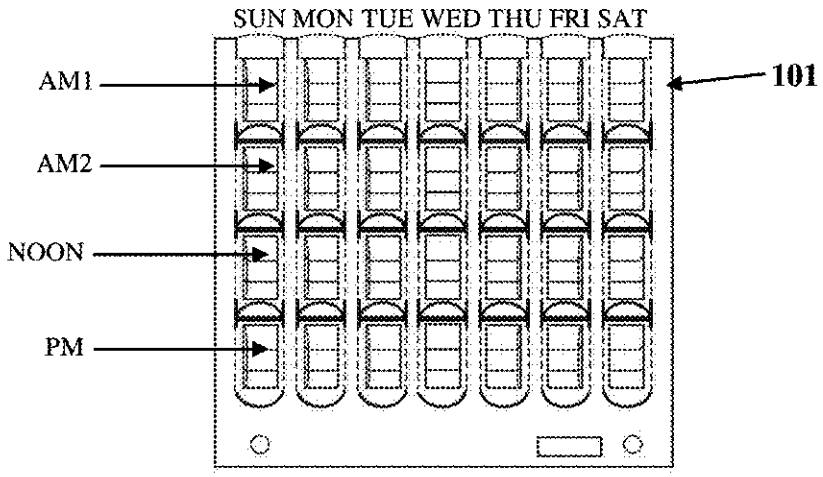

FIG. 19A

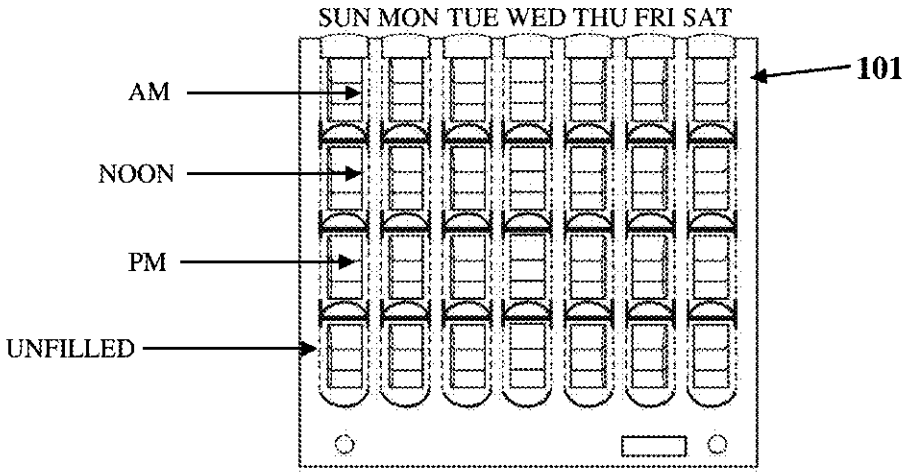

FIG. 19B

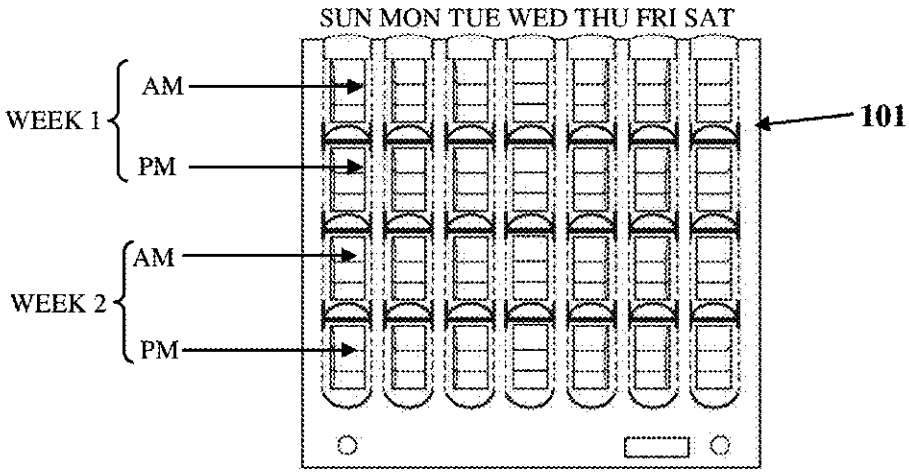

FIG. 19C

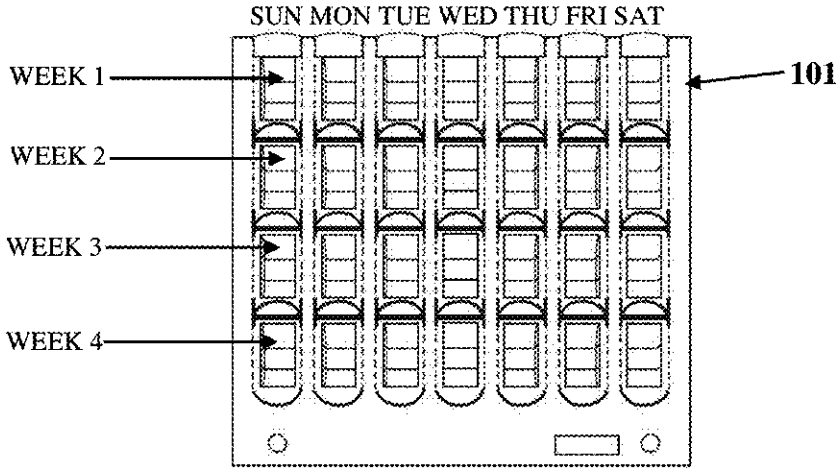

FIG. 19D

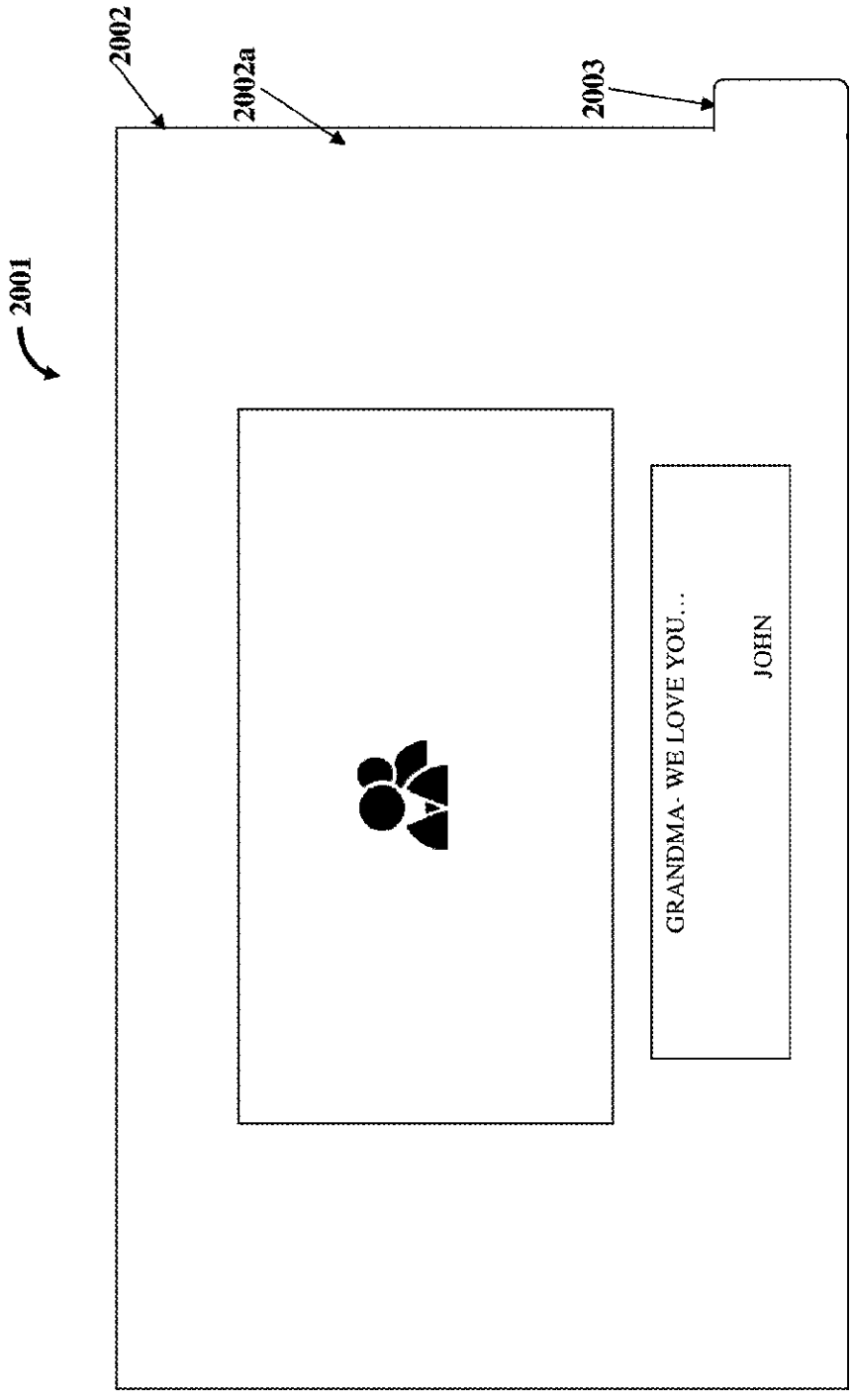

FIG. 20A

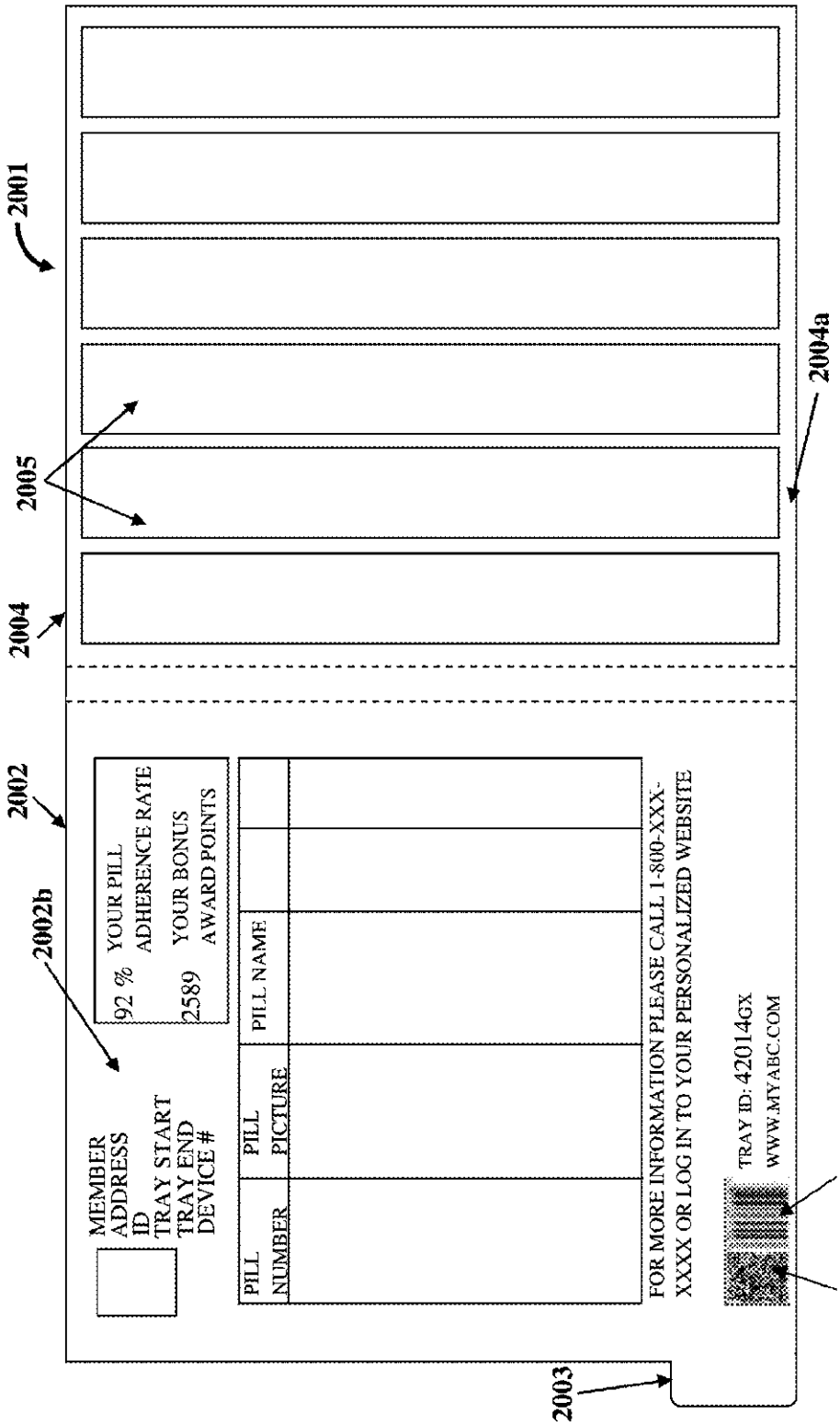
2001
2005
2004
2002
2002b
2004a
2003
123a
123b
MEMBER ADDRESS ID
TRAY START
TRAY END
DEVICE #
92 % YOUR PILL ADHERENCE RATE
2589 YOUR BONUS AWARD POINTS
PILL NUMBER
PILL PICTURE
PILL NAME
FOR MORE INFORMATION PLEASE CALL 1-800-XXX-XXXX OR LOG IN TO YOUR PERSONALIZED WEBSITE
TRAY ID: 42014GX
WWW.MYABC.COM

FIG. 20B

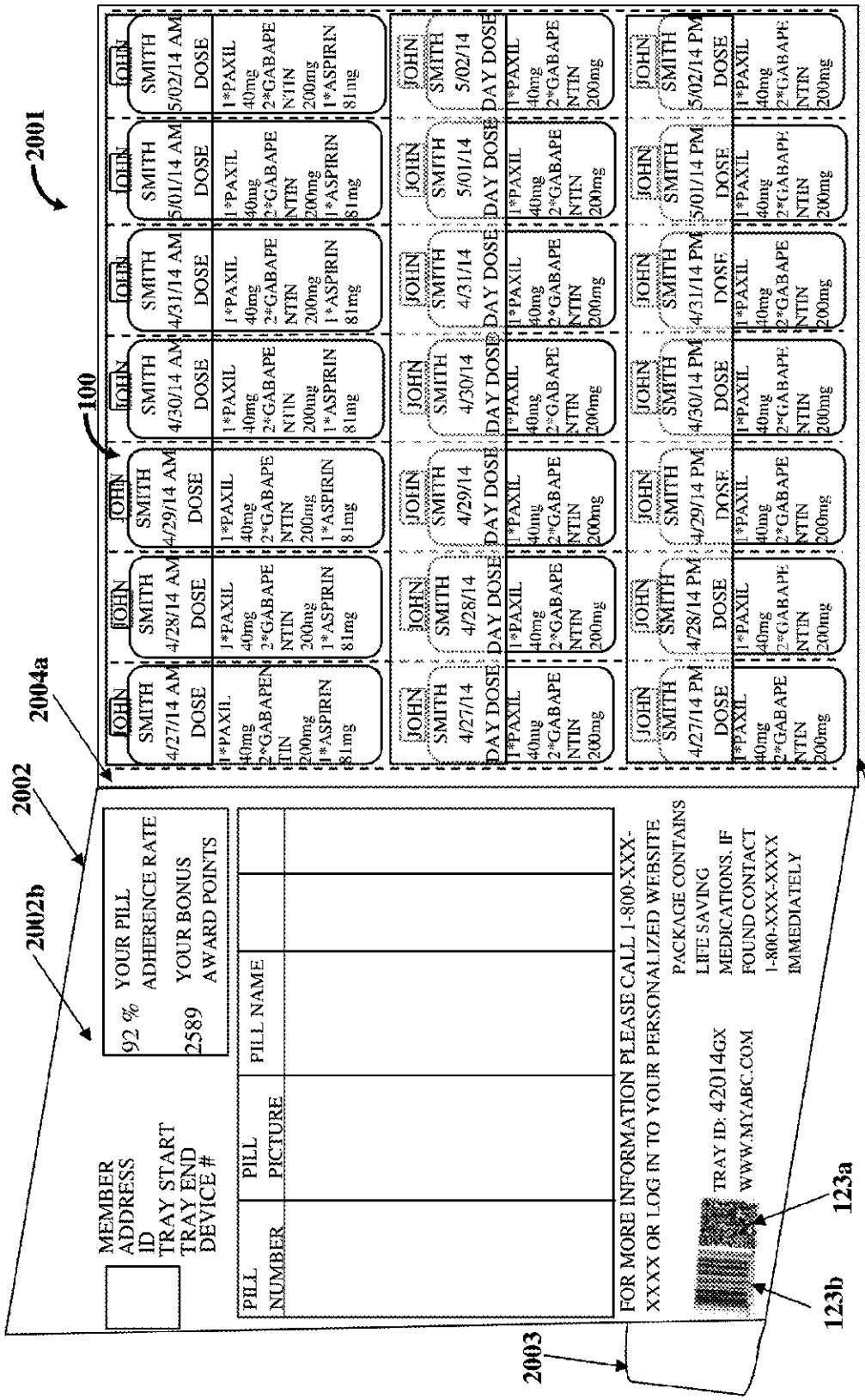
2001
100
2002
2002b
2004a
2004
2003
123a
123b
MEMBER
ADDRESS
ID
TRAY START
TRAY END
DEVICE #
92 %
YOUR PILL
ADHERENCE RATE
2589
YOUR BONUS
AWARD POINTS
PILL
NUMBER
PILL
PICTURE
PILL NAME
FOR MORE INFORMATION PLEASE CALL 1-800-XXX-XXXX OR LOG IN TO YOUR PERSONALIZED WEBSITE
TRAY ID: 42014GX
WWW.MYABC.COM
PACKAGE CONTAINS
LIFE SAVING
MEDICATIONS. IF
FOUND CONTACT
1-800-XXX-XXXX
IMMEDIATELY

FIG. 20C

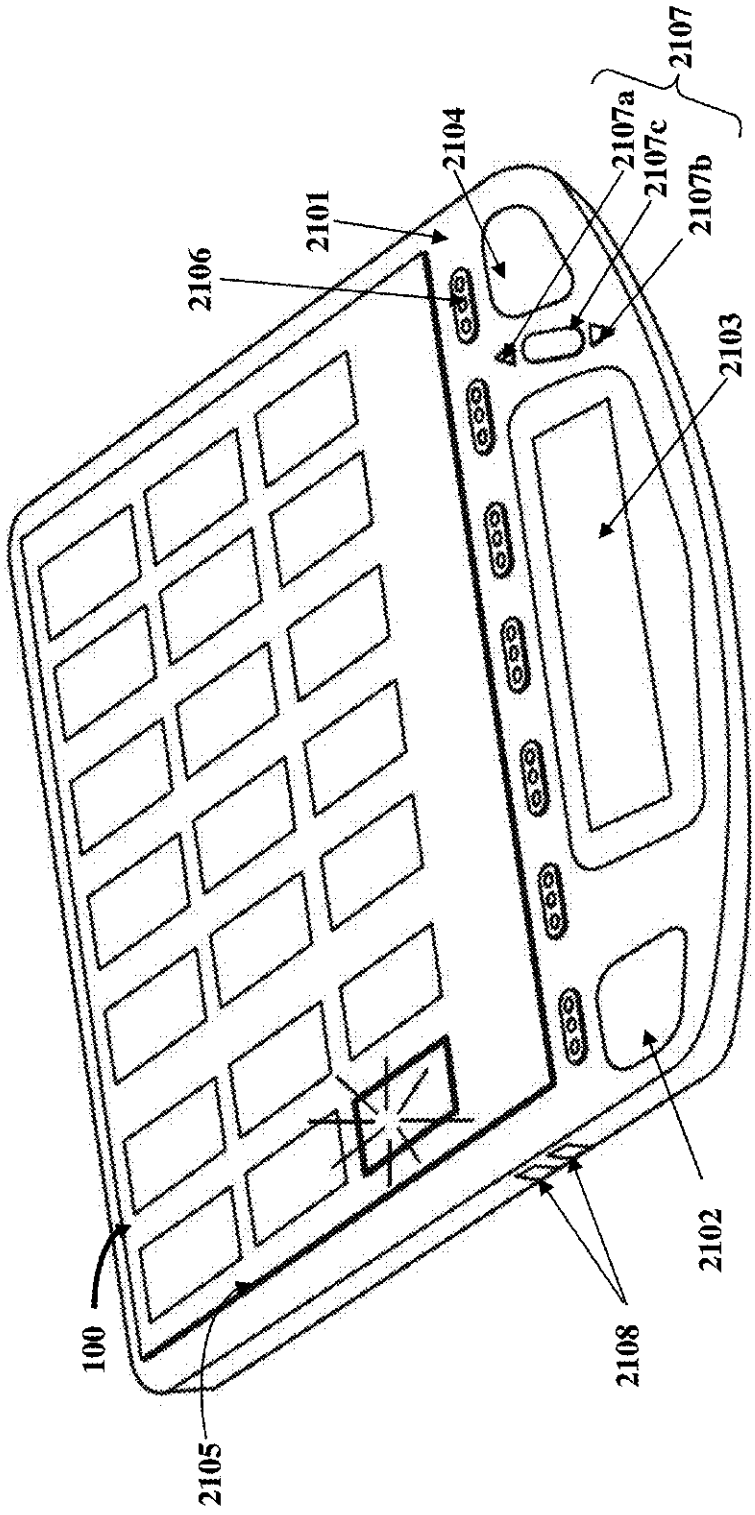
2107
2107a
2107c
2107b
2104
2101
2106
2103
100
2105
2108
2102

FIG. 21A

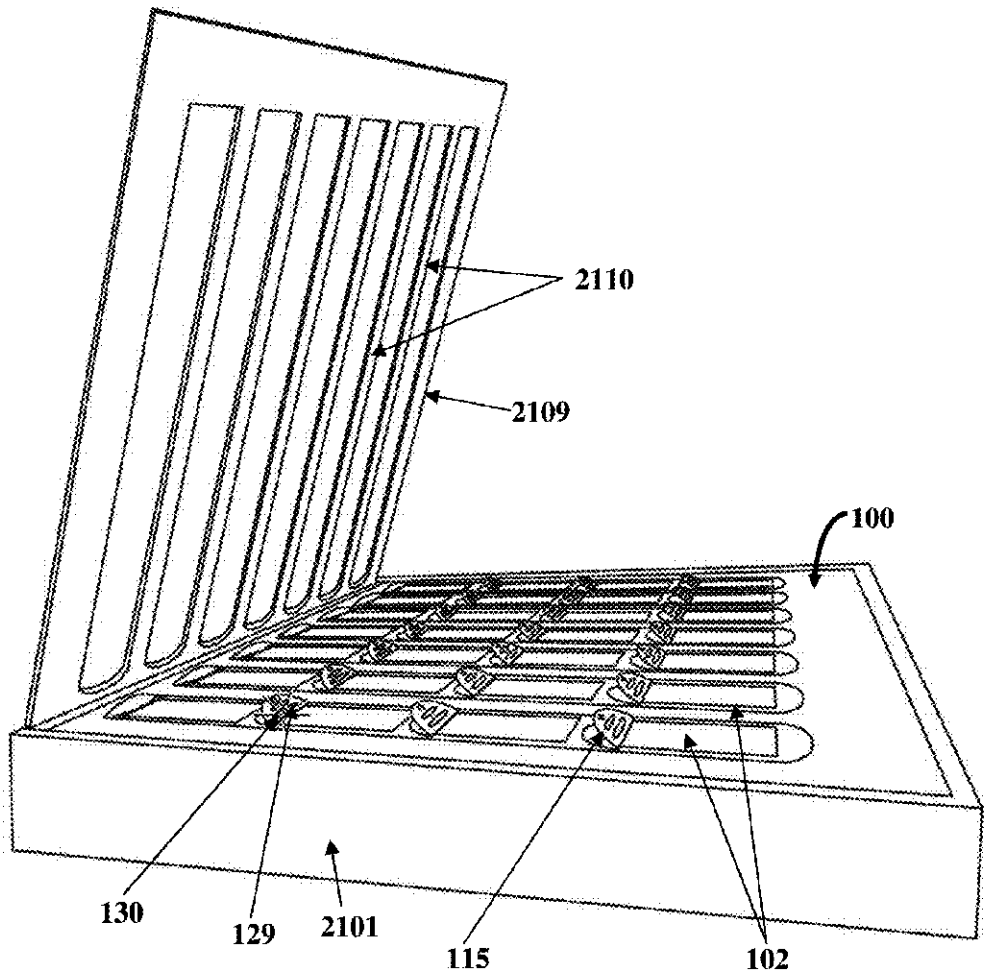

FIG. 21B

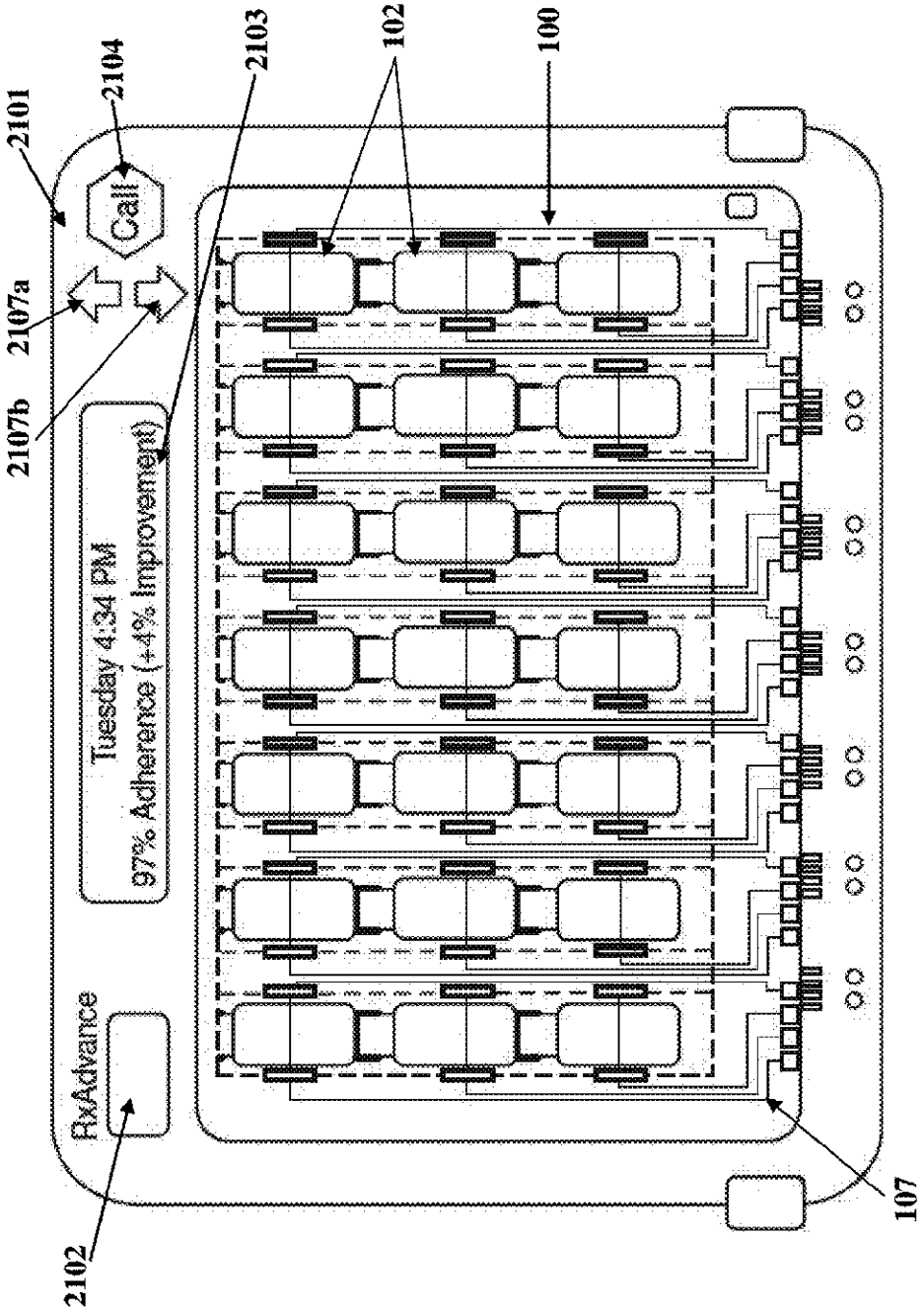
2101
2104
2103
102
100
Call
2107a
2107b
Tuesday 4:34 PM
97% Adherence (+4% Improvement)
RxAdvance
2102
107

FIG. 22

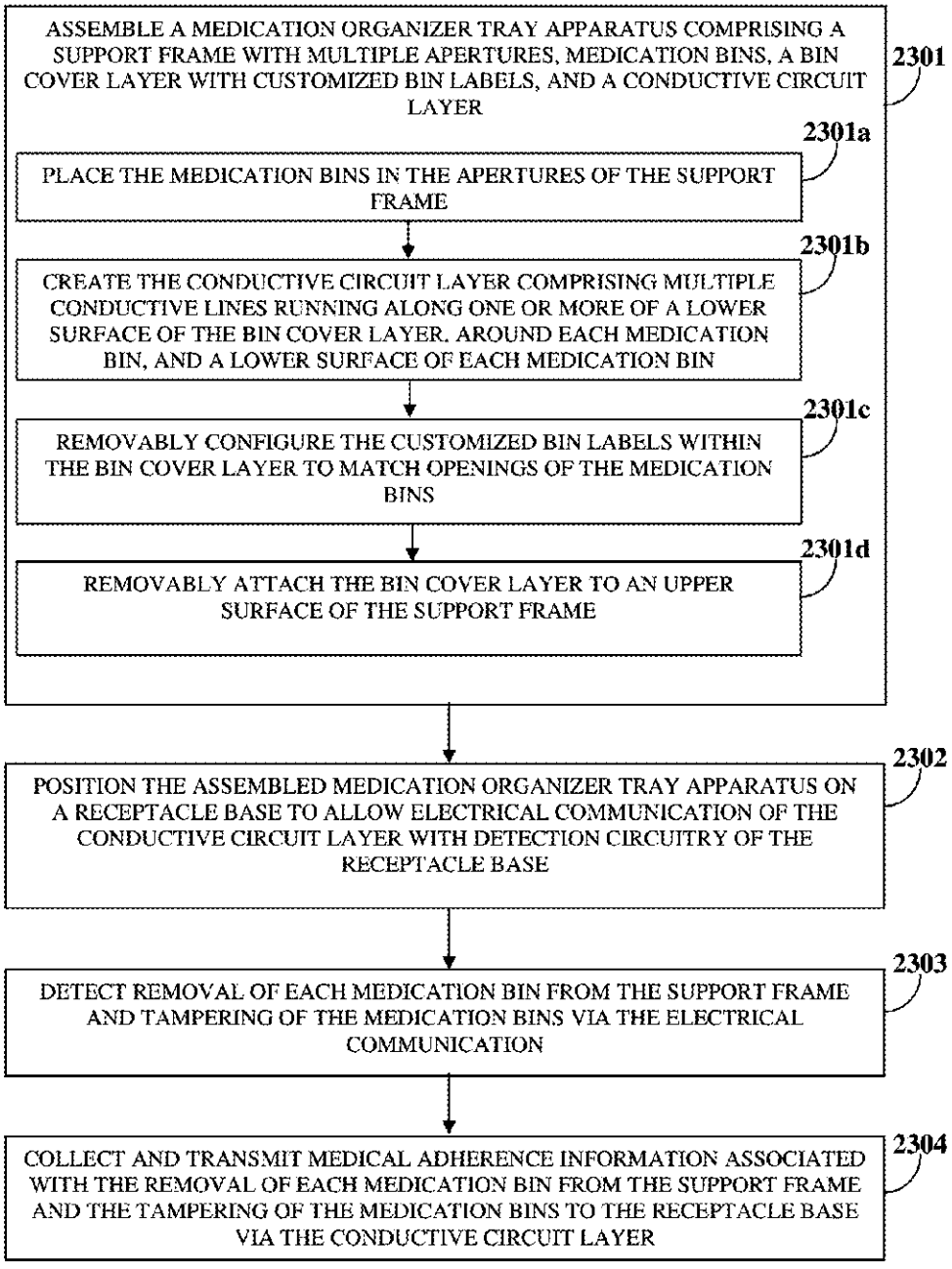
ASSEMBLE A MEDICATION ORGANIZER TRAY APPARATUS COMPRISING A SUPPORT FRAME WITH MULTIPLE APERTURES, MEDICATION BINS, A BIN COVER LAYER WITH CUSTOMIZED BIN LABELS, AND A CONDUCTIVE CIRCUIT LAYER
2301
2301a
PLACE THE MEDICATION BINS IN THE APERTURES OF THE SUPPORT FRAME
2301b
CREATE THE CONDUCTIVE CIRCUIT LAYER COMPRISING MULTIPLE CONDUCTIVE LINES RUNNING ALONG ONE OR MORE OF A LOWER SURFACE OF THE BIN COVER LAYER, AROUND EACH MEDICATION BIN, AND A LOWER SURFACE OF EACH MEDICATION BIN
2301c
REMOVABLY CONFIGURE THE CUSTOMIZED BIN LABELS WITHIN THE BIN COVER LAYER TO MATCH OPENINGS OF THE MEDICATION BINS
2301d
REMOVABLY ATTACH THE BIN COVER LAYER TO AN UPPER SURFACE OF THE SUPPORT FRAME
2302
POSITION THE ASSEMBLED MEDICATION ORGANIZER TRAY APPARATUS ON A RECEPTACLE BASE TO ALLOW ELECTRICAL COMMUNICATION OF THE CONDUCTIVE CIRCUIT LAYER WITH DETECTION CIRCUITRY OF THE RECEPTACLE BASE
2303
DETECT REMOVAL OF EACH MEDICATION BIN FROM THE SUPPORT FRAME AND TAMPERING OF THE MEDICATION BINS VIA THE ELECTRICAL COMMUNICATION
2304
COLLECT AND TRANSMIT MEDICAL ADHERENCE INFORMATION ASSOCIATED WITH THE REMOVAL OF EACH MEDICATION BIN FROM THE SUPPORT FRAME AND THE TAMPERING OF THE MEDICATION BINS TO THE RECEPTACLE BASE VIA THE CONDUCTIVE CIRCUIT LAYER

FIG. 23

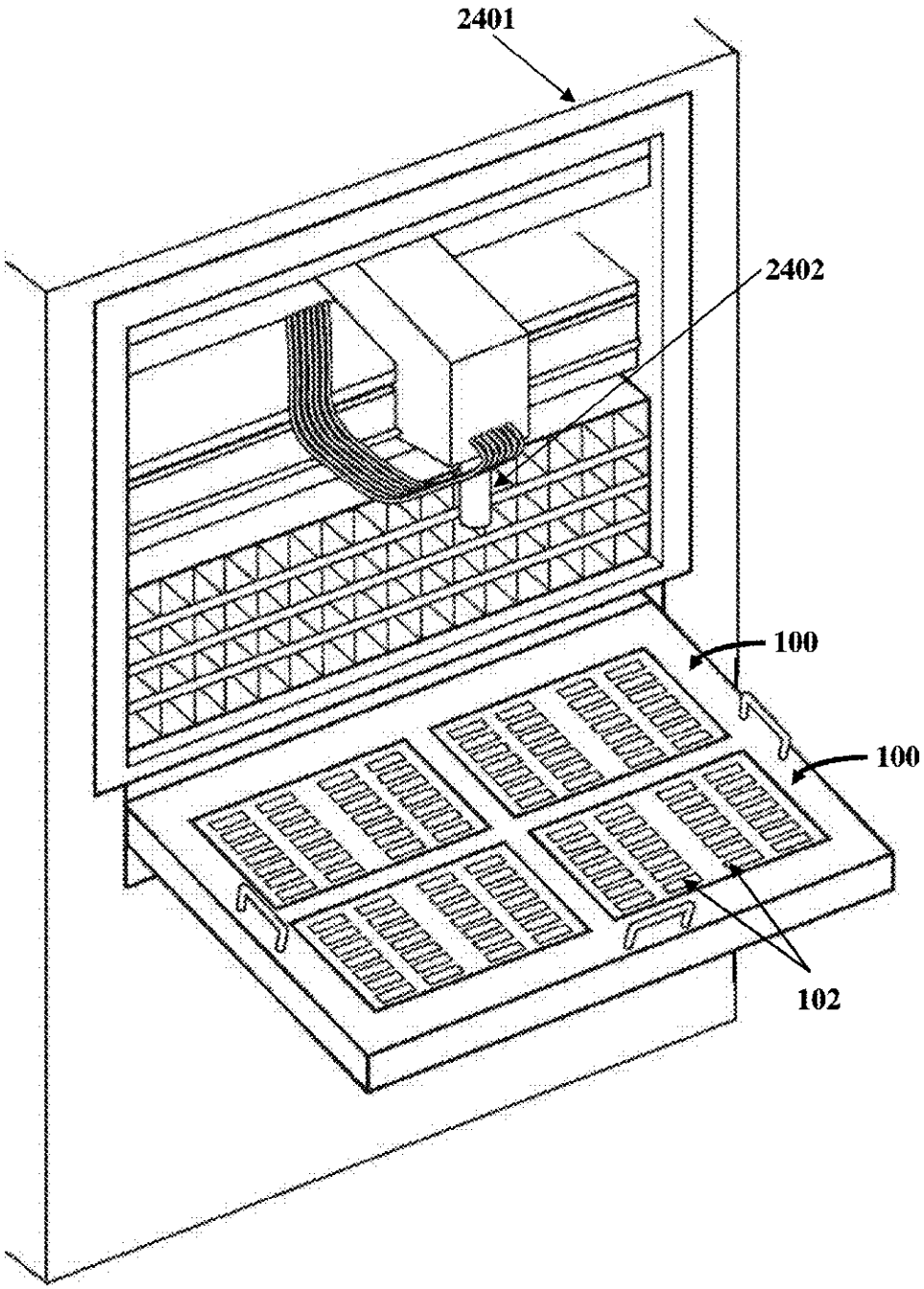

FIG. 24

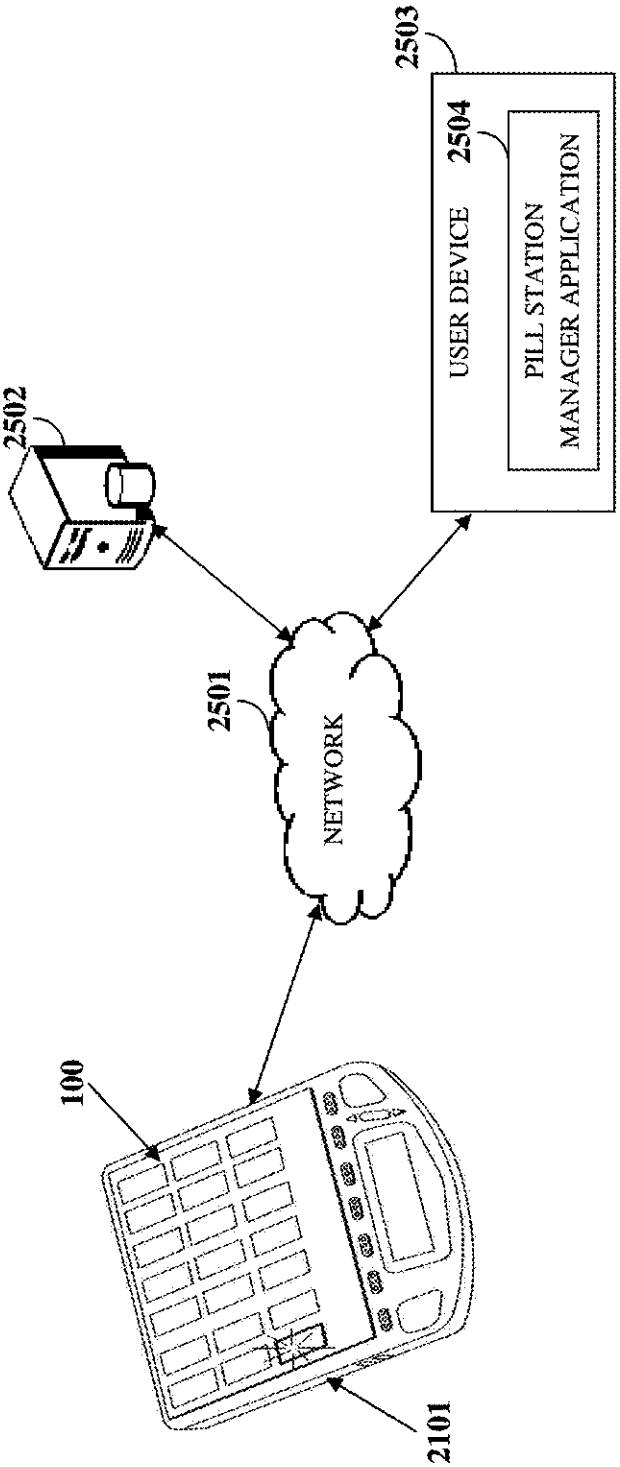
2503
2504
USER DEVICE
PILL STATION MANAGER APPLICATION
2502
2501
NETWORK
100
2101

FIG. 25

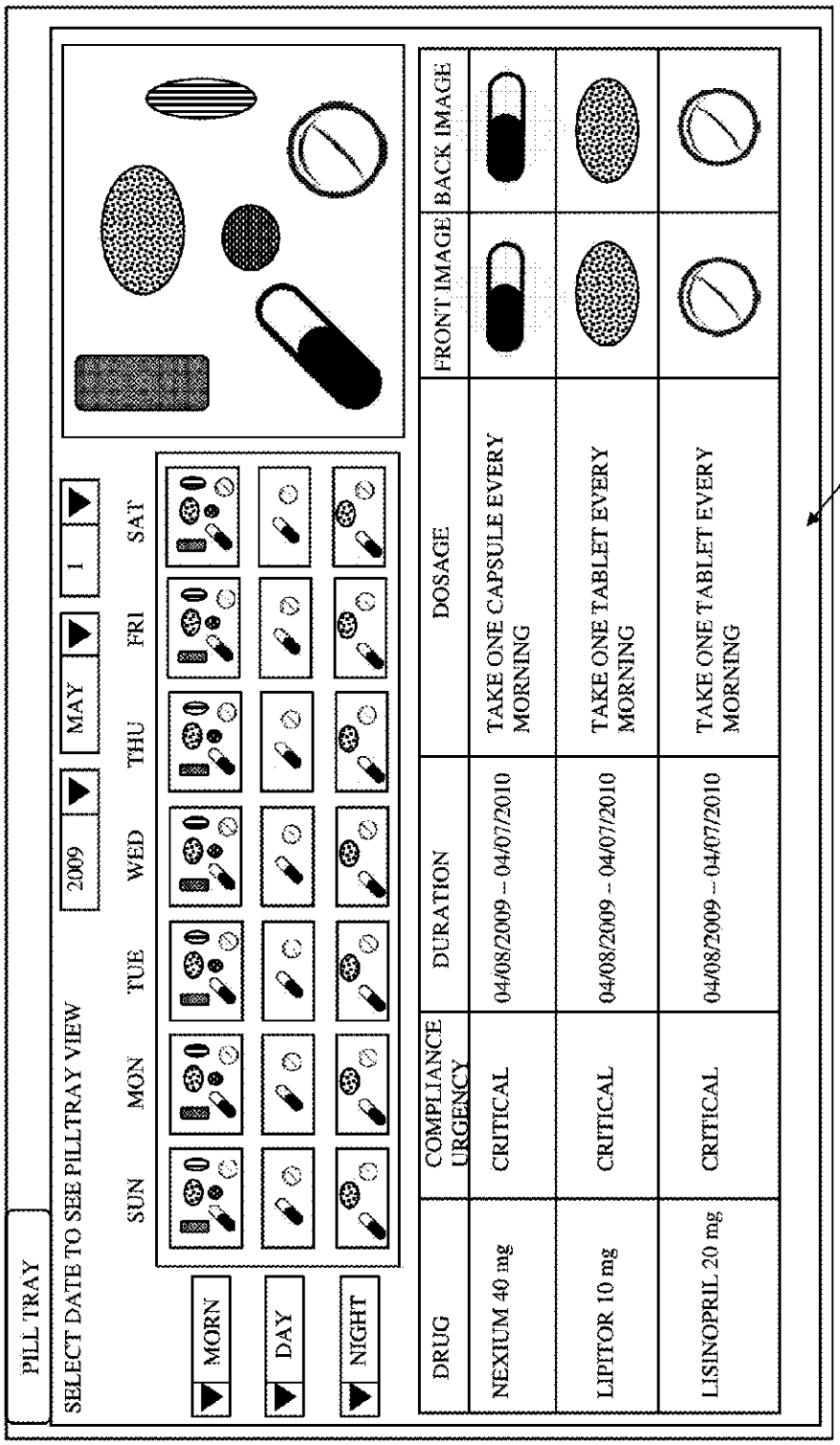
PILL TRAY
SELECT DATE TO SEE PILLTRAY VIEW
2009
MAY
1
SUN
MON
TUE
WED
THU
FRI
SAT
MORN
DAY
NIGHT
DRUG
COMPLIANCE URGENCY
DURATION
DOSAGE
FRONT IMAGE
BACK IMAGE
NEXIUM 40 mg
CRITICAL
04/08/2009 – 04/07/2010
TAKE ONE CAPSULE EVERY MORNING
LIPITOR 10 mg
CRITICAL
04/08/2009 – 04/07/2010
TAKE ONE TABLET EVERY MORNING
LISINOPRIL 20 mg
CRITICAL
04/08/2009 – 04/07/2010
TAKE ONE TABLET EVERY MORNING
2601

FIG. 26

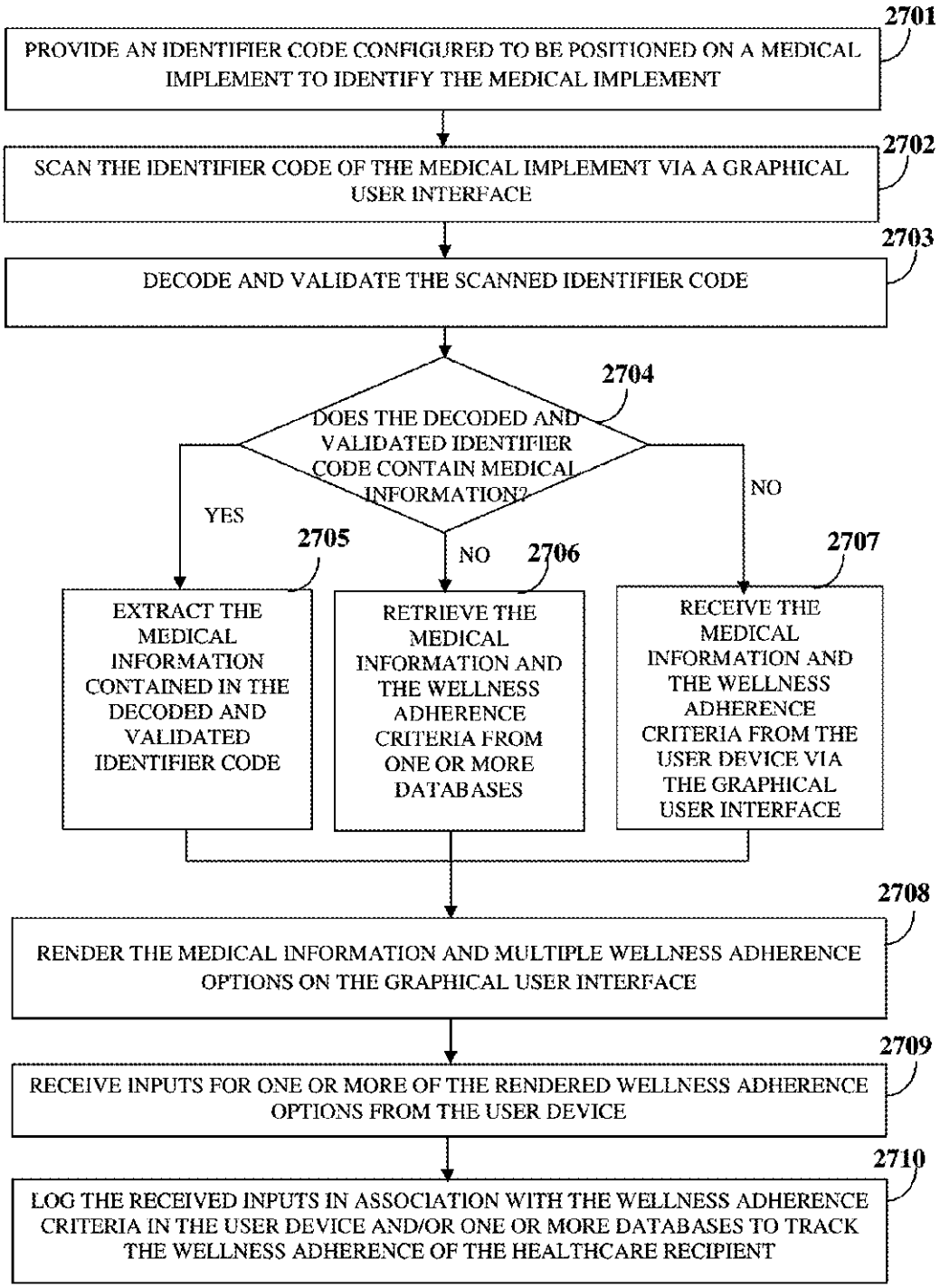
2701
PROVIDE AN IDENTIFIER CODE CONFIGURED TO BE POSITIONED ON A MEDICAL IMPLEMENT TO IDENTIFY THE MEDICAL IMPLEMENT
2702
SCAN THE IDENTIFIER CODE OF THE MEDICAL IMPLEMENT VIA A GRAPHICAL USER INTERFACE
2703
DECODE AND VALIDATE THE SCANNED IDENTIFIER CODE
2704
DOES THE DECODED AND VALIDATED IDENTIFIER CODE CONTAIN MEDICAL INFORMATION?
YES
NO
NO
2705
EXTRACT THE MEDICAL INFORMATION CONTAINED IN THE DECODED AND VALIDATED IDENTIFIER CODE
2706
RETRIEVE THE MEDICAL INFORMATION AND THE WELLNESS ADHERENCE CRITERIA FROM ONE OR MORE DATABASES
2707
RECEIVE THE MEDICAL INFORMATION AND THE WELLNESS ADHERENCE CRITERIA FROM THE USER DEVICE VIA THE GRAPHICAL USER INTERFACE
2708
RENDER THE MEDICAL INFORMATION AND MULTIPLE WELLNESS ADHERENCE OPTIONS ON THE GRAPHICAL USER INTERFACE
2709
RECEIVE INPUTS FOR ONE OR MORE OF THE RENDERED WELLNESS ADHERENCE OPTIONS FROM THE USER DEVICE
2710
LOG THE RECEIVED INPUTS IN ASSOCIATION WITH THE WELLNESS ADHERENCE CRITERIA IN THE USER DEVICE AND/OR ONE OR MORE DATABASES TO TRACK THE WELLNESS ADHERENCE OF THE HEALTHCARE RECIPIENT

FIG. 27

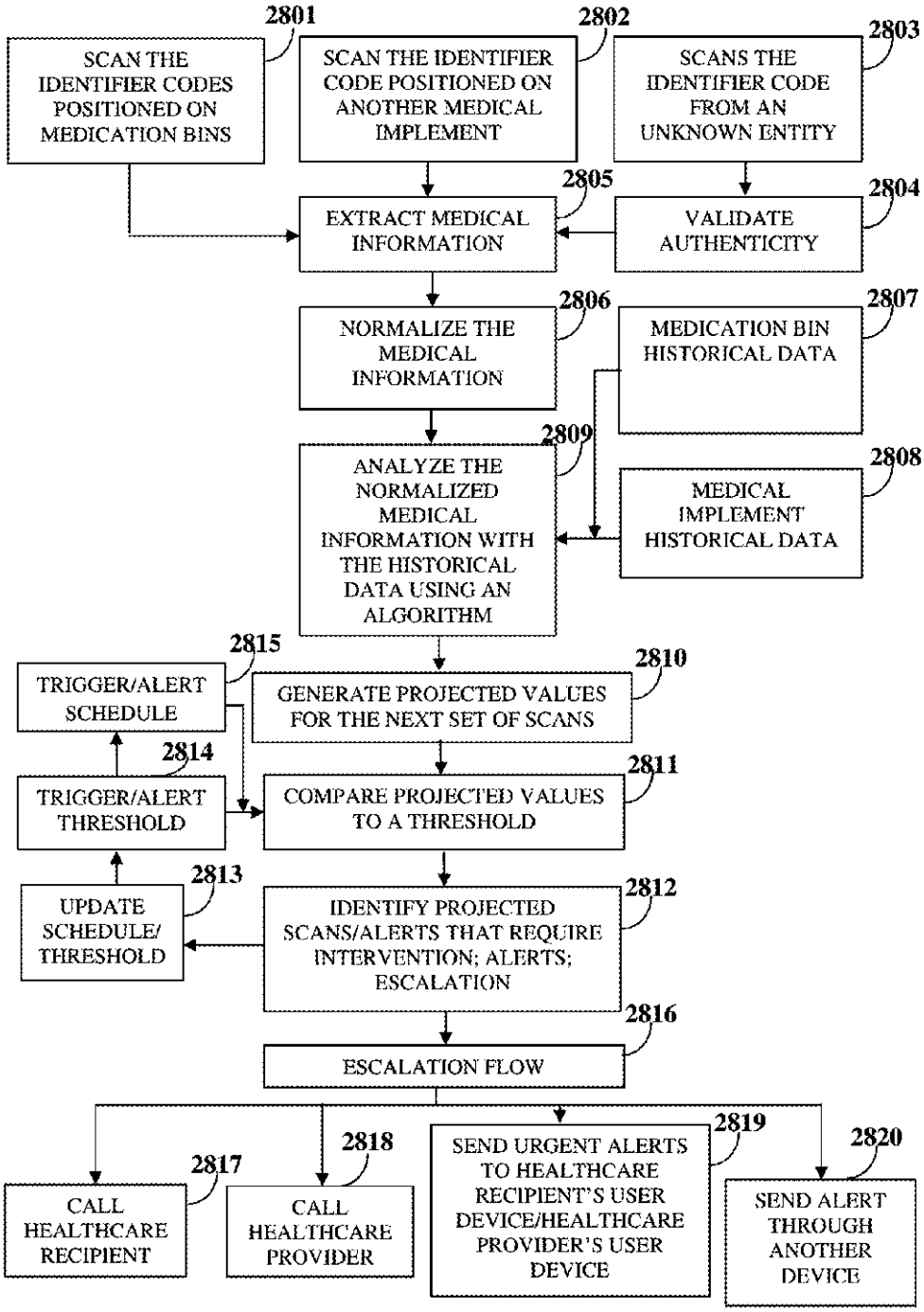
2801
SCAN THE IDENTIFIER CODES POSITIONED ON MEDICATION BINS
2802
SCAN THE IDENTIFIER CODE POSITIONED ON ANOTHER MEDICAL IMPLEMENT
2803
SCANS THE IDENTIFIER CODE FROM AN UNKNOWN ENTITY
2805
EXTRACT MEDICAL INFORMATION
2804
VALIDATE AUTHENTICITY
2806
NORMALIZE THE MEDICAL INFORMATION
2807
MEDICATION BIN HISTORICAL DATA
2809
ANALYZE THE NORMALIZED MEDICAL INFORMATION WITH THE HISTORICAL DATA USING AN ALGORITHM
2808
MEDICAL IMPLEMENT HISTORICAL DATA
2815
TRIGGER/ALERT SCHEDULE
2810
GENERATE PROJECTED VALUES FOR THE NEXT SET OF SCANS
2814
TRIGGER/ALERT THRESHOLD
2811
COMPARE PROJECTED VALUES TO A THRESHOLD
2813
UPDATE SCHEDULE/ THRESHOLD
2812
IDENTIFY PROJECTED SCANS/ALERTS THAT REQUIRE INTERVENTION; ALERTS; ESCALATION
2816
ESCALATION FLOW
2817
CALL HEALTHCARE RECIPIENT
2818
CALL HEALTHCARE PROVIDER
2819
SEND URGENT ALERTS TO HEALTHCARE RECIPIENT'S USER DEVICE/HEALTHCARE PROVIDER'S USER DEVICE
2820
SEND ALERT THROUGH ANOTHER DEVICE

FIG. 28

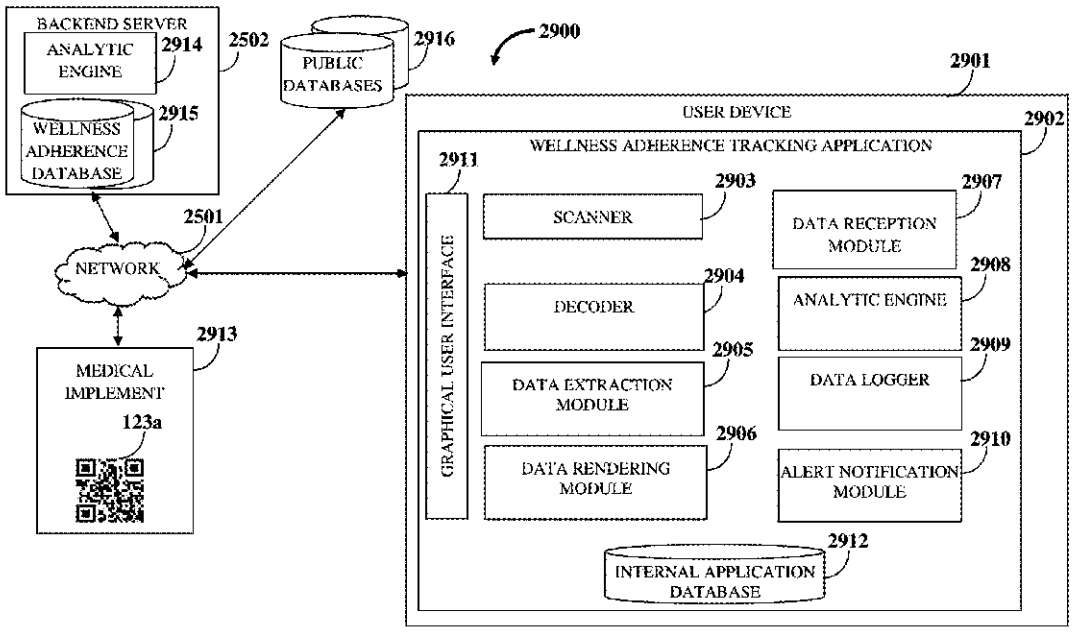
BACKEND SERVER
ANALYTIC ENGINE
2914
2502
WELLNESS ADHERENCE DATABASE
2915
PUBLIC DATABASES
2916
2900
2901
USER DEVICE
2902
WELLNESS ADHERENCE TRACKING APPLICATION
2911
GRAPHICAL USER INTERFACE
2903
SCANNER
2907
DATA RECEPTION MODULE
2908
ANALYTIC ENGINE
2904
DECODER
2905
DATA EXTRACTION MODULE
2909
DATA LOGGER
2906
DATA RENDERING MODULE
2910
ALERT NOTIFICATION MODULE
2912
INTERNAL APPLICATION DATABASE
2501
NETWORK
2913
MEDICAL IMPLEMENT
123a

FIG. 29

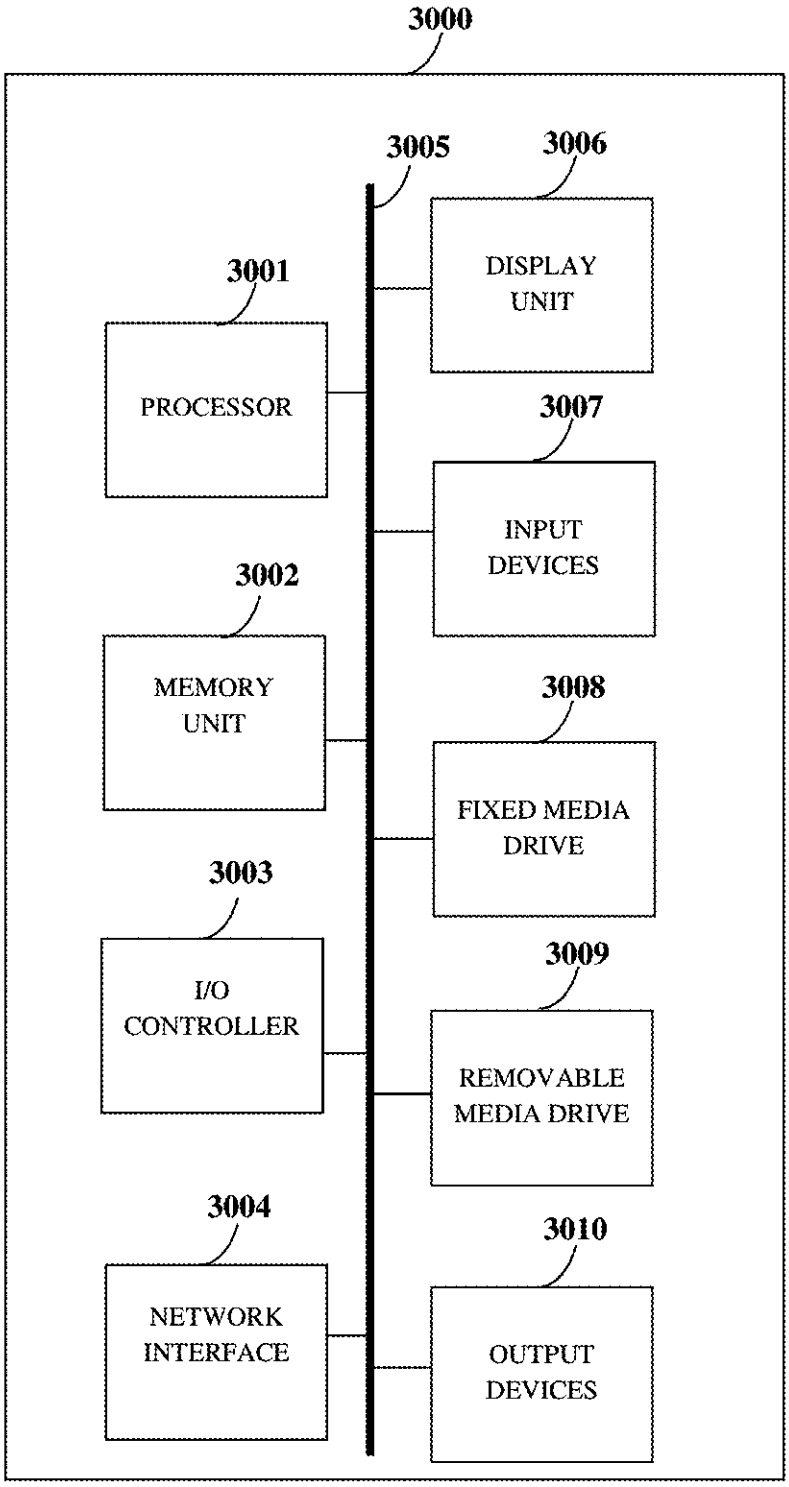
3000
3005
3006
DISPLAY UNIT
3001
PROCESSOR
3007
INPUT DEVICES
3002
MEMORY UNIT
3008
FIXED MEDIA DRIVE
3003
I/O CONTROLLER
3009
REMOVABLE MEDIA DRIVE
3004
NETWORK INTERFACE
3010
OUTPUT DEVICES

FIG. 30

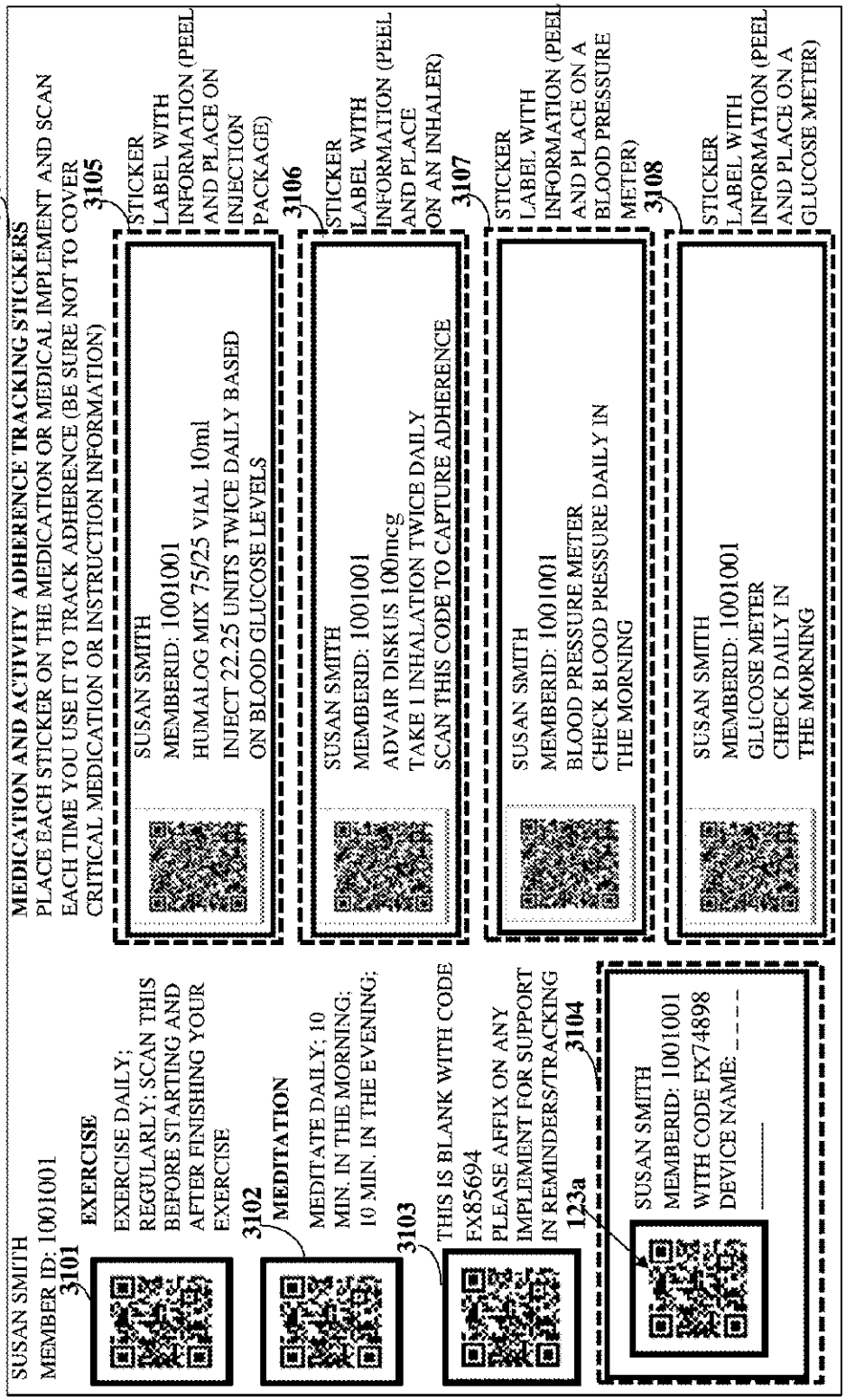
3100
SUSAN SMITH
MEMBER ID: 1001001
3101
EXERCISE
EXERCISE DAILY; REGULARLY; SCAN THIS BEFORE STARTING AND AFTER FINISHING YOUR EXERCISE
3102
MEDITATION
MEDITATE DAILY; 10 MIN. IN THE MORNING; 10 MIN. IN THE EVENING;
3103
THIS IS BLANK WITH CODE FX85694
PLEASE AFFIX ON ANY IMPLEMENT FOR SUPPORT IN REMINDERS/TRACKING
123a
3104
SUSAN SMITH
MEMBERID: 1001001
WITH CODE FX74898
DEVICE NAME: _ _ _ _
_____
MEDICATION AND ACTIVITY ADHERENCE TRACKING STICKERS
PLACE EACH STICKER ON THE MEDICATION OR MEDICAL IMPLEMENT AND SCAN EACH TIME YOU USE IT TO TRACK ADHERENCE (BE SURE NOT TO COVER CRITICAL MEDICATION OR INSTRUCTION INFORMATION)
3105
STICKER LABEL WITH INFORMATION (PEEL AND PLACE ON INJECTION PACKAGE)
SUSAN SMITH
MEMBERID: 1001001
HUMALOG MIX 75/25 VIAL 10ml
INJECT 22.25 UNITS TWICE DAILY BASED ON BLOOD GLUCOSE LEVELS
3106
STICKER LABEL WITH INFORMATION (PEEL AND PLACE ON AN INHALER)
SUSAN SMITH
MEMBERID: 1001001
ADVAIR DISKUS 100mcg
TAKE 1 INHALATION TWICE DAILY
SCAN THIS CODE TO CAPTURE ADHERENCE
3107
STICKER LABEL WITH INFORMATION (PEEL AND PLACE ON A BLOOD PRESSURE METER)
SUSAN SMITH
MEMBERID: 1001001
BLOOD PRESSURE METER
CHECK BLOOD PRESSURE DAILY IN THE MORNING
3108
STICKER LABEL WITH INFORMATION (PEEL AND PLACE ON A GLUCOSE METER)
SUSAN SMITH
MEMBERID: 1001001
GLUCOSE METER
CHECK DAILY IN THE MORNING

FIG. 31

DATA CONFIGURATION	MAX. # OF CHARACTERS	EXAMPLE
DATE	10	08/04/14
DOSE TIME	10	NIGHT
NAME	30	SUSAN SMITH
TOTAL NUMBER OF MEDICATIONS	2	3
NAME OF ALL MEDICATIONS (ASSUME MAXIMUM OF 20 MEDICATIONS WITH 20 CHARACTERS IN EACH = 400 CHARACTERS)	400 (20 MEDS X 20 CHAR PER MEDS)	1 FERROUS SULFATE 325 mg 1 ASPIRIN 81 mg 1 DALIRESP 500 mcg
MOTIVATIONAL MESSAGE	75	WE APPRECIATE YOU TAKING YOUR MEDICATIONS ON TIME…
AWARD MESSAGE	200	YOU JUST WON $100! CLICK TO VISIT THE SITE TO REDEEM YOUR AWARD; WWW.WELLNESSADHERENCETRACKING.AWARD.785949
PROMOTIONAL MESSAGES	100	WOULD YOU LIKE TO KNOW THE BENEFITS OF TAKING YOUR DAILY ASPIRIN? CLICK HERE.
HOW TO TAKE MEDICATION MESSAGE	100	TAKE FERROUS SULFATE WITH FOOD AND WATER
ENCRYPTED ID NUMBER	20	785949 ENCRYPTED TO 873987508
EXPANSION (STICKER TYPE, ETC.)	200	
TOTAL	1147 CHARACTERS	

FIG. 32

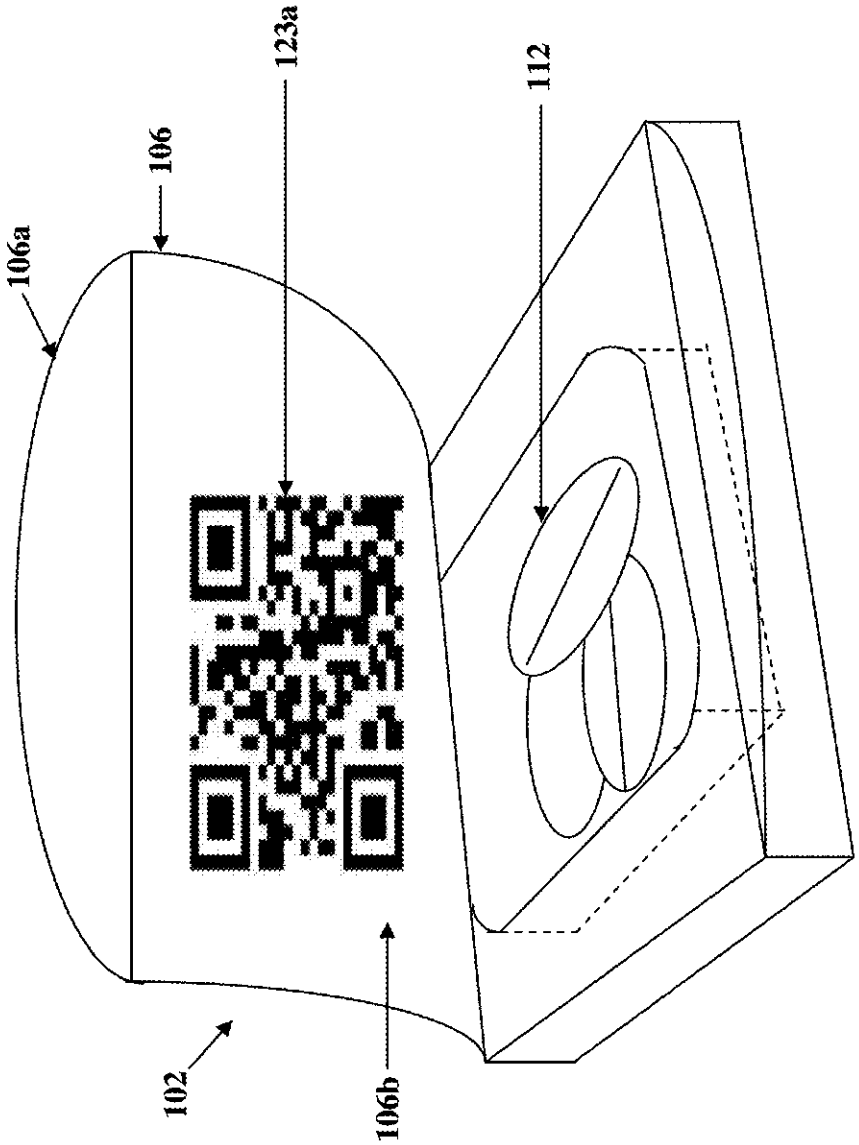

FIG. 33A

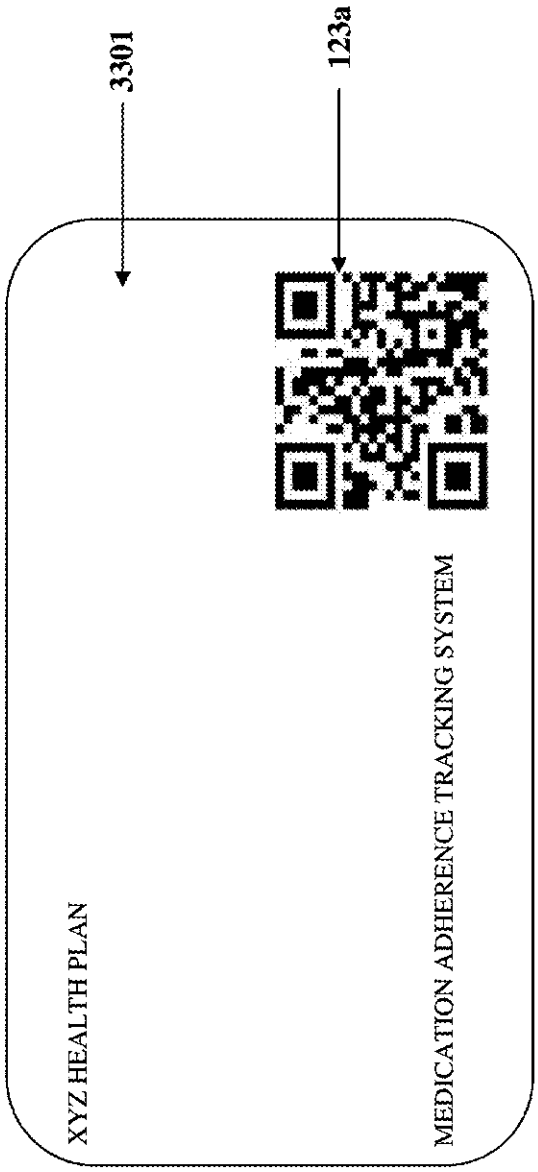
3301
123a
XYZ HEALTH PLAN
MEDICATION ADHERENCE TRACKING SYSTEM

FIG. 33B

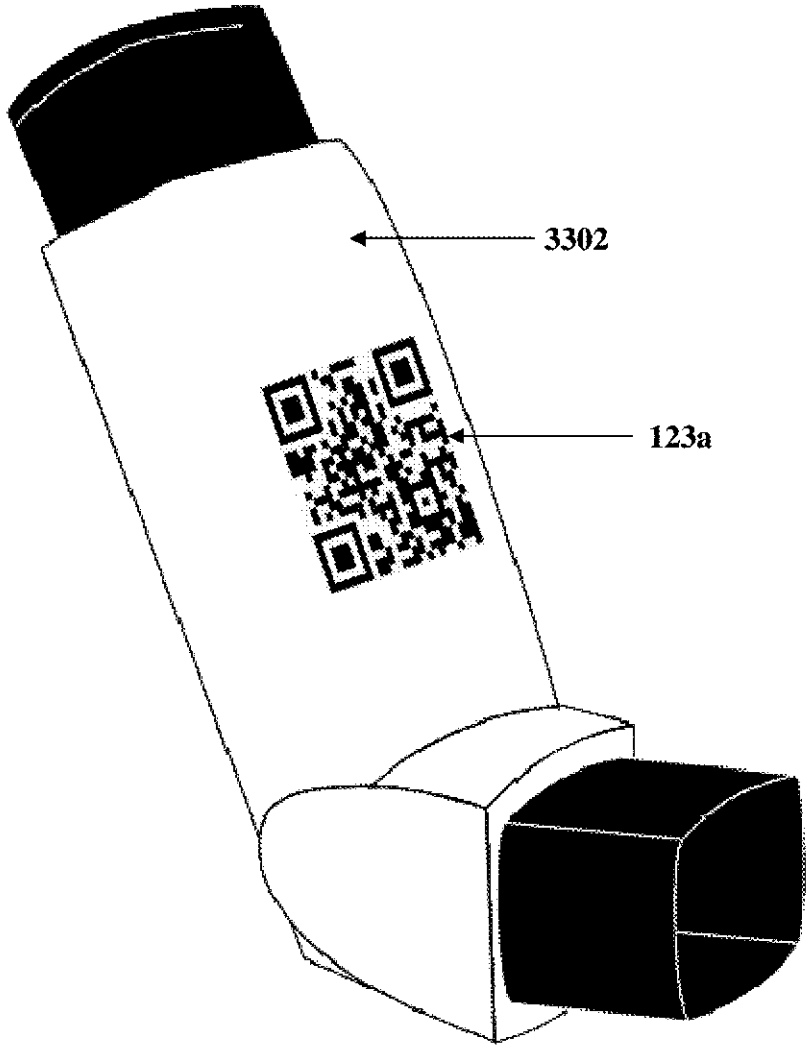

FIG. 33C

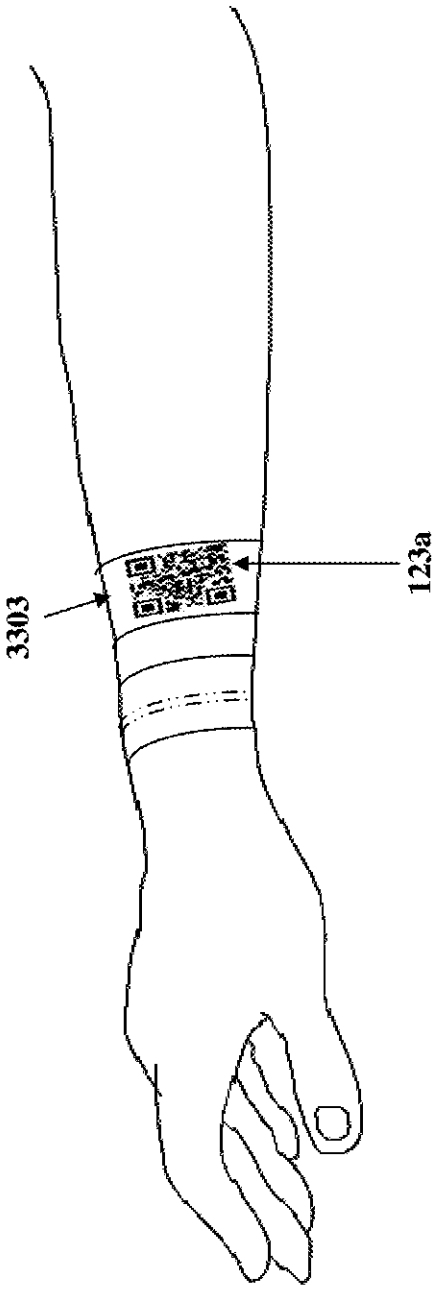

FIG. 33D

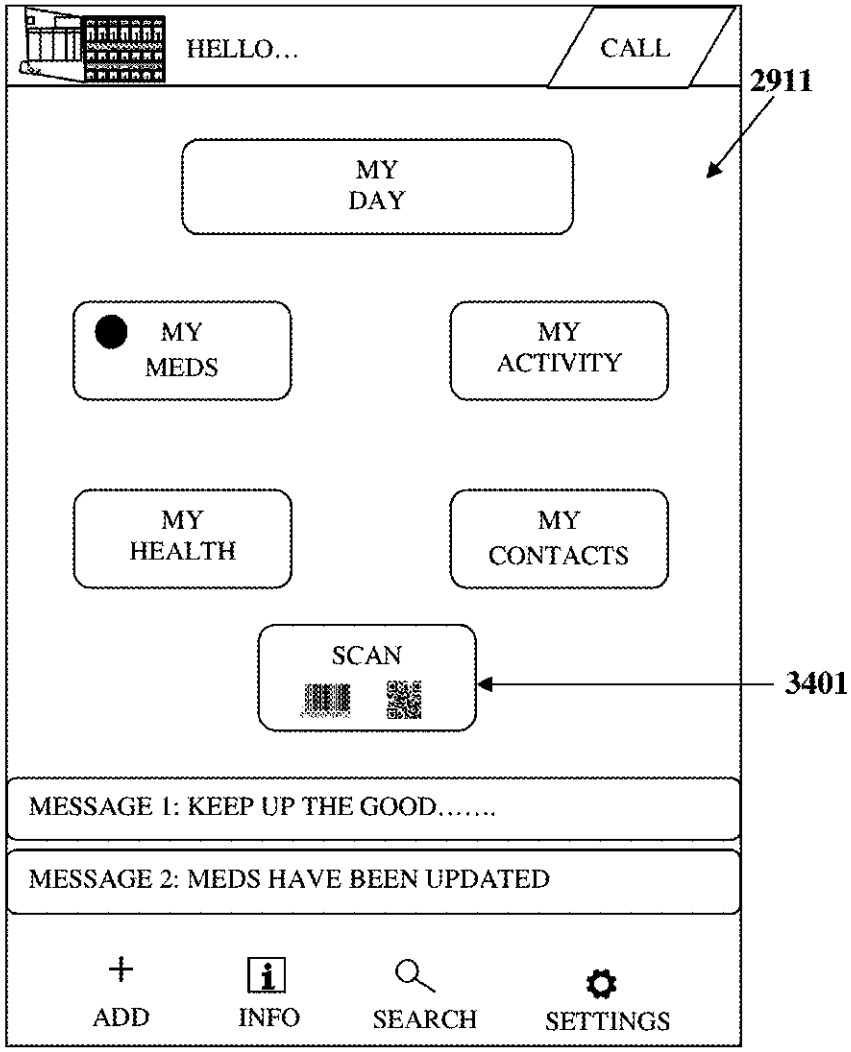
HELLO…
CALL
2911
MY DAY
MY MEDS
MY ACTIVITY
MY HEALTH
MY CONTACTS
SCAN
3401
MESSAGE 1: KEEP UP THE GOOD…….
MESSAGE 2: MEDS HAVE BEEN UPDATED
ADD
INFO
SEARCH
SETTINGS

FIG. 34A

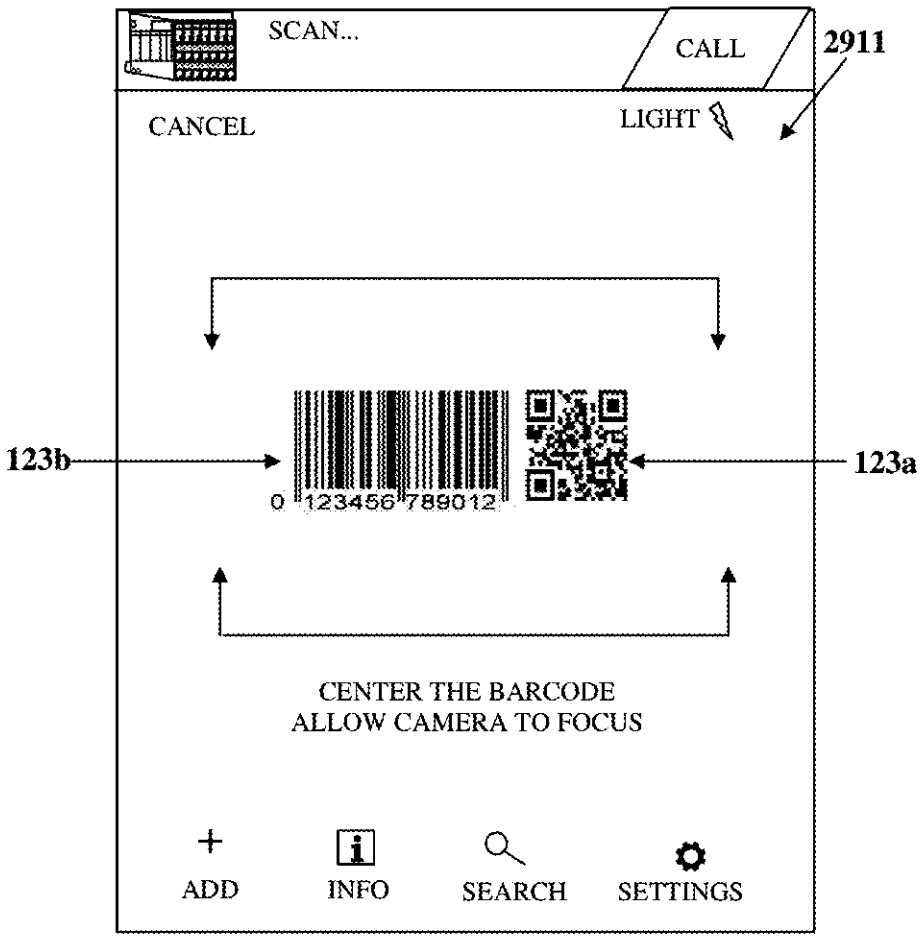
SCAN...
CALL
2911
CANCEL
LIGHT
123b
123a
0 123456 789012
CENTER THE BARCODE
ALLOW CAMERA TO FOCUS
ADD
INFO
SEARCH
SETTINGS

FIG. 34B

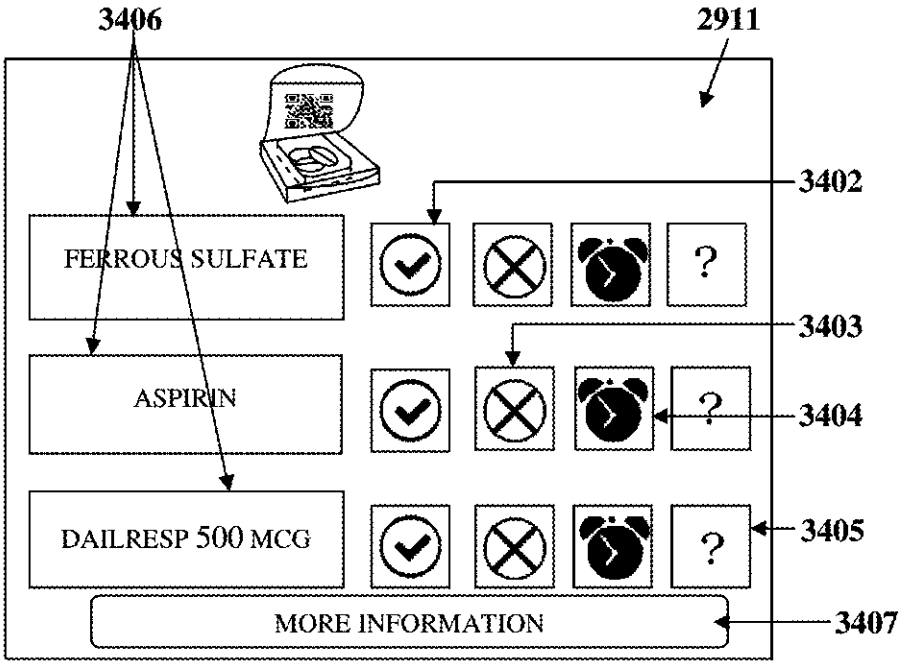
3406
2911
3402
FERROUS SULFATE
?
3403
ASPIRIN
?
3404
DAILRESP 500 MCG
?
3405
MORE INFORMATION
3407

FIG. 34C

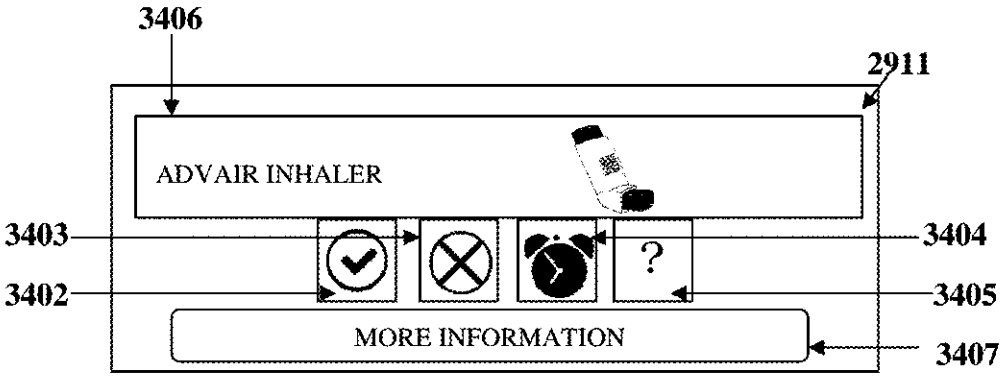
3406
2911
ADVAIR INHALER
3403
3404
3402
3405
?
MORE INFORMATION
3407

FIG. 34D

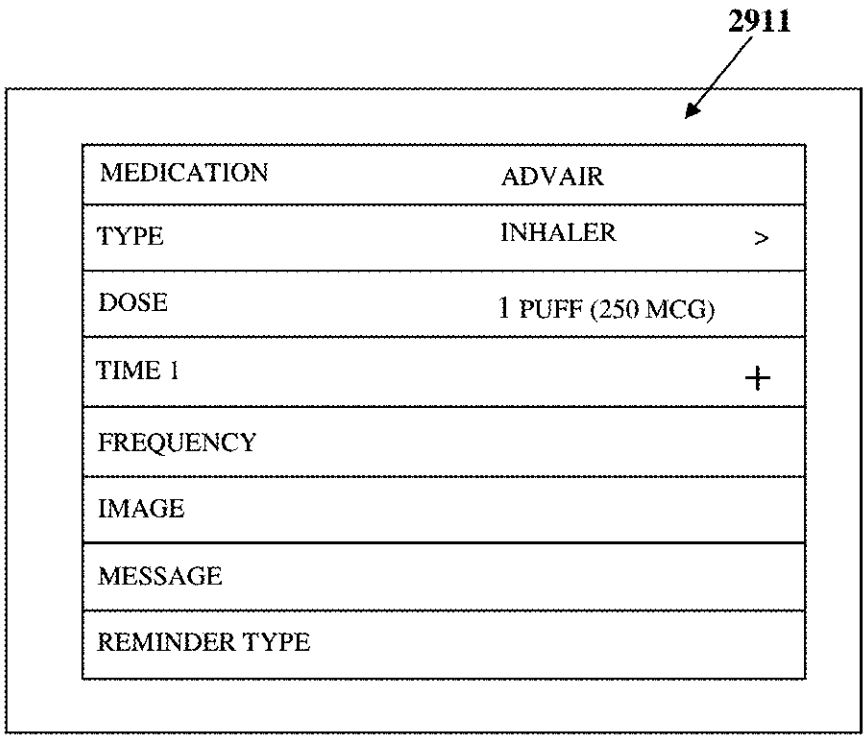
2911
MEDICATION
ADVAIR
TYPE
INHALER
>
DOSE
1 PUFF (250 MCG)
TIME 1
+
FREQUENCY
IMAGE
MESSAGE
REMINDER TYPE

FIG. 34E

MEDICATION IDENTIFICATION, TRACKING AND ADHERENCE MANAGEMENT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part application of non-provisional patent application Ser. No. 14/555,560 titled "Medication Organizer Tray Apparatus", filed in the United States Patent and Trademark Office on Nov. 26, 2014. The specification of the above referenced patent application is incorporated herein by reference in its entirety.

BACKGROUND

[0002] Poor compliance with a healthcare provider or physician-prescribed medication regimen is a significant cause of disease related morbidity and mortality. Poor medication adherence is estimated to cause about 125,000 deaths and about 33% to about 69% of medication related hospital admissions annually. The aggregate cost of hospital admissions related to medication non-adherence alone is estimated to be about $100 billion per year and medication non-adherence accounts for about 10% of overall hospital admissions. Currently, about 50% of prescribed medications are not taken as directed. Noncompliance with prescribed medications leads to a deterioration of the medical condition, hospitalization, and irreversible loss of function, resulting in significant human and financial costs. A growing problem, both among young people and the elderly, is overuse or abuse of certain medications, for example, pain relievers and tranquilizers. Among the elderly, about 90% of healthcare recipients make medication errors, resulting in about 40% of hospital admissions for this growing segment of the American population. Cognition also generally declines with age. Consequently, elderly healthcare recipients may experience difficulty in acquiring, organizing, and remembering to take their medications as prescribed.

[0003] Many healthcare recipients with chronic conditions, for example, elderly patients on multiple medications have difficulty adhering to prescribed therapies. Such healthcare recipients typically consume about 2 medications to about 20 medications per day. In general, when more medications have to be taken and the more times each day the healthcare recipient must use various therapies, the more likely is the probability of medication errors. Often, healthcare recipients have co-morbid conditions that interfere with their adherence to medication regimens. These conditions may include, for example, diabetes and associated complications such as blindness or a lack of mobility, various neurological conditions and dementia, arthritis and associated difficulties in manipulating devices, and other debilitating conditions. In addition to pills, healthcare recipients take other medications, for example, parenterals such as injections, inhalers, eye drops, etc., and adherence to these medications is also very low. At times, healthcare recipients do not have access to transportation or a caregiver to collect their medications. Moreover, many medications are sensitive to certain environmental conditions, for example, heat, humidity, light, or cold. Over exposure of medications to these environmental conditions can reduce the potency or efficacy of the medications.

[0004] The New England Healthcare Institute (NEHI) estimates that eliminating prescription non-adherence can save $290 billion annually by avoiding additional visits to a doctor, emergency room (ER) visits, hospital admissions, and additional medications. Studies have shown a total annual per capita savings of about $7,823 for congestive heart failure, about $3,908 for hypertension, about $3,757 for diabetes, and about $1,259 for dyslipidemia in adherent healthcare recipients. To improve adherence, healthcare recipients need easy access to all of their medications on a regular basis and not have to handle multiple pill bottles which expire at different times, and need to go to a pharmacy as few times as possible for their medications or refills. Various previously proposed devices for testing compliance of healthcare recipients with prescribed medication regimens are unsatisfactory in that they are relatively cumbersome, not accurate, and do not adequately cover extended time spans for which many prescribed dosing regimens must be maintained. Hence, there is a need for an improved device, for example, a pre-filled medication tray that accurately and conveniently packages individual doses of medication, in various forms such as a liquid form or a tablet form, which are more easily manageable in a safe and convenient manner, can be easily dispatched to healthcare recipients, and which measures the compliance of healthcare recipients with prescribed medication regimens.

[0005] Although a pre-filled medication tray ensures that the right medications are loaded and that a healthcare recipient has easy access to the medications, many healthcare recipients are still non-adherent. For example, when a healthcare recipient travels or is out for a day or is on vacation, the healthcare recipient may forget to carry his/her pre-filled medication trays. Moreover, a health plan, pharmacy benefit manager (PBM), or an at risk hospital system requires healthcare recipient adherent information on a dose by dose basis, and not only on a monthly basis. Furthermore, there is a potential for tampering with the pre-filled medication tray when the pre-filled medication tray contains high priced medications and opioids. High priced and/or abusable medications, for example, pain killers, opioids, etc., are typically securely packaged in the pre-filled medication tray to preclude tampering and removal of the high priced and/or abusable medications from the pre-filled medication tray. However, these medications can be removed from the pre-filled medication tray by creating an incision or a cut on front surfaces, rear surfaces, side surfaces, and/or undersides of containers in the pre-filled medication tray.

[0006] Furthermore, a healthcare recipient may remove bins containing one or more medications from the pre-filled medication tray, when the healthcare recipient travels, goes out for a day, or when the medications in the bins need to be refrigerated. When the healthcare recipient does not have the pre-filled medication tray, has medications placed in a refrigerator, or has medications, for example, injections, inhalers, patches, eye drops, etc., that do not fit in the pre-filled medication tray, there is a need to measure compliance of healthcare recipients with prescribed medication regimens in order to ensure that the healthcare recipient consumes the right medication at the right time and from the right bin if the medication is stored in a bin. Typically, based on a health plan's service level agreement between a healthcare recipient and a healthcare provider, the healthcare recipient and/or the healthcare provider may arrange for a phone call to be made to remind the healthcare recipient about consumption of a medication. However, having to place multiple phone calls at different intervals for different healthcare recipients is time consuming and difficult and cannot ensure compliance, if the healthcare recipients are unavailable to receive the phone

calls. Furthermore, conventional methods for testing compliance of healthcare recipients with prescribed medication regimens are typically focused on consumption of the medications and fail to test compliance to auxiliary wellness activities comprising, for example, exercise, diet, health checkups, wound care, etc.

[0007] Conventionally, a healthcare recipient has multiple options to notify healthcare providers about adherence to prescribed medication regimens. For example, notifying the healthcare providers about a consumed medication by updating information regarding the consumed medication on a website, speaking to an interactive voice response (IVR) system via a telephonic call, calling and notifying the healthcare provider about the consumed medication, etc. However, these options require significant effort from the healthcare recipient and the healthcare providers to concur at a given time. Another option for notifying a healthcare provider regarding consumption of a medication is to send an adherence confirmation message to the healthcare provider via a video that the healthcare recipient records while consuming the medication. Moreover, medications such as pills or tablets configured with a small radio can transmit the adherence confirmation message to the healthcare provider when the healthcare recipient consumes the medication. However, the video logging solution is intrusive and configuring each medication with a radio is expensive. Some conventional methods provide parenteral devices, for example, inhalers with one dimensional (1D) codes such as barcodes that can be scanned for extracting information about parenteral devices, patient details, etc. However, the amount of information that a barcode can store is considerably less than the amount of information that can be stored in a quick response (QR) code, and is not used for securely and interactively tracking wellness adherence of a healthcare recipient.

[0008] Hence, there is a long felt but unresolved need for a secure, enhanced pre-filled medication organizer tray apparatus that increases adherence to medications with minimal cost and support by efficiently organizing the medications, providing medical information associated with the medications, providing enhanced access to the medications, continuously monitoring medication adherence by a healthcare recipient, and transmitting alerts to healthcare providers and the healthcare recipient for reducing hospitalizations, readmissions, emergency room (ER) visits, home health visits, nurse support, etc. Moreover, there is a need for a pre-filled medication organizer tray apparatus that can be easily dispatched to healthcare recipients, and that detects tampering, theft, diversion, or abuse of high priced medications and opioids. Furthermore, there is a need for a method and a wellness adherence tracking system that provide two-dimensional identifier codes that can store a substantial amount of information for tracking a healthcare recipient's wellness adherence to medication regimens that prescribe medication consumption and performance of auxiliary wellness activities. Furthermore, there is a need for a method and a wellness adherence tracking system that validates identifier codes and medical information contained in the identifier codes to provide security and privacy to a healthcare recipient.

SUMMARY OF THE INVENTION

[0009] This summary is provided to introduce a selection of concepts in a simplified form that are further disclosed in the detailed description of the invention. This summary is not intended to identify key or essential inventive concepts of the claimed subject matter, nor is it intended for determining the scope of the claimed subject matter.

[0010] The medication organizer tray apparatus disclosed herein address the above stated need for increasing adherence to medications with minimal cost and support by efficiently organizing the medications, providing medical information associated with the medications, providing enhanced access to the medications, continuously monitoring medication adherence by a healthcare recipient, and transmitting alerts to healthcare providers and the healthcare recipient for reducing hospitalizations, readmissions, emergency room (ER) visits, home health visits, nurse support, etc. Furthermore the medication organizer tray apparatus disclosed herein detects tampering, theft, diversion, or abuse of high priced medications and opioids. Furthermore, the medication organizer tray apparatus disclosed herein can be easily dispatched to healthcare recipients. The medication organizer tray apparatus disclosed herein comprises a support frame, multiple medication bins, a bin cover layer, and a conductive circuit layer. The support frame comprises multiple apertures positioned at predefined intervals from each other. The medication bins are adapted for placement into the apertures of the support frame. The medication bins accommodate multiple medications. The medication bins are configured to be removed from the support frame. The bin cover layer is removably attached to an upper surface of the support frame. The bin cover layer comprises multiple customized bin labels removably configured therewithin. The customized bin labels comprise medical information printed thereon and are configured to seal openings of the medication bins. The conductive circuit layer comprises multiple conductive lines running along one or more of a lower surface of the bin cover layer, around each medication bin, and a lower surface of each medication bin. The conductive circuit layer electrically communicates with a receptacle base to enable detection of removal of each medication bin from the support frame and detection of tampering of the medication bins, by detecting a break in the conductive lines of the conductive circuit layer.

[0011] Also, disclosed herein are a method and a wellness adherence tracking system comprising a wellness adherence tracking application deployed on a healthcare recipient's user device for tracking wellness adherence of a healthcare recipient. The method and the wellness adherence tracking system disclosed herein increase adherence to different types of medications and adherence to activities such as exercise, wound care, etc. The method and the wellness adherence tracking system disclosed herein address the above stated need for providing two-dimensional identifier codes that can store a substantial amount of information for tracking the healthcare recipient's wellness adherence to medication regimens that prescribe medication consumption and performance of auxiliary wellness activities. The method and the wellness adherence tracking system disclosed herein also validate identifier codes and medical information contained in the identifier codes to provide security and privacy to the healthcare recipient. In the method disclosed herein, an identifier code, for example, a quick response (QR) code is positioned on a medical implement, for example, a medication bin configured to store one or more medications, a parenteral device, a fitness device, a medical identification card, a medical wellness plan, etc., to identify the medical implement. The wellness adherence tracking system scans the identifier code of the medical implement via a graphical user interface provided by the wellness adherence tracking system accessible

on the healthcare recipient's user device. The wellness adherence tracking system comprises at least one processor configured to execute computer program instructions for tracking wellness adherence of the healthcare recipient. The wellness adherence tracking system decodes and validates the scanned identifier code and obtains medical information associated with the medical implement and/or an activity, for example, administration of medications, an exercise activity, etc., associated with the medical implement from the decoded and validated identifier code, and wellness adherence criteria.

[0012] The wellness adherence tracking system obtains the medical information by directly extracting the medical information from the decoded and validated identifier code. In an embodiment, the wellness adherence tracking system obtains the medical information by transmitting the decoded and validated identifier code to one or more databases via a network and retrieving the medical information and the wellness adherence criteria from the databases. In another embodiment, the wellness adherence tracking system receives the medical information and the wellness adherence criteria from the healthcare recipient's user device, for example, via the graphical user interface. The wellness adherence tracking system renders the medical information and multiple wellness adherence options, for example, indicators that define administration and non-administration of the medications, performance and non-performance of the activity, etc., that are configured, in an embodiment, in accordance with the wellness adherence criteria on the graphical user interface. The wellness adherence tracking system receives inputs for one or more of the rendered wellness adherence options from the user device. The wellness adherence tracking system logs the received inputs in association with the wellness adherence criteria in the user device and/or one or more databases to track the wellness adherence of the healthcare recipient.

[0013] In one or more embodiments, related systems comprise circuitry and/or programming for effecting the methods disclosed herein; the circuitry and/or programming can be any combination of hardware, software, and/or firmware configured to effect the methods disclosed herein depending upon the design choices of a system designer. Also, various structural elements may be employed depending on the design choices of the system designer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The foregoing summary, as well as the following detailed description of the invention, is better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, exemplary constructions of the invention are shown in the drawings. However, the invention is not limited to the specific methods, structures, and components disclosed herein. The description of a method step or a structure or a component referenced by a numeral in a drawing is applicable to the description of that method step or structure or component shown by that same numeral in any subsequent drawing herein.

[0015] FIG. **1**A exemplarily illustrates a top plan view of a medication organizer tray apparatus for organizing medications.

[0016] FIG. 1B exemplarily illustrates a bottom view of the medication organizer tray apparatus for organizing medications.

[0017] FIG. **1**C exemplarily illustrates a front elevation view of the medication organizer tray apparatus.

[0018] FIGS. **2**A-2B exemplarily illustrate top plan views of different embodiments of the medication organizer tray apparatus for organizing medications.

[0019] FIG. **3** exemplarily illustrates different component layers of the medication organizer tray apparatus.

[0020] FIG. **4**A exemplarily illustrates a top plan view of a support frame of the medication organizer tray apparatus.

[0021] FIG. 4B exemplarily illustrates a side elevation view of the support frame of the medication organizer tray apparatus, showing medication bins.

[0022] FIG. **5** exemplarily illustrates a top plan view of an embodiment of the support frame of the medication organizer tray apparatus.

[0023] FIG. **6** exemplarily illustrates a top plan view of an embodiment of the support frame of the medication organizer tray apparatus, showing medication bins of different shapes and sizes for accommodating medications of different types.

[0024] FIG. **7** exemplarily illustrates a coated layer of the medication organizer tray apparatus configured to be removably attached to an upper surface of the support frame.

[0025] FIG. **8** exemplarily illustrates a top perspective view of a medication bin of the medication organizer tray apparatus for accommodating medications.

[0026] FIG. **9** exemplarily illustrates a perspective view of a medication bin of the medication organizer tray apparatus removed from a support frame of the medication organizer tray apparatus.

[0027] FIG. **10** exemplarily illustrates a side perspective view of a medication bin of the medication organizer tray apparatus, showing a raised bump front edge.

[0028] FIGS. **11**A-11B exemplarily illustrate different views of embodiments of a medication bin of the medication organizer tray apparatus, showing conductive sensor circuit lines.

[0029] FIG. **12** exemplarily illustrates a top plan view of an embodiment of a medication bin of the medication organizer tray apparatus.

[0030] FIG. **13** exemplarily illustrates a perspective view of an embodiment of the medication bin, showing conductive sensor circuit lines running along a front surface of the medication bin, a rear surface of the medication bin, a lower surface of the medication bin, and a lower surface of a lip of the medication bin.

[0031] FIGS. **14**A-14D exemplarily illustrate top plan views of different embodiments of a bin cover layer of the medication organizer tray apparatus, showing customized bin labels removably configured within the bin cover layer.

[0032] FIGS. **15**A-15B exemplarily illustrate different types of identifier codes configured to be printed on the bin cover layer of the medication organizer tray apparatus.

[0033] FIG. **16**A exemplarily illustrates a conductive circuit layer of the medication organizer tray apparatus, showing conductive lines and conductive pads.

[0034] FIG. **16**B exemplarily illustrates an embodiment of the conductive circuit layer of the medication organizer tray apparatus, showing conductive sensor circuit lines of different patterns.

[0035] FIG. **16**C exemplarily illustrates communication between the conductive circuit layer of the medication organizer tray apparatus and detection circuitry of a receptacle base.

[0036] FIGS. **17**A-17B exemplarily illustrate embodiments of an electronic identification component of the medication organizer tray apparatus.

[0037] FIG. **18**A exemplarily illustrates an adhesive protective paper layer removably attached to a lower surface of the bin cover layer of the medication organizer tray apparatus.

[0038] FIG. **18**B exemplarily illustrates removal of the adhesive protective paper layer from the lower surface of the bin cover layer to allow attachment of the lower surface of the bin cover layer to an upper surface of a support frame.

[0039] FIGS. **19**A-**19**D exemplarily illustrate different configurations for organizing medications in the medication organizer tray apparatus.

[0040] FIGS. **20**A-**20**B exemplarily illustrate different views of a cover jacket configured to cover and accommodate the medication organizer tray apparatus.

[0041] FIG. **20**C exemplarily illustrates the medication organizer tray apparatus accommodated within the cover jacket.

[0042] FIGS. **21**A-**21**B exemplarily illustrate different views showing the medication organizer tray apparatus inserted into a receptacle base.

[0043] FIG. **22** exemplarily illustrates a top plan view of an embodiment of a receptacle base accommodating the medication organizer tray apparatus.

[0044] FIG. **23** illustrates a method for organizing medications and collecting medication adherence information.

[0045] FIG. **24** exemplarily illustrates a side perspective view of a medication dispensing system for filling the medication organizer tray apparatus with medications.

[0046] FIG. **25** exemplarily illustrates communication between the medication organizer tray apparatus inserted in a receptacle base, a backend server, and a user device via a network.

[0047] FIG. **26** exemplarily illustrates a screenshot of an image of the medication organizer tray apparatus filled with medications, displayed on a graphical user interface provided by a pill station manager application on a user device.

[0048] FIG. **27** illustrates a method for tracking wellness adherence of a healthcare recipient.

[0049] FIG. **28** exemplarily illustrates a flowchart comprising the steps performed by a wellness adherence tracking system for dynamically analyzing medical information.

[0050] FIG. **29** exemplarily illustrates the wellness adherence tracking system for tracking wellness adherence of a healthcare recipient.

[0051] FIG. **30** exemplarily illustrates the hardware architecture of the wellness adherence tracking system for tracking wellness adherence of a healthcare recipient.

[0052] FIG. **31** exemplarily illustrates a tracker card with identifier codes and stickers containing multiple identifier codes that can be positioned on a medical implement for tracking wellness adherence of a healthcare recipient.

[0053] FIG. **32** exemplarily illustrates a tabular representation of data size allocation in an identifier code.

[0054] FIGS. **33**A-**33**D exemplarily illustrate identifier codes positioned on different medical implements.

[0055] FIGS. **34**A-**34**E exemplarily illustrate screenshots of a graphical user interface provided by a wellness adherence tracking application of the wellness adherence tracking system for tracking wellness adherence of a healthcare recipient.

DETAILED DESCRIPTION OF THE INVENTION

[0056] FIGS. **1**A-**1**C exemplarily illustrate different views of a medication organizer tray apparatus **100** for organizing medications **112** exemplarily illustrated in FIG. **1**B. The medication organizer tray apparatus **100** disclosed herein is a medication tray, for example, a thermoform based pill tray or a thermoform plastic tray with sensitive circuitry that electronically alerts healthcare providers on whether medication bins **102** containing medications **112** are opened correctly and at the right time. As used herein, "healthcare provider" refers to a person or an entity, for example, a medical practitioner, a medical specialist, a health specialist, a physician, a doctor, a dentist, a surgeon, a nurse, a therapist, a nutritionist, a pharmacist, a clinical trial professional, a clinical study professional, a healthcare institution such as a hospital, a clinic, etc., a health insurance company, a health maintenance organization, a caregiver, etc., that provides healthcare services, for example, medical treatment, dental treatment, medications **112**, health insurance, etc., to a healthcare recipient. Also, as used herein, "healthcare recipient" refers to a person or an entity, for example, a patient who receives healthcare services from a healthcare provider.

[0057] The medication organizer tray apparatus **100** disclosed herein supports a polymer filling and facilitates intact shipping of the medication organizer tray apparatus **100**, and handling of the medication organizer tray apparatus **100** by healthcare recipients, for example, elderly and sick patients. The medication organizer tray apparatus **100** disclosed herein can be used by healthcare recipients of all ages and can be shipped to healthcare recipients at any location, for example, a home location, an office location, assisted living facilities, nursing homes, etc. The medication organizer tray apparatus **100** provides accurate medications **112** based on prescriptions and provides guaranteed medications **112** to healthcare recipients with medication synchronization. The medication organizer tray apparatus **100** eliminates the need for a healthcare recipient such as a patient or a healthcare provider such as a caregiver to manually fill the medication organizer tray apparatus **100**.

[0058] FIG. **1**A exemplarily illustrates a top plan view of the medication organizer tray apparatus **100** for organizing medications **112**. The medication organizer tray apparatus **100** disclosed herein comprises a support frame **101**, multiple medication bins **102**, a bin cover layer **104**, and a conductive circuit layer **107**. The support frame **101** comprises apertures **111** configured as wells positioned at predefined intervals from each other. FIG. **1**B exemplarily illustrates an aperture **111** of the support frame **101** after removal of a medication bin **102** from the support frame **101**. The medication bins **102** accommodate multiple medications **112** as exemplarily illustrated in FIG. **1**B. The bin cover layer **104** is removably attached to an upper surface **101***a* of the support frame **101**. The bin cover layer **104** comprises multiple customized bin labels **106** removably configured within the bin cover layer **104**. The customized bin labels **106** are configured to seal openings **117** of the medication bins **102** exemplarily illustrated in FIG. **7** and FIG. **10**. The bin cover layer **104** comprises perforations **105** positioned at predefined areas on the bin cover layer **104** as exemplarily illustrated in FIG. 1A, to match perforations **110** positioned proximal to outer edges **111***a* of the apertures **111** of the support frame **101** as exemplarily illustrated in FIG. 1B. In an embodiment, electrically conductive material, for example, conductive ink is applied on the perforations **105**, **110**, etc., of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**B, for ensuring continuity around the perforations **105**, **110**, etc., and connectivity with conductive lines **108** of the conductive circuit layer **107** around the perforations **105**, **110**, etc. The conductive circuit layer **107** comprises multiple conductive

lines **108** running along one or more of a lower surface **104***b* of the bin cover layer **104** as exemplarily illustrated in FIG. **18**A, around each medication bin **102**, and a lower surface **102***a* of each medication bin **102**.

[0059] The medication organizer tray apparatus **100** disclosed herein further comprises an electronic identification component **103** embedded into the support frame **101** as exemplarily illustrated in FIG. **1**A. The electronic identification component **103** is configured to electrically communicate with a receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**. The electronic identification component **103** is further configured to identify the medication organizer tray apparatus **100**, and store and exchange medication adherence information with the receptacle base **2101** as disclosed in the detailed description of FIGS. **17**A-**17**B.

[0060] FIG. 1B exemplarily illustrates a bottom view of the medication organizer tray apparatus **100** for organizing medications **112**. The medication bins **102** are adapted for placement in the apertures **111** of the support frame **101**. The medication bins **102** are configured in one of multiple sizes and shapes as exemplarily illustrated in FIGS. **2**A-**2**B, FIG. **6**, and FIG. **14**A, for accommodating medications **112** of different types. In an embodiment, each medication bin **102** is configured as a removable cup or a cup well containing medications **112**, for example, sufficient for a day's use, and is easy to use. The medication bin **102** is, for example, made of plastic. The medications **112** comprise, for example, oral medications, parenterals, blister packed medications, individual doses of medications, pills, etc., or any combinations thereof. The parenterals comprise, for example, injections, insulin vials, syringes, inhalers, eye drops, etc. The blister packed medications have individual or multiple doses of medications **112** contained in a form of plastic packaging. In an embodiment, the medication bins **102** that accommodate oral medications **112** are of a standard size. As exemplarily illustrated in FIG. **1**B, a lower surface **102***a* of each medication bin **102** is transparent to create a clear optical surface for facilitating imaging of the medications **112** accommodated in each medication bin **102** in the medication organizer tray apparatus **100**, for example, by a camera embedded in the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**, or in a medication dispensing system **2401** exemplarily illustrated in FIG. **24**.

[0061] In an embodiment, the medication bins **102** are configured to be removed from the support frame **101**. When the medication bins **102** are removed from the support frame **101**, the medications **112** accommodated in the medication bins **102** are removed along with the medication bins **102**. Healthcare recipients can remove the medication bins **102** from the support frame **101** and take medications **112** prescribed for a day from the medication bins **102**. When the medication bins **102** are removed from the support frame **101**, the customized bin labels **106** positioned on the medication bins **102** exemplarily illustrated in FIG. **1**A, remain in contact with the medication bins **102** and are removed along with the medication bins **102** to maintain structural integrity of the medication organizer tray apparatus **100**. In another embodiment, the medication bins **102** are retained in the support frame **101**, and the customized bin labels **106** that seal the medication bins **102** can be removed to access the medications **112** in the medication bins **102**.

[0062] Multiple conductive lines **108** and conductive pads **109** of the conductive circuit layer **107** of the medication organizer tray apparatus **100** are exemplarily illustrated in FIGS. **1**A-**1**B. The conductive circuit layer **107** electrically communicates with the receptacle base **2101** to enable detection of removal of each medication bin **102** from the support frame **101** and detection of tampering of the medication bins **102**. The conductive lines **108** of the conductive circuit layer **107** are configured in a multi-layer conductive circuit that trips when one or more medication bins **102** are removed from the support frame **101**.

[0063] In an embodiment, the medication organizer tray apparatus **100** is free from the support frame **101**, and is configured, for example, with a thermoform bottom. The medication organizer tray apparatus **100** is configured using existing prefilled medication trays, for example, with a thermoform design, plastic pill trays, or other types of medication trays of different shapes and sizes. In this embodiment, the bin cover layer **104** with the customized bin labels **106** and the conductive circuit layer **107** are built as a single unit and placed, pasted, and affixed onto the existing prefilled medication tray.

[0064] FIG. **1**C exemplarily illustrates a front elevation view of the medication organizer tray apparatus **100**. In an embodiment, the support frame **101** of the medication organizer tray apparatus **100** comprises one or more depressed button heads **113**, for example, thermoform buttons based on the size of the medication organizer tray apparatus **100**. The depressed button heads **113** attach the medication organizer tray apparatus **100** to the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**.

[0065] FIGS. **2**A-**2**B exemplarily illustrate top plan views of different embodiments of the medication organizer tray apparatus **100** for organizing medications **112** exemplarily illustrated in FIG. **1**B. The medication organizer tray apparatus **100** comprises medication bins **102** of different sizes as exemplarily illustrated in FIGS. **2**A-**2**B. As exemplarily illustrated in FIGS. **2**A-**2**B, the first row of medication bins **102** is of a large size, while the second row of medication bins **102** and the third row of medication bins **102** are of a smaller size than the first row of medication bins **102**. The customized bin labels **106** of the bin cover layer **104** are customized adhesive backed printouts comprising medical information printed thereon as exemplarily illustrated in FIGS. **2**A-**2**B. The medical information printed on the customized bin labels **106** comprises, for example, one or more of a list of medications **112** in each medication bin **102**, dosage information, color coding of dosage times, a time of day for administering the medications **112**, drug names, directions to follow, name of a prescriber, date of preparation, description of contents of each medication bin **102**, a personalized website link configured to link to a secure online interface comprising healthcare recipient information, a healthcare recipient identifier, etc. The medical information is printed on the customized bin labels **106** at a refill location and is configured to meet, for example, the United States Pharmacopeia (USP) standards. In an embodiment, the customized bin labels **106** comprise an updated medication list with images of the medications **112** inside each medication bin **102**. FIGS. **2**A-**2**B also show the perforations **105** of the bin cover layer **104**.

[0066] FIG. **3** exemplarily illustrates different component layers **301** to **309** of the medication organizer tray apparatus **100**. In an embodiment as exemplarily illustrated in FIG. **3**, the medication organizer tray apparatus **100** comprises nine component layers **301** to **309**. The first component layer **301** comprises the support frame **101**, for example, a thermoform

tray with apertures **111** exemplarily illustrated in FIG. **1**B, and medication bins **102** placed in the apertures **111** of the support frame **101**. The medication bins **102** hold the medications **112** as exemplarily illustrated in FIG. 1B and as disclosed in the detailed description of FIG. **1**B. The second component layer **302** is a perforated layer comprising perforations **110** of the support frame **101**. The perforations **110** of the support frame **101** are positioned proximal to the outer edges **111***a* of the apertures **111** of the support frame **101** exemplarily illustrated in FIG. **1**B, to facilitate removal of the medication bins **102** from the support frame **101**. The third component layer **303** is an adhesive protective paper layer **126** exemplarily illustrated in FIGS. **18**A-**18**B and disclosed in the detailed description of FIGS. **18**A-**18**B. The fourth component layer **304** represents a selectively applied adhesive **126***a* of the adhesive protective paper layer **126** configured to match the surface **101***d* exemplarily illustrated in FIG. **18**B, surrounding the outer edges **111***a* of the apertures **111** of the support frame **101** and a lip **121** of each medication bin **102** exemplarily illustrated in FIG. **10** and FIGS. **12**-**13**. The fifth component layer **305** is the conductive circuit layer **107** comprising etched circuitry that electrically communicates with the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22** and disclosed in the detailed description of FIGS. **21**A-**21**B and FIG. **22**, for enabling detection of a break in continuity of the conductive lines **108** exemplarily illustrated in FIGS. **1**A-**1**B, when the medication bins **102** are removed from the support frame **101** of the medication organizer tray apparatus **100**.

[0067] The sixth component layer **306** is the bin cover layer **104**. The bin cover layer **104** is, for example, a paper layer or a cardboard stock layer of thick stock. In an embodiment, the bin cover layer **104** is composed of a coated paper that allows conductive ink or other conductive circuitry applications to be registered in fine line thickness thereon. In another embodiment, the sixth component layer **306** comprises additional information printed thereon for the healthcare recipients. In this embodiment, the additional information is viewable in and/or around the conductive circuit layer **107**. When a healthcare recipient removes the medication bin **102** from the support frame **101** and then peels the customized bin label **106** of the bin cover layer **104** exemplarily illustrated in FIGS. **2**A-**2**B, to access the medications **112**, a bottom surface **106***b* of each customized bin label **106** exemplarily illustrated in FIG. **11**A, displays the additional information printed thereon. This additional information comprises, for example, wellness information, reminders, incentives for medication adherence such as award points, lottery tickets, gaming information such as bingo numbers, quotes such as motivational and religious quotes or a quote of the day, pictures of family members, etc. In an embodiment, a bingo card or another game card can be supplied to a healthcare recipient, and as the healthcare recipient takes his/her medications **112** and fills the bingo card, he/she can win prizes. A healthcare recipient can read the additional information printed on the bottom surface **106***b* of the peeled customized bin label **106** when he or she removes and opens the medication bins **102**. There is minimal to no bleeding of Food and Drug Administration (FDA) approved food grade ink printing on the lower surface **104***b* of the bin cover layer **104**. The bin cover layer **104** allows etching of complex circuits on the lower surface **104***b* of the bin cover layer **104** without short circuiting issues.

[0068] The customized bin labels **106** exemplarily illustrated in FIG. **1**A and FIGS. **2**A-**2**B, on the upper surface **104***a* of the bin cover layer **104** constitute the seventh component layer **307**. The seventh component layer **307** comprises generic information comprising, for example, color coded dosage times for days of the week, medication bins of the day, a company name, contact details, other contact information, etc., printed thereon. The eighth component layer **308** is a layer of perforations **105** on the bin cover layer **104** as exemplarily illustrated in FIG. 1A, which match the perforations **110** on the support frame **101** exemplarily illustrated in FIG. **1**B. The ninth component layer **309** is a final layer comprising personalized printing for healthcare recipients provided on the upper surface **104***a* of the bin cover layer **104**. The ninth component layer **309** represents the printing of healthcare recipient specific medication information and other healthcare recipient information printed on the customized bin labels **106**. The printing of the customized bin labels **106** is performed at one or more of multiple refill stations. The medication organizer tray apparatus **100** is created by attaching the component layers **309**, **308**, **307**, **306**, **305**, **304**, and **303** in the arrangement order shown in FIG. **3** to the component layers **302** and **301** in the arrangement order shown in FIG. **3**.

[0069] FIG. **4**A exemplarily illustrates a top plan view of the support frame **101** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B. The support frame **101** is configured as a support base for supporting the other component layers, for example, **303**, **304**, **305**, **306**, **307**, **308**, and **309** exemplarily illustrated in FIG. **3**. The support frame **101** comprises multiple apertures **111** exemplarily illustrated in FIG. **1**B, positioned at predefined intervals from each other. The apertures **111** of the support frame **101** are configured to house the medication bins **102**. FIG. **4**A also shows the perforations **110** positioned proximal to the outer edges **111***a* of the apertures **111** of the support frame **101**. The perforations **110** on the support frame **101** are rigid and of a predefined shape to facilitate removal of the medication bins **102** from the support frame **101** without damaging the integrity of the support frame **101**. The perforations **110** on the support frame **101** are configured in a shape that maintains the integrity of the medication organizer tray apparatus **100**, when a majority of the medication bins **102** are removed from the support frame **101**. The support frame **101** further comprises cut edges **114** for facilitating removal of the medication bins **102** from the apertures **111** of the support frame **101**. Each cut edge **114** allows easy removal of a specific medication bin **102**. In an embodiment, each of the medication bins **102** comprises a raised bump front edge **115** for facilitating easy removal of each of the medication bins **102** from the support frame **101**. A healthcare recipient can remove a medication bin **102** from the support frame **101** by pulling the raised bump front edge **115** of the medication bin **102**.

[0070] As exemplarily illustrated in FIG. **4**A, the medication organizer tray apparatus **100** further comprises a receptacle **116** positioned, for example, proximal to a lower end **101***c* of the support frame **101** for accommodating an electronic identification component **103** exemplarily illustrated in FIGS. **17**A-**17**B. In an embodiment, the electronic identification component **103** is placed face down in the receptacle **116** of the support frame **101** and embedded into the support frame **101**. The support frame **101** further comprises one or more depressed button heads **113** exemplarily illustrated in FIG. **1**C, for facilitating attachment and alignment of the medication organizer tray apparatus **100** to the receptacle

base **2101** as exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**. FIG. **4**A exemplarily illustrates an upper portion **113***a* of each depressed button head **113**. The medication organizer tray apparatus **100** is aligned with the receptacle base **2101** via the depressed button heads **113** of the support frame **101** to ensure that proper electrical contact is established between the medication organizer tray apparatus **100** and the receptacle base **2101**.

[0071] FIG. **4**B exemplarily illustrates a side elevation view of the support frame **101** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B, showing medication bins **102**. The support frame **101** exemplarily illustrated in FIG. **4**B, is configured by combining the first component layer **301** and the second component layer **302** of the medication organizer tray apparatus **100** as disclosed in the detailed description of FIG. **3**. The first component layer **301** of the medication organizer tray apparatus **100** comprises the support frame **101** with the medication bins **102** placed in the apertures **111** of the support frame **101** exemplarily illustrated in FIG. **1**B, while the second component layer **302** comprises perforations **110** of the support frame **101** exemplarily illustrated in FIG. **3** and FIGS. **4**A-**4**B. Each medication bin **102** is removed from the support frame **101** by pulling the medication bin **102** along with matching portions of the other component layers comprising **303**, **304**, **305**, **306**, **307**, **308**, and **309** exemplarily illustrated in FIG. **3**, in a substantially upward direction with respect to the support frame **101** along the perforations **110** of the support frame **101** exemplarily illustrated in FIG. **4**A. Each of the detached medication bins **102** is of a generally cup shaped configuration as exemplarily illustrated in FIGS. **9**-**13**.

[0072] FIG. **5** exemplarily illustrates a top plan view of an embodiment of the support frame **101** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B. FIG. **5** shows the support frame **101** housing the medication bins **102** in the apertures **111** exemplarily illustrated in FIG. **1**B, the perforations **110** positioned proximal to the outer edges **111***a* of the apertures **111** of the support frame **101**, and the upper portion **113***a* of each depressed button head **113** exemplarily illustrated in FIG. **1**C. In this embodiment, the medication bins **102** are of the same size as exemplarily illustrated in FIG. **5**.

[0073] FIG. **6** exemplarily illustrates a top plan view of an embodiment of the support frame **101** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B, showing medication bins **102** of different shapes and sizes for accommodating medications, for example, **112***a*, **112***b*, and **112***c* of different types. In this embodiment, the support frame **101** houses medication bins **102** of different shapes. The medication bins **102** are shaped to accommodate medications, for example, pills **112***a*, blister packed medications **112***b* in the form of cards or as individual doses, parenterals **112***c* such as insulin vials, syringes, inhalers, small tubes or containers containing ointments, injection vials, etc. In an embodiment, the medication bins **102** are configured as vials. In another embodiment, the medication bins **102** are configured as thermoform cups.

[0074] FIG. **7** exemplarily illustrates a coated layer **701** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B, configured to be removably attached to the upper surface **101***a* of the support frame **101**. The medication bins **102** housed in the support frame **101** accommodate medications **112** exemplarily illustrated in FIG. **1**B, comprising, for example, parenterals **112***c* exemplarily illustrated in FIG. **6**, that have a significant weight. The weight of the medications **112** can be, for example, about 50 grams. The range of the weight of the medications **112** varies based on a type of a container used to contain the medications **112**. In such situations, the support frame **101** requires additional support to maintain the integrity of the medication organizer tray apparatus **100**. For accommodating medications **112** of substantially high weight, the medication organizer tray apparatus **100** is constructed, for example, in a sandwich board configuration that provides a stronger structure. For such a configuration of the medication organizer tray apparatus **100**, the coated layer **701**, for example, a cardboard cover is provided with openings **702** and lip sections **706** that mirror openings **117** of the medication bins **102** and the adjacent lips **121** of the medication bins **102** respectively. In an embodiment, the coated layer **701** made, for example, of paper is attached to the support frame **101** using an adhesive. In another embodiment, the coated layer **701** is attached to the support frame **101** using a clamp (not shown) on two sides of the support frame **101** to securely connect the coated layer **701** to the support frame **101** and strengthen the medication organizer tray apparatus **100**. The coated layer **701** provides additional support to the support frame **101**, for example, when the medications **112** to be accommodated in the medication bins **102** are heavy. The coated layer **701** comprises coated layer alignment holes **703** that mirror tray alignment holes **118** in the support frame **101** as exemplarily illustrated in FIG. **7**. The coated layer **701** further comprises coated layer cut edges **704** and coated layer perforations **705** that mirror the cut edges **114** and the perforations **110** of the support frame **101** respectively, as exemplarily illustrated in FIG. **7**.

[0075] In an embodiment, the coated layer **701** forms a flap or a panel that folds over the support frame **101** and offers additional surface area for various purposes. For example, the coated layer **701** is configured to display supplementary information printed thereon, for example, patient name, patient phone number, patient address, etc. The supplementary information further comprises, for example, coupons, advertisements, incentives for medication adherence such as reward points, lottery tickets, bingo numbers, bingo cards, etc., status of incentives such as status of reward points, appointments for a week, reminders, quotes, images, wellness information, wellness messages, gaming information, quick reference telephone numbers of healthcare providers such as caregivers, case workers, physicians, etc.

[0076] FIG. **8** exemplarily illustrates a top perspective view of a medication bin **102** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B, for accommodating medications **112** exemplarily illustrated in FIG. **1**B. As exemplarily illustrated in FIG. **8**, the customized bin label **106** that seals the medication bin **102** can be removed by pulling a top edge **106***a* of the customized bin label **106** along the perforations **105** of the bin cover layer **104**. The customized bin label **106** on the medication bin **102** is removed to access the medications **112** contained in the medication bin **102**. The customized bin label **106** comprises, for example, a name of a patient, a date for consuming the medications **112** accommodated in the medication bin **102**, name of each of the medications **112**, etc., as exemplarily illustrated in FIG. **8**.

[0077] FIG. **9** exemplarily illustrates a perspective view of a medication bin **102** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS.

2A-2B, removed from the support frame **101** exemplarily illustrated in FIGS. **1A-7**. In an embodiment, when a medication bin **102** is removed from the medication organizer tray apparatus **100** by pulling the medication bin **102** away from the support frame **101** along the perforations **110** of the support frame **101** and the perforated rims **119** of the medication bin **102**, the whole medication bin **102** peels off from the support frame **101**, intact with the customized bin label **106**.

[0078] FIG. **10** exemplarily illustrates a side perspective view of a medication bin **102** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1A-1C** and FIGS. **2A-2B**, showing a raised bump front edge **115**. In an embodiment, each medication bin **102** comprises a cut edge **114**, a bend **120**, and a raised bump front edge **115** as exemplarily illustrated in FIG. **10**, for facilitating removal of the medication bin **102** from the support frame **101** exemplarily illustrated in FIG. **1B**. Each medication bin **102** comprises specific cut edges **114** apart from the perforated rims **119** which allow easy removal of that medication bin **102**. The raised bump front edge **115** of each medication bin **102** is a bump or a tab that can be lifted up for facilitating removal of the medication bin **102** from the support frame **101**. The raised bump front edge **115** that can be folded at a bend **120** is positioned on a top edge **102***b* of the upper surface **102***c* of the medication bin **102** to allow removal of the medication bin **102** from the support frame **101**. In an embodiment, the medication bin **102** is configured as a transparent bottle such that camera images can be taken of the lower surface **102***a* of the medication bin **102** post robotic or pharmacist fills of medications **112**. The opening **117** of the medication bin **102** is sealed with the customized bin label **106** as exemplarily illustrated in FIGS. **8-9**. There is no adhesive **126***a* behind the portion of the adhesive protective paper layer **126** exemplarily illustrated in FIG. **18A**, that contacts the raised bump front edge **115** of the medication bin **102**. Upon removal of the medication bin **102** from the support frame **101**, the portion of the adhesive protective paper layer **126** on the raised bump front edge **115** of the medication bin **102** is easily accessible, as that portion is not glued. The raised bump front edge **115** of the medication bin **102** allows the medication bin **102** to be easily removed from the support frame **101** and reduces the need for a larger surface area to reduce the size and bulkiness of the medication organizer tray apparatus **100**.

[0079] FIGS. **11A-11B** exemplarily illustrate different views of embodiments of a medication bin **102** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1A-1C** and FIGS. **2A-2B**, showing conductive sensor circuit lines **108***a*. FIG. **11A** exemplarily illustrates a front elevation view of the medication bin **102**, showing the customized bin label **106** removed from the medication bin **102**. In an embodiment, the customized bin label **106** is, for example, a paper label, a plastic label, or a label made of some other material that is glued to the medication bin **102**. As exemplarily illustrated in FIG. **11A**, the customized bin label **106** seals the opening **117** of the medication bin **102**. As exemplarily illustrated in FIG. **11A**, the customized bin label **106** is peeled away to access the medications **112** contained in the medication bin **102**. Furthermore, as exemplarily illustrated in FIG. **11A**, a conductive sensor circuit line **108***a* is positioned on an upper section **102***d* of the medication bin **102**. In an embodiment, the bottom surface **106***b* of each customized bin label **106** displays additional information, for example, wellness information, reminders, incentives for medication adherence such as award points, lottery tickets, gaming information, or bingo numbers, quotes such as motivational and religious quotes or a quote of the day, pictures of family members, etc.

[0080] FIG. **11B** exemplarily illustrates a front elevation view of the medication bin **102**, showing conductive sensor circuit lines **108***a* running along the side surfaces **102***e* and **102***f* of the medication bin **102**, on a lower surface **102***a* of the medication bin **102**, and at the upper section **102***d* of the medication bin **102**. To preclude tampering of high priced and/or abusable medications **112**, for example, pain killers, opioids, etc., contained in the medication bin **102** by creation of incisions or cuts on the side surfaces **102***e* and **102***f* of the medication bin **102** and on the lower surface **102***a* of the medication bin **102**, the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1A-1C** and FIGS. **2A-2B**, provides additional security via detection circuitry on the medication bins **102**, for example, by adding conductive sensor circuit lines **108***a* on an upper section **102***d* of each medication bin **102**, the sides surfaces **102***e* and **102***f* of the medication bin **102**, and on the lower surface **102***a* of the medication bin **102** as exemplarily illustrated in FIGS. **11A-11B**, thereby making the overall surface of the medication bin **102** completely conductive. Any incision or a cut in any part of the medication bin **102** can be detected as a change in electrical properties of the medication bin **102** as measured by sensitive detection circuitry **1601** exemplarily illustrated in FIG. **16C**, of the receptacle base **2101** exemplarily illustrated in FIGS. **21A-21B** and FIG. **22**, that is different from a change in electrical properties of the medication bin **102** detected while removing the medication bin **102** from the support frame **101** exemplarily illustrated in FIGS. **1A-7**, during standard use of the medication organizer tray apparatus **100**.

[0081] FIG. **12** exemplarily illustrates a top plan view of an embodiment of a medication bin **102** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1A-1C** and FIGS. **2A-2B**. As exemplarily illustrated in FIG. **12**, in an embodiment, the medication bin **102** comprises a raised bump front edge **115** on a top edge **102***b* of an upper surface **102***c* of the medication bin **102** for facilitating easy removal of the medication bin **102** from the support frame **101** exemplarily illustrated in FIGS. **1A-7**. In an embodiment, the raised bump front edge **115** is configured as a bump on the top edge **102***b* of the upper surface **102***c* of the medication bin **102**, when the medication bin **102** is configured, for example, as a plastic cup for facilitating peeling off the customized bin label **106** exemplarily illustrated in FIGS. **8-9**, from the medication bin **102**. In an embodiment, the raised bump front edge **115** is a configured as a slot. Each medication bin **102** comprises perforated rims **119** at upper edges **102***g* of the medication bin **102**. The perforated rims **119** attach the medication bin **102** to perforations **110** positioned proximal to the outer edges **111***a* of each aperture **111** of the support frame **101** as exemplarily illustrated in FIG. **1B**. The perforated rims **119** of each medication bin **102** facilitate removal of each individual medication bin **102** or a set of medication bins **102** for the day, or for multiple days from the support frame **101**. Each medication bin **102** is, for example, cup shaped and comprises a lip **121** extending around a periphery **102***h* of the upper surface **102***c* of the medication bin **102**. The lip **121** of the medication bin **102** facilitates enhanced access to the medication bin **102** and allows easy handling or carrying of the medication bin **102** by healthcare recipients diagnosed with certain medical conditions, for example, arthritis, nerve disorders that cause tremors, etc.

[0082] FIG. **13** exemplarily illustrates a perspective view of an embodiment of the medication bin **102**, showing conductive sensor circuit lines **108***a* running along a front surface **102***i* of the medication bin **102**, a rear surface **102***j* of the medication bin **102**, a lower surface **102***a* of the medication bin **102**, and a lower surface **121***a* of a lip **121** of the medication bin **102**. The circuit mechanism of the conductive circuit layer **107** disclosed in the detailed description of FIGS. **16**A-**16**C, is activated, when a healthcare recipient removes the medication bins **102** from the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-1C and FIGS. **2**A-2B. The conductive sensor circuit lines **108***a* of the conductive circuit layer **107** exemplarily illustrated in FIGS. **1**A-1B and FIGS. **16**A-**16**C, are ruptured when the medication bins **102** are removed, which are sensed by the detection circuitry **1601** exemplarily illustrated in FIG. **16**C, of the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**.

[0083] In an embodiment, multiple conductive sensor circuit lines **108***a* are applied or printed around each medication bin **102** and on the lower surface **102***a* of each medication bin **102** as exemplarily illustrated in FIG. **13**, for example, via conductive ink printing such that any incision or a cut in the medication bin **102** can be detected by a break in the conductive sensor circuit lines **108***a*. In an embodiment, the layering of the conductive circuit layer **107** around the medication bin **102** is created via conductive pad printing around the medication bin **102**. Multiple layers of conductive sensor circuit lines **108***a* are created to allow one or more of the conductive sensor circuit lines **108***a* to cross over another one or more of the conductive sensor circuit lines **108***a* without short circuiting the conductive circuit layer **107**. The conductive ink is selectively printed on each medication bin **102** such that the conductive circuit layer **107** on the lower surface **104***b* of the bin cover layer **104** exemplarily illustrated in FIG. **18**A, when placed on top of the medication bins **102**, makes an appropriate electrical connection with the medication bins **102** for enabling detection of any incision or any cut in the medication bins **102**. For example, conductive ink is printed on the upper surface **102***c* of the medication bin **102**, on the front surface **102***i* of the medication bin **102**, on the rear surface **102***j* of the medication bin **102**, and on the lower surface **102***a* of the medication bin **102** such that the conductive circuit layer **107** configured, for example, as a conductive paper cover can be placed on top of the medication bin **102**, to allow detection of any incision or any cut in the medication bin **102**. In an embodiment, conductive ink is also printed on the lower surface **121***a* of each lip **121** of the medication bin **102** as exemplarily illustrated in FIG. **13**. When the bin cover layer **104** is placed on such a medication bin **102**, the conductive lines **108** on the lower surface **104***b* of the bin cover layer **104** exemplarily illustrated in FIG. **18**A, connect to the conductive sensor circuit lines **108***a* on the lips **121** of the medication bin **102** to make the circuit connection, so that removal of the medication bin **102** can be detected on breakage of the circuit connection.

[0084] In an embodiment, the medication bins **102** are made of an electrically conductive material for communicating with the receptacle base **2101** for enabling detection of removal of each medication bin **102** from the support frame **101** exemplarily illustrated in FIGS. **1**A-**7**, and detection of tampering of the medication bins **102**. The medication bins **102** are configured, for example, as thermoform cups made of a conductive material to make the medication bins **102** tamper proof. In this embodiment, electrical resistance is measured by an electronic current measuring circuit, that is, the detection circuitry **1601** of the receptacle base **2101**, to detect tampering when cuts or incisions are made on one or more of the surfaces, for example, **102***i*, **102***j*, **102***a*, etc., of the medication bin **102**. The conductive material of the medication bins **102** conducts electricity and when a small current is supplied by a power source (not shown), which is detected by the detection circuitry **1601** of the receptacle base **2101**, any cuts or any incisions in one or more of the surfaces, for example, **102***i*, **102***j*, **102***a*, etc., of the medication bins **102** is detected by the detection circuitry **1601** of the receptacle base **2101** by measuring resistance in the conductive circuit layer **107** in a manner similar to detection of line breaks in the conductive sensor circuit lines **108***a* of the medication bins **102** as disclosed in the detailed description of FIGS. **16**A-**16**C.

[0085] FIGS. **14**A-**14**D exemplarily illustrate top plan views of different embodiments of the bin cover layer **104** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. 1A-1C and FIGS. **2**A-2B, showing customized bin labels **106** removably configured within the bin cover layer **104**. The bin cover layer **104** is removably attached to the upper surface **101***a* of the support frame **101** exemplarily illustrated in FIG. 1A. The customized bin labels **106** of the bin cover layer **104** seal openings **117** of the medication bins **102** exemplarily illustrated in FIGS. **8**-**9** and FIG. **11**A. The lower surface **104***b* of the bin cover layer **104** is attached to the upper surface **101***a* of the support frame **101** by removing the adhesive protective paper layer **126** from the lower surface **104***b* of the bin cover layer **104** as disclosed in the detailed description of FIGS. **18**A-**18**B. Adhesive used around the upper surface **101***a* of the support frame **101** is stronger than the adhesive used on the surface **101***d* surrounding the outer edges **111***a* of the apertures **111** of the support frame **101** between the medication bins **102** exemplarily illustrated in FIG. **18**B, for facilitating easy removal of the medication bins **102** via the perforations **110** of the support frame **101** exemplarily illustrated in FIG. **1**B and FIG. **4**A. The bin cover layer **104** comprises perforations **105** exemplarily illustrated in FIG. **14**C, positioned at predefined areas on the bin cover layer **104** to match perforations **110** positioned proximal to the outer edges **111***a* of the apertures **111** of the support frame **101**. In an embodiment, the bin cover layer **104** further comprises cut portions **122** exemplarily illustrated in FIG. **14**A, for accommodating the raised bump front edge **115** of each medication bin **102** exemplarily illustrated in FIG. **10** and FIG. **12**.

[0086] In an embodiment, the customized bin labels **106** of the bin cover layer **104** conform to chapter 681 of the US Pharmacopeia standards. Each customized bin label **106** is, for example, a paper label sealed within or printed to the upper surface **104***a* of the bin cover layer **104** at a medication packaging location after a medication fill. The customized bin labels **106** comprise medication information printed according to the configuration of the medication organizer tray apparatus **100** with color coded days and times. For example, a seven day medication organizer tray apparatus **100** comprises customized bin labels **106** comprising medication information for seven days. The customized bin labels **106** comprise other information such as the name of the healthcare recipient, names of the medications **112** exemplarily illustrated in FIG. **1**B, FIG. **9**, and FIGS. **11**A-**11**B, directions to be followed, name of a healthcare professional, date of

preparation, date of administration, etc., as exemplarily illustrated in FIGS. **14**A-**14**D. Furthermore, the customized bin labels **106** provide individual bin labeling with a unique printout on the individual customized bin labels **106** displaying, for example, a description of the contents of each medication bin **102**, a time of day for taking the medications **112**, for example, morning, noon/day, or evening, etc., as exemplarily illustrated in FIGS. **14**A-**14**D.

[0087] In addition to the medication information, the bin cover layer **104** of the medication organizer tray apparatus **100** further comprises an identifier code **123***a* and/or **123***b* as exemplarily illustrated in FIGS. **14**C-**14**D, a healthcare recipient picture, and additional information comprising, for example, a personalized website link to the healthcare recipient's information, a user identifier (ID) of the healthcare recipient, past week or past month overall adherence rate or each medication adherence rate, overall or each medication possession ratio, bonus award points based on factors such as how well healthcare recipients have been adherent to the medications **112** in the medication bins **102**, etc., a list of medications **112**, pharmacy and R_x number, healthcare provider information, instructions, etc., printed on the customized bin labels **106**, or on a separate page, or on other surface areas of the bin cover layer **104**.

[0088] FIGS. **15**A-**15**B exemplarily illustrate different types of identifier codes **123***a* and **123***b* configured to be printed on the bin cover layer **104** as exemplarily illustrated in FIGS. **14**C-**14**D, of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B. The identifier code is configured, for example, as a quick response (QR) code **123***a* as exemplarily illustrated in FIG. **15**A, or as a barcode **123***b* as exemplarily illustrated in FIG. **15**B. The bin cover layer **104** displays the identifier code **123***a* and/or **123***b*, healthcare recipient information, etc. For example, a unique identifier (ID) such as a barcode **123***b* or a QR code **123***a* or a one-dimensional (1D) code or a two-dimensional (2D) code is printed on a packaging layer or on the bin cover layer **104**. The identifier code **123***a* and/or **123***b* printed on the bin cover layer **104** identifies the medication organizer tray apparatus **100** and is configured to allow verification of the presence of each medication bin **102** and the medications **112** in each medication bin **102** exemplarily illustrated in FIG. 1B, FIG. **9**, and FIGS. **11**A-**11**B. That is, the identifier code **123***a* and/or **123***b* stores information on the number of medication bins **102** assigned for the medication organizer tray apparatus **100** and the number and type of medications **112** accommodated in each medication bin **102**. The identifier code, for example, the QR code **123***a* exemplarily illustrated in FIG. **15**A, is further configured to provide links to secure web pages with healthcare recipient information. Information associated with the medication organizer tray apparatus **100** comprising, for example, a list of medication codes, an identifier (ID) of the medication organizer tray apparatus **100**, an ID of a healthcare recipient to whom the medication organizer tray apparatus **100** is issued, etc., is embedded in the identifier code **123***a* and/or **123***b*. A healthcare recipient or a healthcare provider can use, for example, a smartphone to scan the identifier code **123***a* and/or **123***b* and view the information embedded in the identifier code **123***a* and/or **123***b*.

[0089] The identifier code **123***a* and/or **123***b* enables a pill station manager application **2504** configured as a client application executable by at least one processor on a user device **2503** exemplarily illustrated in FIG. **25**, to verify that correct medication bins **102** of the medication organizer tray apparatus **100** contain the correct prescribed medications **112**. The pill station manager application **2504** can be installed on the healthcare recipient's user device **2901** exemplarily illustrated in FIG. **29**, and/or on the healthcare provider's user device **2503** exemplarily illustrated in FIG. **25**. The identifier code **123***a* and/or **123***b* is configured to be synchronized with the pill station manager application **2504** to confirm accuracy of alerts and messages being transmitted to a healthcare recipient. When the medication organizer tray apparatus **100** used by a healthcare recipient is connected to the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**, the identifier code **123***a* and/or **123***b* that is scanned, for example, using the healthcare recipient's user device **2901**, synchronizes with the pill station manager application **2504** to ensure that correct messages and alarms are delivered to the healthcare recipient. In an embodiment, the healthcare recipient can transmit the scanned identifier code **123***a* and/or **123***b* from the healthcare recipient's user device **2901** to the pill station manager application **2504** deployed on the healthcare provider's user device **2503** for verification of information, messages, and alarms.

[0090] The identifier code **123***a* and/or **123***b* can be read by code reader devices, for example, smartphones and other identification (ID) readers for identifying the medication organizer tray apparatus **100** and confirming whether the correct medications **112** are filled in the medication bins **102** contained in the medication organizer tray apparatus **100**. In an embodiment, the bin cover layer **104** displays a human readable ID for use in cases when code reader devices are not available. In another embodiment, another type of identifier code, for example, an authentication code is embedded in the quick response (QR) code **123***a* such that only the healthcare recipient's user device **2901** will be able to read the QR code **123***a*, decipher the content, match the identifiers, open a link, and display the content on the healthcare recipient's user device **2901**. This authentication code is useful when the healthcare recipient is located in an area where there is no network connectivity and the healthcare recipient requires a list of medications **112** stored in the medication organizer tray apparatus **100**. In an embodiment, the identifier code configured, for example, as a QR code **123***a* links to a secure online application for verification of the healthcare recipient's information and the medical information.

[0091] FIG. **16**A exemplarily illustrates a conductive circuit layer **107** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B, showing conductive lines **108** and conductive pads **109**. To preclude tampering of high priced and/or abusable medications **112** exemplarily illustrated in FIG. **1**B, FIG. **9**, and FIGS. **11**A-**11**B, for example, pain killers, opioids, etc., by creation of incisions or cuts on the side surfaces **102***e* and **102***f* of the medication bin **102** and on the lower surface **102***a* of the medication bin **102**, the medication organizer tray apparatus **100** provides additional security via detection circuitry on the lower surface **104***b* of the bin cover layer **104** as exemplarily illustrated in FIG. **18**A. The conductive lines **108** and the conductive pads **109** constitute the detection circuitry or the multi-layer conductive circuit of the conductive circuit layer **107**. The conductive lines **108** of the conductive circuit layer **107** comprise, for example, conductive sensor circuit lines **108***a*, a common return line **108***b*, and a redundant circuit common return line **108***c* as exemplarily illustrated in FIGS. **16**A-**16**C. The conductive pads **109** of the conductive circuit

layer **107** comprise edge conductive pads **109***a*, medication bin conductive pads **109***b*, and a redundant conductive pad **109***c* as exemplarily illustrated in FIGS. **16**A-**16**C.

[0092] In an embodiment, the conductive circuit layer **107** is printed and embedded on the lower surface **104***b* of the bin cover layer **104** as exemplarily illustrated in FIG. **18**A, and around each medication bin **102** and on the lower surface **102***a* of each medication bin **102** as exemplarily illustrated in FIG. **13**. In an embodiment, the conductive lines **108** of the conductive circuit layer **107** running along one or more of the lower surface **104***b* of the bin cover layer **104**, around each medication bin **102**, and the lower surface **102***a* of each medication bin **102** are printed using one or more of multiple conductive print technologies to allow etching of complex electric circuits without causing short circuit issues. In another embodiment, the conductive circuit layer **107** is printed using conductive ink. In an embodiment, the conductive ink is an invisible ink. In an embodiment, the conductive ink is printed on each medication bin **102**. In another embodiment, the conductive lines **108** of the conductive circuit layer **107** running along one or more of the lower surface **104***b* of the bin cover layer **104**, around each medication bin **102**, and the lower surface **102***a* of each medication bin **102** are created by applying an electrically conductive material, for example, copper on one or more of the lower surface **104***b* of the bin cover layer **104**, around the medication bins **102** exemplarily illustrated in FIGS. **11**A-**11**B, and the lower surface **102***a* of the medication bins **102**, and removing excess of the electrically conductive material, for example, by an etching process or using chemicals such that only the conductive lines **108** remain. In an embodiment, the conductive lines **108** are color coded such that the conductive lines **108** appear as a design element of the medication organizer tray apparatus **100** and enhance the aesthetics of the medication organizer tray apparatus **100**.

[0093] The multi-layer conductive circuit of the conductive circuit layer **107** is configured to trip when one or more of the medication bins **102** are removed from the support frame **101** exemplarily illustrated in FIGS. 1A-**7**. The multi-layer conductive circuit comprises the conductive sensor circuit lines **108***a*, the conductive connection pads, that is, the edge conductive pads **109***a*, the medication bin conductive pads **109***b*, the common return lines **108***b*, the redundant circuit common return line **108***c*, the redundant conductive pad **109***c*, and additional conductive sensor circuit lines **108***d* and **108***e* exemplarily illustrated in FIG. **16**B. In an embodiment, the edges **107***a* and **107***b* of the conductive circuit layer **107** form large conductive regions as exemplarily illustrated in FIGS. **16**A-**16**C.

[0094] The conductive sensor circuit lines **108***a* of the conductive circuit layer **107** are signal lines for each medication bin **102**. The conductive sensor circuit lines **108***a* ensure connectivity of each medication bin **102** with the conductive circuit layer **107**. Each medication bin **102** has a closed loop circuit comprising a conductive sensor circuit line **108***a* and common return lines **108***b* passing through the edge conductive pads **109***a*. The common return lines **108***b* are configured for one or more medication bins **102**. The common return lines **108***b* increase circuit reliability against incorrect registration of the conductive sensor circuit line **108***a* of each medication bin **102** in the conductive circuit layer **107**. Sharing of common return lines **108***b* increases circuit reliability against incorrect registration of the conductive sensor circuit line **108***a*, for example, while printing, deposition, etc., or tearing beyond medication bin perforations **110** exemplarily illustrated in FIG. **1**B, FIG. **4**A, FIG. **5**, FIG. **7**, and FIG. **9**. Since each medication bin **102** is independent from another medication bin **102** of the medication organizer tray apparatus **100**, single or multiple line breaks in the conductive sensor circuit lines **108***a* of the conductive circuit layer **107** representing removal of single or multiple medication bins **102** from the support frame **101** of the medication organizer tray apparatus **100** can be detected simultaneously.

[0095] The edge conductive pads **109***a* are configured for each conductive sensor circuit line **108***a* of each medication bin **102**. The edge conductive pads **109***a* ensure connectivity to the detection circuitry **1601** exemplarily illustrated in FIG. **16**C, of the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**. The edge conductive pads **109***a* electrically communicate with one or more base conductive pads **1604** of the receptacle base **2101** as exemplarily illustrated in FIG. **16**C, to enable detection of removal of each medication bin **102** from the support frame **101** and detection of tampering of the medication bins **102**. In an embodiment, the edge conductive pads **109***a* are formed by depositing a larger amount of conductive ink in certain regions of the bin cover layer **104**. The conductive sensor circuit lines **108***a* are initiated and terminated through the edge conductive pads **109***a* which are larger in size to maximize electrical connectivity in the medication organizer tray apparatus **100**. In an embodiment, the medication bin conductive pads **109***b* detect a medication bin **102** being opened. The medication bin conductive pads **109***b* are configured as large and wide lines for each of the medication bins **102** and maintain their conductive integrity even after the perforations **105** of the bin cover layer **104** pass through the medication bin conductive pads **109***b*. The medication bin conductive pads **109***b* maintain conductive integrity of the conductive sensor circuit line **108***a* of each medication bin **102** when perforations **105** positioned at predefined areas on the bin cover layer **104** cut through the conductive sensor circuit line **108***a*.

[0096] To further strengthen connectivity and protection against premature tearing during removal of the medication bins **102**, a redundant circuit common return line **108***c* is provided in the conductive circuit layer **107**. The redundant circuit common return line **108***c* is positioned on a periphery **107***c* of the conductive circuit layer **107** and terminates on a different terminating edge conductive pad **109***c* as exemplarily illustrated in FIGS. **16**A-**16**C. The redundant circuit common return line **108***c* ensures electrical conductivity in the conductive circuit layer **107** if a common return line **108***b* of the multi-layer conductive circuit is compromised. All conductive circuit layers **107** can share one redundant circuit common return line **108***c* and reduce the number of overall edge conductive pads **109***a*. For example, the common return lines **108***b* of four day medication bins **102** comprising medications **112** exemplarily illustrated in FIG. **1**B, to be consumed, for example, on a Monday, share a redundant circuit common return line **108***c* as exemplarily illustrated in FIGS. **16**A-**16**C. The common return lines **108***b* for each day's medication bin **102** share the redundant circuit common return line **108***c*. The redundant conductive pad **109***c* is configured for the redundant circuit common return line **108***c*. The redundant conductive pad **109***c* of the redundant circuit common return line **108***c* connects to one or more of the base conductive pads **1604** of the receptacle base **2101** as exemplarily illustrated in FIG. **16**C.

[0097] FIG. **16**B exemplarily illustrates an embodiment of the conductive circuit layer **107** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B, showing conductive sensor circuit lines **108***d* and **108***e* of different patterns. In an embodiment, the conductive circuit layer **107** comprises additional conductive sensor circuit lines **108***d* and **108***e* of different patterns for the medication bins **102** exemplarily illustrated in FIGS. **11**A-**11**B. The additional conductive sensor circuit lines **108***d* and **108***e* are configured to communicate with the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**, to detect tampering of the medication bins **102** and the bin cover layer **104** exemplarily illustrated in FIGS. **1**A-**1**B. In an embodiment, the additional conductive sensor circuit lines **108***d* and **108***e* are configured in different shapes as exemplarily illustrated in FIG. **16**B, to prevent tampering by creation of cuts or incisions in the medication bins **102** to remove the medications **112** exemplarily illustrated in FIGS. **11**A-**11**B. In an embodiment, additional redundant circuitry formed by the additional conductive sensor circuit lines **108***d* and **108***e* may be embedded on the bin cover layer **104** in case one conductive circuit layer **107** is compromised. A second conductive sensor circuit line, for example, **108***e* is provided for additional circuit connections as a backup as exemplarily illustrated in FIG. **16**B. The conductive circuit layer **107** is configured with additional conductive sensor circuit lines **108***d* and **108***e* or circuit connections as backups, thereby forming complex patterns of conductive lines **108**, for example, loops on predefined areas of the bin cover layer **104** that cover the openings **117** of the medication bins **102** exemplarily illustrated in FIG. **7**, FIG. **10**, FIG. **11**A, and FIG. **18**B. These additional conductive sensor circuit lines **108***d* and **108***e* and circuit connections are provided to preclude patients from stealing medications **112**, by creating a small incision or a cut in the medication bin **102** and taking the medications **112** out. This configuration of the conductive circuit layer **107** allows detection of any method of accessing the medication bins **102**, for example, removal of the medication bins **102** from the support frame **101** exemplarily illustrated in FIGS. **1**A-**7**, and any method of tampering of the bin cover layer **104** in any manner, for example, by puncturing the bin cover layer **104** and removing the medications **112** from the upper surface **102***c* of the medication bin **102** exemplarily illustrated in FIG. **10** and FIGS. **12**-**13**. This configuration of the conductive circuit layer **107** allows detection when a person accesses the medication bin **102** by removing the medication bin **102** from the support frame **101** or by removing the medications **112** by puncturing the bin cover layer **104** at the upper surface **102***c* of the medication bin **102**.

[0098] FIG. **16**C exemplarily illustrates communication between the conductive circuit layer **107** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B, and detection circuitry **1601** of the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**. The conductive circuit layer **107** is printed and embedded in the medication organizer tray apparatus **100** such that when one or more of the medication bins **102** containing medications **112** exemplarily illustrated in FIG. **9**, that are scheduled to be consumed by a healthcare recipient in a day are removed, the conductive circuit layer **107** is tripped. The tripped conductive circuit layer **107** is detected by the detection circuitry **1601** of the receptacle base **2101**. The conductive circuit layer **107** communicates with the receptacle base **2101** to enable detection of removal of each medication bin **102** from the support frame **101** and detection of tampering of the medication bins **102**. As exemplarily illustrated in FIG. **16**C, the detection circuitry **1601** of the receptacle base **2101** comprises a detection circuitry processing component **1602** and an electronic identification processing component **1603**. The detection circuitry processing component **1602** is configured to communicate with the conductive circuit layer **107** of the medication organizer tray apparatus **100**. The electronic identification processing component **1603** is configured to communicate with the electronic identification component **103** of the medication organizer tray apparatus **100**. The conductive pads **109** of the conductive circuit layer **107** comprising the edge conductive pads **109***a* and the redundant conductive pad **109***c* positioned on the lower surface **104***b* of the bin cover layer **104** exemplarily illustrated in FIGS. **1**A-**1**B and FIG. **18**B, electrically connect to connector pins **1602***a* that extend from the detection circuitry processing component **1602** of the receptacle base **2101** via multiple base conductive pads **1604***a* and **1604***b* of the receptacle base **2101**. The electronic identification component pads **125** positioned on the lower surface **104***b* of the bin cover layer **104** electrically connect to connector pins **1603***a* that extend from the electronic identification processing component **1603** of the receptacle base **2101** via base conductive pads **1604***c* of the receptacle base **2101**. The base conductive pads **1604** comprise base edge conductive pads **1604***a*, a base redundant conductive pad **1604***b*, and base identification component pads **1604***c*. Each base edge conductive pad **1604***a* is aligned with each edge conductive pad **109***a*. Each base redundant conductive pad **1604***b* is aligned with the redundant conductive pad **109***c*. Each electronic identification component pad **125** is aligned with each base identification component pad **1604***c*. These alignments of the conductive pads **109** of the conductive circuit layer **107** with the base conductive pads **1604** make an electrical connection between the receptacle base **2101** and the medication organizer tray apparatus **100** as exemplarily illustrated in FIG. **16**C.

[0099] In an embodiment, the detection circuitry processing component **1602** of the receptacle base **2101** comprises, for example, about 35 connector pins **1602***a* electrically connected to the edge conductive pads **109***a* of the conductive circuit layer **107** via about 35 base edge conductive pads **1604***a*. In an embodiment, the detection circuitry processing component **1602** provides, for example, about 5 connector pins **1602***a* and base edge conductive pads **1604***a* for making electrical connections to the medication bins **102** of the medication organizer tray apparatus **100**. The conductive sensor circuit lines **108***a* running along the lower surface **104***b* of the bin cover layer **104**, around each medication bin **102**, and on the lower surface **102***a* of each medication bin **102**, via the edge conductive pads **109***a*, connect to the connector pins **1602***a* of the detection circuitry processing component **1602** via the base edge conductive pads **1604***a*. The redundant circuit common return line **108***c*, via the redundant conductive pad **109***c* of the conductive circuit layer **107**, connects to the base redundant conductive pad **1604***b* of the detection circuitry processing component **1602**. The electronic identification processing component **1603** of the detection circuitry **1601** comprises, for example, about 4 base identification component pads **1604***c* extending from the connector pins **1603***a* and configured to align with and electrically connect to connector pins **124** of the electronic identification component

103 via electronic identification component pads **125** of the medication organizer tray apparatus **100** as exemplarily illustrated in FIG. **16**C.

[0100] The conductive sensor circuit lines **108***a* connect to the edge conductive pads **109***a*. The edge conductive pads **109***a* connect to the detection circuitry **1601** of the receptacle base **2101**. Each time a medication bin **102** is opened, the conductive sensor circuit line **108***a* corresponding to that medication bin **102** is tripped, thereby resulting in a tripped conductive circuit layer **107** on the medication organizer tray apparatus **100**. The detection circuitry **1601** of the receptacle base **2101** that is connected to the edge conductive pads **109***a* of the medication organizer tray apparatus **100** senses the tripped conductive sensor circuit lines **108***a* and intact conductive sensor circuit lines **108***a* of the conductive circuit layer **107**. A conductive circuit layer **107** which is broken at times and intact at other times indicates tampering of the medication bins **102**, for example, when a healthcare recipient may have tried to open and close the medication bin **102**, but failed to make a full connection of the conductive circuit layer **107** due to improper removal and/or insertion of the medication bin **102** from the support frame **101** exemplarily illustrated in FIGS. **1**A-**7**. When a healthcare recipient inserts the medication organizer tray apparatus **100** in the receptacle base **2101**, the edge conductive pads **109***a* which are positioned on the lower surface **104***b* of the bin cover layer **104** make physical contact with the base edge conductive pads **1604***a* of the detection circuitry **1601** embedded in the receptacle base **2101**. The positions of the base conductive pads **1604** match the positions of each of the edge conductive pads **109***a*, the redundant conductive pad **109***c*, and the electronic identification component pads **125**. The physical contact makes the electrical connection for signals which connect the detection circuitry **1601** of the receptacle base **2101** to the conductive circuit layer **107** of the medication organizer tray apparatus **100**.

[0101] The detection circuitry **1601** of the receptacle base **2101** collects information associated with detection of a break in the conductive sensor circuit lines **108***a* of the conductive circuit layer **107**. The collected information comprises, for example, a time and a date of the break in the conductive sensor circuit lines **108***a*, the medication bin **102** that is removed from the support frame **101**, etc. The receptacle base **2101** transmits the collected information to a backend server **2502** via a network **2501** exemplarily illustrated in FIG. **25**. The backend server **2502** receives and uses the collected information to monitor compliance of a healthcare recipient with a medication regimen. When a patient has consumed all the prescribed medications **112** contained in the medication bins **102** of the medication organization tray apparatus **100** based on dose time information stored in the electronic identification component **103**, the receptacle base **2101** further transmits the collected medication adherence information to the backend server **2502** via the network **2501**. In an embodiment, the detection circuitry **1601** of the receptacle base **2101** transmits the collected information to the electronic identification component **103**. For example, in cases when the patient using the medication organization tray apparatus **100** has no connectivity to the backend server **2502**, for example, via the internet, a cell phone with internet connectivity, Ethernet, etc., the receptacle base **2101** stores the collected medication adherence information in the electronic identification component **103**, and the patient can remove and ship the electronic identification component **103**, for example, to a company, a pharmacy, or a medical entity for checking medication adherence. The pharmacy can directly access the medication adherence information that is collected from the receptacle base **2101** and stored in the electronic identification component **103**.

[0102] In an embodiment, the conductive circuit layer **107** is electrically connected to a power source for receiving minimal power at predetermined time intervals to enable detection of a break in the conductive circuit layer **107**, in electric communication with the receptacle base **2101**, when one or more of the medication bins **102** are removed from the support frame **101**. In this embodiment, when the medication bin **102** is removed from the support frame **101** of the medication organizer tray apparatus **100**, the detection circuitry **1601** of the receptacle base **2101** detects removal of the medication bin **102** as the circuit connection is broken, at predetermined time intervals. In another embodiment, the conductive circuit layer **107** is electrically connected to a power source for receiving a constant power supply of minimal magnitude to enable detection of a break in the conductive circuit layer **107**, in communication with the receptacle base **2101**, when one or more of the medication bins **102** are removed from the support frame **101**. In this embodiment, the detection circuitry **1601** of the receptacle base **2101** dynamically detects removal of the medication bins **102** as the circuit connection is broken, when the medication bins **102** are removed from the support frame **101** of the medication organizer tray apparatus **100**.

[0103] In an embodiment, a power drop in the conductive sensor circuit lines **108***a* of the conductive circuit layer **107** can be minimized, for example, reduced to zero, except for a predetermined time interval such as a few seconds at the time of sensing removal of each medication bin **102** from the support frame **101** and/or tampering of the medication bins **102**. High power drop across the medication organizer tray apparatus **100** can heat up the conductive circuit layer **107**. In an embodiment, a break in the conductive circuit layer **107** of the medication organizer tray apparatus **100** is detected, when a small current generating a generally small power, for example, of about 30 milliwatts (mW) is passed through the conductive sensor circuit lines **108***a* and the continuity of the generated power along the conductive sensor circuit lines **108***a* is broken. In another embodiment, the conductive circuit layer **107** is isolated with no current flowing through the conductive sensor circuit lines **108***a*; hence no power flows across the conductive sensor circuit lines **108***a*. In this embodiment, the detection circuitry **1601** of the receptacle base **2101** periodically polls the medication organizer tray apparatus **100** at predetermined time intervals. For example, the detection circuitry **1601** of the receptacle base **2101** polls the medication organizer tray apparatus **100** at a polling time of about 15 minutes. The conductive sensor circuit lines **108***a* of the medication organizer tray apparatus **100** are electrically connected at the polling time. When the conductive sensor circuit lines **108***a* are electrically connected, then a small amount of current is passed through the conductive sensor circuit lines **108***a* to detect open and close conductive sensor circuit lines **108***a*.

[0104] FIGS. **17**A-**17**B exemplarily illustrate embodiments of the electronic identification component **103** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B. The electronic identification component **103** is configured as an embedded identifier chip or an integrated circuit chip. In an embodiment,

the electronic identification component **103** is, for example, a security and identifier (ID) chip or a hardwired chip embedded in the support frame **101** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C. The electronic identification component **103** is, for example, an active chip or a passive chip or a tag and operates using one or more wired modes of communication, for example, via direct contact using cables or one or more wireless modes of communication, for example, mobile Wi-Fi® (MiFi®) of Novatel Wireless, Inc., radio frequency identification (RFID), etc. The electronic identification component **103** configured, for example, as an RFID sensor or a MiFi® sensor stores medication adherence information comprising, for example, one or more of a serial identifier that matches a healthcare recipient identifier, information to coordinate medical activities, network identifiers and passwords, dosage times, wellness instructions for providing behavioral support for ensuring medication adherence by a healthcare recipient, messages, calendar information, information associated with removal of each medication bin **102** from the support frame **101** exemplarily illustrated in FIGS. **1**A-**1**C, and tampering of the medication bins **102**, etc. The electronic identification component **103** also stores identifiers of messages for the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**, to play at a specific time.

[0105] In an embodiment, the electronic identification component **103** is installed or embedded into the support frame **101** via a sticker **1701** that is placed on the support frame **101** of the medication organizer tray apparatus **100**. In an embodiment, the sticker **1701** is made of plastic material. In an embodiment, a rear surface **1701***a* of the sticker **1701** is a conductive surface comprising conductive lines **1704** and conductive pads **1703** configured to electrically connect the electronic identification component **103** to the receptacle base **2101**. In an embodiment, the conductive pads **1703** on the sticker **1701** connect through an adhesive such as glue or other means to the electronic identification component pads **125** of the conductive circuit layer **107** exemplarily illustrated in FIGS. **16**A-**16**C, which are etched and exposed on the medication organizer tray apparatus **100**. In an example, the electronic identification component **103** is placed on the sticker **1701** during a manufacturing process of the electronic identification component **103**, and is tested and programmed in a laboratory. Conductive ink is then applied on connector pins **124** of the electronic identification component **103**. Large conductive pads **1703** are configured on the sticker **1701** to ensure appropriate alignment of the conductive pads **1703** to the electronic identification component pads **125** of the conductive circuit layer **107** of the medication organizer tray apparatus **100**. The electronic identification component **103** connects to the detection circuitry **1601** exemplarily illustrated in FIG. **16**C, of the receptacle base **2101** via the conductive pads **1703** of the sticker **1701** and validates the medication organizer tray apparatus **100** and healthcare recipient information.

[0106] The electronic identification component **103** comprises, for example, three or four connector pins **124** that connect to the conductive pads **1703** depending on the type of connector pins **124**. In an embodiment, the electronic identification component **103** comprises four connector pins **124** as exemplarily illustrated in FIG. **17**A. The four connector pins **124** of the electronic identification component **103** represent connections comprising, for example, two control lines **124***a* and **124***c*, a power line **124***b*, and a ground line **124***d* as exemplarily illustrated in FIG. **17**A. In another embodiment, the electronic identification component **103** comprises three connector pins **124** as exemplarily illustrated in FIG. **17**B. In this embodiment, the connector pins **124** of the electronic identification component **103** represent connections comprising, for example, a control line **124***a*, a power line **124***b*, and a ground line **124***d* as exemplarily illustrated in FIG. **17**B. The ground line **124***d* is a return line which can connect, for example, to a ground line of a battery or a ground line of the receptacle base **2101**. The control lines **124***a* and **124***c* are signal lines through which the electronic identification component **103** exchanges information comprising, for example, an identifier code **123***a* and/or **123***b* exemplarily illustrated in FIGS. **15**A-**15**B, of the medication organizer tray apparatus **100**, opening and/or closing of the conductive circuit layer **107**, time of opening and/or closing of the conductive circuit layer **107**, etc., with the receptacle base **2101**. The control lines **124***a* and **124***c* are used to program and load medication adherence information in the electronic identification component **103**. The rear surface **1701***a* of the sticker **1701** comprises conductive lines **1704** that are connected to a series of conductive pads **125** of the electronic identification component **103** via matching conductive pads **1703** of the sticker **1701**. In an embodiment, the electronic identification component **103** receives power from different power sources through the power line **124***b*. The electronic identification component **103** comprises basic information when placed via the sticker **1701**. In an embodiment, the medication organizer tray apparatus **100** further comprises placement alignment markers (not shown) that enable proper placement of the sticker **1701** and the edge conductive pads **109***a* in the medication organizer tray apparatus **100**. For example, the placement location of the sticker **1701** is printed or indented on the medication organizer tray apparatus **100** to ensure that the sticker **1701** with the electronic identification component **103** is placed accurately in the receptacle **116** configured in the support frame **101** exemplarily illustrated in FIG. **4**A, and that a connection has been made between the electronic identification component pads **125** and the base identification component conductive pads **1604***c* of the electronic identification processing component **1603** of the detection circuitry **1601** of the receptacle base **2101**.

[0107] When the medication organizer tray apparatus **100** is inserted in the receptacle base **2101**, the receptacle base **2101** validates healthcare recipient information, matches day time, updates dosage instructions, updates messages, updates wellness information, updates a type of security circuitry, etc., based on the medication adherence information stored in the electronic identification component **103**. The electronic identification component **103** shares the stored medication adherence information with a healthcare recipient to whom the medication organizer tray apparatus **100** is assigned. For example, the healthcare recipient can connect the electronic identification component **103**, for example, to a computing device to access the stored medication adherence information. In an embodiment, the electronic identification component **103** carries a specific security type identifier configuration. In another embodiment, the security type identifier configuration is downloaded from the pill station manager application **2504** exemplarily illustrated in FIG. **25**, when the medication organizer tray apparatus **100** is inserted in the receptacle base **2101**. The electronic identification component **103** confirms the healthcare recipient identifier of the healthcare recipient. The electronic identification component

103 carries additional information to confirm that the right healthcare recipient is receiving the right medication organizer tray apparatus **100** for the right week and provides information that offers additional behavioral support and encouragement to the healthcare recipient to encourage the healthcare recipient to adhere to the medications **112** exemplarily illustrated in FIG. 1B, FIG. **9**, and FIGS. **11**A-**11**B, and his/her wellness regimen.

[0108] In an embodiment, the electronic identification component **103** comprises a power source **1705**, for example, a battery configured to power the electronic identification component **103**. In this embodiment, the power source **1705** can be placed on the sticker **1701**. In another embodiment, the electronic identification component **103** receives power from a power source (not shown) of the receptacle base **2101**. The power source of the receptacle base **2101** connects to the electronic identification component pads **125** in the medication organizer tray apparatus **100** and powers the electronic identification component **103** on the medication organizer tray apparatus **100**. Once the electronic identification component **103** receives power, the electronic identification component **103** is activated in a programming mode to store, for example, alarm information, information associated with a healthcare recipient identifier, etc. In another embodiment, the electronic identification component **103** comprises a light energy collector **1702** for powering the electronic identification component **103**. When a light source illuminates the medication organizer tray apparatus **100**, the light energy collector **1702** collects light energy from the light source which provides a primary or a backup power source for the electronic identification component **103**. If a healthcare recipient inserts the medication organizer tray apparatus **100** in the receptacle base **2101** that is not powered, the light energy collector **1702** can power up the electronic identification component **103** and turn on, for example, a green light or a red light to indicate whether a healthcare recipient identifier of the medication organizer tray apparatus **100** matches a healthcare recipient identifier of the receptacle base **2101**. In an embodiment, the receptacle base **2101** comprises a hardwired chip (not shown) configured to connect to the electronic identification component **103** positioned in the support frame **101** of the medication organizer tray apparatus **100** and also to power the electronic identification component **103**. The electronic identification component **103** can then confirm that an identifier of the medication organizer tray apparatus **100** matches an identifier of the receptacle base **2101** to ensure that a right healthcare recipient receives the right medication organizer tray apparatus **100** assigned to him/her.

[0109] The electronic identification component **103** further comprises a light emitting diode (not shown) which is activated when the electronic identification component **103** is connected to the support frame **101** and when the medication organizer tray apparatus **100** is inserted into the receptacle base **2101**. The light emitting diode confirms that a connection has been made between the electronic identification component **103** and the support frame **101** of the medication organizer tray apparatus **100**, and/or between the electronic identification component **103** and the receptacle base **2101** when the medication organizer tray apparatus **100** is placed in the receptacle base **2101**. In an embodiment, if the electronic identification component **103** of the medication organizer tray apparatus **100** is passive, then, when the medication organizer tray apparatus **100** is inserted into the receptacle base **2101**, an indication such as a beep via a loudspeaker **2102**, a light, or a message on a display screen **2103** of the receptacle base **2101** exemplarily illustrated in FIG. **21**A and FIG. **22**, indicates that the connections are intact.

[0110] FIG. **18**A exemplarily illustrates an adhesive protective paper layer **126** removably attached to the lower surface **104***b* of the bin cover layer **104** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B. The adhesive protective paper layer **126** forms the third component layer **303** of the medication organizer tray apparatus **100** as exemplarily illustrated in FIG. **3**. The adhesive protective paper layer **126** comprises an adhesive **126***a* that is selectively applied on the lower surface **104***b* of the bin cover layer **104**. The adhesive protective paper layer **126** further comprises perforations **127** and openings **128** that mirror the perforations **110** and the openings **117** of the medication bins **102** respectively, as exemplarily illustrated in FIG. **18**B.

[0111] FIG. **18**B exemplarily illustrates removal of the adhesive protective paper layer **126** from the lower surface **104***b* of the bin cover layer **104** to allow attachment of the lower surface **104***b* of the bin cover layer **104** to the upper surface **101***a* of the support frame **101**. The adhesive protective paper layer **126** comprising the adhesive **126***a* is removably attached to the lower surface **104***b* of the bin cover layer **104**. After the medications **112** exemplarily illustrated in FIG. 1B, are loaded in the medication bins **102** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B, the adhesive protective paper layer **126** is removed from the lower surface **104***b* of the bin cover layer **104**. The bin cover layer **104** having the selectively applied adhesive **126***a* exposed on the lower surface **104***b* of the bin cover layer **104** is then removably attached to the upper surface **101***a* of the support frame **101**. When the adhesive protective paper layer **126** is removed from the lower surface **104***b* of the bin cover layer **104**, the adhesive **126***a* of the adhesive protective paper layer **126** is left exposed on the lower surface **104***b* of the bin cover layer **104**. When the adhesive protective paper layer **126** is removed, the exposed adhesive **126***a* on the lower surface **104***b* of the bin cover layer **104** is used to attach the lower surface **104***b* of the bin cover layer **104** to the upper surface **101***a* of the support frame **101**. The exposed adhesive **126***a* is selectively applied on the upper surface **101***a* of the support frame **101** to match an outline of the lips **121** of the medication bins **102** and surfaces **101***d* surrounding the outer edges **111***a* of the apertures **111** of the support frame **101** exemplarily illustrated in FIG. 1B. The adhesive **126***a* is not applied on the cut edges **114** of the medication bins **102** and hence allows peeling and removal of the customized bin labels **106** exemplarily illustrated in FIG. 1A, FIGS. **2**A-**2**B, FIGS. **8**-**9**, and FIGS. **14**A-**14**D, from the medication bins **102**. The adhesive strength provided by the adhesive **126***a* of the adhesive protective paper layer **126** is calibrated to allow easy and clean removal of the customized bin labels **106** from the medication bins **102** and for removing medications **112** from the medication bins **102**.

[0112] FIGS. **19**A-**19**D exemplarily illustrate different configurations for organizing medications **112** in the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B. FIGS. **19**A-**19**D exemplarily illustrate multiple weekly configurations for organizing medications **112** in the medication organizer tray apparatus **100**. The medication organizer tray apparatus **100** can be customized for holding different types of medications **112** and medication dosages. In an example, up to four pre-filled

medication organizer tray apparatuses **100** a month or weekly pre-filled medication organizer tray apparatuses **100** are sent to a healthcare recipient as per his/her prescription with medical information printed on the customized bin labels **106** exemplarily illustrated in FIG. **1**A, FIGS. **2**A-**2**B, FIGS. **8**-**9**, and FIGS. **14**A-**14**D. In an embodiment, the medication organizer tray apparatus **100** is configured to hold a daily dosage, a weekly dosage for 7 days, 14 days, 21 days, or 28 days, or a monthly dosage of medications **112**.

[0113] FIG. **19**A exemplarily illustrates a 4×7 medication organizer tray apparatus **100** containing a medication dosage to be taken four times a day, each day of the week. The first two rows of the 4×7 medication organizer tray apparatus **100** contain medications **112** that are to be taken at different times during the day, every day of the week. The third row contains medications **112** that are to be taken at noon time, every day of the week. The fourth row of the 4×7 medication organizer tray apparatus **100** contains medications **112** that are to be taken in the evening, every day of the week.

[0114] FIG. **19**B exemplarily illustrates a 4×7 medication organizer tray apparatus **100** containing a medication dosage to be taken three times a day, each day of the week. The first row of the 4×7 medication organizer tray apparatus **100** contains medications **112** that are to be taken in the morning, every day of the week. The second row of the 4×7 medication organizer tray apparatus **100** contains medications **112** that are to be taken at noon time, every day of the week. The third row of the 4×7 medication organizer tray apparatus **100** contains medications **112** that are to be taken in the evening, every day of the week. The fourth row is not filled and is empty.

[0115] FIG. **19**C exemplarily illustrates a 4×7 medication organizer tray apparatus **100** containing a medication dosage for two weeks. The first row of the 4×7 medication organizer tray apparatus **100** contains medications **112** that are to be taken in the morning, every day of week 1. The second row of the 4×7 medication organizer tray apparatus **100** contains medications **112** that are to be taken in the evening, every day of week 1. The third row of the 4×7 medication organizer tray apparatus **100** contains medications **112** that are to be taken in the morning, every day of week 2. The fourth row of the 4×7 medication organizer tray apparatus **100** contains medications **112** that are to be taken in the evening, every day of week 2.

[0116] FIG. **19**D exemplarily illustrates a 4×7 medication organizer tray apparatus **100** containing a medication dosage for a month or for four weeks. The first row of the 4×7 medication organizer tray apparatus **100** contains medications **112** that are to be taken every day of week 1, once a day. The second row of the 4×7 medication organizer tray apparatus **100** contains medications **112** that are to be taken every day of week 2, once a day. The third row of the 4×7 medication organizer tray apparatus **100** contains medications **112** that are to be taken every day of week 3, once a day. The fourth row of the 4×7 medication organizer tray apparatus **100** contains medications **112** that are to be taken every day of week 4, once a day.

[0117] FIGS. **20**A-**20**B exemplarily illustrate different views of a cover jacket **2001** configured to cover and accommodate the medication organizer tray apparatus **100** exemplarily illustrated in FIG. **20**C. The cover jacket **2001** securely accommodates the medication organizer tray apparatus **100**, thereby facilitating easy transportation and storage of the medication organizer tray apparatus **100**. FIG. **20**C exemplarily illustrates the medication organizer tray apparatus **100** accommodated within the cover jacket **2001**. In an embodiment, the cover jacket **2001** is configured as a foldable jacket comprising a top panel **2002** exemplarily illustrated in FIGS. **20**A-**20**C, and a bottom panel **2004** exemplarily illustrated in FIGS. **20**B-**20**C. FIG. **20**A exemplarily illustrates a top plan view of the cover jacket **2001**, showing a front surface **2002***a* of the top panel **2002** of the cover jacket **2001**. In an embodiment, the front surface **2002***a* of the top panel **2002** comprises information specific to a healthcare recipient comprising, for example, personalized images, personalized messages, a company name, healthcare recipient information, etc., printed thereon as exemplarily illustrated in FIG. **20**A. The top panel **2002** comprises a tab **2003** for opening the cover jacket **2001** as exemplarily illustrated in FIGS. **20**A-**20**C.

[0118] FIGS. **20**B-**20**C exemplarily illustrate top perspective views of the cover jacket **2001**, showing the top panel **2002** and the bottom panel **2004** of the cover jacket **2001**. In an embodiment, a rear surface **2002***b* of the top panel **2002** comprises, for example, information specific to medications **112** contained in each medication bin **102** of the medication organizer tray apparatus **100**, information specific to a patient to whom the medication organizer tray apparatus **100** is prescribed, incentives for medication adherence, status of incentives such as reward points status, the identifier codes **123***a* and **123***b* of the medication organizer tray apparatus **100**, etc. In an embodiment, the bottom panel **2004** of the cover jacket **2001** comprises multiple slots **2005** that allow insertion of the medication bins **102** of the medication organizer tray apparatus **100** through the slots **2005**. The medication organizer tray apparatus **100** is removably attached to a front surface **2004***a* of the bottom panel **2004** and the medication bins **102** of the medication organizer tray apparatus **100** are inserted through the slots **2005** of the bottom panel **2004**. When a healthcare recipient receives the medication organizer tray apparatus **100** in the cover jacket **2001** from a pharmacy, he/she places the medication organizer tray apparatus **100** together with the cover jacket **2001** into the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**. In an embodiment, the cover jacket **2001** is removed prior to placing the medication organizer tray apparatus **100** into the receptacle base **2101**.

[0119] FIGS. **21**A-**21**B exemplarily illustrate different views showing the medication organizer tray apparatus **100** inserted into the receptacle base **2101**. FIG. **21**A exemplarily illustrates a top perspective view of the medication organizer tray apparatus **100** inserted into the receptacle base **2101**. FIG. **21**B exemplarily illustrates a side perspective view of the medication organizer tray apparatus **100** inserted into the receptacle base **2101**. The receptacle base **2101** is a base that holds the medication organizer tray apparatus **100** with prefilled medications **112** exemplarily illustrated in FIG. **1**B. In an embodiment, the receptacle base **2101** comprises a receptacle **2105**, a loudspeaker **2102**, a display screen **2103** such as a liquid crystal display (LCD) screen, and a call button **2104**. The medication organizer tray apparatus **100** is inserted into the receptacle **2105** of the receptacle base **2101**. The receptacle base **2101** plays personalized audio messages such as "grandma thank you for taking your medication" or chimes to communicate or talk to a healthcare recipient via the loudspeaker **2102**, and displays personalized text messages, adherence status, a clock interface that displays time, etc., on the display screen **2103**. In an embodiment, the loudspeaker **2102** vocalizes a serial identifier that matches a healthcare

recipient identifier. Furthermore, when the medication organizer tray apparatus **100** is inserted into the receptacle base **2101**, the receptacle base **2101** extracts messages and other medication adherence information from the electronic identification component **103** and annunciates the messages at the right dose and alarm time and other times as programmed via the loudspeaker **2102**.

[0120] In an embodiment, the display screen **2103** displays a serial identifier that matches a healthcare recipient identifier. The call button **2104** of the receptacle base **2101** allows a healthcare recipient to call or connect with a healthcare provider or an advisor. The healthcare provider or the advisor responds, when the call button **2104** is pressed by the healthcare recipient. The receptacle base **2101** further comprises adherence indicators **2106** that are configured to indicate behavior of a healthcare recipient based on medication adherence. The adherence indicators **2106** change colors based on medication adherence of the healthcare recipient. The receptacle base **2101** further comprises additional buttons **2107** to allow the healthcare recipients to communicate with the healthcare provider or select options. The additional buttons **2107** comprise, for example, an "up" button **2107***a*, a "down" button **2107***b*, and a "select" button **2107***c* as exemplarily illustrated in FIG. **21**A. In an embodiment, the receptacle base **2101** allows connection, for example, to a computing device, for example, a cell phone, a smartphone, etc., via universal serial bus (USB) ports **2108**. The USB ports **2108** are spaced appropriately to hold, for example, two dongles at one time.

[0121] In an embodiment, the receptacle base **2101** comprises a lid **2109** with sensor bars, hereinafter referred to as "clamp bars" **2110**, as exemplarily illustrated in FIG. **21**B, for keeping the medication organizer tray apparatus **100** from flapping and ensuring a strong electrical connection between the medication organizer tray apparatus **100** and the receptacle base **2101**, when closed. In an embodiment, the receptacle base **2101** comprises, for example, eight clamp bars **2110**. The lid **2109** with the clamp bars **2110** is pushed down by a healthcare recipient or a healthcare provider after placing the medication organizer tray apparatus **100** in the receptacle base **2101**, leaving the medication bins **102** exemplarily illustrated in FIG. **21**B, exposed through the clamp bars **2110**. In an embodiment, a diffused material **130** is deposited on a cut **129** configured on each medication bin **102** as exemplarily illustrated in FIG. **21**B. The diffused material **130** indicates one or more dosage times of the medications **112** in each medication bin **102** and/or a message specific to each medication bin **102**. In an embodiment, the diffused material **130** configured as a blinking light on the medication bin **102** can indicate that there is a message for that specific medication bin **102**, for example, a message indicating medications **112** in that medication bin **102** have changed, a message indicating not to take the medications **112** as that dose period has expired, specific instructions on how to take the medications **112**, etc. The diffused material **130** is configured as a diffused light source and deposited on the raised bump front edge **115** of each of the medication bins **102** to light the raised bump front edge **115** of each of the medication bins **102** as exemplarily illustrated in FIG. **21**B. The lit raised bump front edge **115** of a medication bin **102** shows the healthcare recipient which raised bump front edge **115** of a medication bin **102** needs to be raised and hence which medication bin **102** needs to be opened. This lighting arrangement of the medication organizer tray apparatus **100** assists healthcare recipients with dementia and forgetfulness who may have difficulty in remembering, for example, a day, a date, or a time for consuming the medications **112** and who need to be directed to remove or open a correct medication bin **102**. In an embodiment, for proper adhesive application of the bin cover layer **104** on the medication bins **102** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **2**A-**2**B, at a pharmacy, or for stacking for storage before shipment, or transport of the medication organizer tray apparatus **100**, the medication bins **102** are configured without the raised bump front edges **115**. In this embodiment, the raised bump front edges **115** of the medication bins **102** are raised at the time of inserting the medication organizer tray apparatus **100** into the receptacle base **2101**.

[0122] FIG. **22** exemplarily illustrates a top plan view of an embodiment of the receptacle base **2101** accommodating the medication organizer tray apparatus **100**. The receptacle base **2101** disclosed herein comprises a loudspeaker **2102**, a display screen **2103** such as a liquid crystal display (LCD) screen, and a call button **2104**. The receptacle base **2101** plays audio messages via the loudspeaker **2102** and displays text messages and an adherence status on the display screen **2103**. The call button **2104** of the receptacle base **2101** allows a healthcare recipient to call a healthcare provider. The receptacle base **2101** further comprises additional buttons, for example, an "up" button **2107***a* and a "down" button **2107***b* to allow the healthcare recipients to select options.

[0123] FIG. **23** illustrates a method for organizing medications **112** exemplarily illustrated in FIG. **1**B, FIG. **9**, and FIGS. **11**A-**11**B, and collecting medication adherence information. The method disclosed herein comprises assembling **2301** the medication organizer tray apparatus **100** comprising the support frame **101** with multiple apertures **111** positioned at predefined intervals from each other, multiple medication bins **102**, the bin cover layer **104** with multiple customized bin labels **106**, and the conductive circuit layer **107** as exemplarily illustrated in FIGS. **1**A-**1**C and as disclosed in the detailed description of FIGS. **1**A-**1**C. The medication bins **102** are placed **2301***a* in the apertures **111** of the support frame **101** exemplarily illustrated in FIG. **1**B. The medication bins **102** accommodate multiple medications **112**. In an embodiment, a medication dispensing system **2401** exemplarily illustrated in FIG. **24**, captures an image of an upper surface **101***a* and a lower surface **101***b* of the support frame **101** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**B, after filling of the medication organizer tray apparatus **100** with the medications **112**. The images are captured before attaching the bin cover layer **104** to the upper surface **101***a* of the support frame **101** as exemplarily illustrated in FIG. **18**B. The conductive circuit layer **107** comprising multiple conductive lines **108** running along one or more of the lower surface **104***b* of the bin cover layer **104**, around each medication bin **102**, and the lower surface **102***a* of each medication bin **102** is created **2301***b*. The customized bin labels **106** exemplarily illustrated in FIG. 1A, FIGS. **2**A-**2**B, FIGS. **8**-**9**, and FIGS. **14**A-**14**D, are removably configured **2301***c* within the bin cover layer **104** to match openings **117** of the medication bins **102** exemplarily illustrated in FIG. **7**, FIG. **10**, and FIG. **18**B. The customized bin labels **106** comprise medical information printed thereon. The bin cover layer **104** is removably attached **2301***d* to the upper surface **101***a* of the support frame **101**. The customized

bin labels **106** of the bin cover layer **104** affixed to the upper surface **101***a* of the support frame **101** seals the openings **117** of the medication bins **102**.

[0124] The assembled medication organizer tray apparatus **100** is positioned **2302** on the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**, to allow electrical communication of the conductive circuit layer **107** of the assembled medication organizer tray apparatus **100** with the detection circuitry **1601** of the receptacle base **2101** exemplarily illustrated in FIG. **16**C. Removal of each medication bin **102** from the support frame **101** and tampering of the medication bins **102** are detected **2303** via the electrical communication between the conductive circuit layer **107** of the assembled medication organizer tray apparatus **100** and the detection circuitry **1601** of the receptacle base **2101**. In an embodiment, a power source (not shown) is electrically connected to the conductive circuit layer **107** of the assembled medication organizer tray apparatus **100**. In an embodiment, the power source supplies minimal power at predetermined time intervals to the conductive circuit layer **107** to enable detection of a break in the conductive circuit layer **107** that is in electric communication with the receptacle base **2101**, when one or more of the medication bins **102** are removed from the support frame **101**. In another embodiment, the power source supplies a constant power supply of a minimal magnitude to the conductive circuit layer **107** to enable detection of a break in the conductive circuit layer **107** that is in electric communication with the receptacle base **2101**, when one or more of the medication bins **102** are removed from the support frame **101**.

[0125] The assembled medication organizer tray apparatus **100** collects and transmits **2304** medication adherence information associated with the removal of each medication bin **102** from the support frame **101** and the tampering of the medication bins **102**, to the receptacle base **2101** via the conductive circuit layer **107**. The medication adherence information indicates, for example, which of the medication bins **102** is removed from the support frame **101** for ensuring medication adherence by a healthcare recipient and verifying the presence of medications **112** in each medication bin **102**. The electronic identification component **103** exemplarily illustrated in FIGS. **17**A-**17**B, is embedded into the support frame **101** during assembly of the medication organizer tray apparatus **100**. The electronic identification component **103** is configured to electrically communicate with the receptacle base **2101**. The electronic identification component **103** identifies the medication organizer tray apparatus **100** for verifying the presence of medications **112** in each medication bin **102**, and stores and exchanges the medication adherence information with the receptacle base **2101**.

[0126] FIG. **24** exemplarily illustrates a side perspective view of a medication dispensing system **2401** for filling the medication organizer tray apparatus **100** with medications **112** exemplarily illustrated in FIG. **1**B. Multiple medication bins **102** of different shapes or sizes accommodate medications **112** of different types, for example, parenterals **112***c*, oral medications, blister packed medications **112***b* exemplarily illustrated in FIG. **6**, etc., in the medication organizer tray apparatus **100** as disclosed in the detailed description of FIGS. **1**A-**1**C and FIG. **6**. In an embodiment, up to eight medication organizer tray apparatuses **100** can be placed in the medication dispensing system **2401**. The medication dispensing system **2401** fills medications **112** into the medication organizer tray apparatus **100** using a manual dispenser or a robotic dispenser **2402** as exemplarily illustrated in FIG. **24**. In an embodiment, the medication dispensing system **2401** captures an image of the medication organizer tray apparatus **100** after the filling process is complete. Once the filling is complete, each medication organizer tray apparatus **100** is manually removed, checked, and sealed with the bin cover layer **104** configured with the customized bin labels **106** exemplarily illustrated in FIG. **1**A, FIGS. **2**A-**2**B, FIGS. **8**-**9**, and FIGS. **14**A-**14**D, and the other component layers, for example, **303**, **304**, **305**, **307**, **308**, **309**, etc., exemplarily illustrated in FIG. **3**, of the medication organizer tray apparatus **100** by a pharmacist or a pharmacy technician.

[0127] FIG. **25** exemplarily illustrates communication between the medication organizer tray apparatus **100** inserted in the receptacle base **2101**, and a backend server **2502** and a user device **2503** via a network **2501**. The user device **2503** is an electronic device, for example, a personal computer, a tablet computing device, a mobile computer, a mobile phone, a smartphone, a portable computing device, a laptop, a touch centric device, a workstation, a portable electronic device, a network enabled computing device, an interactive network enabled communication device, any other suitable computing equipment, combinations of multiple pieces of computing equipment, etc. Computing equipment, for example, one or more servers may be associated with one or more online services. The network **2501** is, for example, the internet, an intranet, a wired network, a wireless network, a communication network that implements Bluetooth® of Bluetooth Sig, Inc., a network that implements Wi-Fi® of Wi-Fi Alliance Corporation, an ultra-wideband communication network (UWB), a wireless universal serial bus (USB) communication network, a communication network that implements ZigBee® of ZigBee Alliance Corporation, a general packet radio service (GPRS) network, a mobile telecommunication network such as a global system for mobile (GSM) communications network, a code division multiple access (CDMA) network, a third generation (3G) mobile communication network, a fourth generation (4G) mobile communication network, a long-term evolution (LTE) mobile communication network, a public telephone network, etc., a local area network, a wide area network, an internet connection network, an infrared communication network, etc., or a network formed from any combination of these networks.

[0128] The conductive circuit layer **107** of the medication organizer tray apparatus **100** sends sensor signals that comprise medication adherence information to the detection circuitry **1601** of the receptacle base **2101** as exemplarily illustrated in FIGS. **16**A-**16**C and as disclosed in the detailed description of FIGS. **16**A-**16**C. The receptacle base **2101** then transmits the medication adherence information to the backend server **2502** via the network **2501**. The backend server **2502** processes the medication adherence information and transmits the processed medication adherence information to the user device **2503** via the network **2501**. In an embodiment, the backend server **2502** is implemented in a cloud computing environment. As used herein, "cloud computing environment" refers to a processing environment comprising configurable computing physical and logical resources, for example, networks, servers, storage, applications, services, etc., and data distributed over the network **2501**, for example, the internet. The cloud computing environment provides on-demand network access to a shared pool of the configurable computing physical and logical resources. The backend server **2502** is a cloud computing based platform imple-

mented as a service for receiving medication adherence information collected from the medication organizer tray apparatus **100** and transmitting the received medication adherence information to the user device **2503** via the network **2501**. The backend server **2502** is a cloud computing web based server developed, for example, using Microsoft®.NET, the Oracle® database server, etc. In an embodiment, the backend server **2502** is hosted in a cloud computing environment, for example, at a customer premise, a company premise, a remote hosting center, etc.

[0129] The pill station manager application **2504** downloadable and executable on the user device **2503** displays the medication adherence information received from the backend server **2502** to a user via a graphical user interface (GUI) **2601** exemplarily illustrated in FIG. **26**, provided by the pill station manager application **2504**. A user, for example, a healthcare provider can view the medication adherence information on the GUI **2601** of the user device **2503**. The user device **2503** comprises a non-transitory computer readable storage medium, for example, a memory unit (not shown) configured to store computer program instructions defined by the pill station manager application **2504**. As used herein, "non-transitory computer readable storage medium" refers to all computer readable media, for example, non-volatile media such as optical discs or magnetic disks, volatile media such as a register memory, a processor cache, etc., and transmission media such as wires that constitute a system bus coupled to the processor, except for a transitory, propagating signal. The user device **2503** further comprises at least one processor (not shown) communicatively coupled to the non-transitory computer readable storage medium for executing the defined computer program instructions. The backend server **2502** transmits actionable information, for example, about the medications **112** exemplarily illustrated in FIG. **1**B, wellness information, loyalty program information, surveys, etc., to a user device **2901** exemplarily illustrated in FIG. **29**, of a healthcare recipient who is using the medication organizer tray apparatus **100**, via the network **2501**.

[0130] FIG. **26** exemplarily illustrates a screenshot of an image of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B, filled with medications **112** exemplarily illustrated in FIG. **1**B, displayed on the graphical user interface (GUI) **2601** provided by the pill station manager application **2504** on a user device **2503** exemplarily illustrated in FIG. **25**. The pill station manager application **2504** stores images of the medication organizer tray apparatus **100** in a memory unit (not shown) of the user device **2503**. At a pharmacy, when the medication organizer tray apparatus **100** is filled with medications **112**, an image of the medication organizer tray apparatus **100** can be captured from different angles, for example, from the upper surface **101***a* and the lower surface **101***b* of the support frame **101** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**B, before placing the bin cover layer **104** exemplarily illustrated in FIG. **1**A and FIGS. **2**A-**2**B, on the upper surface **101***a* of the support frame **101**. Imaging at different angles of the medication organizer tray apparatus **100** facilitates capturing of all the medications **112** in all the medication bins **102** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C. In an embodiment, the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**, comprises an embedded camera for capturing images of the medication organizer tray apparatus **100** from the lower surface **101***b* of the support frame **101** of the medication organizer tray apparatus **100**. In this embodiment, the medication organizer tray apparatus **100** is then turned and placed face down using a temporary cover (not shown) to keep the medications **112** intact and in place during imaging of the upper surface **101***a* and the lower surface **101***b* of the support frame **101**.

[0131] In another embodiment, a standard scanner is used to capture, store, and forward images to the pill station manager application **2504** for future reference. The pill station manager application **2504** displays clear views of the medication organizer tray apparatus **100** and provides enlarged views of each medication bin **102** for clarity on the graphical user interface (GUI) **2601** as exemplarily illustrated in FIG. **26**. The pill station manager application **2504** further provides a detailed table providing a list of the different drugs or medications **112** in the medication organizer tray apparatus **100**, compliance urgency of each of the medications **112**, medication duration, dosage details, etc., on the GUI **2601**. The pill station manager application **2504** also displays the latest medication images, for example, front images and back images of each of the medications **112** as exemplarily illustrated in FIG. **26**, on the GUI **2601** for medication bin reconciliation.

[0132] The pill station manager application **2504** stores the captured images in the memory unit for record purposes or transmits the captured images to a remote pharmacist to confirm the right fill. Such remote checks allow robots, technicians, or a licensed pharmacist to fill the medication organizer tray apparatus **100** and get the fill approved and signed off as per standards rules and regulations. Once the medication organizer tray apparatus **100** is approved by the licensed pharmacist, the medication organizer tray apparatus **100** is shipped to the healthcare recipients. For example, the medication organizer tray apparatus **100** is filled in one place and approved by the local pharmacist to be sent to a healthcare recipient who lives in another state. The medication organizer tray apparatus **100** is sent to the healthcare recipient after verification and/or confirmation of a correct fill by a remote pharmacist of that state.

[0133] Each image of the medication organizer tray apparatus **100** that is taken is stored and shared with healthcare providers, for example, advisors through their respective user devices **2501**, for example, smartphones. The captured images can also be used by advisors or healthcare professionals to instruct healthcare recipients about their medications **112** and refer to the medications **112** by color, size, shape, etc., when guiding the healthcare recipients to remove a particular medication **112**. In an embodiment, the image of the medication organizer tray apparatus **100** is also provided on a healthcare recipient portal and a healthcare provider portal for allowing the healthcare recipients, healthcare providers, home health staff, etc., to view the images. These images are also sent to healthcare recipients' user devices **2901** exemplarily illustrated in FIG. **29**, for example, phones, their computer, a care giver's phone, and other physicians to visually indicate what medications **112** have been loaded into the medication organizer tray apparatus **100**. This image capture can be used to verify a correct fill in incidences of incorrect filling reporting by healthcare recipients who may be abusing, diverting, or hoarding the medications **112**.

[0134] FIG. **27** illustrates a method for tracking wellness adherence of a healthcare recipient. As used herein, "wellness adherence" refers to compliance of healthcare recipients to healthcare provider prescribed medications **112** exemplarily

illustrated in FIG. **1**B, and/or wellness activities such as exercise, diet, wound care, etc. Tracking wellness adherence comprises, for example, tracking whether a healthcare recipient administers medicines as prescribed as well as whether the healthcare recipient continues administering the medicines for a prescribed duration. In the method disclosed herein, an identifier code **123***a* exemplarily illustrated in FIG. **29**, FIG. **31**, and FIGS. **33**A-**33**D, configured to be positioned on a medical implement **2913** exemplarily illustrated in FIG. **29**, to identify the medical implement **2913** is provided **2701**. As used herein, "identifier code" refers to a machine readable two-dimensional code rendered on an optical label comprising, for example, square dots arranged in a square grid on a white background, containing a substantial amount of information about a medical implement **2913** to which the optical label is attached. The identifier code **123***a* is, for example, a quick response (QR) code. Also, as used herein, "medical implement" refers to any item used in a medical activity or a wellness activity, on which the identifier code **123***a* can be affixed for tracking wellness adherence of a healthcare recipient. The medical implement **2913** is, for example, a medication bin **102** exemplarily illustrated in FIGS. **1**A-**1**C, configured to store one or more medications **112**, a parenteral device **3302** exemplarily illustrated in FIG. **33**C, a fitness device, a medical identification card **3301** exemplarily illustrated in FIG. **33**B, a medical wellness plan, the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B, etc.

[0135] In an embodiment, the identifier code **123***a* is printed on the medical implement **2913**. In another embodiment, the identifier code **123***a* is fastened to the medical implement **2913**, for example, using glue. In another embodiment, the identifier code **123***a* is etched on the medical implement **2913**. The identifier code **123***a* is configured in multiple sizes, for example, in about a 20 millimeter (mm) square, and is printed in black and white colors. The identifier code **123***a* is configured to be positioned on multiple surfaces of the medical implement **2913**, for example, at the center on an upper surface **102***c* of a medication bin **102** exemplarily illustrated in FIG. **10** and FIG. **12**, or on one of the inner surfaces, for example, on a bottom surface **106***b* of a customized bin label **106** that covers the medication bin **102** as exemplarily illustrated in FIG. **33**A. The identifier code **123***a* is configured to be positioned on a medical implement **2913**, for example, a parenteral device **3302** exemplarily illustrated in FIG. **33**C, containing one week's dose of a medication and which is not discarded after taking a single dose of the medication. In the method disclosed herein, an additional identifier code **123***a* is pre-printed on paper and configured as an identifier code sticker along with labels and notes exemplarily illustrated in FIG. **31**, to allow a healthcare recipient to enter information related to medications **112** or a medical implement **2913** on the labels or on the notes and then stick the labels and the notes along with the identifier code **123***a* on the medical implement **2913**. The identifier code **123***a* is configured to be of use to healthcare recipients who use user devices **2901**, for example, smart phones, tablet computing devices, etc., and applications such as a wellness adherence tracking application **2902** on their user devices **2901** exemplarily illustrated in FIG. **29**. For example, patients who are prescribed medications **112** can use the identifier codes **123***a* and the wellness adherence tracking application **2902** on their smart phones, tablet computing devices, etc., to track the patients' wellness adherence.

[0136] In an embodiment, the identifier code **123***a* is configured to be positioned on a medication bin **102** of the medication organizer tray apparatus **100** to identify the medication bin **102**, in the absence of the receptacle base **2101** exemplarily illustrated in FIGS. **21**A-**21**B and FIG. **22**, that enables detection of removal of each medication bin **102** from the support frame **101** via the conductive circuit layer **107** exemplarily illustrated in FIGS. **1**A-**1**B. The method disclosed herein allows tracking of wellness adherence of healthcare recipients who use the medication organizer tray apparatus **100** without the receptacle base **2101** and/or without the conductive circuit layer **107**. The method disclosed herein tracks the wellness adherence of a healthcare recipient using identifier codes **123***a* positioned on medication bins **102**, when the medication bins **102** are removed from the medication organizer tray apparatus **100** and are used as standalone medication bins **102** for storing medications **112** during travel, for refrigeration of medications **112**, etc. The table below summarizes different scenarios for use of the identifier code **123***a* on a medical implement **2913**:

Medication organizer tray apparatus/ Receptacle base/Parenteral configuration	Conductive circuit layer	Identifier code needed
Medication organizer tray apparatus with a receptacle base	Yes	No
Medication organizer tray apparatus standalone without a receptacle base	No	Yes
Wellness adherence tracking application (Mobile Application) Needed	No	Yes

[0137] As exemplarily illustrated in the table above, an identifier code **123***a* is used for tracking wellness adherence of a healthcare recipient when the medication organizer tray apparatus **100** is used without the receptacle base **2101** and/or without the conductive circuit layer **107**. The method disclosed herein employs a wellness adherence tracking system **2900** exemplarily illustrated in FIG. **29**, comprising at least one processor **3001** exemplarily illustrated in FIG. **30**, configured to execute computer program instructions for tracking the wellness adherence of a healthcare recipient. The wellness adherence tracking system **2900** comprises a wellness adherence tracking application **2902** deployed on the healthcare recipient's user device **2901**. The wellness adherence tracking application **2902** is a software application downloadable and usable on the healthcare recipient's user device **2901** for tracking the healthcare recipient's wellness adherence in the above tabulated scenarios. The wellness adherence tracking application **2902** on the healthcare recipient's user device **2901** communicates with the backend server **2502** of the wellness adherence tracking system **2900** via a network **2501**, for example, the internet exemplarily illustrated in FIG. **29**.

[0138] The identifier code **123***a* is exclusive, that is, unique to each medical implement **2913** for each healthcare recipient as the identifier code **123***a* is, for example, printed at a pharmacy, or pre-printed and sent to the pharmacy for a specific healthcare recipient, or sent directly to the healthcare recipient, for example, through mail, in person, or via electronic mail in a printable format. In an embodiment, the identifier code **123***a* is printed at the pharmacy using Food and Drug Administration (FDA) approved ink as there is minimal exposure of the medications **112** to the identifier code **123***a*. In an embodiment, additional identifier code stickers are printed,

for example, on paper and supplied to the pharmacy for including the identifier code stickers in the healthcare recipient's package, where these identifier code stickers may not be positioned on the medication bins **102**. In this embodiment, the additional identifier code stickers need not use the FDA approved ink. The identifier code **123***a* is configured to store alphanumeric data with a predefined data size in one or more of multiple formats as exemplarily illustrated in FIG. **31**. The identifier code integration depends on one or more requirements comprising, for example, pharmacy printers with sufficient registration to print the identifier code **123***a* and the wellness adherence tracking application **2902** that requires a minimum number of clicks to scan the identifier code **123***a*.

[0139] A healthcare recipient can scan **2702** the identifier code **123***a* of the medical implement **2913** via a graphical user interface (GUI) **2911** provided by the wellness adherence tracking application **2902** of the wellness adherence tracking system **2900** accessible on the healthcare recipient's user device **2901** exemplarily illustrated in FIG. **29**. The wellness adherence tracking application **2902**, in communication with the backend server **2502**, decodes **2703** the scanned identifier code **123***a* and validates the decoded identifier code **123***a*. The identifier code **123***a* is encoded, for example, encrypted, in a way that any other code scanning application apart from the wellness adherence tracking application **2902** will fail to decode the identifier code **123***a*. Only the wellness adherence tracking application **2902** can decode the identifier code **123***a*. If another code scanning application attempts to decode the identifier code **123***a*, the identifier code **123***a* redirects the healthcare recipient, who is scanning the identifier code **123***a*, to a certified website of the wellness adherence tracking system **2900** to download the wellness adherence tracking application **2902**. In an embodiment, the identifier code **123***a* contains a common key for decoding the identifier code **123***a*. In another embodiment, only the healthcare recipient and his/her healthcare providers can decode the identifier code **123***a* using their respective keys. For example, the identifier code **123***a* positioned on a bottom surface **106***b* of a customized bin label **106** that seals the medication bin **102** exemplarily illustrated in FIG. **33**A, can only be read by the wellness adherence tracking application **2902** deployed on authorized user devices **2901**, for example, mobile phones, of the healthcare recipient and his/her healthcare provider and not by any other healthcare recipient or another healthcare provider having the same wellness adherence tracking application **2902**. This type of security precludes another healthcare recipient having the same wellness adherence tracking application **2902** from reading the identifier code **123***a* and obtaining another healthcare recipient's medical information or accessing a wellness adherence database **2915** of the backend server **2502** exemplarily illustrated in FIG. **29**, through a server website account. This type of security also strengthens the privacy of the healthcare recipient in accordance with Health Insurance Portability and Accountability Act (HIPAA) regulations.

[0140] In an embodiment, the identifier code **123***a* comprises one or more authentication codes embedded therein for validation of the identifier code **123***a* with reference to authentication codes stored by the wellness adherence tracking system **2900** in the healthcare recipient's user device **2901** and/or one or more databases, for example, the wellness adherence database **2915** of the backend server **2502**. In an example, an authentication code and a healthcare recipient code is encrypted and embedded in the identifier code **123***a*, for example, a quick response (QR) code. The wellness adherence tracking application **2902**, upon scanning the identifier code **123***a*, decrypts the identifier code **123***a* and searches for the authentication code and the healthcare recipient code. In an embodiment, the authentication codes are positioned in a specific known location or tagged with a header or a footer such that the wellness adherence tracking application **2902** recognizes the authentication codes from a data snippet. If the wellness adherence tracking application **2902** matches the identified authentication code to an internal single or multiple authentication code, then the identifier code **123***a* and an associated message embedded in the identifier code **123***a* is authentic and valid. If the identified authentication code does not match with the internal single or multiple authentication code, then the wellness adherence tracking application **2902** discards the identifier code **123***a* and displays an error message on the graphical user interface (GUI) **2911** of the wellness adherence tracking application **2902** stating that the identifier code **123***a* is invalid. The identifier code **123***a* has a standard built-in error detection and correction option to restore data if the identifier code **123***a* is damaged.

[0141] The identifier code **123***a* assists in identifying potential counterfeit medications. In an embodiment, when the identifier code **123***a* is scanned, decoded, and validated, the wellness adherence tracking application **2902** renders a message on the GUI **2911** on the healthcare recipient's user device **2901** to validate, for example, sources or purchase locations of medications **112**. Furthermore, the wellness adherence tracking application **2902** requests the healthcare recipient to key into a device medication identification (ID) serial number and enter the location of purchase of a medication **112** to further validate the authenticity of the medical implement **2913**, for example, the medication bin **102** that stores the medication **112**. In an embodiment, the wellness adherence tracking system **2900** transmits an alert notification on the GUI **2911**, for example, based on a validation status of the decoded identifier code **123***a*. The validation status of the decoded identifier code **123***a* is, for example, valid or invalid. The alert notification warns the healthcare recipient of an invalid identifier code.

[0142] In an embodiment, the wellness adherence tracking system **2900** performs encryption and decryption of the authentication codes and messages embedded in the identifier code **123***a* using, for example, public-key cryptography which uses an asymmetric key pair having a public key and a private key. The public key is publicly available and the private key is kept secret. The authentication codes, the messages, and other medical information stored in the identifier code **123***a* are encrypted with the public key and decrypted only with the private key. In another embodiment, the wellness adherence tracking system **2900** executes a pretty good privacy (PGP) data encryption and decryption computer program that provides cryptographic privacy and authentication for data communication. The PGP encryption and decryption computer program combines symmetric-key encryption and public-key encryption. In this embodiment, the wellness adherence tracking system **2900** encrypts the authentication codes, the messages, and other medical information in the identifier code **123***a* by executing a symmetric encryption algorithm using a symmetric key that is used only once. The wellness adherence tracking system **2900** encrypts the symmetric key with the public key of the healthcare recipient's user device **2901**. The wellness adherence tracking system

2900 sends the symmetric key encrypted with the public key along with the identifier code **123***a* containing the authentication codes, the messages, and other medical information to the healthcare recipient's user device **2901**, where the symmetric key is decrypted using a private key of the healthcare recipient's user device **2901** to decrypt the identifier code **123***a* and access the authentication codes, the messages, and other medical information.

[0143] After decoding and validating the identifier code **123***a*, the wellness adherence tracking application **2902** of the wellness adherence tracking system **2900** reads and obtains medical information associated with the medical implement **2913** and/or an activity associated with the medical implement **2913** from the decoded and validated identifier code **123***a*, for example, in a quick response format or another coded format, and wellness adherence criteria. The medical information encoded in the identifier code **123***a* comprises, for example, one or more of a number of medications **112** in the medical implement **2913**, a list of the medications **112** in the medical implement **2913**, drug names, directions to follow, color coding of dosage times, name of a prescriber, a date of preparation, a description of contents of the medical implement **2913**, a personalized website link configured to link to a secure online interface comprising healthcare recipient information, a healthcare recipient identifier, etc., and any combination thereof. The activity associated with the medical implement **2913** comprises, for example, administration of one or more medications **112**, an exercise activity, a diet activity, wound care, a health checkup, etc. As used herein, "wellness adherence criteria" refers to one or more parameters associated with administration of medications **112** or performance of the activity that a healthcare provider prescribes to a healthcare recipient in a medication regimen or a wellness regimen. The wellness adherence criteria comprise, for example, dosage information such as amount of a medication **112**, a date for administering one or more medications **112**, a time of day for administering the medications **112**, directions to follow, etc. In an embodiment, the wellness adherence tracking application **2902** obtains the wellness adherence criteria from the decoded and validated identifier code **123***a*. In another embodiment, the wellness adherence tracking application **2902** obtains the wellness adherence criteria from one or more databases, for example, the wellness adherence database **2915** of the backend server **2502** via a network **2501**.

[0144] In an embodiment, the identifier code **123***a* comprises supplementary information comprising, for example, one or more of coupons, advertisements, incentives for wellness adherence, status of incentives, appointments for a week, reminders, quotes, images, wellness information, wellness messages, promotional messages, gaming information, quick reference telephone numbers of healthcare providers, etc., embedded therein. The incentives for wellness adherence comprise, for example, one or more awards for wellness adherence along with an award message. The wellness adherence tracking application **2902** decodes and displays the award message on the graphical user interface (GUI) **2911** of the healthcare recipient's user device **2901**. The healthcare recipient, who has been rewarded for consistent wellness adherence, is directed to a website or a web link to redeem the award. The wellness messages comprise, for example, a motivational message, a healthcare recipient specific message, a generic health motivational message, a medication specific message, a disease specific message, etc. In an embodiment, the wellness adherence tracking application **2902** displays messages, for example, wellness messages contained in the identifier code **123***a* at the time of the scan of the identifier code **123***a* along with instructions. The promotional messages comprise, for example, one or more messages and a web link associated with each message for promotional purposes such as a wellness brand promotion, a wellness event promotion, etc. The wellness adherence tracking system **2900** targets messages to healthcare recipients based on specific diseases, medications **112** present, wellness adherence rates of the healthcare recipient, etc. The wellness adherence tracking system **2900** renders discounts and award points to healthcare recipients who opt to receive the promotional messages. The wellness adherence tracking system **2900** does not transmit the promotional messages to premium healthcare recipients. The wellness adherence tracking system **2900** encodes the medical information in the identifier code **123***a* to allow the wellness adherence tracking application **2902** to decode the medical information.

[0145] The wellness adherence tracking application **2902** determines **2704** whether the decoded and validated identifier code **123***a* contains the encoded medical information, for example, using a key that is embedded in the wellness adherence tracking application **2902**. If the identifier code **123***a* contains the encoded medical information, the wellness adherence tracking application **2902** extracts **2705** the medical information directly from the decoded and validated identifier code **123***a*. In an embodiment, if the medical information is not available in the decoded and validated identifier code **123***a*, the wellness adherence tracking application **2902** transmits the decoded and validated identifier code **123***a* to one or more databases, for example, an internal application database **2912**, the wellness adherence database **2915** in the backend server **2502**, or one or more public databases **2916** via a network **2501** exemplarily illustrated in FIG. **29**, and retrieves **2706** the medical information and the wellness adherence criteria from the databases, for example, **2912**, **2915**, or **2916**. The wellness adherence tracking application **2902** loads the extracted medical information and the wellness adherence criteria in the internal application database **2912** for performing further actions on the extracted medical information and the wellness adherence criteria. In this embodiment, if the medical information is not available in the decoded and validated identifier code **123***a*, the wellness adherence tracking system **2900** prompts the wellness adherence tracking application **2902** and the internal application database **2912**. If the medical information does not exist in the wellness adherence tracking application **2902** and the internal application database **2912**, the wellness adherence tracking application **2902** connects to the backend server **2502** or to one or more public databases **2916** via the network **2501** to retrieve the medical information and the wellness adherence criteria.

[0146] In an embodiment, if the encoded medical information becomes outdated over time and requires updates, the medical information is updated in one or more databases, for example, the wellness adherence database **2915** at the backend server **2502** to which the identifier code **123***a* can link, or to which the wellness adherence tracking application **2902** on the healthcare recipient's user device **2901** can link to retrieve the medical information. In another embodiment, the wellness adherence tracking application **2902** may also prompt the healthcare recipient to enter the medical information and the wellness adherence criteria via the graphical user inter-

face (GUI) **2911** of the wellness adherence tracking application **2902**. The wellness adherence tracking system **2900** receives **2707** the entered medical information and the wellness adherence criteria from the healthcare recipient's user device **2901** via the GUI **2911**. In this embodiment, each time the healthcare recipient scans the identifier code **123***a*, the user entered medical information is displayed on the GUI **2911**.

[0147] In an embodiment, the wellness adherence tracking application **2902**, in communication with the user device **2901** and/or the backend server **2502**, validates the medical information associated with the medical implement **2913** and/or the activity associated with the medical implement **2913** and loads valid medical information into the internal application database **2912** for performing actions on the valid medical information. For example, the wellness adherence tracking application **2902** verifies whether the decoded data from the identifier code **123***a* is correct, incorrect, counterfeit, or not readable. If the decoded data is incorrect, not readable, or counterfeit, then the wellness adherence tracking application **2902** transmits the decoded data to a data logger **2909** exemplarily illustrated in FIG. **29**, or to the backend server **2502** that logs the decoded data for further analysis. In an embodiment, the wellness adherence tracking system **2900** renders an alert notification via the graphical user interface (GUI) **2911** of the wellness adherence tracking application **2902** on identifying invalid medical information. That is, the backend server **2502** transmits an alert notification to the wellness adherence tracking application **2902** on the healthcare recipient's user device **2901** and a healthcare provider's user device **2503** exemplarily illustrated in FIG. **25**, to warn them of a contaminated identifier code and of a potential malicious attack. In an embodiment, the wellness adherence tracking system **2900** transmits an alert notification on the GUI **2911**, for example, based on a validation status of the medical information contained in the decoded identifier code **123***a*. The validation status of the medical information is, for example, valid or invalid. The alert notification warns the healthcare recipient of invalid medical information.

[0148] In an embodiment, the wellness adherence tracking application **2902** on the healthcare recipient's user device **2901** validates the decoded data containing the medical information by executing a hash function on the decoded data for determining whether the decoded data is incorrect, not readable, or counterfeit. The wellness adherence tracking application **2902** executes the hash function on the decoded data and generates a key digest. A key digest is a type of hash that provides a fingerprint for the decoded data. The wellness adherence tracking application **2902** transmits the decoded data encrypted by the hash function and the key digest to the backend server **2502**. The backend server **2502** executes an algorithm to encrypt the decoded data and runs a hash function on the decoded data again. If the key digest generated by the hash function at the backend server **2502** matches the key digest that was transmitted by the wellness adherence tracking application **2902**, the healthcare recipient can conclude that the decoded data is intact and not tampered with, and that no data snippets have been injected into the decoded data.

[0149] The wellness adherence tracking application **2902** renders **2708** the extracted and validated medical information and multiple wellness adherence options on the graphical user interface (GUI) **2911**. The wellness adherence options comprise, for example, indicators that define administration and non-administration of one or more medications **112** such as medication taken or medication not taken, presence and absence of medications **112** in the medical implement **2913** such as medication missing, performance and non-performance of the activity associated with the medical implement **2913**, a percentage of performance of the activity such as exercise performed for half of the prescribed duration, an abortion of the activity, an establishment of communication with a prescriber of the activity, time settings for the administration of the medications **112** and the performance of the activity within preconfigured time periods such as exercise performance snoozed till a future time instant, etc.

[0150] In an embodiment, the wellness adherence tracking system **2900** configures the wellness adherence options in accordance with the wellness adherence criteria and/or user inputs received via the graphical user interface (GUI) **2911** of the wellness adherence tracking application **2902**. The wellness adherence tracking system **2900** identifies possibilities of wellness adherence based on adherence of the healthcare recipient to the prescribed wellness adherence criteria and accordingly configures the wellness adherence options. Consider an example where the prescribed wellness adherence criteria comprises administering two pills each day and reducing the number of pills to be taken per day to one pill after a certain number of days. The healthcare provider makes a decision on the number of pills to be taken per day by the healthcare recipient. In this example, the wellness adherence tracking system **2900** configures the wellness adherence criteria as "2 pills per day to 1 pill per day" and renders wellness adherence options as pills taken, pills not taken, pill consumption reduced, and pill consumption snoozed on the GUI **2911**.

[0151] The healthcare recipient provides inputs for one or more of the rendered wellness adherence options, for example, by checking a box displayed on the graphical user interface (GUI) **2911**, entering the number of pills taken, activating a snooze button displayed on the GUI **2911**, etc. The wellness adherence tracking application **2902** receives **2709** the inputs for one or more of the rendered wellness adherence options from the healthcare recipient's user device **2901** via the GUI **2911**. The wellness adherence tracking application **2902** logs **2710** the received inputs in association with the wellness adherence criteria in the user device **2901** and/or one or more databases, for example, the wellness adherence database **2915** of the backend server **2502**, to track the wellness adherence of the healthcare recipient. In an embodiment, the wellness adherence tracking application **2902**, in communication with the backend server **2502**, compares the received inputs with the wellness adherence criteria and determines whether the healthcare recipient has achieved wellness adherence or not.

[0152] Consider an example where prescribed wellness adherence criteria from a medication regimen comprises a dosage of a pill to be taken once per day post breakfast, a capsule to be taken once per day post dinner, and a brisk walk to be performed for 45 minutes per day. The wellness adherence criteria therefore comprise 1 pill to be taken between 7 am and 10 am, 1 capsule to be taken between 7 pm and 12 pm, and an exercise activity to be performed for 45 minutes. Based on the wellness adherence criteria, the wellness adherence tracking system **2900** configures the wellness adherence options per medication, for example, the pill and the capsule, and the exercise activity as follows: for medication 1, pill administered, pill not administered, pill administration snoozed, and pill missing. Similarly, for medication 2, the configured wellness adherence options comprise, for

example, capsule administered, capsule not administered, capsule administration snoozed, and capsule missing. For the exercise activity, the configured wellness adherence options comprise, for example, activity performed, activity not performed, activity snoozed, and activity partially performed. Assuming the healthcare recipient selects pill administered, capsule administered, and activity performed, the wellness adherence tracking system **2900** compares the user selections and logging times of the user selections with the wellness adherence criteria and determines that the healthcare recipient has achieved wellness adherence. In an embodiment, the wellness adherence tracking system **2900** transmits alert notifications on the GUI **2911**, for example, based on time settings configured on the healthcare recipient's user device **2901**. The wellness adherence tracking system **2900** configures the alert notifications to remind the healthcare recipient to perform one or more actions to meet the wellness adherence criteria. For example, these alert notifications remind a healthcare recipient to perform an incomplete activity that was snoozed by the healthcare recipient.

[0153] In an embodiment, the wellness adherence tracking application **2902** transmits alerts to the healthcare recipient via the graphical user interface (GUI) **2911** for capturing one or more images in one or more views of a medical implement **2913**, for example, the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1A-1C** and FIGS. **2A-2B**, at configurable time instants. The backend server **2502** of the wellness adherence tracking system **2900** then verifies the type, number, and arrangement of medications **112** in the medication bins **102** of the medication organizer tray apparatus **100** exemplarily illustrated in FIG. **1B**, in accordance with the wellness adherence criteria prescribed by the healthcare provider using the captured images for tracking the wellness adherence of the healthcare recipient in accordance with the wellness adherence criteria. In this embodiment, the healthcare recipient may use an image capture device of the user device **2901**, for example, a mobile phone's camera to capture images of the medication bins **102** and the medication organizer tray apparatus **100** and transmit the captured images to the backend server **2502** for review. The healthcare recipient may use any portable user device **2901** with a camera, for example, a smart phone, a tablet computing device, a video camera, etc., to capture images of the filled medication organizer tray apparatus **100**, in one or more different views, for example, a top view, a bottom view, etc., based on which view of the medication bins **102** is clear with minimal to no markings. For example, if medical information such as days and times for administering medications **112** are printed on the customized bin labels **106** of the medication bins **102** exemplarily illustrated in FIGS. **2A-2B**, the healthcare recipient can capture an image of a bottom view of the medication organizer tray apparatus **100** using the image capture device in the healthcare recipient's user device **2901**.

[0154] The wellness adherence tracking application **2902** on the healthcare recipient's user device **2901** with the image capture device transmits the captured images to the backend server **2502** for review by healthcare providers, for example, advisors. The advisors can review the transmitted images and confirm that the medication organizer tray apparatus **100** has been filled properly. At the end of each day or mid-week or randomly, the wellness adherence tracking application **2902** transmits alerts to the healthcare recipient to capture an image of their medication organizer tray apparatus **100**. The wellness adherence tracking application **2902** transmits the captured image to the backend server **2502** for review by an advisor. The advisor reviews the transmitted image to confirm adherence, medications filled correctly for the rest of the week, appropriate use of abusable medications, etc. Furthermore, if a healthcare provider such as a clinician or a pharmacist changes the medication dosage mid-week, the healthcare recipient will be required to reorganize the medication organizer tray apparatus **100** for the remaining week to reflect the new dose regimen. The wellness adherence tracking application **2902** transmits alerts to the healthcare recipient to capture an image of the reorganized medication organizer tray apparatus **100** again for the advisors to confirm that the medications **112** have been loaded and reorganized as per the new dose regime in the healthcare provider's request.

[0155] FIG. **28** exemplarily illustrates a flowchart comprising the steps performed by the wellness adherence tracking system **2900** exemplarily illustrated in FIG. **29**, for dynamically analyzing medical information and adapting the workflow. In an embodiment, the wellness adherence tracking system **2900** dynamically analyzes the medical information with historical data **2807** and **2808** and trends and predicts future medical information and planned actionable tasks and outcomes. The wellness adherence tracking system **2900** executes an algorithm for dynamic real time analyzing, correlating, trending, and updating triggers, alerts, and schedules of scanned data and other medical information. The wellness adherence tracking application **2902** of the wellness adherence tracking system **2900** exemplarily illustrated in FIG. **29**, scans the identifier codes positioned on medication bins **2801**, the identifier code positioned on another medical implement **2802**, for example, a parenteral device, a fitness device, etc., and the identifier code from an unknown entity **2803**, and transmits the scans to the backend server **2502** of the wellness adherence tracking system **2900**. The backend server **2502** receives the scans and validates **2804** the authenticity of the scanned identifier codes as disclosed in the detailed description of FIG. **27**. The backend server **2502** then extracts **2805** medical information from the scanned and validated identifier codes and normalizes **2806** the extracted medical information. The backend server **2502** further receives medication bin historical data **2807** comprising, for example, number of pills taken, number of medication bins emptied, etc., and medical implement historical data **2808** that is stored from past scans to perform an analysis of the normalized medical information.

[0156] The backend server **2502** analyzes **2809** the normalized medical information with the medication bin historical data **2807** and the medical implement historical data **2808**, for example, using the Kalman filter algorithm. The Kalman filter algorithm uses a mathematical predictive representation model of the functions of the medical implement **2913** exemplarily illustrated in FIG. **29**, and the healthcare recipient's interaction with the medical implement **2913** with respect to time, frequency, duration, etc., over time. The Kalman filter algorithm compares expected measurements of the mathematical predictive representation model with actual measurements received from the wellness adherence tracking application **2902** on the healthcare recipient's user device **2901** exemplarily illustrated in FIG. **29**, to predict future measurements. Based on the predicted future measurements generated by application of the Kalman filter algorithm, the backend server **2502** compares the predicted future measurements with thresholds of measurements predefined for the medical implement **2913**. If the predicted future measure-

ments are outside of the thresholds, then the backend server **2502** initiates pre-programmed automated alerts and proactive intervention. For example, if a healthcare recipient has delayed taking his/her morning medications for the past week, the backend server **2502** executes the Kalman filter algorithm to analyze the trend and predicts the consumption of the next morning's medications will be also be delayed. If the Kalman filter algorithm predicts that the delayed time is beyond the window of dose time, for example, a few hours before and after the time that the healthcare recipient should ideally take his/her medications, the backend server **2502** transmits a preemptive alert notification to the healthcare recipient's user device **2901** to remind him/her to take his/her medications. The backend server **2502** transmits this preemptive alert notification, for example, at a previous dose time or a few hours before a dose time alarm based on a pre-programmed intervention plan.

[0157] The Kalman filter algorithm executes on the backend server **2502** and generates **2810** projected values, for example, the expected healthcare recipient medication intake to identify **2812** projected scans or alerts that require intervention, preemptively generate alert notifications, and perform escalations. The backend server **2502** compares **2811** the projected values to a trigger or alert threshold **2814**, for example, a pre-programmed medication intake time and determines the difference. If a trigger or alert time schedule **2815**, for example, a dose time is 10:00 am and the Kalman filter algorithm predicts that the healthcare recipient will take the medications at 12:30 pm and the alert threshold time **2814** for escalating an alert is 12:00 noon, the backend server **2502** determines the difference of 30 minutes over the threshold. Since the difference is above the alert threshold time **2814**, the backend server **2502** generates an alert. The backend server **2502** dynamically updates **2813** the schedule and thresholds. The backend server **2502** implements an escalation flow **2816**, for example, by triggering a call **2817** to the healthcare recipient, triggering a call **2818** to the healthcare provider, sending urgent alerts **2819** to the healthcare recipient's user device **2901** and/or the healthcare provider's user device **2503** exemplarily illustrated in FIG. **25**, sending **2820** an alert through another device, etc.

[0158] FIG. **29** exemplarily illustrates the wellness adherence tracking system **2900** for tracking wellness adherence of a healthcare recipient. The wellness adherence tracking system **2900** is accessible by a healthcare recipient's user device **2901** via a network **2501**, for example, a short range network or a long range network. The wellness adherence tracking system **2900** is accessible, for example, through a broad spectrum of technologies and devices such as personal computers with access to the internet, internet enabled cellular phones, tablet computing devices, smart glasses, etc. In an embodiment, the wellness adherence tracking system **2900** is configured as a web based platform, for example, a website hosted on a server or a network of servers. In another embodiment, the wellness adherence tracking system **2900** comprises the wellness adherence tracking application **2902** downloadable and usable on the healthcare recipient's user device **2901**. In an embodiment, the wellness adherence tracking system **2900** is implemented as a client-server architecture comprising the wellness adherence tracking application **2902** that communicates with the backend server **2502** via a network **2501** as exemplarily illustrated in FIG. **29**. In an embodiment, the wellness adherence tracking system **2900** is implemented in a cloud computing environment. The wellness adherence tracking system **2900** is a cloud computing based platform implemented as a service for tracking wellness adherence of a healthcare recipient.

[0159] The healthcare recipient's user device **2901** is an electronic device, for example, a personal computer, a notebook, a tablet computing device, a mobile computer, a mobile phone, a smart phone, a portable computing device, a laptop, a personal digital assistant, a wearable device such as the Google Glass™ of Google Inc., the Apple Watch™ of Apple Inc., etc., a touch centric device, a workstation, a client device, a portable electronic device, a network enabled computing device, an interactive network enabled communication device, any other suitable computing equipment, combinations of multiple pieces of computing equipment, etc., capable of running the wellness adherence tracking application **2902**. The wellness adherence tracking system **2900** disclosed herein further comprises a non-transitory computer readable storage medium, for example, a memory unit **3002** and at least one processor **3001** communicatively coupled to the non-transitory computer readable storage medium exemplarily illustrated in FIG. **30**. The non-transitory computer readable storage medium is configured to store computer program instructions defined by modules, for example, **2903**, **2904**, **2905**, **2906**, **2907**, **2908**, **2909**, **2910**, etc., of the wellness adherence tracking system **2900**. The processor **3001** is configured to execute the defined computer program instructions.

[0160] In an embodiment, the wellness adherence tracking application **2902** of the wellness adherence tracking system **2900** is configured and coded as a mobile application. The wellness adherence tracking application **2902** comprises a graphical user interface (GUI) **2911**, a scanner **2903**, a decoder **2904**, a data extraction module **2905**, a data rendering module **2906**, a data reception module **2907**, an analytic engine **2908**, a data logger **2909**, an alert notification module **2910**, and an internal application database **2912**. The GUI **2911** is, for example, a webpage of a website hosted by the wellness adherence tracking system **2900**, an online web interface, a web based downloadable application interface, a mobile based downloadable application interface, etc. The scanner **2903** scans the identifier code **123***a* positioned on a medical implement **2913** via the GUI **2911**. The decoder **2904** decodes and validates the scanned identifier code **123***a* as disclosed in the detailed description of FIG. **27**. In an embodiment, the decoder **2904** validates the decoded identifier code **123***a* by comparing the authentication codes embedded therein with authentication codes stored by the wellness adherence tracking application **2902** in the internal application database **2912** in the user device **2901** and/or in one or more databases, for example, the wellness adherence database **2915** of the backend server **2502**.

[0161] The data extraction module **2905** obtains medical information associated with the medical implement **2913** and/or an activity associated with the medical implement **2913** from the decoded and validated identifier code **123***a*, and/or wellness adherence criteria. The decoder **2904** determines the presence of medical information in the identifier code **123***a*. When the decoder **2904** determines the presence of medical information in the decoded and validated identifier code **123***a*, the data extraction module **2905** directly extracts the medical information contained in the decoded and validated identifier code **123***a*. In an embodiment, the data extraction module **2905** receives the medical information and the wellness adherence criteria from the healthcare recipient's

user device **2901** via the graphical user interface (GUI) **2911**. In another embodiment, the decoder **2904** transmits the decoded and validated identifier code **123***a* to one or more databases, for example, the wellness adherence database **2915** in the backend server **2502**, the public databases **2916**, etc., via the network **2501**, and the data extraction module **2905** retrieves the medical information and the wellness adherence criteria from the wellness adherence database **2915**, the public databases **2916**, etc., via the network **2501** based on the decoded and validated identifier code **123***a*. In an embodiment, the analytic engine **2908**, in communication with the user device **2901** and/or the backend server **2502**, validates the medical information associated with the medical implement **2913** and/or the activity associated with the medical implement **2913** and loads the valid medical information in the wellness adherence tracking application **2902** or the backend server **2502** for performing actions on the valid medical information. The data rendering module **2906** renders the medical information and multiple wellness adherence options on the GUI **2911**. In an embodiment, the data rendering module **2906** configures the wellness adherence options in accordance with the wellness adherence criteria and user inputs and then renders the configured wellness adherence options on the GUI **2911**.

[0162] The data reception module **2907** receives inputs for one or more of the rendered wellness adherence options from the healthcare recipient's user device **2901**. The data logger **2909** logs the received inputs in association with the wellness adherence criteria in the user device **2901** and/or one or more databases, for example, the wellness adherence database **2915** for tracking the wellness adherence of the healthcare recipient. The wellness adherence database **2915** refers to any storage area or medium that can be used for storing data and files. The wellness adherence database **2915** can be, for example, a structured query language (SQL) data store or a not only SQL (NoSQL) data store such as the Microsoft® SQL Server®, the Oracle® servers, the MySQL® database of MySQL AB Company, the mongoDB® of MongoDB, Inc., the Neo4j graph database of Neo Technology Corporation, the Cassandra database of the Apache Software Foundation, the HBase™ database of the Apache Software Foundation, etc. In an embodiment, the wellness adherence database **2915** can also be a location on a file system. In another embodiment, the wellness adherence database **2915** can be remotely accessed by the wellness adherence tracking system **2900** via the network **2501**. In another embodiment, the wellness adherence database **2915** is a cloud based database implemented in a cloud computing environment, where computing resources are delivered as a service over the network **2501**.

[0163] The alert notification module **2910** transmits alert notifications on the graphical user interface (GUI) **2911** based on alerting criteria comprising, for example, one or more of time settings configured on the healthcare recipient's user device **2901**, a validation status of the decoded identifier code **123***a*, a validation status of the medical information contained in the decoded identifier code **123***a*, etc. The alert notifications, for example, remind the healthcare recipient to perform one or more actions to meet the wellness adherence criteria, warn the healthcare recipient of an invalid identifier code and/or invalid medical information, etc. In an embodiment, the alert notification module **2910** transmits alerts for capturing one or more images in one or more views of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B, on the GUI **2911** at configurable time instants. In this embodiment, the analytic engine **2908** verifies type, number, and arrangement of medications **112** in the medication bins **102** of the medication organizer tray apparatus **100** exemplarily illustrated in FIG. **1**B, in accordance with the wellness adherence criteria prescribed by a healthcare provider using the captured images for tracking the wellness adherence of the healthcare recipient in accordance with the wellness adherence criteria. The internal application database **2912** stores the medical information that can be retrieved by the data extraction module **2905** if the medical information is not available in the decoded identifier code **123***a*. In an embodiment, the backend server **2502** further comprises an analytic engine **2914** in addition to the wellness adherence database **2915**. The analytic engine **2914** dynamically analyzes the medical information with historical data and trends and predicts future medical information and planned actionable tasks and outcomes as disclosed in the detailed description of FIG. **28**. In an embodiment, the analytic engine **2914** dynamically assesses health, wellness, and adherence requirements of the healthcare recipient and updates the wellness adherence criteria for an associated medical implement **2913**.

[0164] FIG. **30** exemplarily illustrates the hardware architecture **3000** of the wellness adherence tracking system **2900** exemplarily illustrated in FIG. **29**, employed for tracking wellness adherence of a healthcare recipient. The wellness adherence tracking system **2900** is a computer system that is programmable using a high level computer programming language. The wellness adherence tracking system **2900** may be implemented using programmed and purposeful hardware. As exemplarily illustrated in FIG. **30**, the hardware architecture **3000** of the wellness adherence tracking system **2900** comprises a processor **3001**, a non-transitory computer readable storage medium such as a memory unit **3002** for storing programs and data, an input/output (I/O) controller **3003**, a network interface **3004**, a data bus **3005**, a display unit **3006**, input devices **3007**, a fixed media drive **3008** such as a hard drive, a removable media drive **3009** for receiving removable media, output devices **3010**, etc. The processor **3001** refers to any one or more microprocessors, central processing unit (CPU) devices, finite state machines, computers, microcontrollers, digital signal processors, logic, a logic device, an electronic circuit, an application specific integrated circuit (ASIC), a field-programmable gate array (FPGA), a chip, etc., or any combination thereof, capable of executing computer programs or a series of commands, instructions, or state transitions. The processor **3001** may also be implemented as a processor set comprising, for example, a programmed microprocessor and a math or graphics co-processor. The processor **3001** is selected, for example, from the Intel® processors such as the Itanium® microprocessor or the Pentium® processors, Advanced Micro Devices (AMD®) processors such as the Athlon® processor, UltraSPARC® processors, microSPARC® processors, Hp® processors, International Business Machines (IBM®) processors such as the PowerPC® microprocessor, the MIPS® reduced instruction set computer (RISC) processor of MIPS Technologies, Inc., RISC based computer processors of ARM Holdings, Motorola® processors, Qualcomm® processors, etc. The wellness adherence tracking system **2900** disclosed herein is not limited to employing a processor **3001**. The wellness adherence tracking system **2900** may also employ a controller or a microcontroller. The processor **3001** executes the modules, for example, **2903**, **2904**, **2905**, **2906**, **2907**, **2908**, **2909**,

2910, etc., of the wellness adherence tracking application **2902** of the wellness adherence tracking system **2900** exemplarily illustrated in FIG. **29**.

[0165] The memory unit **3002** is used for storing programs, applications, and data. For example, the scanner **2903**, the decoder **2904**, the data extraction module **2905**, the data rendering module **2906**, the data reception module **2907**, the analytic engine **2908**, the data logger **2909**, the alert notification module **2910**, etc., are stored in the memory unit **3002** of the user device **2901** exemplarily illustrated in FIG. **29**. The memory unit **3002** is, for example, a random access memory (RAM) or another type of dynamic storage device that stores information and instructions for execution by the processor **3001**. The memory unit **3002** also stores temporary variables and other intermediate information used during execution of the instructions by the processor **3001**. The wellness adherence tracking system **2900** further comprises a read only memory (ROM) or another type of static storage device that stores static information and instructions for the processor **3001**. The I/O controller **3003** controls input actions and output actions performed by the wellness adherence tracking application **2902**.

[0166] The network interface **3004** enables connection of the wellness adherence tracking application **2902** to the network **2501** exemplarily illustrated in FIG. **29**. In an embodiment, the network interface **3004** is provided as an interface card also referred to as a line card. The network interface **3004** comprises, for example, one or more of an infrared (IR) interface, an interface implementing Wi-Fi® of Wi-Fi Alliance Corporation, a universal serial bus (USB) interface, a FireWire® interface of Apple Inc., an Ethernet interface, a frame relay interface, a cable interface, a digital subscriber line (DSL) interface, a token ring interface, a peripheral controller interconnect (PCI) interface, a local area network (LAN) interface, a wide area network (WAN) interface, interfaces using serial protocols, interfaces using parallel protocols, and Ethernet communication interfaces, asynchronous transfer mode (ATM) interfaces, a high speed serial interface (HSSI), a fiber distributed data interface (FDDI), interfaces based on a transmission control protocol (TCP)/internet protocol (IP), interfaces based on wireless communications technology such as satellite technology, radio frequency (RF) technology, near field communication, etc. The data bus **3005** permits communications between the modules, for example, **2903**, **2904**, **2905**, **2906**, **2907**, **2908**, **2909**, **2910**, **2911**, **2912**, etc., of the wellness adherence tracking application **2902**.

[0167] The display unit **3006**, via the graphical user interface (GUI) **2911** exemplarily illustrated in FIG. **29**, displays information, display interfaces, user interface elements such as text fields, checkboxes, text boxes, windows, etc., for allowing the healthcare recipient to scan the identifier code **123***a* exemplarily illustrated in FIG. **29**, enter the medical information and the wellness adherence criteria, provide user inputs to meet the wellness adherence criteria, select the wellness adherence options, etc. The display unit **3006** comprises, for example, a liquid crystal display, a plasma display, an organic light emitting diode (OLED) based display, etc. The input devices **3007** are used for inputting data into the wellness adherence tracking system **2900**. The healthcare recipient uses the input devices **3007** to provide inputs to the wellness adherence tracking system **2900**. For example, a healthcare recipient may enter the medical information and the wellness adherence criteria for a particular medical implement **2913** exemplarily illustrated in FIG. **29**, when a correct identifier code **123***a* is determined, etc., using the input devices **3007**. The input devices **3007** are, for example, a keyboard such as an alphanumeric keyboard, a microphone, a joystick, a pointing device such as a computer mouse, a touch pad, a light pen, a physical button, a touch sensitive display device, a track ball, a pointing stick, any device capable of sensing a tactile input, etc.

[0168] Computer applications and programs are used for operating the wellness adherence tracking system **2900**. The programs are loaded onto the fixed media drive **3008** and into the memory unit **3002** of the user device **2901** via the removable media drive **3009**. In an embodiment, the computer applications and programs may be loaded directly via the network **2501**. Computer applications and programs are executed by double clicking a related icon displayed on the display unit **3006** using one of the input devices **3007**. The output devices **3010** output the results of operations performed by the wellness adherence tracking application **2902**. For example, the wellness adherence tracking application **2902** provides the wellness adherence options **3402**, **3403**, **3404**, and **3405** exemplarily illustrated in FIGS. **34**C-**34**D, to the healthcare recipients using the output devices **3010**. The wellness adherence tracking system **2900** displays the wellness adherence options **3402**, **3403**, **3404**, and **3405** using the output devices **3010**.

[0169] The processor **3001** executes an operating system, for example, the Linux® operating system, the Unix® operating system, any version of the Microsoft® Windows® operating system, the Mac OS of Apple Inc., the IBM® OS/2, VxWorks® of Wind River Systems, Inc., QNX Neutrino® developed by QNX Software Systems Ltd., Palm OS®, the Solaris operating system developed by Sun Microsystems, Inc., the Android operating system, the Windows Phone® operating system of Microsoft Corporation, the BlackBerry® operating system of BlackBerry Limited, the iOS operating system of Apple Inc., the Symbian™ operating system of Symbian Foundation Limited, etc. The wellness adherence tracking system **2900** employs the operating system for performing multiple tasks. The operating system is responsible for management and coordination of activities and sharing of resources of the wellness adherence tracking system **2900**. The operating system further manages security of the wellness adherence tracking system **2900**, peripheral devices connected to the wellness adherence tracking system **2900**, and network connections. The operating system employed on the wellness adherence tracking system **2900** recognizes, for example, inputs provided by the users using one of the input devices **3007**, the output display, files, and directories stored locally on the fixed media drive **3008**. The operating system on the wellness adherence tracking system **2900** executes different programs using the processor **3001**. The processor **3001** and the operating system together define a computer system for which application programs in high level programming languages are written.

[0170] The processor **3001** of the user device **2901** retrieves instructions defined by the scanner **2903**, the decoder **2904**, the data extraction module **2905**, the data rendering module **2906**, the data reception module **2907**, the analytic engine **2908**, the data logger **2909**, the alert notification module **2910**, etc., for performing respective functions disclosed in the detailed description of FIG. **29**. The processor **3001** of the backend server **2502** of the wellness adherence tracking system **2900** retrieves instructions defined by the analytic engine **2914** for performing associated functions disclosed in the

detailed description of FIG. **29**. The processor **3001** retrieves instructions for executing the modules, for example, **2903**, **2904**, **2905**, **2906**, **2907**, **2908**, **2909**, **2910**, etc., of the wellness adherence tracking application **2902** from the memory unit **3002**. A program counter determines the location of the instructions in the memory unit **3002**. The program counter stores a number that identifies the current position in the program of each of the modules, for example, **2903**, **2904**, **2905**, **2906**, **2907**, **2908**, **2909**, **2910**, etc., of the wellness adherence tracking application **2902**. The instructions fetched by the processor **3001** from the memory unit **3002** after being processed are decoded. The instructions are stored in an instruction register in the processor **3001**. After processing and decoding, the processor **3001** executes the instructions, thereby performing one or more processes defined by those instructions.

[0171] At the time of execution, the instructions stored in the instruction register are examined to determine the operations to be performed. The processor **3001** then performs the specified operations. The operations comprise arithmetic operations and logic operations. The operating system performs multiple routines for performing a number of tasks required to assign the input devices **3007**, the output devices **3010**, and memory for execution of the modules, for example, **2903**, **2904**, **2905**, **2906**, **2907**, **2908**, **2909**, **2910**, etc., of the wellness adherence tracking application **2902**. The tasks performed by the operating system comprise, for example, assigning memory to the modules, for example, **2903**, **2904**, **2905**, **2906**, **2907**, **2908**, **2909**, **2910**, etc., of the wellness adherence tracking application **2902**, and to data used by the wellness adherence tracking application **2902**, moving data between the memory unit **3002** and disk units, and handling input/output operations. The operating system performs the tasks on request by the operations and after performing the tasks, the operating system transfers the execution control back to the processor **3001**. The processor **3001** continues the execution to obtain one or more outputs. The outputs of the execution of the modules, for example, **2903**, **2904**, **2905**, **2906**, **2907**, **2908**, **2909**, **2910**, etc., of the wellness adherence tracking application **2902** are displayed to the healthcare recipient on the display unit **3006**.

[0172] For purposes of illustration, the detailed description refers to the wellness adherence tracking application **2902** being run locally as a single computer system; however the scope of the method and the wellness adherence tracking system **2900** disclosed herein is not limited to the wellness adherence tracking application **2902** being run locally as a single computer system via the operating system and the processor **3001**, but may be extended to run remotely over the network **2501** by employing a web browser and a remote server, a mobile phone, or other electronic devices. One or more portions of the wellness adherence tracking system **2900** may be distributed across one or more computer systems (not shown) coupled to the network **2501**.

[0173] Disclosed herein is also a computer program product comprising a non-transitory computer readable storage medium that stores computer program codes comprising instructions executable by at least one processor **3001** for tracking wellness adherence of a healthcare recipient. The computer program product comprises a first computer program code for scanning an identifier code **123***a* of a medical implement **2913** via a graphical user interface (GUI) **2911**; a second computer program code for decoding and validating the scanned identifier code **123***a*; a third computer program code for obtaining medical information associated with the medical implement **2913** and/or an activity associated with the medical implement **2913** from the decoded and validated identifier code **123***a*, and/or the wellness adherence criteria; a fourth computer program code for rendering the medical information and multiple wellness adherence options on the GUI **2911**; a fifth computer program code for receiving inputs for one or more of the rendered wellness adherence options from the healthcare recipient's user device **2901**; and a sixth computer program code for logging the received inputs in association with the wellness adherence criteria in the user device **2901** and/or one or more databases, for example, the wellness adherence database **2915** exemplarily illustrated in FIG. **29**, to track the wellness adherence of the healthcare recipient. The computer program product disclosed herein further comprises a seventh computer program code for transmitting alert notifications on the GUI **2911** based on the alerting criteria disclosed in the detailed description of FIG. **27** and FIG. **29**. The computer program product disclosed herein further comprises an eighth computer program code for dynamically analyzing the medical information with historical data and trends and predicting future medical information and planned actionable tasks and outcomes as disclosed in the detailed description of FIG. **28**.

[0174] The computer program product disclosed herein further comprises one or more additional computer program codes for performing additional steps that may be required and contemplated for tracking wellness adherence of a healthcare recipient. In an embodiment, a single piece of a computer program code comprising computer executable instructions performs one or more steps of the method disclosed herein for tracking wellness adherence of the healthcare recipient. The computer program codes comprising computer executable instructions are embodied on the non-transitory computer readable storage medium. The processor **3001** retrieves these computer executable instructions and executes them. When the computer executable instructions are executed by the processor **3001**, the computer executable instructions cause the processor **3001** to perform the steps of the method for tracking wellness adherence of the healthcare recipient.

[0175] FIG. **31** exemplarily illustrates a tracker card **3100** with identifier codes **3101** and **3102** and stickers **3103**, **3104**, **3105**, **3106**, **3107**, and **3108** containing identifier codes **123***a* that can be positioned on a medical implement **2913** exemplarily illustrated in FIG. **29**, for tracking wellness adherence of a healthcare recipient. The tracker card **3100** with the identifier codes **3101** and **3102** and the stickers **3103**, **3104**, **3105**, **3106**, **3107**, and **3108** is provided to a healthcare recipient along with the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1A-1C** and FIGS. **2A-2B**. A healthcare provider can also send the tracker card **3100** with the identifier codes **3101** and **3102** and the stickers **3103**, **3104**, **3105**, **3106**, **3107**, and **3108** to the healthcare recipient along with the medication organizer tray apparatus **100**, for example, through mail, or send the tracker card **3100** to the healthcare recipient's user device **2901** via the wellness adherence tracking application **2902** exemplarily illustrated in FIG. **29**. The identifier codes **3101** and **3102** on the tracker card **3100** are used for tracking activities such as exercise and meditation respectively that are not associated with the medication organizer tray apparatus **100** or another medical implement **2913**. For these activities, the healthcare recipient can scan the identifier code **3101** or **3102** corresponding to the

activity performed on the tracker card **3100** using the scanner **2903** of the wellness adherence tracking application **2902** exemplarily illustrated in FIG. **29**, after performing the activity based on the time scheduled in the wellness adherence tracking application **2902**.

[0176] As exemplarily illustrated in FIG. **31**, the tracker card **3100** comprises a blank identifier code sticker **3103** with an identifier code, for example, FX85694 to enable the healthcare recipient to track an activity performed on any medical implement **2913** or to obtain reminders to perform the activity by affixing the blank identifier code sticker **3103** on any medical implement **2913**. When the healthcare recipient scans the blank identifier code FX85694 using the scanner **2903** of the wellness adherence tracking application **2902**, the wellness adherence tracking application **2902** provides an option to the healthcare recipient to enter information to create a reminder to keep track of the medical implement **2913** via the graphical user interface (GUI) **2911** exemplarily illustrated in FIG. **29**, and adds the information entered by the healthcare recipient to the wellness adherence tracking system **2900** exemplarily illustrated in FIG. **29**. The healthcare recipient can affix the sticker **3104** to corresponding medical implements **2913**, for example, a parenteral device **3302** exemplarily illustrated in FIG. **33**C, an exercise bike, a yoga mat, a meditation application, an eye drops vial which can be refrigerated, etc., to track and log wellness adherence of the healthcare recipient with respect to these medical implements **2913**, receive promotional messages, etc. The healthcare recipient can affix the stickers **3105**, **3106**, **3107**, and **3108** to corresponding medical implements **2913**, for example, an insulin injection package, an inhaler, a blood pressure meter, and a glucose meter respectively, to track and log the wellness adherence of the healthcare recipient with respect to these medical implements **2913**. In an embodiment, the identifier codes **3101** and **3102** are static identifier codes that do not change over a period of time unless a new set of codes are electronically mailed or mailed to an address of the healthcare recipient. For example, a sticker used for the exercise bike contains a static identifier code. In another embodiment, the stickers **3105**, **3106**, **3107**, and **3108** comprise dynamic identifier codes that change over a period of time, for example, on a weekly basis or a monthly basis. For example, a sticker **3106** used for inhaler instructions changes on a monthly basis.

[0177] The healthcare recipient may have other medical implements **2913** with different identifier codes **123***a* that are not included in the tracker card **3100**, which can also be linked to the wellness adherence tracking application **2902**. When the healthcare recipient scans the identifier code **123***a* on another medical implement **2913**, the wellness adherence tracking application **2902** determines whether the identifier code is a known identifier code or an unknown identifier code. If the wellness adherence tracking application **2902** does not recognize the identifier code and deems the identifier code as unknown, the wellness adherence tracking application **2902** transmits the identifier code **123***a* to the backend server **2502** of the wellness adherence tracking system **2900** exemplarily illustrated in FIG. **29**. The backend server **2502** retrieves medical information associated with the identifier code **123***a* of the medical implement **2913** from one or more public databases **2916** via the network **2501** exemplarily illustrated in FIG. **29**, and adds secure and credible medical information of the identifier code **123***a* to the wellness adherence tracking application **2902**. In an embodiment, the wellness adherence tracking application **2902** prompts the healthcare recipient to enter reminder information via the graphical user interface (GUI) **2911** for creation of reminders associated with the newly added medical implements **2913**. If the content of the medical information retrieved by the backend server **2502** from one or more public databases **2916** appears suspect, the backend server **2502** sends an alert to the wellness adherence tacking application **2902** warning the healthcare recipient of a contaminated identifier code and to be aware of a potential malicious attack.

[0178] In an embodiment, when the healthcare recipient scans an identifier code **123***a* positioned on a new medical implement **2913** for which there was no corresponding identifier code **123***a* in the tracker card **3100**, the backend server **2502** of the wellness adherence tracking system **2900** receives the medical information encoded in the scanned identifier code **123***a* from the wellness adherence tracking application **2902** via the network **2501** and correlates features and functions of the new medical implement **2913** with the healthcare recipient's health, wellness, and adherence requirements, and transmits specific wellness adherence criteria optimal for the healthcare recipient based on the healthcare recipient's current real time state of health and wellness metrics. In an embodiment, the identifier code **123***a* and associated medical information for the newly added medical implement **2913** is included in an updated tracker card **3100** issued to the healthcare recipient.

[0179] In an embodiment, when the wellness adherence tracking application **2902** scans and decodes the identifier code **123***a* positioned on the new medical implement **2913** for which there was no corresponding identifier code in the tracker card **3100**, the wellness adherence tracking application **2902** searches for two codes, that is, the authentication code and the healthcare recipient code as disclosed in the detailed description of FIG. **27**. If these codes are not found in the scanned and decoded identifier code **123***a*, the wellness adherence tracking application **2902** reviews the content of the decoded identifier code **123***a*. If there is no content in the decoded identifier code **123***a*, that is, if the decoded identifier code **123***a* is a blank identifier code, the wellness adherence tracking application **2902** displays a screen on the graphical user interface (GUI) **2911** where the healthcare recipient can enter specific information about the medical implement **2913** and how, when, frequency, etc., they plan to use the medical implement **2913**. Once this information is entered, the wellness adherence tracking application **2902** transmits the new identifier code **123***a* along with the entered information specific to the medical implement **2913** and its use to the backend server **2502** via the network **2501** for registration and further processing. The backend server **2502** processes and correlates this transmitted information with a similar medical implement to confirm that there is not duplication or overlap.

[0180] If there is a similar medical implement stored in the wellness adherence database **2915** in the backend server **2502** exemplarily illustrated in FIG. **29**, the backend server **2502** sends a notification to the wellness adherence tracking application **2902** to inform the healthcare recipient of the duplicate medical implement and requests the healthcare recipient to indicate which is the dominant medical implement and if the other medical implements are inactive. If the other medical implements are inactive, the statuses of those specific medical implements are updated to an inactive status in the wellness adherence database **2915**. If the medical implement **2913** is new, the backend server **2502** registers the new medical implement **2913** and stores the associated medical informa-

tion in the wellness adherence database **2915**. The backend server **2502** integrates the medical information of the medical implement **2913** with the other medical implements such that the recipient is not alerted or pinged constantly and that a cohesive message instead of a fragmented device by device message is passed to the healthcare recipient upon a trigger from the medical implement **2913**, the wellness adherence tracking application **2902**, or the backend server **2502**.

[0181] In an embodiment where the medical implement **2913** has its own identifier code **123***a* which leads to a corresponding manufacturer's website, the wellness adherence tracking application **2902** connects to the manufacturer's website and determines whether there is a match in the wellness adherence database **2915** for that particular manufacturer's website from previously received identifier codes from other recipients or whether the manufacturer is a registered entity. If there is a match, the wellness adherence tracking application **2902** extracts the medical information of the medical implement **2913** and auto-populates from the wellness adherence database **2915**. If the identifier code **123***a* and the associated medical information appear suspect, the backend server **2502** sends an alert notification to the wellness adherence tracking application **2902** warning the healthcare recipient of the contaminated identifier code and to be aware of a potential malicious attack. These contaminated identifier codes are stored in the wellness adherence database **2915**, and if such a contaminated identifier code on the same or another medical implement **2913** is uploaded in the future from the same or another healthcare recipient's user device **2901**, the wellness adherence tracking application **2902** searches the wellness adherence database **2915** at the backend server **2502** via the network **2501** and recognizes these contaminated identifier codes as malicious identifier codes and alerts the healthcare recipient.

[0182] The backend server **2502** dynamically assesses the healthcare recipient's health, wellness, and adherence requirements and updates the wellness adherence criteria for specific impacted medical implements. For example, if the wellness adherence tracking application **2902** triggers a reminder for a medical implement **2913** to measure blood pressure and detects high blood pressure from the measured values entered by the healthcare recipient via the graphical user interface (GUI) **2911** of the wellness adherence tracking application **2902** or from measured values automatically sent at random, via triggers, or upon availability via a wireless medical implement, in communication with the backend server **2502** via the network **2501**, the wellness adherence tracking application **2902** may prompt the healthcare recipient to measure his/her weight which was not part of the original wellness adherence criteria via the GUI **2911**. In an embodiment, the backend server **2502** transmits updated instructions to medical implements **2913** that are in operable communication with the backend server **2502** or another associated server via the network **2501** to alert the healthcare recipient, for example, through an alarm on the user device **2901** exemplarily illustrated in FIG. **29**.

[0183] FIG. **32** exemplarily illustrates a tabular representation of data size allocation in an identifier code **123***a* exemplarily illustrated in FIG. **29** and FIG. **31**. The identifier code **123***a* contains encrypted alphanumeric data with a data size allocation as exemplarily illustrated in the table in FIG. **32**. The identifier code **123***a* is encrypted and does not contain personal health information of a healthcare recipient which links a medication to the healthcare recipient, when the identifier code **123***a* is scanned by another individual using the wellness adherence tracking application **2902** exemplarily illustrated in FIG. **29**, downloaded on a user device of the other individual. The identifier code **123***a* is configured to store, that is, accommodate data or medical information of, for example, about 1147 characters. However, if there are fewer characters, the wellness adherence tracking system **2900** exemplarily illustrated in FIG. **29**, generates an identifier code **123***a* with a fewer number of rows and columns. In an embodiment, the identifier code **123***a* can hold, for example, about 70 rows and about 70 columns for a total of about 4296 characters with error correction set to low, which allows about one third of the medical information to be available. The identifier code **123***a* stores, for example, about 10 characters for a date of administration of a medication, about 10 characters for a dose time, about 30 characters for a name of the healthcare recipient, about 2 characters for the total number of medications, about 400 characters for names of medications stored in a medication bin, about 75 characters for a motivational message, about 200 characters for an award message, about 100 characters for promotional messages, about 100 characters for instructions on how to administer the medication, about 20 characters for an encrypted identification number, and about 200 characters for a sticker type expansion as exemplarily illustrated in FIG. **32**.

[0184] FIGS. **33**A-**33**D exemplarily illustrate identifier codes **123***a* positioned on different medical implements. The medical implements comprise, for example, a medication bin **102** configured to store one or more medications **112** as exemplarily illustrated in FIG. **33**A, a medical identification card **3301** as exemplarily illustrated in FIG. **33**B, a parenteral device **3302** such as an inhaler as exemplarily illustrated in FIG. **33**C or an injection, a fitness device or a fitness accessory such as a wrist band **3303** as exemplarily illustrated in FIG. **33**D, a medical wellness plan, etc. In an embodiment, the identifier code **123***a* is, for example, affixed using an adhesive or printed on a bottom surface **106***b*, that is, on an inner side of the customized bin label **106** that seals the medication bin **102** as exemplarily illustrated in FIG. **33**A. When the identifier code **123***a* is positioned on the bottom surface **106***b* of the customized bin label **106**, the healthcare recipient can pull a top edge **106***a*, for example, a tab of the customized bin label **106** to access the identifier code **123***a*. In another embodiment, the identifier code **123***a* is positioned on a right side lower corner of the medical identification card **3301**. The healthcare recipient scans the identifier code **123***a* positioned on the bottom surface **106***b* of the customized bin label **106**, on the medical identification card **3301**, on the inhaler **3302**, or on the wrist band **3303** using the scanner **2903** of the wellness adherence tracking application **2902** on the healthcare recipient's user device **2901** exemplarily illustrated in FIG. **29**, to track wellness adherence of the healthcare recipient.

[0185] In an embodiment, the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B, may or may not have the electronic identification component **103** embedded into the support frame **101** of the medication organizer tray apparatus **100** exemplarily illustrated in FIG. **1**A, which is configured to carry an identifier (ID). In this embodiment, the identifier code **123***a* which identifies the medication organizer tray apparatus **100** will be positioned on the cover jacket **2001** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **20**A-**20**C. The healthcare recipient scans the identifier code

123*a* using the scanner **2903** of the wellness adherence tracking application **2902**, to confirm that the medication organizer tray apparatus **100** is for a correct week and a correct healthcare recipient. In an embodiment, when the medical information about one or more medications **112**, for example, nutraceuticals, parenterals, etc., is not listed in the pill station manager application **2504** exemplarily illustrated in FIG. **25**, or when the medical information and alarm schedule for the medications **112** in the medication organizer tray apparatus **100** is absent, the wellness adherence tracking application **2902** scans two dimensional (2D) barcodes **123***b* exemplarily illustrated in FIG. **15**B, of the medications **112** in the medication organizer tray apparatus **100**, and extracts the medical information associated with the medications **112** or receives the medical information from the healthcare recipient, and loads the medical information into the wellness adherence tracking application **2902** and the pill station manager application **2504**.

[0186] FIGS. **34**A-**34**E exemplarily illustrate screenshots of a graphical user interface (GUI) **2911** provided by the wellness adherence tracking application **2902** of the wellness adherence tracking system **2900** on a healthcare recipient's user device **2901** exemplarily illustrated in FIG. **29**, for tracking wellness adherence of the healthcare recipient. FIG. **34**A exemplarily illustrates the GUI **2911**, for example, a dashboard of the wellness adherence tracking application **2902** deployed on the healthcare recipient's user device **2901**. FIG. **34**A exemplarily illustrates multiple interface elements such as buttons or icons named, for example, as "My Day", "My Meds", "My Activity", "My Health", "My Contacts", "Scan", etc., that the wellness adherence tracking application **2902** renders to the healthcare recipient for tracking wellness adherence of the healthcare recipient. Using the "Scan" interface element **3401** of the wellness adherence tracking application **2902**, the healthcare recipient scans identifier codes **123***a* and **123***b* positioned on a medical implement **2913** exemplarily illustrated in FIG. **29**. When the healthcare recipient activates the "Scan" interface element **3401** by tapping the "Scan" interface element **3401**, the wellness adherence tracking application **2902** allows the healthcare recipient to focus a camera lens of the user device **2901** on the identifier codes **123***a* and **123***b* as exemplarily illustrated in FIG. **34**B. When the healthcare recipient focuses the camera lens of the user device **2901** on the identifier codes **123***a* and **123***b*, the wellness adherence tracking application **2902** scans the identifier codes **123***a* and **123***b* and decodes the scanned identifier codes **123***a* and **123***b* to obtain medical information associated with the medical implement **2913**, an activity associated with the medical implement **2913**, and/or the wellness adherence criteria.

[0187] When the healthcare recipient scans the identifier codes **123***a* and **123***b* and the wellness adherence tracking application **2902** determines that the identifier codes **123***a* and **123***b* are valid and obtains the medical information from the identifier codes **123***a* and **123***b*, the wellness adherence tracking application **2902** renders wellness adherence options comprising, for example, an "administered" option **3402**, a "not administered" option **3403**, a time settings option **3404**, and an "absence of a medication" option **3405**, that are configured in accordance with the wellness adherence criteria as exemplarily illustrated in FIGS. **34**C-**34**D. For medications **112** exemplarily illustrated in FIG. **1**B, that need to be taken after a few hours, the healthcare recipient can schedule a time using the time settings option **3404** on the GUI **2911**, which reminds the healthcare recipient at the scheduled time to consume the medications **112**. If the healthcare recipient after being sent a reminder has not cleared the time settings option **3404**, then the wellness adherence tracking application **2902** determines that consumption of the medications **112** in the medical implement **2913**, that is, the medication bin **102** exemplarily illustrated in FIG. **33**A, or any other activity associated with the medical implement **2913** has not been completed. When the time settings option **3404** is not cleared, the wellness adherence tracking application **2902** enables the healthcare recipient to select the "administered" option **3402** after consuming the medication **112**, till a predefined time period of, for example, about four hours after the initial reminder. For example, when the healthcare recipient has not consumed a medication **112** and selected the time settings option **3404**, that is, snoozed the activity of consuming the medication **112**, then the wellness adherence tracking application **2902** enables the healthcare recipient to select the administered option **3402** once he/she consumes the medication **112**, till about four hours after the snooze. Some medications **112** that remain in the medication bin **102** need to be taken a few hours later than the other medications **112** in the medication bin **102**. The wellness adherence tracking application **2902** does not disable reminders for unchecked, that is, not administered medications and triggers a reminder at a selected time.

[0188] When the healthcare recipient scans the identifier codes **123***a* and **123***b* and the wellness adherence tracking application **2902** determines that the identifier codes **123***a* and **123***b* are valid and obtains the medical information, the wellness adherence tracking application **2902** renders a medical information window on the graphical user interface (GUI) **2911** as exemplarily illustrated in FIG. **34**E, for allowing the healthcare recipient to view the medical information and/or for receiving additional medical information and/or wellness adherence criteria from the healthcare recipient via the GUI **2911**. The medical information that the healthcare recipient enters on the GUI **2911** comprises, for example, a type of medication, a type of the medical implement **2913** such as a medication bin **102** or a parenteral device **3302** such as an inhaler exemplarily illustrated in FIG. **33**C, dosage information, frequency of administration, a reminder type, etc.

[0189] Consider an example where a healthcare recipient wants to consume medications **112**, for example, pills from a medication bin **102** of the medication organizer tray apparatus **100** exemplarily illustrated in FIGS. **1**A-**1**C and FIGS. **2**A-**2**B. The healthcare recipient invokes the wellness adherence tracking application **2902** installed on the healthcare recipient's user device **2901** exemplarily illustrated in FIG. **29**. The wellness adherence tracking application **2902** renders a dashboard, for example, a home screen on the graphical user interface (GUI) **2911** comprising the "Scan" interface element **3401** as exemplarily illustrated in FIG. **34**A. In this example, an identifier code **123***a* is positioned on the bottom surface **106***b* of the customized bin label **106** that seals the medication bin **102** exemplarily illustrated in FIG. **33**A. The healthcare recipient lifts the top edge **106***a* of the customized bin label **106** to reveal the identifier code **123***a*, for example, a quick response (QR) code. The healthcare recipient positions his/her user device **2901** such that a camera lens in his/her user device **2901** focuses on the identifier code **123***a* and then taps on the "Scan" interface element **3401** to scan the identifier code **123***a* in focus as exemplarily illustrated in FIG. **34**B. The wellness adherence tracking application **2902**

scans the identifier code **123***a* to determine presence of medical information in the identifier code **123***a*. When the wellness adherence tracking application **2902** determines the presence of the medical information in the identifier code **123***a*, the wellness adherence tracking application **2902** extracts the medical information from the scanned identifier code **123***a* to display names of contents **3406**, for example, pills contained in the medication bin **102** as exemplarily illustrated in FIG. **34**C.

[0190] The wellness adherence tracking application **2902** renders the contents **3406** and multiple wellness adherence options **3402**, **3403**, **3404**, **3405**, etc., and by default displays, for example, a check mark for each medication **112** in the medication bin **102** indicating that the healthcare recipient has consumed each pill stored in the medication bin **102** as exemplarily illustrated in FIG. **34**C. However, if the healthcare recipient has not consumed each of the pills stored in the medication bin **102**, the wellness adherence tracking application **2902** allows the healthcare recipient to manually uncheck the unconsumed pills by selecting the "not administered" option **3403** on the graphical user interface (GUI) **2911**. When the healthcare recipient consumes these unconsumed medications **112** in the medication bin **102** at a later time, he/she can manually select the "administered" option **3402** to indicate administration of the medications **112**. When the healthcare recipient decides to take the medications **112** at a later time of a day, he/she can select the time settings option **3404** to indicate rescheduling of time for the administration of the medications **112**. When the healthcare recipient does not have one or more of the medications **112**, he/she can select the "absence of medication" option **3405** to indicate missing medications **112**.

[0191] On receiving inputs for the wellness adherence options **3402**, **3403**, **3404**, or **3405** from the healthcare recipient, the wellness adherence tracking application **2902** logs the selections and compares the selections and time of each selection that indicates time of consumption of a pill, with the wellness adherence criteria, for example, a medication regimen prescribed by a healthcare provider to the healthcare recipient. If the comparison yields a positive match for each of the medications **112** consumed based on one or more adherence parameters comprising, for example, a prescribed quantity of pills to be consumed, a prescribed time of day of consumption of the pills, a prescribed method of consuming the pills, etc., the wellness adherence tracking application **2902** confirms the wellness adherence of the healthcare recipient. In an embodiment, the wellness adherence tracking application **2902** renders the medical information and/or the wellness adherence criteria exemplarily illustrated in FIG. **34**E, when the healthcare recipient taps on the "more information" interface element **3407** exemplarily illustrated in FIGS. **34**C-**34**D.

[0192] It will be readily apparent that the various methods, algorithms, and computer programs disclosed herein may be implemented on computer readable media appropriately programmed for computing devices. As used herein, "computer readable media" refers to non-transitory computer readable media that participate in providing data, for example, instructions that may be read by a computer, a processor or a similar device. Non-transitory computer readable media comprise all computer readable media, for example, non-volatile media, volatile media, and transmission media, except for a transitory, propagating signal. Non-volatile media comprise, for example, optical discs or magnetic disks and other persistent memory volatile media including a dynamic random access memory (DRAM), which typically constitutes a main memory. Volatile media comprise, for example, a register memory, a processor cache, a random access memory (RAM), etc. Transmission media comprise, for example, coaxial cables, copper wire, fiber optic cables, modems, etc., including wires that constitute a system bus coupled to a processor, etc. Common forms of computer readable media comprise, for example, a floppy disk, a flexible disk, a hard disk, magnetic tape, a laser disc, a Blu-ray Disc® of the Blu-ray Disc Association, any magnetic medium, a compact disc-read only memory (CD-ROM), a digital versatile disc (DVD), any optical medium, a flash memory card, punch cards, paper tape, any other physical medium with patterns of holes, a random access memory (RAM), a programmable read only memory (PROM), an erasable programmable read only memory (EPROM), an electrically erasable programmable read only memory (EEPROM), a flash memory, any other memory chip or cartridge, or any other medium from which a computer can read.

[0193] The computer programs that implement the methods and algorithms disclosed herein may be stored and transmitted using a variety of media, for example, the computer readable media in a number of manners. In an embodiment, hard-wired circuitry or custom hardware may be used in place of, or in combination with, software instructions for implementation of the processes of various embodiments. Therefore, the embodiments are not limited to any specific combination of hardware and software. In general, the computer program codes comprising computer executable instructions may be implemented in any programming language. Examples of programming languages that can be used comprise C, C++, C#, Java®, JavaScript®, Fortran, Ruby, Perl®, Python®, Visual Basic®, hypertext preprocessor (PHP), Microsoft® .NET etc. The computer program codes or software programs may be stored on or in one or more mediums as object code. Various aspects of the method and the wellness adherence tracking system **2900** disclosed herein may be implemented in a non-programmed environment comprising documents created, for example, in a hypertext markup language (HTML), an extensible markup language (XML), or other format that render aspects of a graphical user interface (GUI) or perform other functions, when viewed in a visual area or a window of a browser program. Various aspects of the method and the wellness adherence tracking system **2900** disclosed herein may be implemented as programmed elements, or non-programmed elements, or any suitable combination thereof. The computer program product disclosed herein comprises one or more computer program codes for implementing the processes of various embodiments.

[0194] Where databases are described such as the internal application database **2912** and the wellness adherence database **2915** exemplarily illustrated in FIG. **29**, it will be understood by one of ordinary skill in the art that (i) alternative database structures to those described may be readily employed, and (ii) other memory structures besides databases may be readily employed. Any illustrations or descriptions of any sample databases disclosed herein are illustrative arrangements for stored representations of information. Any number of other arrangements may be employed besides those suggested by tables illustrated in the drawings or elsewhere. Similarly, any illustrated entries of the databases represent exemplary information only; one of ordinary skill in the art will understand that the number and content of the

entries can be different from those disclosed herein. Further, despite any depiction of the databases as tables, other formats including relational databases, object-based models, and/or distributed databases may be used to store and manipulate the data types disclosed herein. Likewise, object methods or behaviors of a database can be used to implement various processes such as those disclosed herein. In addition, the databases may, in a known manner, be stored locally or remotely from a device that accesses data in such a database. In embodiments where there are multiple databases in the wellness adherence tracking system **2900** exemplarily illustrated in FIG. **29**, the databases may be integrated to communicate with each other for enabling simultaneous updates of data linked across the databases, when there are any updates to the data in one of the databases.

[0195] The method and the wellness adherence tracking system **2900** exemplarily illustrated in FIG. **29**, disclosed herein can be configured to work in a network environment comprising one or more computers that are in communication with one or more devices via a network. The computers may communicate with the devices directly or indirectly, via a wired medium or a wireless medium such as the Internet, a local area network (LAN), a wide area network (WAN) or the Ethernet, a token ring, or via any appropriate communications mediums or combination of communications mediums. Each of the devices comprises processors, some examples of which are disclosed above, that are adapted to communicate with the computers. In an embodiment, each of the computers is equipped with a network communication device, for example, a network interface card, a modem, or other network connection device suitable for connecting to a network. Each of the computers and the devices executes an operating system, some examples of which are disclosed above. While the operating system may differ depending on the type of computer, the operating system will continue to provide the appropriate communications protocols to establish communication links with the network. Any number and type of machines may be in communication with the computers.

[0196] The method and the wellness adherence tracking system **2900** disclosed herein are not limited to a particular computer system platform, processor, operating system, or network. One or more aspects of the method and the wellness adherence tracking system **2900** disclosed herein may be distributed among one or more computer systems, for example, servers configured to provide one or more services to one or more client computers, or to perform a complete task in a distributed system. For example, one or more aspects of the method and the wellness adherence tracking system **2900** disclosed herein may be performed on a client-server system that comprises components distributed among one or more server systems that perform multiple functions according to various embodiments. These components comprise, for example, executable, intermediate, or interpreted code, which communicate over a network using a communication protocol. The method and the wellness adherence tracking system **2900** disclosed herein are not limited to be executable on any particular system or group of systems, and are not limited to any particular distributed architecture, network, or communication protocol.

[0197] The foregoing examples have been provided merely for the purpose of explanation and are in no way to be construed as limiting of the method and the wellness adherence tracking system **2900** disclosed herein. While the method and the wellness adherence tracking system **2900** have been described with reference to various embodiments, it is understood that the words, which have been used herein, are words of description and illustration, rather than words of limitation. Further, although the method and the wellness adherence tracking system **2900** have been described herein with reference to particular means, materials, and embodiments, the method and the wellness adherence tracking system **2900** are not intended to be limited to the particulars disclosed herein; rather, the method and the wellness adherence tracking system **2900** extend to all functionally equivalent structures, methods and uses, such as are within the scope of the appended claims. Those skilled in the art, having the benefit of the teachings of this specification, may effect numerous modifications thereto and changes may be made without departing from the scope and spirit of the method and the wellness adherence tracking system **2900** disclosed herein in their aspects.

We claim:

1. A method for tracking wellness adherence of a healthcare recipient, said method comprising:

providing an identifier code configured to be positioned on a medical implement to identify said medical implement;

scanning said identifier code of said medical implement via a graphical user interface provided by a wellness adherence tracking system accessible on a user device, said wellness adherence tracking system comprising at least one processor configured to execute computer program instructions for tracking said wellness adherence of said healthcare recipient;

decoding and validating said scanned identifier code by said wellness adherence tracking system;

obtaining medical information associated with one or more of said medical implement and an activity associated with said medical implement from said decoded and validated identifier code, and wellness adherence criteria by said wellness adherence tracking system;

rendering said medical information and a plurality of wellness adherence options on said graphical user interface by said wellness adherence tracking system;

receiving inputs for one or more of said rendered wellness adherence options from said user device by said wellness adherence tracking system; and

logging said received inputs in association with said wellness adherence criteria by said wellness adherence tracking system in one or more of said user device and one or more databases to track said wellness adherence of said healthcare recipient.

2. The method of claim **1**, wherein said medical implement is one of a medication bin configured to store one or more medications, a parenteral device, a fitness device, a medical identification card, a medical wellness plan, and a medication organizer tray apparatus.

3. The method of claim **1**, wherein said activity associated with said medical implement is one of administration of one or more medications, an exercise activity, a diet activity, wound care, and a health checkup.

4. The method of claim **1**, wherein said wellness adherence criteria comprise dosage information, a date for administering one or more medications, a time of day for administering said one or more medications, and directions to follow.

5. The method of claim **1**, wherein said medical information is obtained by one or more of:

directly extracting said medical information contained in said decoded and validated identifier code by said wellness adherence tracking system;

transmitting said decoded and validated identifier code to one or more databases via a network and retrieving said medical information and said wellness adherence criteria from said one or more databases via said network by said wellness adherence tracking system; and

receiving said medical information and said wellness adherence criteria from said user device via said graphical user interface by said wellness adherence tracking system.

6. The method of claim **1**, wherein said wellness adherence options comprise indicators that define administration and non-administration of one or more medications, presence and absence of medications in said medical implement, performance and non-performance of said activity, a percentage of performance of said activity, an abortion of said activity, an establishment of communication with a prescriber of said activity, and time settings for said administration of said one or more medications and said performance of said activity within preconfigured time periods.

7. The method of claim **1**, wherein said identifier code comprises one or more authentication codes embedded therein for said validation with reference to authentication codes stored by said wellness adherence tracking system in said one or more of said user device and said one or more databases.

8. The method of claim **1**, further comprising validating said medical information associated with said one or more of said medical implement and said activity associated with said medical implement by said wellness adherence tracking system, in communication with one or more of said user device and a backend server.

9. The method of claim **1**, further comprising configuring said wellness adherence options in accordance with said wellness adherence criteria and user inputs by said wellness adherence tracking system.

10. The method of claim **1**, further comprising transmitting alert notifications on said graphical user interface by said wellness adherence tracking system based on alerting criteria, wherein said alerting criteria comprise one or more of time settings configured on said user device, a validation status of said decoded identifier code, and a validation status of said medical information contained in said decoded identifier code, and wherein said alert notifications are configured to one or more of remind said healthcare recipient to perform one or more actions to meet said wellness adherence criteria and warn said healthcare recipient of one or more of an invalid identifier code and invalid medical information.

11. The method of claim **1**, further comprising dynamically analyzing said medical information with historical data and trends and predicting future medical information and planned actionable tasks and outcomes by said wellness adherence tracking system.

12. The method of claim **1**, further comprising dynamically assessing health, wellness, and adherence requirements of said healthcare recipient and updating said wellness adherence criteria for an associated said medical implement by said wellness adherence tracking system.

13. The method of claim **1**, wherein said medical information encoded in said identifier code comprises one or more of a number of medications in said medical implement, a list of said medications in said medical implement, drug names, directions to follow, color coding of dosage times, name of a prescriber, a date of preparation, a description of contents of said medical implement, a personalized website link configured to link to a secure online interface comprising healthcare recipient information, a healthcare recipient identifier, and any combination thereof.

14. The method of claim **1**, further comprising:

transmitting alerts for capturing one or more images in one or more views of a medication organizer tray apparatus, on said graphical user interface at configurable time instants by said wellness adherence tracking system; and

verifying type, number, and arrangement of medications in medication bins of said medication organizer tray apparatus in accordance with said wellness adherence criteria prescribed by a healthcare provider using said captured one or more images by said wellness adherence tracking system for said tracking of said wellness adherence of said healthcare recipient in accordance with said wellness adherence criteria.

15. A wellness adherence tracking system for tracking wellness adherence of a healthcare recipient, said wellness adherence tracking system comprising:

a non-transitory computer readable storage medium configured to store computer program instructions defined by modules of said wellness adherence tracking system;

at least said one processor communicatively coupled to said non-transitory computer readable storage medium, said at least one processor configured to execute said defined computer program instructions;

said modules of said wellness adherence tracking system comprising:

a scanner configured to scan an identifier code positioned on a medical implement via a graphical user interface, said identifier code configured to identify said medical implement;

a decoder configured to decode and validate said scanned identifier code;

a data extraction module configured to obtain medical information associated with one or more of said medical implement and an activity associated with said medical implement from said decoded and validated identifier code, and wellness adherence criteria;

a data rendering module configured to render said medical information and a plurality of wellness adherence options on said graphical user interface;

a data reception module configured to receive inputs for one or more of said rendered wellness adherence options from said user device; and

a data logger configured to log said received inputs in association with said wellness adherence criteria in one or more of said user device and one or more databases to track said wellness adherence of said healthcare recipient.

16. The wellness adherence tracking system of claim **15**, wherein said medical implement is one of a medication bin configured to store one or more medications, a parenteral device, a fitness device, a medical identification card, a medical wellness plan, and a medication organizer tray apparatus, and wherein said activity associated with said medical implement is one of administration of one or more medications, an exercise activity, a diet activity, wound care, and a health checkup.

17. The wellness adherence tracking system of claim **15**, wherein said wellness adherence criteria comprise dosage

information, a date for administering one or more medications, a time of day for administering said one or more medications, and directions to follow.

18. The wellness adherence tracking system of claim **15**, wherein said data extraction module is configured to obtain said medical information and said wellness adherence criteria by performing one or more of:

directly extracting said medical information contained in said decoded and validated identifier code;

retrieving said medical information and said wellness adherence criteria from one or more databases via a network based on said decoded and validated identifier code; and

receiving said medical information and said wellness adherence criteria from said user device via said graphical user interface.

19. The wellness adherence tracking system of claim **15**, wherein said wellness adherence options comprise indicators that define administration and non-administration of one or more medications, presence and absence of medications in said medical implement, performance and non-performance of said activity, a percentage of performance of said activity, an abortion of said activity, an establishment of communication with a prescriber of said activity, and time settings for said administration of said one or more medications and said performance of said activity within preconfigured time periods.

20. The wellness adherence tracking system of claim **15**, wherein said identifier code comprises one or more authentication codes embedded therein for said validation with reference to authentication codes stored by said wellness adherence tracking system in said one or more of said user device and said one or more databases.

21. The wellness adherence tracking system of claim **15**, wherein said modules of said wellness adherence tracking system further comprise an analytic engine configured to validate said medical information associated with said one or more of said medical implement and said activity associated with said medical implement, in communication with one or more of said user device and a backend server.

22. The wellness adherence tracking system of claim **15**, wherein said data rendering module is further configured to configure said wellness adherence options in accordance with said wellness adherence criteria and user inputs.

23. The wellness adherence tracking system of claim **15**, wherein said modules of said wellness adherence tracking system further comprise an alert notification module configured to transmit alert notifications on said graphical user interface based on alerting criteria, wherein said alerting criteria comprise one or more of time settings configured on said user device, a validation status of said decoded identifier code, and a validation status of said medical information contained in said decoded identifier code, and wherein said alert notifications are configured to one or more of remind said healthcare recipient to perform one or more actions to meet said wellness adherence criteria and warn said healthcare recipient of one or more of an invalid identifier code and invalid medical information.

24. The wellness adherence tracking system of claim **15**, wherein said modules of said wellness adherence tracking system further comprise an analytic engine configured to dynamically analyze said medical information with historical data and trends and predict future medical information and planned actionable tasks and outcomes.

25. The wellness adherence tracking system of claim **15**, wherein said modules of said wellness adherence tracking system further comprise an analytic engine configured to dynamically assess health, wellness, and adherence requirements of said healthcare recipient and update said wellness adherence criteria for an associated said medical implement.

26. The wellness adherence tracking system of claim **15**, wherein said medical information encoded in said identifier code comprises one or more of a number of medications in said medical implement, a list of said medications in said medical implement, drug names, directions to follow, color coding of dosage times, name of a prescriber, a date of preparation, a description of contents of said medical implement, a personalized website link configured to link to a secure online interface comprising healthcare recipient information, a healthcare recipient identifier, and any combination thereof.

27. The wellness adherence tracking system of claim **15**, wherein said modules of said wellness adherence tracking system further comprise:

an alert notification module configured to transmit alerts for capturing one or more images in one or more views of a medication organizer tray apparatus, on said graphical user interface at configurable time instants; and

an analytic engine configured to verify type, number, and arrangement of medications in medication bins of said medication organizer tray apparatus in accordance with said wellness adherence criteria prescribed by a healthcare provider using said captured one or more images for said tracking of said wellness adherence of said healthcare recipient in accordance with said wellness adherence criteria.

28. A computer program product comprising a non-transitory computer readable storage medium having embodied thereon, computer program codes comprising instructions executable by at least one processor for tracking wellness adherence of a healthcare recipient, said computer program codes comprising:

a first computer program code for scanning an identifier code of a medical implement via a graphical user interface, said identifier code configured to identify said medical implement;

a second computer program code for decoding and validating said scanned identifier code;

a third computer program code for obtaining medical information associated with one or more of said medical implement and an activity associated with said medical implement from said decoded and validated identifier code, and wellness adherence criteria;

a fourth computer program code for rendering said medical information and a plurality of wellness adherence options on said graphical user interface, wherein said wellness adherence options comprise indicators that define administration and non-administration of one or more medications, presence and absence of said medications in said medical implement, performance and non-performance of said activity, a percentage of performance of said activity, an abortion of said activity, an establishment of communication with a prescriber of said activity, and time settings for said administration of said one or more medications and said performance of said activity within preconfigured time periods, and wherein said wellness adherence options are configured in accordance with said wellness adherence criteria;

a fifth computer program code for receiving inputs for one or more of said rendered wellness adherence options from said user device; and

a sixth computer program code for logging said received inputs in association with said wellness adherence criteria in one or more of said user device and one or more databases to track said wellness adherence of said healthcare recipient.

29. The computer program product of claim **28**, further comprising a seventh computer program code for transmitting alert notifications on said graphical user interface based on alerting criteria, wherein said alerting criteria comprise one or more of time settings configured on said user device, a validation status of said decoded identifier code, and a validation status of said medical information contained in said decoded identifier code, and wherein said alert notifications are configured to one or more of remind said healthcare recipient to perform one or more actions to meet said wellness adherence criteria and warn said healthcare recipient of one or more of an invalid identifier code and invalid medical information.

30. The computer program product of claim **28**, further comprising an eighth computer program code for dynamically analyzing said medical information with historical data and trends and predicting future medical information and planned actionable tasks and outcomes.

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