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Fischer

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(54) **RETRACTION APPARATUS**

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(51) **Int. Cl.**
H02G 11/02 (2006.01)

(52) **U.S. Cl.** ..... **191/12.2 R**; 191/12.2 A; 191/12.4; 242/389; 242/378.1; 242/378.4; 242/379; 242/385.4

(58) **Field of Classification Search** ..... 191/12.2 R, 191/12.2 A, 12.4; 242/370, 372, 374–376, 242/378.1, 378.4, 379, 385.4, 389
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,094,396	A	3/1992	Burke	
5,339,461	A	8/1994	Luplow	
6,082,656	A	7/2000	Thornton	
6,250,443	B1 *	6/2001	Richter et al.	191/12.2 R
6,370,401	B1	4/2002	Baranowski et al.	
6,542,757	B2	4/2003	Bae	
6,567,651	B2	5/2003	Whitley	
6,578,683	B1 *	6/2003	Burke et al.	191/12.4
6,616,080	B1	9/2003	Edwards et al.	
6,619,449	B2 *	9/2003	Liao	191/12.2 R
6,712,304	B1	3/2004	Taylor	
6,731,956	B2	5/2004	Hanna et al.	
6,926,130	B2	8/2005	Skowronski	
7,151,912	B1	12/2006	Morrison	
7,184,565	B2	2/2007	Ohta	
7,264,478	B1	9/2007	Downing	
D583,362	S	12/2008	Hsu et al.	
7,515,706	B2	4/2009	Park	
7,571,874	B2	8/2009	Zhang et al.	
7,597,179	B2 *	10/2009	Chou	191/12.2 R
7,599,509	B2	10/2009	Ito	
2002/0137554	A1	9/2002	Hanna et al.	
2004/0256188	A1	12/2004	Harcourt	
2006/0239491	A1	10/2006	Ito	
2007/0042746	A1	2/2007	Beard	
2008/0080732	A1	4/2008	Sneed	
2012/0138725	A1 *	6/2012	Chen et al.	242/378.1

* cited by examiner

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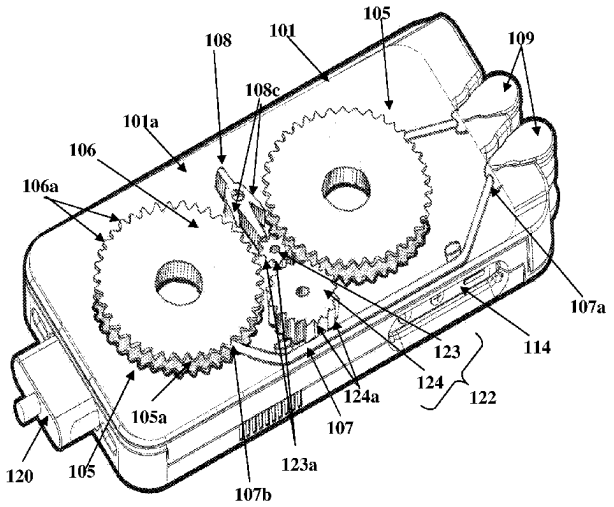
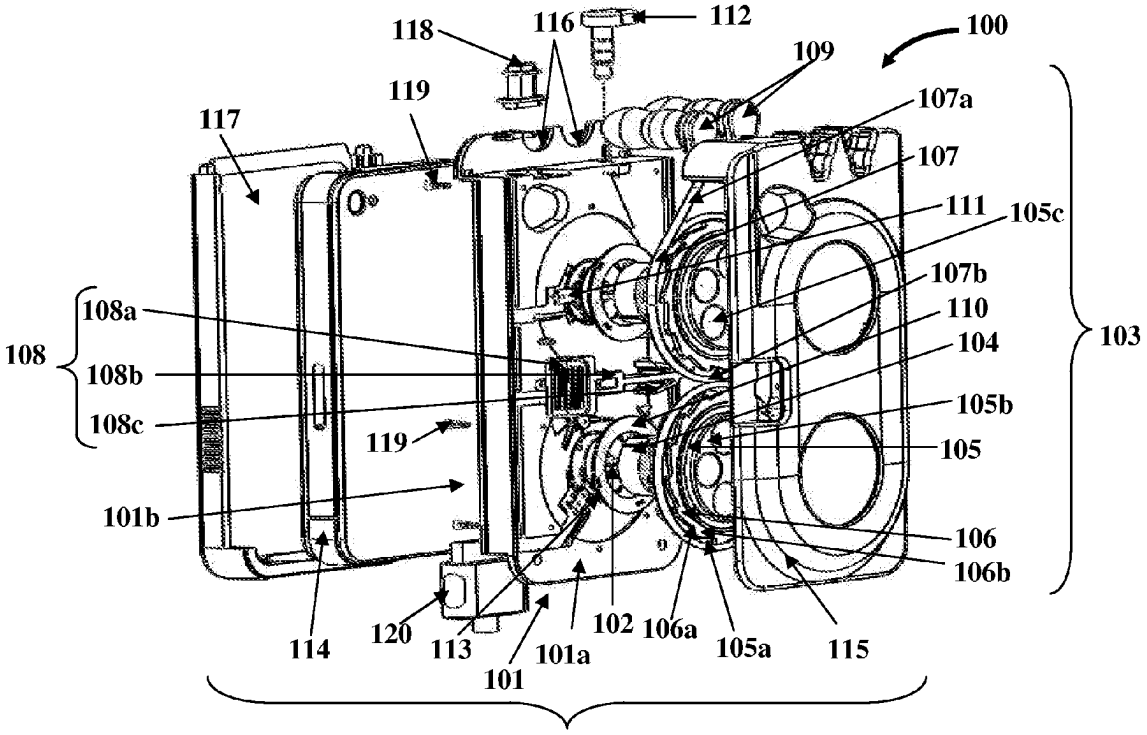
(57) **ABSTRACT**

A retraction apparatus comprising a support housing comprising one or more generally cylindrical spindles, and a retraction assembly mounted on each of the spindles is provided. The retraction assembly comprises a spring member, a generally cylindrical spool member, a retractable cable, a latch member, and a contact wheel member. The spring member is mounted on each of the spindles and affixed to the support housing. The spool member comprising serrated plates is affixed to the spring member. The retractable cable is circularly wound around a cylindrical section defined between the serrated plates of the spool member and extends outwardly from the support housing. The latch member, in engageable communication with the spool member, controls rotation of the spool member. The contact wheel member, in engageable communication with the spool member, via selective drive mechanisms, is rotated to rotate the spool member for retracting the retractable cable.

25 Claims, 13 Drawing Sheets

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113
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106a
105a
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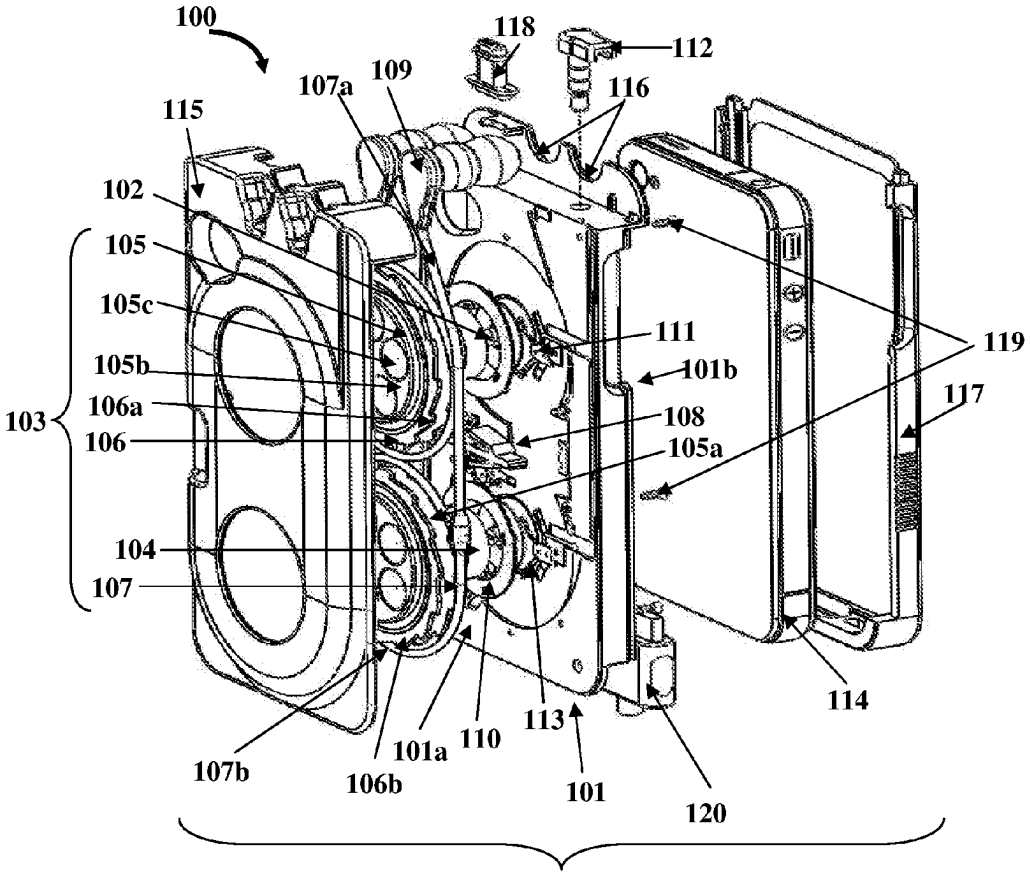
101a
101

FIG. 1A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101a
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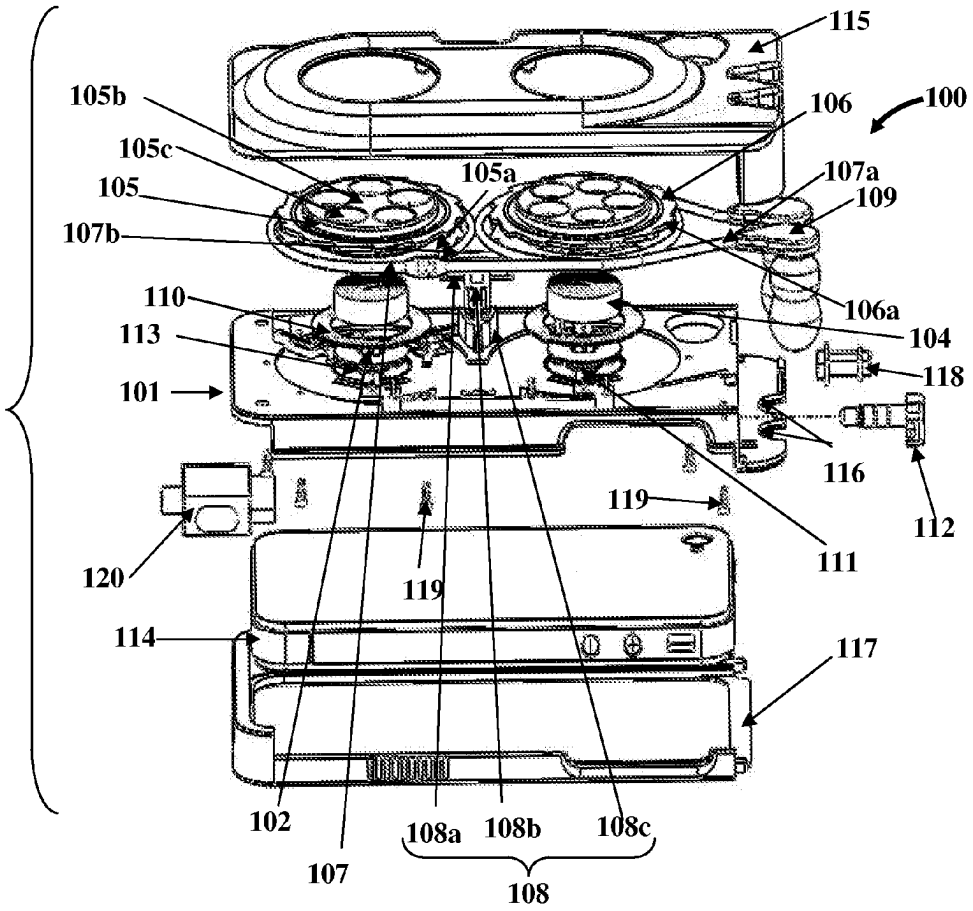
120

FIG. 1B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108c
107
108

FIG. 1C

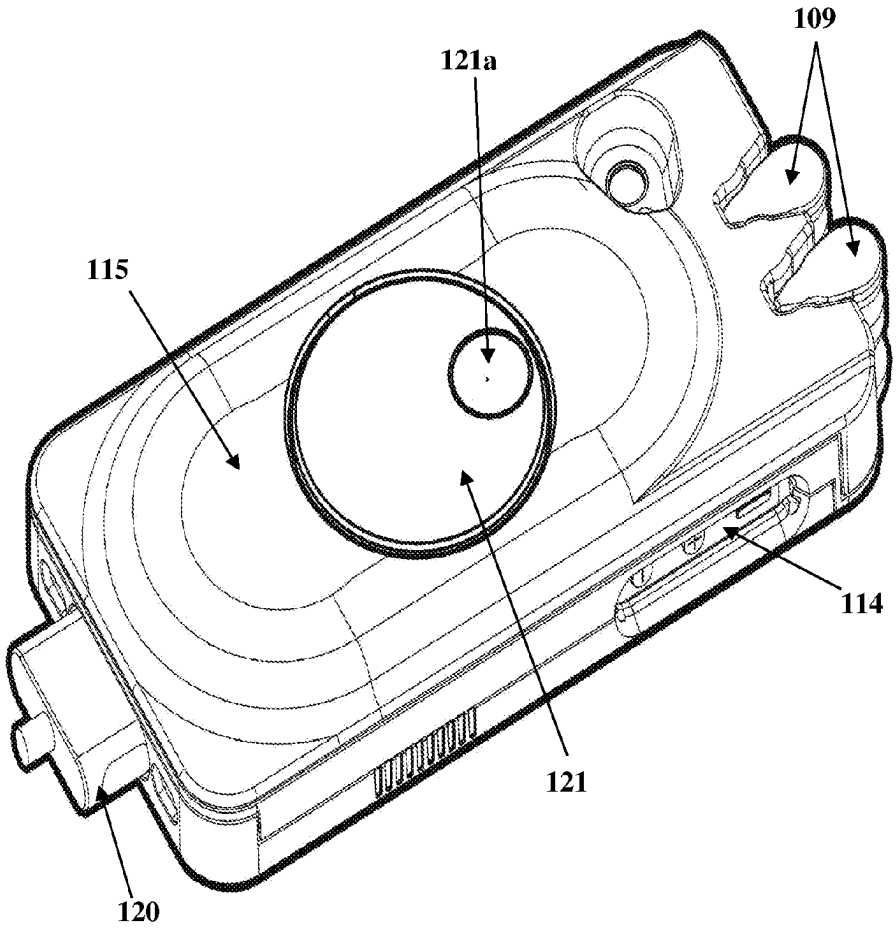
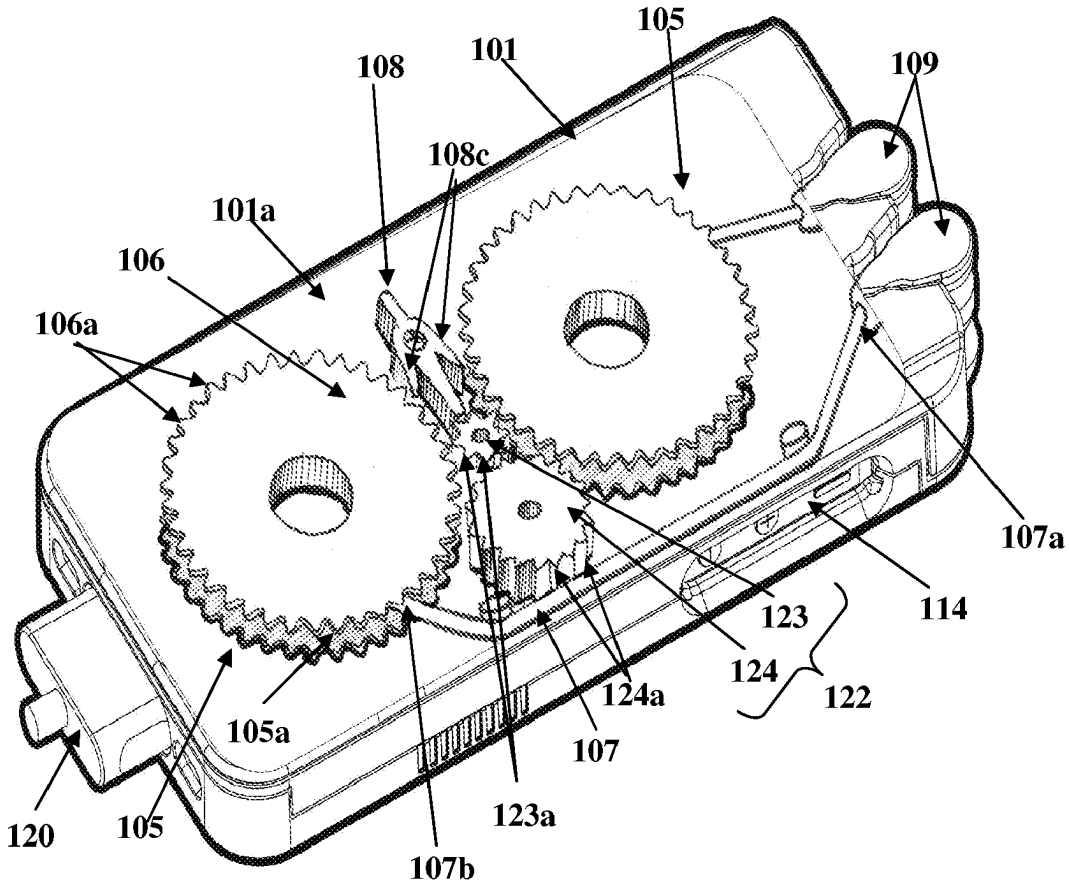


FIG. 2A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124a
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107b

FIG. 2B

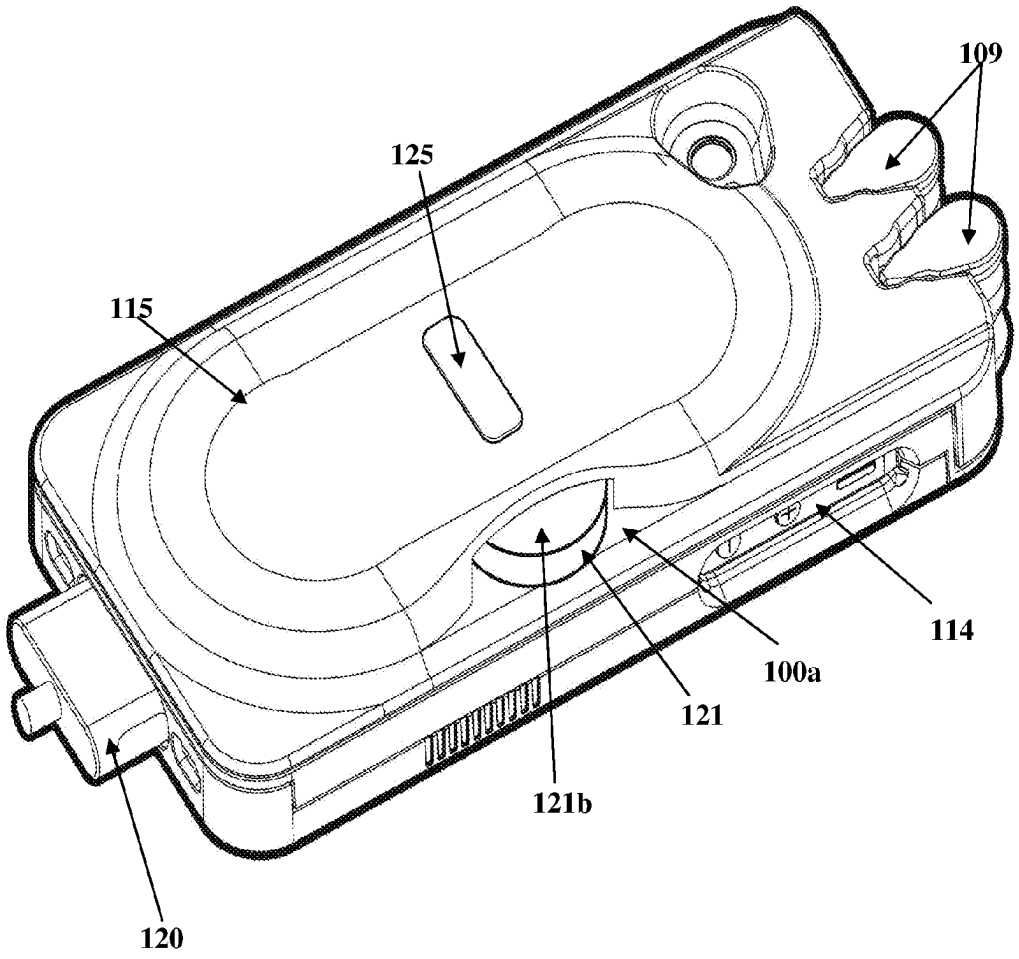
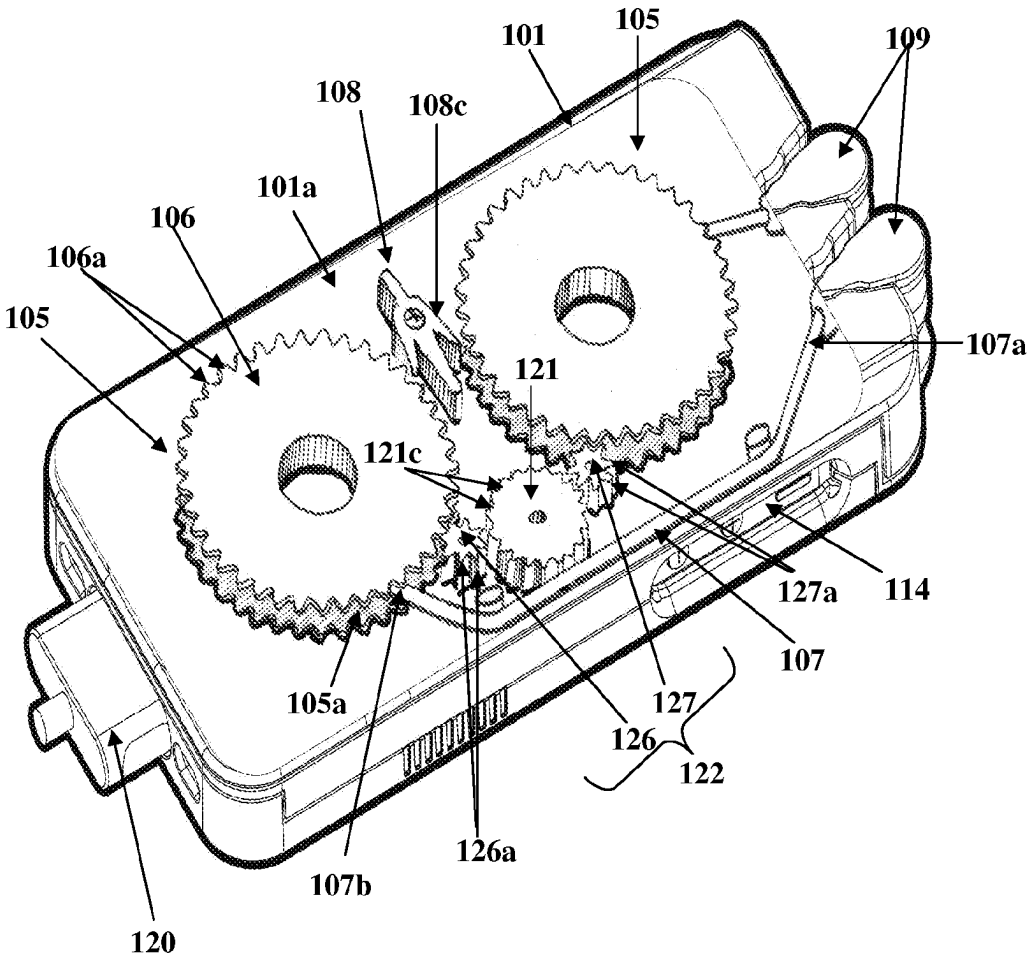


FIG. 3A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101a
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106a
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107a
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121c
127a
114
107
105a
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126
122
126a
107b
120

FIG. 3B

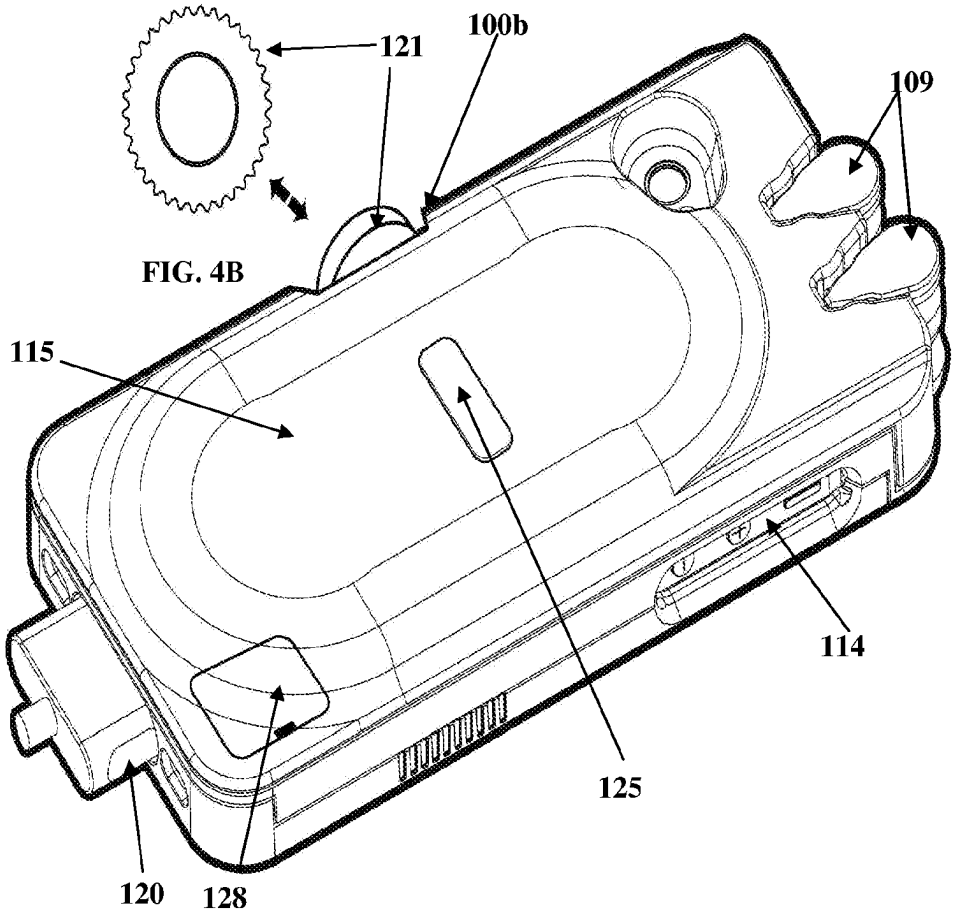
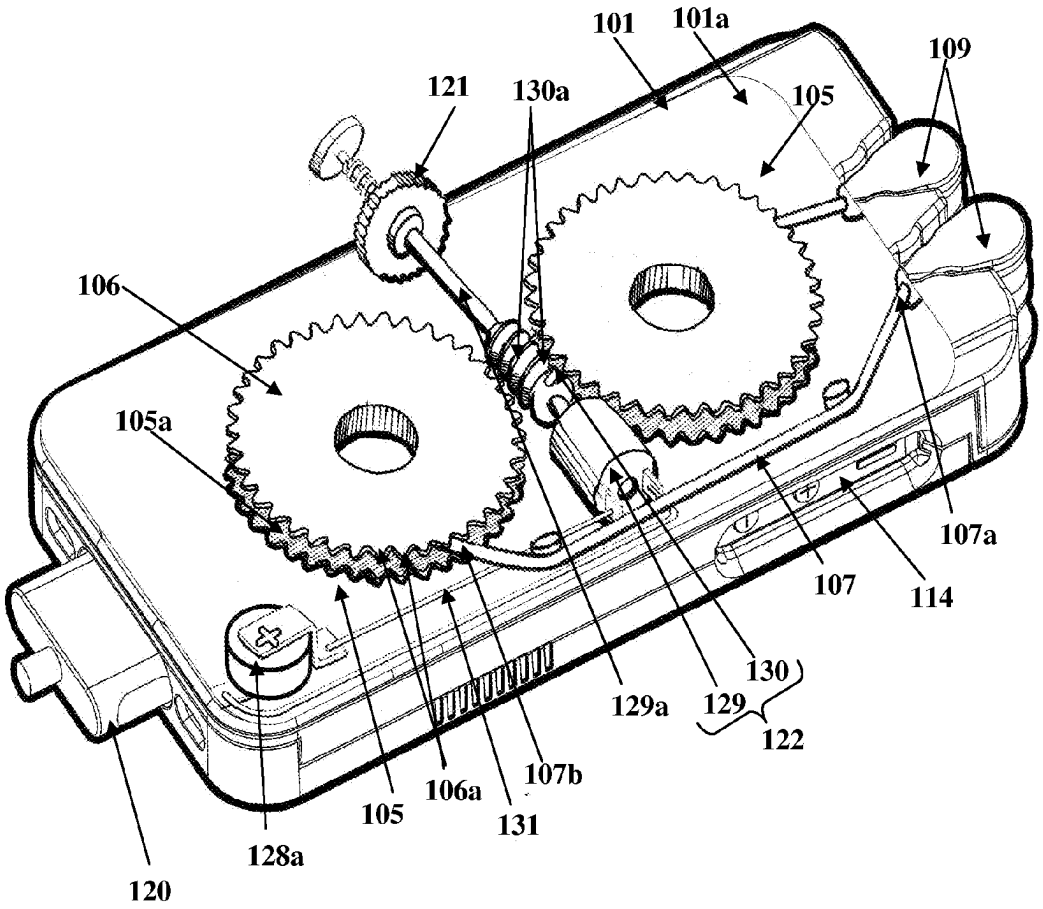


FIG. 4B

FIG. 4A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121
130a
105
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114
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131
128a
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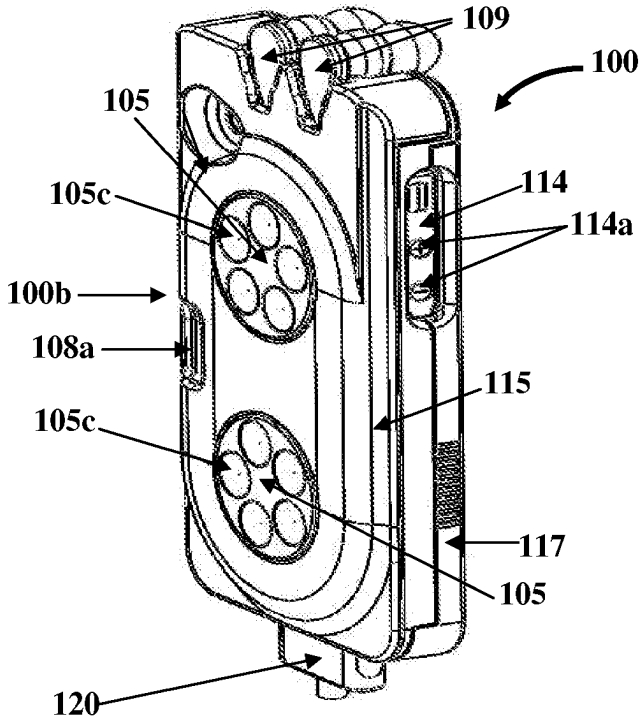
FIG. 4C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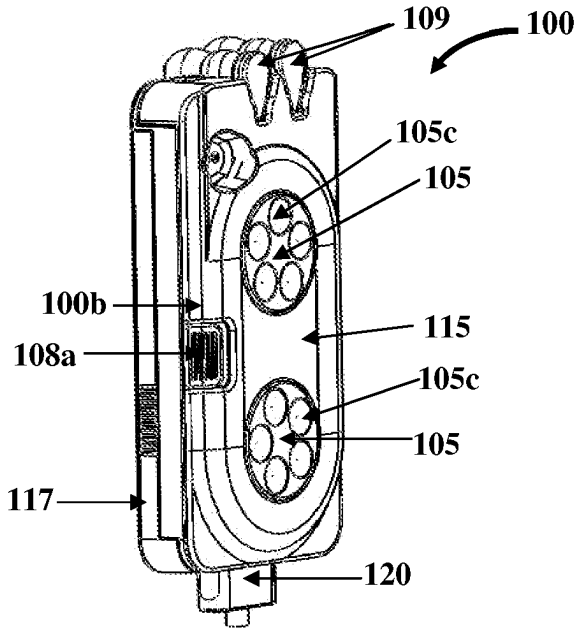
105
105c
114
114a
100b
108a
115
105c
117
105
120

FIG. 5A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105c
105
100b
115
108a
105c
105
117
120

FIG. 5B

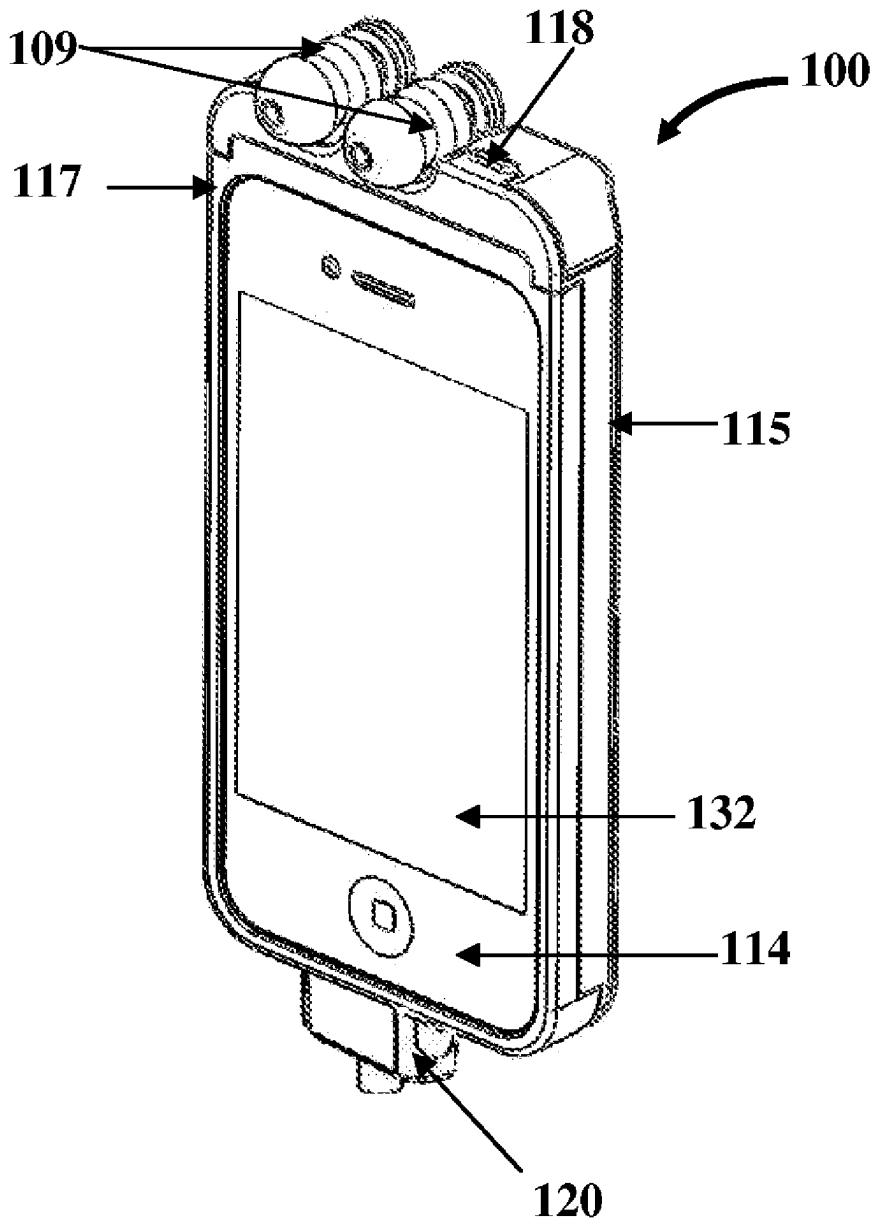
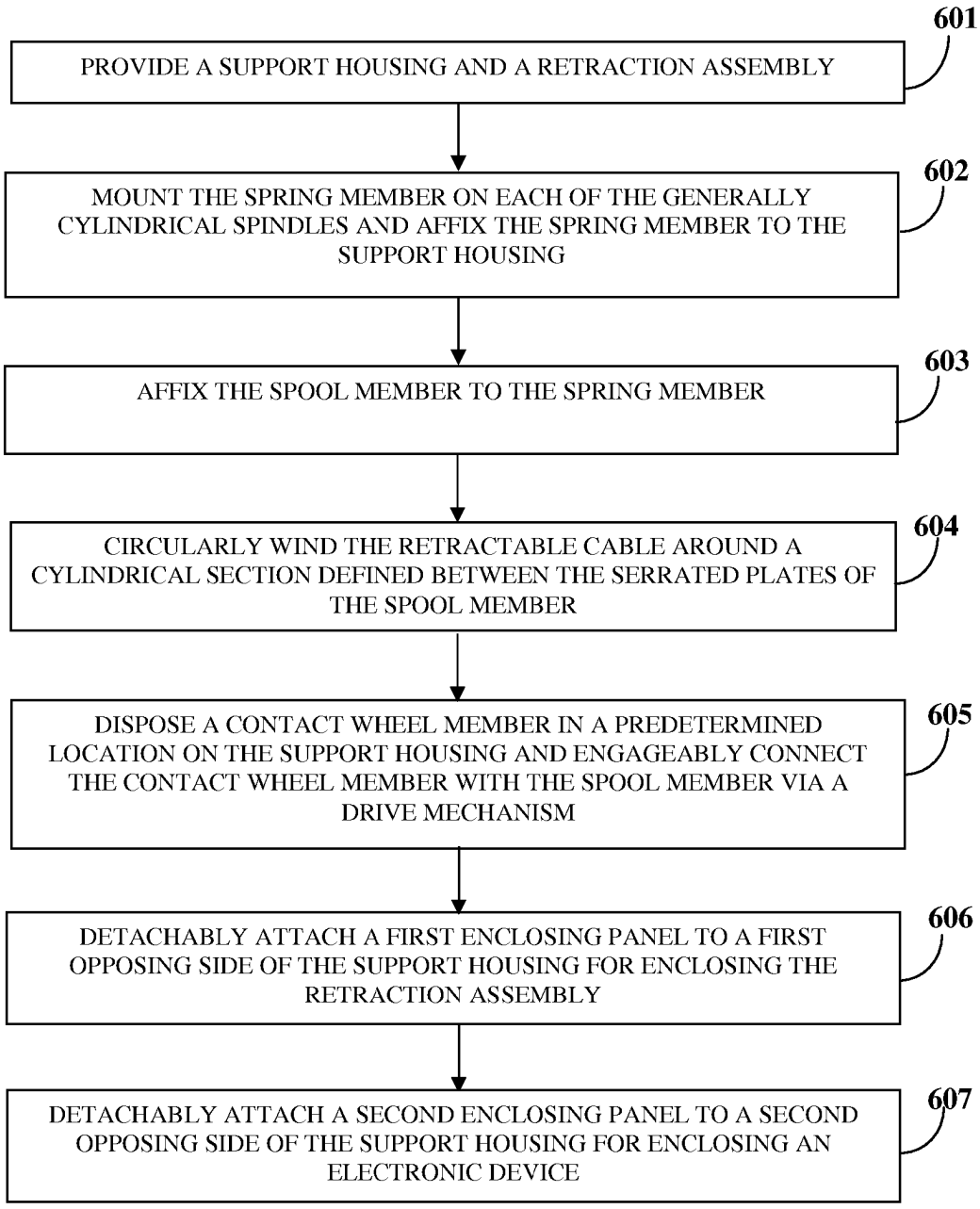


FIG. 5C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PROVIDE A SUPPORT HOUSING AND A RETRACTION ASSEMBLY
602
MOUNT THE SPRING MEMBER ON EACH OF THE GENERALLY CYLINDRICAL SPINDLES AND AFFIX THE SPRING MEMBER TO THE SUPPORT HOUSING
603
AFFIX THE SPOOL MEMBER TO THE SPRING MEMBER
604
CIRCULARLY WIND THE RETRACTABLE CABLE AROUND A CYLINDRICAL SECTION DEFINED BETWEEN THE SERRATED PLATES OF THE SPOOL MEMBER
605
DISPOSE A CONTACT WHEEL MEMBER IN A PREDETERMINED LOCATION ON THE SUPPORT HOUSING AND ENGAGEABLY CONNECT THE CONTACT WHEEL MEMBER WITH THE SPOOL MEMBER VIA A DRIVE MECHANISM
606
DETACHABLY ATTACH A FIRST ENCLOSING PANEL TO A FIRST OPPOSING SIDE OF THE SUPPORT HOUSING FOR ENCLOSING THE RETRACTION ASSEMBLY
607
DETACHABLY ATTACH A SECOND ENCLOSING PANEL TO A SECOND OPPOSING SIDE OF THE SUPPORT HOUSING FOR ENCLOSING AN ELECTRONIC DEVICE

FIG. 6

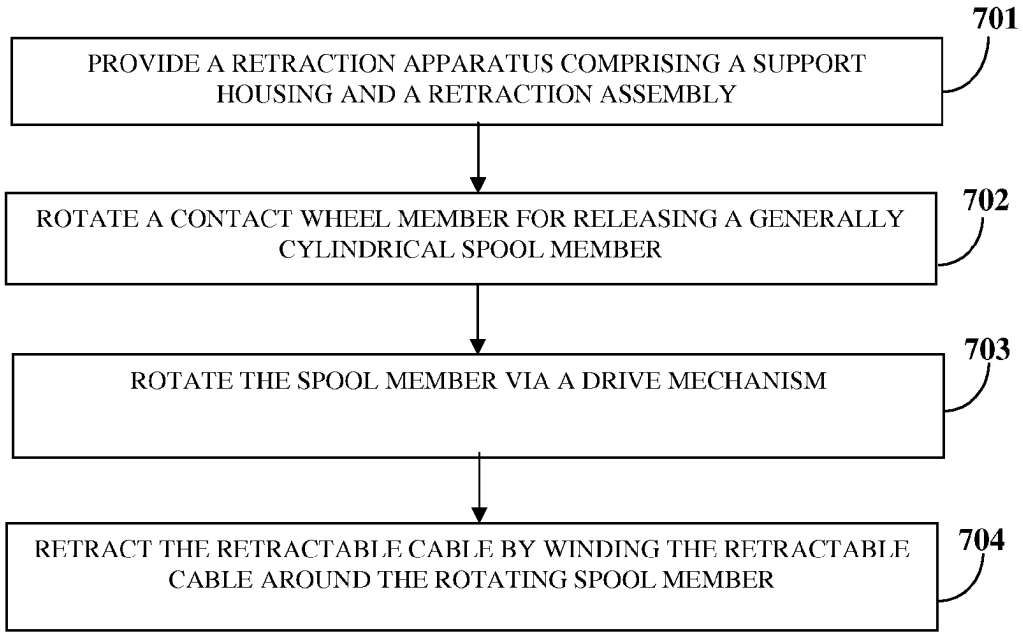
701
PROVIDE A RETRACTION APPARATUS COMPRISING A SUPPORT HOUSING AND A RETRACTION ASSEMBLY
702
ROTATE A CONTACT WHEEL MEMBER FOR RELEASING A GENERALLY CYLINDRICAL SPOOL MEMBER
703
ROTATE THE SPOOL MEMBER VIA A DRIVE MECHANISM
704
RETRACT THE RETRACTABLE CABLE BY WINDING THE RETRACTABLE CABLE AROUND THE ROTATING SPOOL MEMBER

FIG. 7

RETRACTION APPARATUS

BACKGROUND

Electronic devices, for example, mobile phones, allow a user to have a telephone conversation or listen to radio or prerecorded music using an earphone attached to an end of a cable. Earphones protect the user from radio emissions and allow the user to drive safely by precluding the need to hold the electronic device to the user's ear while using the electronic device. Earphones are of different sizes and produce output at different levels of quality. A particular predetermined length of the cable housing the earphones is not always optimal or ideal for all users. In some cases, cables longer than that required by a user are provided to the user. If the user finds the length of the cable too long, the user tries to reduce the length of the cable by winding some portion of the cable around the electronic device. Winding the cable around the electronic device creates stress on wires inside the cable. Moreover, inadequate housing of the cables may result in cross talk and electronic noise, thereby reducing the quality of an audio signal transmitted though the cable. In addition, when the earphones are not in use, the earphones along with the cable need to be conveniently stored. Usually, users store the earphones in their pockets. In order to answer an incoming call, the users are required to connect the earphones to the mobile phone, which is inconvenient for the users.

To eliminate the stress created on the wires inside the cable, there is a need for a convenient housing for winding the cable in the housing irrespective of the length of the cable and for reducing cross talk and electronic noise. Moreover, there is a need for enclosing the electronic device against the housing to allow a user to conveniently release the cable that houses the earphones and answer an incoming call or listen to the radio or any prerecorded music and retract the cable when not in use. Conventional retraction mechanisms inefficiently retract the cable, which result in tangling of the cable and difficulty in releasing the cable when required.

Moreover, some retraction mechanisms comprise springs used for facilitating winding of the cable in a housing. However, these springs wear out, which disallow retraction of the cable into the housing, thereby causing an inconvenience to the user due to the inability to retract the cable into the housing. Therefore, there is need for additional or secondary provisions for retracting the cable into the housing independent of a single means for retracting the cable.

Hence, there is a long felt but unresolved need for a retraction apparatus that retracts a retractable cable into a support housing, allows mounting of an electronic device adjacent to a retraction mechanism, and provides selective mechanisms for retracting the retractable cable into the support housing.

SUMMARY OF THE INVENTION

This summary is provided to introduce a selection of concepts in a simplified form that are further described 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.

The retraction apparatus disclosed herein addresses the above stated need for an easy to use, compact, semi-permanently attached retraction apparatus that retracts a retractable cable into a support housing and allows mounting of an electronic device, for example, a mobile phone, a tablet computing device, etc., adjacent to a retraction mechanism. The retraction apparatus disclosed herein also provides selective mechanisms, for example, mechanical mechanisms, electric mechanisms, etc., for retracting the retractable cable into the support housing. The retraction apparatus disclosed herein is used for retracting a retractable cable that houses earphones, a microphone, earphones with integral or inline microphones, and/or any device that communicates a signal with the electronic device via the retractable cable.

The retraction apparatus disclosed herein comprises a support housing and a retraction assembly. The support housing comprises one or more generally cylindrical spindles herein referred to as "spindles". The retraction assembly is mounted on each of the spindles of the support housing. The retraction assembly comprises a spring member, a generally cylindrical spool member, a retractable cable, and a contact wheel member. The spring member is mounted on each of the spindles and affixed to the support housing. The generally cylindrical spool member, herein referred to as a "spool member", is affixed to the spring member. The spool member comprises serrated plates that define a cylindrical section between the serrated plates for accommodating the retractable cable. In an embodiment, the serrated plates of the spool member comprise multiple projections that engageably communicate with the contact wheel member via a drive mechanism.

The retractable cable is circularly wound around the cylindrical section defined between the serrated plates of the spool member. The retractable cable extends outwardly from the support housing. The spring member is compressed when the retractable cable is outwardly extended from the support housing. The spring member is decompressed when the retractable cable is retracted into the support housing. The first end of the retractable cable houses, for example, an earphone and/or a microphone. The second end of the retractable cable is connected to the cylindrical section defined between the serrated plates of the spool member.

The contact wheel member is in engageable communication with the spool member via selective drive mechanisms. The contact wheel member is disposed in a predetermined location on the support housing. The contact wheel member is rotated to engageably communicate with a drive mechanism for rotating the spool member for retracting the retractable cable. In an embodiment, the contact wheel member is rearwardly exposed for enabling a user to manually rotate the contact wheel member for rotating the spool member via the drive mechanism. In another embodiment, a section of the contact wheel member is sidewardly exposed for enabling a user to manually rotate the contact wheel member for the rotation of the spool member via the drive mechanism. In another embodiment, a surface of the spool member is rearwardly exposed in the absence of the contact wheel member for enabling a user to manually rotate the spool member. In another embodiment, the spool member comprises one or more spherical depressions on the exposed surface of the spool member contactable by the user for the manual rotation of the contact wheel member.

In an embodiment, the retraction assembly further comprises a latch member in engageable communication with the spool member. The latch member controls the rotation of the spool member. The projections of the serrated plates of the spool member engageably communicate with the latch member. The rotation of the spool member in a first direction disengages the latch member from the spool member to release the spool member for retraction of the retractable cable. The latch member prevents the rotation of the spool member in a second direction opposing the first direction.

In an embodiment, the drive mechanism that engageably connects the contact wheel member to the spool member comprises one or more gears in engageable communication

with the spool member for rotating the spool member, on rotation of the contact wheel member. In another embodiment, the drive mechanism comprises a motor operably connected to one or more gears that engageably communicate with the spool member for rotating the spool member on rotation of the motor. The spool member is selectively rotated by the motor or the contact wheel member via the gears.

The retraction apparatus disclosed herein further comprises a printed circuit board fixedly attached to the spring member and embedded in the spool member. The printed circuit board is in electric communication with the retractable cable circularly wound around the spool member via the spring member for communicating, for example, an audio signal from an electronic device, for example, a mobile phone, a tablet computer, etc. The retraction apparatus disclosed herein further comprises an electrical contact fixedly attached to the printed circuit board, for example, via one or more lead wires, for electrically connecting the electronic device to the retraction assembly to communicate the audio signal from the electronic device via the retractable cable of the retraction assembly.

The retraction apparatus disclosed herein further comprises a first enclosing panel detachably attached to a first opposing side of the support housing for enclosing the retraction assembly. The first enclosing panel exposes a surface of the contact wheel member and/or the spool member for manual rotation of the contact wheel member and/or the spool member respectively. The retraction apparatus further comprises a second enclosing panel detachably attached to a second opposing side of the support housing for enclosing the electronic device.

BRIEF DESCRIPTION OF THE DRAWINGS

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 components and methods disclosed herein.

FIGS. **1**A-**1**C exemplarily illustrate exploded views of a retraction apparatus for retracting a retractable cable.

FIG. **2**A exemplarily illustrates an external view of an embodiment of the retraction apparatus, showing a rearwardly exposed contact wheel member.

FIG. **2**B exemplarily illustrates an internal view of the embodiment of the retraction apparatus shown in FIG. **2**A, where the rearwardly exposed contact wheel member engages spool members of a retraction assembly via a drive mechanism.

FIG. **3**A exemplarily illustrates an external view of an embodiment of the retraction apparatus, showing a sidewardly exposed contact wheel member.

FIG. **3**B exemplarily illustrates an internal view of the embodiment of the retraction apparatus shown in FIG. **3**A, where the sidewardly exposed contact wheel member engages the spool members of the retraction assembly via a drive mechanism.

FIGS. **4**A-**4**B exemplarily illustrate an external view of an embodiment of the retraction apparatus, showing a sidewardly exposed contact wheel member.

FIG. **4**C exemplarily illustrates an internal view of the embodiment of the retraction apparatus shown in FIG. **4**A, where the spool members of the retraction assembly are driven by the sidewardly exposed contact wheel member or a motor of a drive mechanism.

FIGS. **5**A-**5**C exemplarily illustrate assembled views of the retraction apparatus.

FIG. **6** illustrates a method for assembling a retraction apparatus.

FIG. **7** illustrates a method for retracting a retractable cable using a retraction apparatus.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. **1**A-**1**C exemplarily illustrate exploded views of a retraction apparatus **100** for retracting a retractable cable **107**. The retraction apparatus **100** disclosed herein is used for retracting retractable cables **107** that house earphones **109**, a microphone, earphones **109** with integral or inline microphones, and/or any device that communicates a signal with an electronic device **114** via retractable cables **107**. As used herein, the term "electronic device" refers to a device, for example, a mobile phone, a tablet computing device, a personal digital assistant, a music player, etc., that communicates a signal, for example, an audio signal, via the retractable cable **107**. The retraction apparatus **100** disclosed herein comprises a support housing **101** and a retraction assembly **103**. The retraction assembly **103** is used for retracting the retractable cable **107** into the support housing **101**. The support housing **101** comprises one or more generally cylindrical spindles **102** herein referred to as "spindles". The spindles **102** extend outwardly from the support housing **101** in a generally perpendicular direction on one or more locations on the support housing **101**. As exemplarily illustrated in FIGS. **1**A-**1**C, two cylindrical spindles **102** extend outwardly from the support housing **101**.

The retraction assembly **103** is mounted on each spindle **102** of the support housing **101**. The retraction assembly **103** comprises a spring member **104**, a generally cylindrical spool member **105**, and a retractable cable **107**. The spring member **104**, for example, a coil spring, is mounted on each spindle **102** and is affixed to the support housing **101**. The spring member **104** is wound in a clockwise direction or a counterclockwise direction. The generally cylindrical spool member **105**, herein referred to as a "spool member", is a low-flanged or unflanged cylinder on which a thread, a wire, a cable, a reel, a film, or a tape is wound for use. The spool member **105** is spring-loaded and is affixed to the spring member **104**. The spool member **105** comprises serrated plates **106** that define a cylindrical section **105***a* between the serrated plates **106** for accommodating the retractable cable **107**. The cylindrical section **105***a* between the serrated plates **106** contacts and accommodates the wound retractable cable **107**. The serrated plates **106** of the spool member **105** have ratchet features for allowing rotation of the spool member **105** in only one direction.

In an embodiment, the spool member **105** comprises one or more spherical depressions **105***c* on an exposed surface **105***b* of the spool member **105** for enabling a user to manually rotate the spool member **105**. In this embodiment, a surface **105***b* of the spool member **105** is rearwardly exposed in the absence of a contact wheel member **121** exemplarily illustrated in FIG. **2**A, FIGS. **3**A-**3**B, and FIGS. **4**A-**4**C, for enabling a user to manually rotate the spool member **105**. The user can contact these spherical depressions **105***c* for manually rotating the spool member **105**. As exemplarily illustrated in FIGS. **1**A-**1**C, about five spherical depressions **105***c* are provided on the exposed surface **105***b* of the spool member **105**. In an embodiment, a single spherical depression **105***c* is provided on the exposed surface **105***b* of the spool member **105** for enabling a user to manually rotate the spool member **105**.

The retractable cable **107** is circularly wound around the cylindrical section **105***a* defined between the serrated plates **106** of the spool member **105**. The first end **107***a* of the retractable cable **107** houses, for example, an earphone **109** such as a headphone. The second end **107***b* of the retractable cable **107** is connected to the cylindrical section **105***a* defined between the serrated plates **106** of the spool member **105**. The retractable cable **107** extends outwardly from the support housing **101**. The spring member **104** is compressed when the retractable cable **107** is outwardly extended from the support housing **101**. The spring member **104** is decompressed when the retractable cable **107** is retracted into the support housing **101**. For example, when the retractable cable **107** is pulled out of the support housing **101**, the retractable cable **107** triggers rotation of the spool member **105**, which winds up or tightens the spring member **104**. When the spool member **105** is released, the spring member **104** unravels and retracts the retractable cable **107**.

The retraction apparatus **100** further comprises a contact wheel member **121**, as exemplarily illustrated in FIG. **2**A, FIGS. **3**A-**3**B, and FIGS. **4**A-**4**C, in engageable communication with the spool member **105** via a drive mechanism **122**. The contact wheel member **121** is disposed in a predetermined location on the support housing **101**. The serrated plates **106** of the spool member **105** comprise multiple projections **106***a* around the circumference **106***b* of the serrated plates **106** that engageably communicate with the contact wheel member **121** via the drive mechanism **122** as disclosed in the detailed description of FIGS. **2**A-**2**B, FIGS. **3**A-**3**B, and FIGS. **4**A-**4**C. The contact wheel member **121** is rotated to engageably communicate with the drive mechanism **122** for rotating the spool member **105** for retracting the retractable cable **107**. Therefore, in addition to providing spherical depressions **105***c* on the exposed surface **105***b* of the spool member **105** for manually rotating the spool member **105**, the retraction apparatus **100** disclosed herein provides the contact wheel member **121** to allow the user to retract the retractable cable **107**, for example, when the spring member **104** wears out. In another embodiment as disclosed in the detailed description of FIGS. **4**A-**4**C, the user can also retract the retractable cable **107** using an electrically driven motor **129**. The user may selectively utilize the contact wheel member **121** or the spherical depressions **105***c* for manually rotating the spool member **105**, if the battery **128***a* controlling the motor **129** wears out or the motor **129** fails.

In an embodiment, the retraction apparatus **100** further comprises a latch member **108** in engageable communication with the spool member **105**. The latch member **108** is in constant contact with the spool member **105** and controls rotation of the spool member **105**. The projections **106***a* of the serrated plates **106** of the spool member **105** around the circumference **106***b* of the serrated plates **106** also engageably communicate with the latch member **108**. The latch member **108** comprises a button **108***a* and clamp **108***b* with forked springs **108***c*. On pressing the button **108***a* of the latch member **108** and pulling the retractable cable **107** out of the support housing **101**, the spool member **105** rotates causing the forked springs **108***c* of the latch member **108** to collapse. The rotation of the spool member **105** tightens the spring member **104**, thereby creating a tension in the spring member **104**. The projections **106***a* on the serrated plates **106** of the spool member **105** pass the forked springs **108***c*. The forked springs **108***c* snap behind the projections **106***a* on the serrated plates **106** thereby preventing the spool member **105** from rotating in a direction opposite to the direction of pull of the retractable cable **107**. As the retractable cable **107** housing, for example, the earphones **109** are pulled out of the support housing **101**, the latch member **108** locks the spool members **105** in place at any given length. On depressing the button **108***a*, the clamp **108***b* linearly slides to disengage the forked springs **108***c* from the spool member **105** and unravel the spring member **104**. The spool member **105** winds up under the tension created in the spring member **104** to retract the retractable cable **107** into the support housing **101**. The earphones **109** housed on separate retractable cables **107** can be retracted independently or simultaneously.

The retraction apparatus **100** disclosed herein further comprises a printed circuit board **110** fixedly attached to the spring member **104** and embedded in the spool member **105**. The printed circuit board **110** is in electric communication with the retractable cable **107** circularly wound around the spool member **105** via the spring member **104** for communicating, for example, an audio signal from an electronic device **114**, for example, a mobile phone. For the purpose of illustration, the detailed description refers to mounting and accommodating a mobile phone within the support housing **101** and an enclosing panel **117**, however the scope of the retraction apparatus **100** disclosed herein may be extended to mount and accommodate other electronic devices, for example, tablet computing devices, personal digital assistants (PDAs), music players, portable media players, cordless phones, and other electronic devices that utilize retractable cables **107** to communicate signals, for example, audio signals. The retraction apparatus **100** disclosed herein further comprises a power switch **118** for switching the electronic device **114** on and off and a plug **112** to plug in the electronic device **114**, for example, to a power supply. The power switch **118** enables the user to activate or deactivate the electronic device **114** without taking the electronic device **114** out of the retraction apparatus **100**. The retraction assembly **103** disclosed herein further comprises an electrical contact **111** fixedly attached to the printed circuit board **110**, for example, via one or more lead wires **113**, for electrically connecting the electronic device **114** to the retraction assembly **103** to communicate the audio signal from the electronic device **114** via the retractable cable **107** of the retraction assembly **103**.

The retraction apparatus **100** disclosed herein further comprises a first enclosing panel **115** detachably attached to a first opposing side **101***a* of the support housing **101** for enclosing the retraction assembly **103**. The earphones **109** are accommodated in holders **116** defined on the support housing **101**. The holders **116** allow for safe storage of the earphones **109** when they are not in use. The first enclosing panel **115** exposes the contact wheel member **121** or a surface **105***b* of the spool member **105** for manual rotation of the contact wheel member **121** or the spool member **105** respectively. The retraction apparatus **100** further comprises a second enclosing panel **117** detachably attached to a second opposing side **101***b* of the support housing **101** for enclosing the electronic device **114**. The second enclosing panel **117** enables secure storage of the electronic device **114**. The electronic device **114** is mounted on the second opposing side **101***b* of the support housing **101** and enclosed between the second enclosing panel **117** and the support housing **101** using fasteners **119**, for example, screws, adhesives, etc. The retraction apparatus **100** therefore creates a modular packaging platform for the electronic device **114**. The retraction apparatus **100** further comprises a power supply input **120** connected to the electronic device **114** for supplying power to the electronic device **114** and a motor **129** as disclosed in the detailed description of FIG. **4**C.

FIG. **2**A exemplarily illustrates an external view of an embodiment of the retraction apparatus **100**, showing a rearwardly exposed contact wheel member **121**. In this embodi-

ment, the contact wheel member **121** is rearwardly exposed for enabling a user to manually rotate the contact wheel member **121** for rotating the spool member **105** via the drive mechanism **122** exemplarily illustrated in FIG. **2**B. The contact wheel member **121** is disposed on top of the spool members **105**. The contact wheel member **121** comprises, for example, a single spherical depression **121***a*. A user may use a finger to contact the spherical depression **121***a* for manually rotating the contact wheel member **121**. The contact wheel member **121** is configured to provide an improved grip to the user for manual rotation.

FIG. **2**B exemplarily illustrates an internal view of the embodiment of the retraction apparatus **100** shown in FIG. **2**A, where the rearwardly exposed contact wheel member **121** engages the spool members **105** of the retraction assembly **103** via the drive mechanism **122**. In this embodiment, the drive mechanism **122** comprises one or more gears **123** and **124** in engageable communication with each spool member **105** for rotating each spool member **105**, on rotation of the contact wheel member **121**. The contact wheel member **121** contacts the latch member **108**. The forked springs **108***c* of the latch member **108** are in constant contact with the projections **106***a* of the serrated plates **106** of the spool members **105**. The latch member **108** engageably communicates with each spool member **105**. As exemplarily illustrated in FIG. **2**B, the drive mechanism **122** comprises a first gear **123** and a second gear **124** engageably connected to each spool member **105** for rotating each spool member **105**. The teeth **123***a* of the first gear **123** are in engageable communication with the teeth **124***a* of the second gear **124**. The manual rotation of the contact wheel member **121** by the user drives the first gear **123**, which in turn drives the second gear **124** by the engageable communication of the teeth **123***a* and **124***a* respectively. The rotation of the first gear **123** in combination with the second gear **124** rotates the spool members **105**. When the contact wheel member **121** is contacted or pressed by the user, the contact wheel member **121** disengages the latch member **108** and/or the gears **123** and **124** from the spool members **105**, thereby causing the spool members **105** to wind back and retract the retractable cable **107**. The user can manually rotate the contact wheel member **121** for desired retraction of the retractable cable **107**. The teeth **123***a* and **124***a* of the gears **123** and **124** respectively control speed of rotation of the spool members **105** of the retraction assembly **103**.

FIG. **3**A exemplarily illustrates an external view of an embodiment of the retraction apparatus **100**, showing a sidewardly exposed contact wheel member **121**. In this embodiment, a section **121***b* of the contact wheel member **121** is sidewardly exposed for enabling a user to manually rotate the contact wheel member **121** for rotating the spool member **105** via the drive mechanism **122**. In this embodiment, the contact wheel member **121** is disposed on the side **100***a* of the retraction apparatus **100** along the plane of the support housing **101**. The section **121***b* of the contact wheel member **121** extends outwardly from the first enclosing panel **115**. A user may use a finger to contact the sidewardly exposed contact wheel member **121** for manually rotating the contact wheel member **121**. The contact wheel member **121** is configured to provide an improved grip to the user for manual rotation.

FIG. **3**B exemplarily illustrates an internal view of the embodiment of the retraction apparatus **100** shown in FIG. **3**A, where the sidewardly exposed contact wheel member **121** engages with the spool members **105** of the retraction assembly **103** via the drive mechanism **122**. In this embodiment, the drive mechanism **122** comprises a first gear **126** and a second gear **127** positioned on opposing sides of the contact wheel member **121**. The teeth **126***a* and **127***a* of the first gear **126** and the second gear **127** respectively are in engageable communication with the teeth **121***c* of the contact wheel member **121**. The first gear **126** and the second gear **127** engageably communicate with each spool member **105** for rotating each spool member **105**. The manual rotation of the contact wheel member **121** by the user drives the first gear **126** and the second gear **127** which in turn, rotate each spool member **105**.

When the user rotates the contact wheel member **121**, the contact wheel member **121** disengages the gears **126** and **127** from the spool members **105**, thereby causing the spool members **105** to wind back and retract the retractable cable **107**. The user can manually rotate the contact wheel member **121** for desired retraction of the retractable cable **107**. The first gear **126** in combination with the second gear **127** controls the speed of rotation of each spool member **105** of the retraction assembly **103**. The ratio of the number of teeth **121***c* on the contact wheel member **121** to the number of teeth **126***a* on the first gear **126** and the number of teeth **127***a* on the second gear **127** controls the speed of retraction of the retractable cable **107** around the spool member **105**.

On pressing a button **125** exemplarily illustrated in FIG. **3**A and pulling the retractable cable **107** out of the support housing **101**, the spool member **105** rotates causing the forked springs **108***c* of the latch member **108** to collapse. The projections **106***a* on the serrated plates **106** of the spool member **105** pass the forked springs **108***c* of the latch member **108**. The forked springs **108***c* snap behind the projections **106***a* on the serrated plates **106**, thereby preventing the spool member **105** from rotating in a direction opposite to the direction of pull of the retractable cable **107**. As the retractable cable **107** housing the earphones **109** are pulled out of the support housing **101**, the latch member **108** locks the spool members **105** in place at any given length. On depressing the button **125**, the latch member **108** linearly slides to disengage the forked springs **108***c* from the spool member **105**. The spool member **105** winds up to retract the retractable cable **107** into the support housing **101**.

FIG. **4**A-**4**B exemplarily illustrates an external view of an embodiment of the retraction apparatus **100**, showing a sidewardly exposed contact wheel member **121**. In this embodiment, the contact wheel member **121** is disposed on the side **100***b* of the retraction apparatus **100**. A front view of the contact wheel member **121** is exemplarily illustrated in FIG. **4**B. A user may use a finger to press and contact the sidewardly exposed contact wheel member **121** for manually rotating the contact wheel member **121** for controlling the rotation of each spool member **105** via the drive mechanism **122**. The contact wheel member **121** is configured in the form of a thumb wheel to provide improved grip to the user for manual rotation. A button **125** is provided on the first enclosing panel **115**, which communicates with the drive mechanism **122** for disengaging the drive mechanism **122** inside the support housing **101**. The retraction apparatus **100** comprises a battery compartment **128** that houses a battery **128***a*. The battery **128***a* is rechargeable by the power supply input **120** when the power supply input **120** is plugged in. The battery **128***a* and/or the power supply input **120** provide power to drive a motor **129** for rotating the spool members **105**.

FIG. **4**C exemplarily illustrates an internal view of the embodiment of the retraction apparatus **100** shown in FIG. **4**A, where the spool members **105** of the retraction assembly **103** are driven by the sidewardly exposed contact wheel member **121** or a motor **129** of the drive mechanism **122**. In this embodiment, the drive mechanism **122** comprises the motor **129** having a shaft **129***a* operably connected to one or more gears, for example, a worm gear **130** that engageably communicates with the spool member **105** for rotating the

spool member **105**, on rotation of the motor **129**. The shaft **129***a* of the motor **129** is also connected to the contact wheel member **121**. The motor **129** is electrically connected to the battery **128***a* and the power supply input **120**, for example, by an electrical wire **131**. In order to drive the motor **129** for rotating the spool members **105**, power from the power supply input **120** is transmitted directly to the motor **129** or via the battery **128***a* through the electrical wire **131**. The user may trigger the transmission of power to the motor **129** by pressing the button **125** exemplarily illustrated in FIG. **4**A. The motor **129** rotates causing the worm gear **130** disposed on the shaft **129***a* of the motor **129** to rotate. The threads **130***a* of the worm gear **130** meshes with each spool member **105** causing each spool member **105** to rotate for retracting the retractable cable **107**. The button **125**, when depressed, may disengage the drive mechanism **122** and allow for manual rotation using the contact wheel member **121**.

In another embodiment, the contact wheel member **121** may be manually turned to wind or unwind the retractable cable **107** around the spool member **105**. The retraction apparatus **100** disclosed herein can therefore be finger-driven when the electrically driven motor **129** is out of battery power or is damaged, or can be electrically driven when the spring member **104** affixed to the spool member **105**, as disclosed in the detailed description of FIGS. **1**A-**1**C, is worn or damaged. The spool member **105** is selectively rotated by the motor **129** or the contact wheel member **121** via the gears **130**. The retraction apparatus **100** disclosed herein therefore provides selective mechanisms, for example, mechanical rotation of the spool member **105** using the contact wheel member **121**, mechanical rotation of the spool member **105** via the spherical depressions **105***c* on the exposed surface **105***b* of the spool member **105**, and/or electric rotation of the spool member **105** via the motor **129** for retracting the retractable cable **107** into the support housing **101**. The contact wheel member **121**, the spherical depressions **105***c*, and the motor **129** of the retraction apparatus **100** disclosed herein can be interchangeably used for retracting the retractable cable **107** into the support housing **101**. The retractable apparatus **100** disclosed herein therefore provides a modular changeable platform for retracting the retractable cable **107** into the support housing **101**. The retractable apparatus **100** disclosed herein can be easily implemented with multiple current and future host electronic devices.

FIGS. **5**A-**5**C exemplarily illustrate assembled views of the retraction apparatus **100**. The assembled views of the retraction apparatus **100** display the earphones **109** housed at the first end **107***a* of the retractable cable **107** in a retracted position. A first enclosing panel **115** is detachably attached to the first opposing side **101***a* of the support housing **101** for enclosing the retraction assemblies **103**. The first enclosing panel **115** exposes a surface **105***b* of the spool member **105** for manual rotation of the spool member **105**. The exposed surface **105***b* of each spool member **105** comprises spherical depressions **105***c* contactable by a user for facilitating manual rotation of the spool member **105** as exemplarily illustrated in FIGS. **5**A-**5**B. The retraction apparatus **100** further comprises a second enclosing panel **117** detachably attached to a second opposing side **101***b* of the support housing **101** for enclosing an electronic device **114**. The second enclosing panel **117** comprises a frontward opening **132** for viewing an interface of the electronic device **114** as exemplarily illustrated in FIG. **5**C. Interfacing components, speakers, camera lenses, buttons **114***a*, etc., of the electronic device **114** are accessible through the edges of the first enclosing panel **115** and the second enclosing panel **117**. The retraction apparatus **100** exposes the button **108***a* of the latch member **108** on the side **100***b* of the retraction apparatus **100**. The button **108***a* of the latch member **108** travels linearly. For example, when you depress the button **108***a*, the button **108***a* slides inward into the support housing **101** and moves the forked springs **108***c* of the latch member **108** out of engagement with the spool members **105**. The spool members **105** wind the pulled out retractable cables **107** into the support housing **101** under the tension of the spring members **104**. The earphones **109** are housed at the first end **107***a* of the retractable cable **107** and are accommodated in the holders **116** provided in the support housing **101**.

FIG. **6** illustrates a method for assembling a retraction apparatus **100**. The retraction apparatus **100** provides **601***a* support housing **101** and a retraction assembly **103**. The support housing **101** comprises one or more generally cylindrical spindles **102**. The retraction assembly **103** is mounted on each of the spindles **102** of the support housing **101**. The retraction assembly **103** further comprises a spring member **104**, a generally cylindrical spool member **105**, a retractable cable **107**, and a contact wheel member **121**. The spring member **104** is mounted **602** on the spindle **102** and affixed **602** to the support housing **101**. The spool member **105** is affixed **603** to the spring member **104**. The retractable cable **107** is circularly wound **604** around a cylindrical section **105***a* defined between the serrated plates **106** of the spool member **105**. The retractable cable **107** extends outwardly from the support housing **101**.

The contact wheel member **121** is disposed **605** in a predetermined location on the support housing **101** and is engageably connected **605** to the spool member **105** via a drive mechanism **122** as disclosed in the detailed description of FIGS. **2**A-**2**B, FIGS. **3**A-**3**B, and FIGS. **4**A-**4**C. The contact wheel member **121** is rotated to engageably communicate with the drive mechanism **122** for rotating the spool member **105** for retracting the retractable cable **107**. In an embodiment, a latch member **108** is engageably connected to the spool member **105** for controlling rotation of the spool member **105** for retracting the retractable cable **107**. A first enclosing panel **115** is detachably attached **606** to a first opposing side **101***a* of the support housing **101** for enclosing the retraction assembly **103**. The first enclosing panel **115** exposes the contact wheel member **121** or a surface **105***b* of the spool member **105** for manual rotation of the contact wheel member **121** or the spool member **105** respectively. A second enclosing panel **117** is detachably attached **607** to a second opposing side **101***b* of the support housing **101** for enclosing the electronic device **114**.

A printed circuit board **110** is fixedly attached to the spring member **104** and embedded in the spool member **105**. The printed circuit board **110** is in electronic communication with the retractable cable **107** circularly wound around the spool member **105** via the spring member **104** for communicating an audio signal from the electronic device **114**. Moreover, an electrical contact **111** is fixedly attached to the printed circuit board **110**, for example, via one or more lead wires **113**, for electrically connecting the electronic device **114** to the retraction assembly **103** to communicate the audio signal from the electronic device **114** via the retractable cable **107** of the retraction assembly **103**.

FIG. **7** illustrates a method for retracting a retractable cable **107** using a retraction apparatus **100**. The retraction apparatus **100**, as disclosed in the detailed description of FIGS. **1**A-**1**C, FIGS. **2**A-**2**B, FIGS. **3**A-**3**B, FIGS. **4**A-**4**C, and FIGS. **5**A-**5**C, is provided **701**. The retraction apparatus **100** comprises the support housing **101** and the retraction assembly **103**. The retraction assembly **103** is mounted on each of one or more generally cylindrical spindles **102** of the support housing **101**. A user rotates **702** the contact wheel member

121 as disclosed in the detailed description of FIGS. 2A-2B, FIGS. 3A-3B, and FIGS. 4A-4C for releasing a spool member 105, whereby the spring member 104 is decompressed. The spool member 105 is rotated 703 via the drive mechanism 122 on rotation of the contact wheel member 121 and decompression of the spring member 104. The retractable cable 107 is retracted 704 by winding the retractable cable 107 around the rotating spool member 105.

The foregoing examples have been provided merely for the purpose of explanation and are in no way to be construed as limiting of the present invention disclosed herein. While the invention has 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 invention has been described herein with reference to particular means, materials and embodiments, the invention is not intended to be limited to the particulars disclosed herein; rather, the invention extends 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 invention in its aspects.

I claim:

1. A retraction apparatus comprising:

a support housing comprising one or more generally cylindrical spindles;

a retraction assembly mounted on each of said one or more generally cylindrical spindles of said support housing, wherein said retraction assembly comprises:

a spring member mounted on said each of said one or more generally cylindrical spindles and affixed to said support housing;

a generally cylindrical spool member affixed to said spring member, wherein said generally cylindrical spool member comprises serrated plates that define a cylindrical section between said serrated plates for accommodating a retractable cable;

said retractable cable circularly wound around said cylindrical section defined between said serrated plates of said generally cylindrical spool member, wherein said retractable cable extends outwardly from said support housing; and

a contact wheel member in engageable communication with said generally cylindrical spool member via a drive mechanism and disposed in a predetermined location on said support housing, wherein said contact wheel member is rotated to engageably communicate with said drive mechanism for rotating said generally cylindrical spool member for retracting said retractable cable.

2. The retraction apparatus of claim 1, wherein said retraction assembly further comprises a latch member in engageable communication with said generally cylindrical spool member, wherein said latch member controls rotation of said generally cylindrical spool member, wherein said serrated plates of said generally cylindrical spool member comprise a plurality of projections that engageably communicate with said latch member.

3. The retraction apparatus of claim 1, wherein said serrated plates of said generally cylindrical spool member comprise a plurality of projections that engageably communicate with said contact wheel member via said drive mechanism.

4. The retraction apparatus of claim 1, wherein a first end of said retractable cable houses an earphone and/or a microphone and a second end of said retractable cable is connected to said cylindrical section defined between said serrated plates of said generally cylindrical spool member.

5. The retraction apparatus of claim 1, wherein said contact wheel member is rearwardly exposed for enabling a user to manually rotate said contact wheel member for said rotation of said generally cylindrical spool member via said drive mechanism.

6. The retraction apparatus of claim 1, wherein a section of said contact wheel member is sidewardly exposed for enabling a user to manually rotate said contact wheel member for said rotation of said generally cylindrical spool member via said drive mechanism.

7. The retraction apparatus of claim 1, wherein a surface of said generally cylindrical spool member is rearwardly exposed in absence of said contact wheel member for enabling a user to manually rotate said generally cylindrical spool member, wherein said generally cylindrical spool member comprises one or more spherical depressions on said exposed surface of said generally cylindrical spool member contactable by said user for said manual rotation.

8. The retraction apparatus of claim 1, wherein said drive mechanism comprises one or more gears in engageable communication with said generally cylindrical spool member for rotating said generally cylindrical spool member, on said rotation of said contact wheel member.

9. The retraction apparatus of claim 1, wherein said drive mechanism comprises a motor operably connected to one or more gears that engageably communicate with said generally cylindrical spool member for rotating said generally cylindrical spool member on rotation of said motor, wherein said generally cylindrical spool member is selectively rotated by one of said motor and said contact wheel member via said one or more gears.

10. The retraction apparatus of claim 1, further comprising a printed circuit board fixedly attached to said spring member and embedded in said generally cylindrical spool member, wherein said printed circuit board is in electric communication with said retractable cable circularly wound around said generally cylindrical spool member via said spring member for communicating an audio signal from an electronic device.

11. The retraction apparatus of claim 10, further comprising an electrical contact fixedly attached to said printed circuit board via one or more lead wires for electrically connecting said electronic device to said retraction assembly to communicate said audio signal from said electronic device via said retractable cable of said retraction assembly.

12. The retraction apparatus of claim 1, further comprising a first enclosing panel detachably attached to a first opposing side of said support housing for enclosing said retraction assembly, wherein said first enclosing panel exposes a surface of one of said contact wheel member and said generally cylindrical spool member for manual rotation of said contact wheel member and said generally cylindrical spool member respectively.

13. The retraction apparatus of claim 12, further comprising a second enclosing panel detachably attached to a second opposing side of said support housing for enclosing an electronic device.

14. The retraction apparatus of claim 1, wherein said spring member is compressed when said retractable cable is outwardly extended from said support housing, and wherein said spring member is decompressed when said retractable cable is retracted into said support housing.

15. A retraction apparatus comprising:
a support housing comprising one or more generally cylindrical spindles;
a retraction assembly mounted on each of said one or more generally cylindrical spindles of said support housing, wherein said retraction assembly comprises:
a spring member mounted on said each of said one or more generally cylindrical spindles and affixed to said support housing;
a generally cylindrical spool member affixed to said spring member, wherein said generally cylindrical spool member comprises serrated plates that define a cylindrical section between said serrated plates for accommodating a retractable cable;
said retractable cable circularly wound around said cylindrical section defined between said serrated plates of said generally cylindrical spool member, wherein said retractable cable extends outwardly from said support housing;
a latch member in engageable communication with said generally cylindrical spool member, wherein said latch member controls rotation of said generally cylindrical spool member; and
a contact wheel member in engageable communication with said generally cylindrical spool member via a drive mechanism, and disposed in a predetermined location on said support housing, wherein said contact wheel member is rotated to engageably communicate with said drive mechanism for rotating said generally cylindrical spool member for retracting said retractable cable.

16. A method for retracting a retractable cable, comprising:
providing a retraction apparatus comprising:
a support housing comprising one or more generally cylindrical spindles;
a retraction assembly mounted on each of said one or more generally cylindrical spindles of said support housing, wherein said retraction assembly comprises:
a spring member mounted on said each of said one or more generally cylindrical spindles and affixed to said support housing, wherein said spring member is compressed when said retractable cable is outwardly extended from said support housing;
a generally cylindrical spool member affixed to said spring member, wherein said generally cylindrical spool member comprises serrated plates that define a cylindrical section between said serrated plates for accommodating said retractable cable;
said retractable cable circularly wound around said cylindrical section defined between said serrated plates of said generally cylindrical spool member, wherein said retractable cable extends outwardly from said support housing; and
a contact wheel member in engageable communication with said generally cylindrical spool member via a drive mechanism and disposed in a predetermined location on said support housing;
rotating said contact wheel member by a user for releasing said generally cylindrical spool member, whereby said spring member is decompressed;
rotating said generally cylindrical spool member via said drive mechanism on said rotation of said contact wheel member and said decompression of said spring member; and
retracting said retractable cable by winding said retractable cable around said rotating generally cylindrical spool member.

17. The method of claim 16, wherein said retraction assembly further comprises a latch member in engageable communication with said generally cylindrical spool member for controlling rotation of said generally cylindrical spool member, and wherein said rotation of said generally cylindrical spool member in a first direction disengages said latch member from said generally cylindrical spool member to release said generally cylindrical spool member for said retraction of said retractable cable, and wherein said latch member prevents said rotation of said generally cylindrical spool member in a second direction opposing said first direction.

18. The method of claim 16, wherein said rotation of said generally cylindrical spool member is performed by said drive mechanism comprising one or more gears in engageable communication with said generally cylindrical spool member, on said rotation of said contact wheel member.

19. The method of claim 16, wherein said rotation of said generally cylindrical spool member is performed by said drive mechanism comprising a motor operably connected to one or more gears that engageably communicate with said generally cylindrical spool member, on rotation of said motor, wherein said generally cylindrical spool member is selectively rotated by one of said motor and said contact wheel member via said one or more gears.

20. A method for assembling a retraction apparatus, comprising:
providing a support housing comprising one or more generally cylindrical spindles, and a retraction assembly mountable on each of said generally cylindrical spindles, wherein said retraction assembly comprises a spring member, a generally cylindrical spool member, a retractable cable, and a contact wheel member;
mounting said spring member on said each of said one or more generally cylindrical spindles and affixing said spring member to said support housing;
affixing said generally cylindrical spool member to said spring member, wherein said generally cylindrical spool member comprises serrated plates that define a cylindrical section between said serrated plates for accommodating said retractable cable;
circularly winding said retractable cable around said cylindrical section defined between said serrated plates of said generally cylindrical spool member, wherein said retractable cable extends outwardly from said support housing;
disposing said contact wheel member in a predetermined location on said support housing and engageably connecting said contact wheel member to said generally cylindrical spool member via a drive mechanism, wherein said contact wheel member is rotated to engageably communicate with said drive mechanism for rotating said generally cylindrical spool member for retracting said retractable cable;
detachably attaching a first enclosing panel to a first opposing side of said support housing for enclosing said retraction assembly, wherein said first enclosing panel exposes a surface of one of said contact wheel member and said generally cylindrical spool member for manual rotation of said contact wheel member and said generally cylindrical spool member respectively; and
detachably attaching a second enclosing panel to a second opposing side of said support housing for enclosing an electronic device.

21. The method of claim 20, wherein said retraction assembly further comprises a latch member, wherein said latch member is engageably connected to said generally cylindrical

spool member for controlling rotation of said generally cylindrical spool member for retracting said retractable cable.

22. The method of claim **20**, further comprising fixedly attaching a printed circuit board to said spring member and embedding said fixedly attached printed circuit board in said generally cylindrical spool member, wherein said printed circuit board is in electric communication with said retractable cable circularly wound around said generally cylindrical spool member via said spring member for communicating an audio signal from said electronic device.

23. The method of claim **22**, further comprising fixedly attaching an electrical contact to said printed circuit board via one or more lead wires for electrically connecting said electronic device to said retraction assembly to communicate said audio signal from said electronic device via said retractable cable of said retraction assembly.

24. The method of claim **20**, wherein said drive mechanism comprises one or more gears, wherein said one or more gears are engageably connected to said generally cylindrical spool member for rotating said generally cylindrical spool member on said rotation of said contact wheel member.

25. The method of claim **20**, wherein said drive mechanism comprises a motor operably connected to one or more gears that are engageably connected to said generally cylindrical spool member for rotating said generally cylindrical spool member on rotation of said motor.

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