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Mehta et al.

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(54) **MANUAL TOILET FLUSHING APPARATUS WITH AN ODOR REDUCING FRESH WATER INLET VALVE ASSEMBLY**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 353 days.

This patent is subject to a terminal disclaimer.

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B60R 15/04	(2006.01)
E03D 11/00	(2006.01)

(52) **U.S. Cl.**

CPC . ***E03D 5/01*** (2013.01); ***B60R 15/04*** (2013.01); ***E03D 11/00*** (2013.01)

(58) **Field of Classification Search**

CPC E03D 5/01; E03D 11/00; E03D 11/11; B60R 15/04; B61D 35/007

USPC 4/321, 354, 433, 449

See application file for complete search history.

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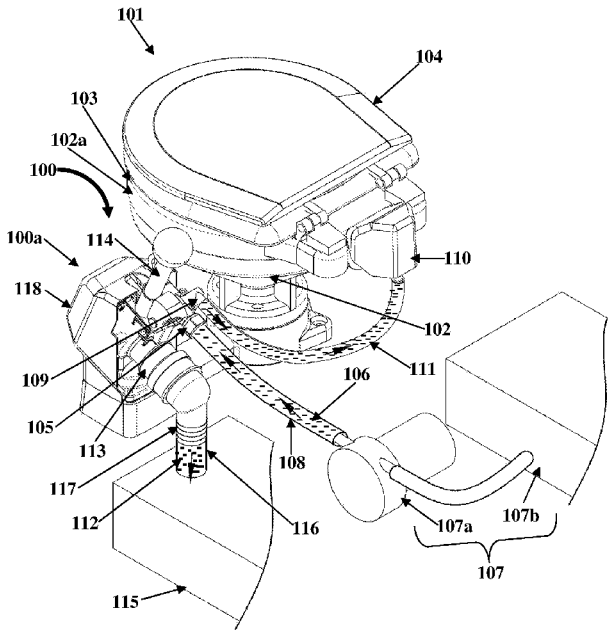
(57) **ABSTRACT**

A manual toilet flushing apparatus including an integral inlet fresh water valve assembly (IIFWVA) and a waste water discharge pump assembly (WWDPA) operably isolated from the IIFWVA is provided to preclude waste water from contaminating pressurized fresh water (PFW). The IIFWVA includes a pressurized fresh water inlet port to receive the PFW, an inlet valve body defining an inlet valve cavity (IVC), a second plunger in communication with a first plunger to actuate a check valve to direct a flow of the PFW into the IVC, and an outlet port. The PFW flows through the outlet port to a rim of a toilet bowl. The WWDPA includes a waste water inlet port to receive waste water, a discharge pump body, and a connecting rod in communication with a retractable handle to actuate a piston in backward and forward directions to suction and discharge the waste water through a discharge port.

27 Claims, 21 Drawing Sheets



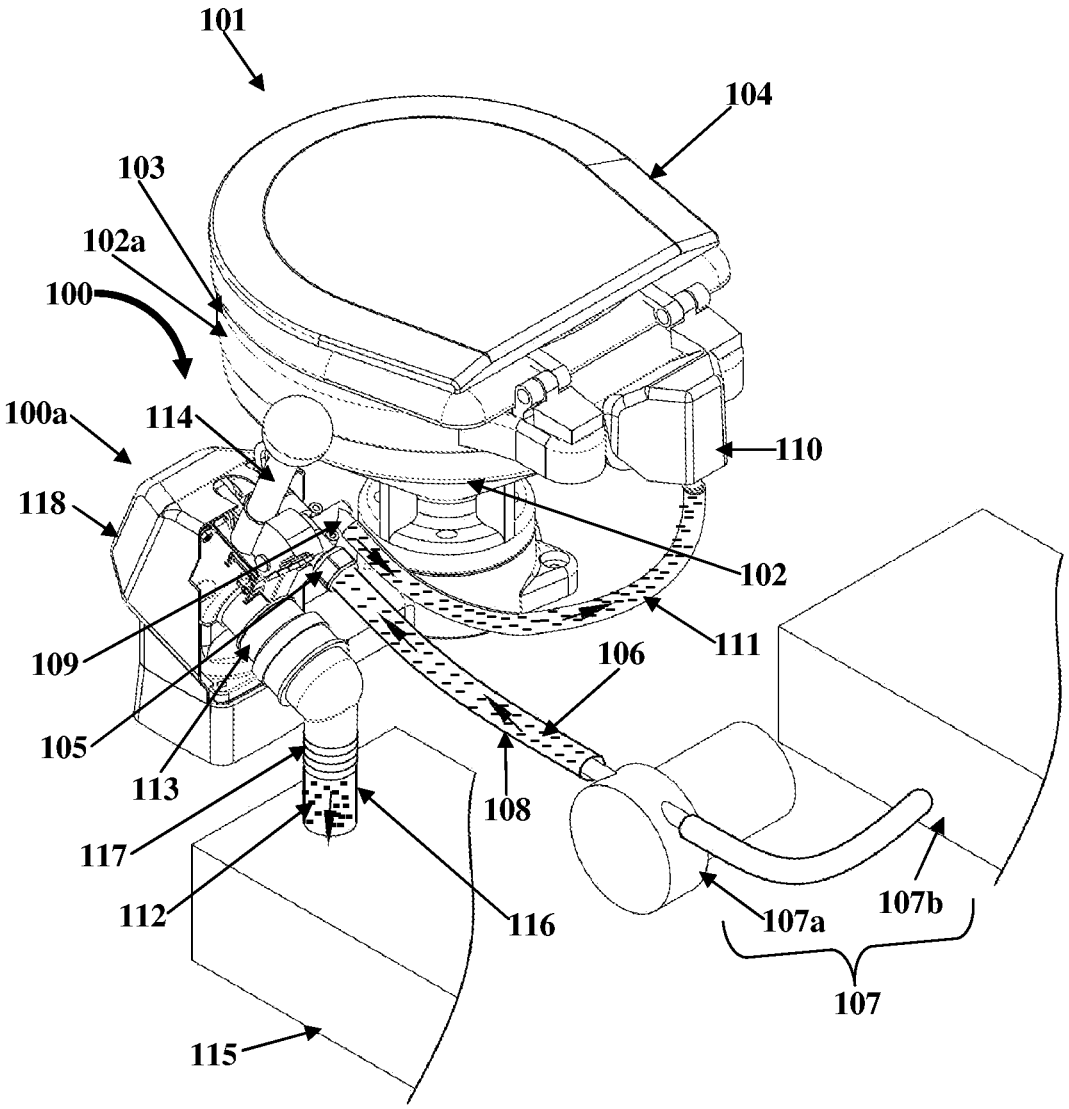

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FIG. 1A

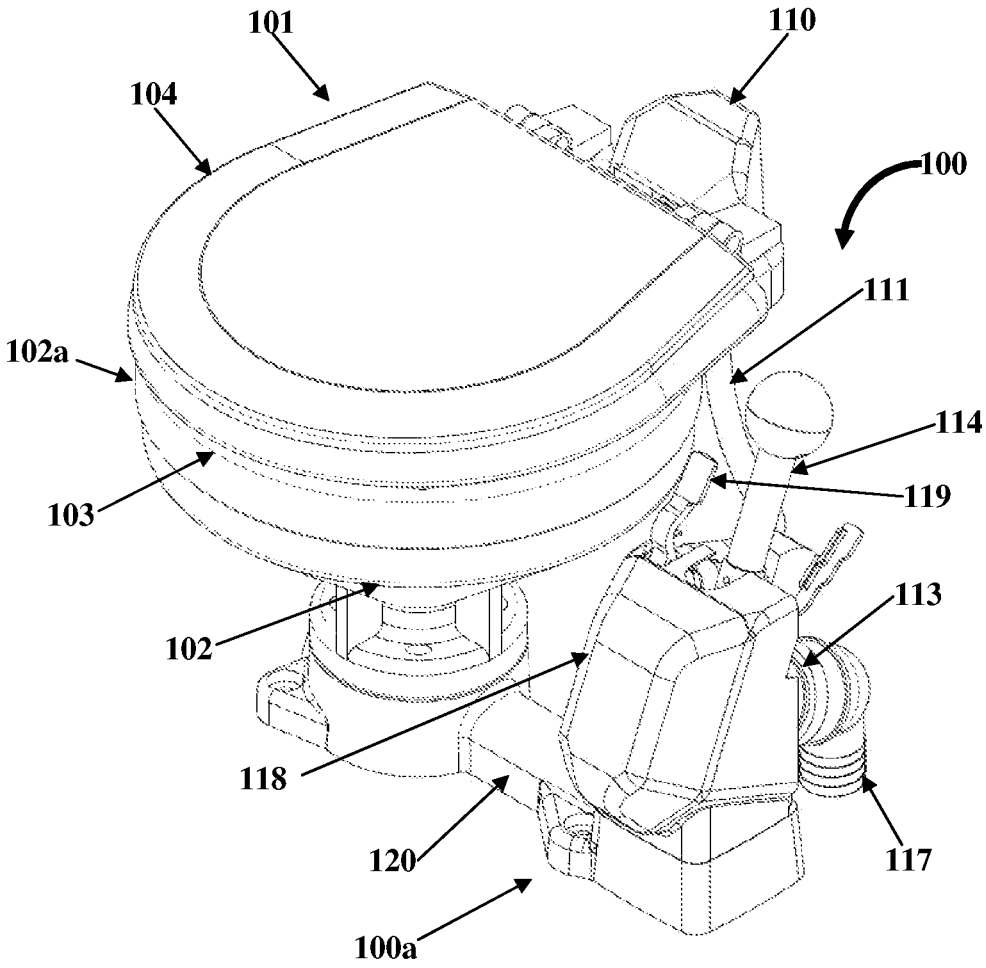

FIG. 1B

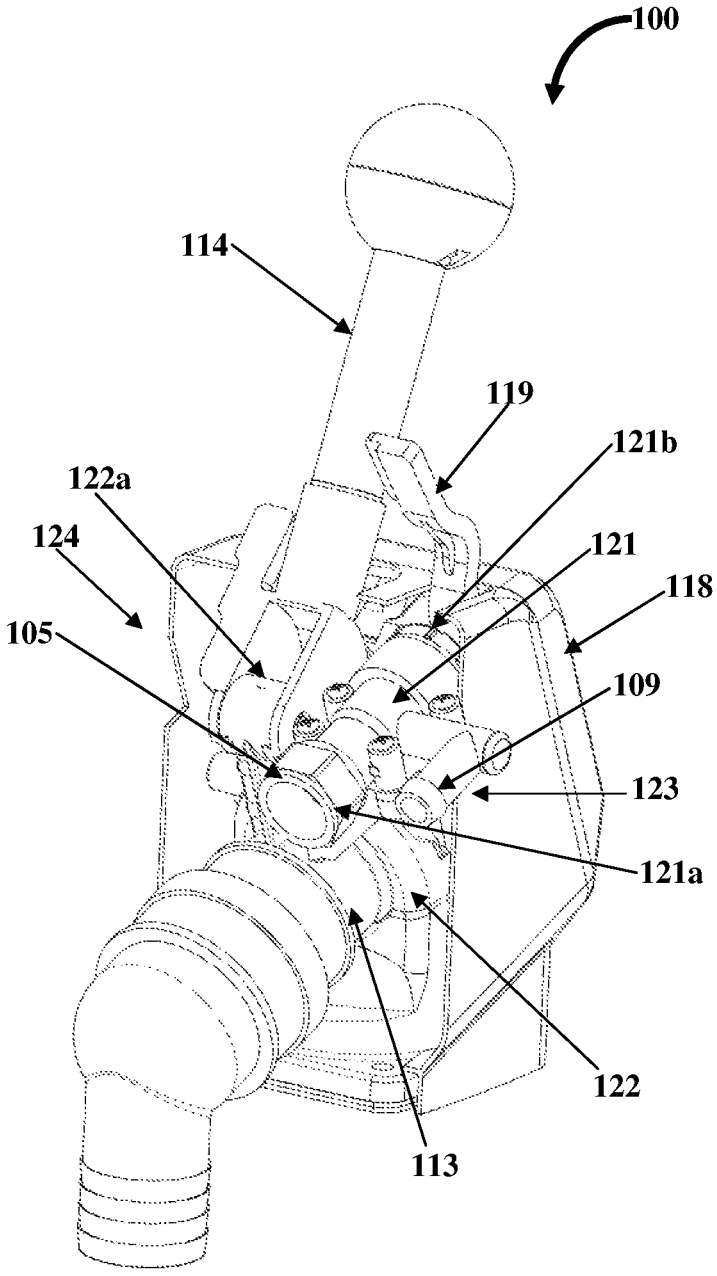

FIG. 2

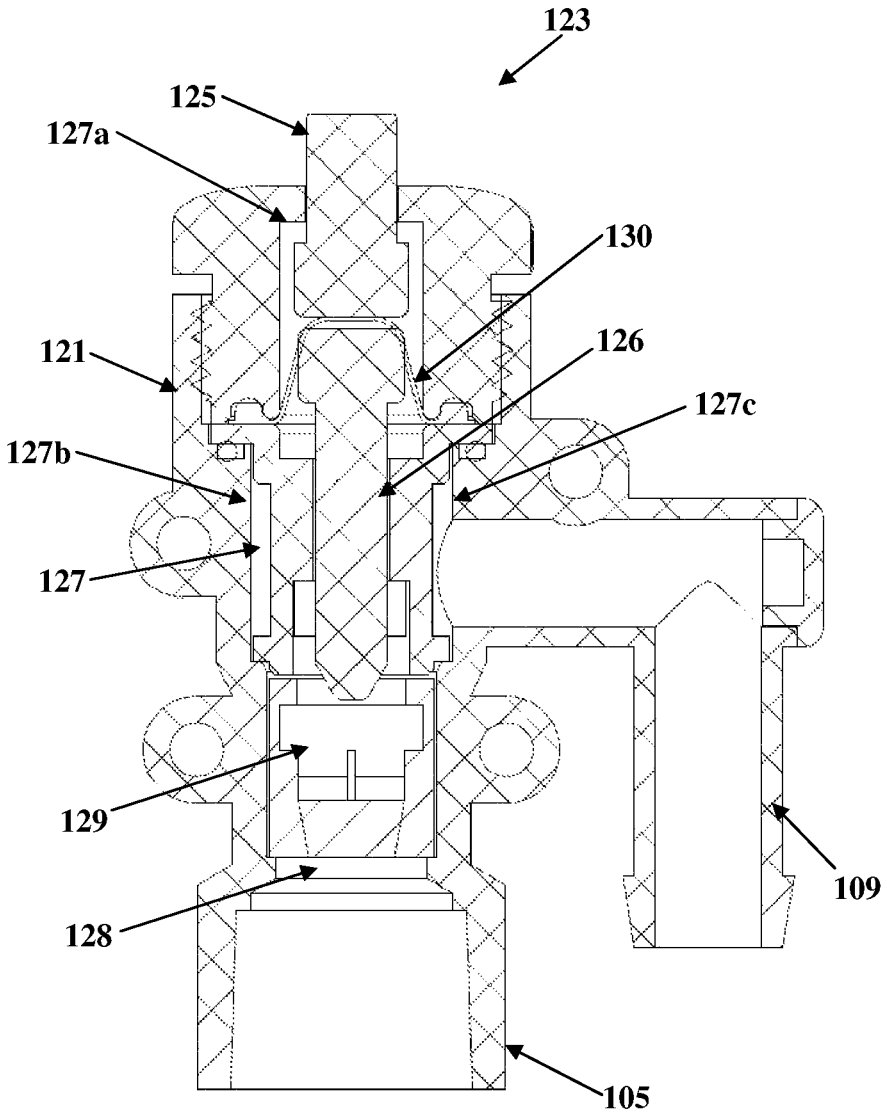

FIG. 3

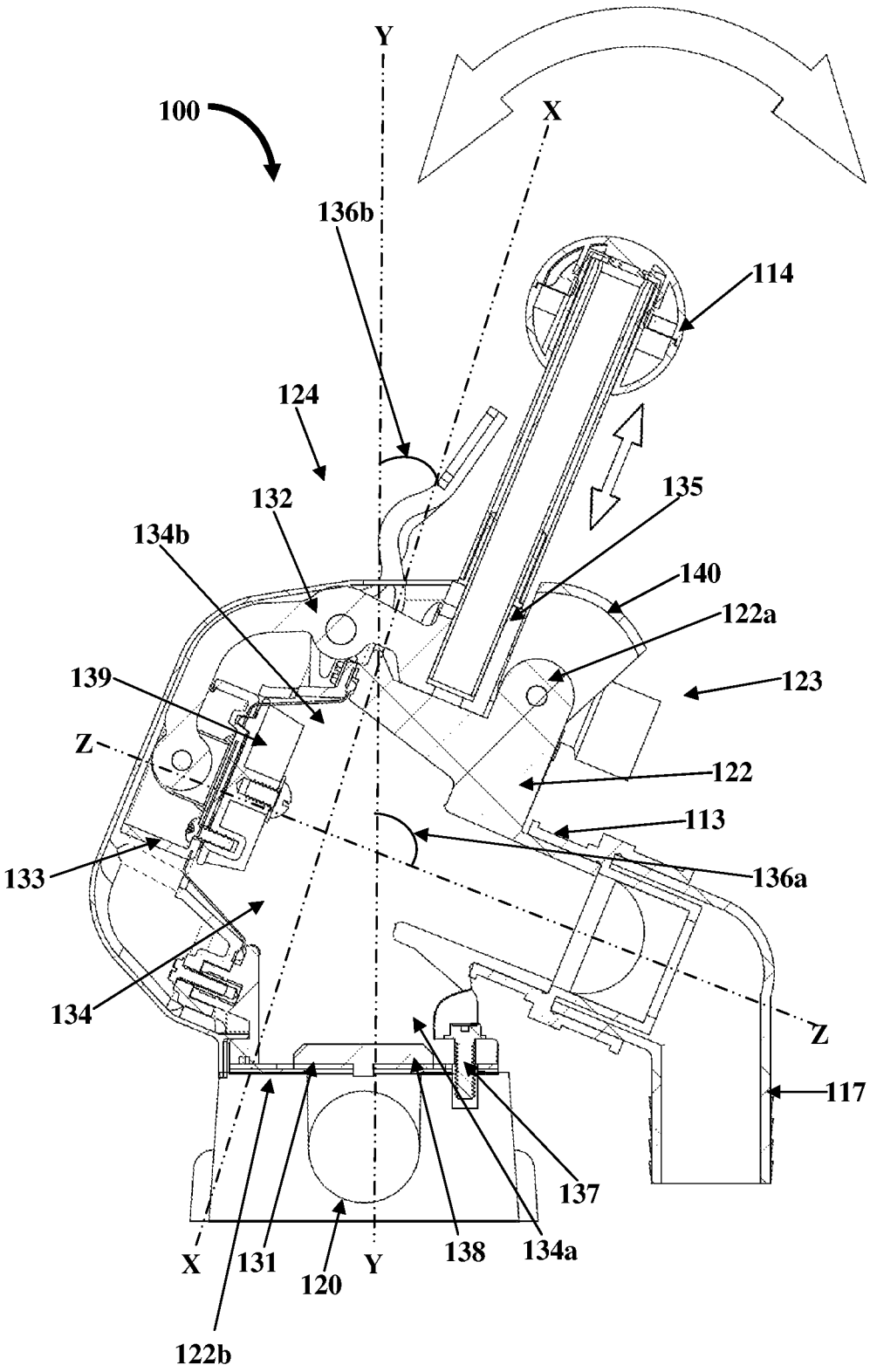
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FIG. 4

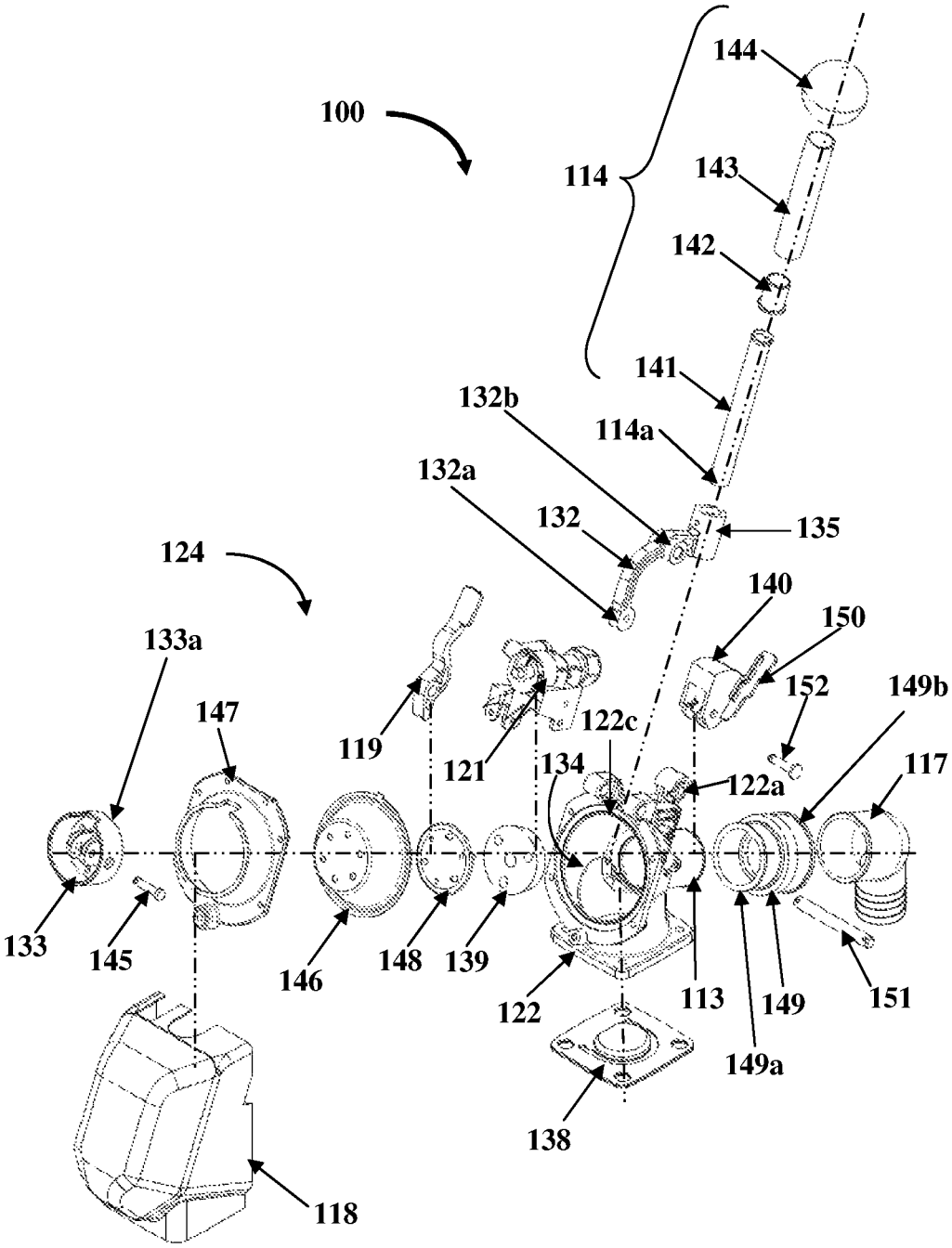
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FIG. 5A

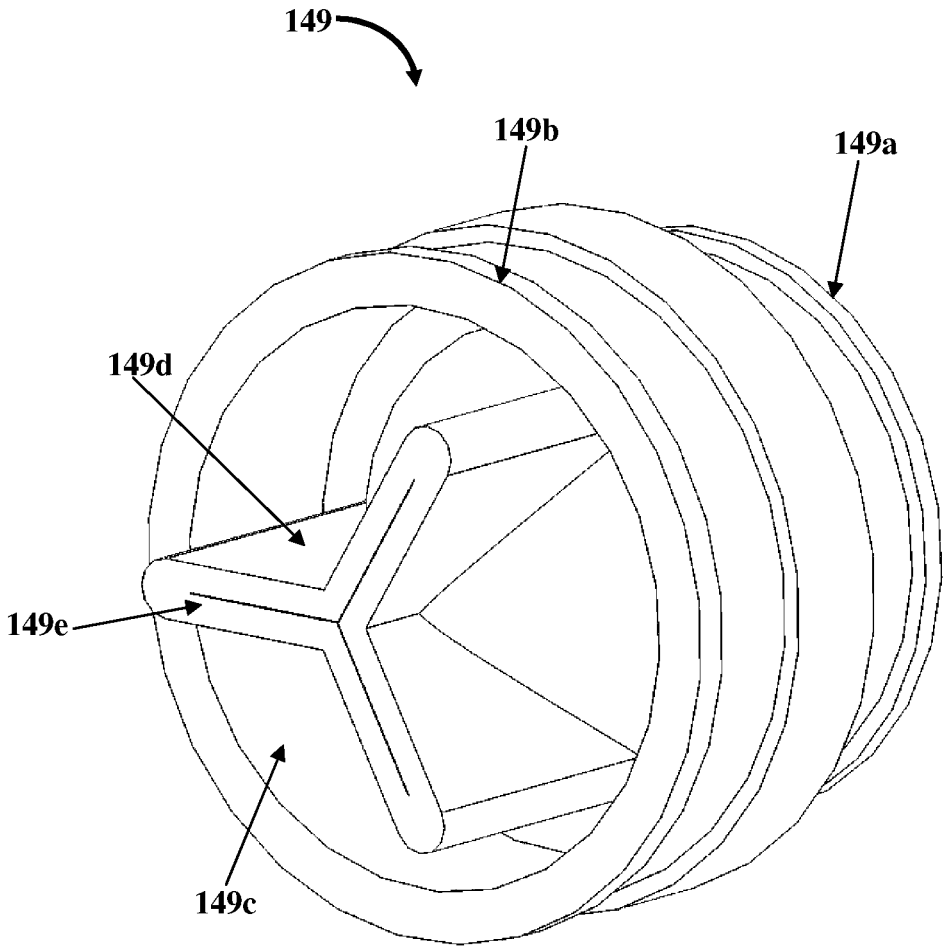

FIG. 5B

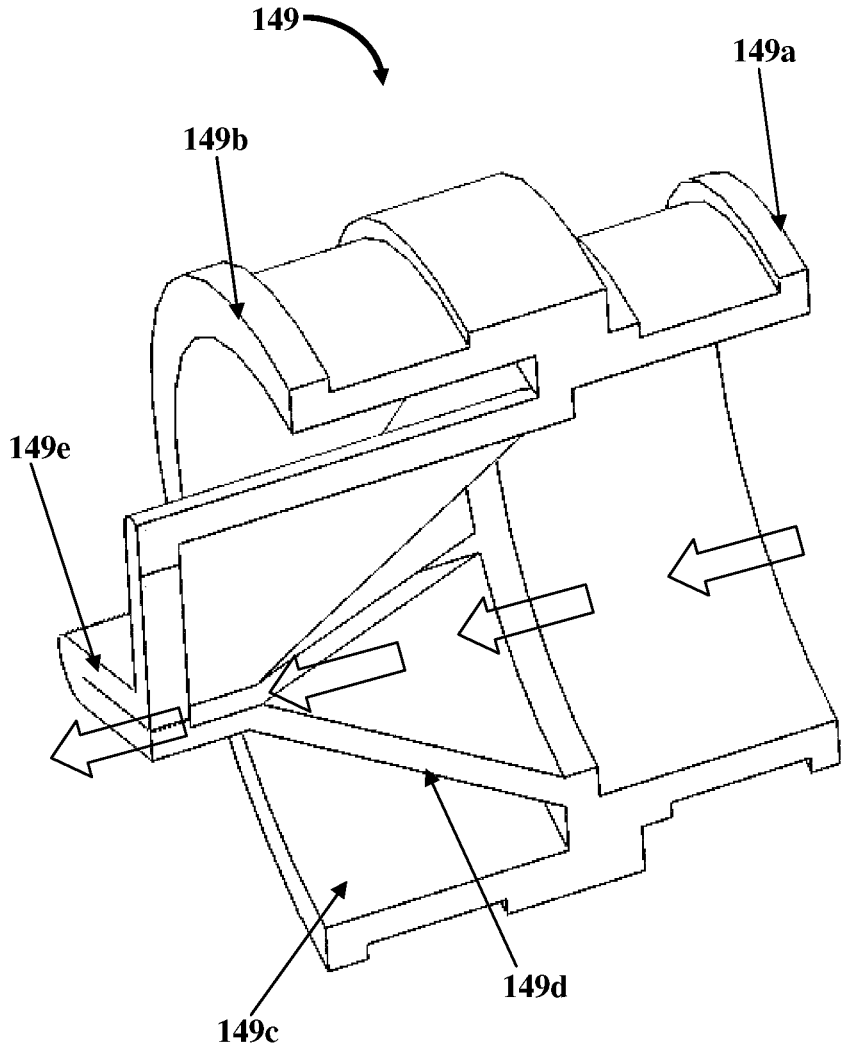

FIG. 5C

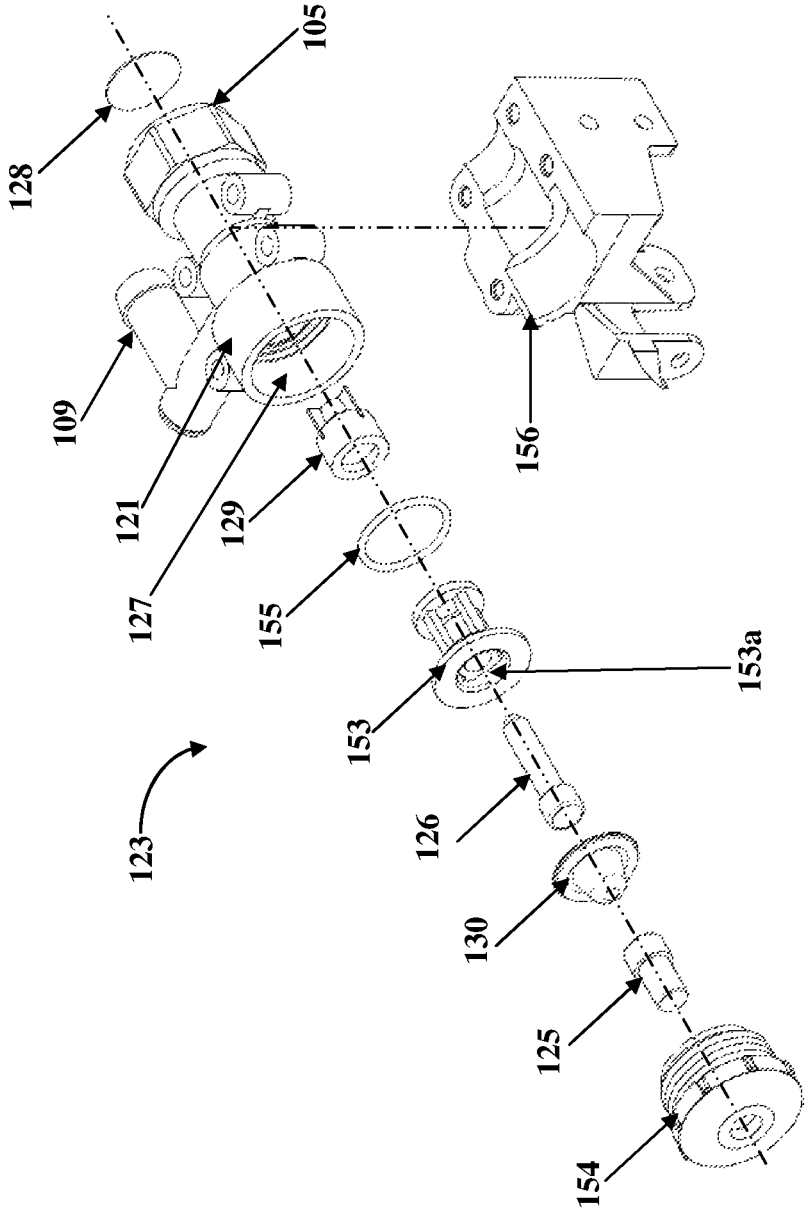

FIG. 6

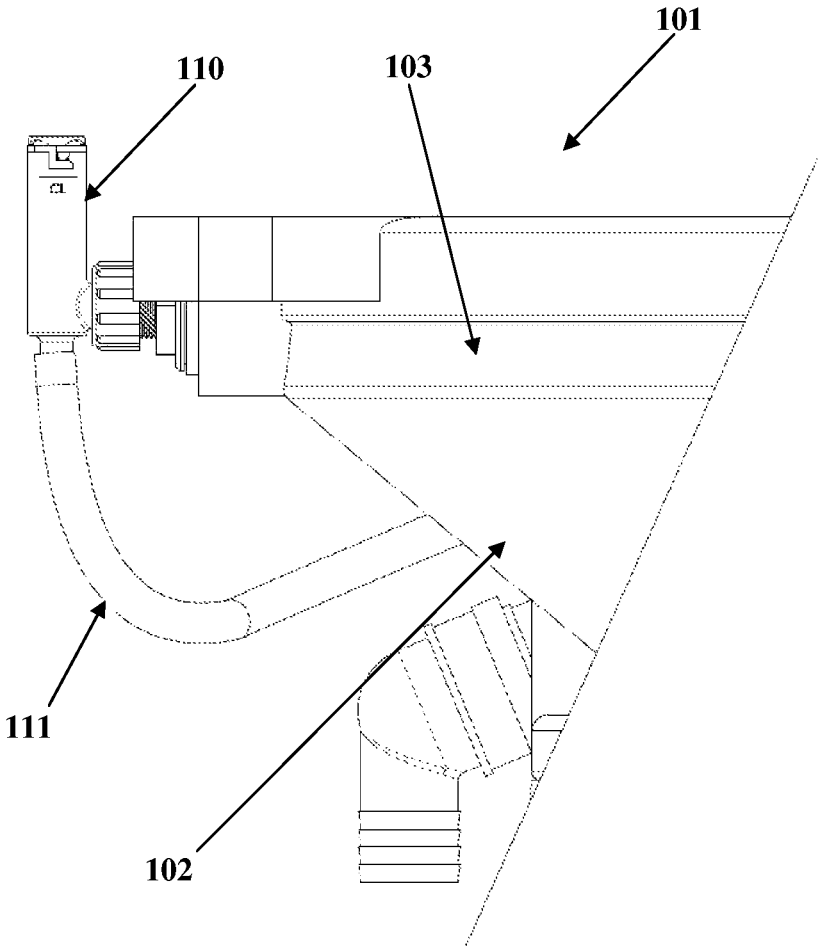

FIG. 7

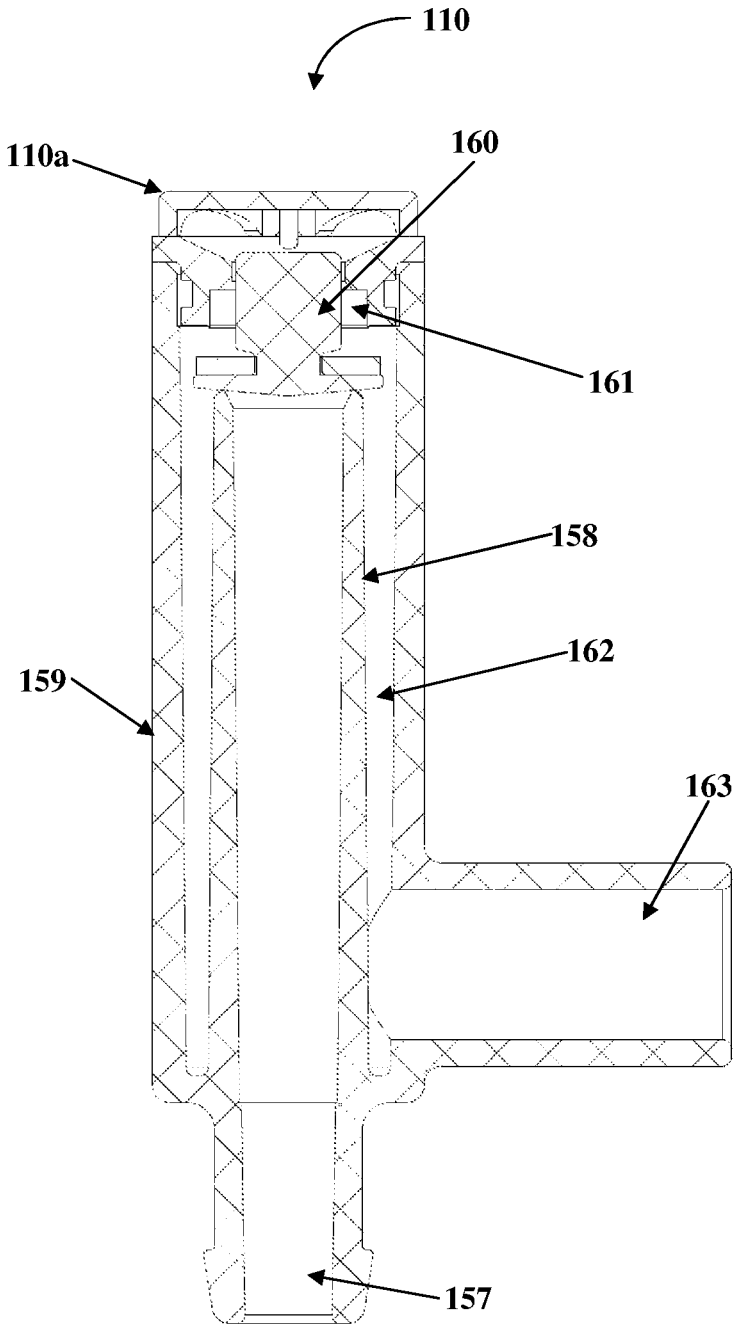

FIG. 8

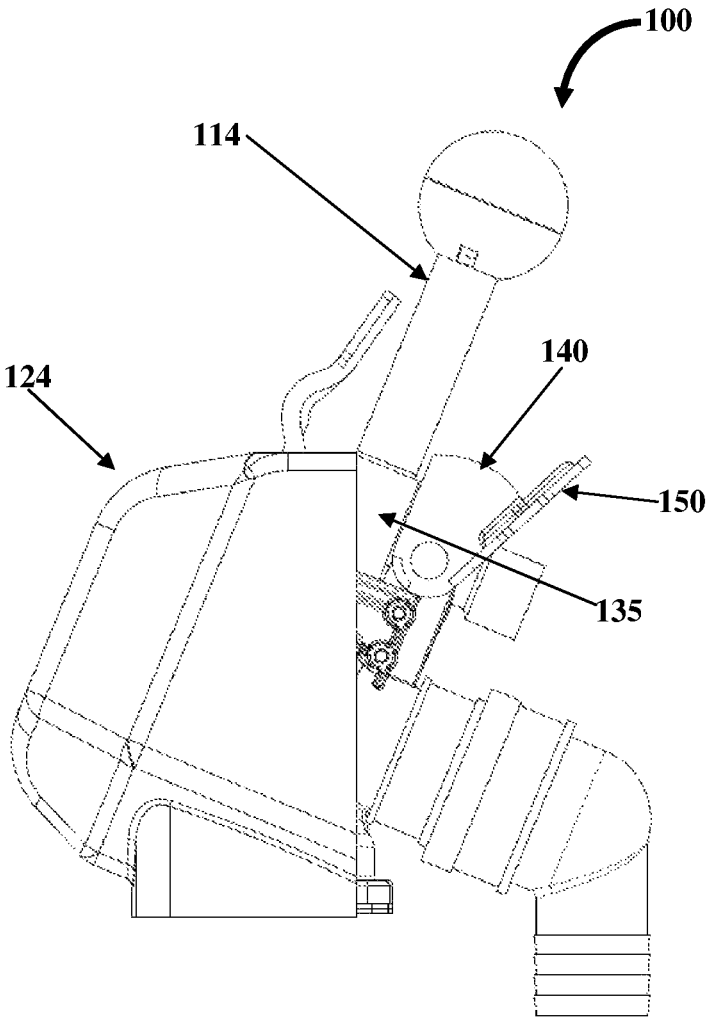

FIG. 9A

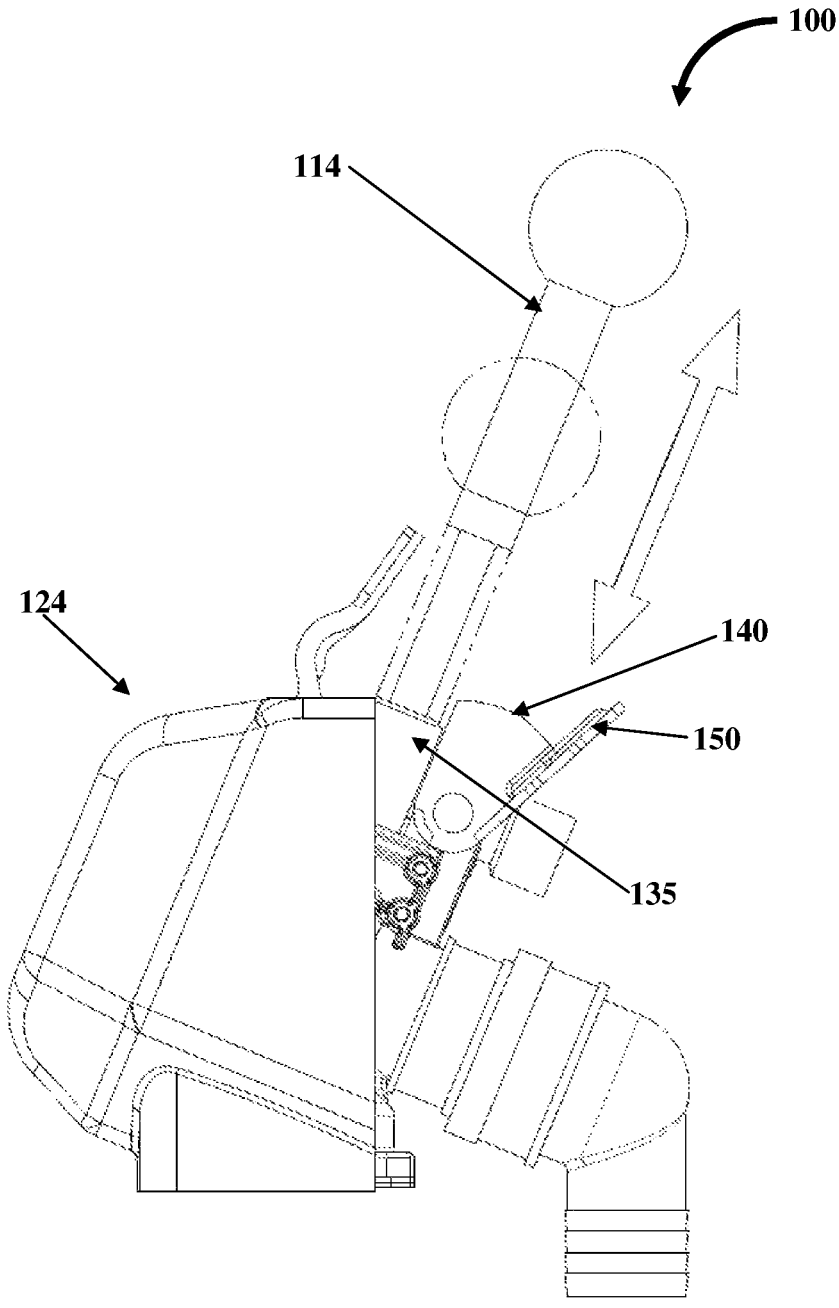

FIG. 9B

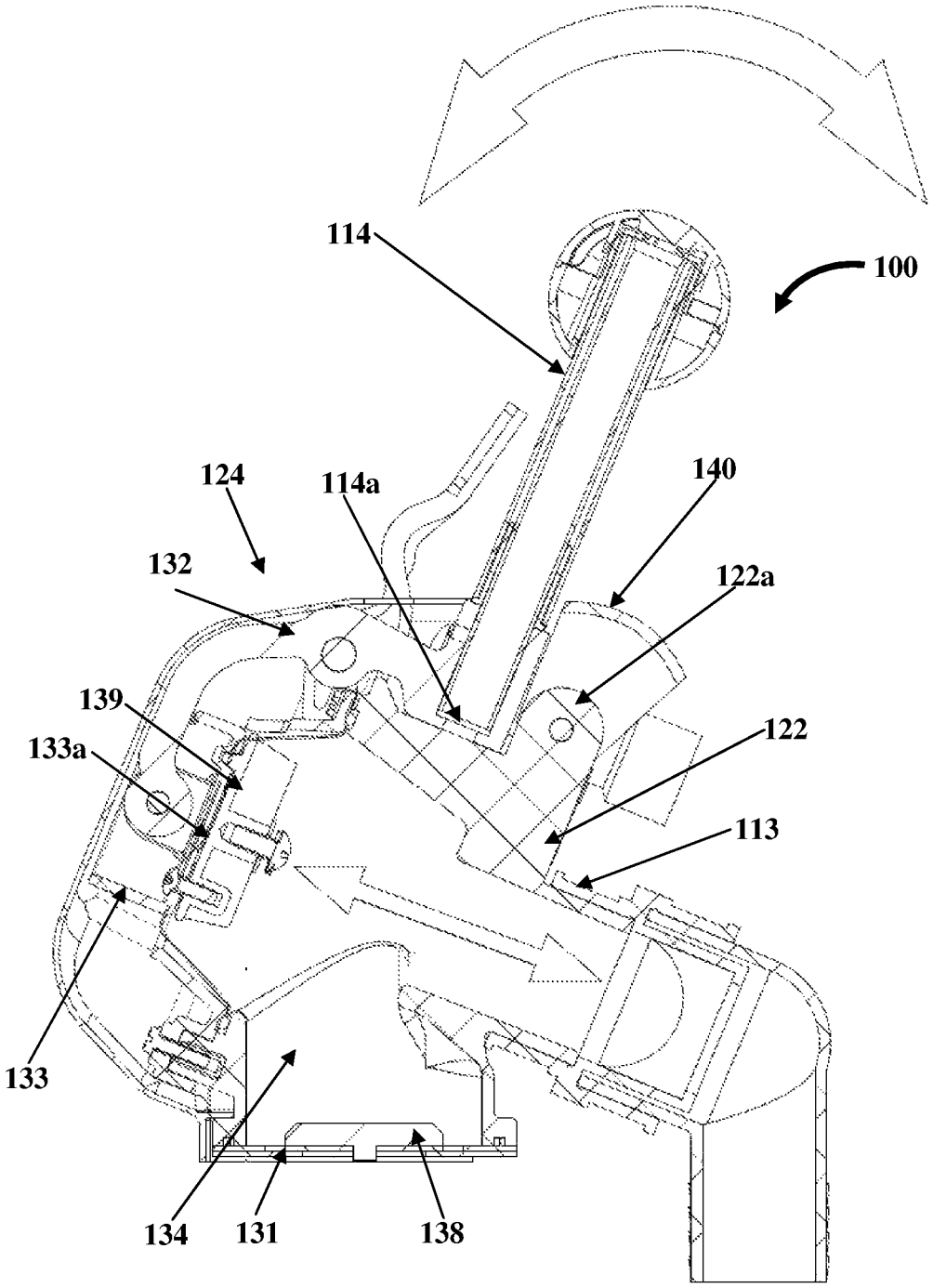

FIG. 10A

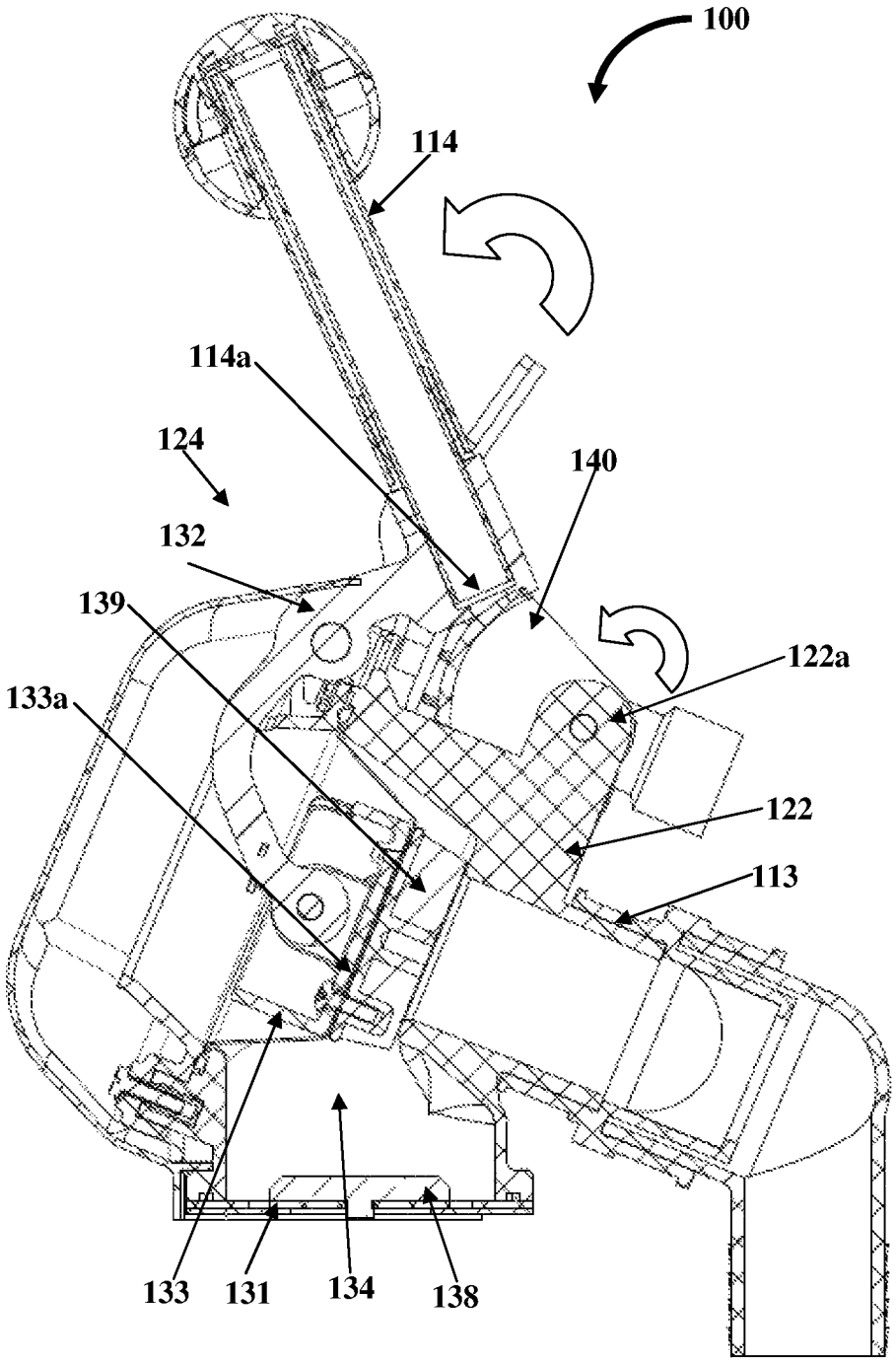

FIG. 10B

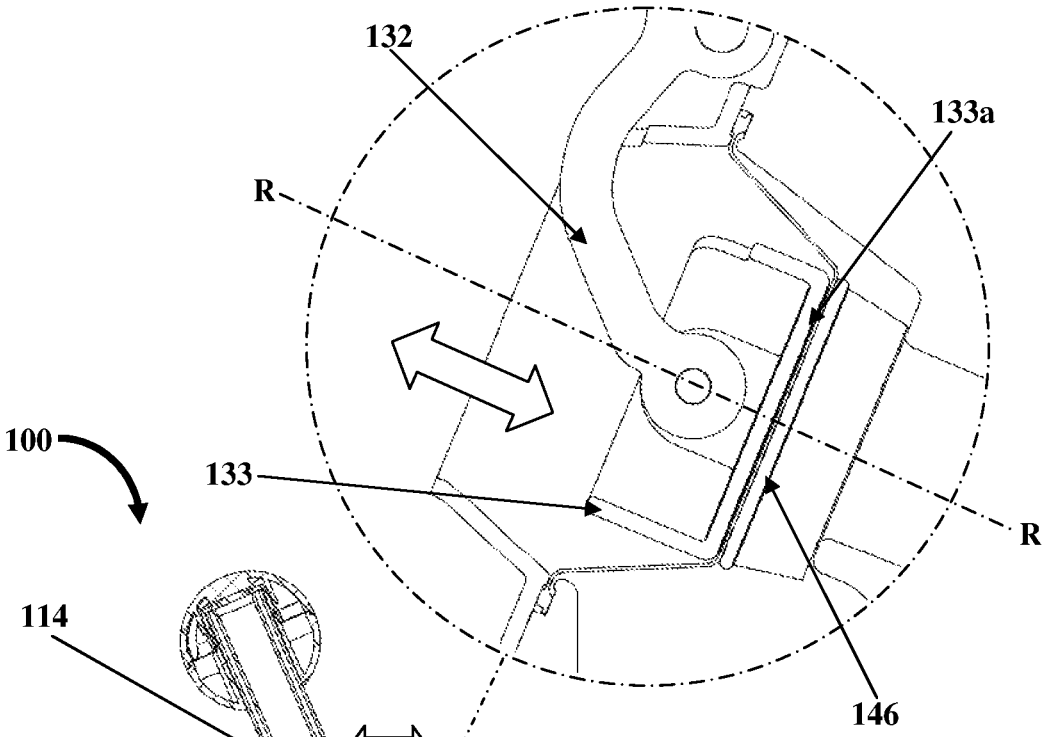

FIG. 11B

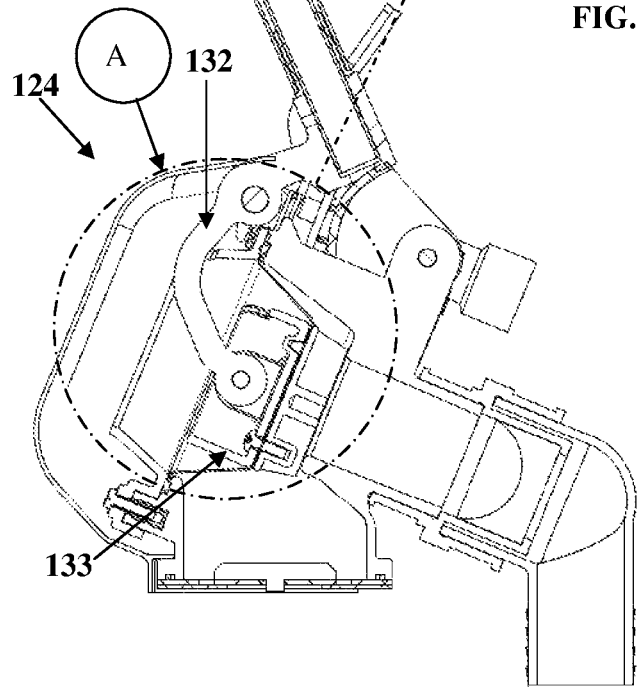

FIG. 11A

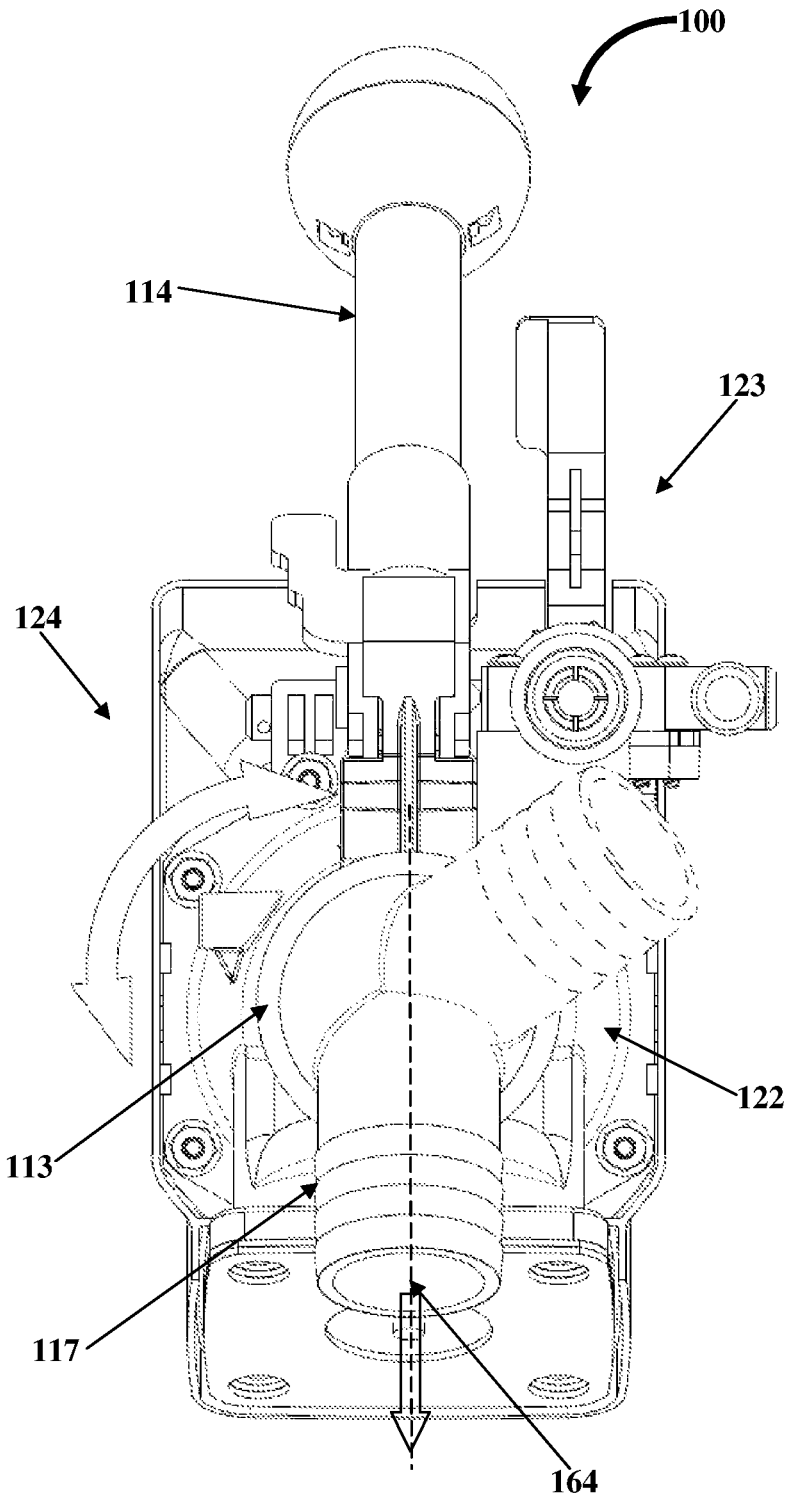

FIG. 12

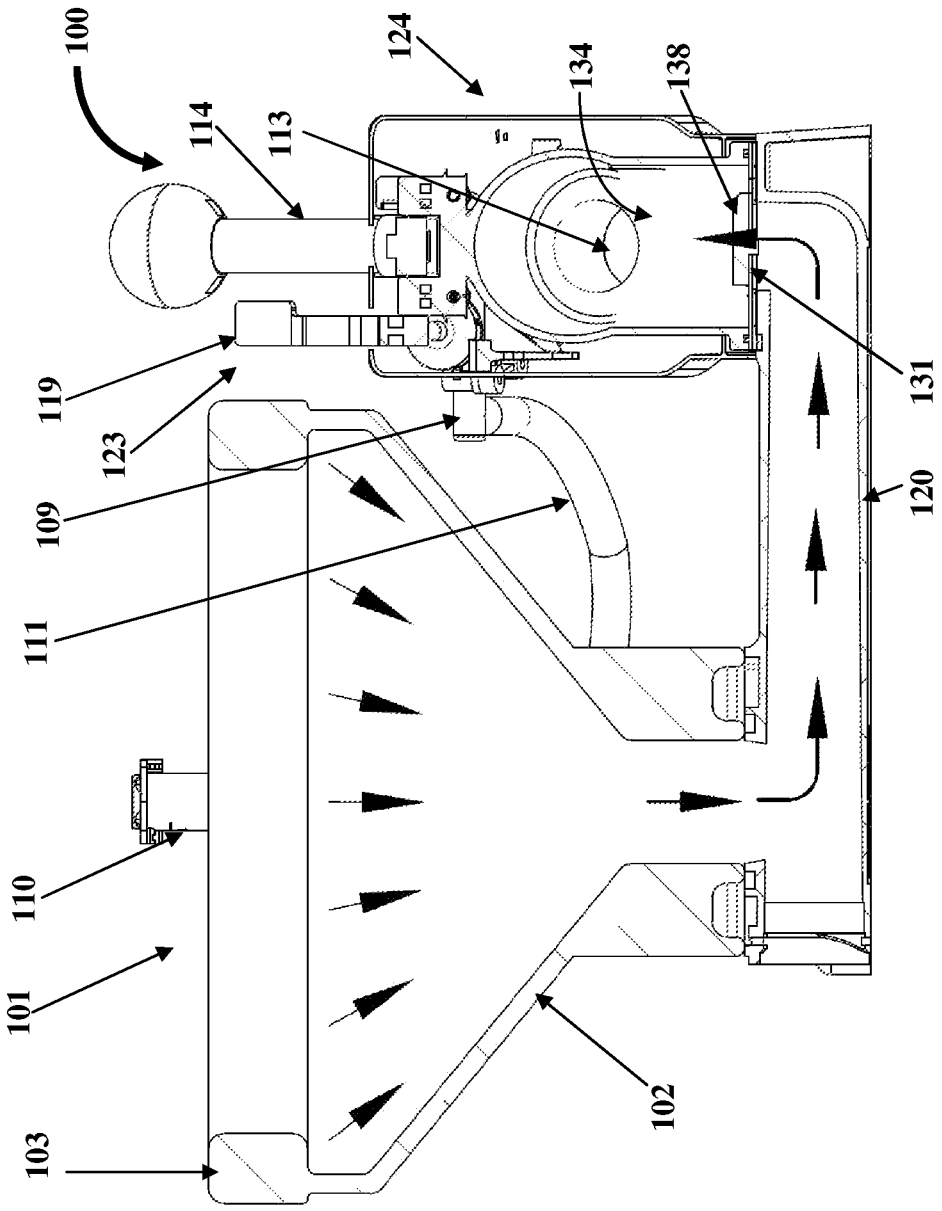

FIG. 13A

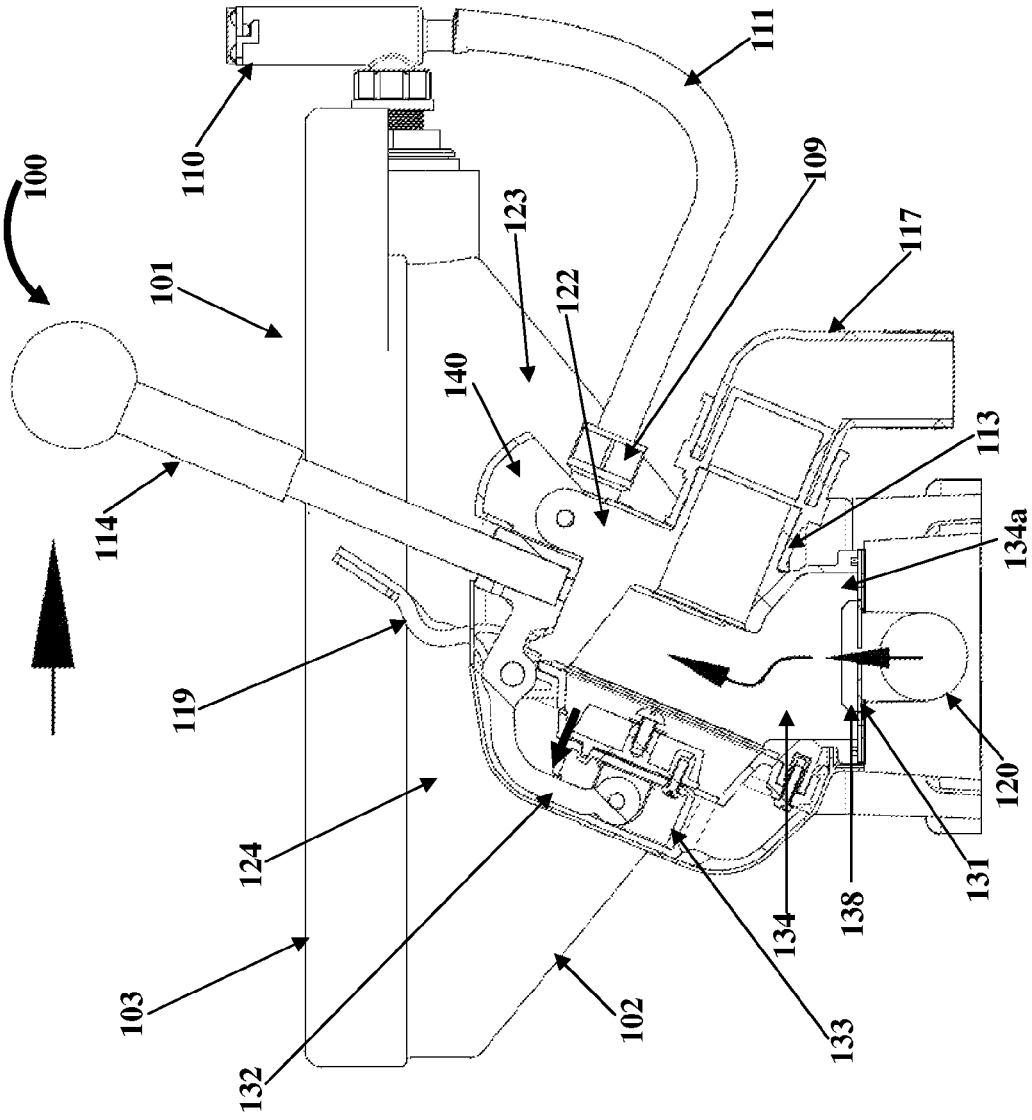
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FIG. 13B

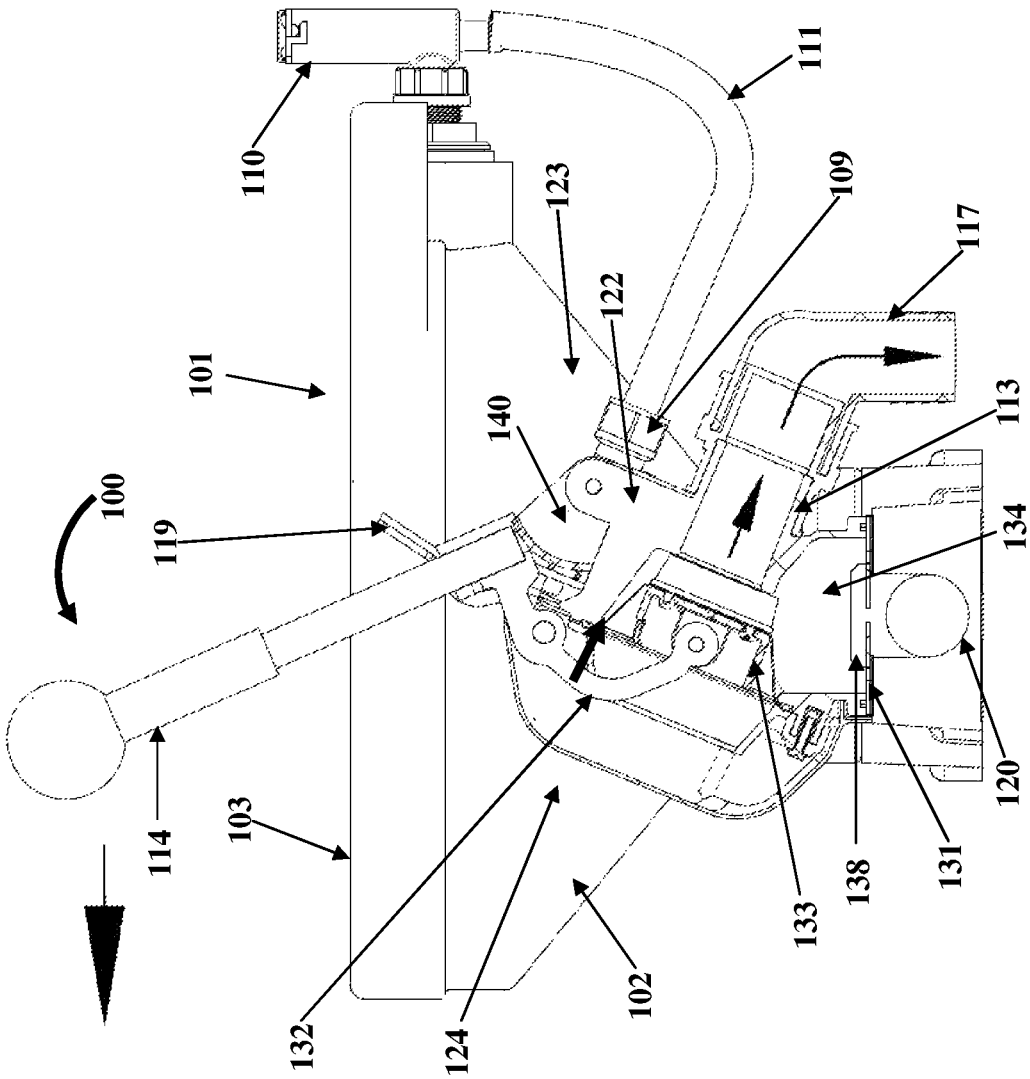
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FIG. 13C

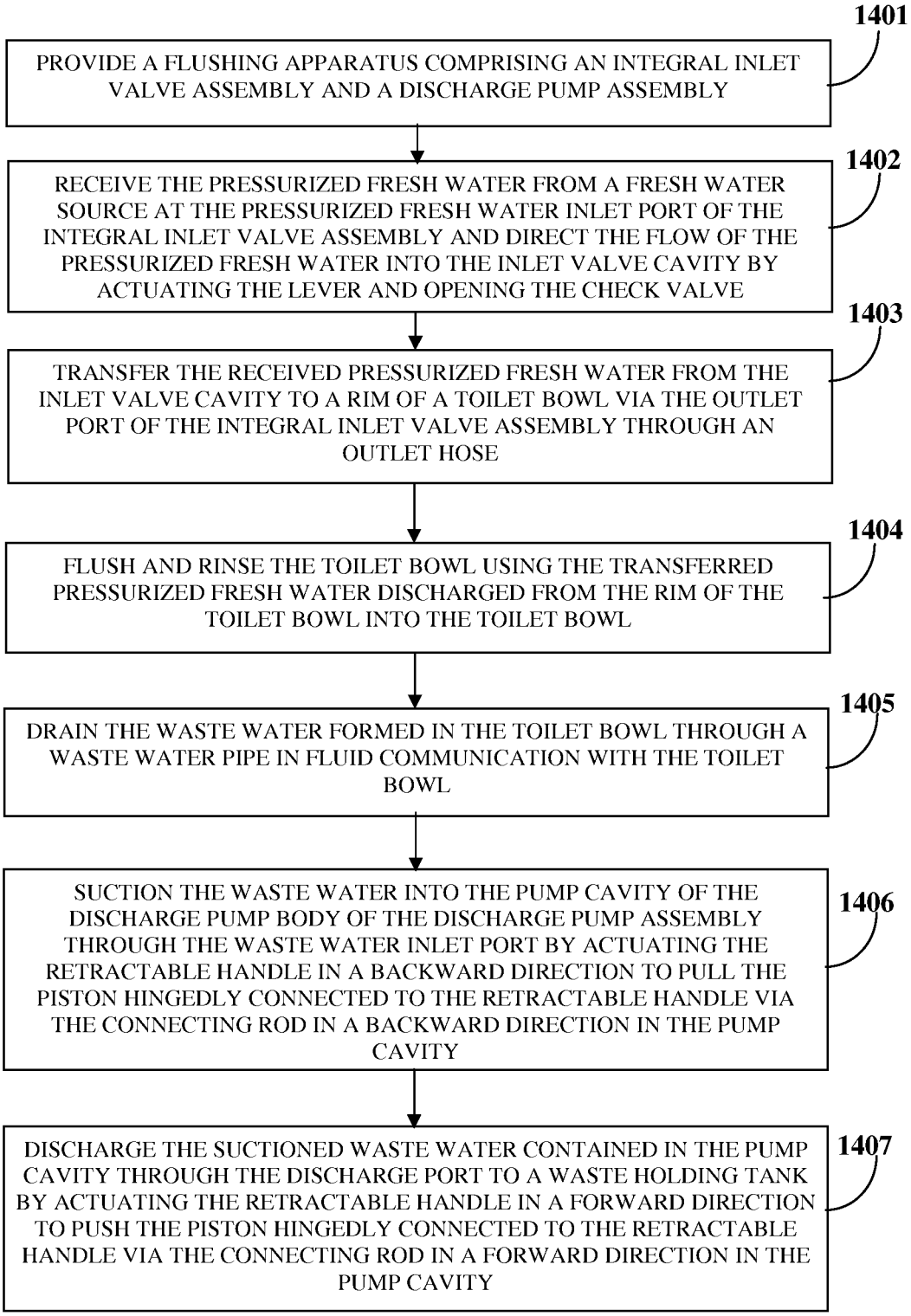
1401
PROVIDE A FLUSHING APPARATUS COMPRISING AN INTEGRAL INLET VALVE ASSEMBLY AND A DISCHARGE PUMP ASSEMBLY
1402
RECEIVE THE PRESSURIZED FRESH WATER FROM A FRESH WATER SOURCE AT THE PRESSURIZED FRESH WATER INLET PORT OF THE INTEGRAL INLET VALVE ASSEMBLY AND DIRECT THE FLOW OF THE PRESSURIZED FRESH WATER INTO THE INLET VALVE CAVITY BY ACTUATING THE LEVER AND OPENING THE CHECK VALVE
1403
TRANSFER THE RECEIVED PRESSURIZED FRESH WATER FROM THE INLET VALVE CAVITY TO A RIM OF A TOILET BOWL VIA THE OUTLET PORT OF THE INTEGRAL INLET VALVE ASSEMBLY THROUGH AN OUTLET HOSE
1404
FLUSH AND RINSE THE TOILET BOWL USING THE TRANSFERRED PRESSURIZED FRESH WATER DISCHARGED FROM THE RIM OF THE TOILET BOWL INTO THE TOILET BOWL
1405
DRAIN THE WASTE WATER FORMED IN THE TOILET BOWL THROUGH A WASTE WATER PIPE IN FLUID COMMUNICATION WITH THE TOILET BOWL
1406
SUCTION THE WASTE WATER INTO THE PUMP CAVITY OF THE DISCHARGE PUMP BODY OF THE DISCHARGE PUMP ASSEMBLY THROUGH THE WASTE WATER INLET PORT BY ACTUATING THE RETRACTABLE HANDLE IN A BACKWARD DIRECTION TO PULL THE PISTON HINGEDLY CONNECTED TO THE RETRACTABLE HANDLE VIA THE CONNECTING ROD IN A BACKWARD DIRECTION IN THE PUMP CAVITY
1407
DISCHARGE THE SUCTIONED WASTE WATER CONTAINED IN THE PUMP CAVITY THROUGH THE DISCHARGE PORT TO A WASTE HOLDING TANK BY ACTUATING THE RETRACTABLE HANDLE IN A FORWARD DIRECTION TO PUSH THE PISTON HINGEDLY CONNECTED TO THE RETRACTABLE HANDLE VIA THE CONNECTING ROD IN A FORWARD DIRECTION IN THE PUMP CAVITY

FIG. 14

MANUAL TOILET FLUSHING APPARATUS WITH AN ODOR REDUCING FRESH WATER INLET VALVE ASSEMBLY

BACKGROUND

Most toilets manufactured for vehicles, for example, boats, recreational vehicles, caravans, buses, etc., are either electric powered, non-electric, or manually operated. Non-electric toilets are either portable or permanently installed. Manual toilets currently bring water from the sea or lakes as raw water. Raw water from the sea or lakes is a major source of odors in and around a rim of a toilet bowl. For example, when a toilet is not used for an extended period of time, organic matter in the raw water in the toilet bowl starts to decompose and produce foul odors. Sea water is also a source of scale formation and clogs in the hose and plumbing of toilet related fixtures, and results in an increased requirement for maintenance of such fixtures. Flushing toilet with pressurized fresh water eliminates odors and scale formation. Most manual toilets currently in the market have an inlet section and a discharge pump as part of a single pump due to which transferring pressurized fresh water to the inlet section of the pump risks contamination of the inlet section of the pump by waste water discharged from the pump. Although fresh water can be added to the toilet bowl directly using a spray nozzle, there is a need for an integral system comprising an integral, manually operated fresh water inlet valve assembly and a waste water discharge pump assembly independent of the inlet valve assembly that flushes fresh water through the rim of the toilet bowl from a pressurized source.

Hence, there is a long felt but unresolved need for a flushing apparatus comprising an integral, manually operated pressurized fresh water inlet valve assembly and a waste water discharge pump assembly that is operably isolated from the integral inlet valve assembly for precluding waste water discharged from the toilet bowl via the waste water discharge pump assembly from contaminating pressurized fresh water transferred to the toilet bowl via the integral inlet valve assembly, thereby reducing odors in and around the toilet and scale formation in toilet related plumbing.

SUMMARY OF THE INVENTION

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.

The apparatus disclosed herein addresses the above mentioned need for a manual toilet flushing apparatus comprising an integral, manually operated pressurized fresh water inlet valve assembly and a waste water discharge pump assembly that is operably isolated from the integral, manually operated pressurized fresh water inlet valve assembly for precluding waste water discharged from a toilet bowl via the waste water discharge pump assembly from contaminating pressurized fresh water transferred to the toilet bowl via the integral, manually operated pressurized fresh water inlet valve assembly, thereby reducing odors in and around the toilet bowl and scale formation in toilet related plumbing. The "manual toilet flushing apparatus" disclosed herein is hereinafter referred to as a "flushing apparatus". The "integral, manually operated pressurized fresh water inlet valve assembly" disclosed herein is hereinafter referred to as an "integral inlet valve assembly". The "waste water discharge pump assembly" disclosed herein is hereinafter referred to as a "discharge pump assembly".

The flushing apparatus disclosed herein comprises an integral inlet valve assembly and a discharge pump assembly operably isolated from each other. The integral inlet valve assembly comprises a pressurized fresh water inlet port, an inlet valve body, a check valve, a lever, a first plunger, a second plunger, and an outlet port. The pressurized fresh water inlet port receives pressurized fresh water from a fresh water source. The fresh water source is, for example, a pressurized water source such as an on-demand pump with a water tank. The inlet valve body is fixedly connected to the pressurized fresh water inlet port. The inlet valve body comprises an inlet valve cavity in fluid communication with the pressurized fresh water inlet port. The inlet valve cavity contains and transfers the pressurized fresh water from the fresh water source to a rim of a toilet bowl. As used herein, the term "rim" refers to an annular cavity defined at an upper section of the toilet bowl to contain and transfer inlet pressurized fresh water to flush the toilet bowl.

In an embodiment, the integral inlet valve assembly of the flushing apparatus disclosed herein further comprises a filter screen fixedly attached to the pressurized fresh water inlet port of the integral inlet valve assembly. The filter screen traps microparticulates from the pressurized fresh water. The check valve of the integral inlet valve assembly is positioned in the inlet valve cavity of the inlet valve body and proximal to the pressurized fresh water inlet port. The check valve opens and closes to direct the flow of the pressurized fresh water from the pressurized fresh water inlet port into the inlet valve cavity. The check valve is removably positioned within the inlet valve cavity to facilitate repair and maintenance of the integral inlet valve assembly. The lever of the integral inlet valve assembly is positioned proximal to a distal end of the inlet valve cavity. The lever is easily accessible and actuates the check valve to allow rinse water or the pressurized fresh water to rinse the toilet bowl independent of the discharge pump assembly. That is, the actuation of the check valve by the lever for rinsing the toilet bowl is independent of the discharge of the waste water from the toilet bowl through the discharge pump assembly. The first plunger of the integral inlet valve assembly is positioned in the inlet valve cavity and is operably connected between the lever and the second plunger. The first plunger, in communication with the lever, actuates the second plunger.

The second plunger of the integral inlet valve assembly is positioned in the inlet valve cavity of the inlet valve body and is operably connected between the first plunger and the check valve. The second plunger, in communication with the first plunger, actuates the check valve to open and close the check valve. In an embodiment, the integral inlet valve assembly further comprises a diaphragm member positioned between the first plunger and the second plunger. The diaphragm member is fixedly connected to the opposing walls of the inlet valve cavity. The diaphragm member isolates the first plunger from the second plunger. The outlet port of the integral inlet valve assembly extends from the inlet valve body and is in fluid communication with the inlet valve cavity. The outlet port directs the flow of the pressurized fresh water from the inlet valve cavity to the rim of the toilet bowl through an outlet hose removably connected to and in fluid communication with the outlet port. In an embodiment, a vacuum breaker is positioned above the rim of the toilet bowl. The vacuum breaker is in fluid communication with the outlet hose and

prevents a back flow of the pressurized fresh water to the integral inlet valve assembly from the rim of the toilet bowl via the outlet hose.

The discharge pump assembly of the flushing apparatus disclosed herein comprises a waste water inlet port, a discharge pump body, a retractable handle, a connecting rod, a piston, and a discharge port. The waste water inlet port of the discharge pump assembly is positioned at a lower section of the discharge pump body. The waste water inlet port receives the waste water from the toilet bowl via a waste water pipe. The discharge pump body of the discharge pump assembly comprises a pump cavity in fluid communication with the waste water pipe via the waste water inlet port to transfer the waste water from the toilet bowl to the discharge port. The retractable handle of the discharge pump assembly is positioned above the pump cavity of the discharge pump body. In an embodiment, the retractable handle is secured within a sleeve of the connecting rod. The retractable handle retracts in a substantially vertical direction within the sleeve in an upward direction and a downward direction. In an embodiment, the sleeve is configured as an integral socket to receive the retractable handle. The connecting rod of the discharge pump assembly is positioned within the pump cavity and is hingedly connected between the retractable handle and the piston. The connecting rod, in communication with the retractable handle, actuates the piston in a forward direction and a backward direction. The piston of the discharge pump assembly is positioned within the pump cavity and is operably connected to the connecting rod. The piston is actuated, for example, in the backward direction by the connecting rod which suctions the waste water into the pump cavity. The piston is actuated, for example, in the forward direction by the connecting rod which discharges the waste water through the discharge port. In an embodiment, the piston within the discharge pump body is oriented at a predefined inclination to a vertical axis such that the piston is in line with the discharge port to prevent clogging of the pump cavity and the discharge port. The discharge port of the discharge pump assembly extends from the discharge pump body and is in fluid communication with the pump cavity. The discharge port discharges the waste water from the pump cavity to a waste holding tank.

In an embodiment, the discharge pump assembly of the flushing apparatus disclosed herein further comprises a flapper valve member positioned proximal to the lower section of the pump cavity of the discharge pump body and secured to the waste water inlet port, for example, via a thread member. The flapper valve member opens during movement of the piston in the backward direction to transfer the waste water from the lower section of the pump cavity to an upper section of the pump cavity via the waste water inlet port. The flapper valve member closes during movement of the piston in the forward direction to discharge the waste water contained in the upper section of the pump cavity through the discharge port. In an embodiment, the flapper valve member prevents a back flow of the waste water to the toilet bowl via the waste water pipe in fluid communication with the pump cavity of the discharge pump body by closing the waste water inlet port.

In an embodiment, the integral inlet valve assembly and the discharge pump assembly of the flushing apparatus disclosed herein are positioned in close proximity behind a cover member for facilitating ease of operation of the flushing apparatus and a clean installation of the flushing apparatus. The discharge pump body of the discharge pump assembly is oriented at a predefined inclination to a vertical axis for facilitating a flexible pumping action of the piston in communication with the retractable handle. In an embodiment, the discharge pump assembly further comprises a piston cap operably connected proximal to a rear surface of the piston of the discharge pump assembly. The piston cap secures a circular diaphragm to the piston. In an embodiment, a predefined geometry of the piston maintains a consistent stroke for the circular diaphragm.

In an embodiment, the flushing apparatus disclosed herein further comprises a locking cam pivotally connected to an upper section of the discharge pump body of the discharge pump assembly. The locking cam locks the retractable handle when the piston is completely pushed to a forward position by rotating and positioning the locking cam below a lower end of the retractable handle. In an embodiment, the discharge pump assembly of the flushing apparatus disclosed herein further comprises an elastomeric stopper attached to a rear surface of the piston of the discharge pump assembly. The elastomeric stopper seals the discharge port of the discharge pump assembly to prevent a back flow of the waste water into the toilet bowl via the waste water pipe in fluid communication with the discharge port, after the piston is completely pushed to a forward position and locked in the forward position using the locking cam. In an embodiment, the discharge pump assembly further comprises a discharge fitting removably connected to the discharge port. The discharge fitting transfers the waste water from the discharge port to the waste holding tank via a discharge outlet pipe. In an embodiment, the discharge fitting rotates 360 degrees with respect to a vertical axis of the discharge fitting to connect to the discharge outlet pipe at multiple angles.

Disclosed herein is also a method for receiving pressurized fresh water and discharging waste water without contamination of the pressurized fresh water. The flushing apparatus comprises an integral inlet valve assembly and a discharge pump assembly as disclosed above. By actuating the lever in communication with the first plunger and the second plunger and opening the check valve of the integral inlet valve assembly, pressurized fresh water from a fresh water source is received at the pressurized fresh water inlet port of the integral inlet valve assembly and the flow of the pressurized fresh water is directed into the inlet valve cavity of the inlet valve body. The received pressurized fresh water is then transferred from the inlet valve cavity to a rim of a toilet bowl via the outlet port of the integral inlet valve assembly and through the outlet hose removably connected to and in fluid communication with the outlet port. The transferred pressurized fresh water discharged from the rim of the toilet bowl into the toilet bowl flushes and rinses the toilet bowl.

The waste water formed in the toilet bowl is drained through the waste water pipe in fluid communication with the toilet bowl. By actuating the retractable handle in a backward direction, which pulls the piston hingedly connected to the retractable handle via the connecting rod in a backward direction in the pump cavity of the discharge pump body, the pump cavity of the discharge pump body of the discharge pump assembly suctions the waste water through the waste water inlet port. Furthermore, actuating the retractable handle in a forward direction pushes the piston in a forward direction in the pump cavity containing the suctioned waste water, whereby the suctioned waste water contained in the pump cavity is discharged through the discharge port to a waste holding tank. In an embodiment, the method disclosed herein prevents a back flow of the waste water from the discharge outlet pipe via the discharge port into the pump cavity using a discharge check valve coupling removably connected to the discharge port and the discharge fitting of the discharge pump assembly, when the retractable handle is actuated in the back-

ward direction to pull the piston in the backward direction in the pump cavity and suction the waste water into the pump cavity via the waste water inlet port of the discharge pump assembly. The discharge check valve coupling further allows the waste water to exit the pump cavity via the discharge port, when the retractable handle is actuated in the forward direction to push the piston in the forward direction in the pump cavity and discharge the waste water through the discharge port to the waste holding tank.

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 methods and structures disclosed herein. The description of a structure or a method step referenced by a numeral in a drawing carries over to the description of that structure or method step shown by that same numeral in any subsequent drawing herein.

FIG. **1**A exemplarily illustrates a rear perspective view of a flushing apparatus operably connected to a toilet.

FIG. **1**B exemplarily illustrates a front perspective view of the flushing apparatus operably connected to the toilet.

FIG. **2** exemplarily illustrates a rear perspective view of the flushing apparatus, showing an inlet valve body of an integral inlet valve assembly and a discharge pump body of a discharge pump assembly of the flushing apparatus.

FIG. **3** exemplarily illustrates a partial sectional view of the integral inlet valve assembly of the flushing apparatus.

FIG. **4** exemplarily illustrates a sectional view of the discharge pump assembly of the flushing apparatus.

FIG. **5**A exemplarily illustrates a partial exploded view of the flushing apparatus.

FIG. **5**B exemplarily illustrates an isometric view of a discharge check valve coupling of the discharge pump assembly.

FIG. **5**C exemplarily illustrates a cutaway view of the discharge check valve coupling of the discharge pump assembly.

FIG. **6** exemplarily illustrates a partial exploded view of the integral inlet valve assembly of the flushing apparatus.

FIG. **7** exemplarily illustrates a side view of a portion of a toilet, showing a vacuum breaker positioned above a rim of a toilet bowl.

FIG. **8** exemplarily illustrates a sectional view of the vacuum breaker.

FIG. **9**A exemplarily illustrates a side elevation view of the flushing apparatus, showing a retractable handle.

FIG. **9**B exemplarily illustrates a side elevation view of the flushing apparatus, showing movement of the retractable handle in an upward direction and a downward direction.

FIG. **10**A exemplarily illustrates a sectional view of the flushing apparatus, showing movement of the retractable handle and a piston of the discharge pump assembly in a forward direction and a backward direction.

FIG. **10**B exemplarily illustrates a sectional view of the flushing apparatus, showing an elastomeric stopper and a locking cam in a resting position.

FIG. **11**A exemplarily illustrates a cutaway view of the flushing apparatus, showing a generally cup shaped geometry of the piston of the discharge pump assembly, configured to maintain a consistent stroke for the circular diaphragm.

FIG. **11**B exemplarily illustrates an enlarged view of a portion marked A in FIG. **11**A, showing the generally cup shaped geometry of the piston.

FIG. **12** exemplarily illustrates a bottom perspective view of the flushing apparatus, showing a discharge fitting positioned at different angles.

FIG. **13**A exemplarily illustrates a partial sectional view of the flushing apparatus operably connected to a toilet, showing flow of waste water from the toilet bowl to a waste water inlet port of the discharge pump assembly through a waste water pipe.

FIG. **13**B exemplarily illustrates a partial sectional view of the flushing apparatus operably connected to the toilet, showing movement of the retractable handle in a backward direction for suctioning waste water into a pump cavity of the discharge pump body of the discharge pump assembly.

FIG. **13**C exemplarily illustrates a partial sectional view of the flushing apparatus operably connected to the toilet, showing movement of the retractable handle in a forward direction for discharging waste water into a discharge port of the discharge pump assembly.

FIG. **14** illustrates a method for receiving pressurized fresh water and discharging waste water without contamination of the pressurized fresh water.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. **1**A-**1**B exemplarily illustrate a rear perspective view and a front perspective view respectively, of a flushing apparatus **100** operably connected to a toilet **101**. The flushing apparatus **100** disclosed herein is, for example, a manual toilet flushing apparatus. The toilet **101** comprises a toilet bowl **102**, a rim **103** positioned at an upper section **102***a* of the toilet bowl **102**, and a lid **104** hingedly connected to the upper section **102***a* of the toilet bowl **102** to cover the toilet bowl **102**. As used herein, the term "rim" refers to an annular cavity defined at an upper section **102***a* of the toilet bowl **102** to contain and transfer pressurized fresh water **106** to flush the toilet bowl **102**. When a lever **119** of the flushing apparatus **100** exemplarily illustrated in FIG. **1**B is actuated, a pressurized fresh water inlet port **105** of the flushing apparatus **100** opens to receive pressurized fresh water **106** from a fresh water source **107** through an inlet hose member **108**. The fresh water source **107** is, for example, a pressurized water source such as an on-demand pump **107***a* in communication with a water tank **107***b* as exemplarily illustrated in FIG. **1**A.

As exemplarily illustrated in FIG. **1**B, the lever **119** is easily accessible and operates or actuates a check valve **129** exemplarily illustrated in FIG. **3**, to allow the pressurized fresh water **106** to rinse the toilet bowl **102**. The actuation of the check valve **129** by the lever **119** for rinsing the toilet bowl **102** is independent of the discharge of waste water **112** from the toilet bowl **102** through a waste water discharge pump assembly **124** of the flushing apparatus **100** exemplarily illustrated in FIG. **2** and FIG. **4**. The pressurized fresh water **106** is transferred from the pressurized fresh water inlet port **105** to an outlet port **109** of the flushing apparatus **100**, which is in fluid communication with the pressurized fresh water inlet port **105**. The pressurized fresh water **106** is transferred from the outlet port **109** to a vacuum breaker **110** positioned above the rim **103** of the toilet bowl **102** via an outlet hose **111** removably connected between the outlet port **109** and the vacuum breaker **110** as disclosed in the detailed description of FIG. **7**. The vacuum breaker **110** prevents a back flow of the pressurized fresh water **106** from the rim **103** of the toilet bowl **102** to the outlet hose **111**. The pressurized fresh water **106** is flushed within the toilet bowl **102** and thereafter discharged as waste water **112** as exemplarily illustrated FIG. **1**A. The waste water **112** from the toilet bowl **102**, after flushing, is transferred through a waste water pipe **120** exem-

plarily illustrated in FIG. **1**B, in fluid communication with the toilet bowl **102**, and is discharged through a discharge port **113** of the flushing apparatus **100** by the actuation of a retractable handle **114** of the flushing apparatus **100**. The waste water **112** is discharged through the discharge port **113** to a waste holding tank **115** as exemplarily illustrated in FIG. **1**A, for example, a treatment unit via a discharge outlet pipe **116**. A discharge fitting **117** removably connects the discharge outlet pipe **116** to the discharge port **113**. A cover member **118** is used to cover a front section **100***a* of the flushing apparatus **100**.

FIG. **2** exemplarily illustrates a rear perspective view of the flushing apparatus **100**, showing an inlet valve body **121** of an integral inlet valve assembly **123** and a discharge pump body **122** of the discharge pump assembly **124** of the flushing apparatus **100**. As exemplarily illustrated in FIG. **2**, the integral inlet valve assembly **123** comprises the pressurized fresh water inlet port **105**, the inlet valve body **121**, the lever **119**, and the outlet port **109**. The inlet valve body **121** is, for example, an elongate structure comprising an inlet valve cavity **127** exemplarily illustrated in FIG. **3**. The pressurized fresh water inlet port **105** is positioned at one end **121***a* of the inlet valve body **121**. The lever **119** is operably positioned at a distal end **121***b* of the inlet valve body **121**. The outlet port **109** extends outwardly from the inlet valve body **121** and is in fluid communication with the inlet valve cavity **127** of the inlet valve body **121**. The discharge pump assembly **124** comprises the discharge pump body **122**, the retractable handle **114**, and the discharge port **113**. The discharge pump body **122** comprises a pump cavity **134** exemplarily illustrated in FIG. **4**. The discharge port **113** is in fluid communication with the pump cavity **134** of the discharge pump body **122**. The retractable handle **114** is positioned at an upper section **122***a* of the discharge pump body **122**.

FIG. **3** exemplarily illustrates a partial sectional view of the integral inlet valve assembly **123** of the flushing apparatus **100** exemplarily illustrated in FIG. **2**. The integral inlet valve assembly **123** is an integral manually operated pressurized fresh water inlet valve assembly. The pressurized fresh water inlet port **105** of the integral inlet valve assembly **123** receives the pressurized fresh water **106** from a fresh water source **107** exemplarily illustrated in FIG. **1**A. In an embodiment, the integral inlet valve assembly **123** further comprises a built-in filter screen **128** fixedly attached to the pressurized fresh water inlet port **105**. The filter screen **128** traps microparticulates, for example, particulate matter such as dust, from the pressurized fresh water **106**. The filter screen **128** is, for example, a built-in screen that traps debris in the pressurized fresh water **106** that may prevent the check valve **129** of the integral inlet valve assembly **123** from closing and opening. The inlet valve body **121** of the integral inlet valve assembly **123** is fixedly connected to the pressurized fresh water inlet port **105**. The inlet valve body **121** comprises the inlet valve cavity **127** in fluid communication with the pressurized fresh water inlet port **105**. The inlet valve cavity **127** contains and transfers the pressurized fresh water **106** from the fresh water source **107** to the rim **103** of a toilet bowl **102** exemplarily illustrated in FIG. **1**A.

In addition to the pressurized fresh water inlet port **105**, the inlet valve body **121**, the lever **119**, and the outlet port **109** exemplarily illustrated in FIGS. **1**A-**1**B and FIG. **2**, the integral inlet valve assembly **123** further comprises the check valve **129**, a first plunger **125**, and a second plunger **126**. The check valve **129** is removably positioned in the inlet valve cavity **127** of the inlet valve body **121** and proximal to the pressurized fresh water inlet port **105**. The check valve **129** opens and closes to direct a flow of the pressurized fresh water **106** from the pressurized fresh water inlet port **105** into the inlet valve cavity **127**. The check valve **129** is configured, for example, as a removable valve cartridge for easy repair and rebuilding or maintenance of the integral inlet valve assembly **123**. The lever **119**, exemplarily illustrated in FIG. **2**, is positioned proximal to a distal end **127***a* of the inlet valve cavity **127**. The first plunger **125** is positioned in the inlet valve cavity **127** and is operably connected between the lever **119** and the second plunger **126**. The first plunger **125**, in communication with the lever **119**, actuates the second plunger **126**.

The second plunger **126** is positioned in the inlet valve cavity **127** of the inlet valve body **121** and is operably connected between the first plunger **125** and the check valve **129**. The second plunger **126**, in communication with the first plunger **125**, actuates the check valve **129** to open and close the check valve **129**. In an embodiment, the integral inlet valve assembly **123** further comprises a diaphragm member **130** positioned between the first plunger **125** and the second plunger **126** and fixedly connected to opposing walls **127***b* and **127***c* of the inlet valve cavity **127**. The diaphragm member **130** isolates the first plunger **125** from the second plunger **126**. The diaphragm member **130** is, for example, a sealing member. The diaphragm member **130** follows the movement of the plungers **125** and **126** when operated by the lever **119**. In an embodiment, the integral inlet valve assembly **123** comprises multiple plungers in the inlet valve cavity **127**. The diaphragm member **130**, for example, isolates the pressurized fresh water **106** from the first plunger **125** precluding the need for shaft sealing components on the first plunger **125**.

The outlet port **109** extends from the inlet valve body **121** and is in fluid communication with the inlet valve cavity **127** of the inlet valve body **121**. The outlet port **109** directs the flow of the pressurized fresh water **106** from the inlet valve cavity **127** to the rim **103** of the toilet bowl **102** through an outlet hose **111** removably connected to and in fluid communication with the outlet port **109** as exemplarily illustrated in FIGS. **1**A-**1**B. In an embodiment, the integral inlet valve assembly **123** and the discharge pump assembly **124** are positioned in close proximity behind the cover member **118** exemplarily illustrated in FIG. **2**, to facilitate ease of operation of the flushing apparatus **100** and a clean installation of the flushing apparatus **100**.

FIG. **4** exemplarily illustrates a sectional view of the discharge pump assembly **124** of the flushing apparatus **100**. The discharge pump assembly **124** comprises a waste water inlet port **131**, the discharge pump body **122**, the retractable handle **114**, a connecting rod **132**, a piston **133**, and the discharge port **113**. The waste water inlet port **131** is positioned at a lower section **122***b* of the discharge pump body **122**. The waste water inlet port **131** is positioned proximal to a lower section **134***a* of the pump cavity **134** of the discharge pump body **122**. The waste water inlet port **131** receives the waste water **112** from the toilet bowl **102** via a waste water pipe **120** as exemplarily illustrated in FIGS. **1**A-**1**B. The pump cavity **134** of the discharge pump body **122** is in fluid communication with the waste water pipe **120** via the waste water inlet port **131**. The waste water pipe **120** transfers waste water **112** from the toilet bowl **102** to the discharge port **113** as exemplarily illustrated in FIGS. **1**A-**1**B. The retractable handle **114** is positioned above the pump cavity **134** at an upper section **122***a* of the discharge pump body **122**. In an embodiment, the retractable handle **114** is secured within a sleeve **135** of the connecting rod **132**. The retractable handle **114** retracts in a substantially vertical direction within the sleeve **135** in an upward direction and a downward direction as exemplarily

illustrated in FIG. **9**B. The sleeve **135** is configured, for example, as an integral socket for receiving the retractable handle **114**.

The connecting rod **132** is positioned within the pump cavity **134** of the discharge pump body **122** and is hingedly connected between the retractable handle **114** and the piston **133**. The connecting rod **132**, in communication with the retractable handle **114**, actuates the piston **133** in a forward direction and a backward direction as indicated by an arrow in FIG. **4**. The piston **133** is positioned within the pump cavity **134** and is operably connected to the connecting rod **132**. The piston **133** actuated in a backward direction by the connecting rod **132** suctions the waste water **112** into the pump cavity **134**. The piston **133** actuated in the forward direction by the connecting rod **132** discharges the waste water **112** through the discharge port **113**. The angle of inclination **136***a* of the discharge port **113** relative to pumping action of the piston **133** prevents clogging of the pump cavity **134**. The angle of inclination **136***a* of the discharge port **113** is exemplarily illustrated by the angle of inclination **136***a* between the inclined axis ZZ of the discharge port **113** and the vertical axis YY. In an embodiment, the piston **133** within the discharge pump body **122** is oriented at a predefined inclination **136***b* to a vertical axis YY such that the piston **133** is in line with the discharge port **113** to prevent clogging of the pump cavity **134** and the discharge port **113**.

The discharge port **113** extends from the discharge pump body **122** and is in fluid communication with the pump cavity **134** of the discharge pump body **122**. The discharge port **113** discharges the waste water **112** from the pump cavity **134** to a waste holding tank **115** exemplarily illustrated in FIG. **1**A. In an embodiment, the discharge pump body **122** is positioned proximal to the integral inlet valve assembly **123** and oriented at a predefined inclination **136***b* to a vertical axis YY, exemplarily illustrated by the predefined inclination **136***b* between the inclined axis XX of the discharge pump body **122** and the vertical axis YY. The predefined inclination **136***b* of the discharge pump body **122** facilitates a flexible pumping action of the piston **133** in communication with the retractable handle **114**.

In an embodiment, the discharge pump assembly **124** of the flushing apparatus **100** disclosed herein further comprises a flapper valve member **138** positioned proximal to the lower section **134***a* of the pump cavity **134** of the discharge pump body **122** and secured to the waste water inlet port **131** via a thread member **137**. The flapper valve member **138** opens during movement of the piston **133** in the backward direction to transfer the waste water **112** from the lower section **134***a* of the pump cavity **134** to an upper section **134***b* of the pump cavity **134** via the waste water inlet port **131**. The flapper valve member **138** closes during movement of the piston **133** in the forward direction to discharge the waste water **112** contained in the upper section **134***b* of the pump cavity **134** through the discharge port **113**. The flapper valve member **138** opens and closes due to suction and pressure caused by the pumping action of the piston **133** within the pump cavity **134**. In an embodiment, the flapper valve member **138** prevents a back flow of the waste water **112** to the toilet bowl **102** via the waste water pipe **120** in fluid communication with the pump cavity **134** by closing the waste water inlet port **131**.

The discharge pump assembly **124** is operably isolated from the integral inlet valve assembly **123** to preclude waste water **112** discharged from the toilet bowl **102** via the discharge pump assembly **124** from contaminating the pressurized fresh water **106** transferred to the toilet bowl **102** exemplarily illustrated in FIG. **1**A, via the integral inlet valve assembly **123**, thereby reducing odors in and around the toilet bowl **102** and avoiding contamination of potable water flowing through the main potable pipe lines in fluid communication with toilet plumbing. The integral inlet valve assembly **123** and the discharge pump assembly **124** are positioned in close proximity and behind the cover member **118** as exemplarily illustrated in FIGS. **1**A-**1**B and FIG. **2**, for easier operation and a cleaner installation. In an embodiment, the flushing apparatus **100** disclosed herein further comprises an elastomeric stopper **139**, a locking cam **140**, and a discharge fitting **117** as disclosed in the detailed description of FIGS. **9**A-**9**B, FIGS. **10**A-**10**B, and FIG. **12**.

FIG. **5**A exemplarily illustrates a partial exploded view of the flushing apparatus **100**. The cover member **118** is a pump assembly cover configured to cover the flushing apparatus **100**. The cover member **118** is removed during cleaning or maintenance. The discharge pump body **122** comprises the pump cavity **134** and a support section **122***c* for a circular diaphragm **146**. The discharge pump body **122** also supports the waste water inlet port **131** exemplarily illustrated in FIG. **4**, and the discharge port **113**. The retractable handle **114** comprises an inner tube **141**, a tube bushing **142**, an outer tube **143**, and a handle knob **144**. The inner tube **141** is secured within the sleeve **135** of the connecting rod **132**. The inner tube **141** allows the retractable handle **114** to extend in an upward direction, thereby extending the length of the retractable handle **114** for pumping ease. The tube bushing **142** is secured to the outer tube **143** and guides the outer tube **143** over the inner tube **141** when the retractable handle **114** is extended or retracted. The handle knob **144** is connected to the outer tube **143** and is used to grip and actuate the retractable handle **114** in a forward direction and a backward direction.

The connecting rod **132** is, for example, a piston lever. The connecting rod **132** comprises the sleeve **135** that receives the inner tube **141** of the retractable handle **114** to connect the retractable handle **114** to the connecting rod **132**. One end **132***a* of the connecting rod **132** is fastened to the piston **133** via a clevis pin **145**. The connecting rod **132** connects the retractable handle **114** to the piston **133**. A piston lever shaft **151** is operably connected to an upper section **132***b* of the connecting rod **132**. The piston lever shaft **151** enables a pivotal connection of the connecting rod **132** within the discharge pump body **122**.

The piston **133** is, for example, a diaphragm piston. The piston **133** is connected to the circular diaphragm **146** on the rear surface **133***a* of the piston **133**. When the retractable handle **114** is moved in a forward direction, the piston **133** in communication with the connecting rod **132** and the retractable handle **114** forces the circular diaphragm **146** in a forward direction in the pump cavity **134** of the discharge pump body **122**. When the circular diaphragm **146** is forced into the pump cavity **134**, a pressure is created within the pump cavity **134**, which forces the waste water **112** exemplarily illustrated in FIG. **1**A, out from the pump cavity **134** through the discharge port **113**. When the retractable handle **114** is moved in a backward direction, the piston **133** in communication with the connecting rod **132** and the retractable handle **114** moves the circular diaphragm **146** in a backward direction out of the pump cavity **134** of the discharge pump body **122**. When the circular diaphragm **146** is pulled away from the pump cavity **134**, a suction force is created drawing the waste water **112** from the toilet bowl **102** through the waste water pipe **120**, the waste water inlet port **131**, and the flapper valve member **138** into the pump cavity **134** as exemplarily illustrated in FIG. **13**B. The flapper valve member **138** is fixedly connected to the waste water inlet port **131** as exemplarily illustrated in FIG. **4**. The flapper valve member **138** allows waste water **112**

to enter the pump cavity **134** of the discharge pump body **122** from the waste water pipe **120** via the waste water inlet port **131**, when the retractable handle **114** is moved in a backward direction and prevents the waste water **112** from returning to the toilet bowl **102** during a forward movement of the retractable handle **114**.

When the circular diaphragm **146** is forced into the pump cavity **134** of the discharge pump body **122** by the piston **133** in communication with the retractable handle **114**, the forward pressure from the circular diaphragm **146** forces the waste water **112** from the pump cavity **134** to the discharge port **113**, and in turn to the waste holding tank **115** via the discharge outlet pipe **116** exemplarily illustrated in FIG. **1**A. A discharge pump body top plate **147** retains the circular diaphragm **146** to the discharge pump body **122**. In an embodiment, the discharge pump assembly **124** further comprises a piston cap **148** operably connected proximal to a rear surface **133***a* of the piston **133** of the discharge pump assembly **124**. The piston cap **148** secures the circular diaphragm **146** to the piston **133**. The piston cap **148** also supports an elastomeric stopper **139**. The elastomeric stopper **139** is, for example, a discharge shut off seal. The elastomeric stopper **139** contacts and seals the discharge port **113** when the retractable handle **114** is secured in the forward position.

The discharge pump assembly **124** further comprises a discharge check valve coupling **149** removably connected to the discharge port **113** and the discharge fitting **117** as disclosed in the detailed description of FIGS. **5**B-**5**C. The discharge check valve coupling **149** couples the discharge fitting **117** to the discharge port **113**. The discharge check valve coupling **149** allows the waste water **112** to exit the pump cavity **134** of the discharge pump body **122** via the discharge port **113**, when the retractable handle **114** is actuated in the forward direction to push the piston **133** in the forward direction in the pump cavity **134** and discharge the waste water **112** through the discharge port **113** to the waste holding tank **115**, while preventing the waste water **112** from the discharge outlet pipe **116** exemplarily illustrated in FIG. **1**A, from flowing back into the pump cavity **134** via the discharge port **113**, when the retractable handle **114** is actuated in a backward direction to pull the piston **133** in the backward direction in the pump cavity **134** and suction the waste water **112** into the pump cavity **134** via the waste water inlet port **131**. The discharge fitting **117** is configured, for example, as a discharge elbow that connects to the discharge outlet pipe **116**. The discharge fitting **117** is capable of rotating, for example, about 360 degrees, and secured in position to connect to the discharge outlet pipe **116** at any angle.

As exemplarily illustrated in FIGS. **9**A-**9**B, the locking cam **140** locks the retractable handle **114** when the piston **133** is completely pushed to a forward position, by rotation and positioning of the locking cam **140** below a lower end **114***a* of the retractable handle **114** by actuating a shut off lever **150**, thereby engaging the elastomeric stopper **139** to close the discharge port **113**. When the retractable handle **114** is pushed in a forward direction, the locking cam **140** is flipped under the retractable handle **114** to preclude the retractable handle **114** from any movement, which moves the elastomeric stopper **139** against the discharge port **113**, thereby sealing a back flow of the waste water **112** from the discharge outlet pipe **116**.

As exemplarily illustrated in FIG. **5**A, a shut off lever pin **152** is operably connected to the locking cam **140** to secure the locking cam **140** to the upper section **122***a* of the discharge pump body **122** and to enable a pivotal action of the locking cam **140** with respect to the discharge pump body **122**. The lever **119** is operably connected to the inlet valve body **121** as exemplarily illustrated in FIG. **2**. When a user applies force to actuate the lever **119**, the lever **119** opens a check valve **129** positioned within the inlet valve body **121**, exemplarily illustrated in FIG. **3**, to receive pressurized fresh water **106** from a fresh water source **107** exemplarily illustrated in FIG. **1**A, for flushing or rinsing.

FIGS. **5**B-**5**C exemplarily illustrate an isometric view and a cutaway view respectively, of the discharge check valve coupling **149** of the discharge pump assembly **124** exemplarily illustrated in FIG. **5**A, that removably connects the discharge port **113** to the discharge fitting **117** exemplarily illustrated in FIG. **5**A. One end **149***a* of the discharge check valve coupling **149** is removably connected to the discharge port **113** and the other end **149***b* is removably connected to the discharge fitting **117** as exemplarily illustrated in FIG. **5**A. The discharge check valve coupling **149** comprises a check valve member **149***d* axially positioned and connected within an inner cavity **149***c* of the discharge check valve coupling **149**. The check valve member **149***d* is, for example, a duckbill check valve. As used herein, the phrase "duckbill check valve" refers to a one-piece elastomeric plumbing component that functions as a backflow prevention device such as a one-way valve or a non-return valve. The check valve member **149***d* further comprises a frontal section **149***e* of a generally duckbill shape which opens and closes depending on the direction of flow of the waste water **112** exemplarily illustrated in FIG. **1**A.

As exemplarily illustrated in FIG. **5**C and FIGS. **10**A-**10**B, the discharge check valve coupling **149** allows the waste water **112**, to exit the pump cavity **134** of the discharge pump body **122** when the retractable handle **114** is actuated in the forward direction, as the frontal section **149***e* of the check valve member **149***d* opens to allow the flow of the waste water **112** from the discharge port **113** to the discharge fitting **117** as indicated by the arrows in FIG. **5**C. When the retractable handle **114** is actuated in a backward direction, a vacuum or suction is created in the pump cavity **134** and this suction causes the frontal section **149***e* within the check valve member **149***d* of the discharge check valve coupling **149** to close and prevent waste water **112** to flow back into the pump cavity **134** from the discharge fitting **117**.

FIG. **6** exemplarily illustrates a partial exploded view of the integral inlet valve assembly **123**. The inlet valve body **121** houses the first plunger **125**, the diaphragm member **130**, the second plunger **126**, the check valve **129**, and a plunger guide **153**. An inlet valve cap **154** secures the first plunger **125**, the diaphragm member **130**, the second plunger **126**, the plunger guide **153**, and the check valve **129** in position within the inlet valve cavity **127** of the inlet valve body **121**. The inlet valve cap **154** also guides the first plunger **125**. The inlet valve body **121** further provides, for example, water line connections from the fresh water source **107** to the toilet bowl **102** exemplarily illustrated in FIGS. **1**A-**1**B. The plunger guide **153** is positioned within the inlet valve cavity **127** and is operably connected to the second plunger **126**. The plunger guide **153** guides the second plunger **126** in the inlet valve cavity **127** keeping the second plunger **126** in axial alignment with the check valve **129**, and limits the inward movement of the second plunger **126** to prevent the second plunger **126** from extending beyond the check valve **129**. The plunger guide **153** contains an opening **153***a* at the end of the diaphragm member **130** to ensure that the pressurized fresh water **106**, exemplarily illustrated in FIG. **1**A, is not trapped in the diaphragm member **130** and allowed to drain from the diaphragm member **130**.

As exemplarily illustrated in FIG. **6**, a plunger guide seal **155** provides a water tight seal between the plunger guide **153**

and the inlet valve body **121**. The filter screen **128** is positioned proximal to the pressurized fresh water inlet port **105**. The filter screen **128** filters any large or small size particles present in the pressurized fresh water **106** supplied from the fresh water source **107**. A mounting bracket **156** is used to mount the inlet valve body **121**. The check valve **129** opens and closes with respect to the actuation of the second plunger **126** to direct the flow of pressurized fresh water **106** from the fresh water source **107** to the outlet port **109**. The outlet port **109** transfers the pressurized fresh water **106** from the inlet valve cavity **127** to the rim **103** of the toilet bowl **102** as exemplarily illustrated in FIG. **1**A. When the check valve **129** is closed, the flow of pressurized fresh water **106** is prevented from the fresh water source **107**.

As exemplarily illustrated in FIG. **6**, the diaphragm member **130** isolates the first plunger **125** from the second plunger **126** and provides a water tight seal between the inlet valve cap **154** and the plunger guide **153**. When a user actuates the lever **119** exemplarily illustrated in FIG. **1**B and FIG. **2**, the first plunger **125** moves inwardly in the inlet valve cavity **127** defined by the inlet valve body **121** to make contact with the diaphragm member **130**. The diaphragm member **130** in turn moves inwardly to contact the second plunger **126**, thereby actuating the second plunger **126**. The actuated second plunger **126** opens the check valve **129** to allow the flow of pressurized fresh water **106** from the fresh water source **107**.

FIG. **7** exemplarily illustrates a side view of a portion of a toilet **101**, showing the vacuum breaker **110** positioned above the rim **103** of the toilet bowl **102**. The vacuum breaker **110** is in fluid communication with the outlet hose **111** and prevents a back flow of the pressurized fresh water **106** exemplarily illustrated in FIG. **1**A, to the integral inlet valve assembly **123** from the rim **103** of the toilet bowl **102** via the outlet hose **111**. When the check valve **129** of the integral inlet valve assembly **123** exemplarily illustrated in FIG. **3** is opened, the pressurized fresh water **106** flows through the check valve **129** and flows through the outlet port **109** and the outlet hose **111** to the vacuum breaker **110**. The pressurized fresh water **106** is transferred to the rim **103** of the toilet bowl **102** after passing through the vacuum breaker **110**.

FIG. **8** exemplarily illustrates a sectional view of the vacuum breaker **110**. When the pressurized fresh water **106** exemplarily illustrated in FIG. **1**A, enters a lower opening **157** of the vacuum breaker **110**, the pressurized fresh water **106** moves in an upward direction inside an inner tube **158** centrally positioned within a housing **159** of the vacuum breaker **110**. A sealing plunger **160** is positioned proximal to an upper end **110***a* of the vacuum breaker **110** and is operably connected to the inner tube **158**. The pressurized fresh water **106** flowing upward through the inner tube **158** forces the sealing plunger **160** in an upward direction to seal an opening **161** to the atmosphere positioned at the upper end **110***a* of the vacuum breaker **110**. The sealing plunger **160** diverts the pressurized fresh water **106** in a downward direction around a breaker cavity **162** within the housing **159** of the vacuum breaker **110** and directs the flow of the pressurized fresh water **106** to an exit port **163** of the vacuum breaker **110** and to the rim **103** of the toilet bowl **102** exemplarily illustrated in FIG. **7**. The pressurized fresh water **106** in the rim **103** of the toilet bowl **102** may be partially contaminated from the waste water **112** already present in the toilet bowl **102**. When the pressurized fresh water **106** stops flowing, the sealing plunger **160** returns to its original position due to gravity and the opening **161** allows atmospheric air to enter the breaker cavity **162** thus breaking any vacuum and preventing a back flow of the pressurized fresh water **106** from the rim **103** of the toilet bowl **102** to the integral inlet valve assembly **123** via the outlet hose **111** exemplarily illustrated in FIG. **1**A and FIG. **7**.

FIGS. **9**A-**9**B exemplarily illustrate a side elevation views of the flushing apparatus **100**, showing the retractable handle **114**. The retractable handle **114** is, for example, a telescopic handle. The retractable handle **114** is positioned within the sleeve **135** of the connecting rod **132** exemplarily illustrated in FIG. **4**. When the retractable handle **114** is not in use, the retractable handle **114** is in a retracted position as exemplarily illustrated in FIG. **9**A. The retractable handle **114** can further be extended upwards or can slide from within the sleeve **135** in a substantially vertical direction in an upward direction and a downward direction as indicated by the arrows in FIG. **9**B. The movement of the retractable handle **114** in the upward direction and the downward direction provides an optimum leverage to a user to move the retractable handle **114** in a forward direction and a backward direction as disclosed in the detailed description of FIGS. **10**A-**10**B and FIGS. **13**B-**13**C. The user can also place the retractable handle **114** in a comfortable pumping position of choice. A locking cam **140** comprising the shut off lever **150** is positioned proximal to the retractable handle **114** and is used for locking the retractable handle **114** in position when the retractable handle **114** is moved in the forward direction as exemplarily illustrated in FIG. **10**B.

FIGS. **10**A-**10**B exemplarily illustrate sectional views of the flushing apparatus **100**, showing movement of the retractable handle **114** and the piston **133** of the discharge pump assembly **124**. A sectional view of the flushing apparatus **100**, showing the elastomeric stopper **139** and the locking cam **140** in a resting position is exemplarily illustrated in FIG. **10**B. When the retractable handle **114** is moved in a backward direction, the piston **133** moves in a backward direction to suction the waste water **112**, exemplarily illustrated in FIG. **1**A, into the pump cavity **134**, and when the retractable handle **114** is moved in a forward direction, the piston **133** moves forward to direct the flow of the waste water **112** to the discharge port **113** as disclosed in the detailed description of FIGS. **13**A-**13**C.

In an embodiment, the elastomeric stopper **139** of the discharge pump assembly **124** is attached to a rear surface **133***a* of the piston **133** of the discharge pump assembly **124**. The elastomeric stopper **139** seals the discharge port **113** to prevent a back flow of the waste water **112** into the toilet bowl **102** via the waste water pipe **120** in fluid communication with the discharge port **113** exemplarily illustrated in FIG. **1**B, after the piston **133** is completely pushed or moves to a forward position and locked in the forward position using the locking cam **140** as exemplarily illustrated in FIG. **10**B. In an embodiment, the locking cam **140** is pivotally connected to an upper section **122***a* of the discharge pump body **122** of the discharge pump assembly **124**. The locking cam **140** locks the retractable handle **114** when the piston **133** is completely pushed to the forward position by rotating and positioning the locking cam **140** below a lower end **114***a* of the retractable handle **114**. The locking cam **140** is rotated and positioned below the lower end **114***a* of the retractable handle **114** by actuating the shut off lever **150** exemplarily illustrated in FIGS. **9**A-**9**B.

FIG. **11**A exemplarily illustrate a cutaway view of the flushing apparatus **100**, showing a generally cup shaped geometry of the piston **133** of the discharge pump assembly **124**, configured to maintain a consistent stroke for the circular diaphragm **146** exemplarily illustrated in FIG. **11**B. In an embodiment, a predefined geometry of the piston **133** maintains a consistent stroke for the circular diaphragm **146**. An enlarged view of a portion marked A in FIG. **11**A, showing

the generally cup shaped geometry of the piston **133** is exemplarily illustrated in FIG. **11**B. When the retractable handle **114** is moved in a forward direction and a backward direction, the piston **133** in communication with the retractable handle **114** via the connecting rod **132** is actuated in a forward direction and backward direction, as indicated by the arrows in FIG. **11**B. The circular diaphragm **146** connected on the rear surface **133***a* of the piston **133** is actuated in a forward direction and a backward direction along an axis of stroke RR of the circular diaphragm **146**. Conventionally, when a piston having a non-specific geometry, for example, a round disc shaped piston is used, the circular diaphragm **146** may distort and misalign from the axis of stroke RR. In the flushing apparatus **100** disclosed herein, the predefined geometry defined, for example, by the cup shape of the piston **133** exemplarily illustrated in FIGS. **11**A-**11**B, enables the circular diaphragm **146** connected on the rear surface **133***a* of the piston **133** to maintain a consistent alignment with the axis of stroke RR of the circular diaphragm **146**.

FIG. **12** exemplarily illustrates a bottom perspective view of the flushing apparatus **100**, showing the discharge fitting **117** positioned at different angles. The discharge fitting **117** is removably connected to the discharge port **113** of the discharge pump assembly **124**. The forward movement of the retractable handle **114** pushes the waste water **112** exemplarily illustrated in FIG. **1**A, from the pump cavity **134** of the discharge pump body **122** to the discharge port **113** as exemplarily illustrated in FIG. **13**C. The discharge fitting **117** transfers the waste water **112** from the discharge port **113** to the waste holding tank **115** via the discharge outlet pipe **116** as exemplarily illustrated in FIG. **1**A. The discharge fitting **117** rotates, for example, about 360 degrees with respect to a vertical axis **164** of the discharge fitting **117** to connect to the discharge outlet pipe **116** at different angles.

FIGS. **13**A-**13**C exemplarily illustrate partial sectional views of the flushing apparatus **100** operably connected to a toilet **101**. FIG. **13**A shows the flow of waste water **112**, exemplarily illustrated in FIG. **1**A, from the toilet bowl **102** to the waste water inlet port **131** of the discharge pump assembly **124** through the waste water pipe **120**. FIG. **13**B shows movement of the retractable handle **114** in a backward direction for suctioning waste water **112** into the pump cavity **134** of the discharge pump body **122** of the discharge pump assembly **124**. FIG. **13**C shows movement of the retractable handle **114** in a forward direction for discharging the waste water **112** into the discharge port **113**. When the flushing process is initiated, the check valve **129** of the integral inlet valve assembly **123**, exemplarily illustrated in FIG. **3**, is opened using the lever **119** to transfer pressurized fresh water **106** from the fresh water source **107** to the rim **103** of the toilet bowl **102** through the inlet hose member **108** and the pressurized fresh water inlet port **105**, and then to the outlet port **109**, the outlet hose **111**, and the vacuum breaker **110** as exemplarily illustrated in FIGS. **1**A-**1**B, FIG. **2**, and FIG. **3**.

The pressurized fresh water **106** is flushed from the rim **103** into the toilet bowl **102** and the waste water **112** in the toilet bowl **102** is transferred through the waste water pipe **120** to the waste water inlet port **131** of the discharge pump assembly **124** as exemplarily illustrated in FIG. **13**A. When the retractable handle **114** is moved in the backward direction as exemplarily illustrated in FIG. **13**B, the piston **133** in communication with the retractable handle **114** via the connecting rod **132** is pulled in a backward direction, as shown by the arrow in FIG. **13**B, which causes the flapper valve member **138** positioned proximal to the lower section **134***a* of the pump cavity **134** of the discharge pump body **122** to open to suction the waste water **112** into the pump cavity **134**. When the retractable handle **114** is moved in the forward direction as exemplarily illustrated in FIG. **13**C, the piston **133** in communication with the retractable handle **114** via the connecting rod **132** is pushed in a forward direction, as shown by the arrow in FIG. **13**C, to allow the discharge of the waste water **112** through the discharge port **113**. The discharge fitting **117** is removably connected to the discharge port **113** to connect to a discharge outlet pipe **116** to transfer the waste water **112** to a waste holding tank **115** as exemplarily illustrated in FIG. **1**A.

FIG. **14** illustrates a method for receiving pressurized fresh water **106** and discharging waste water **112** without contamination of the pressurized fresh water **106**. The flushing apparatus **100** disclosed herein comprising the integral inlet valve assembly **123** and the operably isolated discharge pump assembly **124** as exemplarily illustrated in FIGS. **1**A-**1**B and FIGS. **2**-**4** and as disclosed in the detailed description of FIGS. **1**A-**1**B and FIGS. **2**-**4** is provided **1401**. The integral inlet valve assembly **123** disclosed herein comprises the pressurized fresh water inlet port **105**, the inlet valve body **121**, the check valve **129**, the lever **119**, the first plunger **125**, the second plunger **126**, and the outlet port **109** as disclosed in the detailed description of FIGS. **2**-**3**. The discharge pump assembly **124** disclosed herein comprises the waste water inlet port **131**, the discharge pump body **122**, the retractable handle **114**, the connecting rod **132**, the piston **133**, and the discharge port **113** as disclosed in the detailed description of FIG. **4**.

By actuating the lever **119** in communication with the first plunger **125** and the second plunger **126** of the integral inlet valve assembly **123**, and opening the check valve **129** of the integral inlet valve assembly **123**, pressurized fresh water **106** from a fresh water source **107** is received **1402** at the pressurized fresh water inlet port **105** of the integral inlet valve assembly **123** and the flow of the pressurized fresh water **106** is directed into the inlet valve cavity **127** of the inlet valve body **121**. The outlet hose **111** transfers **1403** the received pressurized fresh water **106** from the inlet valve cavity **127** of the inlet valve body **121** to a rim **103** of a toilet bowl **102** via the outlet port **109** of the integral inlet valve assembly **123**. The transferred pressurized fresh water **106** discharged from the rim **103** of the toilet bowl **102** into the toilet bowl **102** flushes and rinses **1404** the toilet bowl **102**. The waste water pipe **120** in fluid communication with the toilet bowl **102** drains **1405** the waste water **112** formed in the toilet bowl **102** by transferring the waste water **112** from the toilet bowl **102** to the waste water inlet port **131** of the discharge pump assembly **124**.

The waste water **112** is suctioned **1406** into the pump cavity **134** of the discharge pump body **122** of the discharge pump assembly **124** through the waste water inlet port **131** by actuation of the retractable handle **114** in a backward direction which pulls the piston **133** hingedly connected to the retractable handle **114** via the connecting rod **132** in a backward direction in the pump cavity **134**. The discharge port **113** discharges **1407** the suctioned waste water **112** contained in the pump cavity **134** to a waste holding tank **115** by actuation of the retractable handle **114** in a forward direction which pushes the piston **133** hingedly connected to the retractable handle **114** via the connecting rod **132** in a forward direction in the pump cavity **134** containing the suctioned waste water **112**. Since the integral inlet valve assembly **123** is independent and operably isolated from the discharge pump assembly **124**, pressurized fresh water **106** can be received into the rim **103** of the toilet bowl **102** without contamination while the waste water **112** is discharged.

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 affect numerous modifications thereto and changes may be made without departing from the scope and spirit of the invention in its aspects.

We claim:

1. A flushing apparatus, comprising:

an integral inlet valve assembly comprising:

a pressurized fresh water inlet port configured to receive pressurized fresh water from a fresh water source;

an inlet valve body fixedly connected to said pressurized fresh water inlet port, said inlet valve body comprising an inlet valve cavity in fluid communication with said pressurized fresh water inlet port, said inlet valve cavity configured to contain and transfer said pressurized fresh water from said fresh water source to a rim of a toilet bowl;

a check valve positioned in said inlet valve cavity of said inlet valve body and proximal to said pressurized fresh water inlet port, said check valve configured to open and close to direct a flow of said pressurized fresh water from said pressurized fresh water inlet port into said inlet valve cavity;

a lever positioned proximal to a distal end of said inlet valve cavity of said inlet valve body;

a first plunger positioned in said inlet valve cavity of said inlet valve body and operably connected between said lever and a second plunger, said first plunger, in communication with said lever, configured to actuate said second plunger;

said second plunger positioned in said inlet valve cavity of said inlet valve body and operably connected between said first plunger and said check valve, said second plunger, in communication with said first plunger, configured to actuate said check valve to open and close said check valve; and

an outlet port extending from said inlet valve body and in fluid communication with said inlet valve cavity of said inlet valve body, said outlet port configured to direct said flow of said pressurized fresh water from said inlet valve cavity to said rim of said toilet bowl through an outlet hose removably connected to and in fluid communication with said outlet port; and

a discharge pump assembly operably isolated from said integral inlet valve assembly to preclude waste water discharged from said toilet bowl via said discharge pump assembly from contaminating said pressurized fresh water transferred to said toilet bowl via said integral inlet valve assembly, said discharge pump assembly comprising:

a waste water inlet port positioned at a lower section of a discharge pump body, said waste water inlet port configured to receive said waste water from said toilet bowl via a waste water pipe;

said discharge pump body comprising a pump cavity in fluid communication with said waste water inlet port;

a retractable handle positioned above said pump cavity of said discharge pump body;

a connecting rod positioned within said pump cavity of said discharge pump body and hingedly connected between said retractable handle and a piston, said connecting rod, in communication with said retractable handle, configured to actuate said piston in a forward direction and a backward direction;

said piston positioned within said pump cavity of said discharge pump body and operably connected to said connecting rod, wherein said piston actuated in said backward direction by said connecting rod is configured to suction said waste water into said pump cavity, and wherein said piston actuated in said forward direction by said connecting rod is configured to discharge said waste water through a discharge port; and

said discharge port extending from said discharge pump body and in fluid communication with said pump cavity of said discharge pump body, said discharge port configured to discharge said waste water from said pump cavity to a waste holding tank.

2. The flushing apparatus of claim **1**, wherein said integral inlet valve assembly and said discharge pump assembly are positioned in close proximity behind a cover member to facilitate ease of operation of said flushing apparatus and a clean installation of said flushing apparatus.

3. The flushing apparatus of claim **1**, wherein said discharge pump body of said discharge pump assembly is oriented at a predefined inclination to a vertical axis for facilitating a flexible pumping action of said piston in communication with said retractable handle of said discharge pump assembly.

4. The flushing apparatus of claim **1**, wherein said lever of said integral inlet valve assembly is configured to actuate said check valve of said integral inlet valve assembly to allow said pressurized fresh water to rinse said toilet bowl, wherein said actuation of said check valve by said lever for rinsing said toilet bowl is independent of said discharge of said waste water from said toilet bowl through said discharge pump assembly.

5. The flushing apparatus of claim **1**, wherein said check valve of said integral inlet valve assembly is removably positioned within said inlet valve cavity of said integral inlet valve assembly to facilitate repair and maintenance of said integral inlet valve assembly.

6. The flushing apparatus of claim **1**, wherein said piston within said discharge pump body of said discharge pump assembly is oriented at a predefined inclination to a vertical axis to be in line with said discharge port of said discharge pump assembly to prevent clogging of said pump cavity of said discharge pump body and said discharge port.

7. The flushing apparatus of claim **1**, wherein said discharge pump assembly further comprises a piston cap operably connected proximal to a rear surface of said piston of said discharge pump assembly, wherein said piston cap is configured to secure a circular diaphragm to said piston.

8. The flushing apparatus of claim **7**, wherein a predefined geometry of said piston is configured to maintain a consistent stroke for said circular diaphragm.

9. The flushing apparatus of claim **1**, wherein said integral inlet valve assembly further comprises a filter screen fixedly attached to said pressurized fresh water inlet port of said

integral inlet valve assembly, wherein said filter screen is configured to trap microparticulates from said pressurized fresh water.

10. The flushing apparatus of claim **1**, wherein said integral inlet valve assembly further comprises a diaphragm member positioned between said first plunger and said second plunger of said integral inlet valve assembly and fixedly connected to opposing walls of said inlet valve cavity of said inlet valve body of said integral inlet valve assembly, wherein said diaphragm member is configured to isolate said first plunger from said second plunger.

11. The flushing apparatus of claim **1**, further comprising a vacuum breaker positioned above said rim of said toilet bowl, wherein said vacuum breaker is in fluid communication with said outlet hose and is configured to prevent a back flow of said pressurized fresh water to said integral inlet valve assembly from said rim of said toilet bowl via said outlet hose.

12. The flushing apparatus of claim **1**, wherein said retractable handle of said discharge pump assembly is secured within a sleeve of said connecting rod of said discharge pump assembly, wherein said retractable handle is configured to retract in a substantially vertical direction within said sleeve in an upward direction and a downward direction.

13. The flushing apparatus of claim **12**, wherein said sleeve of said connecting rod is configured as an integral socket to receive said retractable handle.

14. The flushing apparatus of claim **1**, wherein said discharge pump assembly further comprises a flapper valve member positioned proximal to said lower section of said pump cavity of said discharge pump body of said discharge pump assembly and secured to said waste water inlet port via a thread member, wherein said flapper valve member is configured to open during movement of said piston in said backward direction to transfer said waste water from said lower section of said pump cavity to an upper section of said pump cavity via said waste water inlet port, and close during movement of said piston in said forward direction to discharge said waste water contained in said upper section of said pump cavity through said discharge port.

15. The flushing apparatus of claim **14**, wherein said flapper valve member is further configured to prevent a back flow of said waste water to said toilet bowl via said waste water pipe in fluid communication with said pump cavity of said discharge pump body by closing said waste water inlet port.

16. The flushing apparatus of claim **1**, wherein said discharge pump assembly further comprises an elastomeric stopper attached to a rear surface of said piston of said discharge pump assembly, wherein said elastomeric stopper is configured to seal said discharge port of said discharge pump assembly to prevent a back flow of said waste water into said toilet bowl via said waste water pipe in fluid communication with said discharge port after said piston of said discharge pump assembly is completely pushed to a forward position and locked in said forward position using a locking cam.

17. The flushing apparatus of claim **16**, wherein said locking cam is pivotally connected to an upper section of said discharge pump body of said discharge pump assembly, wherein said locking cam is configured to lock said retractable handle when said piston is completely pushed to said forward position, by rotating and positioning said locking cam below a lower end of said retractable handle.

18. The flushing apparatus of claim **1**, wherein said discharge pump assembly further comprises a discharge fitting removably connected to said discharge port of said discharge pump assembly, wherein said discharge fitting is configured to transfer said waste water from said discharge port to said waste holding tank via a discharge outlet pipe.

19. The flushing apparatus of claim **18**, wherein said discharge fitting is further configured to rotate 360 degrees with respect to a vertical axis of said discharge fitting to connect to said discharge outlet pipe at a plurality of angles.

20. A method for receiving pressurized fresh water and discharging waste water without contamination of said pressurized fresh water, said method comprising:

providing a flushing apparatus comprising:

an integral inlet valve assembly comprising:

a pressurized fresh water inlet port;

an inlet valve body fixedly connected to said pressurized fresh water inlet port, said inlet valve body comprising an inlet valve cavity in fluid communication with said pressurized fresh water inlet port;

a check valve positioned in said inlet valve cavity of said inlet valve body and proximal to said pressurized fresh water inlet port;

a lever positioned proximal to a distal end of said inlet valve cavity of said inlet valve body, said lever operably connected to said check valve via a first plunger and a second plunger;

said first plunger positioned in said inlet valve cavity of said inlet valve body and operably connected between said lever and said second plunger;

said second plunger positioned in said inlet valve cavity of said inlet valve body and operably connected between said first plunger and said check valve; and

an outlet port extending from said inlet valve body and in fluid communication with said inlet valve cavity of said inlet valve body; and

a discharge pump assembly operably isolated from said integral inlet valve assembly to preclude said waste water discharged from a toilet bowl via said discharge pump assembly from contaminating said pressurized fresh water transferred to said toilet bowl via said integral inlet valve assembly, said discharge pump assembly comprising:

a waste water inlet port positioned at a lower section of a discharge pump body;

said discharge pump body comprising a pump cavity in fluid communication with a waste water pipe via said waste water inlet port, wherein said discharge pump body is positioned proximal to said integral inlet valve assembly at a predefined inclination to a vertical axis, wherein said predefined inclination of said discharge pump body is configured to facilitate a flexible pumping action of a piston in communication with a retractable handle of said discharge pump assembly;

said retractable handle positioned above said pump cavity of said discharge pump body, said retractable handle secured within a sleeve of a connecting rod of said discharge pump assembly, wherein said sleeve of said connecting rod is configured as an integral socket to receive said retractable handle;

said connecting rod positioned within said pump cavity of said discharge pump body and hingedly connected between said retractable handle and said piston;

said piston positioned within said pump cavity of said discharge pump body and operably connected to said connecting rod; and

a discharge port extending from said discharge pump body and in fluid communication with said pump cavity of said discharge pump body;

receiving said pressurized fresh water from a fresh water source at said pressurized fresh water inlet port of said integral inlet valve assembly and directing flow of said pressurized fresh water into said inlet valve cavity of

said inlet valve body by actuating said lever, in communication with said first plunger and said second plunger of said integral inlet valve assembly, and opening said check valve of said integral inlet valve assembly;

transferring said received pressurized fresh water from said inlet valve cavity of said inlet valve body to a rim of said toilet bowl via said outlet port of said integral inlet valve assembly and through an outlet hose removably connected to and in fluid communication with said outlet port;

flushing and rinsing said toilet bowl using said transferred pressurized fresh water discharged from said rim of said toilet bowl into said toilet bowl;

draining said waste water formed in said toilet bowl through said waste water pipe in fluid communication with said toilet bowl;

suctioning said waste water into said pump cavity of said discharge pump body of said discharge pump assembly through said waste water inlet port by actuating said retractable handle in a backward direction to pull said piston hingedly connected to said retractable handle via said connecting rod in a backward direction in said pump cavity; and

discharging said suctioned waste water contained in said pump cavity of said discharge pump body through said discharge port to a waste holding tank by actuating said retractable handle in a forward direction to push said piston hingedly connected to said retractable handle via said connecting rod in a forward direction in said pump cavity containing said suctioned waste water.

21. The method of claim **20**, further comprising preventing a back flow of said pressurized fresh water to said integral inlet valve assembly from said rim of said toilet bowl via said outlet hose, by a vacuum breaker positioned above said rim of said toilet bowl, wherein said vacuum breaker is in fluid communication with said outlet hose.

22. The method of claim **20**, wherein said retractable handle of said discharge pump assembly is configured to retract in a substantially vertical direction within said sleeve of said connecting rod of said discharge pump assembly in an upward direction and a downward direction.

23. The method of claim **20**, further comprising preventing a back flow of said waste water to said toilet bowl via said waste water pipe in fluid communication with said pump cavity of said discharge pump body of said discharge pump assembly via said waste water inlet port of said discharge pump assembly, using a flapper valve member to close said waste water inlet port, wherein said flapper valve member is positioned proximal to said lower section of said pump cavity and secured to said waste water inlet port via a thread member.

24. The method of claim **20**, further comprising preventing a back flow of said waste water from said discharge outlet pipe via said discharge port of said discharge pump assembly into said pump cavity of said discharge pump body of said discharge pump assembly using a discharge check valve coupling removably connected to said discharge port and a discharge fitting, when said retractable handle of said discharge pump assembly is actuated in said backward direction to pull said piston of said discharge pump assembly in said backward direction in said pump cavity and suction said waste water into said pump cavity via said waste water inlet port of said discharge pump assembly.

25. The method of claim **20**, further comprising allowing said waste water to exit said pump cavity of said discharge pump body of said discharge pump assembly via said discharge port of said discharge pump assembly using a discharge check valve coupling removably connected to said discharge port and a discharge fitting, when said retractable handle is actuated in said forward direction to push said piston of said discharge pump assembly in said forward direction in said pump cavity and discharge said waste water through said discharge port to said waste holding tank.

26. The method of claim **20**, further comprising preventing a back flow of said waste water into said toilet bowl via said waste water pipe in fluid communication with said discharge port of said discharge pump assembly, using an elastomeric stopper attached to a rear surface of said piston of said discharge pump assembly to seal said discharge port, after said piston of said discharge pump assembly is completely pushed to a forward position and locked in said forward position using a locking cam, wherein said locking cam is pivotally connected to an upper section of said discharge pump body of said discharge pump assembly, and wherein said locking cam is configured to lock said retractable handle when said piston is completely pushed to said forward position by rotating and positioning said locking cam.

27. The method of claim **20**, further comprising transferring said waste water from said discharge port to a waste holding tank via a discharge outlet pipe using a discharge fitting removably connected to said discharge port of said discharge pump assembly, wherein said discharge fitting is configured to rotate 360 degrees with respect to a vertical axis of said discharge fitting to connect to said discharge outlet pipe at a plurality of angles.

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