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## (54) Title: LEVER PUMP FOR USE IN ANAL IRRIGATION

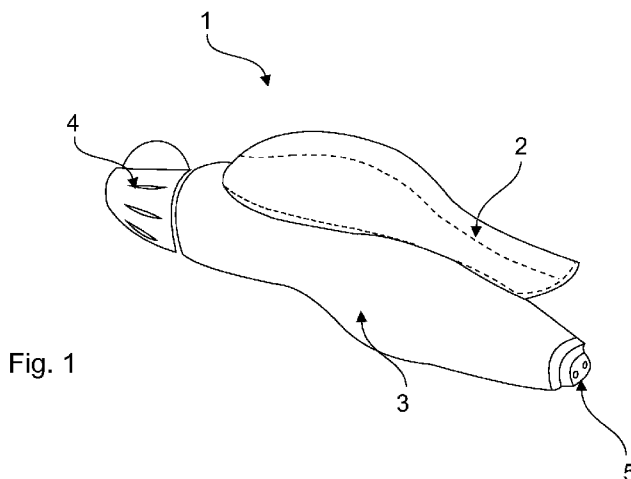


Fig. 1

(57) Abstract: A lever pump (1) for use in anal irrigation is provided. Such a pump has an actuating handle (2) which the user moves up and down. Due to the length of the handle, the handle functions as a lever to the pump mechanism. The pump mechanism may be in the form of a piston (106) including a rod with a plunger (107) movable with respect to a cylinder (109), like a syringe. The pump mechanism may also be in the form of a bellows (607), a compressible bulb (507) or a resilient element of foam (706). The pump may be adapted for pumping liquid, which is possible due to large lever effect of the handle. The pump may include a volume delimiter (350) enabling the pump to be disabled after a preset amount of fluid has been dispensed. The pump may also be adapted for pumping air and may then include a control unit (490) for controlling whether the air flows to a balloon of an anal probe or to a reservoir bag including the irrigation liquid. A system for use in anal irrigation including a lever pump is also provided.



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## Lever Pump for use in Anal Irrigation

The invention relates to a lever pump that is used in connection with anal irrigation. The invention further relates to a system for use in connection with anal irrigation.

### Background

- 5 Anal irrigation is one of a number of treatments used to aid people with bowel problems. People suffering from bowel problems are often paralysed typically due to spinal cord injuries and confined to a wheelchair or hospitalised. In these situations, the peristaltic functions, i.e. the reflexes and muscles of the bowel, often cannot be stimulated correctly. This results in constipation or random discharge of bowel contents. By using anal  
10 irrigation, a stimulation of the peristaltic movements of the colon can be provided.

- To perform such anal irrigation a device comprising an anal probe, also called anal catheter or speculum, is provided. The anal probe is inserted into the rectum through the anus. The anal probe is typically retained in the rectum by retention means, most commonly a balloon, which is inflated against the wall of the rectum. A liquid, such as  
15 water or a saline solution, is introduced into the rectum through the anal probe. The amount of liquid is generally below 1,5 litres, depending on the person. The liquid is contained in a reservoir prior to use. The reservoir may for example be in the form of a canister or a reservoir bag.

- Usually, a pump is used for pumping the liquid into the rectum. The pump may be adapted  
20 for pumping the liquid directly (for example a self-priming pump) or for pumping air into the reservoir (for example an air-pump) and thereby displacing the liquid from the reservoir. In both cases the liquid flows from the reservoir through a tube into the anal probe and from there into the rectum. Particularly, if the system is to be used by the paralysed person it is an advantage if the pump is easy to use for people with poor hand dexterity.

### 25 **Description of related art**

- WO05032617 relates to methods for delivering a colonic lavage with pulsating action produced by operating a manual pump. The method generally entails delivering a lavage liquid to a patient's colon, pulsating the lavage liquid within the colon by operating a manual pump. The manual pump can be a squeeze bulb disposed in-line with a delivery  
30 line. The manual pump can be formed of a rubber, polyvinylelastomer or similar material.

The reservoir is hung from a stand to elevate the reservoir above the patient and allow gravity feed of liquid to the patient

## Summary of the Invention

The invention concerns a pump, which is particularly easy to use for people with poor hand dexterity. The pump has a handle with a lever connected to the interior of the pump so that the lever may be used to perform the pumping action. The lever pump may be used in connection with anal irrigation.

In connection with anal irrigation, the user sometimes wants to measure exactly how much liquid has entered into the rectum. For this purpose, the lever pump may be equipped with a volume delimiter for pre-setting the amount of air or liquid passing through it.

The lever pump may be used for pumping liquid directly into the catheter and from there into the rectum. It may also be used for pumping air into the retention means at the probe as well as for pumping air into the reservoir to displace the liquid.

## Detailed Description of the Invention

In a first aspect, the invention relates to a pump for use in anal irrigation comprising a pump house defining a longitudinal direction of the pump and including a pump mechanism and a handle, wherein the handle is adapted for providing a lever effect to the pumping action upon movement of the handle in a direction transverse to the longitudinal direction.

A lever pump is particularly easy to use for people with poor hand dexterity because less strength is needed to use the pump due to the design of the handle on the pump. The length of the handle on the pump provides a lever effect to the pumping action.

Such a pump may be used for pumping liquid. The pump is able to pump liquid from a reservoir bag standing on the floor to the pump placed in the lap of a user and further into an anal probe inserted in the user's rectum.

The pump may also be used for pumping air in which case the pump pumps air into a reservoir bag or canister thereby displacing the liquid from the reservoir bag or canister.

The liquid travels through a liquid tube to the anal probe and from there further on into the rectum.

The irrigating liquid may be any suitable medium such as tap water, isotonic salt water, sterile water or oily substances.

- 5 The pump may be adapted for placing in the lap for use by the hands of a user. In other words, the pump has a limited size and weight so that it can be placed in the lap. Furthermore, the force needed to activate the pump is a force that can easily be applied by the hands of a user.

- 10 The pump may be in the form of a lever pump having a pivotable pump handle and a support defining a longitudinal direction of the pump and wherein, the cylindrical housing element of the control unit is transverse to the longitudinal direction of the pump.

- The pump has two extreme positions, a relaxed position and a compressed position. In a relaxed position, the pump is ready to start pumping and the pump mechanism is filled with air that can be removed upon compression of the pump mechanism. In the
- 15 compressed position, (almost) all of the air has been removed from the pump mechanism. The pump handle pivots around an axis extending transverse to the longitudinal direction of the pump. In the relaxed position, the pump handle defines an angle with respect to the longitudinal direction of the pump. In the compressed position, the pump handle is substantially parallel to the longitudinal direction of the pump.

- 20 When the pump handle pivots, it actuates a pump mechanism supported by the support of the pump. The pump mechanism in the lever pump may be a bellows element, a foam element, a bulb element or a piston element. All of these pump mechanisms works well with a lever actuator (the pivotable handle). The pump mechanism as such forms no part of this invention and will not be discussed further.

- 25 The pump may be approximately 15 cm in the longitudinal direction and approximately 5 cm in the transverse direction. The pump handle may be approximately 10 cm in the longitudinal direction and extend in an angle of between 30 and 45 degrees with respect to the support, when the pump is in the relaxed position.

The pump mechanism may be in the form of a piston coupled to the handle so that movement of the handle in the direction transverse to the longitudinal direction of the pump house causes movement of the piston in a longitudinal direction.

Such a pump provides a linear pumping movement with respect to the longitudinal direction of the pump house. The linear pumping movement is directly transferred to the piston. The piston is fitted narrowly into a cylinder. Due to the narrow fit between the piston and the cylinder, the pump is able to transfer almost all of the pressure that is applied to the handle of the pump directly to the pressure in the piston, and thereby to the water in the pump.

10 The handle may be connected to the piston via a rack and pinion connection or via a direct linkage. Both mechanisms are well-known in the art.

A piston pump mechanism can be made of materials such as Polycarbonate, Acetal (Delrin) or Polypropylene. However, many other materials are also possible.

15 The pump mechanism may also be in the form of a compressible bulb and a pressure-applying element coupled to the handle. The pressure-applying element may be made integrally with the handle. The bulb may be made of a material such as Polyvinyl Chloride (PVC), Urethane, or Silicone.

In an embodiment, the pump mechanism is in the form of a bellows element that cooperates with the handle of the pump. The bellows may be made of materials such as Urethane, Silicone, or Polypropylene. The bellows could be made of a flexible rubber-like material but it may also be made of a blow-molded plastic material.

In an embodiment, the pump mechanism is in the form of a resilient element of foam material that cooperates with the handle of the pump. When the pump is to be used, the foam element is compressed by the pressure applied to the handle, and the air captured or enclosed in the pores of the foam element is released due to the pressure. When the pressure at the foam element is removed, the foam element will suck in air to fill the pores of the foam. The foam material may be Polyurethane (PU) foam. The foam is selected to provide an optimum balance between the force needed to compress it (compression force) and the resiliency so that the user does not have to wait too long before being able to give the next stroke. PU foam of a density of approximately 40-45 kg/m<sup>3</sup> has been found to provide the right balance between the compression force and the resilience.

In an embodiment the foam element may be enclosed in a liquid tight foil. Thereby the pump can be used and withstand spilling of water at the pump. The foil may consist of a layer of Polyurethane of approximately 0.5 mm.

To prevent the foam element from buckling during the pumping action, the element may  
5 be provided with collapsing lines. The collapsing lines may be provided along the sides of the foam element, that is, the surfaces of the foam element transverse to the longitudinal direction of the pump. These surfaces are in the direction of the movement of the handle. By providing these surfaces with a collapsing line in the longitudinal direction of the pump, the foam element will be prone to collapse at these collapsing lines and will thus not  
10 buckle sideways upon movement of the handle.

The pump house and handle may be made of a material such as high impact Acrylonitrile Butadiene Styrene (ABS).

In an embodiment of the invention, the pump is adapted for pumping liquid. If the pump is adapted for pumping liquid, then the requirements for a reservoir bag in a system for use  
15 in anal irrigation will be reduced. The reservoir bag may then be any regular liquid-tight bag and need not be able to withstand pressure inside the bag.

If the pump is adapted for pumping liquid, the cylinder may be connected to an internal liquid tube extending from the cylinder to an outside surface of the pump house. From there it may be connected to a liquid tube, which is connected to a reservoir bag.  
20 Preferably, the pump house has a connector in one end that connects to the liquid tube, which provides liquid from the reservoir bag. Then the internal liquid tube extends between this connector and the cylinder. The internal liquid tube is provided with a one-way valve so that liquid only flows one way through the system. The end of the cylinder facing away from the piston is provided with an outlet tube in connection with the outlet  
25 from the pump. The cylinder or the outlet tube is also provided with a one-way valve. Such one-way valves are well-known in the art and form no part of this invention.

The outlet from the pump may be in the form of a connector for connecting a liquid tube to the anal probe.

The pump may also be adapted for pumping air in which case the internal liquid tube will  
30 not be present. Instead, the cylinder is provided with an air inlet through a one-way valve mechanism and an air outlet at the end of the cylinder facing away from the piston. The

outlet is also provided with a one-way valve. The outlet communicates with a connector on the pump house. The connector connects one or more air tubes to the pump.

If the pump is used for pumping air, then no part of the pump will come into contact with liquid. Therefore, the pump may be re-used for a long period of time.

- 5 If the pump is adapted for pumping liquid, then the pump may comprise means for dismantling the pump, allowing the pump mechanism to be dried after use.

When liquid has come into contact with the pump mechanism, it is an advantage if the pump mechanism can be dried out before the pump is used again. By drying the pump mechanism thoroughly after each use, the growth of bacteria inside the pump is  
10 minimized, thus enabling the pump to be used numerous times before being replaced.

In an embodiment, the dismantling means include a cap at one end of the pump house. The cap may be attached to the pump house by means of a bayonet fitting, a snap fitting or a screw thread. A cap at one end makes it possible to remove the part of the pump mechanism that comes into contact with water, for example the piston and cylinder,  
15 through the end of the pump house. Thereby the piston including the cylinder and the water tube can be cleaned and dried after use.

If the pump mechanism includes a compressible bulb, the pump house and the compressible bulb may each be made in two parts so that they are easy to disassemble. Thereby the two parts and the internal water tubes can be cleaned and dried after use.  
20 Likewise, if the pump mechanism includes a bellows, the pump house can be made so it can be opened. Thereby the bellows and the internal water tubes can be dried and cleaned.

The pump may comprise means for controlling the volume. These means include a switch which is attached to the pump house so that it may be operated from the outside.

- 25 The switch may be in the form of a slider.

In one embodiment, the slider switch is a true volume limiter in that it can be preset by the user to deliver a prescribed volume of water, after which the pump will be disabled until it is reset by the user.

The switch system may comprise two adjacent sliding elements whose range of motion is the distance required to move the piston between its two extremes. These sliding elements can be locked together or move independently, but in the case of independent movement they are spring loaded so that they tend to return to the same relative positions they would have if they were locked together.

The sliding elements are coupled to the slider switch so that a user may preset the slider switch for a certain amount of liquid.

When the pump has delivered the preset amount of liquid, the sliding elements will dislocate the handle of the pump, giving the user an immediate feedback that the pump has delivered the desired amount of liquid.

In other embodiments, the slider may be either incrementing or decrementing volume indicators, also re-settable by the user. These later embodiments do not affect the operation of the pump.

Another aspect of the invention relates to a system for use in anal irrigation comprising a reservoir bag, an anal probe for insertion into the rectum, a pump as described above, a first liquid tube for connecting the pump and the reservoir bag, and a second liquid tube for connecting the pump and the anal probe.

Such a system uses a liquid pump which means that the system is simple, and the reservoir bag can be any liquid tight bag.

In yet another aspect, the invention relates to a system for use in anal irrigation comprising a reservoir bag, an anal probe for insertion into the rectum, a pump as described above, an air tube for connecting the pump and the reservoir bag, and a liquid tube for connecting the reservoir bag and the anal probe.

Such a system uses an air pump whereby the pump can be re-used repeatedly as it does not get into contact with liquid.

In an embodiment, the anal probe comprises retention means in form of an inflatable balloon, a balloon air tube and a balloon pump for pumping air into the balloon.

Retention means allows the anal probe to keep itself in the rectum for the required time, and therefore the user does not have to hold it through-out the procedure. When the user has finished the procedure, he can deflate the balloon and remove the anal probe.

## **Brief Description of the Drawing**

- 5 Figure 1 illustrates a pump including a handle functioning as a lever according to the invention.

Figure 2 illustrates a tube for connecting to the pump, where the tube further includes a connector for connecting to a reservoir bag.

- 10 Figures 3 and 4 illustrate an embodiment of a pump according to the invention in assembled use-situation and in disassembled cleaning situation.

Figures 5 and 6 illustrate two different embodiments of transferring the movement of the handle to the pump mechanism.

Figures 7 and 8 illustrate an embodiment of a pump according to the invention including a volume delimiter.

- 15 Figure 9 illustrates an exploded view of the volume delimiter in more detail.

Figures 10 and 11 illustrate a pump that includes a control unit.

Figures 12 and 13 illustrate an embodiment of the pump including a compressible bulb.

Figure 14 illustrates an embodiment of the pump including a bellows.

Figure 15 illustrates an embodiment of the pump including a foam element.

## **20 Detailed Description of the Drawing**

Figure 1 illustrates a pump 1 according to the invention. The pump includes a handle 2 which, when in use, is adapted to be moved up and down to provide the pumping effect of the pump 1. The handle 2 functions as a lever due to its length, and it is able to provide a relatively large pumping effect compared to other types of pumps.

The pump **1** further includes a pump house **3** including the pump mechanism (not shown). At one end, the pump **1** may include a cap **4** for opening into the pump mechanism so that the inside of the pump may be dried. At the other end, the pump **1** includes a connector **5** for connecting a tube to the pump **1**.

- 5 Figure 2 illustrates a tube **10** for use with a pump **1** according to the invention. The tube **10** includes a pump connector **11** in one end for connecting to the pump **1** and a reservoir connector **12** in the other end for connecting to a reservoir bag (not shown). The reservoir connector **12** may include a plug **13** for closing the reservoir during use so that spillage is avoided. Furthermore, the tube **10** includes a suction part **14** which may be in the form of  
10 a tube or pipe for entering into the liquid so as to suck it up through the pump.

Figures 3 to 5 illustrate a pump **100** according to the invention, which pump comprises a handle **102** and a pump house **103** including the pump mechanism **101**. Figure 3 illustrates the pump in use configuration and figure 4 illustrates the pump in disassembled configuration. Figure 5 illustrates a schematic drawing of an embodiment of the pump  
15 mechanism.

The pump house comprises a cap **104** for opening into the pump mechanism so that the part of the pump mechanism that has been in contact with liquid can be dried. The pump also comprises a connector **105** at the end of the pump house opposite the cap **104**. In this embodiment, the pump mechanism **101** comprises a piston **106** that comprises a  
20 plunger **107** and a rod **108**. The piston itself moves in a cylinder **109**.

In figure 5, the pump mechanism **101** is illustrated as a rack and pinion mechanism comprising a rack **110** and a pinion **111**. The pinion **111** is connected to the handle **102** through a connecting rod **112** and is, upon actuation from the handle **102**, able to rotate around an axle **113**. The rack **110** is in one end connected to a spring **114** and in the other  
25 end to the rod **107** of the piston. The spring **114** will urge the rack **110** to the original position when pressure on the handle is released.

The pump of this embodiment is adapted for pumping liquid, and for this purpose the pump comprises an internal liquid tube **115** running from the connector **105** to the cylinder **109**. The internal liquid tube **115** is provided with a one-way valve (not shown) so that the  
30 liquid only flows from the connector **105** to the cylinder **109**. The internal liquid tube forms an inlet **116** for the cylinder in the end opposite the connector **105**. The cylinder is placed at the end opposite the plunger **108**, which is provided with an outlet tube **117** which also

includes a one-way valve (not shown). The outlet tube **117** terminates in the outlet **118** from the pump.

Figure 6 illustrates another pump mechanism **201** to be incorporated in a pump according to the invention. Only the pump mechanism is illustrated. It is contemplated that the other parts of the pump can be as illustrated in figures 3 to 5. This pump mechanism **201** connects the handle **202** via a linkage **210** to the rod **207** of the piston **206**. As with the embodiment of figures 3 to 5 the piston **206** also comprises a plunger **208** fitting in a cylinder **209**. The linkage **210** comprises a protrusion **211** on the rod **207** adapted for moving inside a cavity **212** on a protrusion **213** on the handle **202**. Thereby, actuation of the handle **202** in upwards and downwards direction will be transferred to a direction on the rod **207** left and right of the figure.

Figures 7 to 9 illustrate an embodiment of a pump **300** according to the invention, wherein the pump includes a volume delimiter. Figures 7 and 8 illustrate how the volume delimiter may be operated from the outside of the pump. Figure 9 illustrates an exploded view of a volume delimiter incorporated in a pump mechanism including a linkage as the one in figure 6.

The pump **300** in figure 7 includes a volume delimiter which may be operated by turning a switch **330** at one end of the pump.

The volume delimiter of the pump **300** in figure 8 is operated by sliding a switch **330**.

Figure 9 illustrates part of a pump **300** including a volume delimiter **350**. Only the inside parts of the pump are illustrated, thus the pump house is not shown. The pump **300** includes a handle **302** connected to the pump mechanism **301** including a piston (not shown). The piston comprises a plunger **308** and a rod **307**. The volume delimiter comprises an upper sliding element **351** and a lower sliding element **352**. The upper sliding element **351** is permanently connected with the handle **302** of the pump by a linkage **310**. The linkage in the embodiment in figure 6 is used to connect the handle to the rod **307** of the piston. When a volume delimiter is incorporated in the pump, the sliding elements are incorporated between the linkage **310** and the rod **307**. The lower sliding element **352** is connected directly to the rod **307** of the piston. The upper sliding element **351** moves forward in the direction of the plunger **308** when the handle **302** is depressed. The upper and lower sliding elements interconnect through a recess **353** in the upper sliding element **351** and a protrusion **354** in the lower sliding element **352**. The protrusion

**354** is placed on a spring-loaded engagement plate **355** which is pivotable about an axis extending in the plane of the sliding elements. Thereby the engagement plate **355** is pivotable from an engagement position in the plane of the lower sliding element **351** to a disconnected position below the lower sliding element **351**. In the engagement position, the protrusion **354** extends upwards beyond the upper surface of the lower sliding element **352** so that it may engage with the recess **353** of the upper sliding element **351**. The position of the engagement plate **355** is controlled by a spring (not shown) urging it to the disconnected position and a control element **370** which in cooperation with an engagement arm **356** is able to urge it in the engagement position, as described later on.

The engagement arm **356** and the engagement plate **355** are connected to each other through a common hinge (not shown) connecting them to the lower sliding element **352**. Thereby, the two parts will be able to pivot together around the hinge along the side of the lower sliding element.

The control element **370** comprises a button **371** operated by the user. The button is attached to a first end **372** of a leaf spring **373**. The leaf spring **373** defines an angle of approx. 90 degrees having a protruding angle cam **374** at the turn and extends from the cam **374** to a second end **375**. At the second end **375**, the leaf spring has a protruding engagement cam **376**, which is used to hold the engagement plate **355** in engagement position by cooperating with the engagement arm **356**.

The leaf spring **373** has the effect that a user is able to push the button **371** inwards to disengage an edge **377** of the control element from connection to a lead screw **378**. When the edge **377** is disconnected, the button **371** and the control element **370** may be moved along the lead screw **378** to a position indicating the desired volume. The lead screw **378** turns a prescribed angle for each actuation of the pump handle **302**. Through the turning, the lower sliding element **352** is moved. The turning of the lead screw **378** is controlled by a ratchet mechanism **380** at one end of the lead screw **378**. Such ratchet mechanisms are well-known in the art and will only be described briefly. The ratchet mechanism **380** comprises two parts: a pawl **381** and a cylindrical element **382** that has a screw thread **383**. The pawl **381** comprises an end piece **384** and two resilient arms **385a**, **385b** each with a protrusion **386a**, **386b** at the end. The protrusions **386a**, **386b** are adapted for cooperating with the screw thread **383**. The protrusions have a right-angled leading surface **387** and an acute-angled trailing surface **388**. When the pawl **381** is actuated at the end piece **384** in the direction indicated by the arrow, it will, through the engagement between the protrusions and the screw thread, force the cylindrical element **382** to turn in the direction dictated by the screw thread **383**. When actuation of the pawl **381** is stopped,

the pawl will bounce back over the screw thread to the starting position due to the acute angled trailing surface and the urging of the spring **389**.

The ratchet **380** is actuated through means (for example a linkage, a rod or the like, not shown) connected to the handle or the linkage **310**. These means are able to provide an impact on the end piece **384** of the pawl when the handle **302** is actuated. Such a connection is well-known in the art and will not be described further.

Figures 10 and 11 illustrate a pump **400** according to the invention, where the pump has an integrated control unit **490**. The integrated control unit **490** may be used when the pump is adapted for pumping air. Then the pump may be switched between pumping air into the retention means on the probe, pumping air into a reservoir bag to displace the liquid in the bag, and a position where the retention means can be deflated. The three positions are indicated by symbols on the pump. The first symbol **491** indicates that in this position the pump pumps air into the tube extending to the retention means at the anal probe. The second symbol **492** indicates that in this position the pump deflates the retention means, and the third symbol **493** indicates that in this position the pump pumps air into the reservoir bag in order to displace liquid contained in the bag to the anal probe and into the rectum.

When the knob **494** of the control unit is turned, it sets the position of a three-way valve integrated in the pump (not shown). Such a three-way valve is well-known in the art and will only be described briefly.

The valve is composed of two basic parts, the body and the actuator. As explained with the earlier embodiments, there is a one-way valve between the pump mechanism and the valve, so air can only flow into the valve. The body is a cylinder with the air intake on one side and the outflow to the reservoir bag, positioned at the bottom of the cylinder, on-axis. Opposite the air intake is a vent. The actuator is a knob **494** that can be turned by the user over a 180 degree range, which encompasses three positions, and includes a cylindrical shape that fills the open end of the cylinder in the body. The actuator also incorporates the outflow channel to the retention means, on-axis.

In the first actuator position, air is directed from the intake on the side of the cylinder to the on-axis outflow on the actuator and hence to the balloon. Flow is blocked to and from the water bag. In the second position, 90 degrees from the first, flow is blocked to and from the balloon and air is directed from the intake to the on-axis outflow to the water bag. In

the third position, 180 degrees from the start, flow is blocked to and from the water bag, and permitted to deflate the balloon between the balloon and the vent.

The air intake is in communication with the outflow from the piston of the pump and the outflow is in communication with an outflow from the pump. The pump comprises two  
5 outflows – one for the bag and one for the retention means. Furthermore, the pump comprises an air intake, which may be placed anywhere. The outflow(s) are preferably placed either at each end of the pump house either one in each end or as a double lumen tube outlet in one end.

Figures 12 and 13 illustrate another pump **500** according to the invention. The pump **500**  
10 includes a handle **502** and a pump house **503** with the pump mechanism **501**. Figure 12 illustrates the pump in use configuration and figure 13 illustrates the pump in disassembled configuration. Some details are only illustrated in one of the figures. The pump of figures 12 and 13 can be disassembled for drying because the pump house **503** is separated in two parts **503a**, **503b**. The pump also comprises a connector **505** at the  
15 end of the pump house. In this embodiment, the pump mechanism **501** comprises a compressible bulb mechanism **506**. The mechanism **506** comprises a bulb **507** and a pressure-applying element **508**. As seen in figure 13, the bulb **507** can also be disassembled in two parts **507a**, **507b** so that it can be dried.

The pump of this embodiment is adapted for pumping liquid, and for this purpose the  
20 pump comprises an internal liquid tube **515** running from the connector **505** to the bulb **507**. The internal liquid tube **515** is provided with a one-way valve (not shown) so that the liquid only flows from the connector **505** to the bulb **507**. The internal liquid tube forms an inlet **516** for the bulb in the end opposite the connector **505**. An outlet tube **517** extends from a bulb outlet **519** in the bulb **507** to an outlet **518** from the pump. The outlet tube **517**  
25 also includes a one-way valve (not shown).

Figure 14 illustrates yet another pump **600** according to the invention. This pump is adapted for pumping air – however, the same pump mechanism **601** may be used in a pump adapted for pumping liquid. The pump **600** is provided with a handle **602**. The pump mechanism **601** of the pump comprises a bellows element **607** placed in the pump house  
30 **603**. The handle **602** and the bellows element **607** are placed so that, in use, the handle **602** is able to apply pressure to the bellows element **607**. The bellows element **607** has an inlet **616** in form of a one-way valve. The bellows element **607** sucks in air from the ambience through the inlet **616**. Furthermore, the pump **600** has one or more outlets **618**

from the bellows element. Thus air can be delivered selectively to a balloon at an anal probe or to a reservoir for the irrigation liquid.

Although the pump **600** is illustrated as an air pump, it may be adapted to be used for pumping liquid. In that case, the pump house would be openable and it would include two  
5 internal liquid tubes, one for sucking liquid to the bellows and one for delivering it from the bellows to the outlet from the pump. When the pump house is openable, the bellows and the internal liquid tubes can be removed to be cleaned and dried.

Figure 15 illustrates yet another pump **700** according to the invention. In this pump **700**, the pump mechanism **701** is in the form of a foam element **706**. The pump includes a  
10 handle **702**, which, when actuated, provides the pumping pressure to the foam element **706**. The pump **700** has an integrated control unit **790**. The control unit **790** basically functions as the control unit described in figure 11. The control unit **790** has a handle **794**  
to operate the control unit **790**. When the handle **794** of the control unit is turned, it sets the position of a three-way valve **795** integrated in the pump. In this embodiment, the air  
15 inlet to the pump **705** is provided at the control unit, whereas the air outlet **718** is provided as a snorkel placed below the foam element **706**.

## Claims

1. A pump for use in anal irrigation comprising an elongated pump house defining a longitudinal direction of the pump and including a pump mechanism and a handle, wherein the handle is adapted for providing a lever effect to the pumping action upon movement of the handle in a direction transverse to the longitudinal direction.
2. A pump according to claim 1, wherein the pump mechanism is in the form of a piston coupled to the handle so that movement of the handle in the direction transverse to the longitudinal direction of the pump house causes movement of the piston in a longitudinal direction.
3. A pump according to claim 1, wherein the pump mechanism is in the form of a compressible bulb cooperating with a pressure-applying element coupled to the handle.
4. A pump according to claim 1, wherein the pump mechanism is in the form of a bellows element actuated by the handle.
5. A pump according to claim 1, wherein the pump mechanism is in the form of a resilient element of foam material that cooperates with the handle of the pump.
6. A pump according to claim 5, wherein the foam element is enclosed in a liquid tight foil.
7. A pump according to any of claims 5 or 6, wherein the foam element is provided with collapsing lines.
8. A pump according to any of claims 1 to 4, wherein the pump is adapted for pumping liquid.
9. A pump according to claim 8, wherein the pump comprises means for dismantling the pump allowing the pump mechanism to be dried after use.
10. A pump according to claim 9, wherein the dismantling means includes a cap at one end of the pump house.

11. A pump according to claim 9, wherein the pump house is made in two parts so that the pump house may be disassembled for providing access to the parts of the pump.
12. A pump according to any of the preceding claims, wherein the pump comprises means for controlling the volume provided by the pump.
- 5 13. A pump according to claim 12, wherein the volume control comprises a slider switch.
14. A pump according to claim 13, wherein the slider switch is a true volume delimiter so that it can be preset to deliver a certain amount of liquid upon which delivery the pump will be disabled.
15. A pump according to claim 13, wherein the slider switch comprises incrementing or  
10 decrementing volume indicator means.
16. A system for use in anal irrigation comprising a reservoir bag, an anal probe for insertion into the rectum, a pump according to any of the preceding claims, a first liquid tube for connecting the pump and the reservoir bag and a second liquid tube for connecting the pump and the anal probe.
- 15 17. A system for use in anal irrigation comprising a reservoir bag, an anal probe for insertion into the rectum, a pump according to any of the preceding claims, an air tube for connecting the pump and the reservoir bag and a liquid tube for connecting the reservoir bag and the anal probe.
18. A system according to any of claims 16 or 17, wherein the anal probe comprises  
20 retention means in form of an inflatable balloon, a balloon air tube and a balloon pump for pumping air into the balloon.

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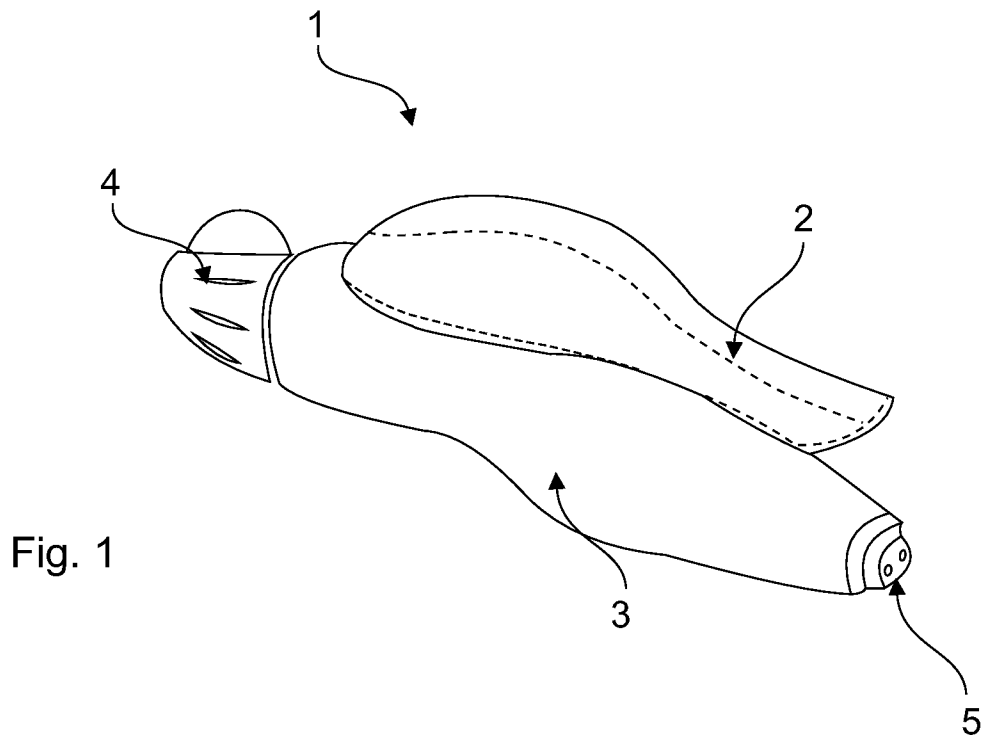


Fig. 1

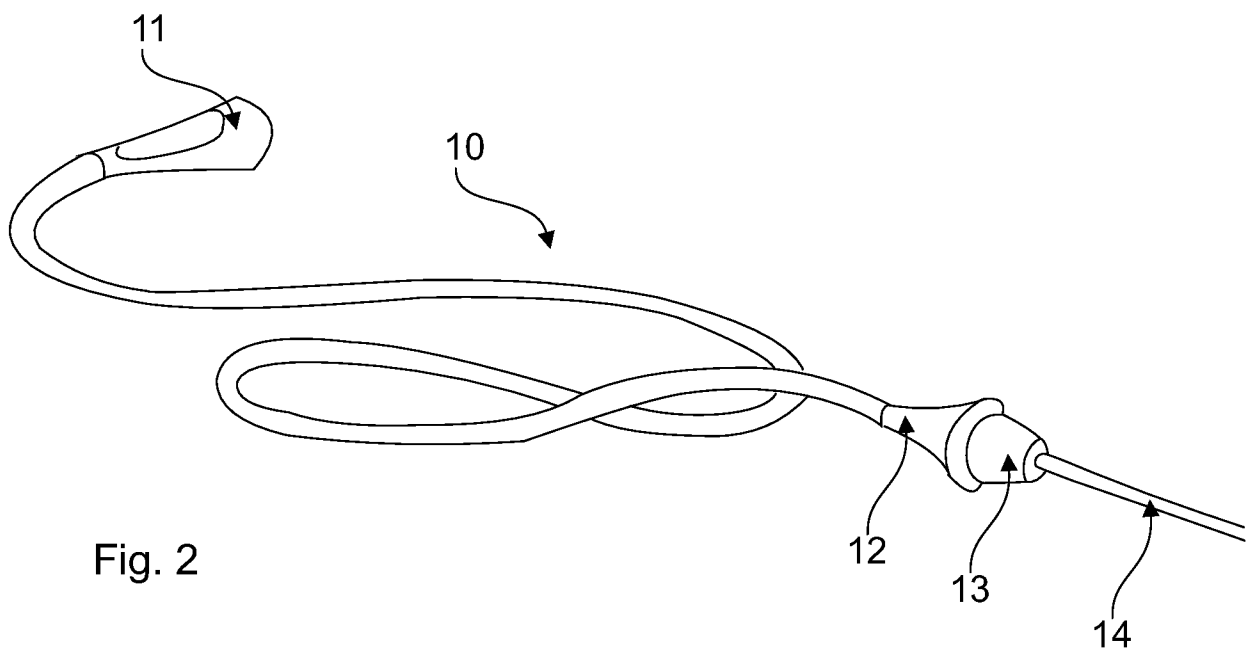


Fig. 2

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Fig. 3

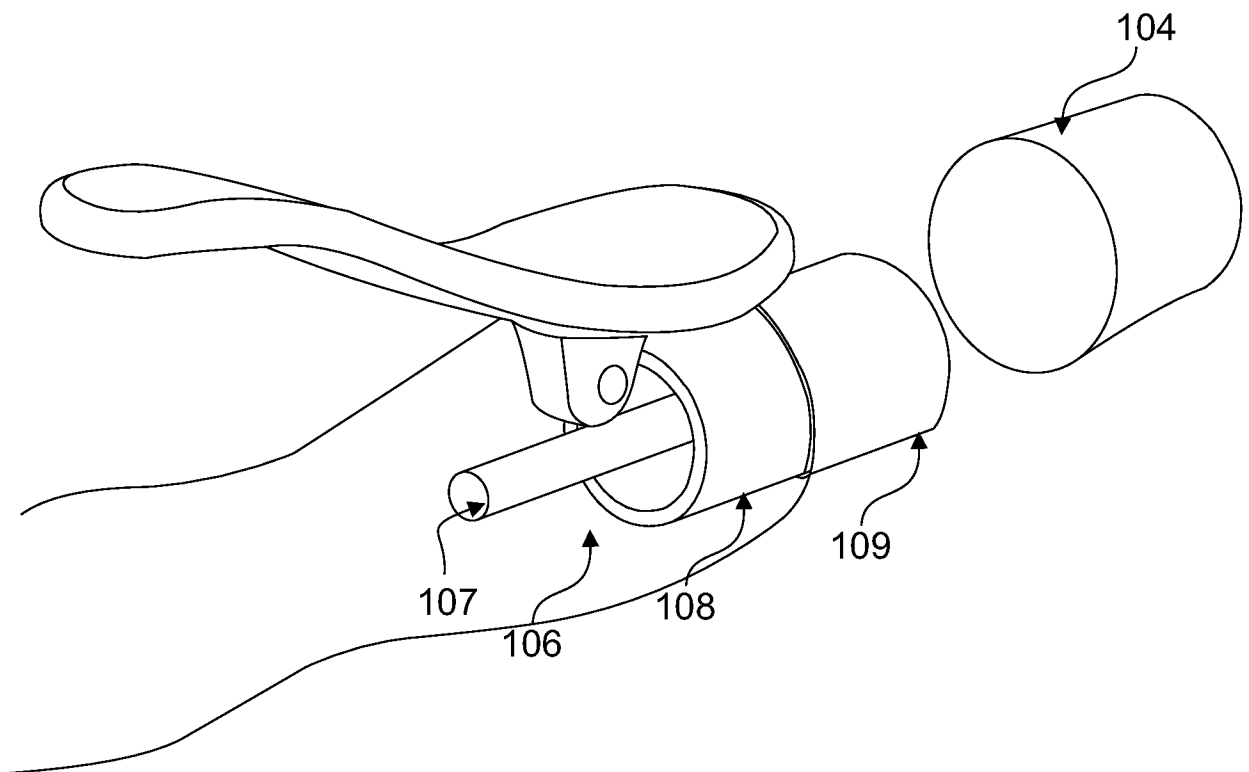
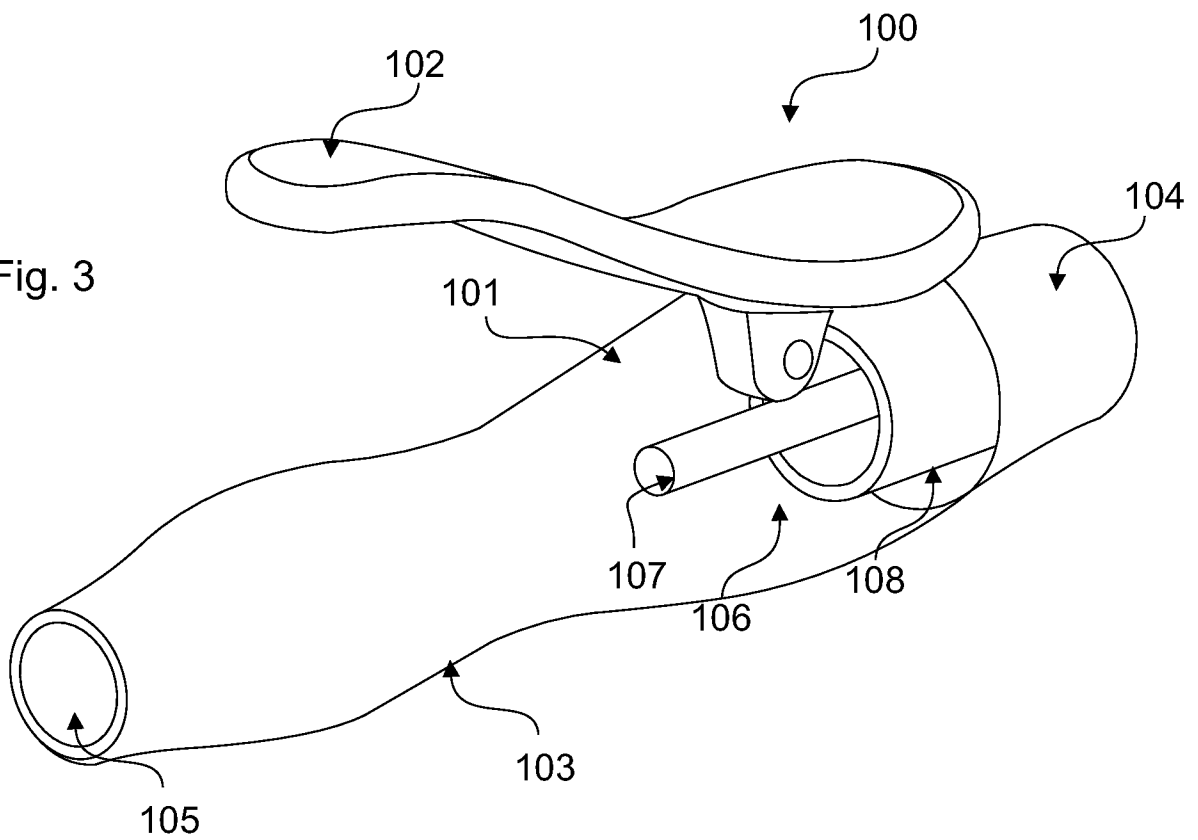


Fig. 4

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Fig. 5

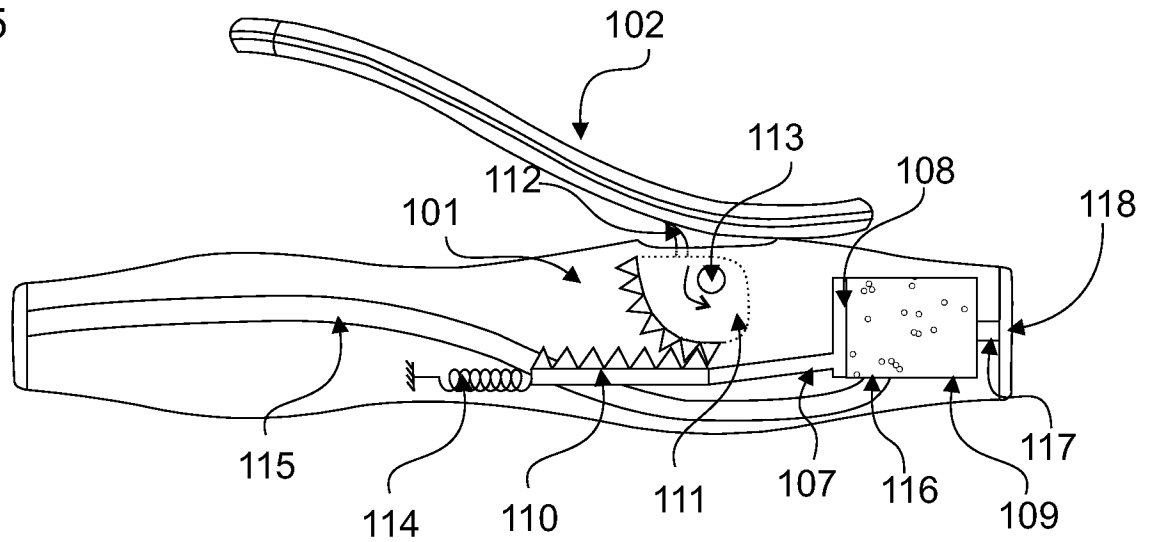
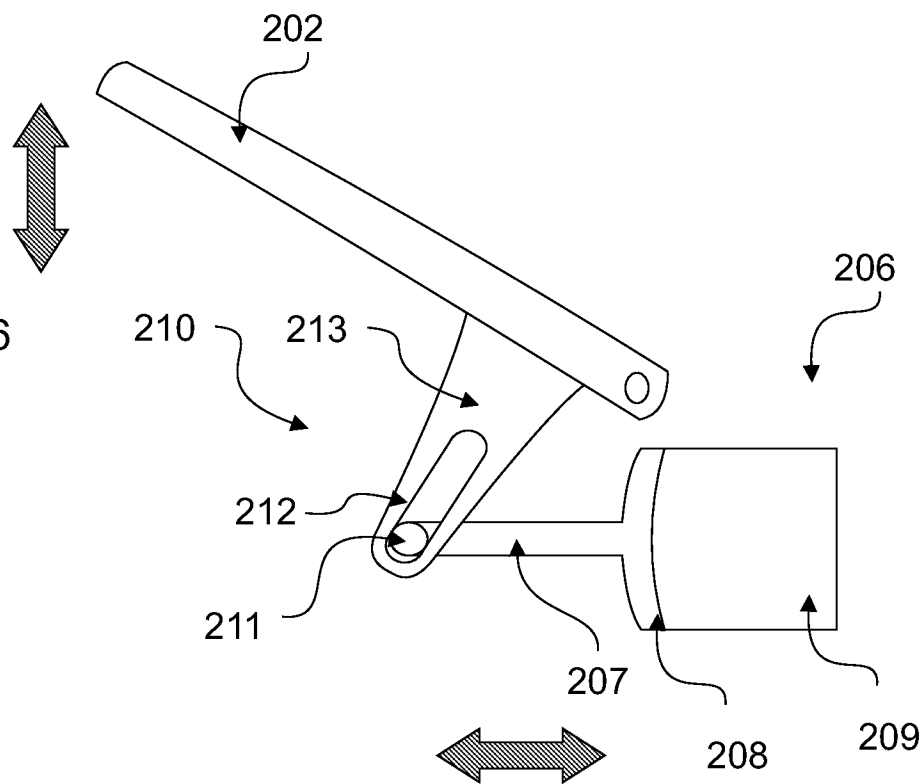


Fig. 6



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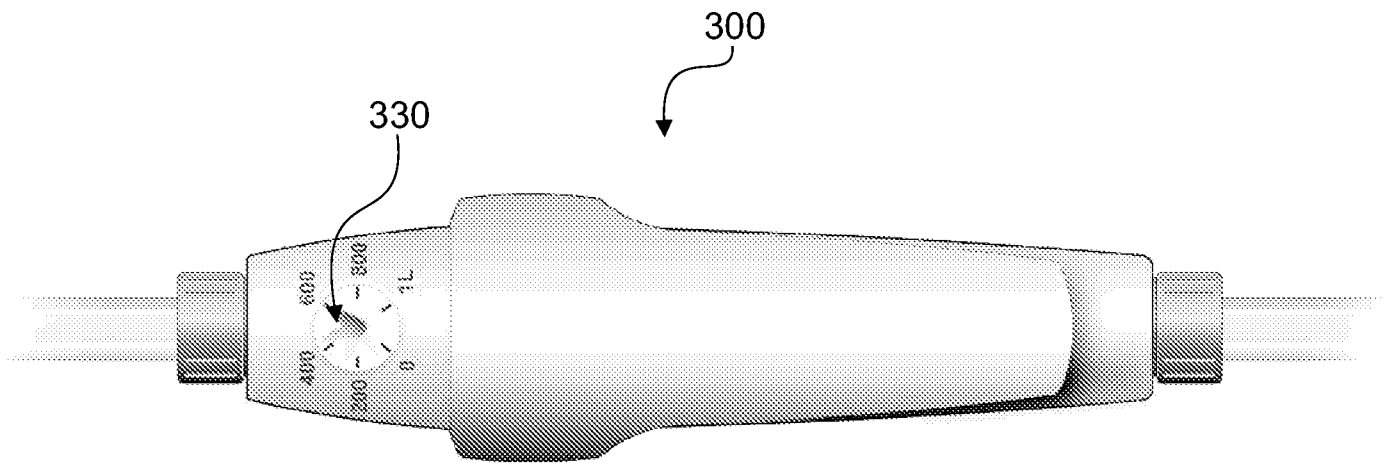


Fig. 7

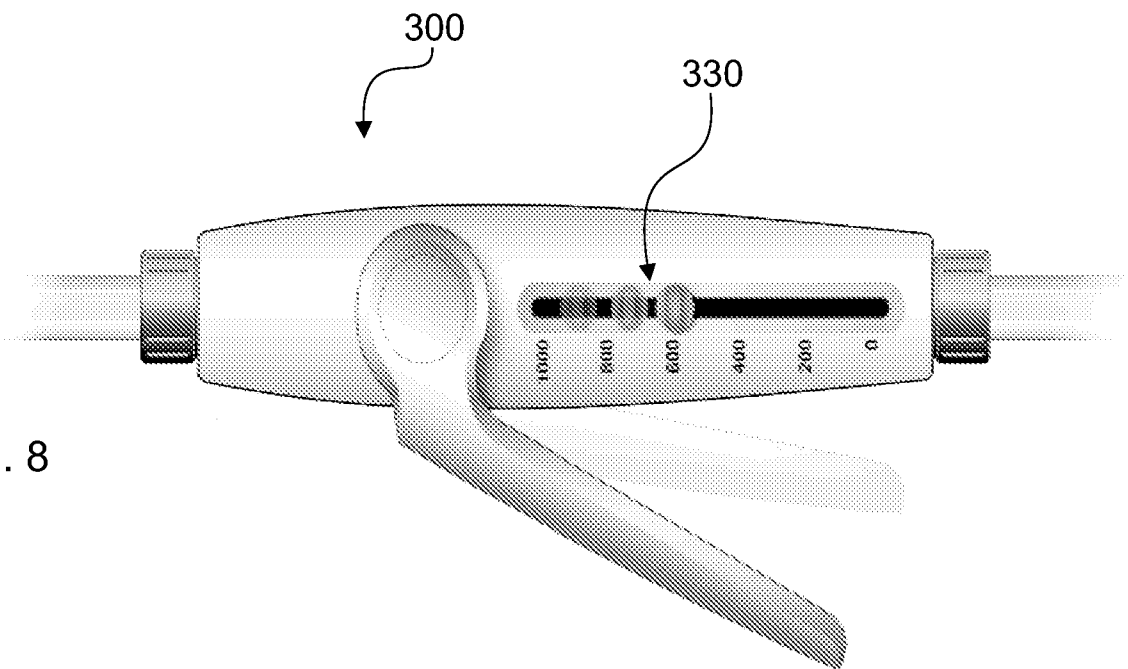


Fig. 8

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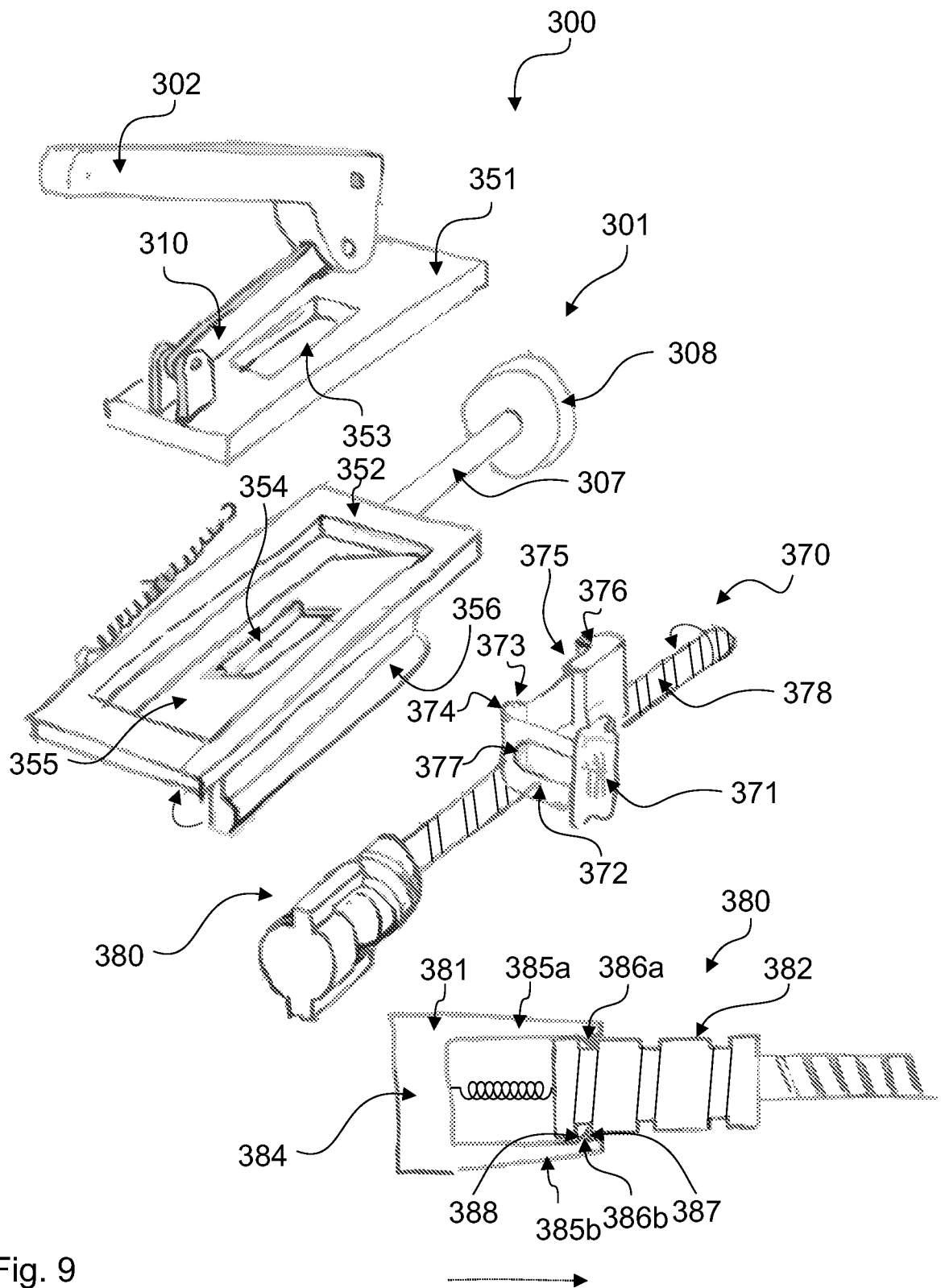


Fig. 9

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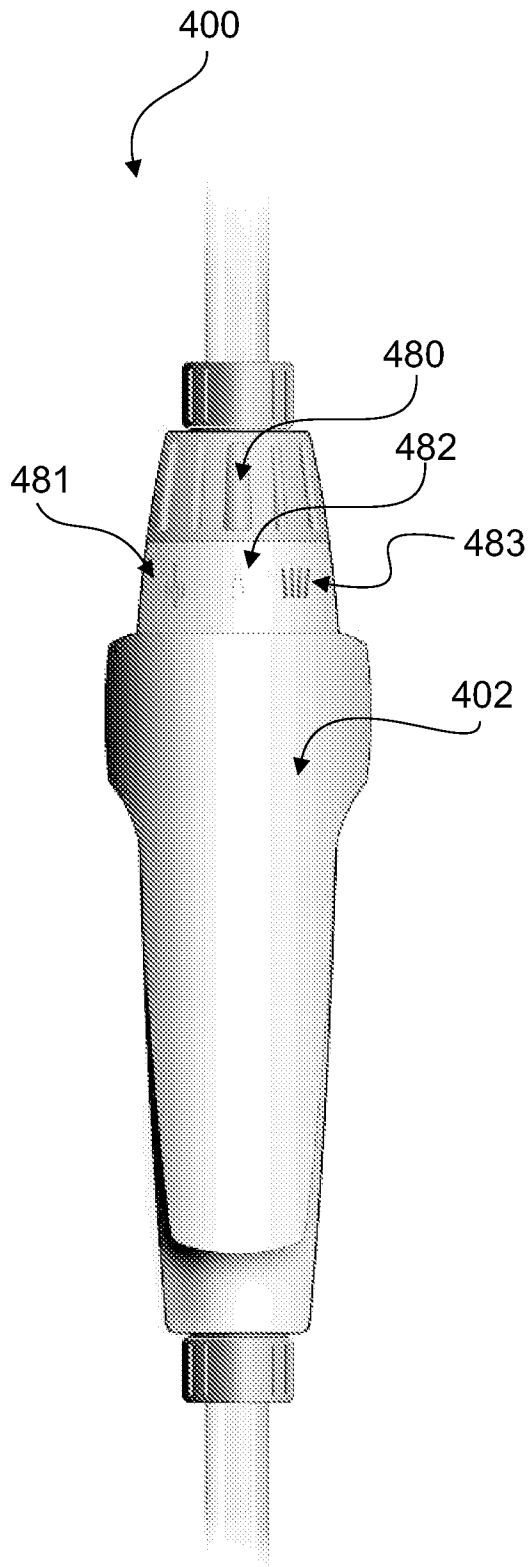


Fig. 10

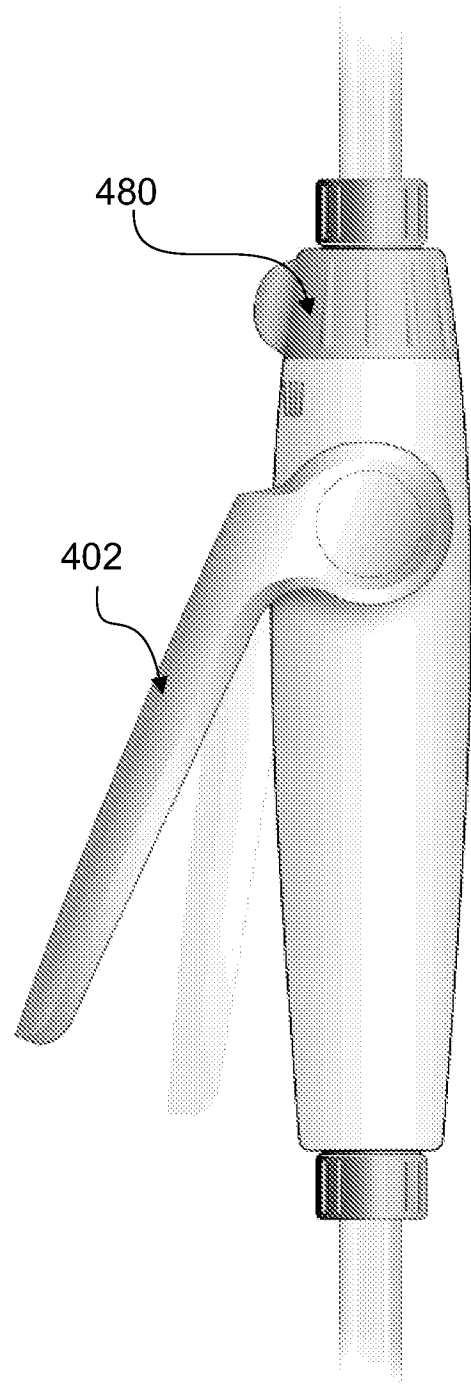


Fig. 11

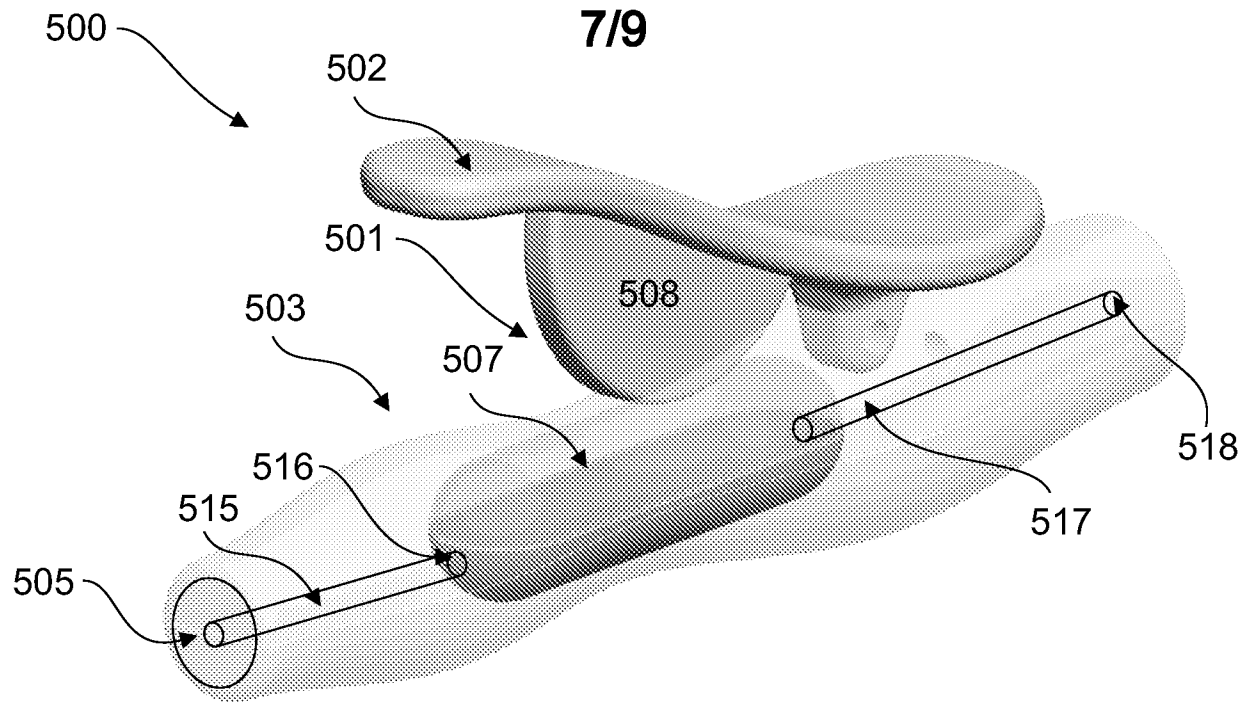


Fig. 12

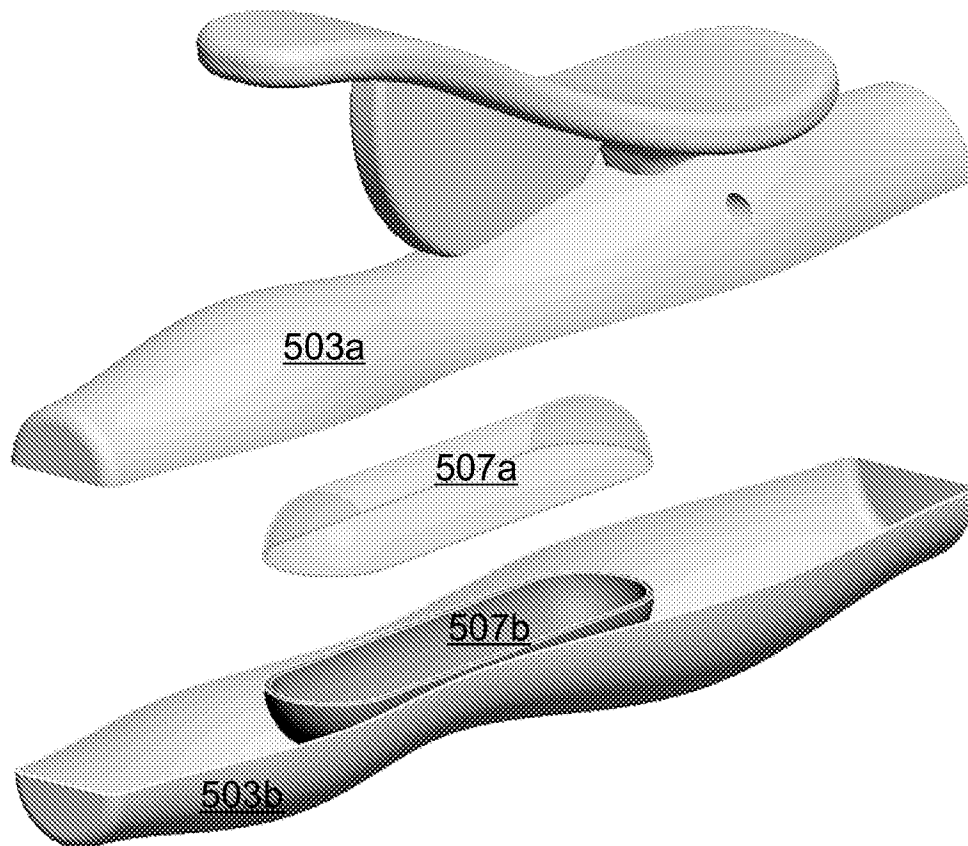


Fig. 13

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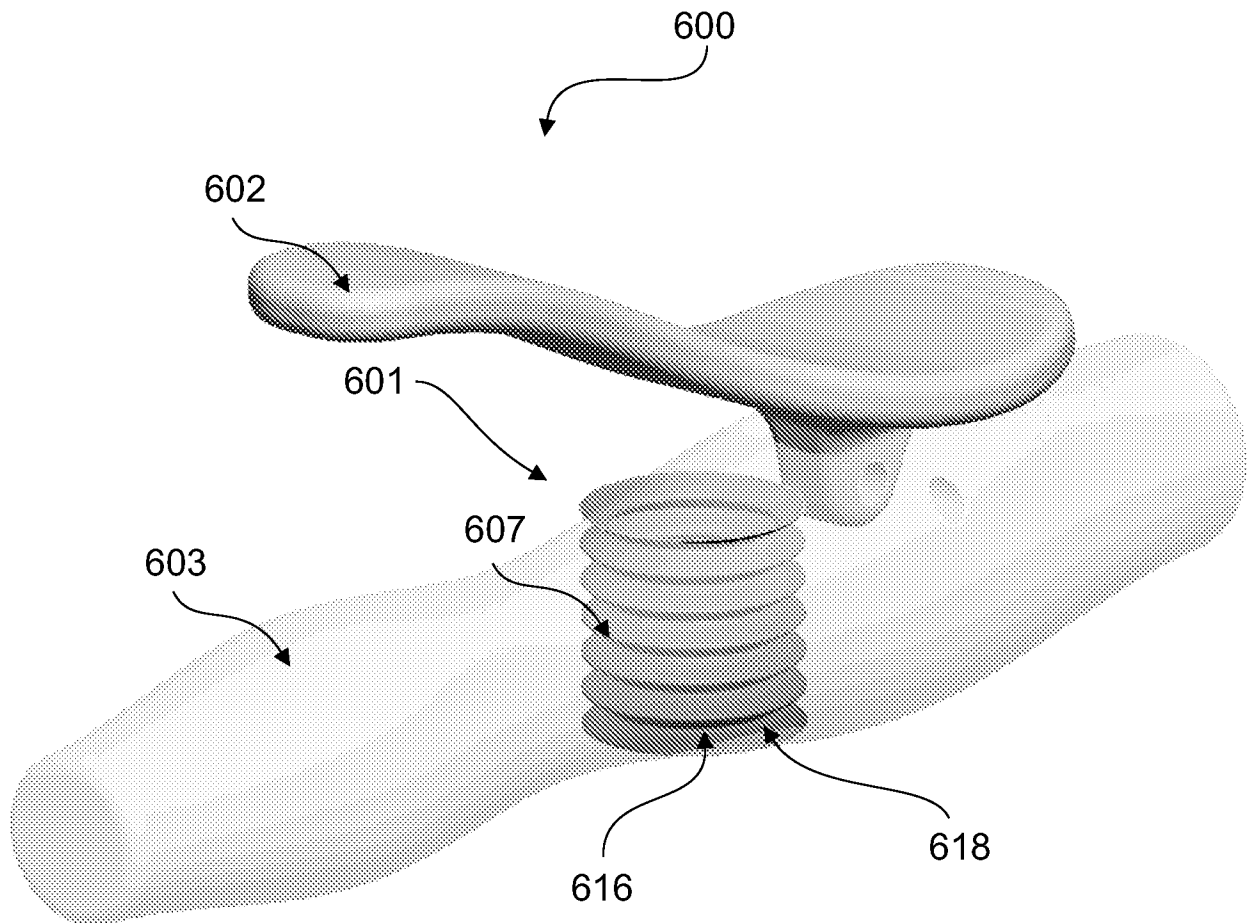


Fig. 14

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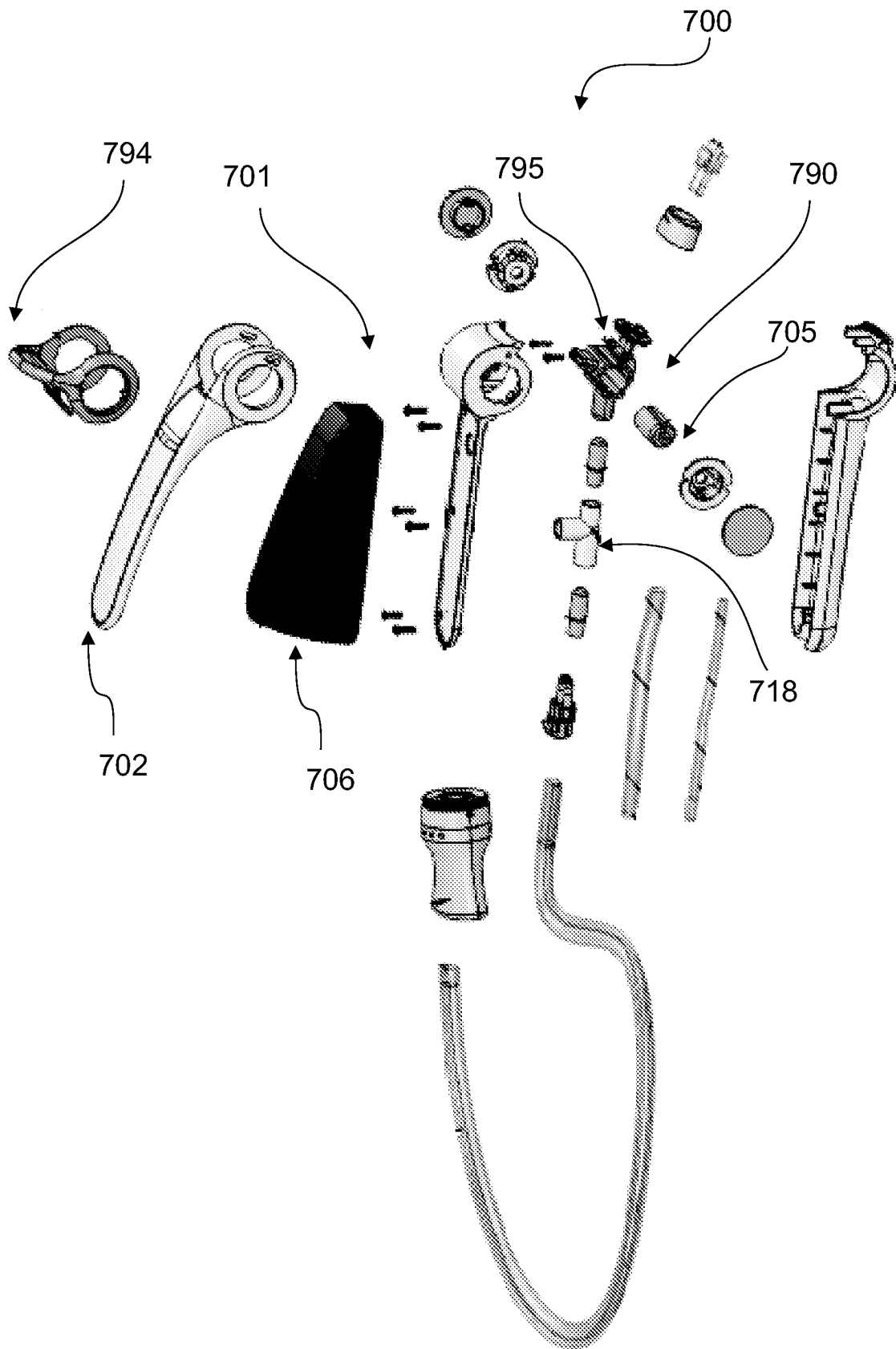


Fig. 15

# INTERNATIONAL SEARCH REPORT

International application No

PCT/DK2010/050075

## A. CLASSIFICATION OF SUBJECT MATTER

INV. A61M3/02 F04B9/14 F04B33/00 F04B43/00 F04B45/00  
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61M F04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                        | Relevant to claim No. |
|-----------|---------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | GB 191 569 A (WILLIAM GEORGE MOORE)<br>18 January 1923 (1923-01-18)                                                       | 1,2,5-8,<br>12-15     |
| Y         | the whole document                                                                                                        | 9-11                  |
| X         | WO 2008/009119 A2 (FUEL TRANSFER<br>TECHNOLOGIES [CA])<br>24 January 2008 (2008-01-24)<br>paragraph [0179]; figures 33-35 | 1,3-7                 |
| X         | US 4 136 678 A (BEACH JANET)<br>30 January 1979 (1979-01-30)<br>figure 2                                                  | 1,3,5-7               |
|           | -----<br>-/--                                                                                                             |                       |

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

4 August 2010

Date of mailing of the international search report

10/08/2010

Name and mailing address of the ISA/

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Fax: (+31-70) 340-3016

Authorized officer

Louarn, Arzhur

# INTERNATIONAL SEARCH REPORT

International application No

PCT/DK2010/050075

**C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                         | Relevant to claim No. |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Y         | US 5 620 314 A (WORTON DAVID M [US])<br>15 April 1997 (1997-04-15)<br>column 2, line 19 - line 24<br>column 3, line 35 - line 48<br>column 12, line 42 - column 13, line 5<br>figures 1-15 | 9-11                  |
| A         | US 5 382 229 A (GRABENKORT RICHARD W [US]<br>ET AL) 17 January 1995 (1995-01-17)<br>column 1, line 49 - line 65<br>claims 1,5<br>figure 1                                                  | 13-15                 |
| A         | US 3 892 311 A (SNEIDER VINCENT R)<br>1 July 1975 (1975-07-01)<br>column 2, line 10 - line 14; figures<br>2-5,11                                                                           | 9-11                  |

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/DK2010/050075

### Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:  
1-15
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

#### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-7

A pump having a compressible chamber (piston, bulb, bellow, foam material) for aspirating a fluid.  
---

2. claims: 8-11

A pump which could be dried after use.  
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3. claims: 12-15

A pump having means for controlling the volume provided by the pump.  
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4. claims: 16-18

A system for anal irrigation.  
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/DK2010/050075

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date         |
|-------------------------------------------|---------------------|----------------------------|-----------------------------|
| GB 191569                                 | A                   | 18-01-1923                 | NONE                        |
| WO 2008009119                             | A2                  | 24-01-2008                 | AU 2007276620 A1 24-01-2008 |
|                                           |                     |                            | AU 2007276622 A1 24-01-2008 |
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|                                           |                     |                            | WO 2008009126 A2 24-01-2008 |
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|                                           |                     |                            | EP 2049434 A2 22-04-2009    |
|                                           |                     |                            | EP 2048992 A2 22-04-2009    |
|                                           |                     |                            | EP 2049433 A2 22-04-2009    |
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| US 4136678                                | A                   | 30-01-1979                 | NONE                        |
| US 5620314                                | A                   | 15-04-1997                 | NONE                        |
| US 5382229                                | A                   | 17-01-1995                 | CA 2131432 A1 22-03-1995    |
| US 3892311                                | A                   | 01-07-1975                 | NONE                        |