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(54) **VALVE FOR REGULATING THE FLOW OF A LIQUID**

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(71) Applicant: **BIOFLO, LLC**, Sanford, FL (US)
(72) Inventor: **Kevin J. Spolski**, Sanford, FL (US)
(73) Assignee: **BIOFLO, LLC**, Sanford, FL (US)

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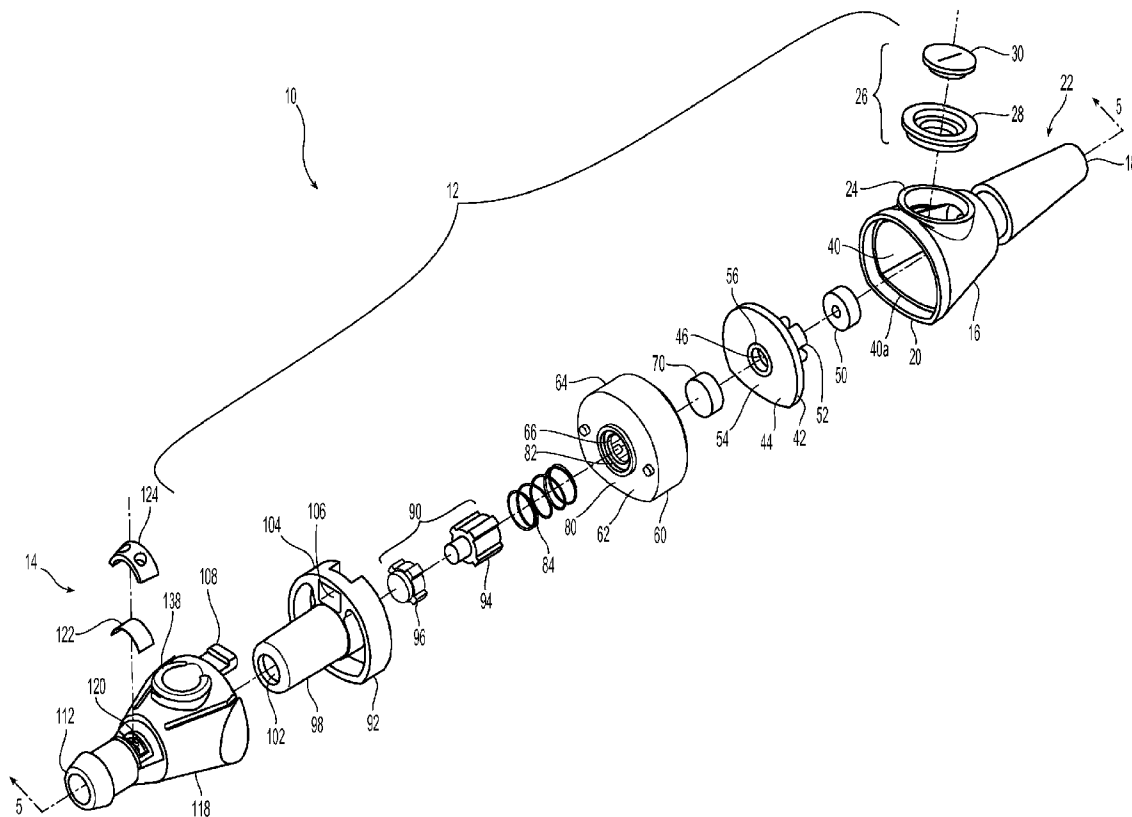
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Related U.S. Application Data

(63) Continuation of application No. 13/105,640, filed on May 11, 2011, now Pat. No. 8,684,331.

(57) **ABSTRACT**

A new valve for regulating the flow of liquid has two housings that are removably attached to one another. When the housings are separated, the liquid can no longer pass through the valve. A system of magnetic elements is used to cycle the flow of liquid (urine) through the valve. The valve is typically connected to an indwelling bladder catheter and the valve allows the patient to be at least temporarily disconnected from a collection bag.



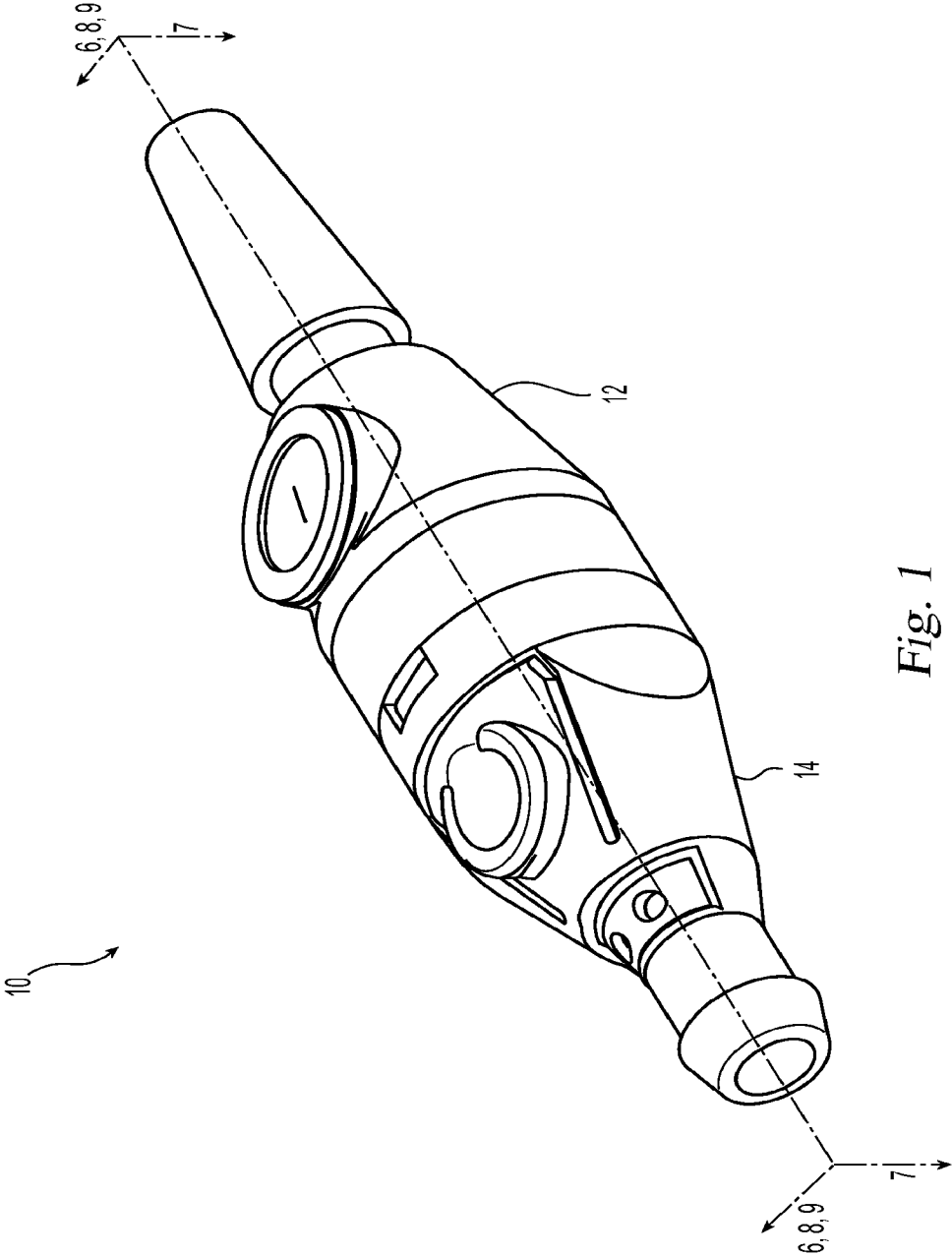


Fig. 1

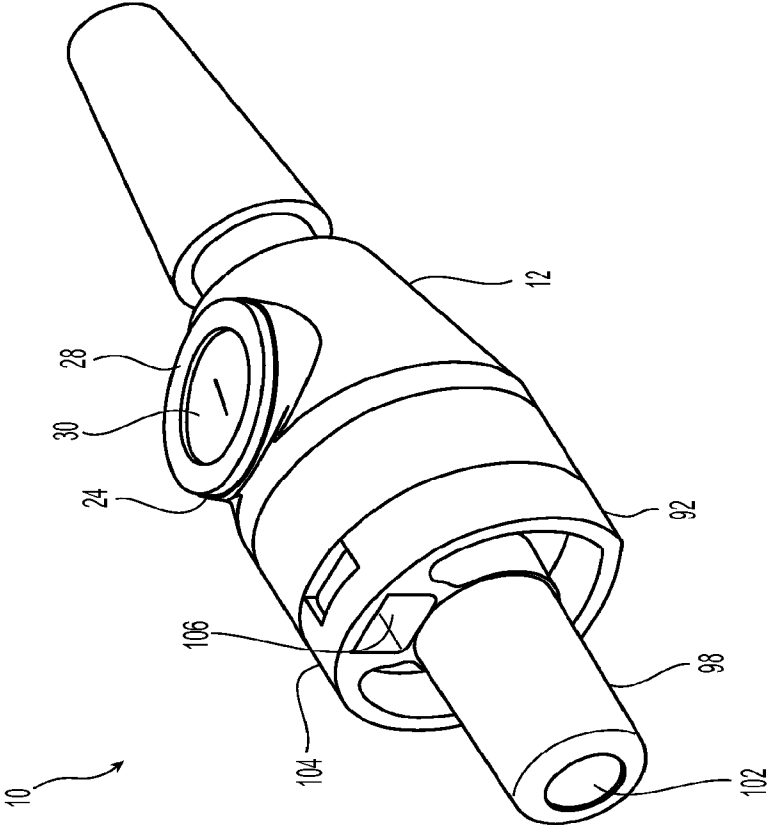
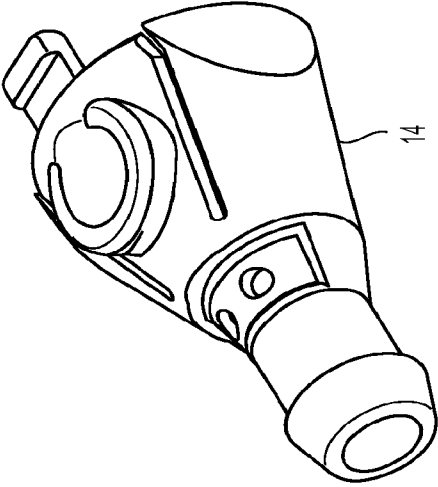


Fig. 2



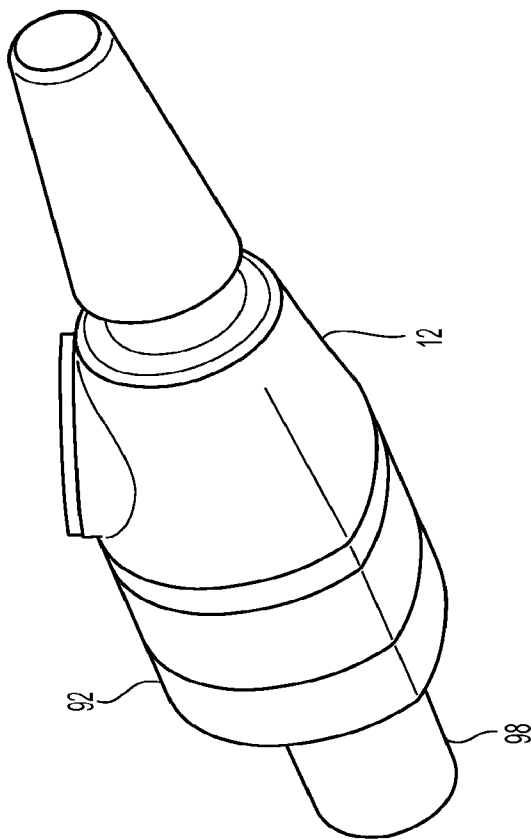
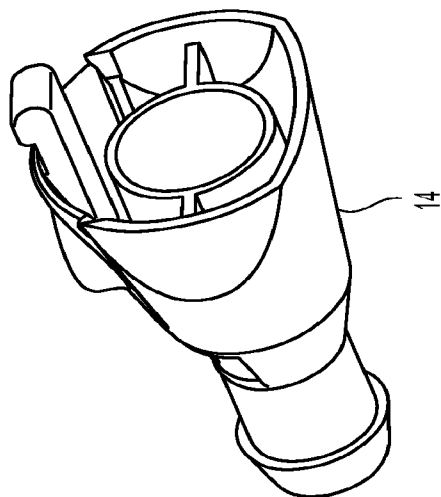


Fig. 3



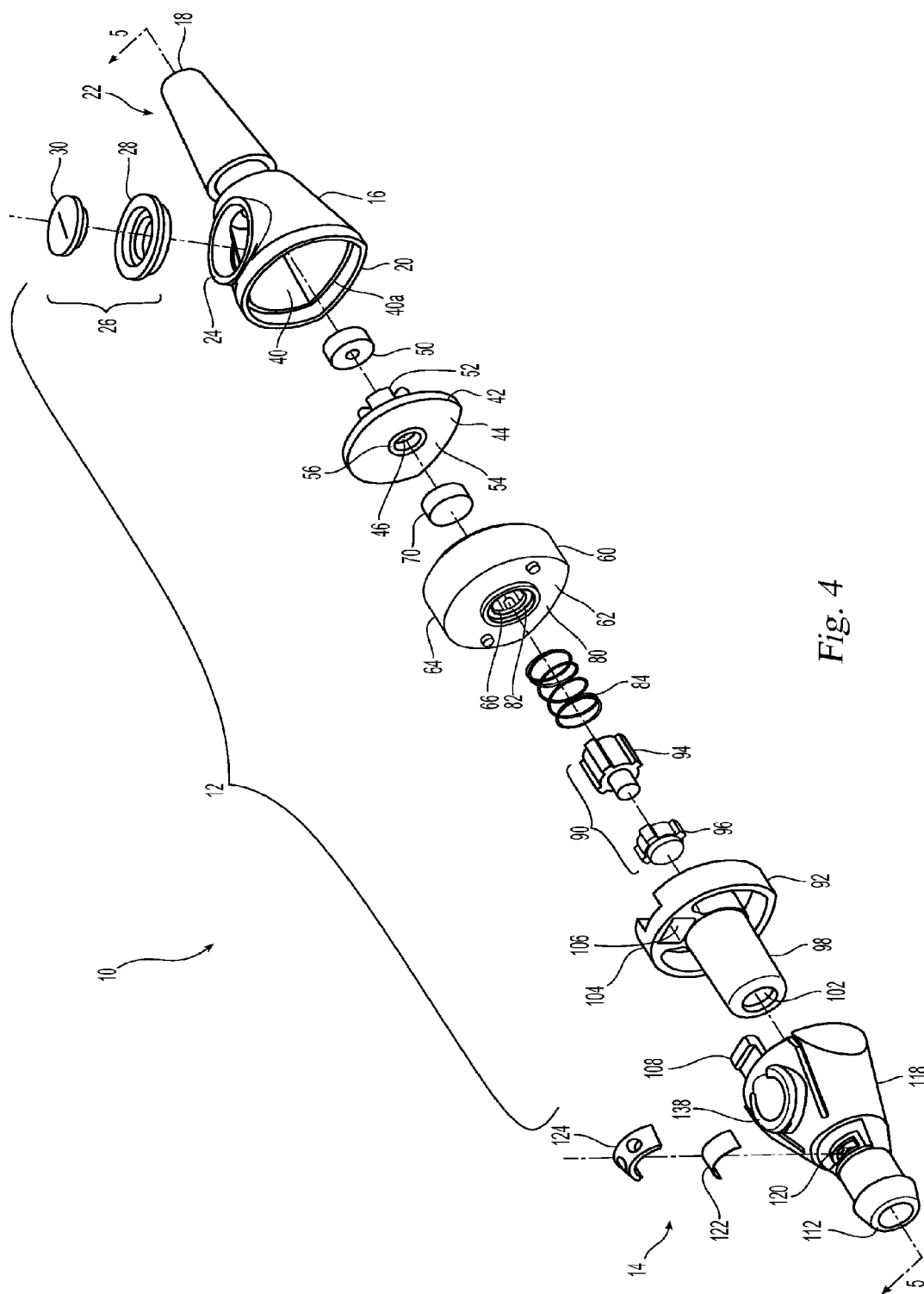


Fig. 4

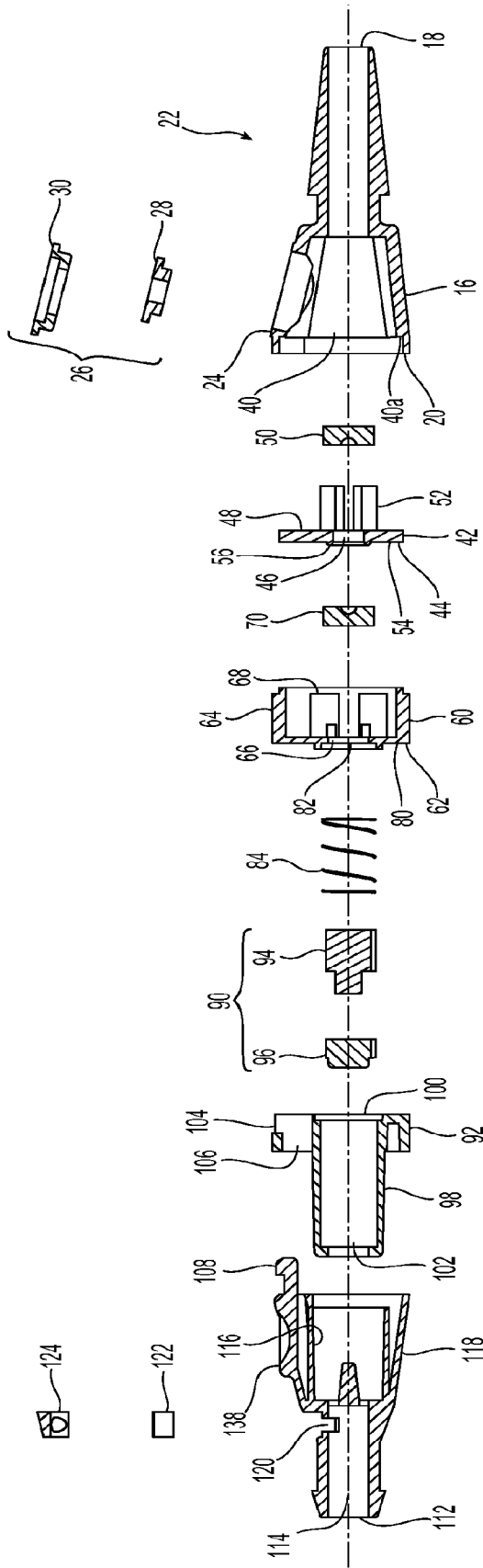


Fig. 5

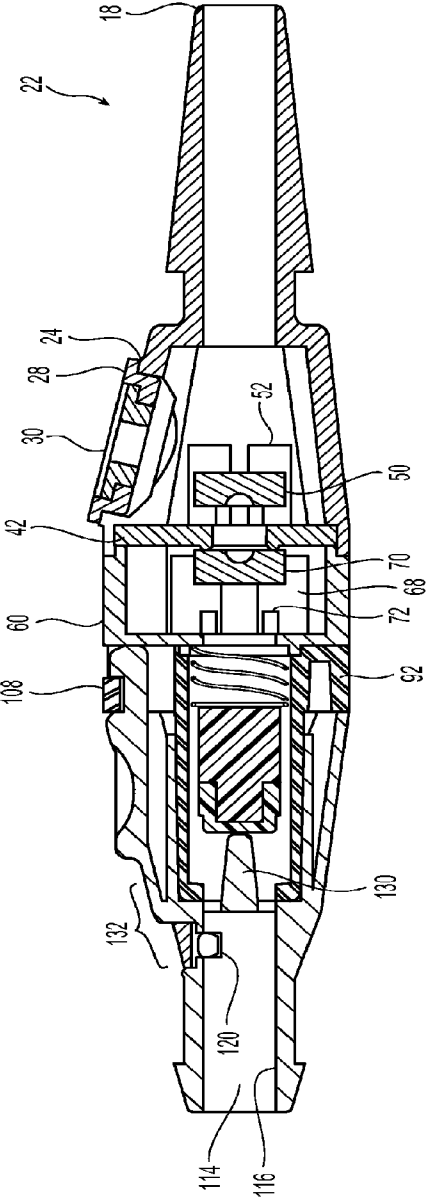


Fig. 6

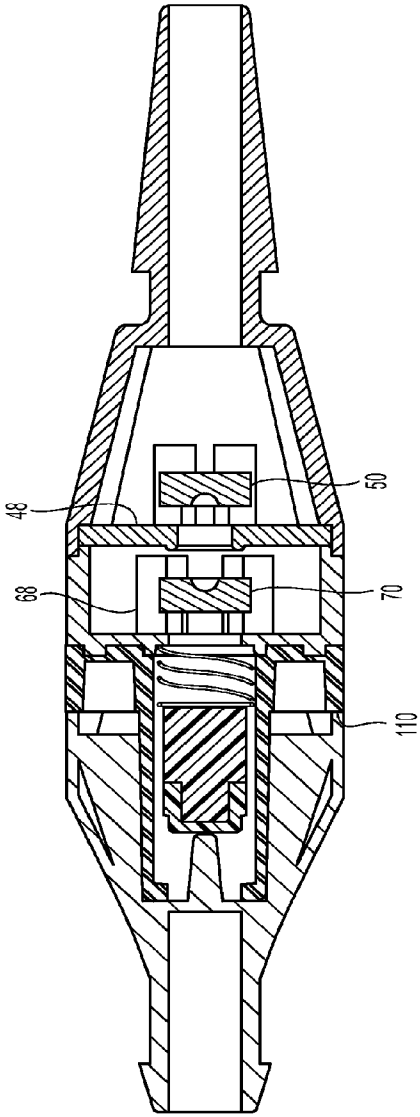


Fig. 7

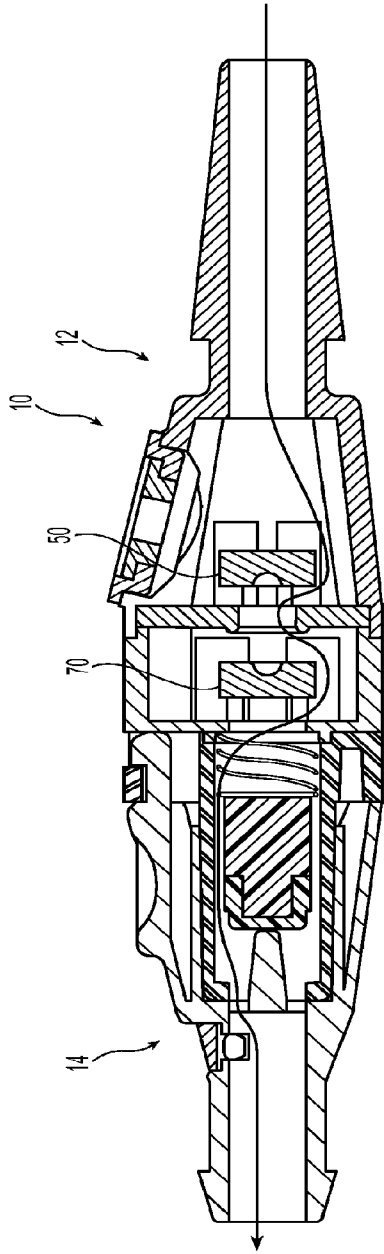


Fig. 8

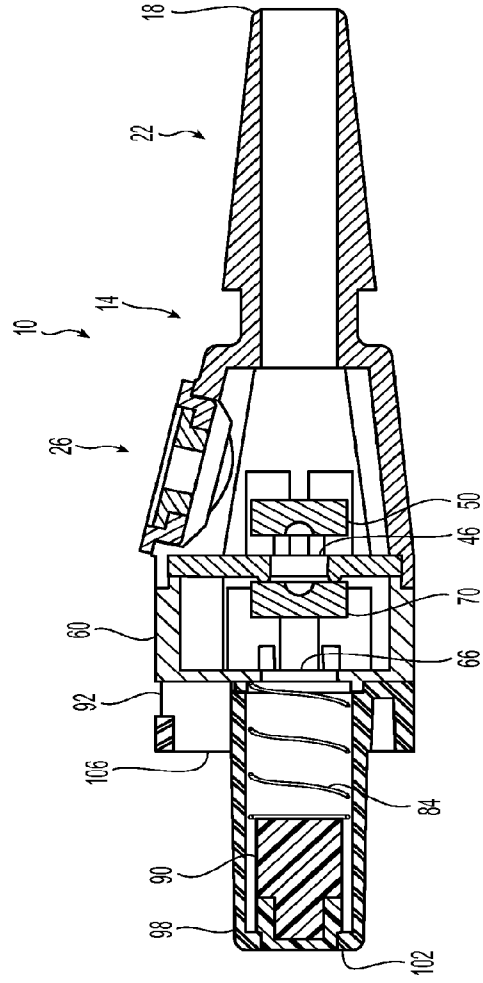
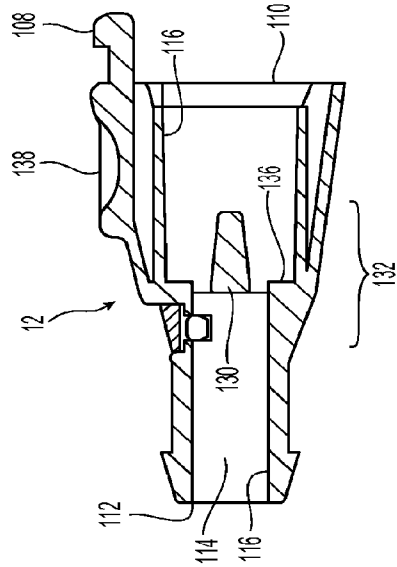


Fig. 9



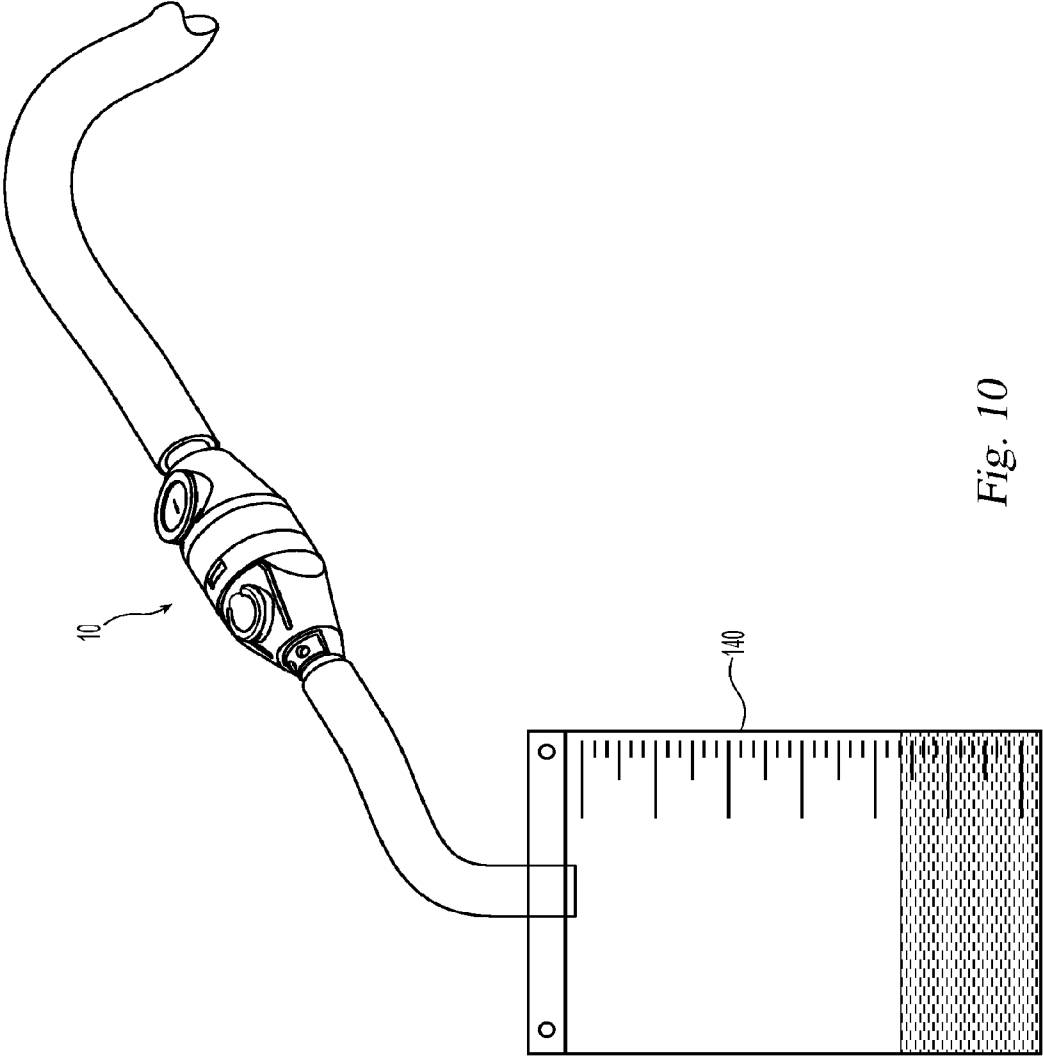


Fig. 10

VALVE FOR REGULATING THE FLOW OF A LIQUID

BACKGROUND OF THE INVENTION

[0001] This application is a continuation application of and claims priority to U.S. patent application Ser. No. 13/105,640, filed on May 5, 2011, which is hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0002] A new design for a valve that regulates the flow of a liquid has the ability to passively regulate the flow of liquid and allows the valve housing to be disconnected, allowing movement of the person to whom the valve is connected away from a collection bag.

[0003] Many people, at home, in a hospital, and in third-party care facilities require the use of an in-dwelling bladder catheter because of a medical condition. However, being constantly attached to a bladder bag that holds the liquid (urine) is inconvenient and potentially and unnecessarily limits the person's movement and living conditions.

[0004] A new valve allows for the cyclical emptying of the bladder and allows the patient to be disconnected from the collection bag.

SUMMARY OF THE INVENTION

[0005] The present invention is directed to a valve for regulating the flow of a liquid therethrough that includes a first housing having an inlet and an outlet, a second housing removably attachable to the first housing, the second housing having an opening extending therethrough, a first magnet disposed in the first housing in a predetermined position, the first magnet being stationary relative to the housing, a second magnet disposed in the first first housing, the second magnet movable relative to the first magnet, and a sealing member disposed in the first housing adjacent the outlet, the sealing member sealing the outlet in the first housing when the second housing is disengaged from the first housing.

[0006] In some embodiments, the valve includes a resealable opening disposed in the first housing.

[0007] In some embodiments, the valve includes a vent disposed in the second housing.

[0008] In some embodiments, the sealing member includes an elastic member that engages a portion of the first housing and the second housing has a projection that engages the sealing member and compresses the elastic member when the second housing engages the first housing.

[0009] In another aspect, the invention is directed to a removable housing to engage a housing with at least one closable opening therein, the removable housing includes an outer housing having first end to engage the housing with at least one closable opening and a second end to engage tubing, an opening extending between the first end and the second end of the outer housing, a latch disposed adjacent the first end to engage at least a portion of the housing with at least one closable opening to maintain the removable housing in contact with the housing with at least one closable opening, a projection disposed at least partially within the opening, the projection extending from a middle portion of the opening toward the first end and configured to be disposed within an opening of the housing with at least one closable opening.

[0010] In yet another aspect, the invention is directed to a valve for regulating the flow of a liquid therethrough that

includes a first housing having an inlet and an outlet, the inlet and outlet being in fluid communication with one another, a second housing removably attachable to the first housing, the second housing having an opening extending therethrough and in fluid communication with the outlet when the second housing is connected to the first housing, and a sealing member disposed in the first housing adjacent the outlet, the sealing member sealing the outlet in the first housing when the second housing is disengaged from the first housing.

[0011] Additional features and advantages of the invention will be set forth in the detailed description which follows, and in part will be readily apparent to those skilled in the art from that description or recognized by practicing the invention as described herein, including the detailed description which follows, the claims, as well as the appended drawings.

[0012] It is to be understood that both the foregoing general description and the following detailed description of the present embodiments of the invention, and are intended to provide an overview or framework for understanding the nature and character of the invention as it is claimed. The accompanying drawings are included to provide a further understanding of the invention, and are incorporated into and constitute a part of this specification. The drawings illustrate various embodiments of the invention, and together with the description serve to explain the principles and operations of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a front perspective view of one embodiment of a valve for regulating the flow of a liquid according to the present invention;

[0014] FIG. 2 is a front perspective view of the housings of the valve in FIG. 1 separated from one another;

[0015] FIG. 3 is a rear perspective view of the housings of the valve in FIG. 1 separated from one another;

[0016] FIG. 4 is an exploded perspective view of the valve of FIG. 1;

[0017] FIG. 5 is a cross sectional view from the left side of the valve in FIG. 4;

[0018] FIG. 6 is a cross section view of the valve along the line 6-6 in FIG. 1 with one magnet in a first position and sealing the valve;

[0019] FIG. 7 is a cross section view of the valve along the line 7-7 in FIG. 1;

[0020] FIG. 8 is a cross section view of the valve along the line 8-8 in FIG. 1 with the magnet in a second position and allowing liquid to flow therethrough;

[0021] FIG. 9 is a cross section view of the valve along the line 9-9 in FIGS. 2; and

[0022] FIG. 10 is a perspective view of the valve connected to tubing on one end and a collection bag on the other end.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] Reference will now be made in detail to the present preferred embodiment(s) of the invention, examples of which are illustrated in the accompanying drawings. Whenever possible, the same reference numerals will be used throughout the drawings to refer to the same or like parts.

[0024] One embodiment of the present invention illustrated in the figures is directed is a valve 10 for regulating the flow of a liquid. The valve 10 has a first housing 12 and a second housing 14 that is removably attachable to the first housing

12. The first housing **12** has a catheter connector **16** having a proximal end **18** and a distal end **20**, the proximal end **18** of the catheter connector **16** has an inlet **22** that is configured to engage a tubing (see, e.g., FIG. **10**). The inlet **22**, as illustrated, has a generally smooth outer surface that increases in diameter from the end of the inlet **22** toward the remaining portion of the catheter connector **16**. The inlet **22** may have any other configuration that allows for connection to tubing and still fall within the scope of the present invention. The first and second housings **12,14** are preferably made from a K-Resin SBC material.

[0025] As best illustrated in FIG. **4**, the catheter connector **16** also has an opening **24** that functions as a sampling port. The opening **24** preferably has a needleless port **26**. The needleless port **26** allows for insertion of a needleless syringe (not shown) to withdraw a sample of the liquid (generally urine) for testing. The needleless port **26** is preferably a resealable opening. The needleless port **26** has a main body **28** and the resealable portion **30**, the resealable portion **30** may or may not have a pre-cut slit therein. It is also possible that the needleless port **26** is a single unit and not made of two different portions. The main body **28** is preferably made of polypropylene and the resealable portion **30** is preferably made of a thermoplastic elastomer, but any appropriate materials may be used.

[0026] The catheter connector **16** also has an opening **40** at the distal end **20** that is in fluid communication with the inlet **22**. The opening **40** has a recessed portion **40a** adjacent the distal end **20** into which a first magnet housing **42** is disposed, sealing the opening **40** of the catheter connector **16**. See, e.g., FIGS. **6-9**. The first magnet housing **42** has a base plate **44** that has the same configuration as the opening **40** and an opening **46** in the base plate **44** to allow the liquid to pass therethrough. On a first side **48** of the base plate **44** a first magnet **50** is secured. The first magnet **50** is secured in extensions **52** that extend from the first side **48** of the base plate **44** to keep the first magnet **50** at a predetermined distance from the opening **46** and a second magnet, which is described in more detail below. The first magnet housing **42** preferably has on a second side **54** a raised portion **56** around the opening **46**. As described in more detail below, the raised portion provides a surface against which the second magnet can maintain contact to seal the opening **46**.

[0027] As best illustrated in FIGS. **4** and **6-9**, second magnet housing **60**, also a part of the first housing **12**, is attached to the first magnet housing **40** and the catheter connector **16** and extends distally from the catheter connector **16**. The second magnet housing **60** is preferably generally cup-shaped, having a base member **62** and a peripheral wall **64**, with an opening **66** in the base member **62** to allow the liquid to flow therethrough. Extending from the base member **62** toward the catheter connector **16** and the first magnet housing **42** are extensions **68** that slidably hold a second magnet **70**. Preferably, there are four extensions **68**, but there may be other numbers of extensions and still be within the scope of the invention. The extensions **68** also have a surface **72** to engage the second magnet **70** and prevent the second magnet **70** from moving too far distally (toward the base member **62**). The second magnet **70** is drawn magnetically toward the first magnet **50** causing the second magnet **70** to engage the raised portion **56** around the opening **46**, thereby closing the opening **46** and preventing the flow of liquid through the valve **10**. However, when sufficient liquid is present in the opening **40** and exerts pressure on the second magnet **70** sufficient to

overcome the magnetic attraction between the two magnets **50,70**, then the second magnet **70** moves axially away from the opening **46** within the extensions **68** (but no farther than the surfaces **72**) to allow the liquid to drain through the opening **46** (and the tubing that is inserted into bladder of a patient). When the liquid has drained away and removes this force, then the magnetic attraction causes the second magnet **70** to once again close the opening **46**.

[0028] The second magnet housing **60** has on a bottom side **80** a recessed portion **82** to receive an elastic member **84** that engages and biases a sealing member **90** toward the second housing **14** in a drain end **92**. While a coil spring is illustrated as the elastic member **84**, any appropriate style of spring or elastic member may be used to bias the sealing member **90**. The sealing member **90** preferably has two elements, a main sealing member **94** and a resilient cover member **96** that is attached to the main sealing member **94**. However, the sealing member **90** may be one integral element rather than two separate elements and may be made from a single material rather than multiple materials.

[0029] The drain end **92**, which constitutes the last element of the first housing **12**, is attached to the second magnet housing **60** and is in fluid communication with the inlet **22** in the catheter connector **16**. See FIGS. **4** and **6-9**. The drain end **92** has a generally cylindrical center portion **98** in which the sealing member **90** is slidably movable. The cylindrical center portion **98** has an inlet **100** and an outlet **102**. The sealing member **90** is, as noted above, biased away from the second magnet housing **60** and toward the outlet **102** of the drain end **92**. The drain end **92** also has an outer portion **104** that is secured to the bottom side **80** of the second magnet housing **60**. Between the cylindrical center portion **98** and the outer portion **104** is an opening **106** into which a cantilevered latch **108** from the second housing **14** is inserted to hold the second housing **14** to the first housing **12**.

[0030] The second housing **14** has a proximal end **110** and a distal end **112**. The second housing **14** has an inner opening **114** that extends between the proximal end **110** and the distal end **112** and defines an inner surface **116**. The second housing **14** also has an outside surface **118** and an opening **120** that extends between the outside surface **118** and the inner surface **116**. The opening **120** functions as a vent to allow air to enter the valve **10** and the liquid to move through the valve **10** and into the collection bag **140**. See FIG. **10**. The opening **120** is preferably covered by a Tyvek covering **122** and a cover **124**, which allows air to enter into the valve **10** for complete (or near-complete) emptying of the valve **10** without allowing the liquid to escape therethrough.

[0031] Positioned within the inner opening **114** is a projection **130** that extends from central portion **132** of the inner opening **114** toward the proximal end **110**. The inner opening **114** also has in the central portion **132** (and preferably at the location of the distal end **134** of the projection **130**) a proximally-facing surface **136**. The inner opening **114** is configured and sized to receive the cylindrical center portion **98** of the first housing **12** therein and the proximally-facing surface **136** is positioned and configured such that the outer portions of outlet **102** of the drain end **92** make contact with the surface **136** and seal the valve **10** to prevent leaking when the two housings **12,14** are attached. The projection **130** is configured and sized, when the second housing **14** is connected to the first housing **12**, to engage the sealing member **90** through the outlet **102** of the drain end **92** and move it axially and in a proximate direction (toward the inlet **22**). This allows for the

liquid to drain from the first housing 12 in to the second housing 14. Openings spaced around the bottom of the projection 130 allow the liquid to pass around the projection 130 and along the inner surface 114. Since the proximal end 110 of the second housing 14 is, by way of the latch 108, removably mounted to the first housing 12, removing the second housing 14 also removes the projection 130 from the drain end 92, allowing the sealing member 90 to seal the outlet 102, even if the second magnet 70 moves to allow the liquid to pass through the opening 46. This allows the patient to, at least temporarily, be separated from a collection bag 140, which is illustrated in FIG. 10.

[0032] As noted above, the first and second housings 12,14 are removably attached to one another by the latch 108. By “removably attached,” Applicant means that the two housings 12,14 are intended to and can repeatedly engage and disengage one another without any other elements (e.g., glues, adhesives, bands, etc.), structures, or destroying any portions or parts that are intended to be used to attach housings 12,14. As best seen in FIGS. 5 and 6, the latch 108 is integral with the button 138, which when pressed then causes the latch 108 to be disengaged from the outer portion 104 of the drain end 92, and the housing 14 can be removed from housing 12. It should also be noted that due to the tight fit of the cylindrical center portion 98 in the inner opening 114, only one latch 108 needs to be used to maintain the connection between the two housings 12,14. Other types of latches and numbers of latches may also be used with the valve 10 and still come within the scope of the present invention.

[0033] Turning now to FIGS. 6-10, the operation of the valve 10 will be described in more detail. FIG. 6 is a cross sectional view of the valve 10 through the latch 108. The position of the second magnet 70 is in the proximal position, that is the second magnet 70 is sealing off the opening 46 as it makes contact with the raised portion 56 around the opening 46. As can be seen in the left side of the figure, the projection 130 has engaged the sealing member 90 through the outlet 102 since the second housing 14 is attached to the first housing 12.

[0034] FIG. 7 is a cross sectional view of the valve 10 at a 90° angle to the view in FIG. 6. In this figure, the second magnet 70 is illustrated as if the liquid has exerted a sufficient force on the second magnet 70 to move it away from the raised portion 56 around the opening 46 and toward the surfaces 72.

[0035] FIG. 8 is a cross sectional view of valve 10 in the same orientation as FIG. 6, but the second magnet 70 is in the open position and not closed as in FIG. 6. Additionally, the arrow indicates at least one path for the liquid to pass through the valve 10.

[0036] FIG. 9 is a cross section of the valve 10 with the first housing 12 and the second housing 14 separated from one another. In this figure, it is clear that the projection 130 no longer engages the sealing member 90, and the sealing member 90 is firmly in the outlet 102, preventing the liquid from exiting the first housing 12. This configuration allows a patient to disconnect the housings 12,14 for better mobility (or other reasons), and not have to worry about the liquid draining onto the floor or other equally distasteful places. While the second magnet 70 is illustrated as being against the raised portion 56 around the opening 46, thereby closing the opening 46, even if opening 46 were open, the liquid still would not leak from the first housing 12.

[0037] It will be apparent to those skilled in the art that various modifications and variations can be made to the

present invention without departing from the spirit and scope of the invention. Thus it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

1. A valve for regulating the flow of a liquid therethrough comprising:

- a first housing having an inlet and an outlet;
- a second housing removably attachable to the first housing, the second housing having an opening extending there-through;
- a first magnet disposed in the first housing in a predetermined position, the first magnet being stationary relative to the housing;
- a second magnet disposed in the first housing, the second magnet movable relative to the first magnet; and
- a sealing member disposed in the first housing adjacent the outlet, the sealing member sealing the outlet in the first housing when the second housing is disengaged from the first housing.

2-3. (canceled)

4. The valve according to claim 1, wherein the outlet of the first housing engages the opening in the second housing.

5. The valve according to claim 1, wherein the sealing member includes an elastic member that engages a portion of the first housing and the second housing has a projection that engages the sealing member and compresses the elastic member when the second housing engages the first housing.

6-9. (canceled)

10. A removable housing to engage a housing with at least one closable opening therein, the removable housing comprising:

- an outer housing having first end to engage the housing with at least one closable opening and a second end to engage tubing;
- an opening extending between the first end and the second end of the outer housing;
- a latch disposed adjacent the first end to engage at least a portion of the housing with at least one closable opening to maintain the removable housing in contact with the housing with at least one closable opening; and
- a projection disposed at least partially within the opening, the projection extending from a base toward a proximate end of the outer housing and configured to be disposed within an opening of the housing with at least one closable opening; and
- openings adjacent the base of the projection.

11. (canceled)

12. A valve for regulating the flow of a liquid therethrough comprising:

- a first housing having an inlet and an outlet, the inlet and outlet being in fluid communication with one another;
- a second housing removably attachable to the first housing, the second housing having an opening extending there-through and in fluid communication with the outlet of the first housing when the second housing is connected to the first housing; and
- a sealing member disposed in the first housing between the inlet and the outlet, the sealing member sealing the outlet in the first housing when the second housing is disengaged from the first housing.

13. The valve according to claim 12, further comprising a resealable opening disposed in the first housing.

14. The valve according to claim **12**, further comprising a vent disposed in the second housing.

15. The valve according to claim **12**, wherein the outlet of the first housing engages the opening in the second housing.

16. The valve according to claim **12**, further comprising:
a first magnet disposed in the first housing in a predetermined position, the first magnet being stationary relative to the housing; and

a second magnet disposed entirely within the first housing, the second magnet movable relative to the first magnet.

17. The valve according to claim **13**, wherein the resealable opening is accessible by a needleless syringe.

18. The valve of claim **1**, wherein the second magnet is disposed between the inlet and outlet of the first housing.

19. The valve of claim **1**, wherein sealing member disposed in the first housing between the inlet and the outlet.

20. The valve of claim **10**, wherein the openings are disposed between the projection and the outer housing.

21. The valve of claim **10**, wherein the projection has an outside surface extending from a proximate end to the base and wherein the fluid flows around the outside surface of the projection.

22. The valve of claim **12**, wherein the sealing member is movable between a first position and a second position upon removal of the second housing, the sealing member being disposed within the outlet of the first housing in the second position.

* * * * *