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(54) FLEXIBLE HOSE APPARATUS

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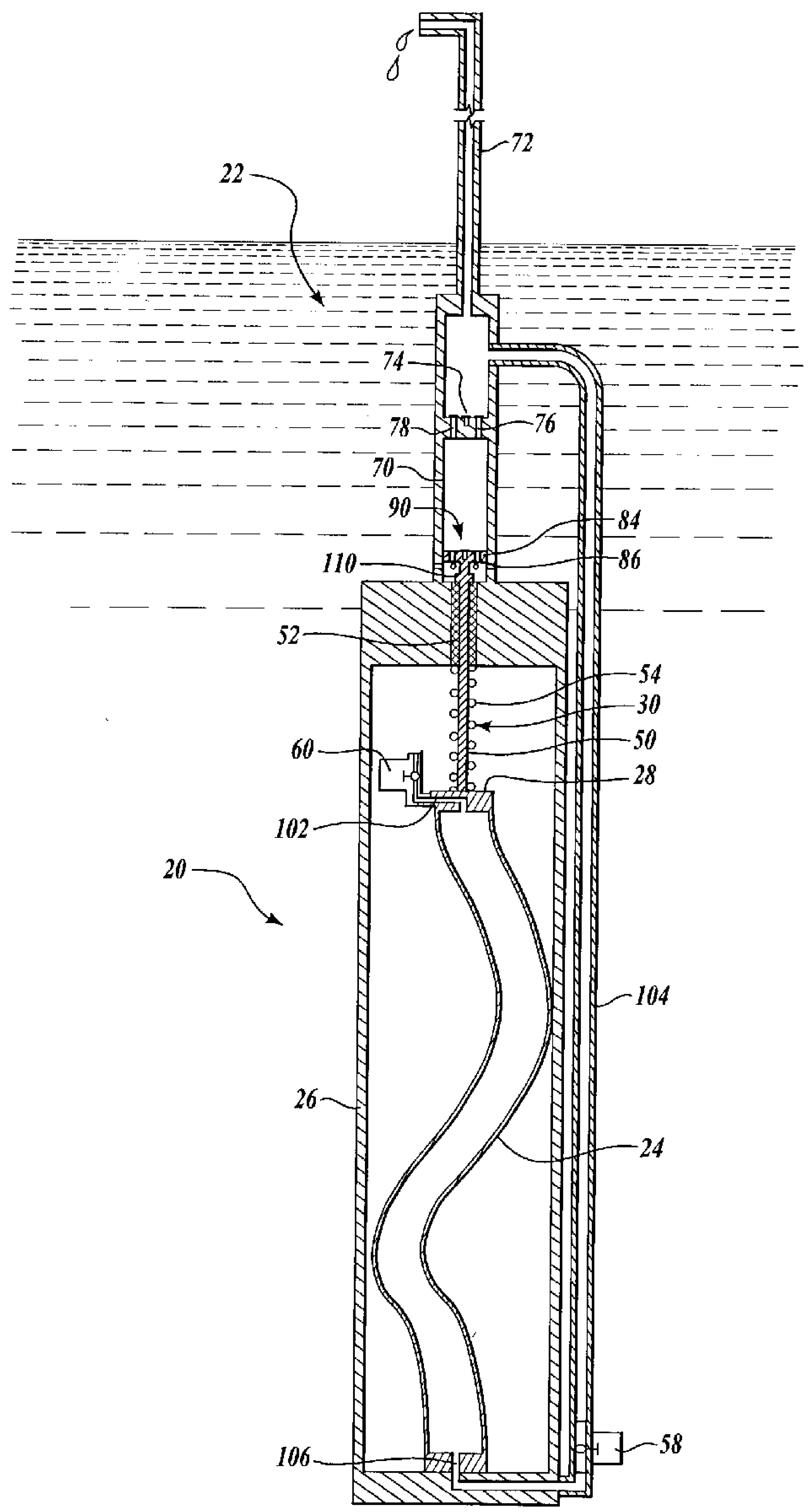
(57) ABSTRACT

Described is a drive assembly (20) and a production assembly (22) for use in producing reciprocating motion. In one embodiment, the drive assembly is formed as a flexible hose hydraulic cylinder that uses a source of fluid pressure to extend and retract a flexible hose. One or more valves are available to regulate the pressure within the flexible hose. A reciprocating member is connected to the flexible hose. Extension and retraction of the hose cause corresponding translation in the reciprocating member. In one embodiment, the reciprocating member is a piston rod that is biased in one direction.



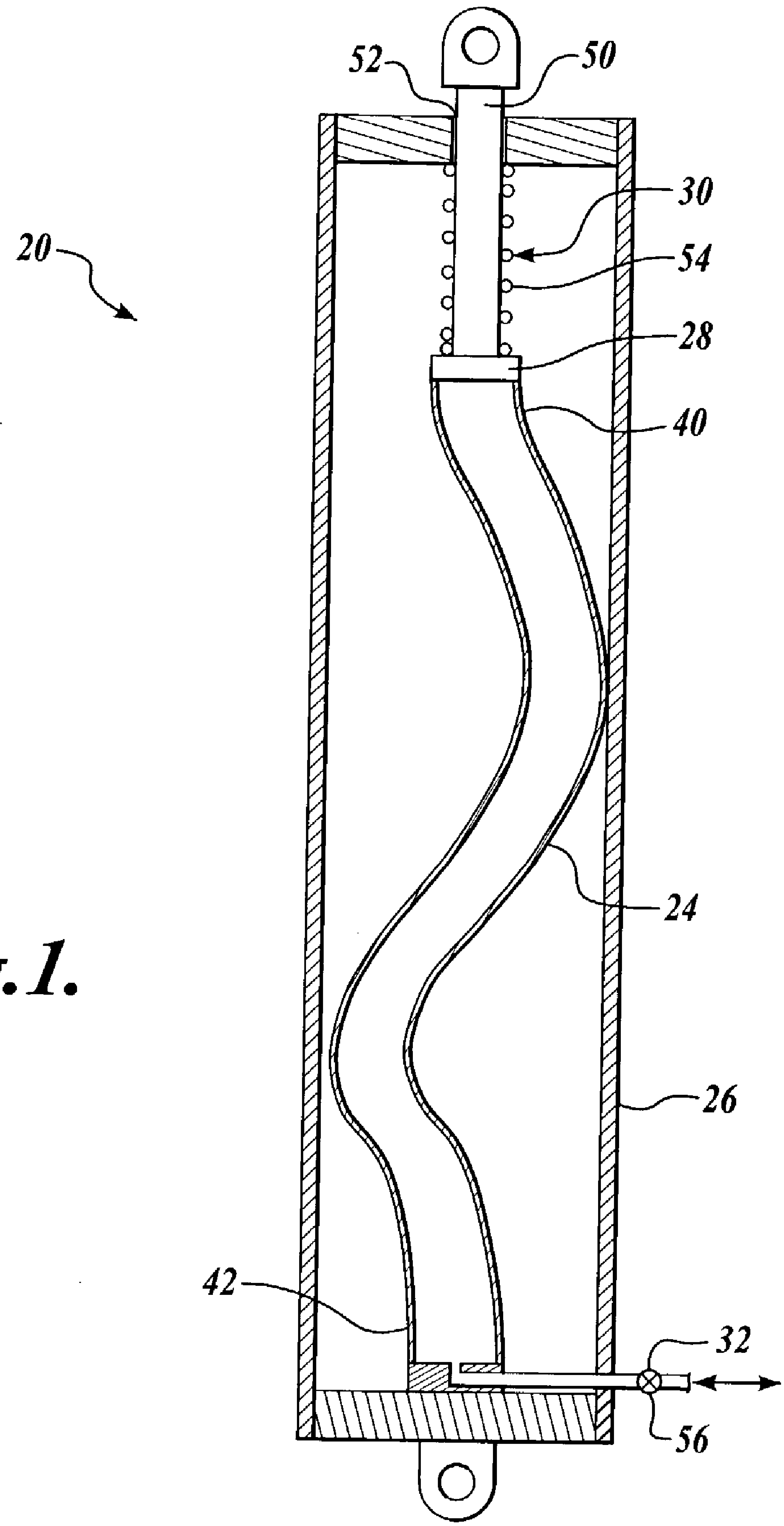



*Fig.1.*

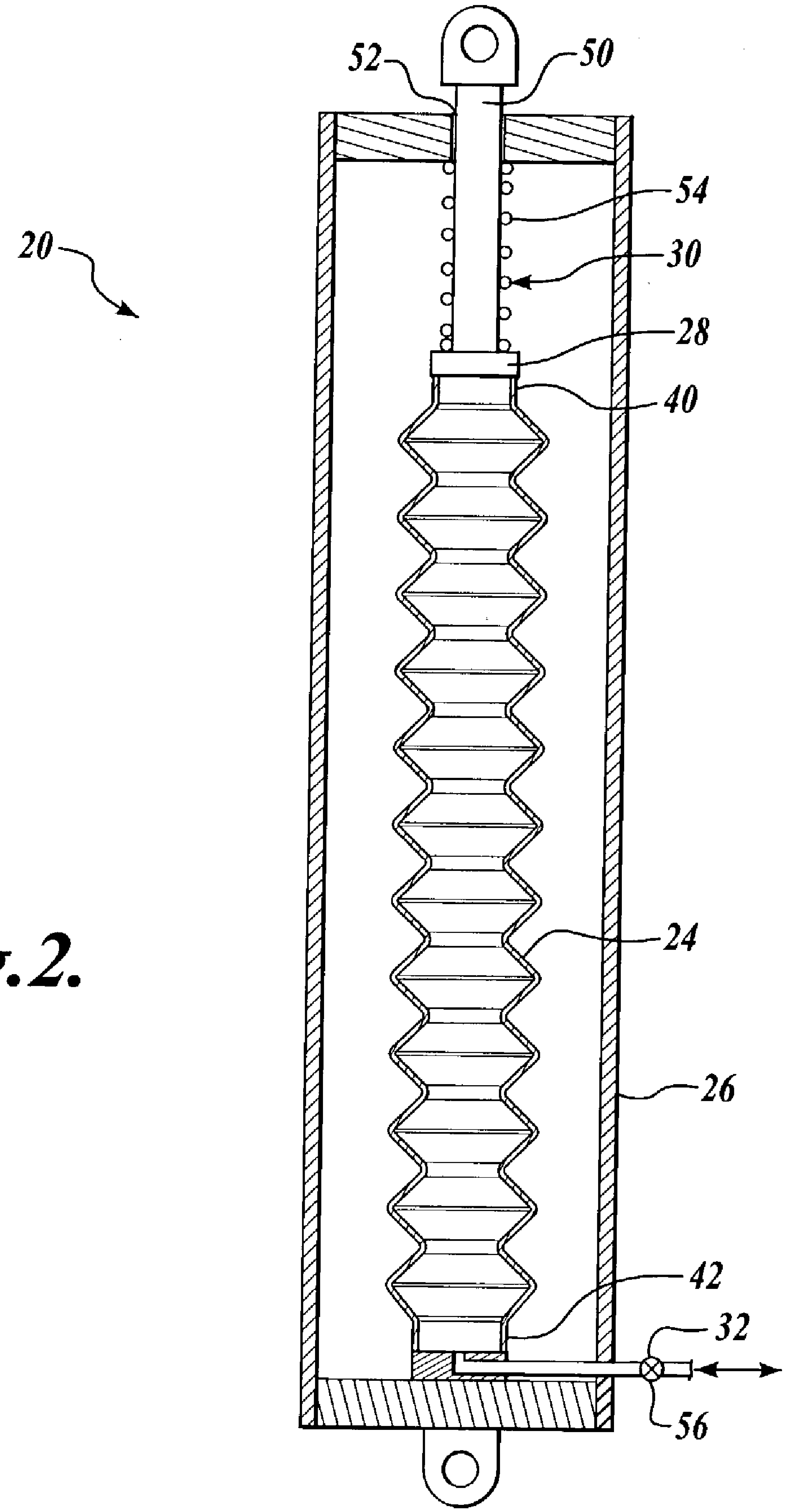



Fig.2.

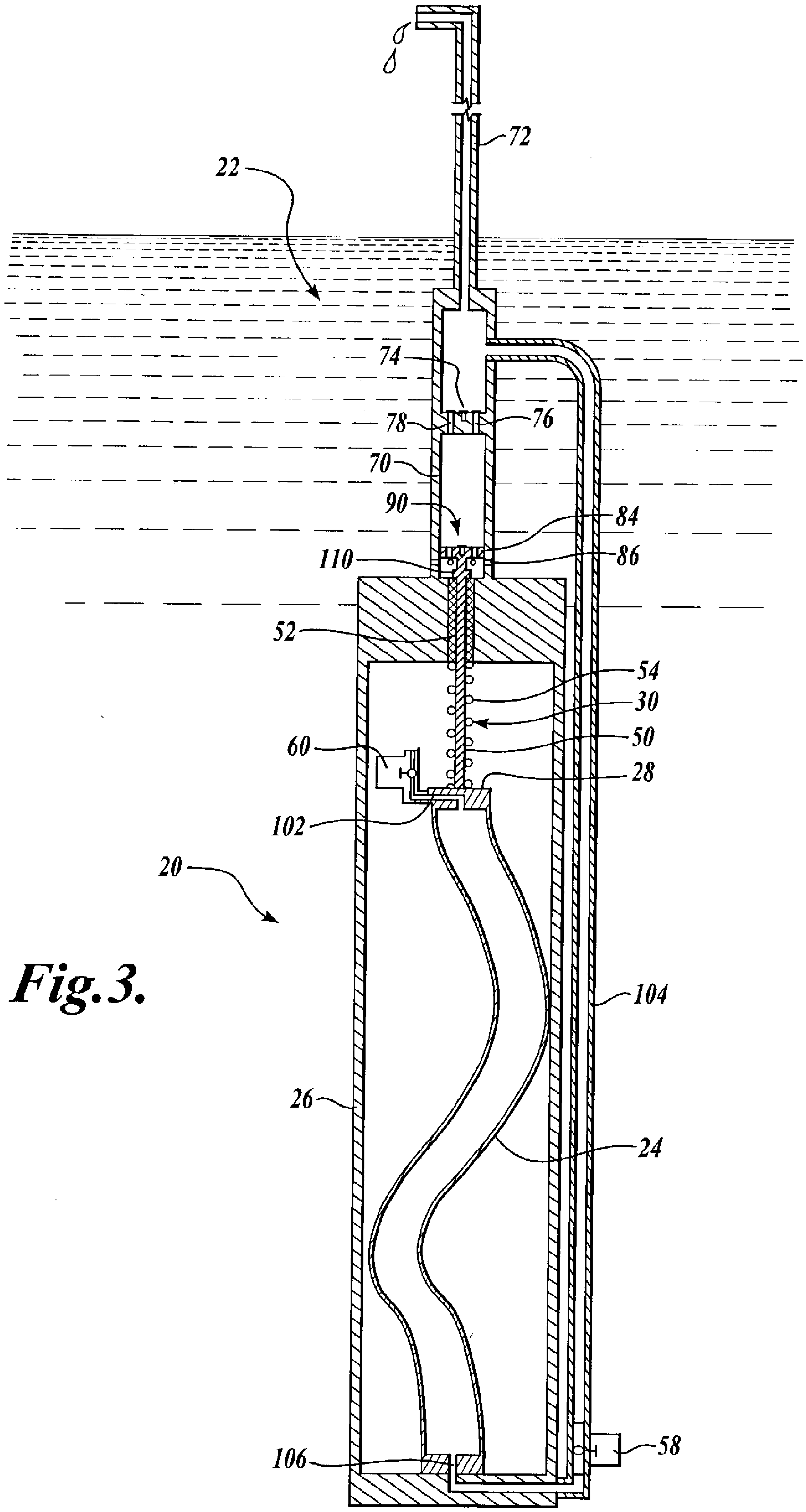

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*Fig.3.*

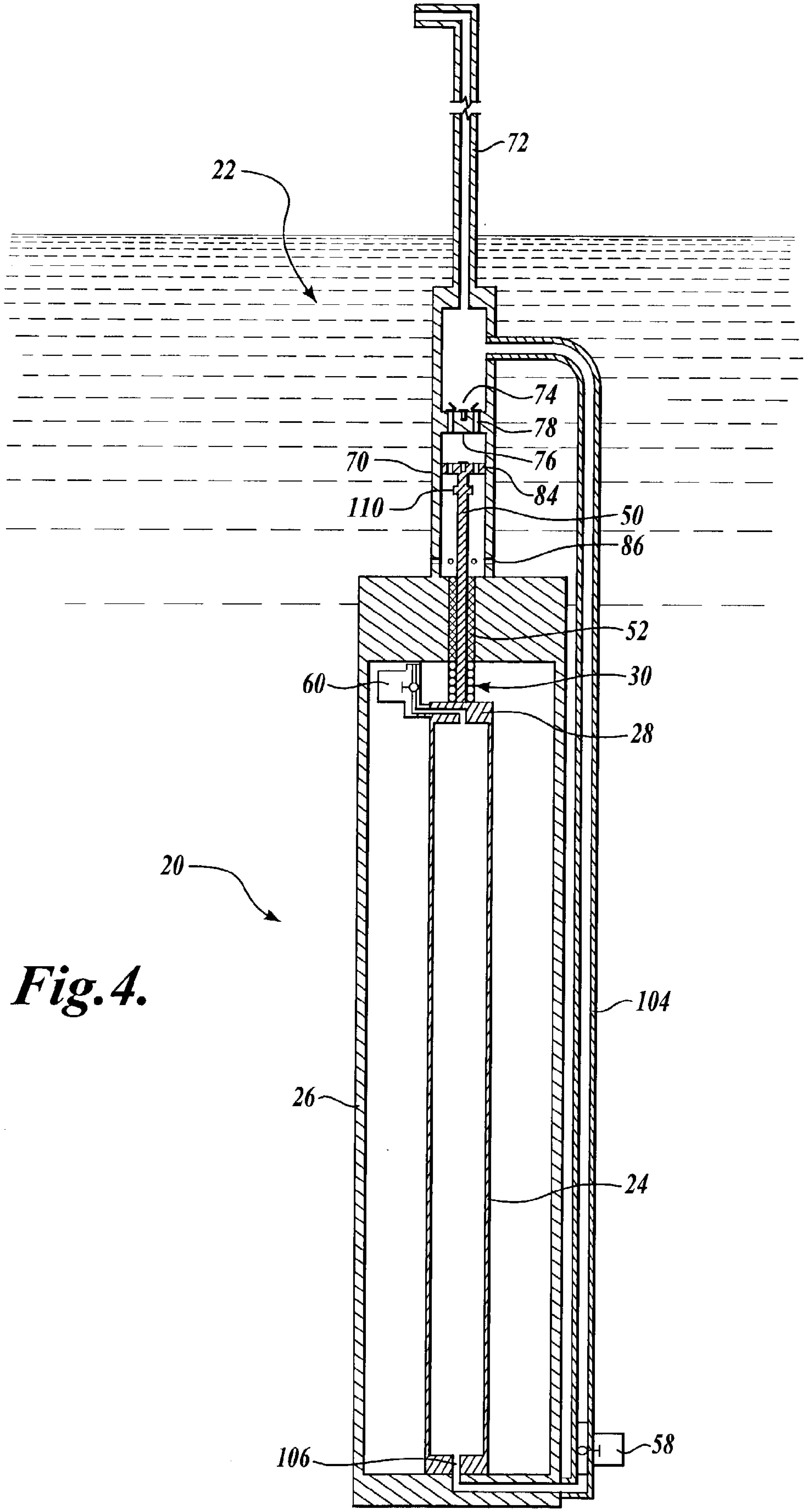


Fig.4.

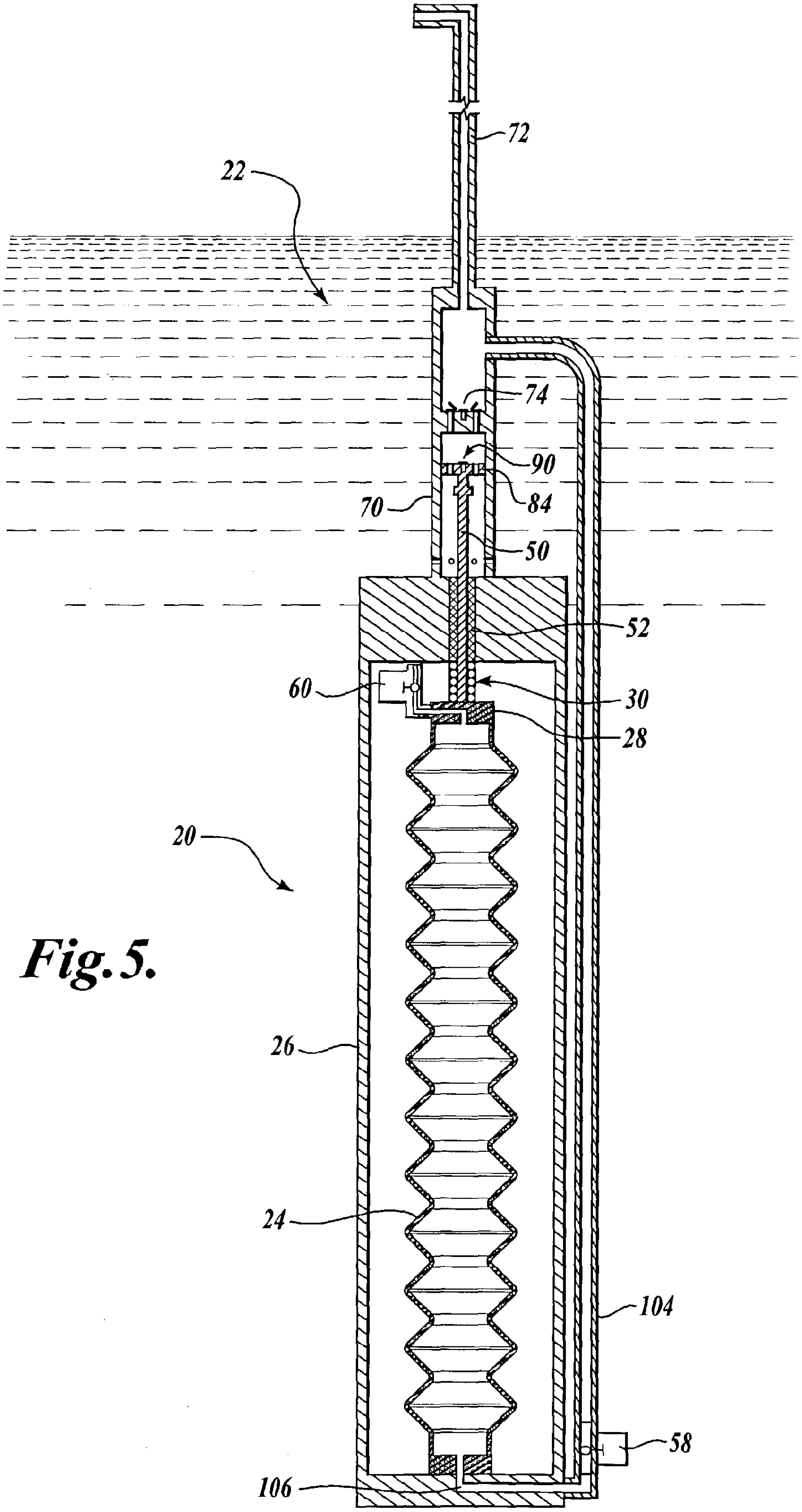


Fig. 5.

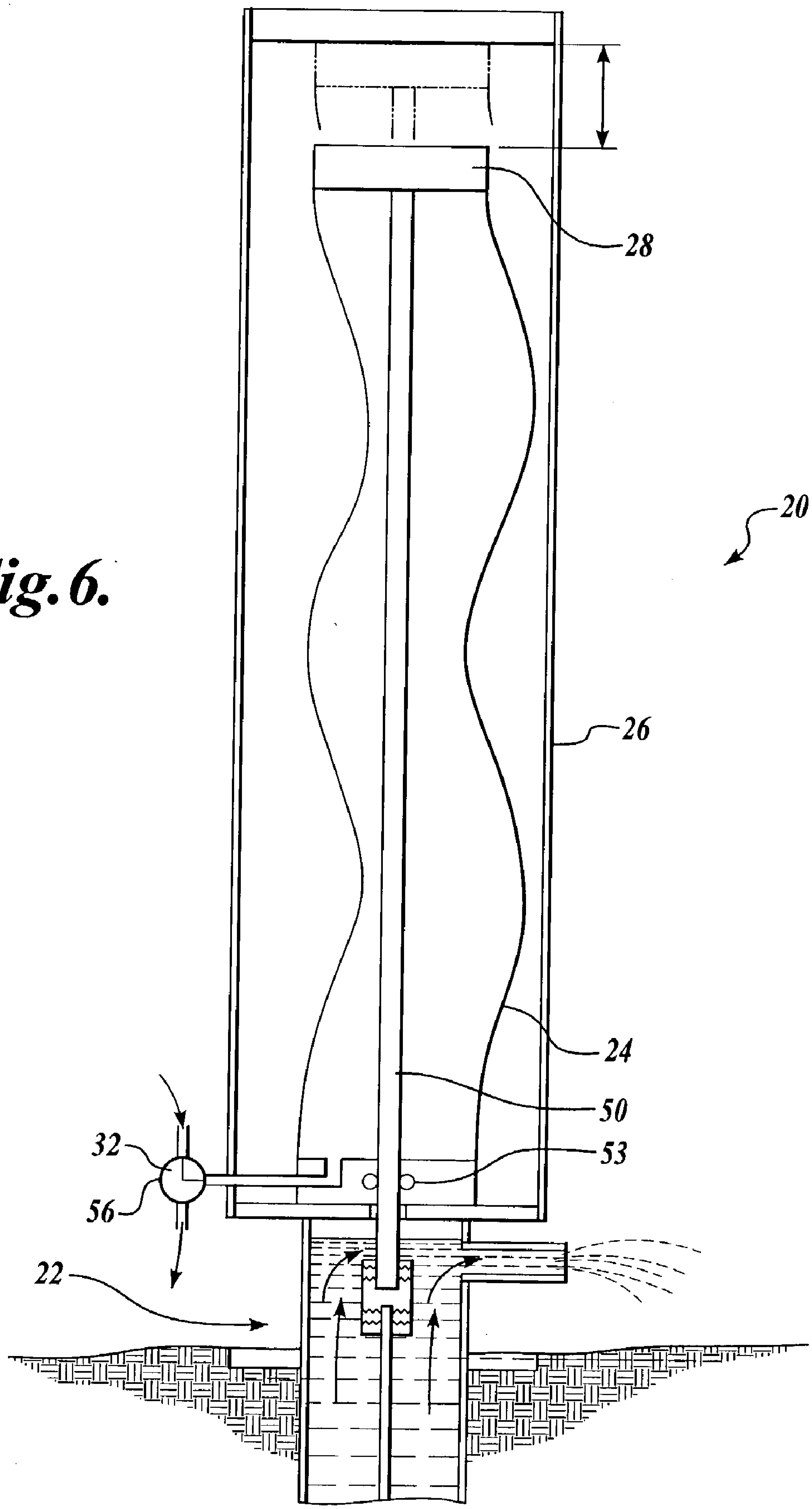


Fig. 6.

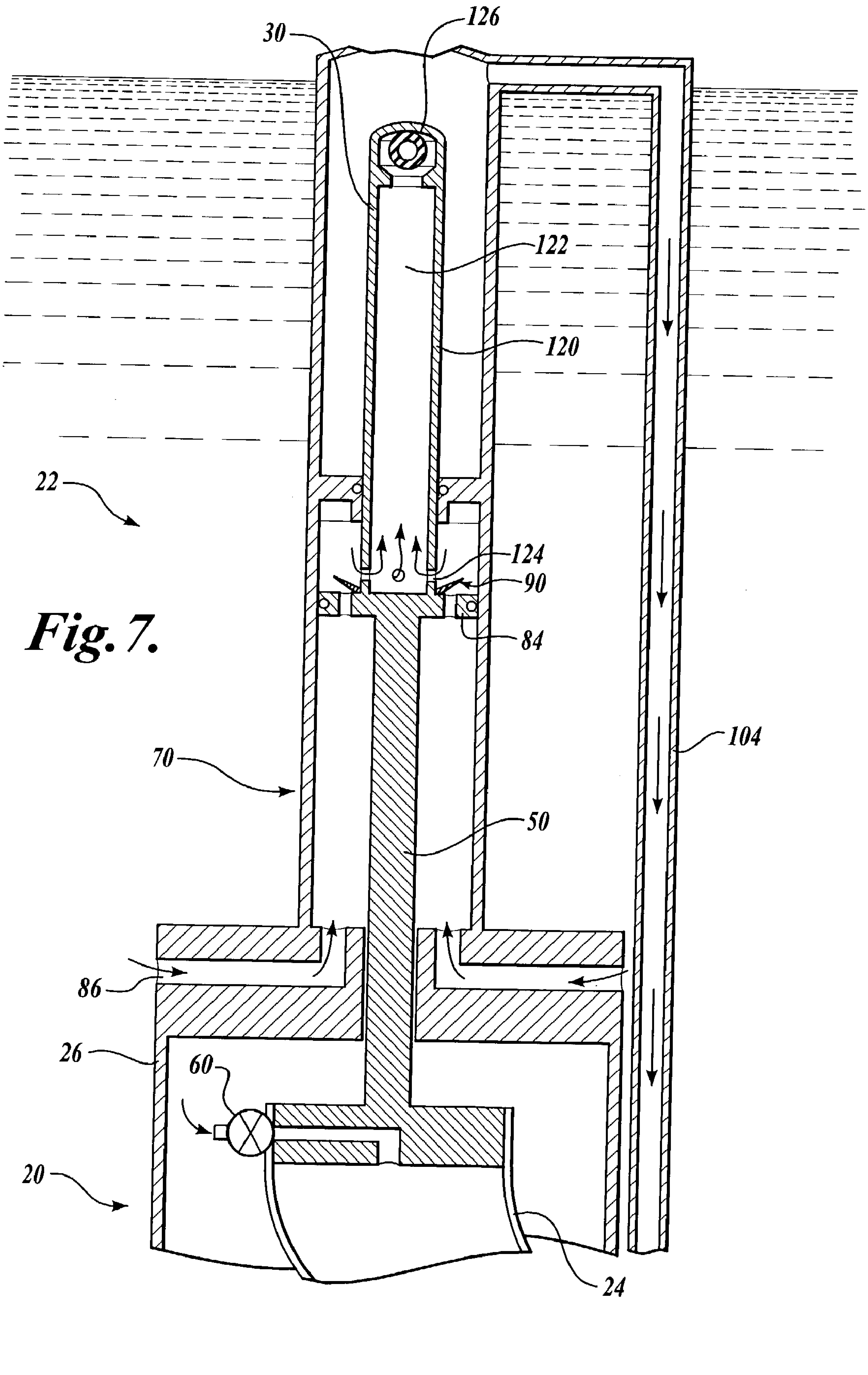


*Fig. 7.*

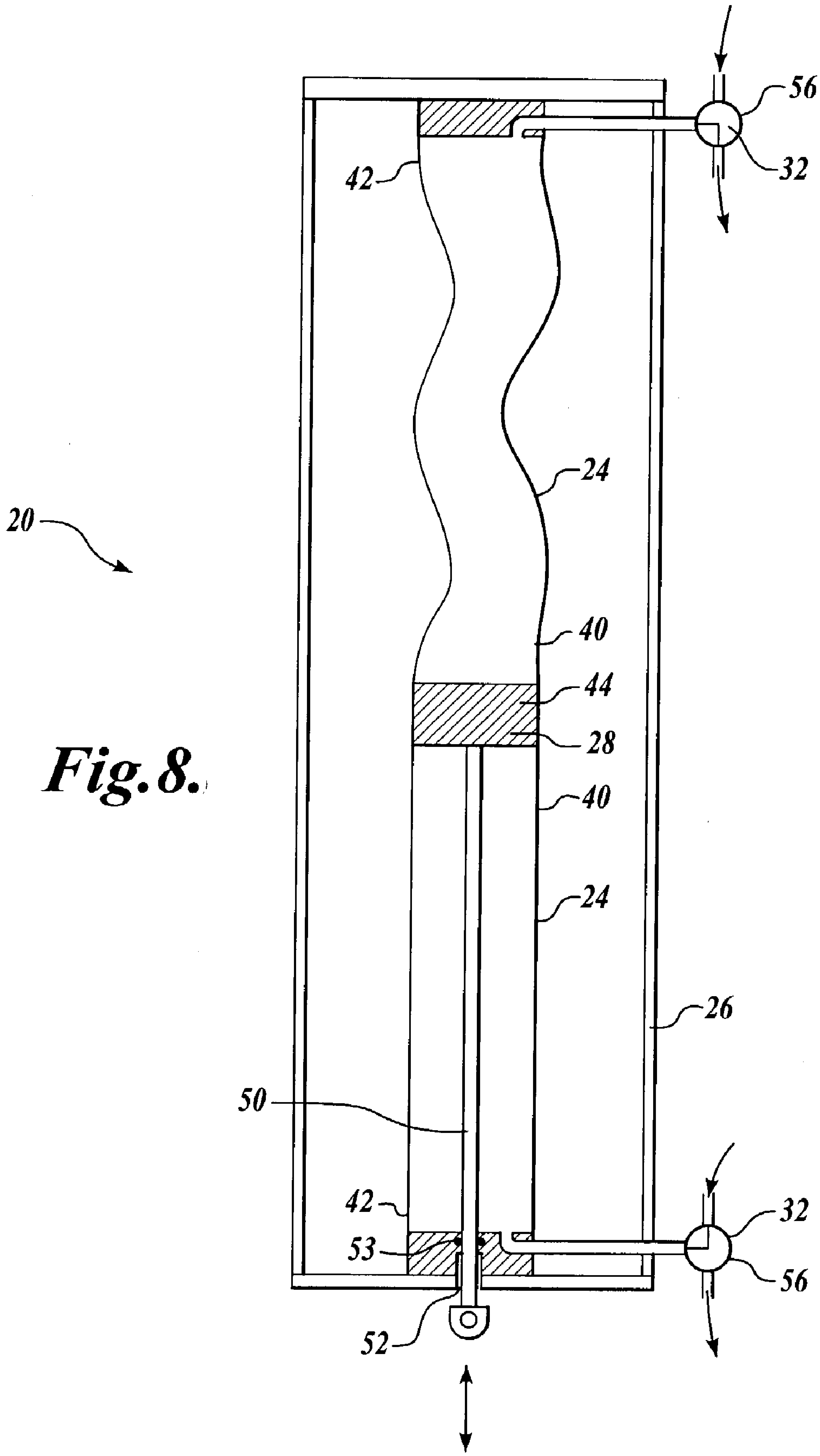


Fig.8.

# FLEXIBLE HOSE APPARATUS

## FIELD OF THE INVENTION

[0001] The present invention relates to pumps and, more particularly, to hydraulic cylinders that produce reciprocal motion.

## BACKGROUND OF THE INVENTION

[0002] There are currently a number of different types of hydraulic cylinders that utilize an essentially incompressible fluid to drive a piston in a reciprocating manner. These cylinders are typically used to drive mechanical devices in a reciprocal linear or rotary motion. In general, such cylinders require movement of hydraulic fluid that is proportional to the size and stroke of the piston. A pressure source, such as a pump that is driven by an electric or internal combustion motor, is used to deliver the hydraulic fluid to the cylinder.

[0003] One of the disadvantages of known hydraulic cylinders is the inefficiency between the amount of energy required to move the piston and the amount of energy delivered to the driven mechanical device. As such, a need exists for a hydraulic cylinder that is more efficient, and particularly one that requires a reduced amount of energy to drive the piston than is generally found. The present invention is directed to fulfilling these needs and others as described below.

## SUMMARY OF THE INVENTION

[0004] The present invention is directed to a pumping mechanism having a number of unique aspects. In one embodiment, the drive assembly includes a flexible hose capable of holding a pressurized fluid, a housing for supporting the hose, one or more valves to regulate pressure within the flexible hose, and a production assembly including a reciprocating member connected to the flexible hose. By inputting fluid pressure into the flexible hose, it extends and accomplishes a production stroke. The extension of the hose causes the reciprocating member to translate. Venting pressure from the flexible hose allows the flexible hose and reciprocating member to return to their initial positions. The translation of the reciprocating member may also be used to drive other components in a linear or rotary manner. Various other arrangements are described that make use of the flexible hose hydraulic cylinder and fluid pressure design. As will be appreciated upon reading the following, the flexible hose hydraulic cylinder may be used for driving various types of mechanical devices, such as crankshafts, mechanical arms, lifting mechanisms, and pumps.

[0005] In accordance with aspects of this invention, in one embodiment, a drive assembly includes a tubular chamber with fixed ends and a flexible hose that is positioned inside the tubular chamber. One end of the flexible hose is attached to one end of the tubular chamber, and the other end of the flexible hose is attached to a piston rod. The piston rod slides through a passageway in the second, fixed end of the tubular chamber. The flexible hose piston assembly is biased in a retracted position by a coiled spring. A source of fluid pressure introduced to the flexible hose piston causes the flexible hose piston to extend and drive the piston assembly in an outward direction.

[0006] In accordance with other aspects, in one embodiment, a production piston is attached to the distal end of the piston rod and is used to push fluid from a production chamber. As the piston rod moves from its retracted to its extended position, the production piston forces fluid out of the production chamber. In one embodiment and simultaneous with this movement, is the drawing of external fluid into the production chamber through a fluid entry port in the chamber. As the piston rod moves from its extended to its retracted position, the production piston moves back through the production chamber. External fluid passes through a valve in the production piston in order to fill the outer regions of the chamber in preparation for the next production stroke.

[0007] In accordance with still further aspects, in one embodiment, a column of fluid head pressure provides the fluid pressure to the hydraulic cylinder. In another embodiment, the apparatus is immersed in a body of fluid and the production chamber is in fluid communication with a production conduit. Head pressure in the conduit drives the drive assembly, while the conduit also provides an outlet for the pumped fluid. This arrangement results in only a minimum amount of energy needed to raise a substantial amount of fluid.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

[0009] **FIG. 1** is a cross-sectional schematic side view of one embodiment of a flexible hose hydraulic cylinder formed in accordance with the present invention;

[0010] **FIG. 2** is a cross-sectional schematic side view of another embodiment of a flexible hose hydraulic cylinder formed in accordance with the present invention;

[0011] **FIG. 3** is a cross-sectional side view of yet another embodiment of a flexible hose hydraulic cylinder attached to a production assembly and in a retracted position, both formed in accordance with the present invention;

[0012] **FIG. 4** is a cross-sectional side view of the device of **FIG. 3**, shown in an extended position;

[0013] **FIG. 5** is a cross-sectional side view of still another embodiment of a flexible hose hydraulic cylinder attached to a production assembly and in an extended position, both formed in accordance with the present invention;

[0014] **FIG. 6** is a cross-sectional schematic side view of another embodiment of a flexible hose hydraulic cylinder attached to a production assembly in a retracted position, both formed in accordance with the present invention;

[0015] **FIG. 7** is a cross-sectional side view of an alternative production assembly formed in accordance with the present invention; and

[0016] **FIG. 8** is a cross-sectional schematic side view of a dual-hose drive assembly formed in accordance with the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0017] The present invention is a pumping mechanism having a number of unique aspects that may be used separately or in combination to result in improved pumping efficiencies. In general, described below are two main aspects—a drive assembly **20** and a production assembly **22**. The drive assembly is also referred to herein as a "flexible hose hydraulic cylinder" or, simply, "hydraulic cylinder". The drive assembly **20** provides a power stroke, while the production assembly **22** uses the stroke to accomplish some specific reciprocating work. **FIGS. 1, 2**, and **8** illustrate various embodiments of a flexible hose hydraulic cylinder. FIGS. **3-7** illustrate specific embodiments of a production assembly that take advantage of a hydraulic cylinder stroke. As will be appreciated upon reading the materials, there are numerous configurations possible using these teachings.

[**0018**] Referring to **FIGS. 1 and 2**, the flexible hose hydraulic cylinder **20** is arranged to produce a reciprocating motion. In these embodiments, the cylinder **20** includes a flexible tube or hose **24**, a guide chamber **26**, a pushing plate **28**, an optional biasing member **30**, and one or more valves **32**. The pushing plate moves in a linear manner and places a force against an adjoining object. In this way, the pushing plate itself is a type of "piston", unique to this invention. A source of fluid pressure is provided to the cylinder, such as from an incompressible fluid, e.g., hydraulic fluid, water, etc. The term "incompressible fluids" means those fluids that are absolutely incompressible as well as those that are essentially or substantially incompressible. The amount of compression permissible may depend on the particular circumstances in which the apparatus is being used.

[**0019**] In **FIG. 1**, the hose **24** has a tubular shape. In **FIG. 2**, the hose has an accordion shape. In both instances, the hose is preferably made of a flexible, though nonexpandable, material. Example materials include, but are not limited to, a synthetic, a natural or manmade rubber, a thermal plastic, a high-strength bidirectional fabric (e.g., aramid bidirectional fabric), Kevlar™, and others. The rubber or other material may be reinforced by fabric or fibres, such as carbon fibres. Further, in some embodiments, the hose may include a metal material component. As used herein, the term "nonexpandable material" includes those materials that are absolutely nonexpandable as well as those that are essentially or substantially nonexpandable. The amount of expansion permissible may depend on the particular circumstances in which the apparatus is being used.

[**0020**] The hose **24** further includes a first end **40** closed off by the pushing plate and a second end **42** anchored to the guide chamber or other support structure. Alternatively, the flexible hose **24** may include a middle pushing plate **44**, thereby allowing both ends of the drive assembly to produce a production stroke. See, for example, **FIG. 8**, in which two flexible hoses are positioned end to end and are arranged to operate in alternative fashion. A piston rod **50** or other energy transmitting component is attached to, or in communication with, a moving end of the flexible hose **24**. In **FIGS. 1 and 2**, the flexible hose hydraulic cylinder is housed and supported within the guide chamber **26**, the second end of the hose being fixedly attached to the bottom of the chamber. An opening **52** at the top of the chamber provides a passageway through which the piston rod **50** may extend. In **FIG. 8**, the hoses are positioned within a guide chamber and an elongated piston rod **50** is connected to the middle support member that divides the hoses. The rod **50** extends out of the opening **52** at one end of the chamber **26**. Various seals and sealants may be used throughout. (See, for example, **FIG. 6**, item **53**.)

[**0021**] In some embodiments, a biasing member may be used to push the piston rod **50** and flexible hose **24** to a desired position. Various types of biasing methods are known and may be incorporated into the present invention. For example, **FIGS. 1 and 2** show a coil spring **54** held in compression between the upper wall of the guide chamber and the top surface of the pushing plate **28**. The spring **54** continuously pushes the piston rod **50** toward its retracted position.

[**0022**] During use, the flexible hose **24** moves the piston rod **50** between extended and retracted positions in response to the pressure within the flexible hose. This is accomplished using one or more valves that selectively allow pressurized fluid to enter and exit the flexible hose. There are many different combinations of valves that can be used to accomplish these tasks.

[**0023**] In the embodiments of **FIGS. 1, 2, 6**, and **8**, a single three-way valve **56** fills and relieves fluid pressure in the flexible hose **24**. When filled, the internal pressure in the flexible hose **24** causes the hose to extend. In doing so, it pushes the piston rod **50** outward. Turning valve **56** to its second position relieves pressure from the flexible hose **24**, which results in the rod **50** returning to its retracted position by force of the biasing member **30**. In the embodiments of **FIGS. 3, 4, 5**, and **7** separate two-way valves (items **58** and **60**) are used to fill and relieve fluid pressure.

[**0024**] Referring to the embodiment of **FIGS. 3 and 4**, the production assembly **22** is adapted to push fluid out of a production chamber **70** and into a production conduit **72**. The production chamber **70** is an enclosed volume capable of holding a desired amount of fluid. The production chamber **70** is in fluid communication with the lower end of the production conduit **72**, though separated by a wall having a first one-way valve **74**. In the embodiment of **FIG. 3, a** fixed plug **76** is positioned near the top of the production chamber **70** and a series of holes **78** are drilled through the plug **76** to allow fluid to pass through the plug. The first one-way valve **74** is a flapper valve that releases fluid into the production conduit **72** during the production stroke.

[**0025**] Still referring to **FIGS. 3 and 4**, the piston rod **50** is located in a generally upright orientation and includes a proximal end and a distal end. A production piston **84** is connected to the proximal end of the piston rod **50**. The production piston **84** is located within the production chamber **70**, preferably in a sealed relationship with the inner surfaces of the production chamber side walls **70**.

[**0026**] One or more external fluid entry ports **86** are located in the production chamber **70** at a location below the production piston **84**. Ports **86** are in fluid communication with a source of static fluid, such as water in a ground well. The production piston **84** is located between the fluid entry ports **86** and the first one-way valve **74**. When the production piston **84** is in a retracted position, it is located closer to the ports **86**. When the production piston **84** is in an extended position, it is located closer to the first one-way valve **74**. The ports **86** allow fluid to be drawn into the production chamber **70** during the production stroke. **FIG. 7** illustrates an alternative method of inputting fluid into the production chamber **70** in which the fluid entry ports **86** are made through the upper wall of the guide chamber **26** and into the lower end of the production chamber **70**.

[**0027**] Referring back to **FIGS. 3 and 4**, a second one-way valve **90** is located at the production piston, thereby permitting fluid to travel in an outward direction. In one arrangement, the second one-way valve **90** is a rubber flapper valve fitted over a series of holes drilled through the production piston **84**. The flapper is located on the external side surface of the production piston **84**. The holes and valve allow fluid to pass into the production chamber **70**, through the production piston **84** when the production piston **84** is moving from its extended position to its retracted position.

[**0028**] The guide chamber **26** is located adjacent the production chamber **70**. In the embodiment shown, these chambers **70** and **26** are connected to one another with the piston rod **50** extending therebetween. The guide chamber **26** is an upright enclosure having an upper end and a lower end. The upper end includes the passage **52** for holding the piston rod **50** and supporting it therein during reciprocation. In this embodiment, the flexible hose **24** is a flexible tube with a lower end fixedly attached to the bottom of the guide chamber **26**. **FIG. 5** shows a similar arrangement with the flexible hose **24** formed in an accordion or bellows shape. The guide chamber **26** may be open to the surrounding fluid source.

[**0029**] As described with reference to **FIGS. 1 and 2**, the drive assembly **20** of **FIGS. 3 and 4** includes the flexible hose **24**, which is in communication with a source of pressure. During use, the flexible hose **24** pushes against the distal end of the piston rod **50** so that reciprocating motion of the flexible hose **24** causes similar reciprocating motion of the production piston **84**. In this manner, the device may be used to easily move fluid from one elevation to a second, higher elevation.

[**0030**] As stated above, the piston rod and drive assembly have a retracted position (see **FIG. 3**) and an extended position (see **FIG. 4**). In the embodiment shown, these assemblies are biased in the retracted position by a compressed coil spring **54** surrounding the production piston rod **50**. The spring **54** extends between the upper, inner surface of the guide chamber **26** and the upper, outer surface of the flexible hose **24**.

[**0031**] A relief valve **60** is connected to the upper end of the flexible hose **24**. The relief valve relieves fluid pressure from the interior of the flexible hose **24** via a relief passage **102**. A fluid return path **104** extends between the production conduit **72** and a head pressure fluid entry port **106** in the guide chamber **26**. A third valve **58** is provided at the fluid entry port **106**. The third valve **58** selectively allows fluid pressure to alternately be opened or closed from entering the fluid return path **104** into the flexible hose **24**. Example valves that may be used are two-way electrical valves, pneumatic valves, manual valves, etc. The optimal valve type will depend on the particular application. In alternative embodiments, placements of the third valve **58** and the relief valve **60** may be switched. Alternatively, these components may both be placed on top of the flexible hose **24**, or both could be located on the bottom of the flexible hose **24**. The fluid entry port **106** and the fluid return path **104** would change locations commensurately.

[**0032**] Fluid is pumped by opening the third valve **58**. When this happens, fluid pressure from the fluid return path **104** is permitted to enter into the flexible hose **24**, thus causing the flexible hose **24** to extend fully. In doing so, the upper end of the flexible hose **24** drives the production piston and rod, **84** and **50**, respectively, upward, against the compressive force of the biasing spring **54**. In general, the diameter of the flexible hose is larger than the diameter of the production piston **84** in order to overcome the various forces acting on the piston **84**.

[**0033**] Upward movement of the production piston **84** causes fluid in the production chamber **70** to flow out of the chamber **70** and into the production conduit **72**. In the embodiment of **FIG. 3**, the fluid flows through the first one-way valve **74**. In the embodiment of **FIG. 7**, fluid flows through the ball valve **126**. During this upward movement, the second one-way valve **90** is closed. Driving the production piston **84** upward causes fluid within the production conduit **72** to spill out of its upper end. Simultaneous with fluid moving out of the production chamber **70** is the inward flow of external static fluid into the production chamber **70** through the fluid entry ports **86**. In creating an arrangement for a particular application, the flexible hose **24** should have a piston area of sufficient size that when pressurized, the force generated is greater than the combined forces of the head pressure pushing against the production piston **84**, the biasing spring **54**, and any friction. In this way, the force generated by the flexible hose is always greater than the opposing forces during the intended production stroke.

[**0034**] Once the production piston **84** has reached the end of its stroke, the third valve **58** is closed, completely shutting off head pressure in the fluid return path **104** to the flexible hose **24**. The two-way relief valve **60** is momentarily opened to vent pressure in the flexible hose **24**. In doing so, biasing spring **54** expands and drives the production piston **84** downward toward its retracted state. The outflow of fluid pressure from the flexible hose **24** enables it to return to its original serpentine, coiled, or other folded configuration. The elimination of pressure should be to an extent necessary to allow movement of the flexible hose **24** to its retracted state. During this movement, the second one-way valve **90** allows the newly entered external static fluid to move through the production piston **84** and into the upper regions of the production chamber **70**. Fluid in the production conduit **72** is prohibited from reentering the production chamber by the orientation of the first one-way valve **74**.

[**0035**] In the retracted position, the production piston **84** is located just above the fluid entry ports **86**. A stop ledge **110** may be used on the piston rod **50** (or alternatively along the production chamber walls) to prohibit the production piston **84** from moving below the ports **86**. In the retracted position, the third valve **58** is closed. The production chamber **70**, the production conduit **72**, and the fluid return path **104** are each filled with fluid. A maximum head pressure is felt at the third two-way valve **58**. The flexible hose **24** is in a flexed state, and the two-way relief valve **60** is closed.

[**0036**] Pressure to drive the drive assembly may be provided from various sources. In the embodiment of **FIG. 3**, fluid head pressure available in the production conduit **72** via the fluid return path **104** is used to move the drive assembly. Thus, during use, the production conduit **72** should be filled enough to provide sufficient head pressure to the drive assembly. In another embodiment, pressure is provided from a pressurized vessel having a pressurized gas over fluid. In such an arrangement, the fluid may need to be replenished periodically. As will be appreciated by those skilled in the art, the invention can use any number of pressure means as a way to fully extend the flexible hose **24**.

[**0037**] As will also be appreciated from a reading of the above, using the present invention to raise a column of fluid has a number of distinct advantages. The drive assembly itself performs as a piston, while requiring only a very small movement of fluid within the flexible hose. When sufficient pressure is introduced into the flexible hose **24** by opening the third valve **58**, the head pressure in the column of liquid is introduced to the flexible hose **24**. The hose **24** then straightens and moves in an upward direction, causing the production piston **84** to move similarly. When the hose **24** has reached the end of the stroke, the third valve **58** is closed, shutting off the head pressure to the hose **24**. When the pressure is released from the flexible hose **24** by opening the relief valve **60**, the flexible hose **24** returns to its unextended state from the pushing force of the compressed coil spring **54**. Because fluid is essentially incompressible and because the flexible hose **24** is constructed of minimally expanding materials, only a very small amount of fluid is lost when the pressure is released. The spring force required to reset the flexible hose **24** is that force necessary to overcome the friction in the seals and to overcome the resistance of the flexible hose **24** to return to its unextended configuration.

[**0038**] Using only one conduit for both power and production has benefits as well. Simpler and more efficient construction is possible, which enables the return of the small amount of fluid lost in the flexible hose when pressure is released from the flexible hose. The energy required to operate the device is essentially the energy used to open and close the relief valve and the third valve. These energy requirements remain essentially the same, regardless of how high the column of fluid happens to be. Therefore, the higher the head, the more efficient the device becomes. Other known pumps using a column of fluid as a power source all have similar problems—they either have to raise two volumes of fluid and use one volume to reset the piston, or they have to increase the pressure on the power side equal to the force to lift one volume of fluid to the surface. Therefore, there is no saving of energy in these prior art devices.

[**0039**] **FIG. 6** illustrates an embodiment of a drive assembly and production assembly for use in lifting sucker rods in fluid wells. Instead of using the extended position of the piston rod **50** to define the production stroke, the piston rod **50** is connected to the hydraulic cylinder **20** such that extension of the flexible hose **24** causes retraction of the piston rod **50**. In this embodiment, the piston rod **50** is elongated to pass through the hose **24** and to extend the length of the hose when pressurized. The result is that the hydraulic cylinder **20** pulls the rod **50** inward, into the hose **24**, in order to draw fluid from a source. The combined weight of the piston rod **50** and the sucker rods returns the flexible hose **24** to its bent position once pressure is relieved in the flexible hose.

[**0040**] **FIG. 7** illustrates an alternate method of biasing the device. Other methods may be used as well. In **FIG. 7**, an elongated reset tube **120** extends from the exterior side surface of the production piston **84**. The reset tube **120** includes an inner delivery channel **122**. A series of openings **124** are provided at the base of the reset tube **120** and provide fluid communication between the production chamber **70** and the delivery channel **122**. The opposite end of the reset tube **120** includes a ball check valve or other one-way valve **126**. The openings **124** and valve **126** allow fluid in the production chamber **70** to flow into the channel **122**, out of the reset tube **120**, and into the production conduit **72** during the production stroke. The reset tube **120** passes through the wall or plug **76** that separates the production chamber **70** from the production conduit **72**. The valve **126** is located in the production conduit **72** at all times. Once the production stroke is complete and pressure is relieved from the flexible hose **24**, head pressure on the valve **126** is sufficient to reset the production piston **84** to its retracted position. (Head pressure is generally defined as the fluid force or pressure present at the lower end of a fluid column, calculated as fluid density times column height times the gravitational constant, g.)

[**0041**] In an alternative embodiment, the flexible hose has a length of approximately 10 feet with a stroke in the range of about 5 to 6 inches. In another embodiment, the hose is nominally formed in a coil shape to increase the stroke length.

[**0042**] While the preferred embodiment of the invention has been illustrated and described, it will be appreciated that various changes can be made therein without departing from the spirit and scope of the invention. For example, the mechanisms are shown in an upright orientation. They may also be oriented laterally and still work effectively for some configurations, e.g., lying on the bottom of a tank, lake, or other body of fluid. Various types of sealants may be used throughout.

[**0043**] In addition, the present invention may find use in many different applications, such as irrigation, dewatering mines, power generation, water wells, oil wells, reverse-osmosis systems, driving crankshafts, and others. The present invention is particularly well suited for use in oil or water fluid production wells (i.e., free-flowing fluid environments) as a replacement to the motor of the lifting mechanism. The present invention may also be used for driving crankshafts or other mechanical devices to obtain rotary or linear movement.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A drive assembly for producing reciprocal motion, a source of fluid pressure being provided to the drive assembly, the assembly comprising:

(a) a flexible hose capable of holding a pressurized fluid;

(b) a housing within which the hose is disposed; and

(c) at least one valve operable to selectively allow pressurized fluid to enter the flexible hose, the at least one valve further operable to vent pressure from the hose; and

(d) a reciprocating member connected to the flexible hose;

wherein, during use, fluid pressure is supplied to the flexible hose via the at least one valve, thereby increasing the internal pressure in the flexible hose and causing the flexible hose to extend and the reciprocating member to translate; and wherein, during use, the at least one valve vents pressure from the flexible hose causing the flexible hose and reciprocating member to return to their retracted positions.

**2**. The drive assembly according to claim 1, wherein the reciprocating member is a piston rod having a retracted position and an extended position, the piston rod being biased in the retracted position.

**3**. The drive assembly according to claim 2, wherein the flexible hose is made of a nonexpandable material.

**4**. The drive assembly according to claim 2, wherein the flexible hose is formed of a nonpermeable flexible woven fabric.

**5**. The drive assembly according to claim 2, wherein the flexible hose is formed in an accordion shape.

**6**. The drive assembly according to claim 5, wherein the accordion-shaped flexible hose is made of a material having at least one component of metal.

**7**. The drive assembly according to claim 5, wherein the accordion-shaped flexible hose is made of at least one of a rubber material, a synthetic material, and a fabric material.

**8**. The drive assembly according to claim 1, wherein the at least one valve is a three-way valve capable of providing both positive fluid pressure and relief of fluid pressure within the flexible hose.

**9**. The drive assembly according to claim 1, wherein the at least one valve includes two two-way valves that cooperate to provide positive fluid pressure and relief of fluid pressure within the flexible hose.

**10**. The drive assembly according to claim 2, wherein the fluid pressure is a hydraulic fluid pressure.

**11**. The drive assembly according to claim 2, wherein the pressurized fluid used to enter the flexible hose is provided from a column of fluid having an associated head pressure.

**12**. The drive assembly according to claim 2, wherein the drive assembly includes a spring and the piston rod includes a proximal end attached to the flexible hose, the spring being held in compression between the flexible hose and the housing and urging the piston rod to its retracted position.

**13**. The drive assembly according to claim 12, wherein the spring is a coil spring wrapped around the piston rod.

**14**. The drive assembly according to claim 12, further comprising a production assembly including a production chamber located adjacent the housing and into which the piston rod extends.

**15**. The drive assembly according to claim 2, further comprising a production assembly including a production chamber located proximate the housing and into which the piston rod extends.

**16**. The drive assembly according to claim 2, further comprising a production assembly including a production chamber capable of holding a fluid, the production chamber including at least one fluid entry port for entry of external fluid;

wherein the production assembly includes a production piston connected to a distal end of the piston rod and located within the production chamber; the production assembly including a valve;

wherein, as the piston rod moves from its retracted position to its extended position, the production piston forces fluid out of the production chamber; simultaneous with this movement is the drawing of external fluid into the production chamber through an at least one fluid entry port located in the production chamber;

wherein, as the piston rod moves from its extended position to its retracted position, the production piston moves back through the production chamber and external fluid passes through the valve in preparation for the next production stroke.

**17**. The drive assembly according to claim 16, wherein the at least one fluid entry port allows fluid to enter the production chamber but not to exit the production chamber, thereby ensuring passage of fluid from the production chamber through the production piston during the return stroke.

**18**. The drive assembly according to claim 16, wherein the production chamber includes a distal valve that allows fluid to exit the production chamber during the extend stroke but not to enter the production chamber, thereby ensuring passage of fluid from the production chamber through the production piston during the return stroke.

**19**. The drive assembly according to claim 16, wherein the at least one valve includes a valve to selectively allow pressurized fluid to enter the flexible hose and another valve to vent pressure from the flexible hose.

**20**. The drive assembly according to claim 16, wherein the at least one fluid entry port includes multiple openings located along the sides of the production chamber.

**21**. The drive assembly according to claim 16, wherein the housing is a guide chamber located adjacent the production chamber, the guide chamber holding the drive assembly, the piston rod extending between the guide chamber and the production chamber through a passageway extending therebetween.

**22**. The drive assembly according to claim 21, wherein the drive assembly includes a spring located within the guide chamber, the spring being held in compression between the flexible hose and the guide chamber and urging the piston rod into the guide chamber.

**23**. The drive assembly according to claim 22, wherein the spring is a coil spring wrapped around the piston rod.

**24**. The drive assembly according to claim 16, wherein the drive assembly is adapted for use with a production conduit, the drive assembly being immersed in a source of external fluid, a source of fluid pressure being provided to the flexible hose, during the extend stroke, the production piston forcing fluid out of the production chamber and into the production conduit.

**25**. The drive assembly according to claim 24, wherein the pressurized fluid used to enter the flexible hose is provided from a column of fluid having an associated head pressure.

**26**. The drive assembly according to claim 25, further comprising a fluid return path connected between the production conduit and the at least one valve to selectively allow pressurized fluid to enter the flexible hose, the column of fluid thus being provided from the production conduit.

**27**. The drive assembly according to claim 24, wherein the pressurized fluid used to enter the flexible hose is provided from a secondary pressurized fluid source.

**28**. The drive assembly according to claim 24, wherein the fluid used to drive the flexible hose includes at least one of fresh water, oil, and saltwater.

**29**. The drive assembly according to claim 24, wherein the fluid used to drive the flexible hose is a free flowing fluid.

**30**. In a device having a reciprocating member, an improvement comprising a flexible hose connected to the reciprocating member to drive the reciprocating member in at least one direction, the flexible hose being formed of a nonexpandable material, the flexible hose being capable of accepting and releasing pressure of an incompressible fluid in order to move between extended and retracted states.

**31**. In a device having a reciprocating member, an improvement comprising a flexible hose connected to the reciprocating member to drive the reciprocating member in at least one direction, the flexible hose being formed of a nonexpandable material made in an accordion shape, the flexible hose being capable of accepting and releasing pressure of an incompressible fluid in order to move between extended and retracted states.

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