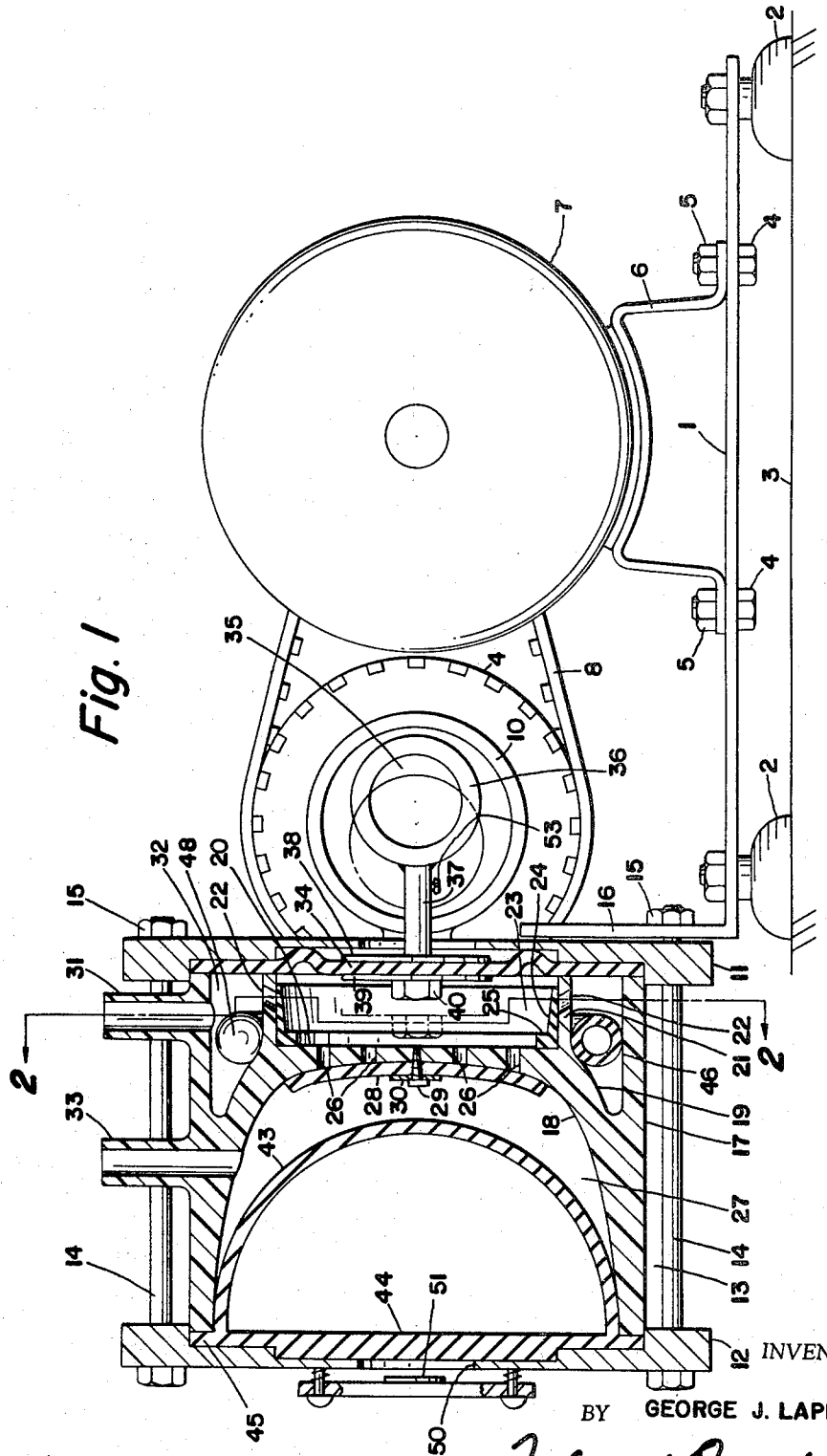
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Fig. 1



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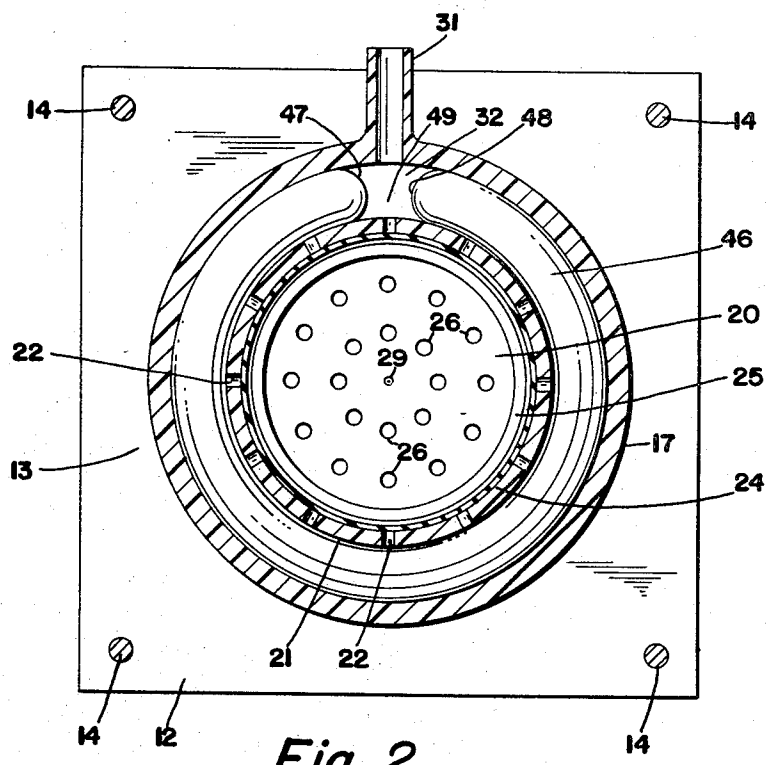


Fig. 2

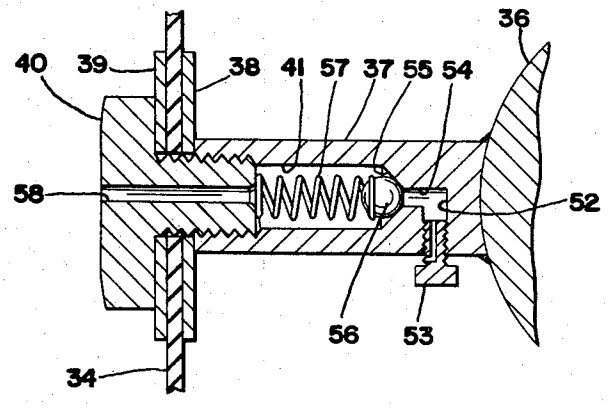


Fig. 3

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ABSTRACT OF THE DISCLOSURE

The invention is concerned with a pump which is especially useful for prividing a water pressure system for trailers and the like, and which comprises a one-piece housing having a concentric arrangement of fluid ante-chamber and inlet chambers, a novel disposition of a fluid pumping diaphragm over these chambers, novel means for introducing atmospheric air into the fluid inlet chamber, and for controlling the fluid pumping action.

This invention relates generally to pumps, but has reference more particularly to a pump which is especially useful for providing a water pressure system for trailers and the like.

Pumps of this general type are described, for example, in Patents Nos. 2,980,031, 3,070,029 and 3,194,576, but these pumps are of extremely complicated and expensive design or construction, and are not adaptable for use in all positions.

The present invention has as its primary object the provision of a pump of the above-described character, which is of extremely simple construction, enabling it to be manufactured at low cost, and sold in commercially feasible quantities.

Another object of the invention is to provide a pump of the character described, consisting of parts which can be made with a minimum of machining or other mechanical operations, and which can be quickly and easily assembled, or disassembled, for replacement of any of the parts.

A further object of the invention is to provide a pump of the character described, having incorporated therein pulsation eliminating members of novel design and construction.

A further object of the invention is to provide a pump of the character described, having incorporated therein certain novel and useful features, including means for admitting atmospheric air into the water which is being pumped, a micro-switch for controlling the water pressure provided by the pump, etc.

A still further object of the invention is to provide a pump of the character described, which may be used efficiently in virtually any position.

Other objects and advantages of my invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification, and in which like numerals are employed to designate like parts throughout the same,

FIG. 1 is a view of the pump, partly in side elevation, and partly in cross-section;

FIG. 2 is a cross-sectional view, taken on the line 2—2 of FIG. 1;

FIG. 3 is an enlarged cross-sectional view of the means for admitting atmospheric air into the water inlet chamber.

Referring more particularly to the drawings, there is disclosed a platform or base **1**, having secured to the corners thereof rubber vacuum or suction cups **2**, whereby the base may be supported on any suitable smooth supporting surface **3**.

Secured to the base **1**, as by means of bolts **4** and nuts **5**, is a supporting bracket or cradle **6**, for an electrically-driven motor **7**.

The motor **7** drives an endless cog belt **8**, which, in turn, drives a gear or pinion **9**, which is supported for rotation on a bearing **10**, which, in turn, is supported by the cover or end plate **11** of the pump.

The pump comprises the covers or end plates **11** and **12**, which, as shown in FIG. 2, are rectangular in form, and a cylindrical body or housing, designated generally by the reference numeral **13**, interposed between the covers or end plates **11** and **12**. The covers **11** and **12** and the body or housing **13** are removably secured together by means of bolts **14** and nuts **15**. The two lower bolts **14** extend through an upright end flange **16** of the base **1**, so that the pump is thus removably supported on the base plate.

For the sake of lightness and economy, the body or housing **13** of the pump is preferably molded in a single piece, of a plastic, to provide a cylindrical outer wall **17**, a dome-like partition having a concave wall **18**, a convex wall **19**, and a flat wall **20**. At the intersection of the convex wall **19** and the flat wall **20**, the housing is formed to provide an annular flange **21**, which is in concentric spaced relation to the wall **17**.

The flange **21** is provided with a series of circumferentially spaced water inlet openings **22** through which water is adapted to pass into the water inlet chamber or compartment **23** formed by the wall **20** and flange **21**.

The openings **22** are normally closed by means of a flexible annular rubber valve **24**, having a base flange **25** which seats on the wall **20**.

The dome-like partition, to which reference has been made, is provided with a multiplicity of openings **26**, which extend from the wall **20** of the partition to the concave wall **18**, and provide for passage of water therethrough from the chamber or compartment **23** to a water outlet chamber or compartment **27** formed by the concave wall **18**.

The outlet ends of the openings **26** are normally covered by a flexible disc-shaped rubber valve **28**, which is secured to the central portion of the wall **18** by means of a pin **29** and a washer **30**.

The body or housing **13** is provided with a water inlet tube **31**, which admits water into an annular ante-chamber **32**, which is formed by the wall **17**, wall **19** and flange **21**. In addition to its function of providing a manifold for admitting water into the openings **22**, the ante-chamber **32** serves another purpose to be presently described.

The body or housing **13** is also provided with a water outlet tube **33** which conducts the water from the water outlet chamber or compartment **27**, and is parallel with the inlet tube **31**.

Secured to one end of the wall **17** and to the end of the flange **21** is a molded flexible rubber diaphragm **34**, this diaphragm being clamped to the housing by the cover or end plate **11**.

The pinion or gear **9** is provided with an eccentric pin **35**, which imparts reciprocal movement to a crank **36** having a crank arm **37**, which, as best seen in FIG. 3, is secured to the central portion of the diaphragm **34** by means of circular plates **38** and **39**, and a bolt **40**, which extends through these plates and is threaded into an axial bore **41** in the arm **37**.

Disposed within the water outlet chamber **27** is a hollow hemispherical member **43**, molded of flexible rubber, and having a disc-like base **44**, providing an annular flange **45**, which is clamped between one end of the housing **13** and the cover or end plate **12**. The function of the member **43** and its base **44** will be presently described.

With the pump as thus described, the operation of the pump may be described as follows.

On the intake stroke of the pump, as represented by the position of the crank **36** shown in solid lines in FIG. 1,

the suction created by the movement of the diaphragm 34 to the position shown in FIG. 1, causes water to be drawn from a source of supply into the tube 31 and ante-chamber 32. At the same time, the valve 24 is sucked away from the flange 21 to permit water from the chamber 32 into the compartment 23. Moreover, the rubber valve 28 remains in closed position, as shown in FIG. 1, due to the aforesaid suction created by the diaphragm 34.

On the discharge stroke of the pump, as represented by the position of the crank 36 shown in broken lines in FIG. 1, and by the position of the bolt 40 shown in broken lines, the pressure of the diaphragm 34 on the water in the compartment 23 causes the valve 24 to close and the valve 28 to open, permitting the water to be discharged through the openings 26, into the compartment 27 and out through the outlet tube 33.

For the purpose of eliminating pulsations during operation of the pump, which cause vibrations and noise, and which interfere with the smooth and uninterrupted operation of the pump, I have provided novel pulsation eliminators.

One of these pulsation eliminators is in the form of a hollow torus-shaped member 46, molded of soft flexible rubber, and disposed within the ante-chamber 32 between the wall 17 and flange 21 and adjacent the wall 19. This member 46 has closed ends 47 and 48 (FIG. 2), spaced apart to form a gap or space 49 therebetween to facilitate passage of water from the tube 31 into the ante-chamber 32. The member 46 acts as a cushion which takes the impact of the water entering the chamber 32, and thus aids in preventing pulsation.

The other of the pulsation eliminators is the hemispherical member 43, which cushions the impact of the water which enters the chamber 27, and thus aids in preventing pulsation.

In the event the pressure of the water in the compartment 27 becomes excessive, the member 43 will be compressed radially towards the center of the member 43, compressing the air within such member, and causing the central portion of the base 44 to be distended toward the left, as seen in FIG. 1, and outwardly through the opening 50 in the end plate 12. This causes a micro-switch 51 to be opened, and since this switch is in the circuit to the motor 7, the motor will stop until the pressure in the chamber 27 drops sufficiently to permit the micro-switch 51 to close, placing the motor 7 in operation again. This arrangement of the parts 44, 50 and 51 thus constitutes a means of controlling the water pressure in the system.

I have found, as the result of a series of tests, that a smoother operation of the pump may be effected by admitting atmospheric air into the compartment 23 on the intake stroke of the pump.

For this purpose, the crank arm 37, as best seen in FIG. 3, is provided with a radial passageway 52 into which atmospheric air, controlled as to amount by an adjusting screw 53, may be admitted. The passageway 52 communicates with an axial passageway or bore 54, which, in turn, communicates with one end of the axial bore 41. The junction of the passageways 41 and 54 provides a seat 55 for a ball valve 56, which is normally closed by means of a compression coil spring 57, which is interposed between the stem of the bolt 40 and the valve 56. The bolt also has an axial passageway 58 which communicates with the compartment 23.

On the intake stroke of the pump, the valve 56 is opened, thus permitting atmospheric air to pass through the screw 53, passageways 52 and 54, bore 41 and passageway 58 into the compartment 23.

On the discharge stroke of the pump, the spring 57 will cause the valve 56 to be seated or closed.

This admission of atmospheric air into the compartment 23 will occur on each intake stroke of the pump, and results in a smoother and more efficient operation of the pump.

The pump is thus of extremely simple construction, enabling it to be manufactured at low cost and sold in commercially feasible quantities. It consists of parts which can be made with a minimum of machining or other mechanical operations, and can be quickly and easily assembled and disassembled for replacement of any of the parts.

The pump is further characterized as having incorporated therein pulsation-eliminating members of novel design and construction.

The pump is still further characterized as having incorporated therein novel and useful features, including means for admitting atmospheric air in the water which is being pumped, a micro-switch for controlling the water pressure, etc.

Due to the manner in which the pump is constructed and assembled, it may be used efficiently in any and all positions.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes may be made in the shape, size and arrangement of parts thereof, without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described by invention, I claim:

1. In a pump of the character described, a housing having an outer cylindrical wall, a partition interconnecting said wall, and an annular flange formed integrally with and extending from said partition in concentric spaced relation to said outer wall, and forming with said partition and outer wall an annular ante-chamber, and forming with said partition a fluid inlet chamber spaced radially-inwardly from said ante-chamber for receiving fluid from said ante-chamber, said partition providing a fluid outlet chamber at the side thereof opposite said fluid inlet chamber, a flexible pumping diaphragm disposed against one end of said flange and against one end of said outer cylindrical wall and overlying said anti-chamber and fluid inlet chamber, and means for reciprocating the central portion of said diaphragm.

2. A pump, as defined in claim 1, including cover plates clamped to the ends of said outer cylindrical wall of said housing.

3. A pump, as defined in claim 1, wherein said flange is provided with circumferentially-spaced openings for the passage of fluid from said ante-chamber to said fluid inlet chamber, and a flexible annular valve is provided within said fluid inlet chamber which closes said openings.

4. A pump, as defined in claim 4, wherein said partition is provided with a plurality of openings for the passage of fluid from said fluid inlet chamber to said fluid outlet chamber, and a flexible disc-shaped valve is secured to said partition for closing said last-named openings.

5. A pump, as defined in claim 1, including means responsive to the fluid pressure in said fluid outlet chamber for controlling said reciprocating means.

6. A pump, as defined in claim 1, including a pulsation-reducing member disposed in said anti-chamber, and a pulsation-reducing member disposed in said fluid outlet chamber.

7. In a pump of the character described, a housing having an outer cylindrical wall, a partition interconnecting said wall, and an annular flange extending from said partition in concentric spaced relation to said outer wall, and forming with said partition and outer wall an ante-chamber, and forming with said partition a fluid inlet chamber for receiving fluid from ante-chamber, said flange provided with circumferentially-spaced openings for the passage of fluid from said ante-chamber to said fluid chamber, a flexible annular valve provided in said fluid inlet chamber which closes said openings, said partition providing a fluid outlet chamber at the side thereof opposite said fluid inlet chamber, said partition provided with a plurality of openings for the passage of fluid from said fluid inlet chamber to said fluid outlet chamber, a flexible disk-shaped valve secured to said partition for

closing said last-named openings, a pulsation reducing member disposed in said ante-chamber, a pulsation reducing member disposed in said fluid outlet chamber, a flexible pumping diaphragm overlying said ante-chamber and fluid inlet chamber, means for reciprocating the central portion of said diaphragm, and cover plates clamped to the ends of said outer cylindrical wall.

8. A pump, as defined in claim 7, including means responsive to the fluid pressure in said fluid outlet chamber for controlling said reciprocating means.

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