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2,732,804

AUTOMATIC PRESSURE LIQUID SUPPLY SYSTEM

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2 Sheets-Sheet 1

Fig. 1

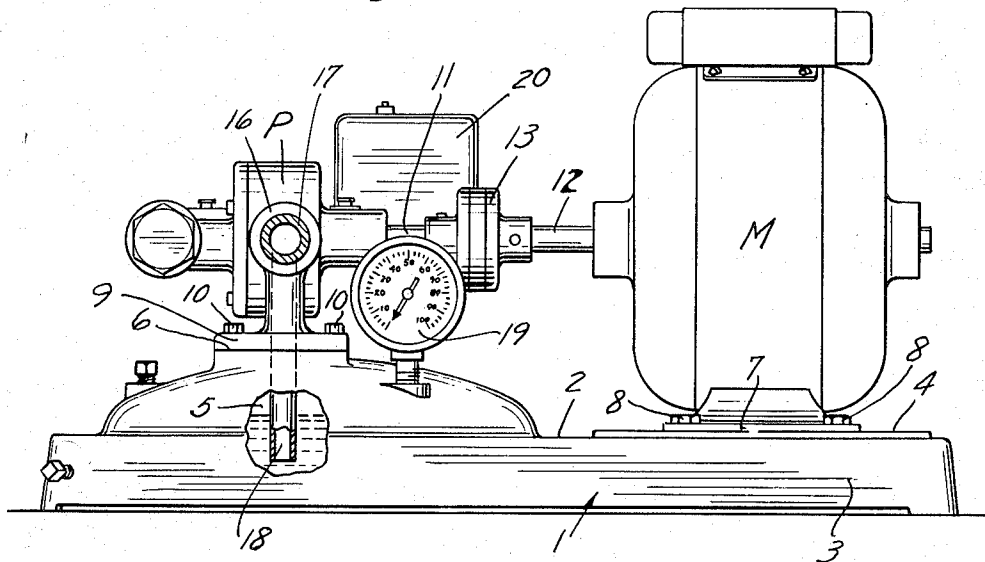
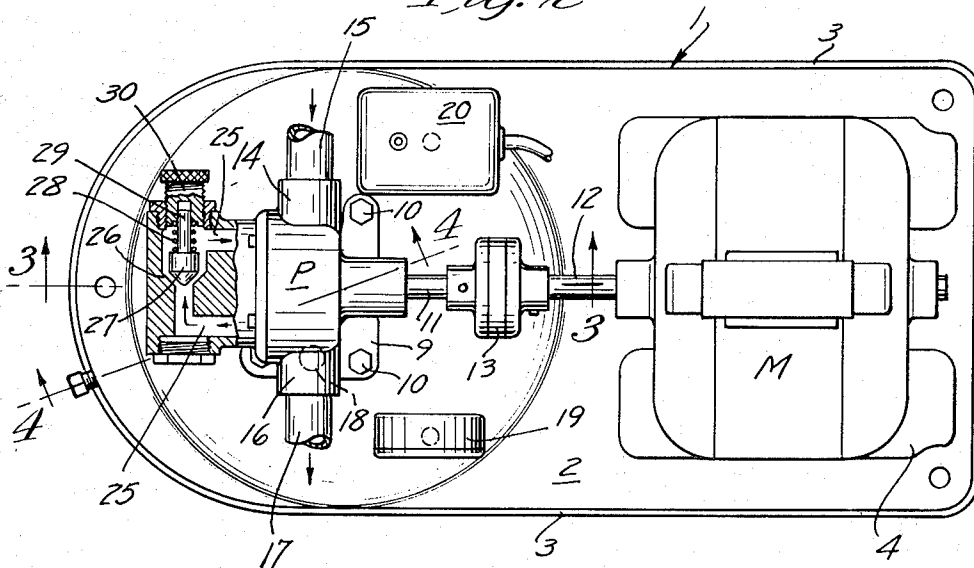


Fig. 2



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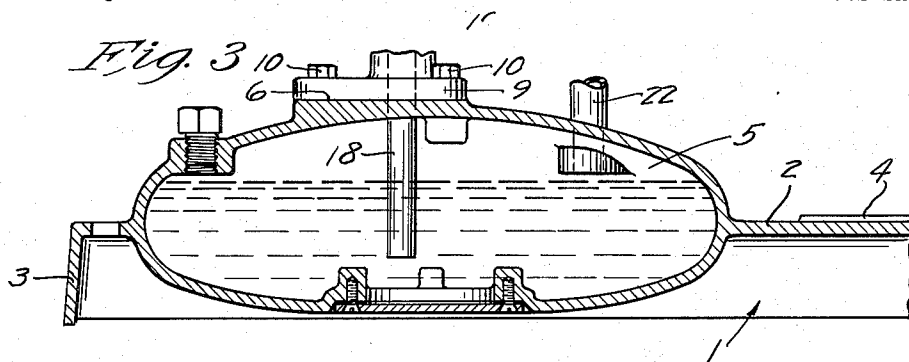
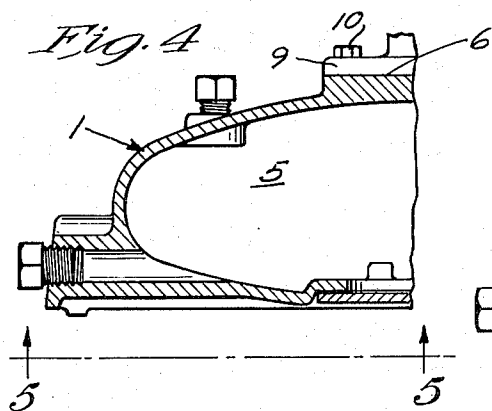
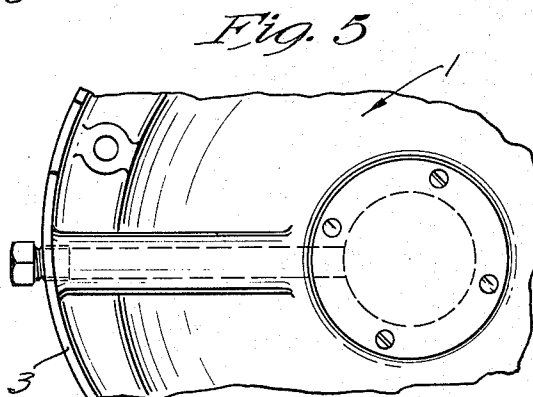
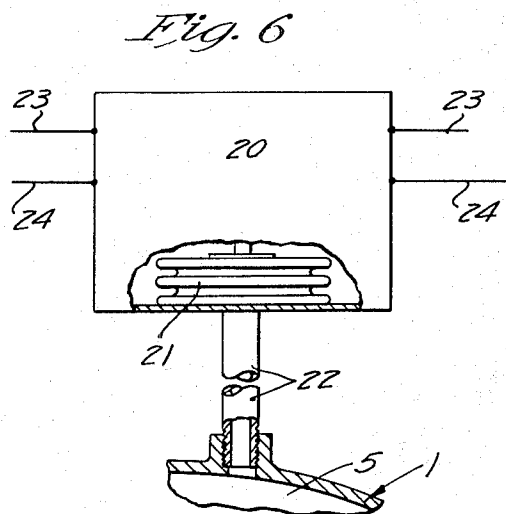
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AUTOMATIC PRESSURE LIQUID SUPPLY SYSTEM

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3 Claims. (Cl. 103-25)

Generally stated, our present invention relates to improvements in automatic water pressure supply systems of the kind commonly employed, particularly in rural areas, to supply running water under pressure from wells or other sources to valve-controlled outlets suitably located in or about dwellings or the like. Generally speaking, the present system and systems of this general character comprise a pump which is adapted to be connected in a supply line or conduit from a well or other reservoir to a valve-controlled outlet or outlets, an electric motor for driving the pump, a tank defining a fluid pressure chamber connected to the outlet side of the pump, and a fluid pressure-operated control operative to start the pump motor when the pressure at the outlet side of the system and said chamber drops below a predetermined minimum pressure and to stop the motor when the pressure in the outlet side of the system and said chamber rises above a predetermined maximum pressure.

One important phase of the invention relates to systems of the kind described wherein the pump, pump motor, and the tank forming the pressure chamber, are constructed and assembled to provide a self-contained complete pumping unit, which unit may also involve the automatic pressure actuated control for the pump motor. With respect to this phase of the invention, an important objective is the provision of a low-cost, simplified and exceptionally compact, neat and attractive unit of the class described. To achieve this objective, we provide a common mounting base for the pump motor and other parts, which mounting base is integrally formed to provide a chamber-defining tank portion and mounting surfaces for the motor and pump. In our improved construction, the motor mounting surface is horizontally offset from the chamber-defining tank portion of the base, and the pump mounting surface is located on top of the chamber-defining tank portion of the base and is sufficiently above the plane of the motor mounting surface to compensate for the relatively great difference in physical dimensions between the pump and motor; it being understood that in units of the kind under consideration, the pumps which are usually of the rotary variety are of relatively small diameter or radius as compared to the motors.

Another phase of the instant invention has as an important objective the provision, in a system of the kind described, means for automatically preventing undesirably rapid recycling of the pump and motor under conditions of prolonged but highly restricted flow when the capacity of the pump greatly exceeds the rate of discharge.

The above and highly important objects and advantages of the invention will be made apparent from the following specification, claims and appended drawings.

In the accompanying drawings, like characters indicate like parts throughout the several views.

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Referring to the drawings:

Fig. 1 is a view in side elevation of a complete pumping unit of the invention; some parts broken away and some parts shown in section;

Fig. 2 is a plan view of the pumping unit of Fig. 1 with some parts broken away and some parts sectioned;

Fig. 3 is an enlarged fragmentary sectional view taken on the line 3-3 of Fig. 2, with some parts broken away;

Fig. 4 is an enlarged fragmentary sectional view taken approximately on the line 4-4 of Fig. 2, with some parts broken away;

Fig. 5 is a fragmentary bottom plan view taken on the line 5-5 of Fig. 4; and

Fig. 6 is a view largely in schematic diagram and illustrating the hook-up of certain of the component elements or devices of the system.

The commercial embodiment of the invention illustrated in the drawings comprises a conventional electric motor M, a positive displacement-type rotary pump P and a common mounting base 1 for the pump and motor. This common mounting base 1 is preferably a cast structure integrally formed to provide a superstructure supporting top wall 2 and a depending and preferably endless marginal flange or wall 3. This base 1 is elongated and one end portion of the superstructure supporting top wall 2 is relatively thin and solid and has a flat motor mounting surface 4 substantially in the horizontal plane of the top of the marginal flange or wall 3. The other end portion of this superstructure supporting top wall 2 of the main base 1 is hollow and is bulged both above and below the plane of the top of the skirt-like marginal flange or wall 3 to provide a sealed chamber 5 and a flat pump mounting surface 6 that is materially above the plane of the motor mounting surface 4. The motor M is provided with its own mounting base 7, which is seated on the flat motor mounting surface 4 and is bolted in place at 8. The pump P is provided with its individual mounting base 9, which is seated on the flat pump mounting surface 6 and is securely held in place by bolts or the like 10.

The pump shaft 11 is directly connected to the motor shaft 12 by a conventional coupling 13, the shafts 11 and 12 being in coaxial alignment. By reference particularly to Fig. 1, it will be seen that the overall radius of the motor M as measured through its mounting base is very much greater than the overall radius of the pump P as measured through its mounting base, and that the difference in elevation between the pump mounting surface 6 and the motor mounting surface 4 resulting from the upward bulging of the top wall 2 to provide the pressure chamber 5 is substantially equal to the difference in the said overall radial measurements of the pump and motor, and thereby automatically brings about horizontal axial alignment between the shafts 11 and 12 of the pump and motor respectively.

The inlet coupling sleeve of the pump P is indicated by 14 and is adapted to be connected to a well or other suitable source of water by a pipe line or conduit section 15. The discharge or outlet coupling of the pump P is indicated by 16 and is adapted to be coupled to a suitable remote discharge valve or faucet, not shown, through the medium of a conduit or pipe line section 17. The outlet side of the pump P is connected to the lower portion of the fluid pressure chamber 5 through the coupling sleeve 16 and a depending conduit section 18. Pressure within the chamber 5 is visually indicated by a conventional pressure gage 19.

As in other systems of the same general class, the pump motor M is automatically controlled by a pressure

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responsive control switch mechanism having a pressure-responsive element exposed to pressure in the chamber 5 or equivalent. For the purpose of the present invention, any one of several commercially-available pressure-responsive controls may be employed. Such a conventional pressure-responsive control may be assumed to be contained within a control housing 20 of the drawings and comprises a pressure-responsive switch-actuating element, which may be in the nature of a bellows 21 (see Fig. 6). This pressure-responsive element or bellows 21 is exposed to internal pressure of the chamber 5 through the medium of a standpipe 22, which serves as a mounting medium for the pressure-responsive motor control switch mechanism contained within the housing 20. The control switch mechanism within housing 20 may be assumed to be of the double pole variety and to be interposed in both of the power-supply circuit leads 23 and 24 of the motor M (see Fig. 6). It will be understood that pressure-responsive control switch mechanisms of the kind contained within housing 20 will automatically complete the motor circuit and start the motor M when the pressure in the chamber 5 drops below a predetermined minimum pressure and automatically closes the motor circuit and starts the motor M when the pressure within chamber 5 rises above a predetermined maximum pressure. It will further be understood that in systems of the kind described, a considerable head of air is maintained within the fluid pressure chamber 5 for the reason that air is compressible and provides a cushion, which effectively reduces the speed at which the pressure changes take place in the system.

When, as in accordance with the presently-described system, a positive displacement type of pump is employed, as distinguished, for example, from the centrifugal impeller type, considerable trouble or annoyance has heretofore been encountered with unduly rapid and undesirable recycling of the pump and motor, particularly under conditions when the capacity of the pump, by virtue of great restriction of the outlet thereof greatly exceeded the rate of discharge; this undesirable condition resulting in a very rapid building up of pressure within the control chamber 5 from the motor starting minimum pressure to the motor stopping maximum pressure, even when a relatively large air space was present in the chamber 5 or its equivalent, and a relatively wide tolerance was provided between motor stopping and motor starting pressures.

In accordance with the present invention, the last above noted objection to prior art systems of the class under consideration is obviated by the simple expedient of providing a check valve controlled by-pass conduit or passage 25 between the inlet and outlet sides of the pump P (see particularly Fig. 2). This passage 25 is formed to provide an annular valve seat 26, the orifice through which is controlled by a normally-closed check valve 27, which is pressure-opened and is yieldingly biased toward its closed position against the seat 26 by a compression spring or the like 28. The valve 27 is formed on the end of a valve stem 29 extending through the spring 28 and slidably mounted in a threaded plug 30, which serves also as a base of reaction for the valve-closing spring 28. The valve 27 is, of course, fully closed when the pump is inoperative and remains closed under conditions of relatively unrestricted discharge from the outlet side of the pump when the pressure in the chamber 5 is essentially very low. However, during periods of pump operation when the flow through the system is retarded, by a relatively high restriction in the outlet side of the system, to the point where the capacity of the pump materially exceeds the rate of discharge, the pressure in the outlet side of the pump will rapidly build up sufficiently to open the valve 27. Of course, the extent to which the valve 27 opens will depend upon the degree of pressure at the outlet side

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of the pump and the adjustment of the valve biasing spring 28 through the medium of threaded plug 30. When the valve 27 is open, fluid will by-pass through passage 25 from the outlet to the inlet side of the pump and thereby greatly reduce the rate at which pressure is built up in the chamber 5 to the motor cut-off pressure of control 20, thereby greatly reducing the frequency of recycling of the system under the conditions mentioned. However, another important advantage of the valve-controlled by-pass 25 is the elimination of motor overload or stalling. It will, of course, be further appreciated that the pressure at which the valve 27 opens may be adjustably varied by varying the pressure exerted on the valve by spring 28 through the medium of the knurled head-equipped screw-threaded plug 30.

The above and other important objects and advantages of the invention will be made apparent from the following claims and appended drawings.

What we claim is:

1. In a self contained complete liquid supply unit, an elongated mounting base comprising a top wall and a relatively shallow flange integral with and depending from the perimeter thereof, said top wall having a relatively flat motor mounting surface adjacent one end thereof and in the plane of the top of said flange, said top wall adjacent the opposite end thereof including opposed wall portions arched upwardly and downwardly from said plane and providing a pressure chamber, the lower arched wall portion being disposed within the vertical range of said flange and the upper arched wall portion being provided with a flat pump mounting surface parallel with and materially above said motor mounting surface, a pressure pump having input and output sides mounted on said last mounting surface with its axis parallel to said plane, a motor of substantially greater vertical dimensions than said pump mounted on said first mounting surface with its axis horizontally aligned with the axis of said pump, a drive shaft operatively connecting said motor and said pump, and a liquid conduit connecting the output side of said pump to the interior of said pressure chamber.

2. In a system of the type defined in claim 1, in which a liquid supply is connected to the input side of the pump, a by-pass connecting the input and output sides of said pump, a motor control means also mounted on said last mentioned surface and being in communication with the interior of said pressure chamber, a variably adjustable pressure responsive valve means in said by-pass preventing rapid build up of pressure therein and in said pressure chamber and thereby reducing the speed of motor cut-off by said motor control means under restricted flow from the output side of said pump.

3. An automatic pressure liquid supply system including a mounting base, a pressure chamber in said base, a pressure pump having inlet and outlet sides supported on said base, a motor supported on said base in driving connection with said pump, a conduit connection between said chamber and the outlet side of the pump, pressure responsive motor control means in communication with said pressure chamber, a by-pass in said pump intermediate the inlet and outlet sides thereof, a variably adjustable pressure responsive valve means in said by-pass, said valve means being responsive to pressure in said outlet side of the pump preventing rapid build up of pressure therein and in said pressure chamber reducing the speed of motor cut-off by said motor control means under restricted flow from the output side of the pump.

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