June 27, 1950 F. C. BYRAM 2,512,765

ROTARY PUMP

Filed Dec. 20, 1946 2 Sheets-Sheet 1

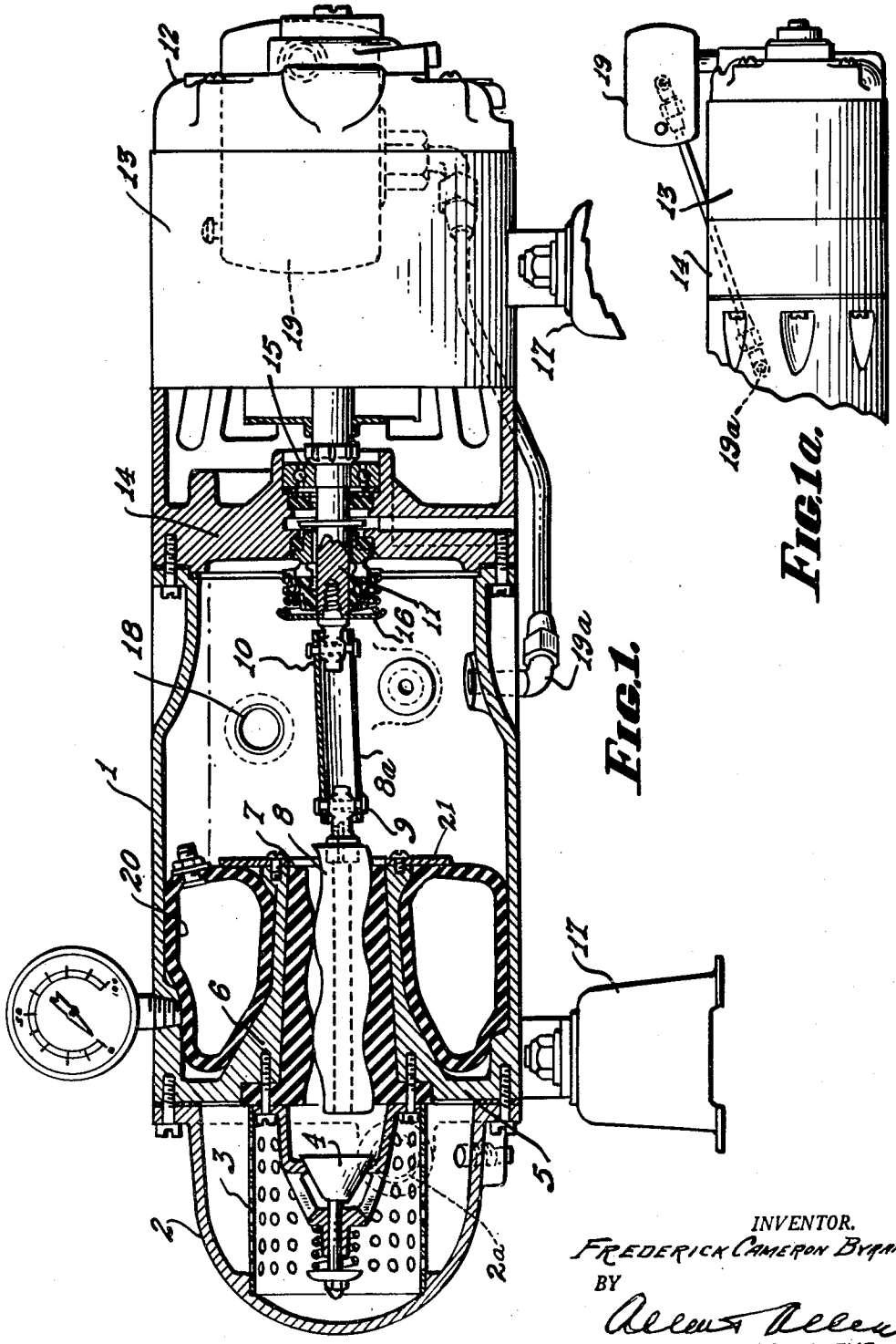


Fig. 1.

Fig. 1a.

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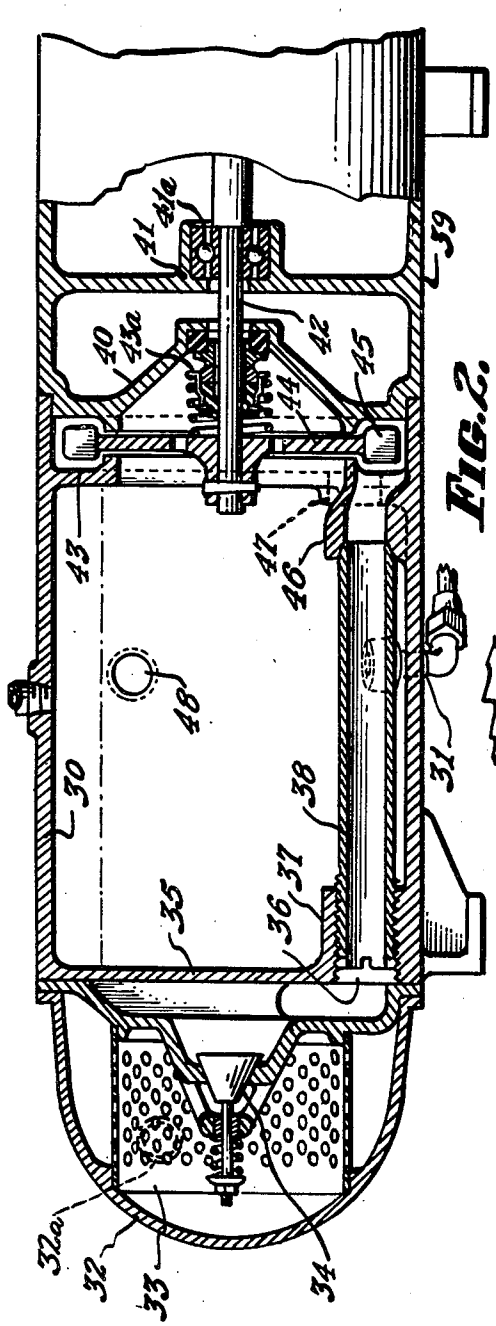


FIG. 2.

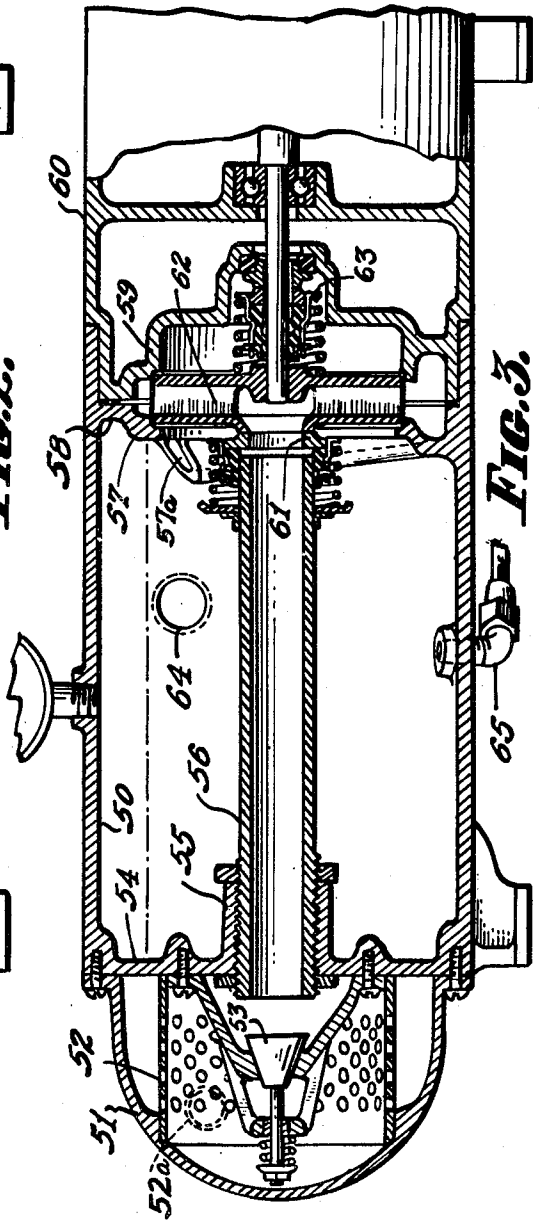


FIG. 3.

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ROTARY PUMP

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Application December 20, 1946, Serial No. 717,401

4 Claims. (Cl. 103—118)

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My invention relates to rotary pumps and is concerned principally with provision for pumps which without an added pressure system, may be arranged to be operated advantageously with stopping and starting switches responsive to pressure for their operation.

So far as I am advised there has been no effort in the past to design a pump proper in such a way that within itself it carried a pressure chamber which could be employed for control of a pressure sensitive stopping and starting switch. In all cases with which I am familiar, some sort of pressure tank is added into the system in order to provide for this, which adds considerably to the cost of installation of pumps.

It is therefore a primary object of this invention to provide an integral pump unit, wherein no additional pressure tank facilities are required outside the pump casing proper, so that a pressure switching device will be properly actuated. In such uses as for fresh drinking water (i. e. water pumped directly and immediately from the water source) for residences, refreshment stands, rural service stations and the like, it is necessary that the pumping device not be incorporated with tank facilities which involve large volumes of stored water else this water cannot be fresh and cold. On the other hand it is also necessary on such fresh water systems that sufficient pneumatic storage facilities be provided so as to properly actuate the pressure switch and also to provide a certain amount of storage so as to offset reasonable faucet leaks—this is done in this case within the pump unit itself.

It is a secondary object of this invention to provide a pumping device so complete in an integral unit so that it can be used directly without additional equipment or be used with any size or arrangement of additional equipment, thus providing the utmost in flexibility, standardization of models and resultant low costs.

It is the object of my invention to provide a horizontally arranged pump device where the motor can be directly coupled to the rotary element of a rotary pump and at the same time to so provide that the exhaust side of the pump is into a chamber of considerable magnitude, with the outlet from said chamber located down from the top sufficiently to maintain an air space which is subject to compression. This requires in the various types of pump using rotary impellers of one kind or another, for an extension either of the drive shaft or the supply ducts between the intake and the pump proper so as to permit of the development of a pressure zone of sufficient contents.

An ancillary object is the provision of a resilient inflated element within such chamber to insure against the chamber becoming water bound by absorption of air by the water being pumped.

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I have shown several types of pumps in the appended drawings in order to illustrate the mode of application of my invention, but do not wish to be limited to structures which are other than equivalent in nature to those shown, to accomplish the invention which is set forth in the appended claims.

In the drawings:

Figure 1 is a longitudinal central vertical section through a pump of the Moineau type.

Figure 1*a* is a detail top plan view of the motor end of Figure 1.

Figure 2 is a like view through a turbine impeller type pump.

Figure 3 is a like view through a centrifugal impeller type.

The pumping units per se, as shown, are not here sought to be protected, as such.

Referring first to Figure 1, there is supplied a cylindrical casing 1 somewhat extended horizontally. At the intake end this casing is equipped with a dome 2, which is provided with a port 2*a*, and which houses an inlet strainer sleeve 3, there being a check valve 4 within the strainer. The particular pump illustrated in Figure 1 is of the type having internally and externally helically threaded pumping elements, the internally threaded element having one more thread than the externally threaded element.

The casing 1 in this instance is cast with an end body 5 closing it except for a central opening. This body has a tapered sleeve portion 6 integral with it, and within this sleeve is mounted the stator 7 of the pump. The stator and check valve construction are bolted to the end body 5, as shown.

The rotor 8 of this pump is provided with a drive in the form of a hollow shaft 8*a* coupled by a universal joint 9 with the rotor at its delivery end. The rotor is free at the intake end. This hollow shaft is coupled by a universal joint 10 with a shaft 11, which is the shaft of a motor 12.

The motor 12 has its casing 13 formed with an end body 14 which is bolted to the casing 1, to close the end of said casing except for the opening for the motor shaft. The motor shaft has ball bearings at 15, which serve to take up the thrust on the shaft, and sealing means 16 are located about the opening where the shaft enters the casing.

It will be noted that this construction is one in which the discharge of the pump when driven by the motor is into the casing 1, which is a relatively long one because of the extended drive shaft. However, the motor and pump are a single unit for convenient mounting, as for example on domes 17 on a supporting floor where desired.

The discharge opening in the casing 1 through which water is delivered to the system, say for domestic purposes, is located at 18 which is well

below the top of the casing 1, but above the point where the seal for the drive shaft is located. The result is that when the pump is operated the chamber will fill, except for a pocket above the discharge opening which will contain air. Thus a pressure sensitive switch element 19 may be connected up to the casing 1 at 19a, and connected in the supply lines to the driving motor. There will be sufficient volume of compressible fluid to operate the regular pressure sensitive switch to start and stop the motor, yet there will be practically no stale water delivered through the discharge when the pump goes into operation after a period of rest.

I have described the pump now briefly described in my application for Letters Patent, Serial No. 707,956 filed November 5, 1946 with which this case is co-pending.

As an additional precaution, where the water being pumped is such as to dissolve or absorb air to an excessive amount, I will desirably locate within the casing 1, an inflated ring of rubber or rubber-like material as indicated at 20. In the illustrated instance I use the projection or sleeve member within which the stator is located to hold this ring, and keep it in place with an end plate 21 mounted over the projection. Instead of a ring, a series of inflated elastic balls could simply be located without restraint within the casing, or a flat inflated arrangement of oval cross section could be used. The essential is a water impenetrable elastic, inflated structure which will supply a pressure element to take the place of air, if the air naturally in the casing is withdrawn and the casing tends to become water bound.

Reference is now made to Figure 2, which shows a turbine impeller. In this case the cylindrical casing is indicated at 30, with the pressure sensitive switch connection at 31. The same dome 32 having the part 32a is used at the one end of this casing, with the same strainer as at 33, and the same check valve at 34. In this instance the mounting of the dome and check valve casing are combined, as indicated.

As in the first noted pump, the casing 30 has an end body 35 which closes it except for an opening 36 which is surrounded by an internally threaded sleeve 37, integral with the end body.

The sleeve 37 is fitted with a pipe 38 which extends across the bottom of the casing to the housing of the pump proper. This housing is formed by flanges in the end of the casing 30, and on the end body of the motor casing. The motor casing as shown at 39 has an end body 40, and a support 41 for a ball thrust bearing 41a for the motor shaft 42.

The end body 40 when bolted up to the end of the casing 30 will form the impeller annular chamber 43 for the pump. A rotary seal 43a is arranged over the motor shaft where it projects through the end body 40. On the shaft is mounted the impeller 44, with the buckets 45 on its periphery, said buckets traversing the chamber 43.

The intake to the chamber 43 is from the intake projection 46 in which the end of the pipe 38 is seated. The discharge from the chamber 43 into the casing 30 is indicated by dotted lines at 47, entering the casing 30 behind the intake projection in the illustrated showing.

It will be noted that in this instance the casing 1 is developed as a long chamber by extending the intake line from the check valve across the casing instead of locating the pump proper close to the intake and extending the drive shaft across the casing.

As in the first instance the discharge opening 48 from the casing is below the top thereof to leave a pressure chamber whereby the switch will operate to supply and cut off current from the motor.

The third form illustrated embodies a casing 50, dome 51, strainer 52, and check valve 53, and port 52a. The casing end body 54 has a central hole surrounded by an integral sleeve 55 which is internally threaded for the pump intake pipe 56. This pipe extends across the casing to supply the length required, to the pump proper.

The volute casing 57 for the pump is developed in the end body 58 of the casing 50, in this instance, supplemented by the end body 59 of the motor casing 60, and opens into the casing 50 through the orifice 57a. The pipe 56 is provided with a rotary seal 61 and abuts the wall about the central opening in the centrifugal impeller 62. A rotary seal 63 protects the entrance of the motor shaft through the end body 59 into the volute casing.

The seals shown are all alike and can be of any style, the one shown being a commercial bellows or diaphragm type in which the spring element holds a friction ring on a seat, with respect to which the ring revolves. As in the other forms, the discharge outlet from the casing 50 at 64 is below the top of the casing and above the level of the seals. The pressure sensitive switch connection is at 65.

In these three forms, either the pumping element is located at one end of a discharge casing of substantial size and the drive shaft is extended or the intake into the pump is extended through a pipe permitting the pumping element to be on the far side of the discharge casing. In other words, the interconnection of the pumping element with its source of power and intake supply is so arranged that the distance between the intake of the pump and the point of entry of the drive shaft into the casing is substantially extended, thus leaving a discharge chamber of substantial lengthwise dimension, permitting the accumulation of a substantial pocket of compressed air in the discharge chamber above the discharge outlet. When coupled with a pressure sensitive switch device, this will serve adequately for fresh water systems in particular, without any pressure tank, and in any system to save the cost of tanks and connections, as well as avoiding the use of space which cannot be provided in connection with location of the pump at a convenient point. Finally the entire device requires a minimum of technical skill in installation, the only requirements being to bolt down the pump and connect up the piping. I prefer to use ordinary hose couplings for the intake and discharge ports, thus cutting down vibration and simplifying the problem of coupling the pump into a system.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In combination a pneumatic pressure switch operated pump having a casing with an intake opening, a pumping element within the casing operating to discharge fluid into a chamber within said casing, the chamber being of a size to retain a substantial amount of the fluid being pumped, a discharge opening from said chamber located in the upper portion below the top thereof so as to develop a body of air above the level of

fluid in the chamber, and an elastic inflated element located within the chamber and impervious to the fluid being pumped, said element providing an auxiliary body of air to be subjected to compression, to provide a safe minimum pressure for pneumatic pressure switch operation regardless of lack of air within the discharge chamber external to said elastic element.

2. The combination of claim 1 wherein means are provided to restrain movement of said elastic body in said chamber.

3. An electric motor driven, pneumatic pressure switch operated pump, comprising in axial alignment a ventilated motor chamber, a central chamber having a discharge port below the level of the ceiling of said chamber to constitute a discharge and pneumatic storage chamber, and a suction chamber, an electric motor in said motor chamber having a shaft extending into said central chamber, a helical pumping mechanism having a rotor and stator in said central chamber, a connecting rod connecting said motor shaft with said rotor, a suction port in said suction chamber, seal means to prevent fluid flow from said central chamber to either said motor chamber or said suction chamber, and an elastic inflated element located within the central chamber and impervious to the fluid being pumped, said element providing an auxiliary body of air to be

subjected to compression, to provide a safe minimum pressure for pneumatic pressure switch operation regardless of lack of air within the central chamber external to said elastic element.

4. A pump according to claim 3 wherein means are provided to restrain movement of said elastic body in said central chamber.

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