April 10, 1951 R. W. JOHNSON ET AL 2,548,799

PUMP

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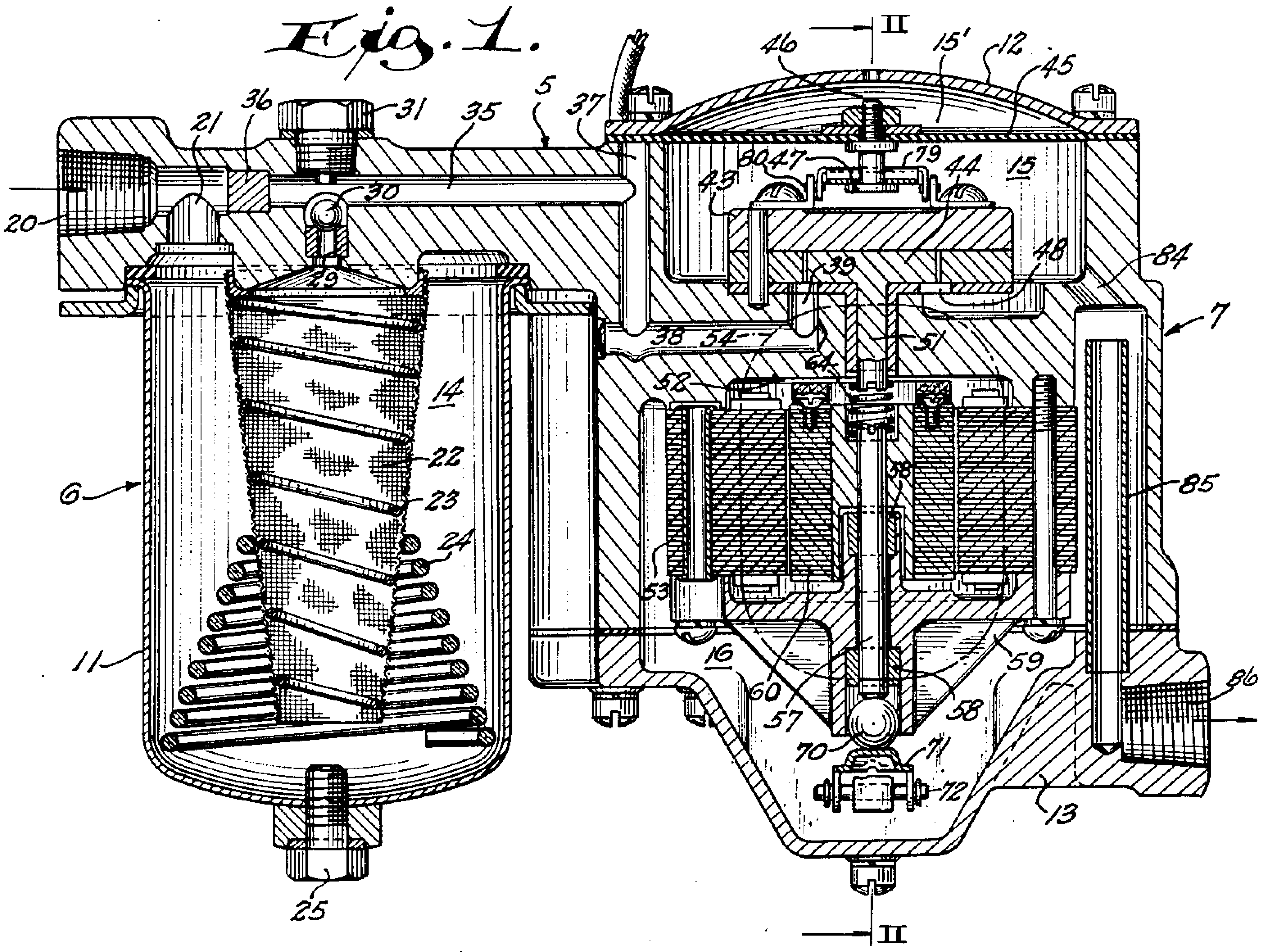
Fig. 1.



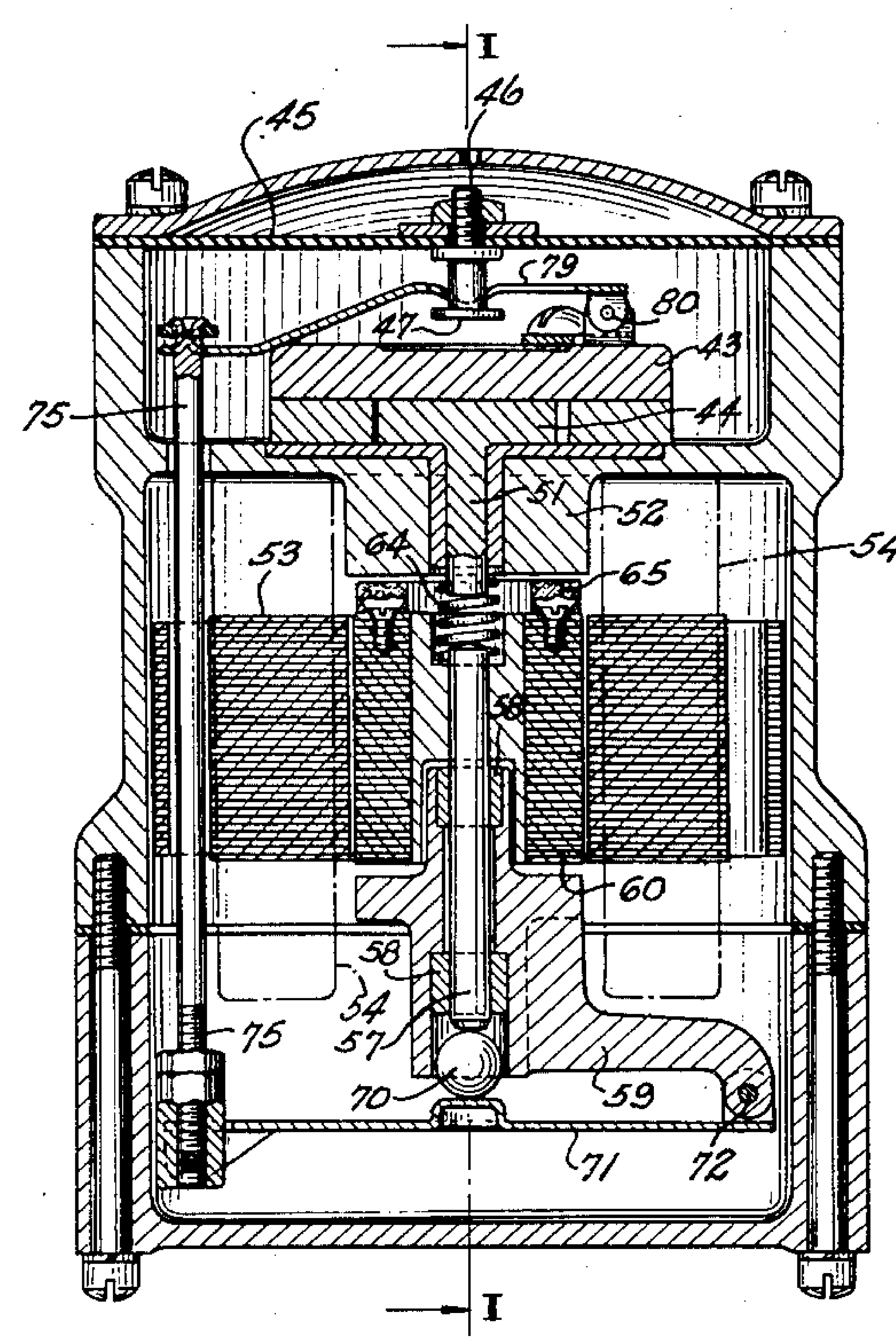


Fig. 2.

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7 Claims. (Cl. 103—25)

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This invention relates to improvements in pumps for continuously maintaining a minimum pressure in a conduit receiving the pump discharge and in which increase in pressure in such conduit above a predetermined value interrupts operation of the pump.

The application of Roy W. Johnson for "Liquid Fuel Supply Device," Serial No. 793,975, filed December 26, 1947, discloses a device for controlling the flow of liquid fuel to a burner. Such device includes a control valve and a positive displacement pump driven by a continuously energized motor. In the modification of Fig. 2, the motor is adapted to be stalled by a pressure responsive brake shoe acting on a brake disc on the motor shaft when the valve closes. This method of braking requires fine balancing to avoid excessive pressure on the bearings and in general adds to the inertia of the motor rotor. Also to properly seat the brake shoe, it is supported on a universal type joint which is apt to become inoperable.

It is one object of the present invention therefore to provide a motor-pump unit for maintaining pressure in the discharge passage of the pump within predetermined limits and which gently stalls upon increase of such pressure above the upper limit.

Another object of the invention is to provide a motor-pump unit of rugged construction, with greatly simplified structure, and in which the pump discharge pressure actuates especially simple and rugged means for stalling the motor upon rise of the pressure in the pump discharge conduit above a given limit.

And a further object of the invention is to provide a combined strainer and motor driven-pump unit which will have a minimum number of simple parts so related as to provide a particularly safe structure for pumping liquid fuel in living quarters.

Objects and advantages other than those above set forth will be apparent from the following description when read in connection with the accompanying drawing in which:

Fig. 1 is a cross sectional view on a vertical plane taken longitudinally and centrally through the device; and

Fig. 2 is a vertical sectional view on the plane of line II—II of Fig. 2.

In the present device, a single rigid casing member has mounted thereon a plurality of casing portions separately defining a plurality of chambers. Passages in the rigid casing member direct flow of liquid fuel through a strainer

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in one chamber to the inlet of a positive displacement pump and thence to an outlet chamber. The pump may be of the sliding vane type and is mounted in a second or pump chamber. An electric driving motor is in the outlet or third chamber. The pump rotor shaft extends from the pump casing and is connected by a compressible and resilient coupling with the rotor of the electric motor. Since the motor is to be stalled it is preferably of the shaded pole induction type to prevent overheating. The motor rotor shaft is mounted in a casing portion to permit both axial and rotational movement of the shaft and rotor and an annular band of friction material is fixed on one end of the motor rotor to engage with a casing surface to act as a brake. One end of the motor shaft bears on a ball resting on a second class lever connected at its free end with one end of a rod extending into the chamber containing the pump. The other end of the rod is connected with the free end of another second class lever engageable with a diaphragm for moving the above leverage upon flexing of the diaphragm in one direction. With the diaphragm in unstressed neutral state, the upper of the two levers abuts against the pump casing to suspend the rotor on the ball with the friction band spaced from the casing member. The diaphragm is subjected to the discharge pressure of the pump and, as the pressure rises above a given value the diaphragm moves the leverage to raise the rotor and press the friction band on the motor rotor into engagement with the casing member. This gently brings the motor to a stop, locking the pump to maintain pressure.

Referring to the drawing by reference numerals, **5** designates a casing member common to both the strainer unit generally designated **6** and the pump-motor unit generally designated **7**. The member **5** has fixed thereon casing portions **11**, **12** and **13** coacting with such member to form a plurality of chambers **14**, **15** and **16** and has a passage **20**, **21** formed therein to serve as an inlet to the chamber **14**. Such chamber has mounted therein a frusto-conical screen **22** of relatively small mesh which is internally supported by a coil spring **23** and is held in position by a coil spring **24** acting between the strainer screen **22** and an end wall of chamber **14**. The chamber **14** may be drained by a plug **25** inserted in the end wall thereof. Flow from inside the screen passes through a seat **29** having a ball valve **30** which checks return of liquid into the strainer and its chamber, movement of the ball being limited by a plug **31** in the casing member **5**.

Liquid flows through the valve 29, 30 into a passage connecting chambers 14 and 15 and comprising a passage 35 which is actually made as a part of passage 20 but is shut-off therefrom by a plug 36. Passage 35 is connected with passage portions 37, 38 and 39 leading to an inlet port into a casing 43 for an impeller 44, the casing and impeller forming a pump of the positive displacement type such as the well known sliding vane construction. The pump discharges through outlet 48 into chamber 15. The chamber 15 is divided into two portions by a flexible diaphragm 45 with the chamber portion 15' vented to atmosphere. The diaphragm bears a stud 46 with a head 47 engageable with a leverage to be described.

The pump impeller has a shaft 51 extending in sealed relation through a wall 52 of the casing member 5 into chamber 16 where the pump shaft is connected with the shaft of an electric motor of the shaded pole induction type. The motor stator comprises a stack of laminations 53 fixed on the casing member 5 within the chamber 16 and bearing the usual winding indicated at 54. The motor rotor comprises a shaft 57 mounted in bearings 58 in a wall portion 59 of the casing member 5, and a stack of laminations 60 fixed on such shaft. The motor shaft 57 is alined with the pump shaft 51 and is connected thereto by a flexible coupling 64 which is preferably a helical spring with the turns relatively widely spaced so that the spring may be compressed to a considerable degree. One end of the motor rotor 60 has fixed thereto an annular band 65 of friction material which, while normally spaced therefrom, is brought into contact with a surface of the casing wall 52 to form a brake for the motor.

The motor shaft 57 rests on a ball 70 which is supported intermediate the ends of a lever 71 pivoted at one end as at 72 on the casing wall portion 59 and having its other end adjustably secured to one end of a rod 75. Such rod extends from chamber 16 into chamber 15 where it is pivotally engageable with one end of lever 79. The lever 79 is pivoted at 80 and has an aperture intermediate its ends through which the diaphragm stud 46 extends so that the stud head 47 engages the underside of such lever. The stud 46 and lever 79 are so related that in the neutral position of the diaphragm 45 the lever 79 abuts against the edge of casing 43 and suspends the leverage and motor rotor shaft 47 so that the rotor is spaced from the wall portion 59 and the annular band 65 is spaced from the casing wall 52. Whenever the diaphragm is flexed upwardly by pressure in excess of the predetermined value the leverage causes the rotor to rise and the band 65 contacts the casing wall. This causes the rotor to slow down and stop if the excess pressure continues.

In use, the pump, driven by the continuously energized motor, draws liquid through the strainer 22 and discharges it into chamber 15 from which it flows through port 84 in the casing wall 52 into chamber 16. A standpipe 85 in chamber 16 assures that such chamber will always be filled with liquid and is connected with an outlet passage 86. As previously pointed out, pressure in chambers 15 and 16 acts on the diaphragm 45 which flexes upwardly raising the motor rotor and compressing the coupling spring 64 to force the brake band 65 against the surface of wall 52. This brings the motor rotor gently to a stop as the pressure increases. So long as the motor is stalled, the pump 43, 44 and the valve 29, 30 both act to check reverse flow of liquid to a source thereof (not shown).

It will be seen that the present structure provides a particularly simple device in which all of the elements are rugged, compactly arranged, and in which the various elements are so related that the present device may be safely used to pump liquid fuel in any location desired with no attention whatever to the device so long as fuel is discharged thereby. The device is completely safe which is of great importance particularly where the pump and a space heater are to be installed directly in living quarters for persons.

Although but one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

We claim:

1. A power driven pump unit comprising a continuously energized motor, a pump of the positive displacement type driven by the motor, the motor having a rotor provided with braking means operable upon axial movement of the rotor, and pressure operated means for axially moving the motor rotor to gradually stall the same.

2. A power driven pump unit comprising a casing, a continuously energized motor, said motor having a rotor movable axially into engagement with said casing to resist rotation of said motor, a pump of the positive displacement type driven by the rotor, and pressure operated means for axially moving the motor rotor into engagement with the casing upon increase above a given value in pressure in the pump discharge.

3. A power driven pump unit comprising a casing, a continuously energized motor, said motor having an axially movable rotor, means acting between said rotor and said casing to stall said rotor upon axial movement thereof, a pump of the positive displacement type driven by the rotor, a diaphragm flexing responsive to an excess of pressure in the discharge from the pump over a predetermined value, and means transmitting flexure of the diaphragm to axially move the motor rotor for stalling the same.

4. A power driven pump unit comprising a casing, a continuously energized motor having an axially movable rotor, means reacting between said casing and said rotor for stalling said rotor upon axial movement thereof, a pump of the positive displacement type driven by the rotor, a diaphragm flexing responsive to an excess of pressure in the discharge from the pump over a predetermined value, and leverage supporting the rotor and transmitting axial movement thereto as said diaphragm flexes to press the motor rotor toward the casing.

5. A power driven pump unit comprising a casing, an electric motor of the shaded pole induction type having a rotor mounted in the casing for axial movement toward a casing portion, a pump of the positive displacement type driven by the motor, a band of friction material mounted on the motor rotor, a diaphragm flexing responsive to rise in pressure in the discharge passage of the pump, and means transmitting flexure of the diaphragm beyond a given amount to the motor rotor for pressing the friction band against the casing.

6. A pumping unit comprising, a continuously energized electrical motor having an axially movable rotor, means responsive to axial move-

ment of said rotor to stall the rotor, a pump driven by said motor, and means responsive to excessive pump discharge pressure to move said rotor axially so said first named means stalls the rotor.

7. A pumping unit comprising, a continuously energized electrical motor having an axially movable rotor, means responsive to axial movement of said rotor from its normal position to another position to stall the rotor, means normally positioning said rotor in said normal position, a pump driven by said rotor, and means responsive to excessive pump discharge pressure

to move said rotor to said other position to stall the rotor.

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The following references are of record in the file of this patent:

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