

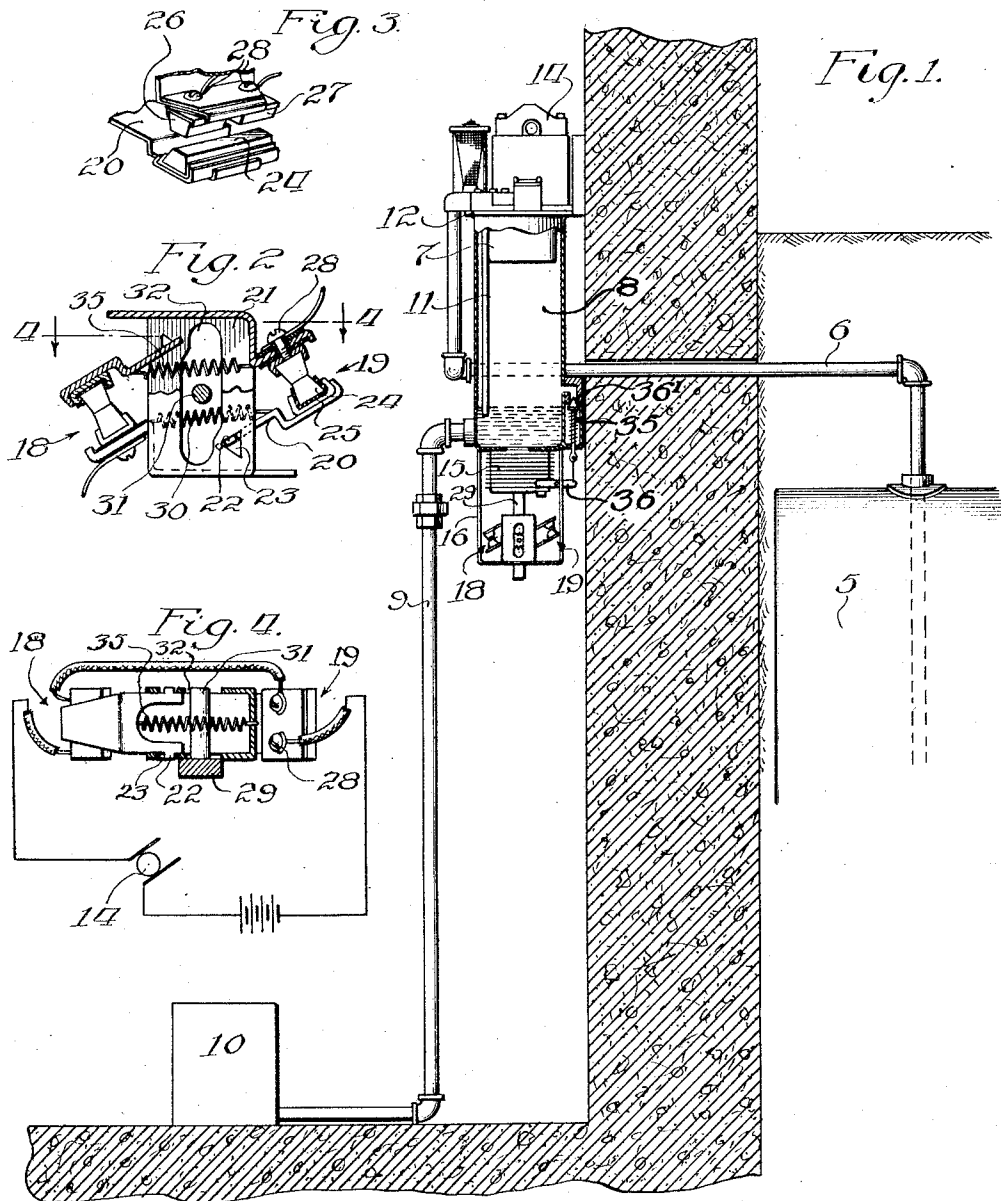
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PRESSURE CONTROL FOR AUTOMATIC PUMPS

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UNITED STATES PATENT OFFICE

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PRESSURE CONTROL FOR AUTOMATIC PUMPS

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My invention relates to pumping apparatus for fluid supply systems.

An object of my invention is to provide pumping apparatus having an improved type of control capable of wide application to fluid supply systems for controlling the supply of fluid fed by the pump.

In fluid supply systems, particularly those employed to feed liquid fuel, say, to oil burners used for heating purposes, or the like, the oil is generally pumped from a storage tank, such as may be installed on the outside of the building, to a supply tank located in the building or adjacent to the burner for the purpose of minimizing the amount of oil necessarily retained within the building near the burner, and from which tank the oil flows to the burner. It is obvious that some means of automatic operation is desirable for the pumping apparatus, so that a constant supply will be available for feeding to the burner from the supply tank. Considerable attention has been given to such an automatic control because there is a possibility that it will function to pump the entire contents from the storage tank into the building in the event a leak occurs, or in the event a siphoning action takes place after the system is stopped. On the other hand, there is a tendency to minimize the cost of oil burner installations, with a consequent tendency to eliminate control apparatus if possible.

One of the objects of my invention is to provide an improved simple and inexpensive form of control, which is practical and may be associated with any type of pump in a fluid supply system, and which embodies all the elements of safety, as well as protects against a siphonic action of the fluid when the pump is stopped. Besides affording greater safety and protection, the control eliminates unnecessary piping such as an overflow from the pump and may be embodied in a tank located anywhere in the system. While it is desirable to associate the pump with the tank, obviously the pump and tank may be provided separately and each located at different points in the system.

A more specific object of the invention is to provide means for starting and stopping the pump, which means is controlled by the volume or pressure of fluid in the tank, and, to associate therewith, an air vent operated thereby to prevent siphoning of the fluid through the delivery line leading to the burner, either when the pump is stopped, or when a leak occurs in the delivery line.

If the type of pump employed be motor driven, the aforesaid means may be in the form of an electric switch associated with a pressure element capable of expansion and contraction to operate the switch. The air vent may be controlled either by the switch or by the pressure element to vent air into the tank, thereby breaking any siphonic action which the fluid may have when flowing therefrom into the delivery pipe.

In order to apprise those skilled in the art how to construct and practice my invention, I shall now describe a preferred embodiment thereof in connection with the accompanying drawings forming a part hereof.

In the drawings:

Figure 1 is a diagrammatic view of a fluid supply system employing an improved control embodying my invention;

Fig. 2 is a detail view of one form of electric switch which may be employed therewith;

Fig. 3 is a detail view showing one side of the switch; and

Fig. 4 is a top plan view of the switch taken on line 4—4 of Fig 3 to illustrate the manner in which both sides of the switch may be connected in series with each other and in the motor circuit.

The drawings illustrate my invention embodied in an oil burning system, in which the pumping apparatus pumps oil from a storage tank into a supply tank for the purpose of feeding the oil to a burner.

It will be obvious to those skilled in the art that my invention is capable of embodiment in practically any type of fluid supply system where safe, economical and automatic operation is desirable.

In the apparatus shown in the drawings, oil or liquid in the storage tank 5, or other

suitable source of supply, is drawn through a pipe 6, constituting a suction line, by means of a pump 7 and is discharged into a supply tank or receptacle 8, from which receptacle the oil is fed to burner 10 through a pipe 9. Burner 10 may be of any preferred type employed for the style of burner apparatus used, or it may for the purpose of this description represent the point to which it is desirable to feed oil or any liquid.

Pump 7 may be of any desirable type and may be located in any suitable manner in the system. It may comprise a gear pump driven by the motor of an oil distributor or blower commonly employed in oil burner apparatus.

Pump 7 and receptacle 8 are connected by means of a small tube 11, by which the oil enters receptacle 8 after having been drawn from storage tank 5 by the pump. I find it desirable to seal the receptacle against the normal admission of air by suitably attaching its upper open end to the base 12 of pump 7. A suitable motor 14 is furnished to drive the pump. The lower end of the receptacle may be closed. A pressure actuated element 15 is sealed to this lower end, but in communicating relation with the interior of the receptacle so as to be responsive to and governed by the liquid head therein. Element 15 is illustrated in the present disclosure as a bellows adapted to contract and expand as the volume or pressure of the fluid varies. I find it desirable to locate the switching device below the bellows, thereby positioning it out of the interior of the tank and away from the fluid contained therein. Moreover, it may be placed in a dirt proof housing 16, conveniently attached to the receptacle in order to protect the contacts of the switch against dirt and oil.

The switching device is preferably of a double acting type to open the motor circuit when the bellows is either expanded or contracted to a predetermined distance. Hence, motor 14 may be stopped when two conditions obtain, viz: when a maximum pressure or volume of fluid is contained within receptacle 8, and when a minimum pressure or volume of fluid is present. To accomplish this feature, a double switch is provided. Both switches 18 and 19 are substantially the same in construction and are of a quick make and break type, so that the motor circuit is instantly made or broken. Describing but one of these switches, preferably the one designated 19 shown on the right hand side of Fig. 2, a pivotally mounted plate 20 is carried by a bracket 21 suitably secured in housing 16, the plate having opposed laterally extending lugs 22 loosely lying in openings 23 in the sides of the bracket. A carbon contact 24 may be secured to the end of the plate by interposing therebetween suitable insulation, such as a lining of mica 25 or the like. Bracket 21 may be formed to extend outwardly to

furnish a seat for a pair of contacts 26 and 27, also suitably insulated. These contacts are inserted in the motor circuit by means of screws 28, which pass through bracket 21 and provide proper electrical connection between the leads of the circuit and the contacts 26 and 27. It will be observed that the circuit is closed by the lower contact 24, in this instance moving upwardly to bridge across contacts 26 and 27. This movement is obtained by the provision of a downwardly projecting arm 29, on the base of bellows 15, cooperating with a spring 30. One end of this spring is fixed to bracket 21, while the opposite end is fastened to plate 20 to move the same upwardly when the spring is released by a lateral pin 31 carried by arm 29. Pin 31 may ride in a slot 32 formed in the side of bracket 21.

Hence, it will be noted that as bellows 15 contracts, which movement might be the result of a normal flow of fluid out of tank 8 through pipe 9 to burner 10, the fluid level will descend and the head or pressure on the bellows will be lowered. When bellows 15 has undergone sufficient contraction, the pin 31 allows spring 30 to flip bridging contact 24 across contacts 26 and 27, thereby closing the motor circuit and allowing pump 7 to start operating, whereby to replenish the fluid withdrawn from tank 8. However, should the flow from the tank be at a greater rate than that which the pump will function to supply fluid to tank 8, the bellows further contracts and moves pin 31 upwardly until it engages a second spring 35 to open the left hand switch 18. The motor circuit will again be broken and the pump stopped.

When the fluid flows, in this manner, at a greater rate from tank 8 than that at which the pump will supply it thereto, an abnormal condition has occurred somewhere in the system. Such abnormal condition may be the result of improper functioning of burner 10, or a leak or siphoning action in the line.

In the event of normal operation, the level in tank 8 will rise if the burner is not consuming fluid as fast as it is supplied by pump 7. To maintain the proper amount of fluid in the tank, the bellows is set to expand when a predetermined high pressure exists in the tank. Such expansion will lower pin 31 to again engage spring 30 to open switch 19. Thus, the proper amount of fluid will be maintained in tank 8.

In order to protect the system against siphoning when pump 7 is stopped, I prefer to admit air into tank 8, which tends to break the suction in pipe 9 and stop this siphoning. Admission of air is controlled by a valve 35 at the side of tank 8. Valve 35 is normally spring pressed against its seat 36', but is forced open by the contraction of the bellows. When the system is at rest with the liquid level as shown in the draw-

ings, bellows 15 is expanded and switch 19 is open. The setting up of a siphonic action when pump 7 stops will lower the level, close switch 19, and the contracting movement of bellows 15 will pivotally swing a lever 36 connected to one end of valve 35, thereby opening the valve to admit air into tank 8. The rate of contraction of the bellows in such a case will open switch 18 before the pump is effective to supply additional fluid to again expand the bellows. The arrangement may be such, of course, as not to open valve 35 during normal contraction of the bellows, by requiring a predetermined swing of lever 36 before it unseats the valve.

It will be observed, therefore, that venting of air with tank 8 is preferably desirable when the pump is stopped as the result of an abnormal condition, namely, a leak in line 9, or a siphoning of the fluid after pump 7 is stopped. A leak in line 9 immediately drains tank 8 of its liquid so as to open switch 18. Hence the pump is instantly stopped and the valve is unseated.

It will furthermore be evident that the system is designed to deliver oil to the burner under a slight pressure which results from the head of oil in pipe 9 and receptacle 8. Any breaking of or leak in the delivery line will cause this pressure to fall and immediately cut off the system from any further pumping of oil. Hence, siphoning of oil is prevented when a leak occurs, thereby assuring safety in the control of the pump, in that, the entire contents of the bulk supply tank 5 cannot be emptied into the basement of the building.

From the foregoing description, it will be observed that a novel form of automatic control, embodying the essential features of safety required particularly in oil burning apparatus, is disclosed which is simple and inexpensive, and which may be used universally with any type of pump, associated therewith, or provided apart from the pump in the system. Moreover, the control is apparently capable of embodiment with pumps other than the motor driven type.

Other modifications, arrangements and embodiments of the present invention may be obtained without departing from the spirit and scope of the invention.

I claim:

1. A liquid fuel feeding system including the combination of a pump, an electric motor for driving said pump, a receptacle for receiving the liquid fuel supplied by said pump, and circuit breaker mechanism operated by the pressure of the liquid fuel in said receptacle for opening the motor circuit when the pressure rises or falls beyond predetermined limits.

2. A fluid supply system including the combination of a pump, a receptacle for receiving the fluid supplied by said pump, and

pressure operated means including a bellows communicating with the interior of said receptacle, said bellows being responsive to and governed by the pressure of the fluid in said receptacle for stopping of said pump when the pressure rises or falls beyond predetermined limits.

3. A liquid fuel feeding system including the combination of a pump, a delivery line, a receptacle between said pump and said delivery line, and means controlled by the pressure of liquid fuel in said receptacle for stopping said pump upon the occurrence of a leak in said delivery line.

4. A liquid fuel feeding system including the combination of a receptacle containing a varying amount of liquid fuel therein, a delivery line leading from said receptacle, and means controlled by the pressure of the liquid fuel in said receptacle for preventing a siphoning of liquid fuel from said source of supply to said receptacle.

5. A fluid supply system including the combination of a source of supply, a receptacle adapted to receive fluid therefrom, a delivery pipe extending from said receptacle, and means responsive to and governed by the pressure of fluid in said receptacle for preventing a siphoning of the fluid from said source of supply into said receptacle upon the occurrence of a leak in said delivery pipe.

6. A liquid fuel feeding system including the combination of a source of supply, a receptacle, a motor driven pump for supplying liquid fuel to said receptacle from said source of supply, and electric switch mechanism operated by the pressure of the liquid fuel in said receptacle whereby to close the motor circuit when the amount of liquid fuel therein varies between predetermined limits and to open the circuit when the amount of liquid fuel therein rises above or falls below said predetermined limits.

7. A fluid supply system including the combination of a source of supply, a receptacle, a pump for supplying fluid to said receptacle from said source of supply, and a pocket formed in the lower part of said receptacle having at least a portion of its wall flexible and influenced in its movement by variation of the fluid in said receptacle for controlling said pump.

8. A fluid supply system including the combination of a source of supply, a receptacle, an electric motor, a pump driven thereby for supplying fluid to said receptacle from said source of supply, a pressure operated device communicating with said receptacle, and electrical means operated by said pressure device for automatically opening the motor circuit upon an increase of pressure to a maximum and upon a decrease of pressure to a minimum.

9. A fluid supply system including the combination of a source of supply, a recep-

tacle, an electric motor, a pump driven thereby for supplying fluid to said receptacle from said source of supply, a contractible and expansible pressure operated element, and electrical circuit breaking means adapted to open the motor circuit upon a predetermined contraction of said element and upon a predetermined expansion of said element.

10. A fluid supply system including the combination of a source of supply, a receptacle, an electric motor, a pump driven thereby for supplying fluid to said receptacle from said source of supply, a contractible and expansible pressure operated element, and two electrical switching devices, one of said switches opening the motor circuit upon a predetermined contraction of said element, the other of said switches opening the motor circuit upon a predetermined expansion of said element.

11. A fluid supply system including the combination of a source of supply, a receptacle, an electric motor, a pump driven thereby for supplying fluid to said receptacle from said source of supply, a pressure responsive device governed by the pressure in said receptacle, and two electrical switching devices, one of said switches opening and closing the motor circuit at operating pressure for normal control of said pump, the other of said switches opening the motor circuit at minimum pressure for safety control when an abnormal condition obtains.

12. A fluid supply system including the combination of a source of supply, an electric motor, a pump driven thereby, a pressure responsive device, and two electrical switching devices operated thereby, one of said switches opening and closing the motor circuit for normal control when normal operating pressure obtains; the other of said switches opening the motor circuit at minimum pressure for safety control when an abnormal condition obtains.

13. A fluid supply system including the combination of a pump, a receptacle for receiving the fluid pumped, a delivery line communicating with said receptacle, means for starting and stopping the pump according to the pressure of the fluid in said receptacle, and anti-siphoning means for preventing a siphonic action of the fluid through said delivery line.

14. A fluid supply system including the combination of a pump, a pressure operated element for starting and stopping said pump, and an air vent operated upon the stopping of said pump for preventing a siphonic action of the fluid through the system.

15. A fluid supply system including the combination of a pump, a receptacle for receiving the fluid pumped, a delivery line communicating with said receptacle, means for starting and stopping the pump according to the pressure of the fluid in said receptacle,

and an air vent for said receptacle for preventing a siphonic action of the fluid when the pump is stopped.

16. A fluid supply system including the combination of a pump, a pressure operated element for starting and stopping said pump, and anti-siphoning means for preventing a siphonic action of the fluid when the pump is stopped.

17. A fluid supply system including the combination of a pump, a pressure operated element for starting and stopping said pump, and anti-siphoning means controlled by said pressure element for preventing a siphonic action of the fluid when the pump is stopped.

18. A fluid supply system including the combination of a pump, a receptacle for receiving the fluid pumped, a delivery line leading from said receptacle, provisions controlled by the pressure of the fluid in said receptacle for starting and stopping said pump, and an air vent operated by said pressure controlled provisions to prevent siphoning of the fluid through said delivery line when the pump is stopped.

19. In combination, a fluid pump, a pressure system supplied by said pump, means for stopping said pump when predetermined maximum and minimum pressures obtain in said system, and means operable thereby to vent air into the system to prevent a siphonic action of the fluid in the system.

20. In combination, a fluid pump, a pressure system supplied by said pump, means for stopping said pump when predetermined maximum and minimum pressures obtain in said system, and means operable thereby to prevent a siphonic action of the fluid through said system when minimum pressure is reached.

21. A fluid supply system including the combination of a motor driven pump, a receptacle for receiving the fluid pump, a contractible and expansible element operably associated with said receptacle, an electric switch controlled by said element to open the motor circuit when the pressure of the fluid in said receptacle reaches a minimum limit, and a valve adapted to be opened to vent air in said receptacle when the motor circuit is opened by said switch.

22. A fluid supply system including the combination of a source of supply, a receptacle, means for delivering fluid from said source of supply to said receptacle, and means controlled by the pressure of the fluid in said receptacle for preventing a siphoning of the fluid from said source of supply to said receptacle upon stopping of said fluid delivery means.

In witness whereof, I have hereunto subscribed my name.

LAWRENCE M. PERSONS.