

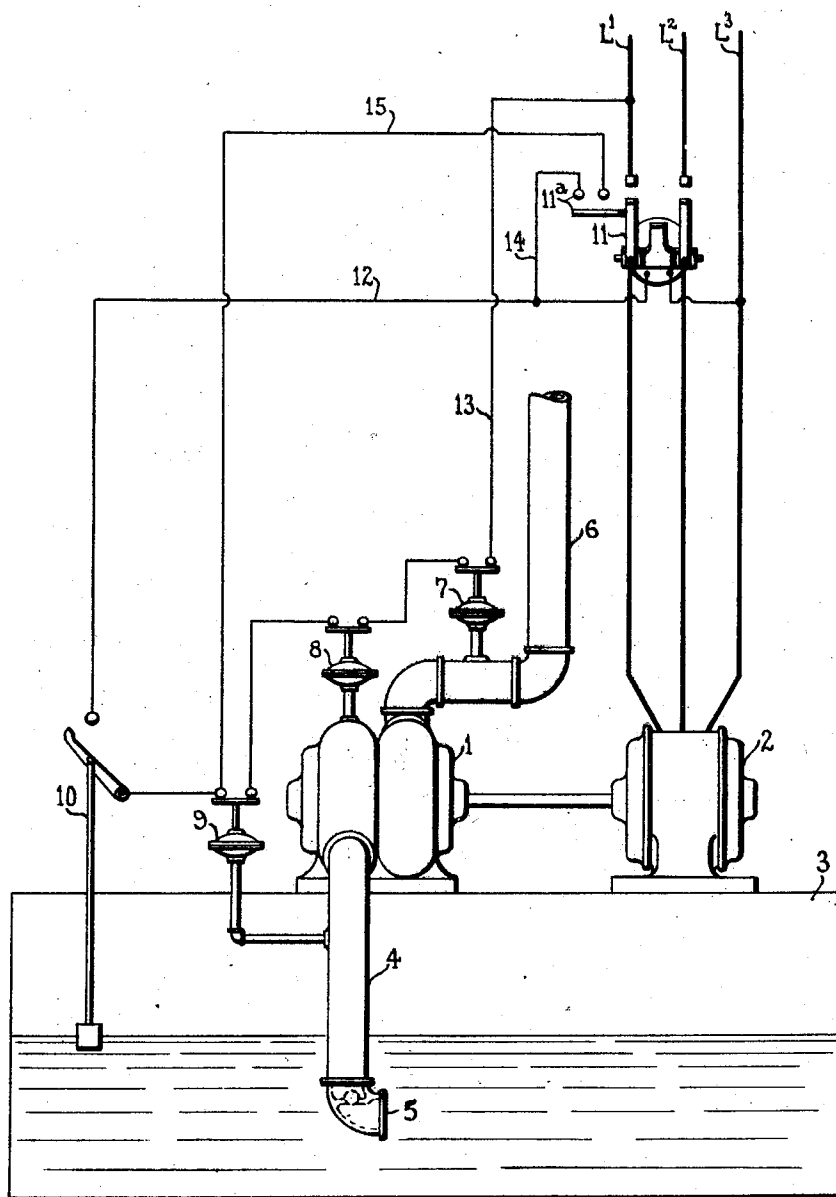
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CONTROLLER FOR POWER DRIVEN PUMPS

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CONTROLLER FOR POWER-DRIVEN PUMPS.

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This invention relates to controllers for power driven pumps and is particularly advantageous for motor driven centrifugal pumps of sump pumping systems and the like.

In pump installations of the type to be described, it is necessary to maintain a suitable head of water in the discharge pipe above the pump to insure priming thereof, and one of the objects of this invention is to provide control means to prevent starting of the pump should the head of water fall below a predetermined minimum priming level.

Another object is to provide automatic pump control means to terminate operation thereof when air enters the suction side to a degree which would cause the pump to fail to deliver water.

Another object is to provide automatic pump control means to terminate operation thereof under predetermined conditions of vacuum in the suction side.

Another object is to provide automatic pump control means of the aforementioned character having the several elements correlated in a manner affording complete control of the pump under various conditions.

Other objects and advantages of the invention will hereinafter appear.

The drawing, consisting of a single figure, illustrates schematically and diagrammatically one of the embodiments which the invention may assume in practice.

In the drawing is illustrated a pump 1 having a driving motor 2 to discharge the contents of a sump, receptacle or tank 3.

The pump, as shown, is illustrated as a two stage centrifugal pump, but any single or multiple stage pump may be employed. Pump 1 has a suction line 4 extending to the low water level and has at the bottom thereof a foot valve 5. A discharge line 6 extends a suitable distance above pump 1. Discharge line 6, pump 1 and suction line 4 are first filled with water, and, assuming that foot valve 5 does not leak, pump 1 will at all times remain primed, discharge line 6 maintaining a given head of water on said pump.

A pressure operated switch 7 is mounted at a suitable point in the discharge line 6 and said pressure operated switch is arranged to remain closed so long as a predetermined head of water is maintained in

said discharge line to insure priming of pump 1. To guard against running of the pump when air enters the suction line 4 to a degree which would cause the pump to fail to deliver water, a second pressure operated switch 8 is mounted on the pump 1. Any air entering the suction line 4 will tend to reduce the suction caused by the centrifugal action of the water traveling in the pump casing and thereby result in failure of the pump to deliver water. There is a considerable reduction in pressure in the pump when this condition occurs resulting in opening of pressure operated switch 8 thus stopping the operation of the pump. A vacuum controlled switch 9 is mounted in the suction line 4 and is calibrated to open under predetermined vacuum conditions in the suction line. Such vacuum conditions may result from stoppage in the suction line, or other causes.

A float operated switch 10 serves to control starting of the driving motor 2. Motor 2 is arranged to be connected to the line through switch 11. Obviously, however, any suitable form of self starter may be employed to provide for acceleration of the motor. Switch 11 is provided with auxiliary contacts 11^a which serve to maintain an energizing circuit therefor.

Assuming now that discharge line 6, pump 1 and suction line 4 have been previously filled with water and the water in the sump 3 rises above the low water level and to a point at which float operated switch 10 is arranged to close, said switch closes and completes a circuit extending from line L³, through the winding of switch 11, by conductor 12, through float operated switch 10, vacuum controlled switch 9 and pressure operated switches 8 and 7 by conductor 13 to line L¹. Switch 11 thereupon responds to thereby complete the motor circuit and is maintained closed independently of the float operated switch. The maintaining circuit of said switch 11 extends from line L³ through the winding of said switch, by conductor 14, through auxiliary contacts 11^a, by conductor 15, through vacuum controlled switch 9, and pressure operated switches 8 and 7, by conductor 13 to line L¹.

Thus it is apparent that the maintenance of switch 11 in closed position is made dependent upon the maintenance in closed position of vacuum controlled switch 9 and

pressure operated switches 7 and 8. In the event of an insufficient head of water in discharge line 6 or upon failure of foot valve 5 to properly close, pressure operated switch 7 will open to prevent completion of the energizing circuit of switch 11 and consequently prevent starting of motor 2. If, after the pump has been started, a condition arises in which air enters the suction line to a degree which would cause the pump to fail to deliver water, pressure operated switch 8 will open, thereby interrupting the maintaining circuit of switch 11 and stopping motor 2. If the suction increases beyond a safe value, switch 9 will open and interrupt the maintaining circuit of switch 11 to stop motor 2.

Thus, operation of the driving motor and the pump is dependent upon maintenance of all conditions required for the operation of pumping systems of the present type.

What I claim as new and desire to obtain by Letters Patent is:

1. The combination with a hydraulic pump, of driving means therefor, means for initiating the operation of said driving means, and means in the discharge side of said pump subject to control in accordance with priming conditions in the pump to render said first mentioned means inoperative.

2. The combination with a hydraulic pump, of driving means therefor, means for initiating the operation of said driving means, means to render said last mentioned means subject to control in accordance with the pressure of fluid level in the discharge side of said pump.

3. The combination with a hydraulic pump, of driving means therefor, means for initiating the operation of said driving means, and means in the discharge side of said pump to render said last mentioned means subject to control by the pressure of the priming charge to necessitate a given minimum charge for starting.

4. The combination with a hydraulic pump, of driving means therefor, means to retain in the discharge line of said pump a priming charge therefor, starting means for said driving means including means rendering said starting means dependent upon the pressure of the priming charge to necessitate a given minimum charge for starting.

5. The combination with a hydraulic pump, of driving means therefor, means to retain in the discharge line of said pump a priming charge therefor, starting means for said driving means including a pressure responsive device rendering said starting means dependent upon the pressure of the priming charge to necessitate a given minimum charge for starting.

6. The combination with a hydraulic pump, of driving means therefor, means to

retain in the discharge line of said pump a priming charge therefor, starting means for said driving means including a pressure responsive device requiring predetermined positioning thereof to permit starting by said starting means, said pressure responsive device being subjected to the pressure of the priming charge and being dependent thereon for retention in said predetermined position.

7. The combination with a hydraulic pump, of driving means therefor, means to retain in the discharge line of said pump a priming charge therefor, starting means for said driving means including a fluid level operated means, electro-responsive means and a pressure responsive device, said pressure responsive device requiring predetermined positioning thereof to permit starting and being subjected to the pressure of the priming charge in said discharge line and being dependent thereon for retention in said predetermined position.

8. The combination with a hydraulic pump, of driving means therefor, means whereby upon stopping of the pump a priming charge therefor is normally retained in the discharge line thereof, starting means for said pump including a pressure responsive device requiring predetermined positioning thereof to permit starting by said starting means, said device being subjected to the pressure of the priming charge and being dependent thereon for retention in said predetermined position.

9. The combination with a hydraulic pump, of driving means therefor, means whereby upon stopping of the pump a priming charge therefor is normally retained in the discharge line thereof, starting and stopping means for the pump, said starting means including a fluid level operated means, electro-responsive means and a pressure responsive device, the latter requiring predetermined positioning thereof to permit starting by said fluid level operated means and said electro-responsive means, said pressure responsive device being subjected to the pressure of the priming charge and being dependent thereon for retention in said predetermined position, said stopping means including a pressure responsive device subjected to control in accordance with pressure conditions on the suction side of said pump.

10. The combination with a hydraulic pump, of driving means therefor, means whereby upon stopping of the pump a priming charge therefor is normally retained in the discharge line thereof, starting and stopping means for the pump, said starting means including a fluid level operated means, electro-responsive means and a pressure responsive device, the latter requiring predetermined positioning thereof to permit start-

ing by said fluid level operated means and said electro-responsive means, said pressure responsive device being subject to control by the pressure of the priming charge to necessitate a given minimum charge for starting, said electro-responsive means after response thereof being independent of said fluid level operated means, said stopping means including a pressure responsive device subjected to control in accordance with pressure conditions on the suction side of said pump to interrupt circuit of said electro-responsive device.

11. The combination with a hydraulic pump, of driving means therefor, means whereby upon stopping of the pump a priming charge therefor is normally retained in the discharge line and suction line and in the pump, starting and stopping means for the pump, said starting means including a fluid level operated means, electro-responsive means and a pressure responsive device, the latter requiring predetermined positioning thereof to permit starting by said fluid level operated means and said electro-responsive means, said pressure responsive device being subject to control by the pressure of the priming charge to necessitate a given minimum charge for starting, said electro-responsive means after response thereof being independent of said fluid level operated means, said stopping means including a vacuum responsive device being subjected to control in accordance with vacuum conditions on the suction side of said pump to interrupt circuit of said electro-responsive device.

12. The combination with a hydraulic pump, of driving means therefor, means whereby upon stopping of the pump a priming charge therefor is normally retained in the discharge line and suction line and in the pump, starting and stopping means for the pump, said starting means including a

pressure responsive device and being dependent upon predetermined positioning of said pressure responsive device by the pressure of the priming charge, said stopping means including a pressure responsive device and a vacuum responsive device, said pressure and vacuum responsive devices being subjected respectively to pressure and vacuum conditions on the suction side of said pump to interrupt circuit of said electro-responsive device to thereby stop said pump.

13. The combination with a self-priming hydraulic pump, of driving means therefor, and means subject to control in accordance with priming conditions in the pump to control the operation of said driving means.

14. The combination with a normally self-priming hydraulic pump, of a motor for driving the same, means for initiating operation of said motor, and pressure responsive means subjected to pressure of fluid in the discharge side of said pump for controlling the operation of said last-mentioned means.

15. The combination with a hydraulic pump, of driving means therefor, a check valve operable upon stopping of the pump to retain a priming charge in the latter, starting and stopping means for the pump, said starting means including a liquid level operated switch and electroresponsive means, said electroresponsive means after response thereof being independent of said liquid level operated switch, and said stopping means including a pressure responsive switch subject to control in accordance with pressure conditions on the inlet side of said pump to thereby interrupt the circuit of said electroresponsive means upon failure of the liquid supply.

In witness whereof, I have hereunto subscribed my name.

BAYARD M. HORTER.