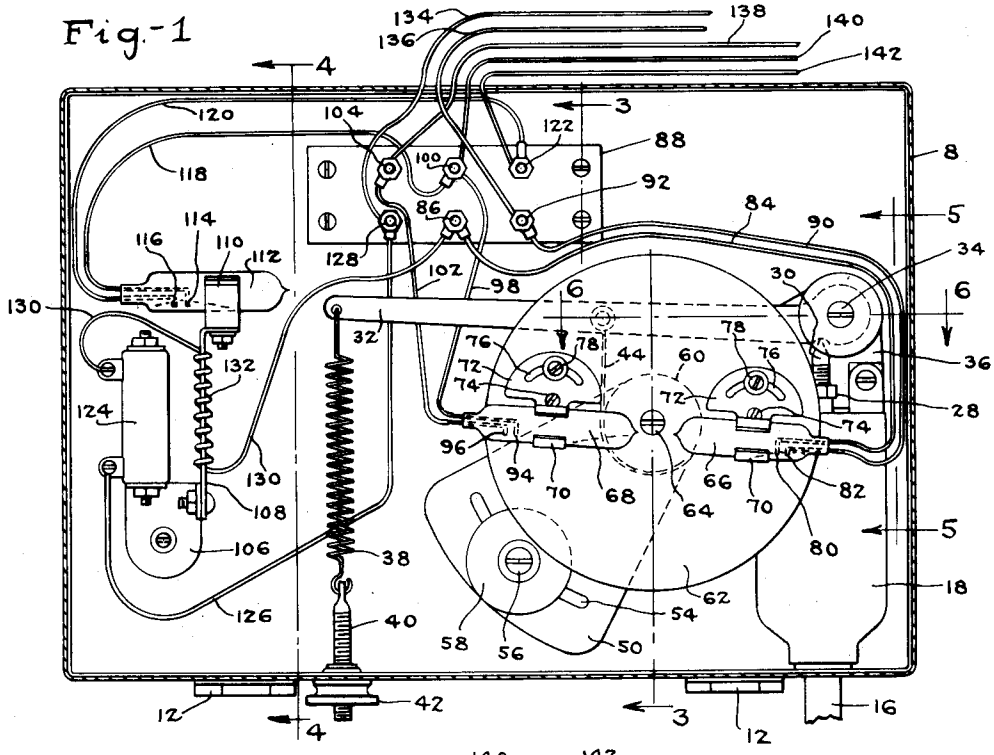
Aug. 27, 1935. W. H. HOLLINSHEAD 2,012,428

CIRCUIT CONTROLLING DEVICE

Filed March 16, 1934 2 Sheets-Sheet 1

Fig. 1



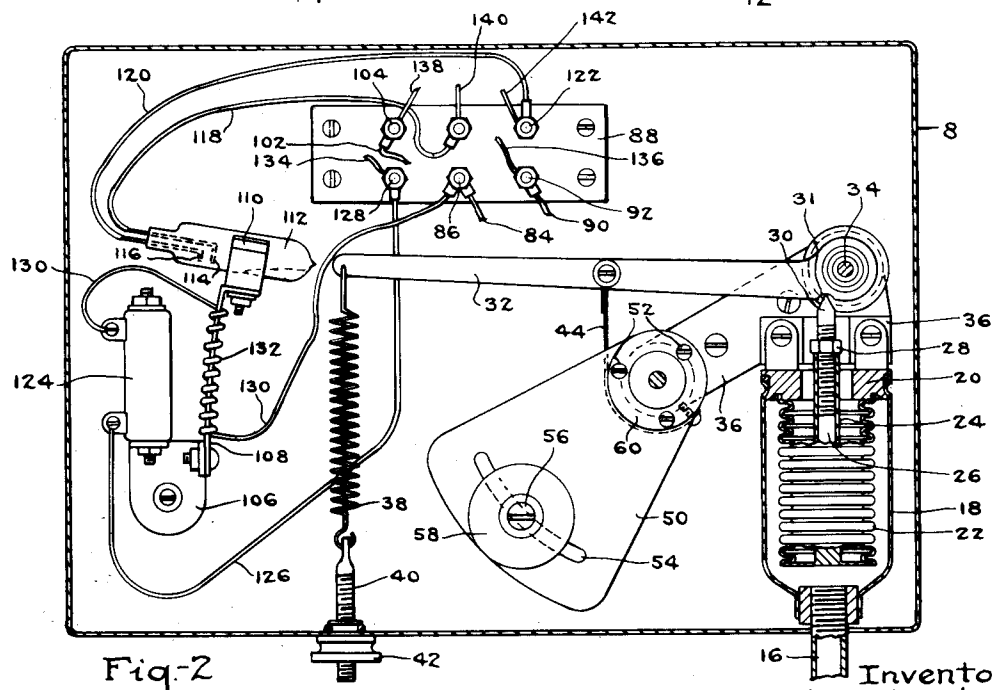


Fig. 2

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CIRCUIT CONTROLLING DEVICE

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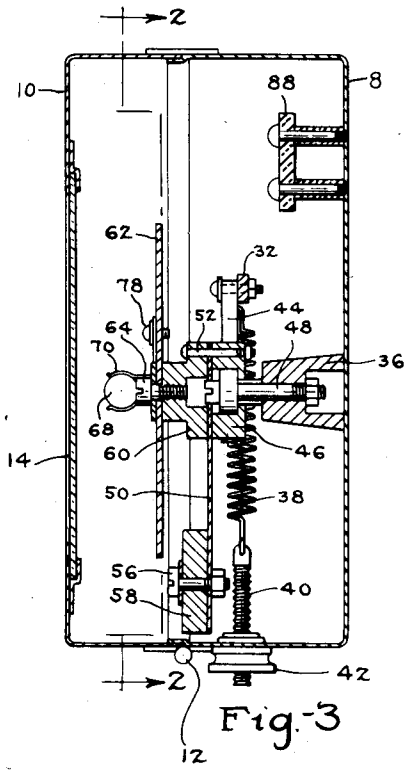


Fig.-3

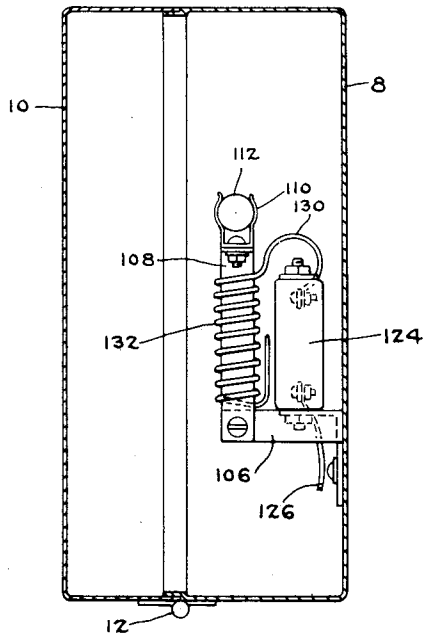


Fig.-4

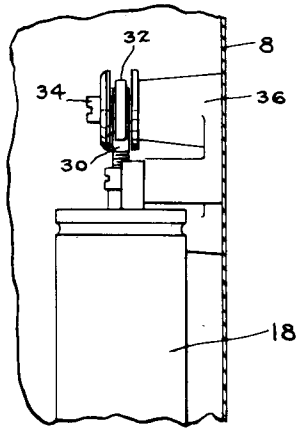


Fig.-5

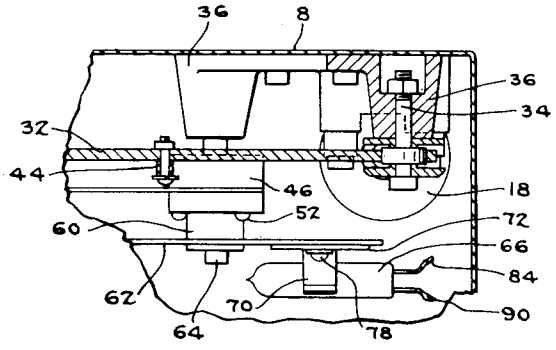


Fig.-6

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UNITED STATES PATENT OFFICE

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CIRCUIT CONTROLLING DEVICE

William H. Hollinshead, St. Paul, Minn.

Application March 16, 1934, Serial No. 715,898

5 Claims. (Cl. 200—83)

My invention relates to circuit controlling devices. While intended more particularly for use in connection with the control of water levels in tanks and sumps, it is to be understood that the device may be applied to other uses. An object of the invention is to provide a device of this character which is efficient and dependable in operation and not affected by expansion and contraction due to changes in temperature. Another object is to provide a device which is capable of minute and accurate adjustment. Another object is to provide a device embodying a plurality of sets of contact members controlled from one source of pressure. Another object is to provide a device embodying a plurality of sets of contact members which can be independently adjusted so that any one of the sets can be adjusted without disturbing any other set. Another object is to provide a movable support carrying a plurality of sets of contact members so arranged that at least one of said sets will be brought into engaged condition when the support is moved in one direction and at least another of said sets will be brought into engaged condition when the support is moved in the other direction. The full objects and advantages of my invention will appear in connection with the detailed description thereof and the novel features embodied in my inventive idea will be particularly pointed out in the claims appended at the end of the specification.

In the accompanying drawings which illustrate a practical embodiment of my invention—Fig. 1 is a view in front elevation of the device after the front of a casing has been removed. Fig. 2 is a view in vertical section on the line 2—2 of Fig. 3. Fig. 3 is a view in vertical section on the line 3—3 of Fig. 1. Fig. 4 is a view in vertical section on the line 4—4 of Fig. 1. Fig. 5 is a fragmentary view taken on the line 5—5 of Fig. 1. Fig. 6 is a view in horizontal section on the line 6—6 of Fig. 1.

Referring to the construction shown in the drawings, the numeral 8 designates a casing for the device, the front of this casing being provided with a door 10 hinged at the bottom as indicated at 12 in Fig. 3 and having a transparent panel 14 through which the interior of the casing can be seen without opening the door. The casing may be constructed of any suitable material and may be placed in any convenient location. A pipe 16 leads into the bottom of the casing, this pipe being connected to a liquid or gaseous supply which is to be controlled. The end of the pipe 16 in the casing is connected into the lower end of a diaphragm case 18 in whose upper end is secured an annular member 20. Within the case 18, there is a long flexible diaphragm 22 whose upper end is tightly secured to the lower surface of the member 20. The diaphragm 22 hangs freely from the member 20 so that fluid pressure transmitted through the pipe 16 is imposed upon the bottom of the diaphragm. A vertical tube 24 is centrally disposed within the diaphragm with its upper end extending up through the opening in the annular member 20. A rod 26 in the tube 24 is threaded on its upper portion and provided with a nut 28 adapted to rest upon top of the tube 24 whereby adjustment up and down may be made. The upper end of the rod 26 is provided with a knife edge 30 which engages in a notch 31 formed in the lower side of an arm 32 which at one end has a pivot 34 carried by a bracket member 36 secured to the inside of the casing 8, it being noted from Fig. 2 that the upper end of the diaphragm case 18 is secured to the bracket 36. A coiled spring 38 is attached at its upper end to the movable end of the arm 32. This spring extends downwardly and its lower end is attached to a screw extending through the bottom of the casing 8 and provided on the outside thereof with a nut 42 by means of which the tension of the spring may be adjusted. One end of a flexible strip 44 is intermediately secured to the arm 32. The other end of this strip is secured to the periphery of an annular disk 46 mounted for rotative movement on an enlarged portion of a bolt 48 carried by the support 36 as shown in Fig. 3. A pendulum 50 is secured to the disk by bolts 52 so that the bolt 48 constitutes the pivot of the pendulum. The lower end of the pendulum is provided with an arcuate slot 54. A bolt 56 passing through said slot and through a weight 58 serves to adjustably secure the weight on the lower end of the pendulum. The upper end of the pendulum 50 is positioned between the annular disk 46 and a flanged member 60, the bolts 52 previously referred to passing through the flange of the member 60.

A supporting disk 62 is secured to the outer face of the member 60 by a screw 64 whereby the disk 62 constitutes a movable support which moves to and fro together with the annular disk 46 and the pendulum 50. The movable support 62 serves to carry a plurality of contact members shown in the present embodiment as consisting of two mercury switches embodying two tubes 66 and 68 disposed substantially diametrally upon the opposite sides of the support 62. It will be

understood as a matter of course that the support 62 is capable of carrying additional contact members. The tubes 66 and 68 are held by similar clips 70 attached to segmental members 72 respectively. Each segmental member is attached to the support 62 by a pivot screw 74 and is provided with an arcuate slot 76 through which a screw 78 passes whereby the tubes 66 and 68 may be independently adjusted. The tube 66 toward its outer end is provided with two terminals 80 and 82. The terminal 80 is connected by a wire 84 with a binding post 86 carried by a block 88 of insulating material secured inside of the casing 8 as shown in Fig. 3. The terminal 82 is connected by a wire 90 with a binding post 92 carried by the block 88. The tube 68 toward its outer end is provided with two terminals 94 and 96. The terminal 94 is connected by a wire 98 with a binding post 100 carried by the block 88. The terminal 96 is connected by a wire 102 with a binding post 104 carried by the block 88. Secured within the casing 8 is a bracket 106 to which the lower end of a bimetallic bar 108 is secured. The upper end of the bar 108 carries a clip 110 which holds a mercury switch embodying a tube 112. The tube 112 is provided with two terminals 114 and 116. The terminal 114 is connected by a wire 118 with the binding post 100 while the terminal 116 is connected by a wire 120 with a binding post 122 carried by the block 88. The bracket 106 carries a resister 124 of well known construction, the lower portion of which is connected by a wire 126 with a binding post 128 carried by the block 88. The upper portion of the resister is connected by a wire 130 with the binding post 86, the wire including a heating coil 132 wrapped around the bimetallic bar 108. The binding posts 128 and 92 are connected by wires 134 and 136 respectively with a motor which is to be controlled. The binding posts 104, 100, and 122 are connected by wires 138, 140 and 142 respectively with a motor starter associated with a motor, the wire 138 being a starting line, the wire 140 being a common line and the wire 142 being a stopping line as commonly employed in three wire systems.

The operation and advantages of my invention will be understood in connection with the foregoing description and the accompanying drawings. Fig. 1 shows the parts in the position which they assume when the pressure in the pipe 16 has reached the desired maximum and the motor is to be stopped. The pressure exerted on the diaphragm 22 has turned the disk 62 against the gravity of the pendulum 50 and the tension of the spring 38. This causes the mercury in the tube 66 to bridge the terminals 80 and 82 so that current flows through the wire 134, the wire 126, the resister 124, the wire 130 including the heating coil 132, the wire 84, the wire 90, and out through the wire 136. The heating coil 132 soon flexes the thermostatic bar 108 from the position shown in Fig. 1 into that shown in Fig. 2, so that the mercury in the tube 112 opens the terminals 114 and 116. Current now ceases to flow through the wire 140, the wire 118, the wire 120, and the stop wire 142 so that the motor is stopped. When the pressure in the pipe 16 falls sufficiently so that the pendulum 50 and the spring 38 turn the disk in the opposite direction the requisite distance, the mercury in the tube 68 bridges the terminals 94 and 96. Current now flows through the wire 140, the wire 98, the wire 102, and the starting wire 138 so that the motor is started. It is to be noted that the thermostat 108 and the resister 124 serve as an electric snubber so that rapid vibration of the disk 62 due to surging in the fluid whose pressure is imposed on the diaphragm will not cause starting and stopping of the motor in rapid succession. Surging in the source of fluid pressure will not cause current to stop flowing through the stop wire 142 even if the disk 62 should be momentarily rocked sufficiently to bridge the terminals 94 and 96 since the current would first have to flow through the resister and the heating coil around the thermostat and for this to flex the thermostat requires a greater period of time than the period of vibration due to surging. While I prefer to employ the electric snubber which has been described it is apparent that some other form of snubber might be employed so that it would not be necessary to provide the thermostat 108, the resister 124, the mercury tube 112 and the wires associated with these parts. My device has the advantage of not being materially affected by expansion and contraction caused by changes in temperature. By tightening the spring 38 some of the effect of the pressure exerted on the diaphragm 22 is overcome. The provision of both the spring 38 and the pendulum 50 acting on the arm 32 cuts down the period of vibration of the disk 62. It will be noted further that the device is capable of being minutely and accurately adjusted.

I claim:

1. A circuit controlling device comprising a support mounted for rotative movement, a plurality of mercury switches carried by said support, a source of pressure, a diaphragm subjected to pressure exerted by said source, an arm pivoted at one end, a rod actuated by said diaphragm and engaging said arm to exert an upward thrust thereon, a pendulum, a disk to which said support is attached concentric with the pivot of said pendulum, said disk and pendulum being secured together for movement in unison, a flexible strip secured at one end to the periphery of said disk and secured at its other end to said arm, means whereby a circuit is completed by one of said switches when said support is given rotative movement in one direction, and means whereby another circuit is completed by another of said switches when said support is given rotative movement in the other direction.

2. A circuit controlling device comprising a support mounted for rotative movement, a plurality of mercury switches carried by said support, a source of pressure, a diaphragm subjected to pressure exerted by said source, an arm pivoted at one end, a rod actuated by said diaphragm and engaging said arm to exert an upward thrust thereon, a pendulum having its pivot positioned underneath said arm, a disk to which said support is attached rotatable on said pivot and to which said pendulum is attached, a flexible strip secured at one end to the periphery of said disk and secured at its other end to said arm, a spring exerting downward stress on the free end of said arm, means whereby a circuit is completed by one of said switches when said support is given rotative movement in one direction, and means whereby another circuit is completed by another of said switches when said support is given rotative movement in the other direction.

3. A circuit controlling device comprising a support mounted for rotative movement, a switch carried by said support, a source of pressure, a diaphragm subjected to pressure exerted by said source, a pivoted arm, a rod actuated by said

diaphragm and cooperating with said arm to exert a thrust thereon, a pendulum, a disk to which said support is attached concentric with the pivot of said pendulum, said pendulum and disk being secured together for movement in unison, and a flexible strip secured at one end to the periphery of said disk and secured at its other end to said arm, said switch being closed when said support is given rotative movement in one direction and being opened when said support is given rotative movement in the other direction.

4. A circuit controlling device comprising a support mounted for rotative movement, a switch carried by said support, a pivoted arm, means for swinging said arm on its pivot, a pendulum, a disk to which said support is attached, said pendulum and disk being secured together for movement in unison, and a flexible strip secured at one end to the periphery of said disk and secured at its other end to said arm, said switch being closed when said support is given rotative movement in one direction and being opened when said support is given rotative movement in the other direction.

5. A circuit controlling device comprising a support mounted for rotative movement, a switch carried by said support, a pivoted arm, means for swinging said arm on its pivot, a disk to which said support is attached, and a flexible strip secured at one end to the periphery of said disk and secured at its other end to said arm, said switch being closed when said support is given rotative movement in one direction and being opened when said support is given rotative movement in the other direction.

WILLIAM H. HOLLINSHEAD.