Oct. 27, 1953 H H. WOLFE ET AL 2,657,289

PRESSURE SWITCH

Original Filed April 27, 1948 3 Sheets-Sheet 1

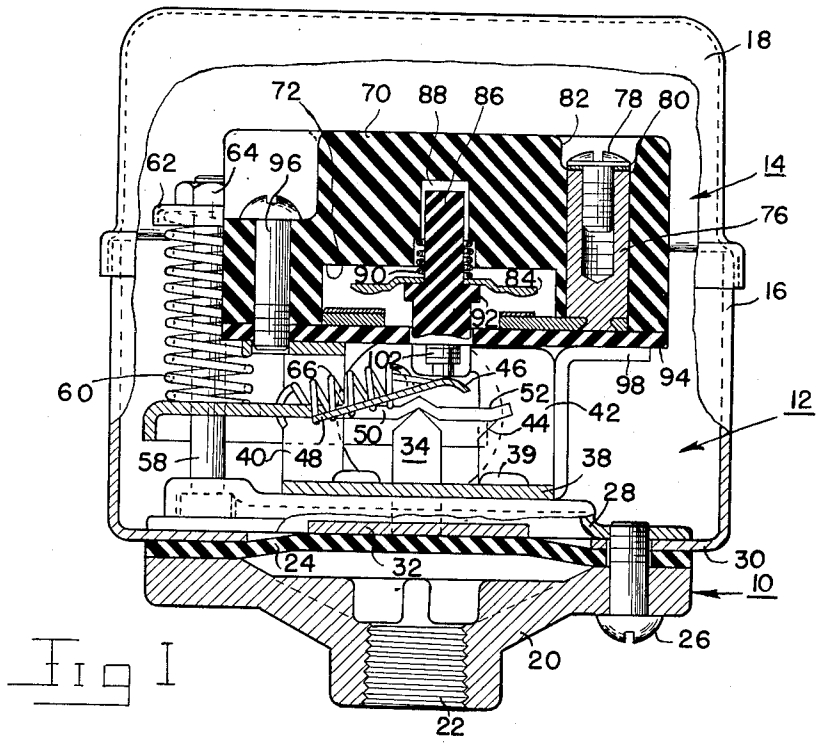


Fig 1

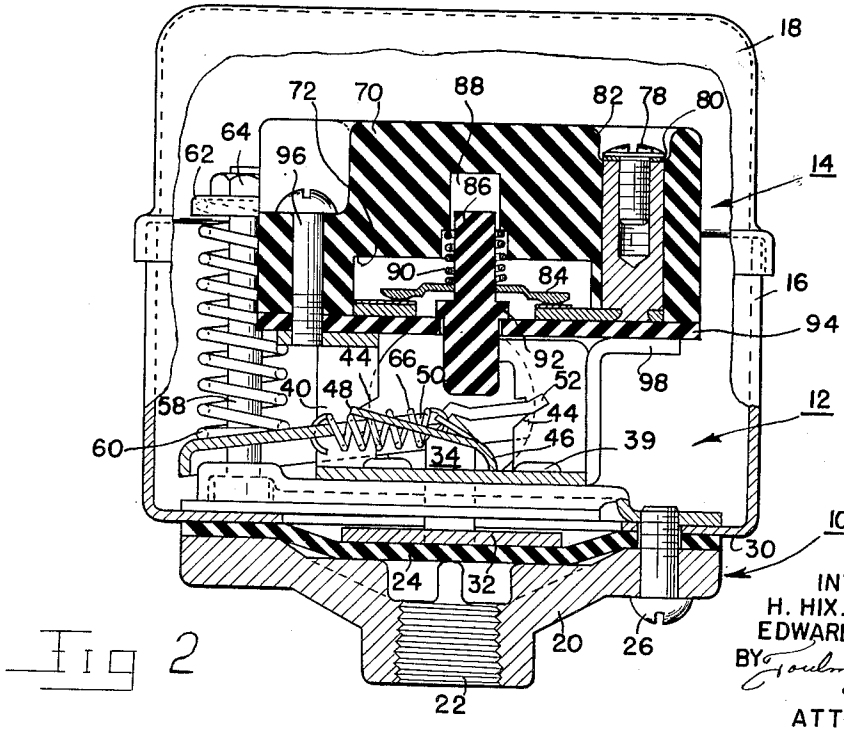


Fig 2

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Original Filed April 27, 1948 3 Sheets-Sheet 2

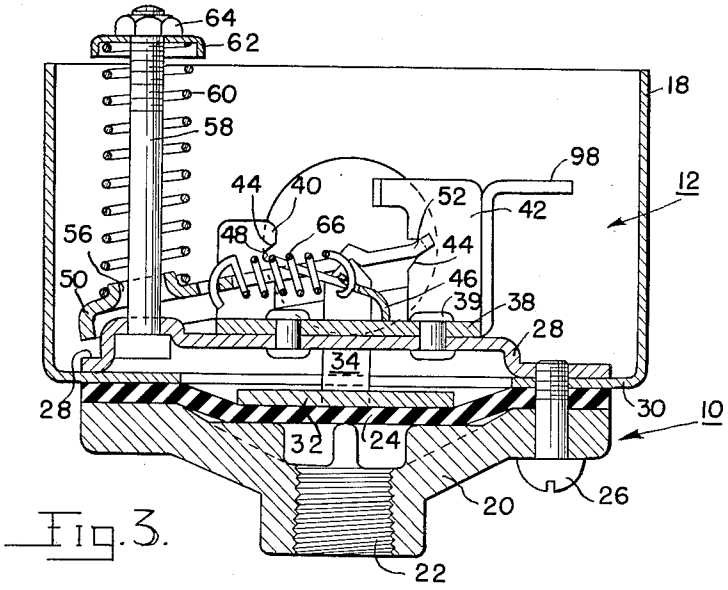


Fig. 3.

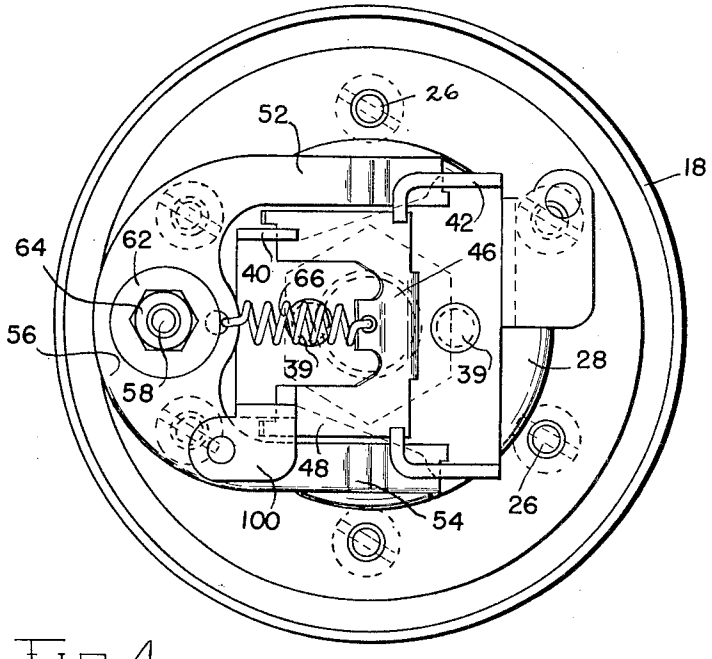


Fig. 4.

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Fig 5

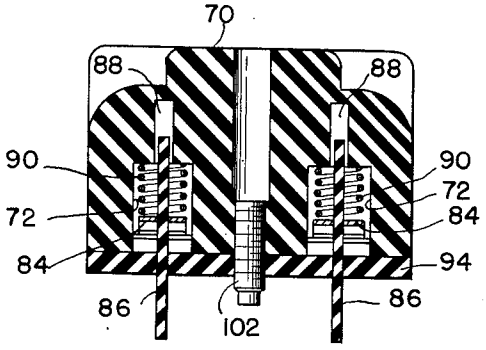


Fig 6

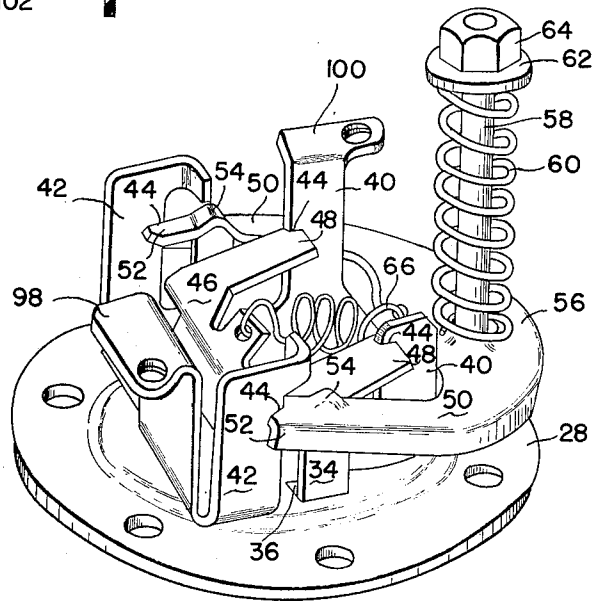
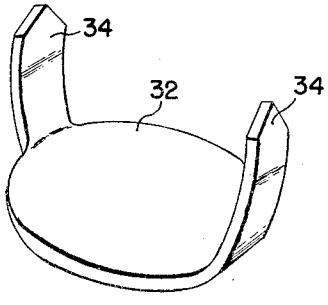


Fig 7



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2,657,289

PRESSURE SWITCH

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Original application April 27, 1948, Serial No. 23,536, now Patent No. 2,623,963, dated December 30, 1952. Divided and this application February 20, 1951, Serial No. 211,938

7 Claims. (Cl. 200—83)

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This invention relates to pressure switches and to improvements therein, and is particularly concerned with the types of pressure switches which are used on water pumping systems and the like. This application is a division of our prior copending application, Serial No. 23,536, filed April 27, 1948, and now matured as Patent No. 2,623,963 under date of December 30, 1952.

The usual type pressure switch for use with water systems, such as domestic systems, is quite complex and is often difficult to adjust and repair due to a plurality of small parts and to the arrangement of these parts in the switch. It is desirable, and particularly with switches for domestic installation, to simplify the structure of such a switch to reduce the chance that it will become inoperative and render the system it controls useless for a long period of time.

Furthermore, such pressure switches generally have rollers and cams and similar mechanisms which have an inherent amount of friction that materially detracts from the accuracy with which the switch can be adjusted to open or close at any predetermined pressure.

The primary object of the present invention is to provide an improved pressure switch of the type referred to above and which overcomes the objectionable features of the ordinary type pressure switch.

It is another object of this invention to provide an improved pressure switch constructed of a relatively few number of parts and being substantially free of frictional engagement of the moving parts with each other.

These and other objects and advantages will become more apparent upon reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 is a vertical section taken through the switch of this invention and showing it with the contacts in open position.

Figure 2 is a view similar to Figure 1 but showing the contacts of the switch in closed position.

Figure 3 is a view similar to Figure 2 but with the contact portion of the switch removed in order better to show the pressure responsive actuator for the switch.

Figure 4 is a plan view looking down on the actuator mechanism shown in Figure 3.

Figure 5 is a vertical section indicated by the line 5—5 on Figure 2.

Figure 6 is a perspective view of the actuator mechanism; and

Figure 7 is a perspective view showing the member which transmits thrust from the pressure diaphragm to the actuator mechanism.

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Referring to the drawings, the switch according to this invention generally comprises a part indicated at 10, which is the pressure responsive portion of the assembly, a part indicated at 12, which is the actuator portion of the assembly, and a portion indicated at 14 which is the terminal block and contact assembly.

These several parts are assembled together and are then enclosed with a casing 16 which includes the removable cover 18. The entire assembly is then ready to be connected to the electric lines to be controlled by the switch and the pressure part 10 can be connected with the source of pressure which is to effect the said control.

Referring to the aforementioned pressure part 10, this will be seen to comprise a bottom or base part 20 having a threaded opening 22 that receives a pressure pipe, as, for example, the pressure line leading from a pump to the reservoir.

The upper portion of the base part 20 has a machined peripheral flange and against this flange there is the flexible diaphragm 24. The diaphragm 24 is retained in position by the screws 26 which extend through the member 20 and the periphery of the flange and into engagement with a plate 28.

The lower portion of the casing 16 is turned in as indicated at 30 and is clamped between the periphery of the plate and the marginal portion of the diaphragm 24. Resting on top of the diaphragm 24 is an actuator plate 32 which has arms 34 extending upwardly from each side thereof and extending through the openings 36 in the plate 28. The member 32 and the arms 34 are for the purpose of transmitting thrust from the diaphragm 24 to the switch actuator mechanism at 12.

Referring to the actuating mechanism, this will be seen to comprise a bracket member 38 mounted on the plate 28 by the rivets 39 and having the spaced upstanding arms 40 at one end and the more widely spaced upstanding arms 42 at the other end.

The said arms are notched on their inside edges as indicated at 44 and a pair of bifurcated or U-shaped plates are arranged to have their legs engaged by the said notches. As shown, a first plate 46 is arranged so that the ends of its legs 48 are engaged by the notches 44 in the upstanding arms 40. Similarly, a second plate 50 is arranged to have the ends of its legs 52 engaged by the notches in the upstanding arms 42.

It will be noted that the plate 50 is substantially larger than the plate 46 and extending

completely around the upstanding arms 40, and that each of the legs 52 thereof have the V-shaped recesses therein and which are positioned to be engaged by the V-shaped upper ends of the arms 34 upstanding from the plate 32.

Having its head positioned beneath the plate 28 and extending upwardly through an aperture 56 in the closed end of the plate 50 is a bolt 58. A spring 60 surrounds the bolt and bears at its lower end on the top of the plate 50 and at its upper end beneath the washer 62, which is adjustably retained on the upper end of the bolt 58 by the adjusting nut 64.

Interconnecting the plates 46 and 50 is a tension spring 66, and it will be observed that the said tension spring is positioned so as to continuously urge the said plates toward engagement with the notches in their supporting arms.

The general arrangement of the aforementioned plates, springs and associated parts is best illustrated in Figures 3, 4 and 6.

Turning now to the contact and terminal block 14 of the switch, this will be seen in Figures 1, 2 and 5 to comprise a block 70 of insulating material and which has extending therein from one side a pair of recesses 72. The recesses 72 are substantially rectangular and extending into each end of each of the recesses is a stationary contact plate 74. Each of the contact plates 74 is connected with a rod 76 which extends transversely through the block 70 to the side opposite the recesses therein and receives a screw 78. The screw 78 is for the purpose of connecting the electric leads 80 to the said rods, and as will be noted in Figure 1 the leads are brought into the ends of the rods through grooves or slots 82 in the adjacent side of the block 70.

Disposed in each of the recesses 72 between the bottom thereof and the stationary contact plate 74 are the movable contact plates 84. These plates are adapted for bridging the stationary contact plates when in their Figure 2 position and for interrupting the electrical connection between the plates when in their Figure 1 position.

The movable contact plates are guided and actuated by the blades 86 of insulating material which extend through the plates 84 and into the recesses 88 of the block 70. A spring 90 surrounds each of the blades 86 and continuously urges the associated movable contact plate toward its contact making position.

Each of the blades 86 is shouldered as at 92 and thus when moved upwardly engages the associated movable contact plate and lifts it from its contact making position. The blades 86 extend beyond the limits of the block 70 and there is a cover plate 94 which closes the recess 72 and also retains the blades 86 in position.

The block 70 together with its contacts, contact actuating blades, and cover plate 94, is mounted in position on the actuator 12 by means of the screws 96 which extend through the said block and cover plate and into the turned back tabs 98 and 100 which are integral with the bracket 38.

In Figures 1, 2 and 5 it will be noted that there is an adjustable screw 102 extending outwardly from the block 70 on the actuator side thereof. This screw is adjustable by means of a socket head therein from the top of the block and serves as a stop for limiting the maximum upward movement of the plate 46, as will be seen in Figure 1 wherein the plate and screw are shown in engagement.

The screw also serves to adjust the pressure differential within which the switch operates, because the closer the screw stops the palte 46 to a horizontal position the smaller the drop in pressure required beneath the diaphragm 24 to allow the said plate to return to its Figure 2 position.

In operation, the switch can be assumed normally to have all of its parts shown in the Figure 2 position. At that time the pressure at which the switch will operate is set by means of the nut 64. Thereafter the switch will remain in its Figure 2 position until pressure builds up beneath the diaphragm 24 and moves the plate 32 upwardly and the arms 34 cause the plate 50 to rotate clockwise about its pivotal connection with the upstanding arms 42.

The setting of the spring 60 determines the amount of pressure required to so move the plate 50. When the plate 50 is moved upwardly until the line of action of the spring 66 is above the engagement of the legs 48 of the plate 46 of the upstanding arms 44, the said plate 46 will snap upwardly to its Figure 1 position and bring about a quick opening of the switch contacts. Thereafter the switch will remain open until the pressure beneath the diaphragm drops to the point where the plate 50 will move downwardly and again snap the plate 46 downwardly.

As mentioned before, the pressure at which the switch will open can be adjusted by the nut 64 and the pressure differential, that is, the amount which the pressure must drop beneath the diaphragm 24 before the switch again closes, can be adjusted by the screw 102. Both the nut and screw are available from the top of the switch merely by removing the cover member 18.

It will be apparent that the switch has substantially no friction due to the pivotal arrangement of the plates 46 and 50 and thus can be adjusted as to operating pressure very accurately. Furthermore, a minimum of assembling operations are necessary because the switch part 14 is merely assembled and then is retained in assembled position by the same means which secures it in place on the bracket of the actuator. Similarly, in the actuator the two plates 46 and 50 are retained in position by the same spring which causes the plate 46 to snap over center.

It will be apparent that the construction of the switch is inexpensive and that the assembly thereof is quite simple, and servicing and repair of the switch can easily be done at any time.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions and, accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

We claim:

1. In a pressure switch; a toggle actuator comprising a bracket having spaced pairs of upstanding arms, the arms of each pair being spaced differently than the other pair, each said pair of arms having notches in their edges opening toward the other pair of arms, a first bifurcated plate having the ends of its legs in the notches of one pair of arms, a second bifurcated plate having the ends of its legs in the notches of the other pair of arms and extending around said first pair of arms, a tension spring connecting the closed ends of said plates, a compression spring acting on the closed end of said second plate for urging the toggle toward one of its operative positions, other arm means upstanding

from said bracket, and switch means mounted on said other arm means and positioned to be operated by said first plate when said second plate is moved against the thrust of said compression spring, a stop mounted in the switch and extending downwardly therefrom to engage and retain said first plate in a predetermined position when the plates are moved against said compression spring, and said stop being adjustable from the top of said switch.

2. In a pressure switch; a toggle actuator comprising a bracket having spaced pairs of upstanding arms, the arms of each pair being spaced differently than the other pair, each said pair of arms having notches in their edges opening toward the other pair of arms, a first bifurcated plate having the ends of its legs in the notches of one pair of arms, a second bifurcated plate having the ends of its legs in the notches of the other pair of arms and extending around said first pair of arms, a tension spring connecting the closed ends of said plates, a compression spring acting on the closed end of said second plate for urging the toggle toward one of its operative positions, other arm means upstanding from said bracket, a terminal block mounted on said other arm means and switch means mounted in said terminal block and positioned to be operated by said first plate when said second plate is moved against the thrust of said compression spring, spring means yieldably urging said switch means towards its closed position and means for adjusting the pressure differential between said compression spring and said spring means whereby predetermined amounts of pressure are required to open and close said switch means.

3. In a pressure switch, a toggle actuator comprising a bracket having spaced pairs of upstanding arms, the arms of each pair being spaced differently than the other pair, each said pair of arms having notches in their edges opening toward the other pair of arms, a first bifurcated plate having the ends of its legs in the notches of one pair of arms, a second bifurcated plate having the ends of its legs in the notches of the other pair of arms and extending around said first pair of arms, a tension spring connecting the closed ends of said plates, a compression spring acting on the closed end of said second plate for urging the toggle toward one of its operative positions, other arm means upstanding from said bracket, a terminal block mounted on said other arm means, and switch means mounted in said terminal block and positioned to be operated by said first plate when said second plate is moved against the thrust of said compression spring, spring means yieldably urging said switch means towards its closed position and means for adjusting the pressure differential between said compression spring and said spring means whereby predetermined amounts of pressure are required to open and close said switch means, said adjusting means including a stop member threadably mounted in said switch means and extending downwardly to abut said first plate when the latter is in said operative position, and means for moving said stop member in and out of said switch means through an aperture in the top of said switch means.

4. In a pressure switch, a toggle actuator comprising a bracket having spaced pairs of upstanding arms, the arms of each pair being spaced differently than the other pair, each said pair of arms having notches in their edges opening toward the other pair of arms, a first bifurcated plate having the ends of its legs in the notches of one pair of arms, a second bifurcated plate having the ends of its legs in the notches of the other pair of arms and extending around said first pair of arms, a tension spring connecting the closed ends of said plates, a compression spring acting on the closed end of said second plate for urging the toggle toward one of its operative positions, other arm means upstanding from said bracket, a terminal block mounted on said other arm means, and switch means mounted in said terminal block and positioned to be operated by said first plate when said second plate is moved against the thrust of said compression spring, spring means yieldably urging said switch means towards its closed position and means for adjusting the pressure differential between said compression spring and said spring means whereby predetermined amounts of pressure are required to open and close said switch means, said adjusting means including a stop member threadedly mounted in said switch means and extending downwardly to abut said first plate when the latter is in said operative position, means for moving said stop member in and out of said switch means through an aperture in the top of said switch means and means for varying the amount of pressure exerted by said compression spring against said second plate when said second plate is in its said one operative position.

5. In a pressure switch, a diaphragm, means for applying a variable pressure against said diaphragm, a switch means operatively connected to said diaphragm, means for opening said switch means at a first predetermined pressure and for closing said switch at a second predetermined pressure, said last means comprising a bracket having spaced pairs of upstanding arms, the arms of each pair being spaced differently than the other pair, each said pair of arms having notches in their edges opening toward the other pair of arms, a first bifurcated plate having the ends of its legs in the notches of one pair of arms, a second bifurcated plate having the ends of its legs in the notches of the other pair of arms and extending around said first pair of arms, a tension spring connecting the closed ends of said plates, a compression spring acting on the closed end of said second plate for urging the toggle toward one of its operative positions, means for varying the amount of compressive force exerted by said spring against said second plate when the latter is in said one operative position, other arm means upstanding from said bracket, a terminal block mounted on said other arm means, said switch means being mounted in said terminal block and positioned to be operated by said first plate when said second plate is moved against the thrust of said compression spring, spring means yieldably urging said switch means towards its closed position.

6. In a pressure switch, a diaphragm, means for applying a variable pressure against said diaphragm, a switch means operatively connected to said diaphragm, means for opening said switch means at a first predetermined pressure and for closing said switch at a second predetermined pressure, said last means comprising a bracket having spaced pairs of upstanding arms, the arms of each pair being spaced differently than the other pair, each said pair of arms having notches in their edges opening toward the other pair of arms, a first bifurcated plate having the ends of its legs in the notches of one pair of

arms, a second bifurcated plate having the ends of its legs in the notches of the other pair of arms and extending around said first pair of arms, a tension spring connecting the closed ends of said plates, a compression spring acting on the closed end of said second plate for urging the toggle toward one of its operative positions, means for varying the amount of compressive force exerted by said spring against said second plate when the latter is in said one operative position, other arm means upstanding from said bracket, a terminal block mounted on said other arm means, said switch means being mounted in said terminal block and positioned to be operated by said first plate when said second plate is moved against the thrust of said compression spring, spring means yieldably urging said switch means towards its closed position, and a stop member threadably mounted in said switch means and extending downwardly to abut said first plate when the latter is in said operative position and means for moving said stop member in and out of said switch means through an aperture in the top of said switch means.

7. In a pressure switch, a diaphragm, means for applying a variable pressure against said diaphragm, a switch, means for operatively connecting said diaphragm to said switch whereby variations in pressure will act to open and close said switch and means for adjusting the pressure differential between the open and closed positions

of said switch, said connecting means comprising a bracket having spaced pairs of upstanding arms, the arms of each pair being spaced differently than the other pair, each said pair of arms having notches in their edges opening toward the other pair of arms, a first bifurcated plate having the ends of its legs in the notches of one pair of arms, a second bifurcated plate having the ends of its legs in the notches of the other pair of arms and extending around said first pair of arms, a tension spring connecting the closed ends of said plates, a compression spring acting on the closed end of said second plate for urging the toggle toward one of its operative positions, other arm means upstanding from said bracket, a terminal block mounted on said other arm means, and switch means mounted in said terminal block and positioned to be operated by said first plate when said second plate is moved against the thrust of said compression spring, spring means yieldably urging said switch means towards its closed position.

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