Dec. 26, 1961 W. E. ELSNER ETAL 3,015,006

CONTACT BLOCK AND TERMINAL ARRANGEMENT

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Fig. 1

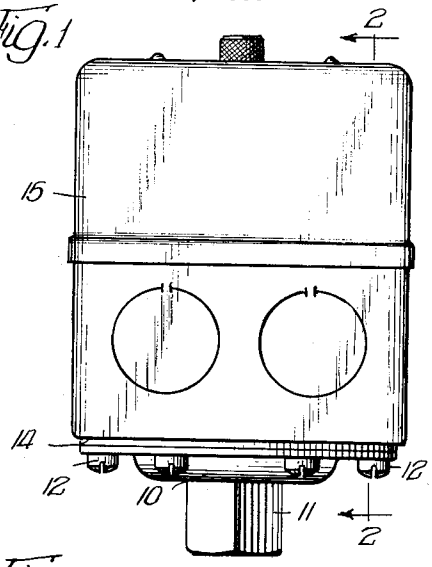


Fig. 2

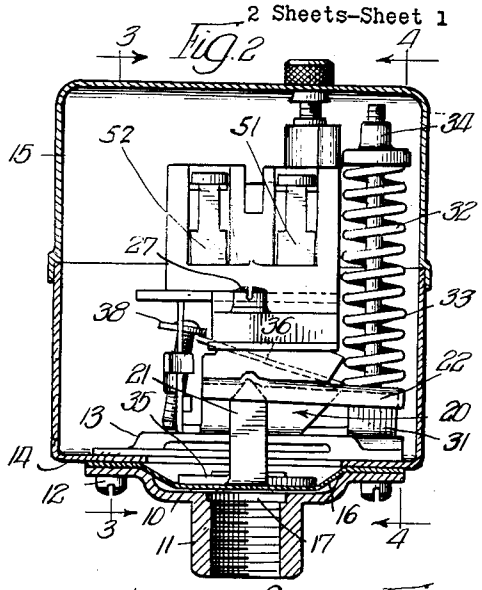


Fig. 3

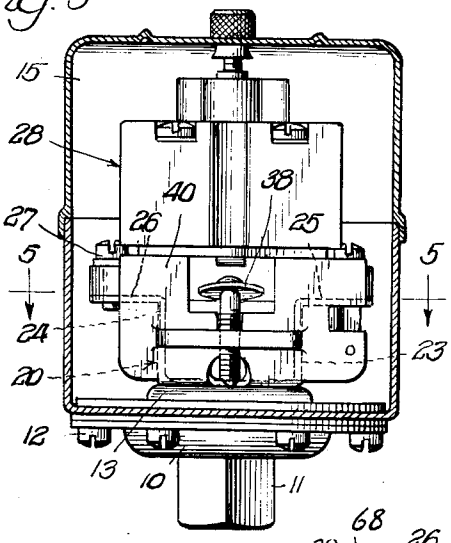


Fig. 4

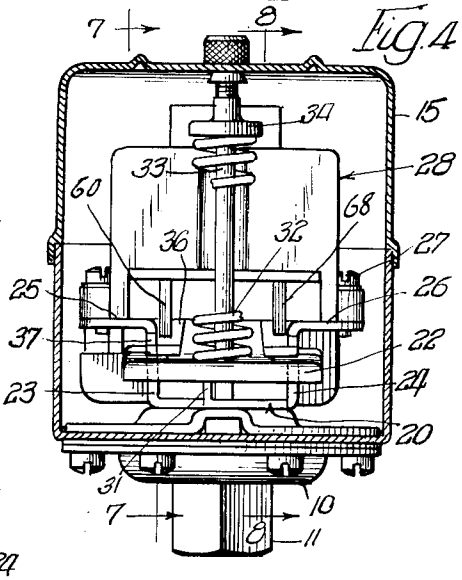
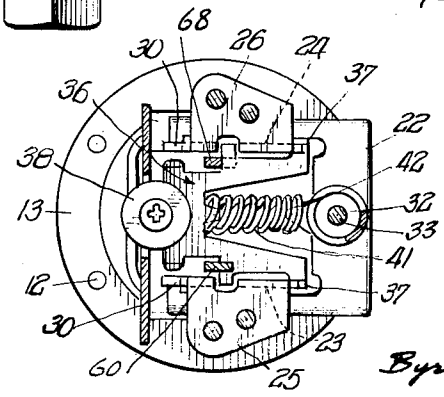


Fig. 5



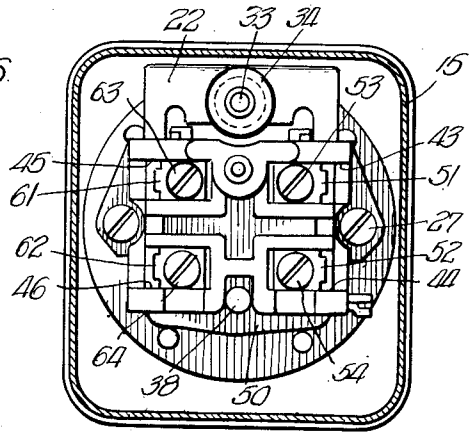
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Fig. 6



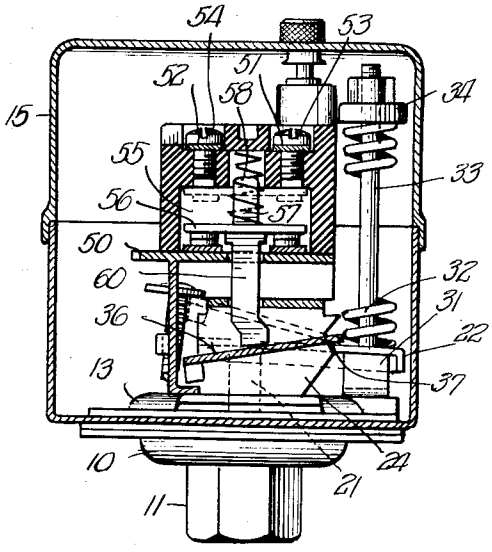


Fig. 7

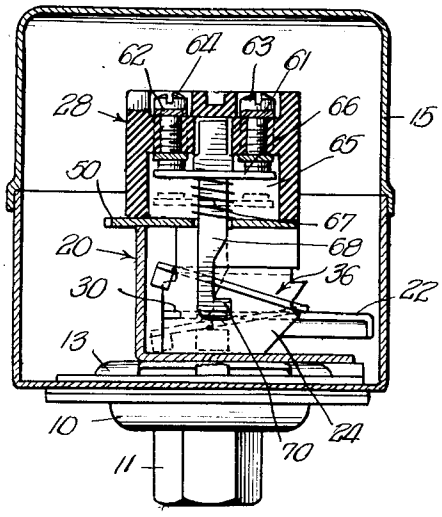


Fig. 8

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3,015,006 CONTACT BLOCK AND TERMINAL ARRANGEMENT

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7 Claims. (Cl. 200—83)

The invention relates to electric switches and has reference to electric switches of the pressure type having a toggle member which is moved in response to certain pressure conditions to effect opening and closing of the contacts of the switch.

An object of the invention resides in the provision of a pressure actuated switch having a contact block associated therewith and which preferably contains normally closed contacts and normally open contacts. The present switch additionally incorporates a toggle member adapted to move in response to certain pressure conditions and which is operative to effect opening and closing of the said contacts.

Another object is to provide a pressure switch of the toggle actuated type having normally closed contacts and normally open contacts and wherein the normally closed contacts are actuated by a push rod which connects the said contacts with the toggle member of the switch, whereas the normally open contacts are actuated by a pull rod also having an operative connection with the toggle member.

Another object of the invention is to provide a switch such as described which will have general utility as regards pressure switch applications and uses, since all the contacts of the switch may be of the normally closed or of the normally open type, with both of the connecting members being either push or pull rods, respectively.

A further object is to provide a pressure switch having a toggle member for actuating the contacts thereof, said switch being relatively simple in structure, although positive and highly efficient in operation.

With these and other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended thereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts:

FIGURE 1 is an elevational view showing the switch of the invention as enclosed within a housing;

FIGURE 2 is a vertical sectional view through the switch device of FIGURE 1 taken substantially on line 2—2 of said figure, and which illustrates in detail the several improvements which have been incorporated in the switch structure;

FIGURE 3 is a vertical sectional view taken substantially along line 3—3 of FIGURE 2;

FIGURE 4 is a vertical sectional view taken substantially along line 4—4 of FIGURE 2;

FIGURE 5 is a horizontal sectional view taken substantially along line 5—5 of FIGURE 3, the same showing the toggle structure and the push and pull rods in operative relation therewith;

FIGURE 6 is a top plan view showing the contact block and terminal arrangement such as may be associated with the toggle type of pressure switch as disclosed;

FIGURE 7 is a vertical sectional view taken substantially along line 7—7 of FIGURE 4 and illustrating the action of the toggle member and push rod in actuating the normally closed contacts; and

FIGURE 8 is a vertical sectional view taken substantially along line 8—8 of FIGURE 4 and illustrating the action of the toggle member and pull rod in actuating normally open contacts.

The pressure switch which has been selected for illustrating the invention includes an adaptor or base portion 10 having a threaded inlet 11 for admitting a fluid under pressure, and which is suitably secured by the screws 12 to the supporting ring 13 of the switch structure. The bottom wall 14 of the housing 15, together with the flexible diaphragm 16 are interposed between the parts 10 and 13 so that the switch structure, housing and adaptor are fixedly joined together as a unit. The bottom wall 14 of the housing has an opening 17 in alignment with the inlet 11 so that the pressure fluid in the inlet is in direct contact with the undersurface of the diaphragm 16 to flex the same in a manner depending on the pressure conditions to which the diaphragm is subjected. The toggle mechanism of the present switch is in turn actuated by the flexing of the diaphragm 16 and as the toggle mechanism is caused to oscillate from one side of a dead center position to the other, the contacts of the switch are respectively actuated.

The supporting ring structure 13 is accordingly fixedly secured to the housing 15, and said ring structure has associated therewith the frame assembly 20 and the pivot structure comprising the pivots 21 for the lever 22. The frame assembly shown in FIGURES 3 and 4 is substantially U-shaped and the same has its bottom wall fixedly secured to the supporting ring 13. The said frame assembly thus provides the upstanding side walls 23 and 24 which are bent outwardly at their upper ends to form the flanges 25 and 26. Said flanges in turn support the contact block which is designated in its entirety by the numeral 28. The screws 27 extend through side extensions formed on the contact block and the said screws are threaded into the flanges 25 and 26 for releasably securing the contact block to the frame assembly 20. The side walls 23 and 24 are each slotted or notched at 30 as best shown in FIGURE 8, and the pivot ends of the lever 22 are located in the notches for pivotally mounting the lever on the frame assembly 20. The stop portion 31, FIGURE 7, which is fixed to and extends upwardly from the ring 13 is located at the opposite end of the lower 22, and said stop limits movement of the lever in a downward direction under tension of the coil spring 32.

Said coil spring 32 has encircling relation with the rod 33 which is anchored at its base end in the ring structure 13, and which extends upwardly from said structure to approximately the top surface of the contact block 28. The top end of the coil spring 32 is confined by the cap 34 which is threaded on the upper end of the rod 33. The cap can be adjusted on said rod as regards its position vertically so as to vary the compressive force exerted by the spring on the lever 22.

The pivot structure 21 comprises the actuator for the lever 22, since the same includes a base 35, FIGURE 2, which provides the pivots 21, the same being integral therewith. The base 35 is located in contact with the flexible diaphragm 16 on the top side thereof, and thus the pivot structure will move bodily in a vertical direction as the pressure fluid on the diaphragm 16 causes the same to flex. This bodily movement of the pivots 21 will be transmitted to the lever 22, and accordingly said lever will oscillate with respect to the pivot axis 30.

The toggle member 36, having the shape as shown in FIGURE 5, is pivotally mounted at its extremities as at 37 on the frame assembly 20. Whereas the pivot ends 30 for the lever 22 are located at the left edge of each side wall 23 and 24, the pivot extremities 37 of the toggle member engage in notches on the right edge of the said side walls. Also, it will be observed that whereas the

lever 22 is disposed in surrounding relation with the frame assembly, the toggle member 36 is located within the side walls 23 and 24. This locates the movable end of the toggle member adjacent the threaded screw 38 which is located in plate 40, FIGURE 3. The screw is adjustable in a vertical direction to limit upward movement of the said toggle member. When the toggle member is caused to move downwardly its position is limited by the bottom wall of the frame assembly. The toggle structure of the switch is completed by the coil spring 41 which is retained at its left hand end by the toggle member and at its right hand end by the nose 42 provided by the lever 22, FIGURE 5.

The contact block assembly 28 which is fixedly secured to the frame assembly 20 by the screws 27 is preferably formed of a moldable plastic, although other insulating materials may be used. Said block is cored internally to provide the recesses 43, 44, 45 and 46, and the cavities 47 and 48. The recesses are accessible from the top of the block, FIGURE 6, for receiving terminal screws to be presently described. The cavities are open at the bottom of the block and said cavities contain the contacts of the switch. The insulating plate 50 is suitably secured to the bottom surface of the block and said plate closes the cavities, although the said plate is readily removable for convenient access to the contacts.

Refering again to the particular recesses 43 and 44, it will be seen that conductors 51 and 52 terminate therein with each conductor being threadedly secured to the contact block by the respective terminal screws 53 and 54. As best shown in FIGURES 2 and 7 the conductors 51 and 52 are in the form of metal strips and the same extend vertically of the side walls of the contact block to eventually enter and terminate within the cavity 55, FIGURE 7. In said cavity the conductors 51 and 52 contact with and the same are supported by the insulating plate 50, and the supported terminal ends of the conductors are each provided with silver contacts for coaction with silver contacts carried by the contact strip 56. The strip is yieldingly biased by the coil spring 57 having encircling relation with portion 58 of the push rod 60. The intermediate portion of the push rod 60 is enlarged for engagement with the contact strip 56. Thus the strip is yieldingly biased on one side by the coil spring 57 and is held to the push rod on the opposite side. The push rod depends downwardly through insulating plate 50 for eventual contact with the toggle member 36.

When the toggle member is below a dead center position as shown in FIGURE 7, the pressure of the fluid for actuating the diaphragm 16 will be below a preset limit. Accordingly the push rod will be located as shown in said figure. The push rod is under the compressive force exerted by coil spring 57 to thus maintain the contact strip 56 in contact with the conductors 51 and 52. This structure constitutes the normally closed contacts of the switch.

Recesses 45 and 46 contain conductors 61 and 62 and which terminate within said recesses, the said terminal ends being held to the insulating contact block by the terminal screws 63 and 64, respectively. The conductors 61 and 62 also extend downwardly on one side of the contact block to eventually enter at the top of the cavity 65, FIGURE 8, where the conductors terminate. Silver contacts are also provided for each terminal end within the cavity 65 and similar contacts are located on the contact strip 66. The said strip is yieldingly biased in an upward direction by the coil spring 67 which is located on the pull rod 68, being confined between the strip 66 and the insulating wall 50. The pull rod 68 extends downwardly through an opening in the plate 50 and through an opening in the toggle member 36 to extend below the member where the pull rod is provided with the lateral projection 70. When the toggle member 36 is located in its below dead center position as shown in FIGURE 7, it has been stated that the pressure fluid on the diaphragm 16 will be below a predetermined limit. This down position of the toggle member 36 will, however, pull the rod 68 downwardly, thus locating the contact strip 66 adjacent the bottom of the cavity 65 so that the strip is out of contact with the conductors 61 and 62. This structure accordingly comprises the normally open contacts of the switch.

As the pressure conditions of the fluid acting on the diaphragm 16 may vary, it will be understood that the pivots 21 will have bodily movement to effect oscillating movement of the lever 22. When the pressure is below a preset limit, lever 22 will engage its stop 31 which limits its movement in a downward direction under tension of the coil spring 32. In this position of lever 22 the toggle member 36 will be located in a below dead center position as a result of the action thereon by the over center spring 41. This position of the parts is shown in FIGURE 7 and it will be observed that push rod 60 is so positioned as to allow the normally closed contacts including the strip 56 and the conductors 51 and 52 to close. However, the normally open contacts including the strip 66 and the conductors 61 and 62 are open, since in this down position of the toggle member, the pull rod 68 has been pulled down locating strip 66 in the bottom portion of the cavity 65 and out of engagement with the contacts 61 and 62. In the event the fluid acting on diaphragm 16 should increase in pressure, then the toggle lever 22 will be caused to pivot in a counterclockwise direction about its fixed axis 30. Should this pivotal movement of lever 22 exceed a pre-set maximum, the said lever will so influence the center spring 41 as to cause a snap acting movement of the toggle member 36 into an above dead center position, such as shown in FIGURE 8. This snap-acting movement of the toggle member which takes place in a clockwise direction about its fixed axis 37 will reverse the position of the contact strips. In other words, contact strip 56 will be caused to move out of engagement with the conductors 51 and 52, whereas contact strip 66 will move into contact with conductors 61 and 62. As the pressure of the fluid acting on the diaphragm 16 may vary above and below a predetermined maximum, the toggle member 36 will have snap acting movement in opposite directions between given extreme positions to thereby effect the desired operation of the contact structure of the switch.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings, as various other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. In an electric switch, the combination with a supporting base structure, of a frame assembly secured to said base structure and providing a pair of spaced, upstanding side frames, toggle mechanism pivotally supported by the side frames, said mechanism including a toggle member having pivotal movement in a direction parallel to the side frames, a contact block of insulating material fixedly supported by the side frames, a plurality of fixed contacts located within the contact block, a plurality of movable contacts within the said block for respectively coacting with the fixed contacts, a push rod operatively connecting the toggle member with certain of the movable contacts, and a pull rod operatively connecting the toggle member with the remaining of the movable contacts.

2. In an electric switch, the combination with a supporting ring structure, of a frame assembly secured to said ring structure and providing a pair of spaced, upstanding side frames, a toggle lever pivotally supported by the upstanding side frames, and adapted to oscillate in a direction parallel to the side frames, a toggle member also pivotally supported by the upstanding side frames so as to oscillate in a direction parallel to the side frames, resilient means operatively connecting the toggle member

with the toggle lever whereby said member will move to and from positions on respective sides of dead center when the toggle lever is oscillated to a predetermined degree, a contact block of insulating material fixedly supported by the side frames, a plurality of fixed contacts located within the block, a plurality of movable contacts within said block for respectively coacting with the fixed contacts when the same are actuated, and means for actuating said movable contacts including a push rod operatively connecting the toggle member with certain of the movable contacts and a pull rod operatively connecting the toggle member with the remaining movable contacts.

3. In an electric switch, the combination with a supporting ring structure, of a frame assembly secured to said ring structure and providing a pair of spaced, upstanding side frames, a toggle lever pivotally engaging the side frames at one edge thereof, said toggle lever being disposed exteriorly of the side frames and being adapted to oscillate in a direction parallel to the side frames, a toggle member pivotally engaging the side frames at the opposite edge thereof and also being adapted to oscillate in a direction parallel to the side frames, resilient means disposed between the toggle lever and member and connecting therewith whereby the toggle member has movement in opposite directions between given extreme positions when the toggle lever is oscillated to a predetermined degree, a contact block of insulating material fixedly supported by the side frames, a plurality of fixed contacts located within the block and which are disposed in pairs, a movable contact strip mounted within the block for coaction with a first pair of said fixed contacts, another movable contact strip mounted within the block for coaction with a second pair of said fixed contacts, and means for actuating the said movable contact strips including a push rod operatively connecting the toggle member with one of the movable contact strips and a pull rod operatively connecting the toggle member with the other movable contact strip.

4. In an electric switch, the combination with a supporting ring structure, of a frame assembly secured to said ring structure and providing a pair of spaced, upstanding side frames, a toggle lever supported by the side frames and movable about a fixed axis in a direction parallel to the side frames, a toggle member also supported by the side frames and movable about a fixed axis in a direction parallel to the side frames, an overcenter spring between the toggle lever and member whereby said toggle member has snap acting movement in opposite directions between given extreme positions when the toggle lever is oscillated to a predetermined degree, a contact block of insulating material fixedly supported by the side frames, a plurality of fixed contacts located within the block and which are disposed in pairs, a movable contact strip for coaction with a first pair of said fixed contacts, a push rod supporting said contact strip and operatively connecting with the toggle member, a second movable contact strip for coaction with a second pair of said fixed contacts, and a pull rod supporting said second contact strip and operatively connecting with the toggle member.

5. An electric switch as defined by claim 4, additionally including coil springs having encircling relation with the push rods respectively for yieldingly biasing the movable contact strip supported by the particular rod into contact relation with its pair of fixed contacts.

6. In a switch of the type as disclosed, a contact block having a pair of cavities therein at respective sides of the block, a pair of conductors for each cavity, said conductors extending from the exterior of the block to within the cavities respectively and said conductors terminating therein, a contact strip within each cavity, resilient means associated with each contact strip and operative to maintain its contact strip in contact with the terminal ends of the conductors within its particular cavity, a push rod mounting one of said contacts strips and having a portion engaging the strip to effect movement of the strip out of contact with the terminal ends of its conductors when the push rod is actuated, and a pull rod mounting the other contact strip and having a portion engaging the strip to effect movement of the strip out of contact with the terminal ends of its conductors when the pull rod is actuated.

7. In a switch of the type as disclosed, a contact block having first and second cavities therein at respective sides of the block, a pair of conductors for each cavity, said conductors extending from the exterior of the block to within the cavities respectively and said conductors terminating therein, the terminating conductors within the first cavity having location adjacent the bottom wall of said cavity and the terminating conductors within the second cavity having location adjacent the top wall of said cavity, a contact strip within each cavity, resilient means associated with each contact strip and operative to maintain its contact strip in contact with the terminal ends of the conductors within its particular cavity, a push rod mounting the contact strip in the first cavity and having a portion below the strip for engaging the same to effect movement of the strip out of contact with the terminal ends of its conductors when the push rod is actuated, and a pull rod mounting the contact strip in the second cavity and having a portion above the strip for engaging the same to effect movement of the strip out of contact with the terminal ends of its conductors when the pull rod is actuated.

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