Dec. 6, 1932. H. L. VAN VALKENBURG 1,890,009

PRESSURE SWITCH

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Fig. 2

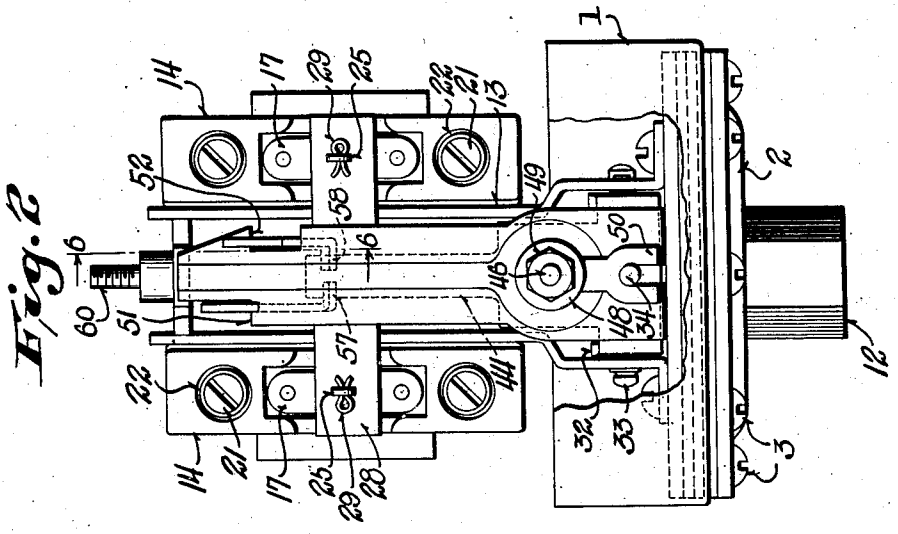
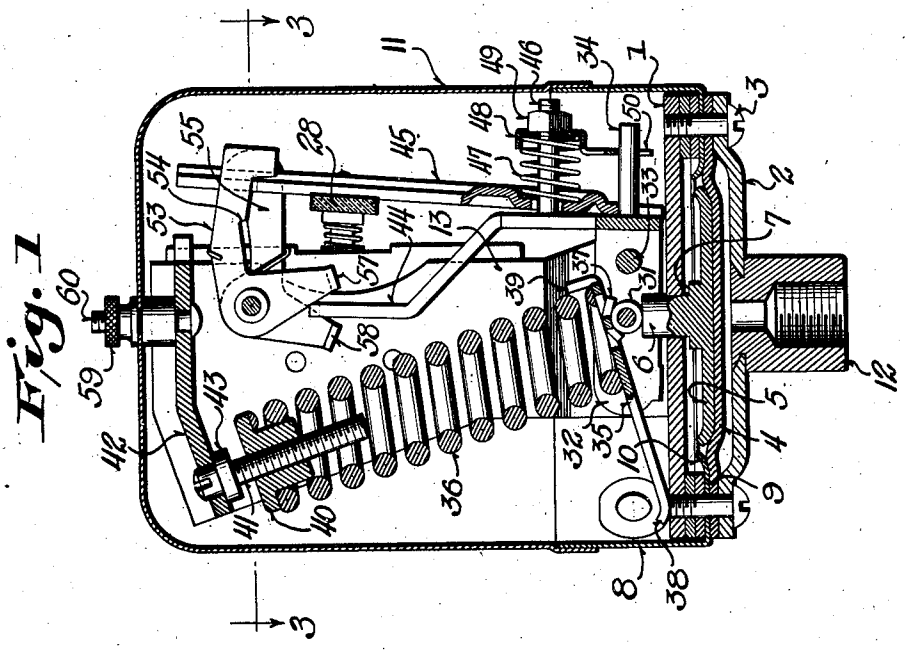


Fig. 1



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Fig. 3

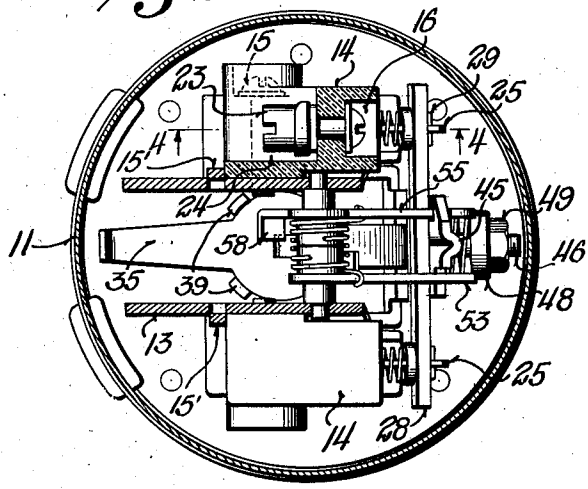


Fig. 4

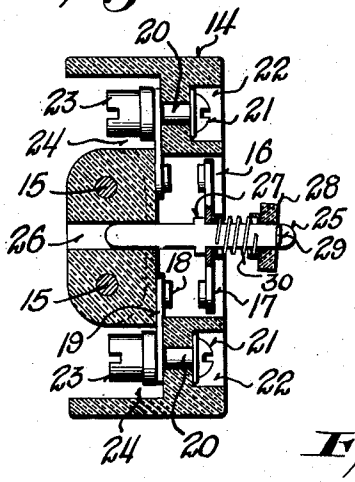


Fig. 5

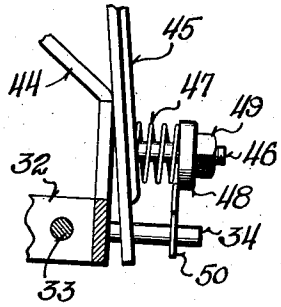
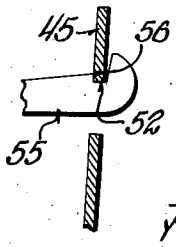


Fig. 6



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UNITED STATES PATENT OFFICE

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PRESSURE SWITCH

Application filed August 11, 1930. Serial No. 474,449.

This invention relates to pressure switches.

Objects of this invention are to provide a novel form of pressure switch which is so constructed that a quick make and a quick break is obtained, and which is positive in its operation so that the make and break occur at definite, predetermined pressures.

Further objects are to provide a pressure switch in which the pressure at which the switch will open or close is adjustable and may be made any value desired, in which the difference in pressure between opening and closing is also adjustable, and in which a single spring is employed for placing tension on the contact lever for both the opening and closing movements of the switch.

Further objects are to provide a pressure switch in which great compactness is obtained, in which the contact bar or contact member is well recessed, in which the contacts are fully protected by barriers of adequate extent so that no flashing over or grounding can occur during the operation of the switch, and in which the actual extent of insulating surface between the contacts and the metal body portion of the switch is extensive without detracting from the compactness of the structure.

Further objects are to provide a pressure switch in which contact bars are loosely mounted on extensions and are adapted to adjust themselves independently of the extensions to accurately engage stationary contacts, in which a stop is formed on the extension and is adapted to engage one side of the contact bar, a spring being positioned on the other side of the contact bar, and in which the contact bars, the extensions, and the springs operating directly on the contact bars may be most easily assembled on an operating cross head.

Further objects are to provide a novel form of pressure switch in which an insulating block is provided for each pair of stationary contacts and is so formed that the stationary contacts are individually removable so that they may be renewed, and in which the insulating block is itself bodily removable carrying with it the stationary contacts without requiring dismantling of the remaining portions of the switch.

Further objects are to provide a pressure switch in which the insulating blocks and the associated parts are easy to produce and to assemble, in which the insulating blocks guide the extension which loosely supports the contact bars, and in which a recess is provided which under all operating conditions completely houses both the stationary contacts and the movable contact bar so that maximum protection is afforded.

Further objects are to provide a pressure switch which may be very cheaply produced, which is simple, and which, although positively locking in both open and closed position, nevertheless is composed of a relatively small number of simple parts.

An embodiment of the invention is shown in the accompanying drawings, in which:

Figure 1 is a vertical, sectional view through the switch showing the parts in the position they occupy when the mechanism is moving towards closed position.

Figure 2 is a face view, partly broken away, of the structure shown in Figure 1 with the casing removed.

Figure 3 is a sectional view on the line 3—3 of Figure 1.

Figure 4 is an enlarged, sectional view on the line 4—4 of Figure 3.

Figure 5 is a fragmentary view showing the switch lever and the operating lever in the position they occupy when the mechanism is moving towards open position.

Figure 6 is a fragmentary detail showing the latch restraining the switch lever from moving towards closed position, the switch lever being shown in section, such view corresponding to a section on the line 6—6 of Figure 2.

Referring to the drawings, it will be seen that the entire switch mechanism is supported from a base plate 1 which is clamped to the diaphragm casing 2 in any suitable manner, as by means of the screws 3. Within the diaphragm casing a diaphragm 4 is positioned and clamped in place, as shown, and bears against a disc-like head 5 which is provided with an integral plunger 6 projecting

upwardly through the base plate 1, as shown in Figure 1. If desired, a shoulder 7 may be formed on the plunger 6 to limit upward motion of the plunger.

It has been found preferable to provide a bottom portion or shell 8 which forms the lower part of the casing, and to provide this shell with an inwardly extending flange 9 which is clamped against the diaphragm and which is preferably provided with an upturned portion 10, as shown in Figure 1. The portion 8 is adapted to telescopically receive the upper portion 11 of the casing which houses the switch mechanism.

It is also preferable to provide a fitting 12 which is rigidly secured to the diaphragm casing 2 and which is internally threaded for the reception of the pressure pipe.

While the mechanism is shown as primarily adapted for actuation by pressure, it is to be understood that the switch can be operated by vacuum by a slight change in the design. The actual pressure diaphragm and associated parts are merely shown in the form given as an illustration of fluid responsive means for operating the switch mechanism, and the invention is to be so interpreted.

A pair of side plates 13, see Figures 1, 2 and 3, are secured to the base plate 1 and support the switch mechanism. In the switch chosen for illustration, two main contact bars and associated stationary contacts have been illustrated, but it is obvious that any number of contact bars and associated stationary contacts could be employed. For example, the switch chosen for illustration is adapted to open each side of an electric line to a motor or other translating device, although obviously, if a three-phase motor were employed, three contact bars could be used. It is thought, however, needless to illustrate this form, as it is obvious from an inspection of the drawings of the switch chosen for the illustration.

Referring to Figure 2, it will be seen that an insulating block 14 is provided for each upright supporting plate 13, and from Figure 3 it is clear that these insulating blocks 14 are of similar construction although they are made, in the form shown, right and left hand. Each insulating block 14 is secured in place by means of screws 15, see Figure 3, which are well recessed or set in depressions formed in the insulating blocks 14, so that the heads of the screws are protected by barriers. If desired, lugs 15′ may be formed on the plates 13 to aid in locating the insulating blocks. Further, it will be seen that each insulating block is provided with an outwardly opening recess 16, which, as may be seen from Figure 4, accommodates the corresponding movable contact bar 17. The stationary contacts 18 are rigidly mounted on metallic strips 19 which project into apertures adjacent the base of the recess 16, as most clearly shown in Figure 4. From this figure it will also be seen that these metallic bars 19 are clamped in place by means of screws or bolts 20, each outer head 21 thereof being seated within a recess 22 formed in the insulating block, and the nut 23 being similarly seated within a recess 24 formed on the rear side of the insulating block. The nut 23 is adapted to clamp the appropriate conductor tightly against its contact strip 19. From Figure 3 it will be seen that the recesses 24 are open to the side of the insulating block 14, so that conductors (not shown) may be led laterally therefrom.

The movable contact bars 17 are each carried by an extension bar or member 25 of rectangular construction which loosely extends through a rectangular aperture formed in the contact bar 17. The inner end of the extension 25 is loosely guided within a rectangular slot 26 formed in the body portion of the insulating block 14. These extensions 25 are provided with ears 27 located rearwardly of the contact bars 17 and forming positive stops against which the contact bars bear when the switch is in open position, as shown in Figure 4.

An insulating cross head 28 extends transversely of the switch mechanism and is provided with rectangular apertures through which the extensions 25 are loosely threaded, split pins 29 being passed through the extensions to prevent detachment from the cross head 28, as may be seen from Figures 2 and 4. A light compression spring 30 loosely surrounds each extension 25 and urges the contact bar 17 inwardly. Inward motion of the contact bar 17 is restrained when the switch is in open position, as the contact bar bears against the stops or ears 27, see Figure 4. However, when the cross head 28 is moved inwardly by means hereinafter described, the contact bar 17 engages the stationary contacts 18 and accurately and freely adjusts itself, the stops 27 moving inwardly just clear of the contact bar 17, and the contact bar being yieldingly pressed inwardly against the stationary contacts 18 by the spring 30. Thus a perfect seating of the contact bars upon the stationary contacts is secured. In other words, the contact bars are free to independently adjust themselves when the switch is closed, but are restrained from rotation with reference to the cross head.

From the description thus far given, it is apparent that barriers are provided which afford the maximum insulation and the maximum surface along which an arc must travel to reach the metallic body portion of the switch. Further, it is apparent that the insulating blocks at all times house not only the stationary contacts, but also the movable contact bars.

The operating mechanism of the switch will now be described.

The plunger 6 bears against a roller 31 carried by a lever 32 pivoted as indicated at 33. This lever is preferably provided with a pair of spaced arms, as may be seen from Figures 1 and 2, and is preferably provided with an extension or projecting pin 34, see Figure 1. A saddle 35 is provided for a compression spring 36, such spring constituting the main pressure resisting spring in the apparatus. The saddle 35 is preferably provided with down turned ears 37 which loosely span or seat upon the roller 31, as shown in Figure 1, and it is preferable to extend the saddle outwardly and provide it with an upturned portion 38, as may be seen from Figure 1, which loosely bears against the base plate 1. It is to be noted, from Figure 1, that the spring 36 is slightly off center with reference to the roller 31, although this off center position is very slight. The spring is retained in the off center position by upturned ears 39 formed on the saddle 35, as may be seen from Figures 1 and 3. The upper end of the spring carries a collar 40 which is internally threaded and which receives the adjusting screw or pressure regulating screw 41. This screw is provided with a head which projects through the transverse upper portion or plate 42 of the main frame and is also provided with an integral collar 43 which bears against the under side of the plate or upper portion 42, as shown in Figure 1. The pressure of the spring may thus be easily adjusted by inserting a screw driver in the head of the screw 41 and turning such screw until the requisite pressure is obtained.

The lever 32 is provided with an upwardly extending trip arm 44, see Figures 1 and 2, which, together with the lever 32, constitutes a bell crank lever. Further, it is to be noted that the lower portion of the lever 44 is relatively wide, as may be seen from Figure 2, and that an operating lever 45 bears against such widened lower portion. This operating lever is provided with an aperture through which a threaded screw or pin 46 carried by the lever 44 loosely passes. A light compression spring 47 loosely bears against the operating lever 45 at one end and at the other end seats within a non-rotating washer 48 whose position is adjusted by means of a nut 49. The washer 48 is provided with a downwardly extending bifurcated portion 50 which loosely fits over the pin 34 and thus prevents rotation of the washer.

The operating lever 45 rigidly carries the insulating cross head 28 previously described. The upper portion of the operating lever 45 is provided with a shoulder 51 on one side and a shoulder 52 on the opposite side, the shoulder 51 being directed upwardly and the shoulder 52 being directed downwardly. The shoulder 51 is engaged by an opening latch 53 when the switch is closed, such latch being provided with a notch or shoulder 54. The shoulder 52, see Figure 6, is engaged when the switch is in open position by a closing latch 55, such latch being provided with a notch or shouldered portion 56. The latches 53 and 55 are respectively provided with downwardly extending, laterally turned portions 57 and 58 which lie in the path of movement of the trip lever 44.

Assume that the switch is in open position, as shown in Figure 1, and that the plunger 6 is descending. This motion of the plunger rocks the trip lever 44 inwardly and causes the operating lever 45 to rock about its lower end in contact with the lever 44, thus compressing the spring 47. However, the operating lever 45 is restrained from motion by the closing latch 55 until the trip lever 44 engages the portion 58 of such closing latch, thus releasing the lever 45 and allowing the switch to close with a quick motion under the influence of the spring 47. It is to be noted that there is a relatively large distance between the point of pressure from the spring 47 and the lower point of bearing of the lever 45. Consequently there is considerable spring pressure exerted during the closing motion.

Assume now that the switch is in closed position and that the plunger 6 is rising. Under these conditions the trip lever 44 moves outwardly and the operating lever 45 rocks about a point above the spring 47, as shown in Figure 5, thus tending to throw the operating lever outwardly. The distance between the point of contact of the operating lever and the point of pressure of the spring 47, as shown in Figure 5, may be made such as to produce less spring pressure for opening motion than that previously described for closing motion, depending upon the particular design of the switch. At all events, these pressures may be made equal or different by selecting the points of bearing between the operating lever 45 and the trip lever or rocking lever 44. As the plunger 6 continues upwardly, the trip lever 44 engages the extension 57 of the opening latch 53 and raises the latch at a predetermined point, thus permitting the operating lever to move outwardly with a quick or snap motion, thus effecting a quick break or opening motion of the switch.

It is preferable to completely house the mechanism, and such housing is readily furnished by means of the casing 11, previously described, which telescopes upon the casing 8. The casing 11 is prevented from slipping out of place or being inadvertently removed by means of a thumb nut 59 screwed upon a pin 60 rigidly carried by the upper portion 42 of the main frame, as shown in Figure 1. However, when it is desired to inspect or

adjust the switch, it is merely necessary to remove the single thumb nut 59, thereafter slipping the casing 11 upwardly. This exposes the mechanism of the switch and permits easy adjustment or inspection.

It will be seen that a novel form of pressure switch has been provided by this invention which is reliable in operation, which is compact, and which is of extremely simple design.

It is to be noted, also, that the compactness is not secured at a sacrifice of insulating properties. Instead, adequate insulation is afforded and the operating contacts are at all times housed within the insulating blocks associated therewith.

Further, it is to be noted that the operating contacts may be most easily renewed and that the insulating blocks may be independently removed to facilitate inspection, repair or renewal.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. A switch comprising an automatically moved operating member, a contact bar yieldingly supported by said member, an insulating block having a recess housing said contact bar in all positions of said contact bar, stationary contacts carried by said insulating block and located within said recess and adapted to be engaged by said contact bar, and means supporting said insulating block.

2. In an automatic switch, the combination of a supporting frame, a movable member, an insulating block having an outwardly opening recess, means removably holding said block to said frame independently of other structure of said switch, a movable contact carried by said movable member and housed within said recess, and a stationary contact secured to and carried by said insulating block and located within said recess, said insulating block and said stationary contact being removable as a unit without disturbing said movable contact.

3. In an electric switch, the combination of a movable, automatically actuated member, a contact bar yieldingly and loosely supported by said movable member, a frame, an insulating block having an outwardly opening approximately rectangular recess housing said contact bar in all positions of said contact bar, means removably holding said block to said frame, and a pair of stationary contacts located within said recess and secured to and carried by said insulating block, said stationary contacts and said block being removable as a unit without disturbing said contact bar.

4. In an electric switch, the combination of a movable member, a contact bar, a projecting member supported from said movable member and loosely supporting said contact bar from said movable member, said projecting member having a flat face preventing rotation of said contact bar, a frame, an insulating block carried by said frame and having a recess housing said contact bar and having means for directly guiding said projecting member, a pair of contacts located within said recess and carried by said insulating block, and means removably securing said block to said frame independently of other portions of said switch, whereby said block and said stationary contacts may be removed as a unit independently of other portions of said switch.

5. In an electric switch, the combination of a movable member, a contact bar, a projecting member supported from said movable member and loosely supporting said contact bar from said movable member, said projecting member having a flat face preventing rotation of said contact bar, a frame, an insulating block carried by said frame and having a recess housing said contact bar and having means for guiding said projecting member, a pair of contacts carried by said insulating block, a pair of terminals removably holding said contacts to said insulating block, and means removably holding said insulating block to said frame independently of other portions of said switch, said insulating block and said pair of contacts and terminals being bodily removable as a unit without disturbing said contact bar.

In testimony whereof, the signature of the inventor is affixed hereto.

HERMON L. VAN VALKENBURG.