April 3, 1951 O. H. SIMMONS 2,547,050

AUTOMATIC PRESSURE SWITCH

Filed March 15, 1949

Fig. 1

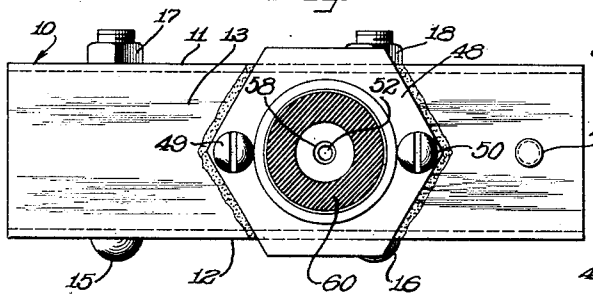


Fig. 3

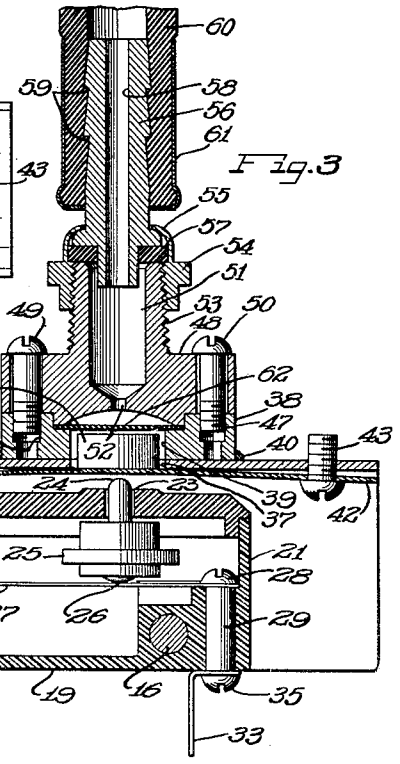


Fig. 2

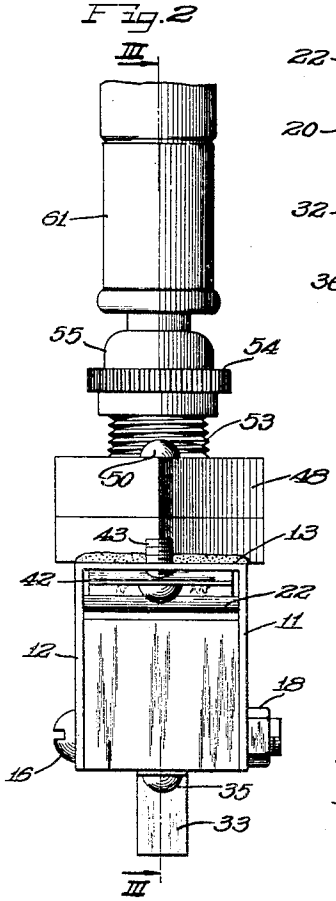


Fig. 4

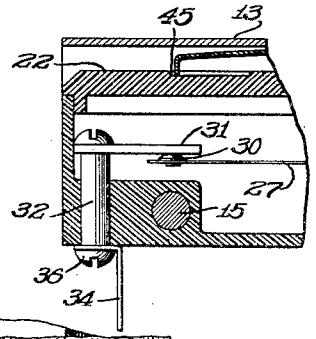
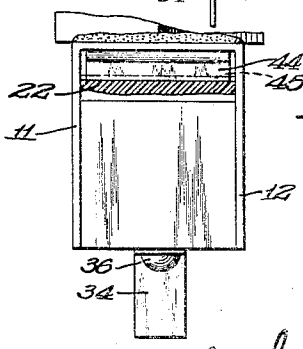


Fig. 5



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AUTOMATIC PRESSURE SWITCH

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4 Claims. (Cl. 200—83)

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The present invention relates to an automatic pressure switch, and more particularly to an automatic pressure switch which is compact and easily adjustable so that it may be activated over a wide range of fluid pressures.

An object of the present invention is to provide an automatic pressure switch for use in a fluid pressure system.

Another object of the present invention is to provide an automatic pressure switch capable of being opened and closed at predetermined levels of fluid pressure, and capable of operating over a wide range of fluid pressures.

A further object of the present invention is to provide a switch assembly which will open and close electrical contacts at predetermined pressure ranges.

The invention will be more fully described in connection with the description of the attached sheet of drawings, in which:

Figure 1 is a top plan view of the housing carrying the pressure switch of the present invention;

Figure 2 is an end view of the switch assembly, with parts in elevation;

Figure 3 is a cross-sectional view taken along the line III—III of Figure 2;

Figure 4 is a view similar to Figure 3, but showing more particularly the switch contact in the switch housing; in one modification of the present invention;

Figure 5 is an end view of the assembly with parts broken away to show the disposition of the frame within the switch assembly.

As shown on the drawings:

Reference numeral 10 denotes generally a supporting structure for the assembly in the form of a channel strip having side walls 11 and 12 and a top web portion 13.

Secured within the channel member 10 at one end thereof is a switch unit 14 preferably made of a non-conducting plastic material. The switch unit 14 is held within the channel 10 by means of bolts 15 and 16 passing through corresponding apertures in the side walls 11, 12 and the switch unit 14, and being held in position by nuts 17 and 18. The switch unit 14 is formed into a base portion 19, walls 20 and 21 and a cover 22. The cover 22 contains an aperture 23 formed therein for receiving a contacting nub 24 of a switch actuating member 25. The switch actuating member 25 is formed at its base into a contacting button 26 which acts against a flexible switch contact arm 27. One end of the flexible arm 27 is secured by means of a nut 28 threaded

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into a contact post 29 rigidly held within the switch unit 14. The free end of the flexible contact arm 27 contains a contacting button 30 which acts against a rigid contacting bar 31 to complete the electrical circuit within the switch unit. The rigid arm 31 is secured to a post 32 by means of a screw 33. The posts 29 and 32 are in electrical contact with corresponding lugs 33 and 34 which are held thereagainst by means of bolts 35 and 36.

The web 13 of the channel member 10 is provided with an aperture 37 which overlies the contacting nub 24 of the switch actuating member 25. At the top surface of the web 13 there is provided a nipple support member 38 having an annular recess 39 directly overlying the recess 37 in the web 13. The nipple support 38 is secured to the web 13 by means of a solder joint 40. Within the aligned recesses 37 and 39 there is a spacer 41 which rests on a leaf spring 42.

As best shown in Figure 3, the leaf spring 42 is formed into a generally convex surface with its highest portion serving as a base for the spacer 41. One end of the leaf spring 42 is adjustably held within the web 13 by means of a screw 43 passing through an appropriate recess in the web 13. The screw 43 serves as a means for adjusting the tension on the leaf spring 42 and is situated within the channel member 10 at a point beyond the limit of the switch unit 14 so that it may be easily adjusted by means of a screw driver without the necessity of disrupting the switch unit 14.

The leaf spring 42 is formed at the opposite end into a finger 44 which contacts the cover 22 of the switch unit 14 at the top surface of the cover, as shown in Figure 3, or preferably over a limited area defined by a channel 45 which extends the full transverse width of the cover 22, as shown in Figures 4 and 5. The leaf spring 42 extends somewhat less than the full transverse width of the switch unit 14, as will be seen in Figure 5. The notched channel 45 provides a somewhat limited area of engagement for the finger 44 of the leaf spring 42 to allow for large variations in the activating pressure applied to the center of the leaf spring 42.

The nipple support member 38 is provided with bosses 46 and 47 for securing a threaded nipple 48 thereto by means of screws 49 and 50. A pressure sensitive means, such as a flexible diaphragm 62, is interposed between the bottom surface of the nipple 48 and the nipple support member 38, the diaphragm 62 overlying the spacer 41. Al-

ternatively, the pressure sensitive means may be of a system of collapsible bellows.

The nipple 48 has an internal bore 51 which communicates to a pressure source such as a compressor which is to be regulated by the pressure switch. The bore 51 is tapered down at the base of the nipple 48 to a restricted throat 52 which overlies the center of the flexible diaphragm 62. The nipple 48 is also provided with a threaded neck portion 53 which receives a knurled swivel nut 54 in threaded engagement. The swivel nut 54 has a neck portion 55 rotatable about an adapter 56. A gasket 57 provides a seal between the adapter 56 and the nipple assembly 48.

The adapter 56 contains a bore 58 running throughout its axial length, the bore 58 being in communication with the bore 51 of the nipple 48. The surface of the adapter 53 is formed into a plurality of annular ridges 59 which serve to hold a resilient hose 60 in close contact therewith. The flexible hose 60 also contains a ferrule 61 to provide compression to hold the hose 60 in close association with the adapter 56. The hose is connected to a source of fluid pressure, not shown, which is to be regulated by the switch assembly.

The operation of the device will be described in connection with an air compressor circuit which is to be regulated such that the compressor is to run when the pressure in the line drops below a predetermined value. The flexible hose 60 is connected to the pressure line, and the terminals 33 and 34 are connected in one side of the energizing line to the compressor motor. The motor will remain running as long as the contacting button 30 of the contact arm 27 is in contact with the rigid arm 31. As the pressure in the line builds up, this increased pressure acts to deflect the diaphragm 62 downwardly toward the spacer 41 which, in turn, acts against the leaf spring 42. At a pressure determined by the adjustment of the adjusting screw 43, the leaf spring will contact the contacting nub 24 of the switch actuating member 25 causing the flexible arm 27 to lose contact with the fixed arm 31 of the switch assembly, thus interrupting the electrical circuit to the compressor motor. When the pressure in the system has decreased to below the desired point, the leaf spring 42 breaks contact with the actuating member 25 so that the contacting button 30 will recontact the arm 31 and reenergize the circuit to the compressor motor.

When it is desired to vary the range of pressures over which the devices operate, it is merely necessary to adjust the tension of the screw 43 by inserting a screwdriver therein. When it is desired to operate at a higher pressure, the screw 43 should be adjusted inwardly thus imparting a higher tension on the spring 42 which will necessitate a higher pressure in the line to deflect the leaf spring 42 against the contacting nub 24 of the actuating member 25.

It will be apparent from the above description that I have herein provided an automatic pressure switch which is simple in operation and structure. A distinct advantage of the structure herein described is the ease with which the activating pressure ranges may be varied. The device is inexpensive to construct and is practically free from mechanical difficulties which so often arise in more complex pressure switches.

I claim as my invention:

1. A pressure actuated switch comprising a switch unit, a casing enclosing said switch unit, an actuator for said switch projecting from said casing, a channel strip removably securing said casing at one end of said strip and defining an adjusting space at the other end thereof beyond said casing, said channel having an aperture overlying said actuator; a nipple support mounted on said channel, and surrounding said aperture, a nipple connected to a source of varying fluid pressure removably mounted on said support; a pressure responsive member held between said nipple and said support, a spring adapted to contact said actuator upon a predetermined increase of fluid pressure disposed between said member and said actuator, one end of said spring being attached to said channel strip at a point in communication with said adjusting space; and an adjusting member holding said spring to said channel strip for adjusting the spring tension such that a predetermined minimum fluid pressure will actuate said switch.

2. A pressure actuated switch comprising a switch unit, a non-conductive casing enclosing said switch unit, an actuator for said switch projecting from said casing, a channel strip removably secured to said casing at one end of said strip and defining an adjusting space at the other end thereof beyond said casing, said channel having an aperture overlying said actuator; a nipple support mounted on said channel and surrounding said aperture; a nipple connected to a varying fluid pressure and removably mounted on said support, a pressure responsive member held between said nipple and said support, a spring adapted to contact said actuator at a predetermined increase in fluid pressure disposed between said pressure responsive member and said actuator, one end of said spring being attached to said channel strip at a point in communication with said adjusting space, the other end of said spring contacting a surface of said casing along a limited portion thereof, and an adjusting member holding said spring to said channel strip for adjusting the spring tension such that a predetermined minimum fluid pressure will actuate said switch.

3. A pressure actuated switch comprising an encased electrical switch having an actuator projecting therefrom, a channel strip removably holding said switch in one end thereof with the actuator adjacent the web of the strip, a leaf spring between the web and casing overlying the actuator having one end bottomed on the casing and the other end projecting in the channel beyond the casing, an adjusting screw anchoring said other end of the spring to the web, said web having an aperture therethrough overlying the spring, a hollow member secured to the web around said aperture, a pressure responsive diaphragm spanning the interior of said member for deflecting said spring to shift the actuator, said screw being adjustable to preload said spring as desired for predetermining the pressure required on said diaphragm to actuate the switch.

4. A fluid pressure controlled electric switch adapted to be easily adjusted to operate at different pressure ranges which comprises an encased electrical switch having an operating button projecting therefrom; a metal channel strip having sidewalls and a connecting web receiving the switch casing thereon in engagement with the side walls thereof; bolts extending through said sidewalls and switch casings to hold the casing in the strip in spaced relation from one end of the strip to leave a portion of the web exposed and to also hold the button containing side of the casing in spaced opposed relation to the web; said web

having an aperture therethrough overlying said button, a nipple support integrally affixed to said web and surrounding said aperture, a nipple removably mounted on said support, a flexible diaphragm clamped between said nipple and support, a leaf spring in said channel strip extending from the exposed web end thereof between the web and switch casing and having a portion between the button and the aperture, an adjustable screw anchoring one end of the spring to the exposed web portion and being easily accessible for adjustment through the open face of the channel, a lip on the other end of the spring bottomed on the switch casing, and a spacer extending freely through said aperture between the diaphragm and spring to transfer movement from the diaphragm to the spring whereby fluid pressure in the nipple may act on the diaphragm to shift the

spacer for deflecting the spring against the button to actuate the switch and whereby said screw will preload the spring as desired to resist said deflection and cause the switch to be operated at a predetermined pressure.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,281,544	Beeman et al.	May 5, 1942
2,281,764	Hanke	May 5, 1942
2,411,796	Leupold	Nov. 26, 1946