April 2, 1957 J. O. ROESER 2,787,681

PRESSURE ACTUATED SWITCHES

Filed Sept. 11, 1952

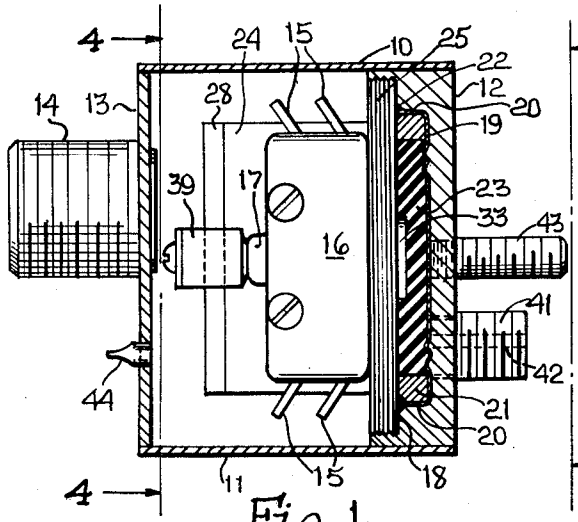



Fig. 1.

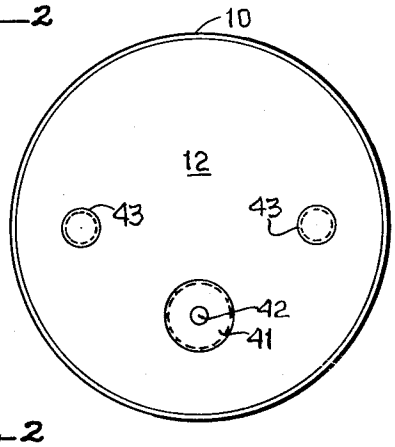



Fig. 2.

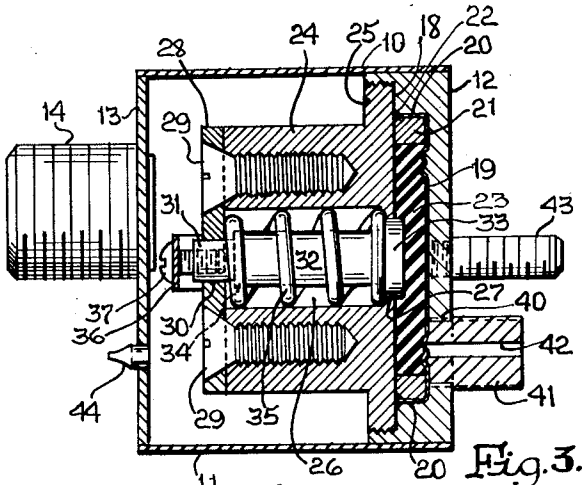



Fig. 3.

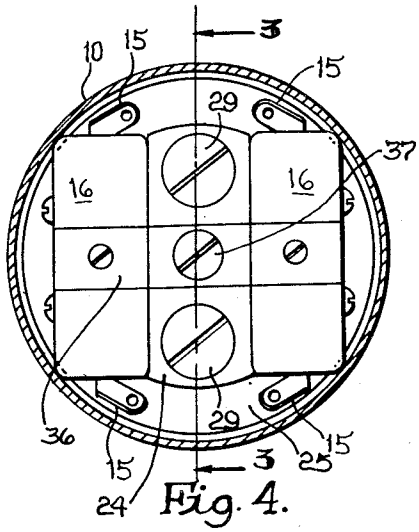



Fig. 4.

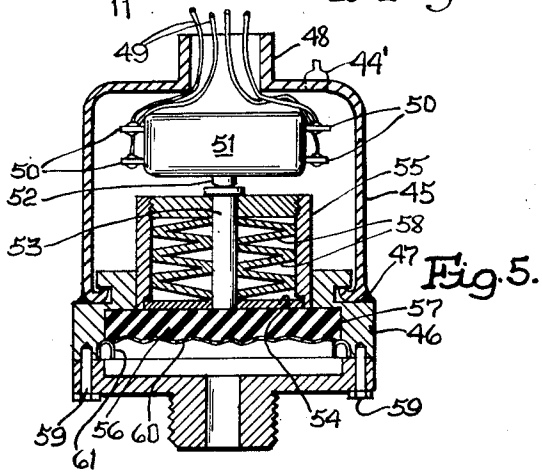



Fig. 5.

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United States Patent Office 2,787,681 Patented Apr. 2, 1957



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# PRESSURE ACTUATED SWITCHES

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Application September 11, 1952, Serial No. 308,960

3 Claims. (Cl. 200—83)

This invention relates to new and useful improvements in pressure actuated switches preferably, though not necessarily, of the snap-action type. It has for its principal object the provision for the introduction of either hydraulic or pneumatic pressure against the face of a diaphragm so arranged as to transmit such pressure to a rubber base or covering of the diaphragm normally under compression by a spring-urged piston, whereby upon expansion of the rubber base or covering, the piston will be caused to act against a restraining spring to effect operation of the switch actuating plunger.

An important object of this invention is to provide such a switch which will be speedy in operation, small and compact in construction, and positive in its operation of effectuating closing and opening of the switch elements.

Another and equally important object of the invention is the provision in a switch construction of the character hereinafter described, wherein the maximum movement of the acutating piston is obtained by a minimum movement or expansion of the diaphragm when the latter is under pressure.

Other objects will appear hereinafter.

The invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings showing the preferred form of construction, and in which:

Fig. 1 is a cross sectional detail view of a pressure switch embodying the invention;

Fig. 2 is an end view taken substantially on line 2—2 of Fig. 1;

Fig. 3 is a sectional detail view taken substantially on line 3—3 of Fig. 4;

Fig. 4 is a sectional detail view taken substantially on line 4—4 of Fig. 1;

Fig. 5 is a cross sectional detail view of a pressure switch showing a modified form of construction over that illustrated in Figs. 1 to 4 inclusive.

The several objects of this invention are accomplished by the preferred form of construction illustrated in the accompanying drawings. In this connection, I provide an enclosure 10 which is of a construction comprising cylindrical side walls 11, and end walls 12 and 13. These walls are related to each other in a manner such as to provide an effective seal to prevent the admission of moisture or other elements into the enclosure 10.

The wall 13 carries a nipple 14 through which conductor wires pass for connection to the terminals 15 of a switch 16.

In the form illustrated in Figs. 1 to 4 inclusive, there are provided two such switches 16 each of which are of identical construction and each including a switch actuating plunger 17. These switches may be of a construction such as is shown in United States Patents Nos. 2,518,255 and 2,594,216.

The end wall 12 is provided with a two-step recess 18.



In the lower portion of this recess 18 is seated a diaphragm 19 preferably of relatively thin flexible material. The ends 20 of this diaphragm 19 are wedged within the lower portion of the recess by a wedging ring 21 around the edges of which is arranged a suitable seal 22. Within this ring 21 and in confronting abutment with the diaphragm 19 is an flexible member 23 preferably formed of silicon rubber.

When the assembly consisting of the diaphragm 19, the rubber expansible member 23, and the binding ring 21 is assembled as a unit or assembled within the bottom portion of the recess 18, the entire unit is sealed within such bottom portion of the recess by a post 24 having an annular flange 25 threaded or otherwise securely fixed into the outer portion of the recess 18. This post 24 provides a bore 26 terminating at its inner end portion into a reduced opening 27. The opposite end portion of this bore is closed by a cap plate 28 secured to the post 24 by suitable screws 29. This cap plate 28 provides a central opening 30 through which projects the reduced stem portion 31 of a piston 32. This piston 32 has an enlarged end portion 33 which bears against and seats into the rubber base member 23. The end portion 34 of the piston 32 under action of an expansion spring 35 is normally spaced from the cap plate 28 to permit longitudinal movement of the piston 32 toward the cap plate 28 when the rubber base member 23 is expanded in a manner hereinafter set forth. This spring 35 embraces the piston 32 and is arranged in the bore 26 in a manner shown in Fig. 3. Such spring 35 serves to bear the piston against the rubber base member 23 and normally compresses the same according to the degree of pressure exerted thereon by the spring 35.

A bridge plate 36 at its medial portion is connected to the projecting end portion of the stud 31 by any suitable means such as a screw 37 or the like. The ends of this bridge plate carry laterally extending buttons 39 which engage the switch plungers 17.

Formed in the end wall 12 is an opening 40 into which is fixedly mounted in any suitable manner a nipple 41 having a passage 42 formed therein communicating with the inner portion of the recess 18. To this nipple 41 is attached the pressure line which may, as hereinbefore indicated, be air or hydraulic pressure.

Attached to the end plate 12 are mounting studs 43 by means of which the switch is mounted in a suitable location to a suitable supporting structure.

The wall 13 carries what is commonly known as a tubulation 44. The tubulation is useful in evacuating the enclosure and filling with inert gas in the process of hermetically sealing the electrical portion of the switch.

In the form shown in Fig. 5, the casing 45 is mounted upon a base plate 46 and is sealed thereto as at 47. This casing 45 has a nipple 48 through which the conductor wires 49 are admitted for connection to the leads 50 of the switch 51. This switch 51 is of a structure substantially similar to the switches 16 and includes a switch actuating plunger 52. This plunger 52 engages a piston 53, the end of which carries a relatively flat disc 54 arranged within a post 55. This disc 54 bears against a rubber base 56 arranged within a recess 57 provided by the base plate 46. In the post 55 are arranged expansible spring discs 58 which bear the disc 54 against the rubber base 56. The base plate 46 comprises two parts secured together by means of attaching bolts 59. The outer section of this base plate 46 carries a nipple 60 to which the pressure line is attached.

The rubber base 56 is mounted in confronting engagement with a diaphragm plate 60 securely sealed within the recess 57 by a binder ring 61 or the like.

The rubber base 56 is, like the rubber base member 23, preferably formed of silicon rubber.

When pressure strikes against either the diaphragm of the switch structure illustrtaed in Figs. 1 to 4, or the switch structure illustrated in Fig. 5, the rubber base of such switch structure will transmit that pressure to the piston of such switch structure and effect longitudinal movement of the piston so as to effect movement of the switch plungers of the snap-action switches. By such an arrangement, it requires but a small movement of the diaphragm to effect longitudinal movement of the piston for the purposes hereinbefore stated.

From the foregoing description, it is manifest that I provide a pressure switch which requires but a relatively short movement of the switch actuating piston under a pressure necessary only to overcome the resistance of the spring yieldably resisting the movement of such piston. Such a construction provides a pneumatic switch which is small, compact, and one comprising relatively few parts, positive in their operation and capable of being manufactured at an economical cost. The mechanism is free from vibration effects since the rubber dampens out the vibration.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. A pressure actuated switch comprising a hermetically sealed casing closed at one end by an end wall having a recess opening inwardly of the casing; a diaphragm in said recess having one side in confronting relation with the walls thereof; means sealing the edges of said diaphragm to said end wall; a rubber body within said recess engaging the other side of said diaphragm; a rigid member fixed on said end wall and engaging said rubber body to press it against said diaphragm, there being a bore through said member the axis of which coincides with the center of said diaphragm and rubber body, a perforated plate fixed upon said rigid member and extending across the bore therein; a piston rod journaled in a perforation in said plate and extending coaxially through said bore; an enlarged head on said rod projecting out of the bore and against said rubber body; spring means encircling said rod and bearing against said plate and head to urge the head into said rubber body; a switch unit fixed in said casing and having an actuating plunger; a mechanical connection between said rod and said plunger; and means on said end wall for directing fluid under pressure against said one side of said diaphragm thereby to move it to compress said rubber body and move said rod to actuate said switch unit.

2. A pressure actuated switch comprising: a hermetically sealed casing closed at one end by an end wall which contains a circular recess opening inwardly of the casing; a cuplike diaphragm disposed in said recess and having one side in confronting relation with the walls thereof; a metal ring sealing the edges of said diaphragm to the walls of the recess; a rubber body within the ring and recess engaging the other side of the diaphragm; a rigid member fixed to said end wall and engaging said ring and rubber body to confine the rubber body in said recess, there being a bore through said member the axis of which coincides with the center of said rubber body and diaphragm; a plate fixed on said member and extending across said bore, there being an opening in the plate centered on the axis of the bore; a rod journaled in the opening in the plate and extending through the bore coaxially therewith; a head said on rod engaging said rubber body; spring means in the bore encircling said rod and compressed between the plate and head to press the head against the rubber body; a switch unit fixed in said casing and having an actuating plunger; a mechanical connection between said rod and plunger; means on said end wall for directing fluid under pressure against said diaphragm to move the diaphragm towards said rubber body and the rod towards said plate thereby to actuate the switch unit; and means for limiting the movement of the rod towards said plate.



3. A pressure actuated switch comprising: a hermetically sealed casing closed at one end by an end wall which contains a circular recess opening inwardly of the casing; a cuplike diaphragm disposed in said recess and having one side in confronting relation with the walls thereof; a metal ring sealing the edges of said diaphragm to the walls of said recess; a rubber body within the ring and recess engaging the other side of the diaphragm; a rigid member fixed to said end wall and engaging said ring and rubber body to confine the rubber body in the recess, there being a bore through said member the axis of which coincides with the center of the rubber body and diaphragm; a plate fixed on said member and extending across said bore, there being an opening in the plate centered on the axis of the bore; a rod journaled in the opening in the plate and extending through the bore coaxially therewith; a head on said rod engaging said rubber body; spring means in the bore encircling said rod and compressed between the plate and head to press the head against the rubber body; a pair of switch units in said casing, each including an actuating plunger, a bar fixed on said rod and engaging the plungers of the switch units; and means on said end wall for directing fluid under pressure against said diaphragm to move the diaphragm towards said rubber body and the rod towards said plate, thereby to actuate said switch units.


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