May 4, 1943. R. M. BAILEY 2,318,355

SWITCH OPERATING MEANS

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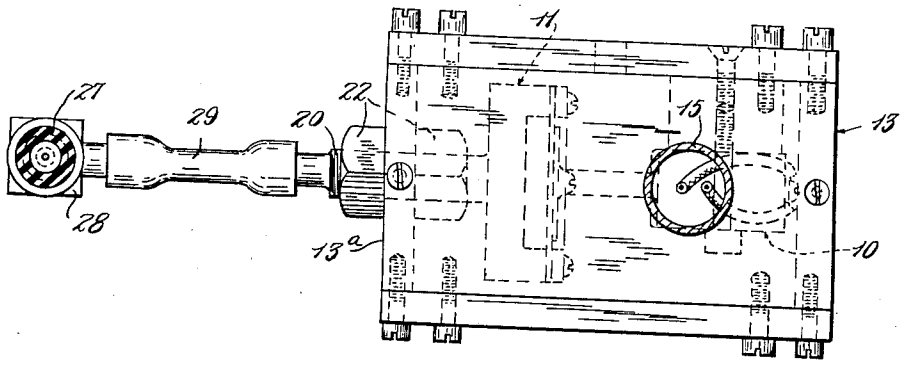
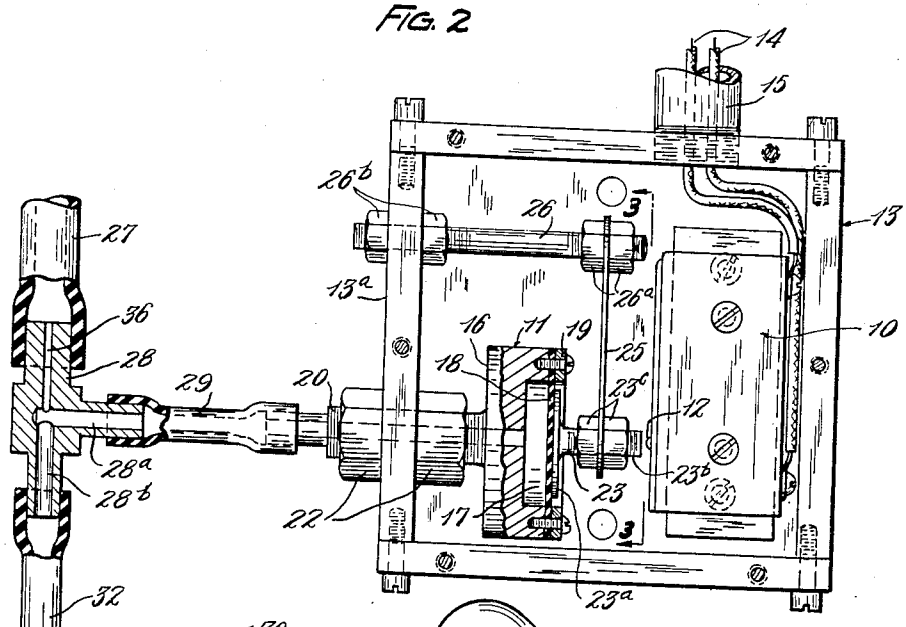


FIG. 2



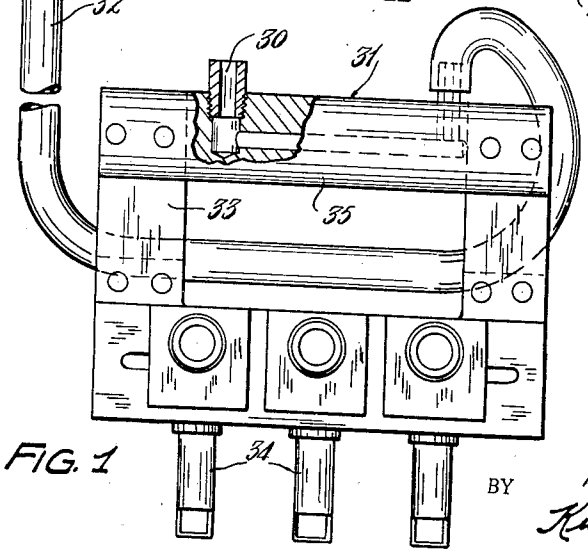


FIG. 1

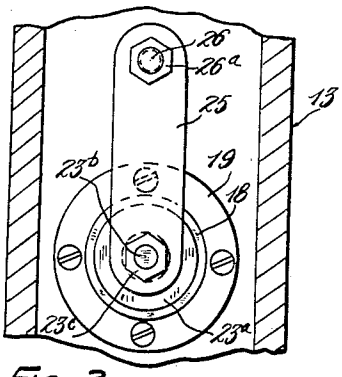


FIG. 3

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SWITCH OPERATING MEANS

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4 Claims. (Cl. 200—83)

This invention relates to switch operating means, and as one of its objects, aims to provide an improved arrangement by which fluid pressure may be employed for causing the desired actuation of an electric switch.

Another object of my invention is to provide improved switch operating means embodying an expansible chamber device and in which the closing of a normally open relief passage causes fluid pressure to build up in the device for actuating the switch.

A further object of my invention is to provide improved switch operating means of this character in which the normally open relief passage is located on a portable tool or the like and the electric switch to be operated is located at a point relatively remote from the station at which the operator handles the portable tool.

Still another object of my invention is to provide improved switch operating means of the character referred to in which there is a restriction in the pressure fluid supply means leading to the expansible chamber device and to the normally open relief passage.

The invention may be further briefly summarized as consisting in certain novel combinations and arrangements of parts hereinafter described and particularly set out in the appended claims.

In the accompanying sheet of drawings,

Fig. 1 is a side elevation showing improved switch operating means embodying my invention; portions of the apparatus being removed or broken away for a better illustration of the various details and features of the apparatus;

Fig. 2 is a plan view of the apparatus showing particularly the unit containing the electric switch and the expansible chamber device; and

Fig. 3 is a partial vertical sectional view taken through the switch-containing unit or casing as indicated by line 3—3 of Fig. 1.

Further reference will now be made to the drawing for the purpose of describing the construction and operation of my switch operating means in greater detail, but I wish it understood that my invention is not to be regarded as limited thereby, because it is susceptible of being embodied in various other arrangements coming within the scope of the appended claims.

In the embodiment of the invention illustrated in the drawing, I show an electric switch 10 and a fluid pressure responsive device 11 of the expansible-chamber type for operating such switch. This switch may be used for any desired purpose such as for controlling the circuit of a relay embodied in liquid dispensing or battery filling apparatus of the kind disclosed in copending application, Serial No. 390,944, filed April 29, 1941. The switch may be of any suitable construction and may be of the kind having contacts adapted to be opened or closed with a snap action in response to a very small travel of its operating plunger or button 12. Such a switch is disclosed in U. S. Patent No. 1,960,020, granted May 22, 1934.

As shown in the drawing, the switch 10 and the fluid pressure responsive device 11 may be mounted in a suitable box or housing 13 and the switch may have a pair of conductors 14 extending therefrom and leading away from the housing through a conduit 15.

The expansible chamber device 11 may comprise a body 16 having a pressure chamber 17 therein, one wall of which is formed by a flexible or elastic diaphragm 18 having edge portions thereof held against the body 16 by a clamping ring 19. The body 16 may have a projecting threaded stem 20 thereon with a passage extending therethrough and communicating with the pressure chamber 17. The body 16 may be mounted in the housing 13, at a point substantially opposite the plunger 12 of the switch 10, by means of the threaded stem 20 which extends through a wall 13a of the housing and has nuts 22 thereon in clamping engagement with opposite faces of such housing wall. Pressure fluid entering the chamber 17 expands or distends the diaphragm 18 to actuate the switch 10, as will be later explained. The outward or expansive movement of the diaphragm 18 may be transmitted or applied to the switch actuating plunger 12 by means of a thrust member or screw 23 moveably supported between the diaphragm and plunger. The screw 23 may have a head or disk portion 23a adjacent the diaphragm 18 and has the outer end of its threaded stem 23b closely adjacent to, or in engagement with, the plunger 12. Although the disk portion 23a of the screw 23 may be connected to the diaphragm 18, I prefer to have it unconnected but located against or close to the outer face of the diaphragm.

The movement-transmitting member or screw 23 may be carried by the diaphragm 18 or preferably, as shown in this instance, may be carried by a plate spring or resilient arm 25 which may be mounted on a stud 26 projecting from the wall 13a of the housing 13. The threaded stem 23b may extend through an opening of the spring 25 and may have nuts 23c thereon in clamping engagement with opposite faces of the spring.

The upper end of the spring 25 may be connected with the stud 26 by clamping nuts 26a thereon and the stud may be connected with the housing wall 13a by clamping nuts 26b disposed on opposite sides of such wall. The spring 25 serves to retract the diaphragm 18 and the screw 23 when the pressure in the chamber 17 has been relieved. The position of the body 16 relative to the switch 10, as well as the action of the spring 25, can be adjusted or varied by making the desired adjustment at one or more of the several pairs of clamping nuts 22, 23c, 26a, and 26b.

Pressure fluid, such as compressed air, may be supplied to my switch operating means through a conduit 27 leading from a tank or other suitable source of supply for fluid at super-atmospheric pressure. The delivery end of the conduit 27 is connected with a T-fitting 28 having two branch passages 28a and 28b, the former of which is connected with the pressure chamber 17 of the expansible chamber device 11 through a conduit 29 and the passage of the stem 20. The branch passage 28b of the T-fitting 28 is connected with a normally open passage or orifice 30 provided on a portable device or tool 31. The passage 28b may be connected with such normally open orifice by a flexible conduit 32 of appropriate length to permit the tool to be used by an operator at a station relatively remote from the housing 13 in which the electric switch is contained.

The portable device or tool 31 may be any one of various kinds of portable tools or devices, but in this instance, is a filling head for use in filling the cells of storage batteries with acid or other electrolyte. The portable tool or filling head here shown has a frame 33 carrying discharge nozzles 34 adapted to be inserted into the cell openings of the battery to be filled and also having a handle 35 by which the tool can be manipulated by the workman. The normally open orifice or passage 30 may be located on the handle 35 at a point conveniently accessible to the thumb or finger of the workman, so that by applying his thumb or finger to such passage or orifice, he can close the same and prevent the escape of air or other pressure fluid therefrom to atmosphere which will actuate the switch 10 as hereinafter described.

The switch 10 may have contacts which are either normally closed or normally open, depending upon the requirements of the circuit controlled by the switch. When super-atmospheric pressure builds up in the chamber 17, the diaphragm 18 will be distended or flexed outwardly, thereby shifting the screw 23 and causing the same to actuate the switch plunger or button 12 to produce the desired opening or closing of the switch contacts. So long as the orifice or passage 30 remains open to atmosphere, no appreciable pressure will build up in the chamber 17, but when the operator closes this orifice or passage, the fluid being supplied through the conduit 27 will cause super-atmospheric pressure to build up in the chamber 17 and will distend the diaphragm and actuate the switch 10 in the manner just explained. When the operator uncovers the orifice or passage 30, the pressure in the chamber 17 is vented or relieved to atmosphere and the spring 25 acts to retract the diaphragm 18 and the screw 23.

To prevent the building up of pressure in the chamber 17 while the passage or orifice 30 is open or uncovered, I may provide the T-fitting 28 with a restricted passage 36 by which the supply conduit 27 is connected with the passages 28a and 28b. Thus the passages connecting the chamber 17 with the atmosphere will be of larger cross-sectional area than the restricted passage 36 and pressure will not build up in the chamber 17 unless the orifice or opening 30 has first been closed by the operator. The restricted passage 36 also serves to increase the speed with which the pressure builds up when the orifice 30 has been closed. This is due to the fact that when the restricted passage 36 is used there is a more limited space in which pressure is to be built up than would be the case if the restricted passage were not employed. I find that actuation of the electric switch will occur within a fraction of a second after the operator places his finger over the orifice 30.

From the foregoing description and the accompanying drawings, it will now be readily seen that I have provided improved switch operating means by which compressed air or other pressure fluid may be used to actuate an electric switch. The arrangement which I have provided permits the switch to be located at a relatively remote point from the operator's station which is an advantage in situations where its is unsafe or undesirable to have the operator come in contact with any kind of electrical apparatus whatever. My improved switch operating mechanism is of relatively simple construction but, nevertheless, it provides a positive and efficient means by which an electric switch located at any desired point relative to the work station can be actuated whenever designed.

While I have illustrated and described my improved switch operating means in more or less detail, it will be understood, of course, that I do not wish to be limited to the particular arrangement and details herein disclosed, but regard my invention as including such changes and modifications as do not constitute a departure from the spirit of the invention and the scope of the appended claims.

Having thus described my invention, I claim:

1. In switch operating mechanism, an expansible chamber device having a member adapted to be moved in response to the building up of super-atmospheric pressure in the device, a manually portable device having thereon an air escape opening normally communicating with atmosphere but adapted to be manually closed, an air line for supplying air at super-atmospheric pressure, said line having a restriction therein and having connections leading from the restriction to said expansible chamber device and to said air escape opening, and an electric switch arranged to be actuated by movement of said member.

2. In apparatus for operating an electric switch, a device adjacent the switch having a pressure chamber and a movable diaphragm forming a wall of said chamber, means between said diaphragm and switch for transmitting expansive movement of the diaphragm to the switch, a spring acting to retract the diaphragm, and air pressure supply means connected with said chamber and having a normally open escape passage to atmosphere adapted to be manually closed to cause super-atmospheric pressure to build up in said chamber and expand said diaphragm.

3. In apparatus for operating an electric switch, a device adjacent the switch having a pressure chamber and a movable diaphragm forming a wall of said chamber, means between said diaphragm and switch for transmitting ex-

pansive movement of the diaphragm to the switch, a spring acting to retract the diaphragm, a manually portable device having thereon on air discharge passage normally open to atmosphere but adapted to be manually closed, a flexible conduit connecting said portable device with the pressure chamber device, an air supply line for supplying air at super-atmospheric pressure and having connection with said pressure chamber and with said normally open passage of the portable device through said flexible conduit, and a restriction in said supply line ahead of said connection to the pressure chamber.

4. In switch operating mechanism of the character described, a housing, an electric switch therein having an actuating plunger, a fluid pressure responsive device in the housing and having a flexible diaphragm spaced from said switch, a resilient arm connected with said housing and extending into the space between said diaphragm and said switch, a thrust member carried by said arm and having a head adjacent said diaphragm and a stem adjacent said plunger, the stem of said member being threaded and having adjustable connection with said arm, a manually portable device having thereon a fluid discharge passage which is normally open to atmosphere but adapted to be manually closed, and a fluid pressure supply line connected with said pressure responsive device and with the normally open discharge passage for causing super-atmospheric pressure to build up in said pressure responsive device for flexing the diaphragm and actuating the switch upon the closing of the normally open passage of said portable device.

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