

April 9, 1935.

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1,996,891

PUSH BUTTON SWITCH

Filed March 14, 1934

2 Sheets-Sheet 1

Fig. 1

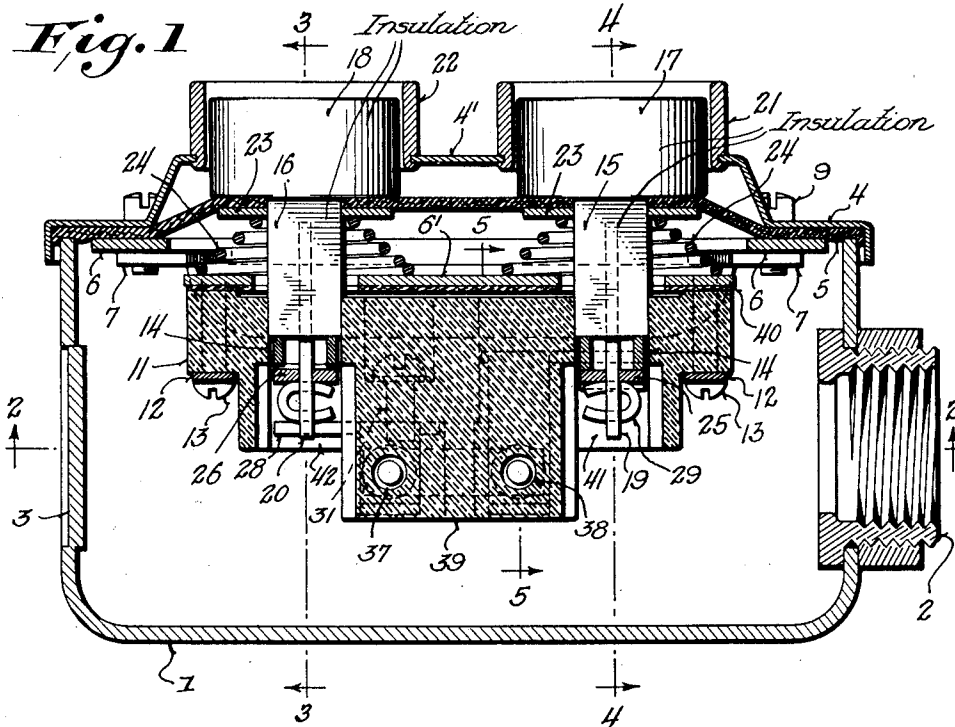
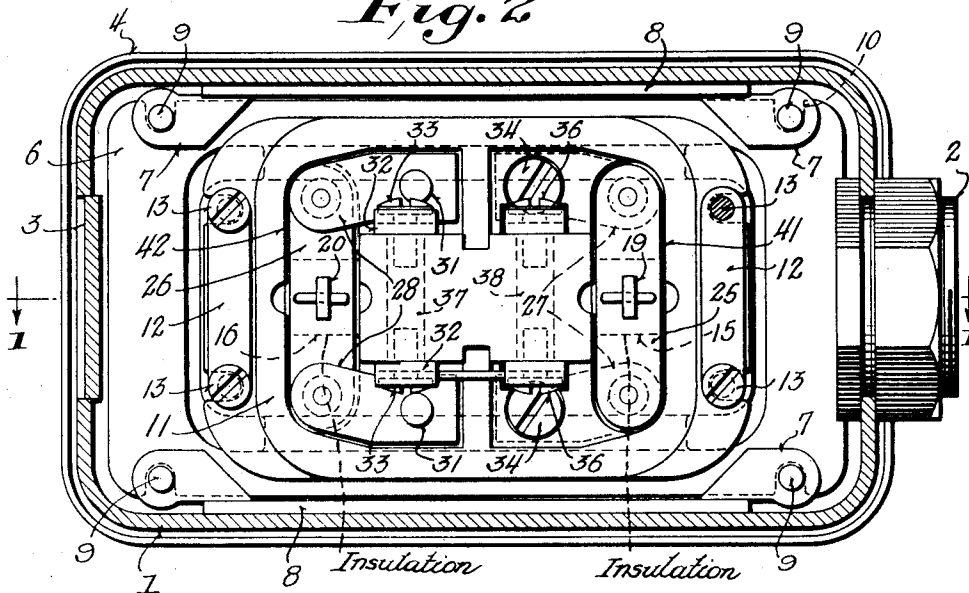


Fig. 2



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Fig. 3

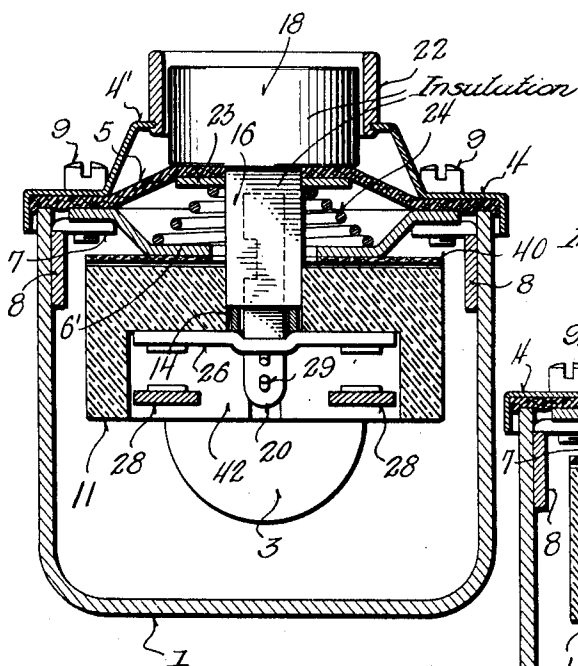


Fig. 4

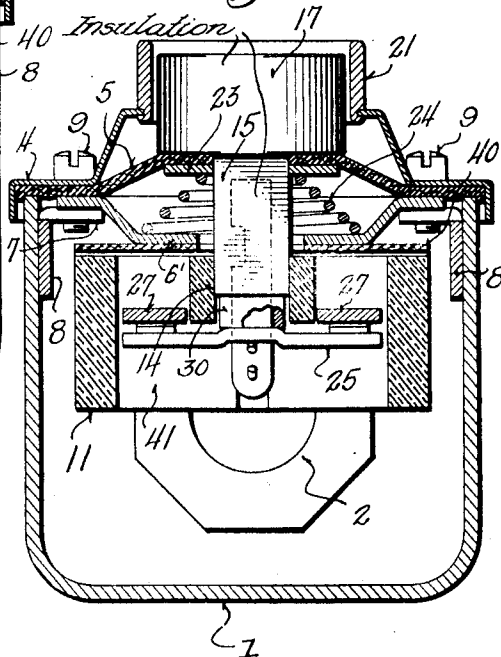
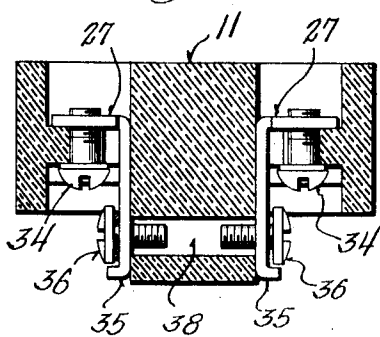


Fig. 5



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PUSH BUTTON SWITCH

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11 Claims. (Cl. 200—159)

This invention relates to a push button switch. In certain installations, such as the control switches for motors, it is the customary practice to provide start and stop switches which are usually the push button type. These are frequently installed in dusty places and in places where there is considerable chance of the entrance of harmful materials into the switch. Also they are often installed in places where there is danger of explosion from floating combustible dust particles.

Objects of this invention are to provide an enclosed type of push button switch which is adequately sealed against the entrance of foreign material, which is provided with one or more push buttons and a flexible diaphragm held in a sealed relation to the casing and to the push button or push buttons and yet allowing free and unhampered operation of the push buttons.

It has heretofore been proposed to make the body portion or insulating portion of these switches of "Bakelite" as the switches as heretofore constructed had the insulating body portion clamped between the cover and the casing. Obviously porcelain could not be used in this type of construction for the reason that porcelain readily cracks and, therefore, this cheaper material had to be omitted and a more expensive construction followed.

In addition to this, where the insulating body portion is carried between the cover plate and the casing, it is apparent that a double gasket is needed, one above and one below the insulating portion. In addition to this, the depth of the box due to this construction is relatively great.

This invention is designed to overcome the above noted defects, and further objects of this invention are to provide a novel construction of push button switch in which the cheaper and more serviceable material—porcelain—may be used, in which the porcelain is not subject to any clamping strains between the cover plate and casing and is not located between such portions, but is suspended below the cover plate and is thus relieved of the danger of cracking, and in which a single diaphragm is employed which acts not only as the seal between the top plate and body, but also acts as the diaphragm seal for the push buttons.

Further objects are to provide a construction of push button switch which insures a relatively shallow box materially less than the constructions heretofore outlined.

Further objects are to provide a very simple construction of push button switch in which the

movable contacts themselves act as the limit means or stop to limit the raising motion or outward motion of the push buttons, and in which a loose mechanical connection is provided between the push button and the contact so that the movable contact is floating and may adjust itself accurately to the stationary contacts.

Further objects are to provide a very simple construction which is easy to produce and assemble, and which is very inexpensive to make.

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

Figure 1 is a longitudinal sectional view through the device, such view corresponding to a section on the line 1—1 of Figure 2.

Figure 2 is a sectional view on the line 2—2 of Figure 1.

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

Figure 4 is a sectional view on the line 4—4 of Figure 1.

Figure 5 is a fragmentary sectional view on the line 5—5 of Figure 1.

Referring to the drawings, it will be seen that a metal casing 1 is provided which is of boxlike construction with an open top or front. This casing is provided with an opening which receives the threaded fitting or nipple 2 which is adapted to receive the conduit. If desired, a knock-out portion 3 may be provided at any suitable point in the casing to accommodate any special type of wiring desired.

A cover plate 4 closes the opening of the casing and is spaced from the casing by a flexible diaphragm 5 which may be of any suitable material, such, for instance, as rubber, leather, or other material. A suspension plate 6 is positioned below the cover plate and rests upon ears 7, see Figures 2, 3 and 4, such ears being preferably formed integrally with a strap metal portion 8, the strap metal portion being welded or otherwise secured to the inner side of the casing 1.

Screws 9 pass through the cover plate and through notches 10, see Figure 2, formed in the suspension plate and are threaded into the ears 7, thereby locking the parts together and clamping the diaphragm 5 securely between the casing 1 and the cover plate 4, and also positioning and holding the suspension plate 6 in its proper position.

A porcelain block 11 is suspended below the suspension plate, the suspension plate being preferably provided with a downwardly dished or depressed central portion 6' which contacts with the upper portion of the porcelain block 11. The

porcelain block may be held to the suspension plate in any suitable manner, as by means of the strap members 12, held in place by screws 13 provided with spring washers or lock washers, and threaded into the depressed portion 6' of the suspension plate.

The porcelain block 11 is provided with rectangular apertures 14 through which the rectangular plungers 15 and 16 of the push buttons 17 and 18 slidably pass. These push buttons and their plungers may be formed of a phenolic condensation product and may have a rectangular metal stem molded therein and respectively indicated by the reference characters 19 and 20, see Figures 1, 3 and 4.

These push buttons 17 and 18 are preferably provided as indicated with cylindrical outer heads which slide within the cylindrical guides 21 and 22 respectively, such cylindrical guides being preferably formed of metal and being swaged or otherwise locked to the upwardly pressed portion 4' of the cover plate, as shown particularly in Figure 1.

It is to be noted that the flexible diaphragm 5 is apertured and receives the plungers 15 and 16 and is positioned immediately below the heads of the push buttons 17 and 18. Washers 23 surround the plungers 15 and 16 and are located below or inside of the diaphragm 5. They are held in place by means of the cone-shaped helical springs 24, such springs resting upon the depressed portion 6' of the suspension plate. Thus the flexible diaphragm is held securely sealed against the push buttons, although permitting free operation of such push buttons.

The plunger 19 loosely carries a movable contact bar 25 and the plunger 20 similarly loosely carries a movable contact bar 26. These bars are respectively provided with contact points on their upper and lower sides. Stationary contacts are provided for each of these contact bars. The stationary contacts for the bar 25 are indicated in Figure 4 by the reference character 27 and the stationary contacts for the bar 26 are indicated in Figure 3 by the reference character 28. The movable contacts 25 and 26 may be very simply secured to the stems 19 and 20 of their respective plungers by the looped, relatively stiff wire members 29 which act somewhat in the manner of cotter pins, as shown most clearly in Figures 1, 3 and 4. These looped members or fastening means are merely slipped through spaced apertures in the respective plungers and have their ends slightly bent towards each other to retain them in place.

If desired, small spacing sleeves of metal, as indicated at 30 in Figure 4, may be employed and positioned between the bottom of the plungers and the movable contact bars.

The stationary contacts are very simply held to the porcelain block as indicated in Figures 1 and 5. For instance, the contacts 28 are continued inwardly and receive the screws 31, as shown in Figure 1, such screws having their heads seated within apertures formed from the upper side of the porcelain block 11, as shown in Figures 1 and 2. These contacts 28 have extensions 32 which receive the terminal screws 33.

The stationary contacts 27 receive the upwardly directed screws 34, see Figure 5, such screws having their heads located in apertures extending upwardly into the porcelain block. These contacts 27 are provided with extensions 35 which receive the terminal screws 36, as most clearly shown in Figures 2 and 5.

The terminal screws 33 and 36 have their shanks located within apertures 37 and 38 formed in the downwardly projecting centrally located web 39 of the porcelain block 11, as shown in Figures 1, 2 and 5.

It will be seen that the porcelain block is carried from the suspension plate and, as an additional safety precaution, an insulating gasket 40, see Figures 1, 3 and 4, may be interposed between the upper face of the porcelain block and the depressed portion 6' of the suspension plate. It is also preferable to form the porcelain block with a slightly dished upper face so that its marginal portions are presented towards the suspension plate and contact with the fiber insulating sheath 40. This fiber sheath gives an additional electrical protection for the device and also serves somewhat to cushion the porcelain block.

It will be seen that a novel and extremely simple form of push button switch has been provided in which the flexible gasket serves the double purpose of sealing the push buttons, though permitting free motion thereof, and in which it also serves as a gasket or seal located directly between the casing and the cover plate.

It is also to be noted that each of the movable contacts 25 and 26 are positioned within rectangular cavities 41 and 42, as shown in Figures 1, 2, 3 and 4.

In the case of the contact bar 26, this contact bar acts as a stop for the upward or outward motion of its push button by engaging the upper face of its cavity 42, that is to say, engaging against that portion of the porcelain block 11 immediately above the movable contact bar 26. In the case of the contact bar 25, it also acts as a stop for the upward or outward motion of its push button by engaging the stationary contacts 27 and thus there is no necessity for any additional stops, thereby considerably simplifying the construction.

It will be seen that this invention permits the use of a porcelain body portion or insulating block which carries the stationary contacts and the terminal members, and which is not subject to cracking by the binding stress between the cover plate and the casing, as it is suspended from the suspension plate and is not positioned between the cover plate and casing. Additionally, this provides a very shallow construction of push button switch and one that is of neat appearance.

It will be seen also that the construction is relatively simple and is economical to make.

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.

While the casing is referred to as having an open top and is provided with a cover plate, it is to be understood that the casing may be mounted either horizontally or vertically, or in other positions, and, therefore, these expressions—top, bottom, and the like—are not intended as limiting but are used only to simplify the description. Therefore, these or similar expressions that are mentioned in defining or claiming the invention are not to be interpreted as limiting expressions, but are to be understood as used solely for the purpose of avoiding needless definition.

I claim:

1. A push button switch comprising a casing having an open top, a cover plate for said casing,

a push button extending through said cover plate, a flexible diaphragm extending across said open top and beneath said cover plate and forming a gasket seal between said cover plate and said casing, said diaphragm sealing against said push button, said cover plate directly guiding said push buttons and being freely removable from said casing without disturbing said push buttons, an insulating block mounted within said casing and suspended from said casing adjacent the upper edge thereof independently of the upper edge of said casing, stationary contacts carried by said insulating block, and a movable contact carried by said push button.

2. A push button switch comprising a casing having an open top, a cover plate for said casing, a push button extending through said cover plate and into said casing, a diaphragm located between and directly contacting the under side of said cover plate and the upper edge of said casing, a suspension plate supported from said casing, an insulating block carried by said suspension plate and provided with contacts, and a movable contact operated by said push button and cooperating with said first mentioned contacts, said diaphragm forming a gasket seal between said cover plate and the upper edge of said casing, said diaphragm sealing against said push button.

3. A push button switch comprising a casing having an open top, a cover plate for said casing, a push button extending through said cover plate and into said casing, a diaphragm located between and directly contacting the under side of said cover plate and the upper edge of said casing, a suspension plate supported from said casing, an insulating block carried by said suspension plate and provided with contacts, a movable contact operated by said push button and cooperating with said first mentioned contacts, said diaphragm forming a gasket seal between said cover plate and the upper edge of said casing, said diaphragm sealing against said push button, ears carried by and projecting inwardly of said casing, and securing means passing through said cover plate and engaging said ears for locking said cover plate in place.

4. A push button switch comprising a casing having an open top, a cover plate for said casing, a push button extending through said cover plate and into said casing, a diaphragm located between and directly contacting the under side of said cover plate and the upper edge of said casing, a suspension plate supported from said casing, an insulating block carried by said suspension plate and provided with contacts, a movable contact operated by said push button and cooperating with said first mentioned contacts, said diaphragm forming a gasket seal between said cover plate and the upper edge of said casing, said diaphragm sealing against said push button, ears carried by and projecting inwardly of said casing, and securing means passing through said cover plate and engaging said ears for locking said cover plate in place, said securing means positioning said suspension plate with reference to said casing.

5. A push button switch comprising a metal casing having an open top, a metal cover plate for said casing, a push button extending through said cover plate, a yielding diaphragm interposed between said cover plate and the upper edge of said casing and forming a gasket seal between said cover plate and said casing, a metal suspension plate supported by said casing, a porce-

lain block suspended from said suspension plate and having stationary contacts, and a movable contact carried by said push button, said flexible diaphragm sealing against said push button.

6. A push button switch comprising a metal casing having an open top, a metal cover plate for said casing, a push button extending through said cover plate, a yielding diaphragm interposed between said cover plate and the upper edge of said casing and forming a gasket seal between said cover plate and said casing, a metal suspension plate supported by said casing, a porcelain block suspended from said suspension plate and having stationary contacts, a movable contact carried by said push button, said flexible diaphragm sealing against said push button, a washer located below said flexible diaphragm and surrounding a portion of said push button, and a compression spring between said washer and said suspension plate.

7. A push button switch comprising a metal casing having an open top, a cover plate for said casing, a flexible diaphragm interposed between the upper edge of said casing and said cover plate and forming a gasket between said cover plate and the upper edge of said casing, push buttons extending through said cover plate and having shanks extending through said diaphragm, a suspension plate carried within said casing, washers surrounding the shanks of said push buttons and bearing against the under side of said flexible diaphragm, compression springs surrounding said shanks and interposed between said washers and said suspension plate, an insulating block suspended from said suspension plate and provided with stationary contacts, and movable contacts supported from the shanks of said push buttons for engaging said stationary contacts.

8. A push button switch comprising a metal casing having an open top, a cover plate for said casing, a flexible diaphragm interposed between the upper edge of said casing and said cover plate and forming a gasket between said cover plate and the upper edge of said casing, push buttons extending through said cover plate and having shanks extending through said diaphragm, a suspension plate carried within said casing, washers surrounding the shanks of said push buttons and bearing against the under side of said flexible diaphragm, compression springs surrounding said shanks and interposed between said washers and said suspension plate, an insulating block suspended from said suspension plate and provided with stationary contacts, movable contacts supported from the shanks of said push buttons for engaging said stationary contacts, said insulating block being formed of porcelain, and securing means locking said cover plate to said casing, said securing means imposing no compression stresses on said insulating block.

9. A push button switch comprising a casing having an open top, a cover plate for said casing, a flexible diaphragm interposed between said cover plate and the upper edge of said casing and directly contacting the under side of said cover plate and the upper edge of said casing, a push button extending through said cover plate and projecting into said casing, said push button having an outer head provided with a shoulder on its inner side, a shank extending inwardly from said shoulder, a movable contact carried by said shank, a suspension plate supported within said casing, a compression spring surrounding said shank and forcing said flexible diaphragm into sealing engagement with the

shoulder of said push button, an insulating block suspended from said suspension plate, and contact means carried by said insulating block and engageable by said movable contact when said push button is depressed, said movable contact engaging said insulating block at the extreme outer travel of said push button and acting as a limit for such outer travel.

- 10 10. A push button switch comprising a metal casing having inwardly turned ears and having an open upper portion, a cover plate for said casing, a flexible diaphragm interposed between said cover plate and the upper edge of said casing and acting as a gasket between said cover plate and the upper edge of said casing, a push button extending through said cover plate and having an inwardly located shoulder, a shank extending inwardly of said casing from said shoulder, spring means for forcing said diaphragm against the shoulder of said push button, a movable contact supported from the shank of said push button, a suspension plate supported from the inwardly projecting ears of said casing, securing means passing through said cover plate and locking said cover plate to said ears, to thereby clamp the flexible diaphragm between said cover plate and the upper edge of said casing, and an insulating block suspended from said cover plate and provided with stationary contacts engageable by the said movable contact.

11. A push button switch comprising a metal casing having inwardly turned ears and having an open upper portion, a cover plate for said casing, a flexible diaphragm interposed between said cover plate and the upper edge of said casing and acting as a gasket between said cover plate and the upper edge of said casing, a push button extending through said cover plate and having an inwardly located shoulder, a shank extending inwardly of said casing from said shoulder, spring means for forcing said diaphragm against the shoulder of said push button, a movable contact supported from the shank of said push button, a suspension plate supported from the inwardly projecting ears of said casing, securing means passing through said cover plate and locking said cover plate to said ears, to thereby clamp the flexible diaphragm between said cover plate and the upper edge of said casing, and an insulating block suspended from said cover plate and provided with stationary contacts engageable by the said movable contact, said insulating block having a cavity formed therein within which said movable and stationary contacts are located and forming a housing for said contacts, said insulating block being free of compression strains due to the securing means for said cover plate.

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