

May 29, 1928.

W. J. LARSON

1,671,196

ELECTRIC SWITCH

Filed Jan. 25, 1927

2 Sheets-Sheet 1

Fig. 1

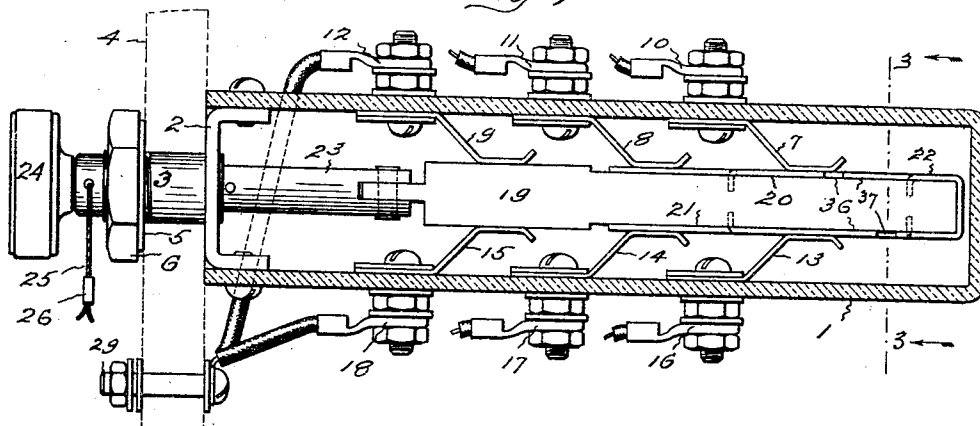


Fig. 2

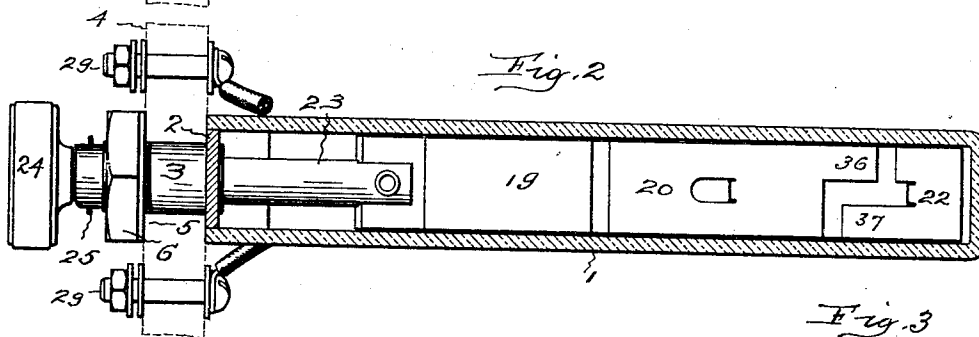


Fig. 4

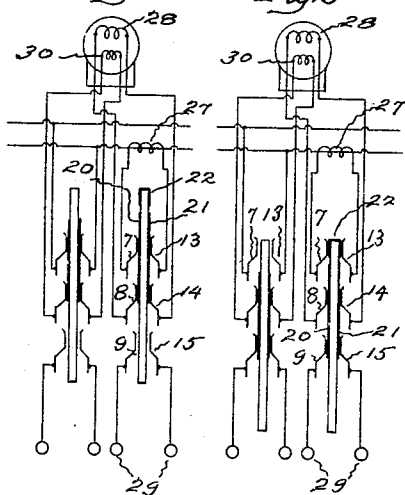


Fig. 5

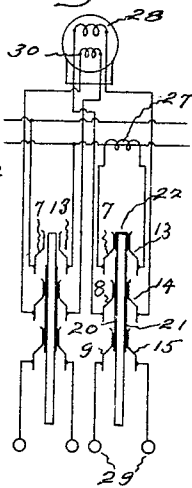


Fig. 6

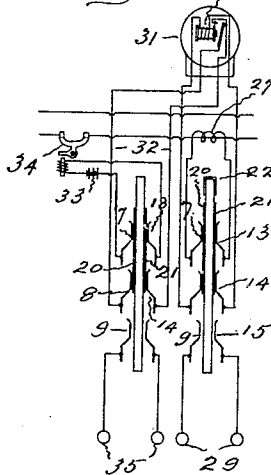
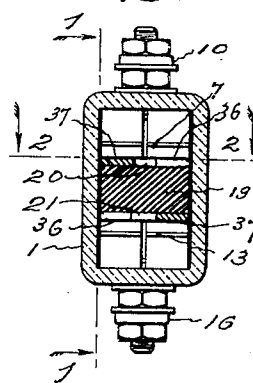


Fig. 3



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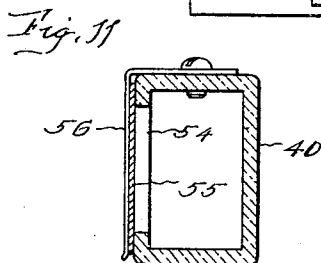
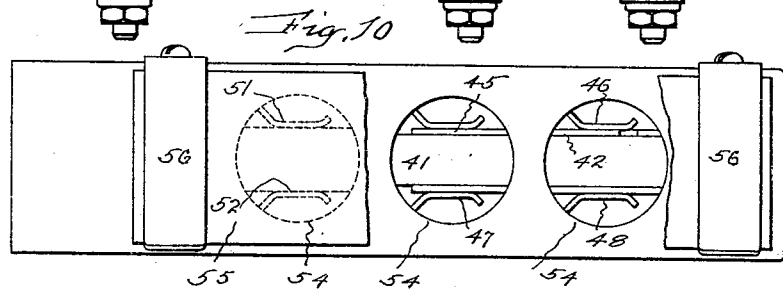
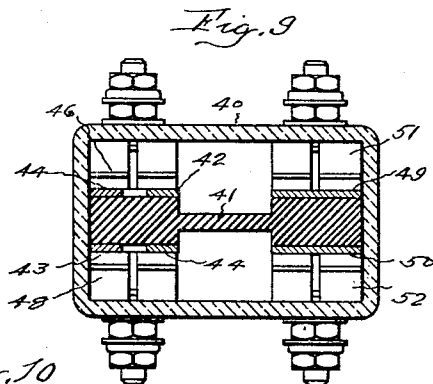
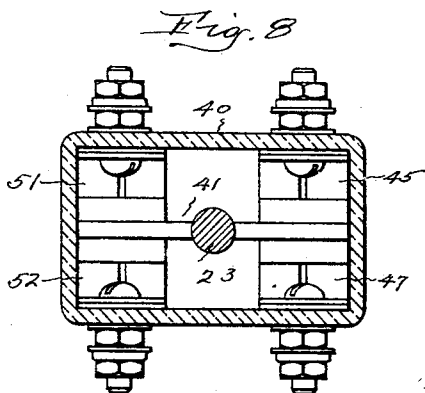
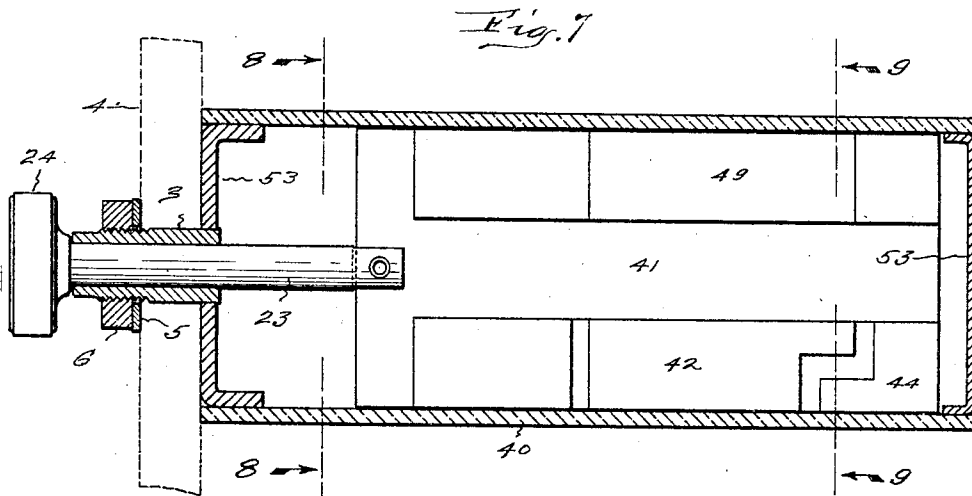
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ELECTRIC SWITCH

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

Application filed January 25, 1927. Serial No. 163,381.

This invention relates to an electric switch of the push and pull type which is particularly adapted to be applied to a panel for testing electric apparatus, such, for instance, as relays, meters and the like instruments.

The object of the invention is to provide a switch of this character which is very inexpensive to manufacture, which is of small size and of such shape that it requires but the making of a single hole in the panel to the back of which it is to be applied and does not interfere with or obstruct any apparatus mounted on or connected with the panel, which is effective, safe and readily sealable to prevent unwarranted use, and with which the testing instrument leads may be readily connected in such position that a test may be made with the test instruments in front of the panel on which the instruments showing the normal conditions are mounted.

In attaining this object the switch has a tubular insulating case with brushes on the inside that are connected with terminals on the outside, and a plug fitted to slide in the interior and carrying contact plates arranged to make the required connections between the brushes, said case having means whereby it may be securely fastened to the back of a panel and the plug having a stem adapted to extend through the panel and on the front having a knob by means of which it may be conveniently pushed or pulled. Means are also provided for sealing the stem of the plug so that the circuits cannot, inadvertently or out of curiosity, be switched from normal operative position.

In the accompanying drawings, Fig. 1 is a side elevation of the switch with the tubular case cut in longitudinal section, on the plane indicated by the dotted line 1—1 on Fig. 3. Fig. 2 is a top view with the case cut away on the plane indicated by the dotted line 2—2 on Fig. 3. Fig. 3 is a transverse section of the switch on the plane indicated by the dotted line 3—3 on Fig. 1. Fig. 4 is a diagram illustrating a pair of the switches in normal position and connected in a meter circuit. Fig. 5 is a similar view with the switches in testing position. Fig. 6 is a diagram showing the switches arranged in a relay circuit. Fig. 7 is a longitudinal section of a modified form of the switch. Fig. 8 is a transverse section on the dotted line 8—8 on Fig. 7. Fig. 9 is a transverse section on the dotted line 9—9 on Fig. 7. Fig. 10 is a side view showing a modified form of casing. Fig. 11 is a transverse section of the modified casing.

In the embodiment of the invention illustrated the case 1 of the switch is a tube of insulating material that is substantially rectangular in cross-section. The opening in the interior is rectangular and one end of the tube may be closed and the other open, as shown in Fig. 1, or both ends of the tube may be open as shown in Fig. 7. Fastened in the open end of the case is a yoke 2. Extending forwardly from the yoke is a sleeve 3 which is circular in cross-section, and is adapted to fit a round hole bored in the panel 4 (indicated in dotted outline) to which the switch is to be applied. The sleeve is inserted through the hole from the back of the panel and on the front side of the panel has a washer 5 outside of which is a nut 6. When the nut is turned up the switch case is firmly secured with its end tight against the back of the panel, by the washer and the yoke.

In the interior of the case at the top are three conducting brushes 7, 8, 9, which are respectively connected with terminals 10, 11, 12 on the outside of the top of the case, and in the interior at the bottom are a similar number of brushes 13, 14, 15 that are connected with terminals 16, 17, 18, respectively, on the outside of the bottom of the case.

Fitted to slide in the interior of the case is a rectangular plug 19 of insulation that carries a conducting plate 20 on one face and a conducting plate 21 on the opposite face. At the inner end the plug may have a conducting plate 22 that extends over both faces. The main body of the plug is rectangular and is closely fitted to the rectangular opening in the case, and the conducting plates are preferably of such width that they are kept in proper alignment with each other and with the brushes, by the side walls of the opening in which the plug slides. The brushes are also desirably the same width as the opening in the case so that although each is held by a single screw they cannot turn out of alignment. Attached to the outer end of the plug is a circular stem

23 that is fitted to slide in the sleeve 3 of the yoke 2, and at the outer end of the stem is a knob 24 that forms the handle by means of which the plug is pushed or pulled to cause the desired switching of the circuits. The sleeve 3 is designed to project a little beyond the face of the panel and nut 6, and holes are drilled through the sleeve and through the stem of the plug in such locations that they will coincide when the plug is pushed in to its normal position, and when in this relation a wire 25 may be passed through the holes and provided with a seal 26 in order that the switch plug may be secured in normal closed position against unwarranted moving.

The terminals 10 and 16 are designed to be connected with the normal source of current, which can be a current transformer 27. The terminals 11 and 17 are intended to be connected with the current coil 28 of the instrument to be tested, which may be a meter or a retarded relay. The terminals 12 and 18 are adapted to be connected with binding posts 29 on the front of the panel, and to which the testing instrument terminals are to be attached.

When the plug 19 is in its inner or normal position, as indicated in Fig. 4, the plate 20 connects the brushes 7 and 8 and the plate 21 connects the brushes 13 and 14, and the circuit from the main source of current, or current transformer 27, to the load, that is, the current coil 28 of the meter or relay coil is closed. With the plug in this position the plate 22 is out of contact with any of the brushes, and the test terminal brushes 9 and 15 are not in contact with any plate. When the plug is pulled out, as indicated in Fig. 5, the current transformer brushes 7 and 13 are short-circuited by the plate 22, and the plate 20 connects the brushes 8 and 9, and the plate 21 connects the brushes 14 and 15, thus connecting the current coil of the meter or relay in circuit with the current test terminals 29.

The switch has been described as connected with the current coil of a meter or coil of a relay. A second switch may be connected with the potential coil 30 of a meter in like manner except of course the current brushes 7 and 13 are connected across the line and are never short-circuited, as indicated on the left in Figs. 4 and 5. Similarly, a second switch may be connected with the make and break circuit of a retarded relay 31, as indicated on the left in Fig. 6. In this last mentioned case when the plug is in normal position the make and break circuit 32 is connected respectively through the plates 20 and 21 and brushes 7, 8, 13 and 14 with the trip circuit that is shown as containing a battery 33 and circuit breaker 34. When the plug is drawn out the trip circuit is disengaged and the

make and break circuit is connected with the terminals 35, to which may be attached any testing or time interval instrument that it may be desired to use.

When the switch is used between a current transformer and a current coil the conducting plates 20, 21, 22 are so shaped and located with relation to each other and the brushes 7, 8, 13 and 14 that the transformer circuit is never completely opened, that is, the plates 20 and 21 do not become disengaged from the brushes 7 and 13 until the plate 22 engages the brushes 7 and 13. This is accomplished in the switch illustrated by extending sections 36 of the plates 20 and 21 past the sections 37 of the plate 22 so that the brushes will engage one before leaving the other when the plug is pushed in or pulled out.

Instead of employing two independent switches, as above described, the contacts and brushes may be arranged in a single case to effect the same result, as illustrated in Figs. 7, 8 and 9. In this form the insulating case 40 is sufficiently wide to contain a double set of brushes and the insulating plug 41 is wide enough to carry both sets of contact plates. The plug along one edge has contact plates 42 and 43 on opposite sides, and the plate 44 that extends around the end. The plate 42 is adapted to normally connect the brushes 45 and 46 above, and the plate 43 is adapted to normally connect the brushes 47 and 48 below the plug, as previously set forth. While along the other edge of the plug are the contact plates 49 and 50 on opposite sides that are adapted to normally connect the brushes 51 above and brushes 52 below. These brushes are designed to be connected in the respective circuits, as are the corresponding brushes before described and illustrated in Figs. 4, 5 and 6.

The insulating tube first described and shown in Figs. 1 and 2 has its side walls solid and one end closed. The tube, however, may be made open at both ends and closed by heads 53 as shown in Fig. 7, and holes 54 may be made through the sides of the tubes so that the brushes may be conveniently held when being assembled and fastened in place, and may be inspected at any time to see that they are making good contacts with the plates, as shown in Fig. 10. When such openings are made in the side of the insulating tube a plate 55 of insulation or metal, as desired, may be placed over them. This plate may be removably held in place by yielding fingers 56, as illustrated in Fig. 11.

The tubular case of this switch being comparatively small in cross-section, but extending lengthwise to allow the approved distances between contacts, takes up but little space and offers practically no obstruction.

tion to the apparatus on a panel or back of it, and the case is so closed that the possibility of dust and moisture entering and causing trouble is eliminated. The brushes and plates are cheaply stamped to shape and easily fastened in their respective positions, and being of the same width as the opening in the case it is only necessary to attach them so that they will be held against endwise movement, the casing normally holding them from sidewise turning. The insulating plug is guided in its movements by the inside walls of the tubular case which it fits, and the stem is guided by the sleeve that may be passed through a single circular hole drilled in the panel, which sleeve bears the nut that when turned up draws the end of the case firmly and tightly against the back of the panel. This construction lends itself to the ready application of a simple seal to prevent tampering with the switch and disturbing the circuits.

The invention claimed is:—

1. An electric switch comprising a tubular insulating case, a tubular sleeve fastened to and extending outwardly from said case, an insulating plug slidable in the case, a stem extending from said plug through the sleeve, a plurality of conducting brushes fastened to the inner wall of said case on one side, a plurality of conducting brushes fastened to the inner wall of said case on the opposite side, conducting terminals on the outside of the case connected respectively to said brushes, and conducting plates fastened to opposite sides of said plug and each adapted to electrically connect at least two sets of said brushes.

2. An electric switch comprising a tubular insulating case, a circular sleeve fastened to and extending outwardly from said case and having a threaded outer end, a nut turning on said sleeve, an insulating plug slidable in the case, a circular stem extending from said plug through the sleeve, a plurality of conducting brushes fastened to the inner wall of said case on one side, a plurality of conducting brushes fastened to the inner wall of said case on the opposite side, conducting terminals on the outside of the case connected respectively to said brushes, and conducting plates fastened to opposite sides of said plug and each adapted to electrically connect at least two sets of said brushes.

3. An electric switch comprising a tubular insulating case having a rectangular interior opening, a yoke fastened in the case, a circular sleeve extending outwardly from said yoke and having a threaded outer end, a nut turning on said sleeve, an insulating rectangular plug fitting and slidable in the case, a circular stem extending from said plug through the sleeve, a plurality of conducting brushes fastened to the inner top

wall of said case, a plurality of conducting brushes fastened to the inner bottom wall of said case, and conducting plates fastened to opposite faces of said plug and each adapted to electrically connect at least two sets of said brushes.

4. An electric switch comprising a tubular insulating case having a rectangular interior, a tubular sleeve extending outwardly from said case and adapted to be passed through a perforation in a panel and fastened therein, a rectangular plug fitting and slidable in the case, said plug having a stem extending through the sleeve, a plurality of conducting brushes fastened to opposite interior walls of said case, and a plurality of conducting plates loosely mounted on opposite faces of said plug and adapted to electrically connect said brushes, said plates being held from sidewise movement on the plug by the interior side walls of the case.

5. An electric switch comprising a tubular insulating case having a rectangular interior, a tubular sleeve extending outwardly from said case and adapted to be passed through a perforation in a panel and fastened therein, a rectangular plug fitting and slidable in the case, said plug having a stem extending through the sleeve, a plurality of conducting brushes fastened to opposite interior walls of said case, a plurality of conducting plates fastened to opposite faces of said plug and adapted to electrically connect said brushes, and a conducting plate extending around the end of said plug onto said opposite faces, the ends of said last mentioned plate overlapping the ends of the adjacent plates whereby when the plug is moved to testing position the brushes contact with the end plate before leaving the adjacent plates.

6. An electric switch comprising a tubular insulating case having a rectangular interior, a tubular sleeve extending outwardly from said case and adapted to be passed through a perforation in a panel and fastened therein, a rectangular plug fitting and slidable in the case, said plug having a stem extending through the sleeve, a plurality of conducting brushes fastened to opposite interior walls of said case, and a plurality of conducting plates fastened to opposite faces of said plug and adapted to electrically connect said brushes, said insulating tube having observation openings through its side opposite said brushes.

7. An electric switch comprising a tubular insulating case having a rectangular interior, a tubular sleeve extending outwardly from said case and adapted to be passed through a perforation in a panel and fastened therein, a rectangular plug fitting and slidable in the case, said plug having a stem extending through the sleeve, a plurality of conducting brushes fastened to opposite in-

terior walls of said case, a plurality of conducting plates fastened to opposite faces of said plug and adapted to electrically connect said brushes, said case having through one side observation openings opposite said brushes, and a plate detachably fastened to the side of the case over said openings.

8. An electric switch comprising a tubular insulating case having a rectangular interior, a tubular sleeve extending outwardly from said case and adapted to be passed through a perforation in a panel and fastened therein, a rectangular plug fitting and slidable in the case, said plug having a stem extending through the sleeve, a plurality of conducting brushes fastened to opposite interior walls of said case, and conducting plates of a width of the opening between the side walls of the case loosely fastened to opposite faces along each edge of said plug

and adapted to electrically connect said brushes.

9. An electric switch comprising a tubular insulating case, a tubular sleeve fastened to and extending outward from said case, an insulating plug slidable in the case, a stem extending from said plug through the sleeve, means whereby said stem and sleeve may be sealed to retain the plug against movement in the case, a plurality of conducting brushes fastened to the inner wall of said case on one side, a plurality of conducting brushes fastened to the inner wall of said case on the opposite side, conducting terminals on the outside of the case connected respectively to said brushes, and conducting plates fastened to opposite sides of said plug and each adapted to electrically connect at least two sets of said brushes.

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