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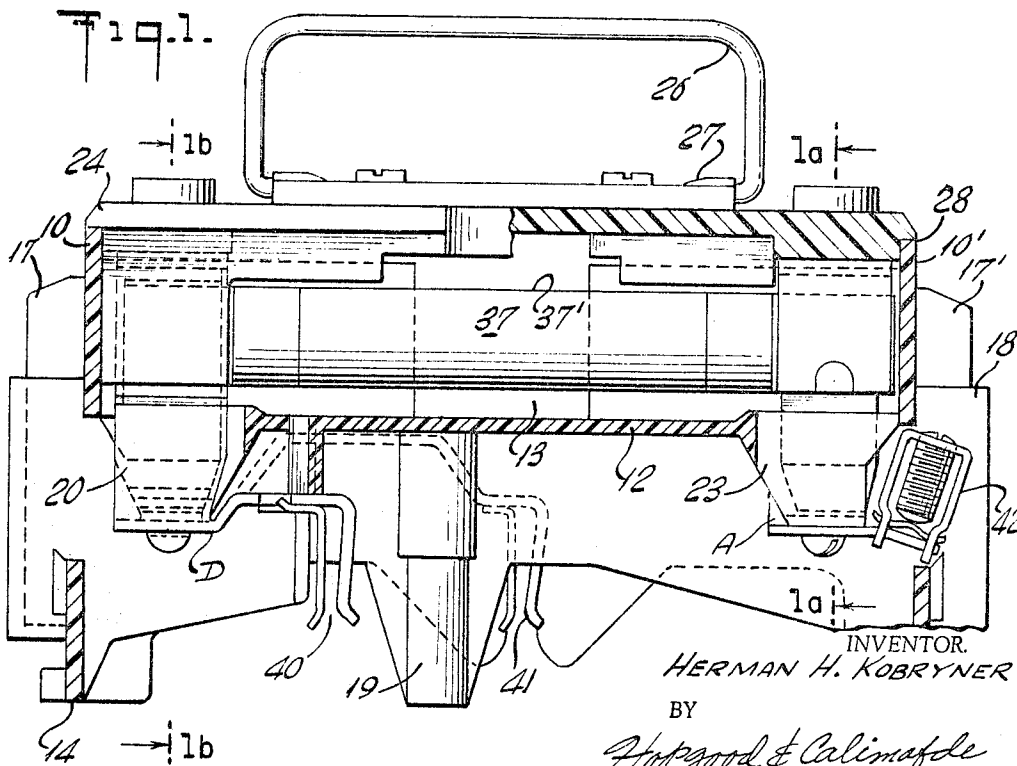
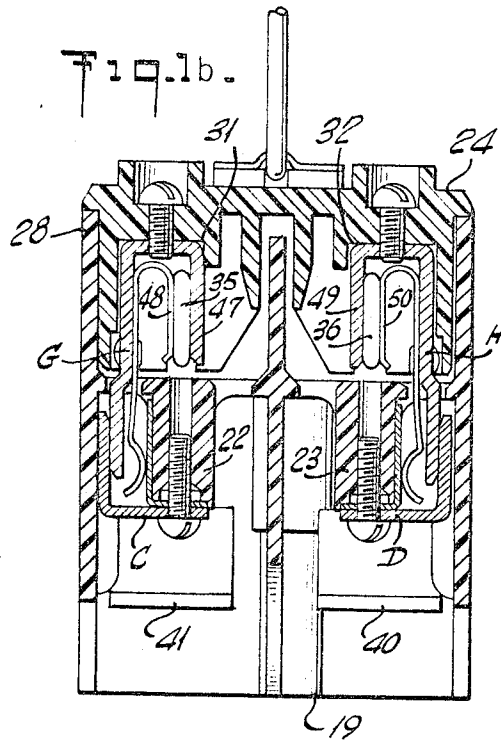
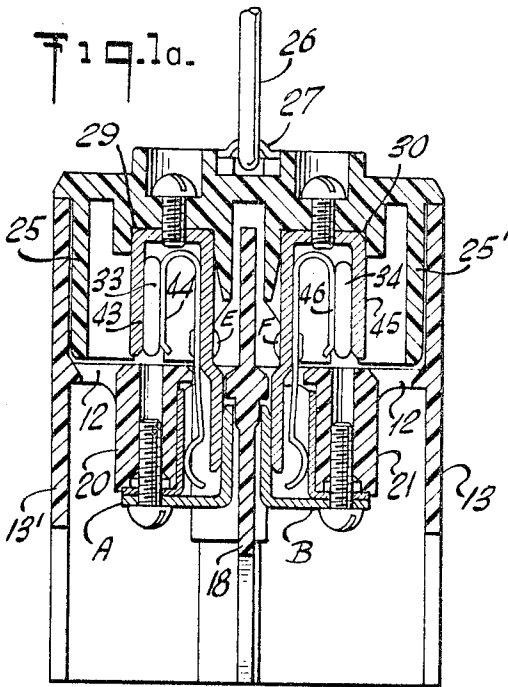
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3,272,947

SWITCH CONTACT ARRANGEMENT

Filed May 11, 1964

2 Sheets-Sheet 1



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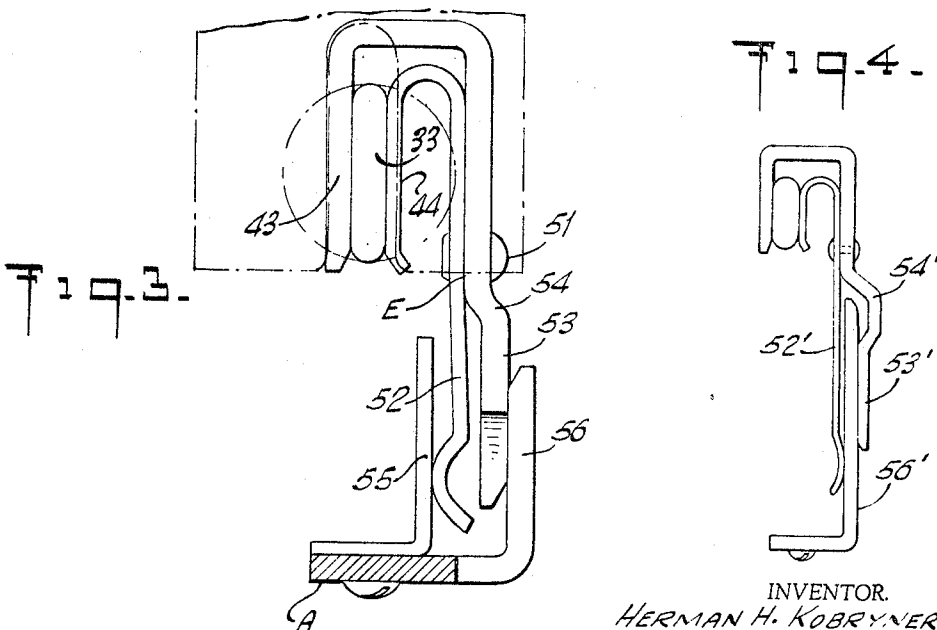
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SWITCH CONTACT ARRANGEMENT

2 Sheets-Sheet 2



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3,272,947

SWITCH CONTACT ARRANGEMENT

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2 Claims. (Cl. 200-163)

This invention pertains to a contact arrangement for embodiment in switches.

For purposes of illustration and discussion the novel contact arrangement is depicted as embodied in a pull-out switch, however, it is to be clearly understood that the invention is not so limited and may be embodied in any switch mechanism in which arcing is of primary concern.

The conventional pull-out switch is comprised of essentially two parts. The first is a base or tube including line and load terminals and a switch contact associated with each terminal. The second part is the puller, which is dimensioned for seating in the tub, and which contains the fuse or fuses, and includes fuse blade clips and a switch contact associated with each clip. Upon seating of the puller in the tub, a fused, line-to-load, circuit is completed by the corresponding engagement of tub and puller switch contacts. Unseating the puller causes circuit interruption and permits fuse inspection or replacement.

These devices, which serve the dual function of circuit overload protection and circuit disconnect, have enjoyed widespread exploitation in applications where it is desirable to isolate individual circuits. They suffer, however, from one inherent disadvantage, common in switches of large current carrying capabilities.

That is, when it is found necessary to interrupt service by unseating the puller, this inevitably (except where there is but a negligible load in the associated circuit) causes a sizeable arc to be drawn between the mating tub and puller contacts. A similar effect is found upon contact engagement and is particularly dangerous when the insertion is made hesitantly. This arcing seriously impairs the life of the contacts, and hence the switch, as a consequence of the resultant contact pitting. It is to this defect in conventional large current carrying contacts that the disclosed invention is directed.

Accordingly, it is the object of this invention to increase switch life by decreasing the effect of arcing when engaging and disengaging switch contacts.

It is a further object of the present invention to embody the inventive concept in a pull-out switch, modified to decrease the arcing period itself.

Briefly, the invention is predicated upon the concept of providing the aforementioned contacts with electrically integral auxiliary contacts which meet first and release last, and which, upon final engagement of contacts are shunted out of the current path. In order to reduce the arcing period when the contacts according to the invention are mounted in a pull-out switch, an obstruction is provided which, upon insertion or removal of the puller, requires an increased force on the part of the operator immediately prior to the make or break of contacts. Since the effectiveness of the obstruction obtains for only a predetermined time the followthrough is accelerated, creating a quick make or break as the case may be.

The above mentioned and other features and objects of this invention, and the manner of attaining them, will become more apparent, and the invention itself will best be understood by reference to the following description of an embodiment of the invention, taken in conjunction with the accompanying drawings, wherein:

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FIG. 1 is a front cross-sectional view of a mated puller and tub embodying the contacts of the invention;

FIGS. 1a and 1b are right and left cross-sectional views, taken along lines 1a and 1b respectively of FIG. 1;

FIGS. 2a and 2b are partial side cross-sections illustrating time transitions during puller seating;

FIG. 3 is a detail of the corresponding male and female contacts of the invention fully mated; and

FIG. 4 illustrates an alternative contact arrangement according to the invention.

Referring now to the figures, and in particular, to FIGS. 1, 1a and 1b, there may be seen a fully mated puller and tub. The tub, formed of insulating material such as Bakelite, comprises end walls 10 and 10', a platform 12, and side walls 13 and 13'. The side and end walls are extended downwardly to form footings 14 adapted to suitably engage a panelboard bearing bus bars (not shown).

In order to isolate adjacent terminals, connectors and leads, and lend structural rigidity to the tub, the side and end walls have affixed thereto ribs 17, 17' and 18 (the forward ribs not being shown), which are preferably integral with the walls. The rib 18, which extends through the body of the tub, contains a flanged cylinder 19, through which a bolt may be placed for securing the tub to the panelboard.

Mounted upon insulated projections 20-23 on the tub platform 12, are four tub connector assemblies A, B, C, and D, the upper parts of which form the tub contacts (to be described in detail), and the lower parts of two of which comprise resilient grasping fingers 40 and 41 for female cooperation with the panelboard bus bars. The lower parts of the two remaining tub connector assemblies (only one of which 42 is shown) comprise the terminal connectors for the load conductors.

At this point, it might be well to point out that the term "connector assembly" as used herein, includes all those elements which are permanently electrically integral. The means by which the elemental parts are connected together mechanically (e.g. force fit, rivet, weld, etc.) forms no part of this invention, and as such details would serve merely to lengthen this specification, they have by and large been omitted.

The puller portion of the pull-out switch comprises a rectangular cover 24, of insulating material similar to that of the tub, dimensioned for a slide fit into the tub; the flanged portion 28 acting as a stop. Perpendicular side walls 25 and 25', together with the end walls (omitted for simplicity) lend structural rigidity and prevent skewing. A handle 26 is pivotally mounted, by means of a suitably affixed plate 27 to the outside of the cover 24.

Four puller connector assemblies E, F, G, and H are mounted within corresponding recesses 29-32 on the underside of the cover 24. The lower portions of these assemblies comprise the puller contacts for engagement, upon seating of the puller in the tub, with the corresponding tub contacts as will be described. The upper portions of these connector assemblies, in the form of inner and outer inverted U's, constitute the fuse clips 43-50 for retaining the fuse blades 33-36, respectively, of the fuses 37 and 37'.

Two fused circuits are thus formed between a pair of bus bars and a pair of load conductors. The first consists of the serial connections; assembly D, assembly H, fuse blade 36, fuse, fuse blade 33, assembly E, and assembly A; while the second consists of; assembly C, assembly G, fuse blade 35, fuse, fuse blade 34, assembly F, and assembly B. Inasmuch as the two sections establishing these connections are virtually mirror images, save for the asymmetrical location of the bus bar fingers 40 and 41, only one section will be referred to hereinafter. Further, since aside from the modification of the lower parts of the

tub connector assemblies to adapt to the bus bar and branch conductors, each pair of puller and tub connector assemblies is identical, the discussion will be limited to the single pair of assemblies A and E shown in FIG. 3. It may be noted that although the assemblies are the same, their relative positions within the switch are not. Assemblies A, E, F and B are disposed adjacent the center rib facing outwardly, while assemblies C, D, G and H are disposed adjacent the side walls facing inwardly. This permits the switch to be in the "off" condition when so desired, by simply reverse-seating the puller in the tub.

In FIG. 3, the puller connector assembly E is depicted as fully mated with the tub connector assembly A (the terminal connector 42 of which has been omitted for clarity). The lower portion of the puller connector assembly, and the upper portion of the tub connector assembly constitute the opposing male and female contacts of the switch.

The male contact includes the auxiliary and primary elements 52 and 53, joined at one end 51, and biased outwardly from one another by the S-curve 54. By making the auxiliary element 52 of material possessing good resilient properties a firm engagement to both the auxiliary and primary elements 55 and 56 of the electrically integral U-shaped female contact is insured, and as a result the desired low contact resistance is obtained between primary elements.

As may be seen, two parallel current carrying paths are thus formed. Because of the relative lengths of the elements, the auxiliary path always makes first and breaks last. As a result, the arc is absorbed by, and its deteriorating effects are relegated to the auxiliary contact elements. Put another way, since a secondary path is always available upon the making and breaking of the primary elements, the latter join and separate without arc and consequently the pitting of these elements is precluded.

In order to provide smooth camming surfaces for the make, both of the primary elements 53 and 56 have their respective leading edges beveled. The auxiliary element 52, however, rather than being edge beveled is curved. This materially facilitates the make, however, its primary purpose will be explained.

FIGS. 2a and 2b illustrate the utility of the curved end of the male auxiliary element 52. Within the tub, located adjacent the end of the female auxiliary element 55 is a lip 57 jutting into the engagement path of the male contact. As shown in FIG. 2a, upon initially seating the puller in the tub, and just prior to tub-puller contact engagement, the curved section of the male auxiliary element encounters the lip. It is now incumbent upon the operator to supply an additional amount of force to deflect the obstructed element. As the engagement proceeds, and the curved end of the auxiliary element clears the lip, the obstruction suddenly disappears. As a consequence of the operator followthrough a quick make is effectuated.

During the disengagement of contacts the situation is reversed, however, the resultant effect is quite similar. Again an increased force is required, but this time the impedance must be overcome before the parting of contacts. As in the "make," it is the abrupt removal (relatively speaking) of an obstruction, which the operator needed an increased force to surmount, which via the followthrough effectuates the quick break.

FIG. 4 illustrates an alternative embodiment for the basic male and female contact arrangement of the invention. In this case the auxiliary female element is eliminated and the primary element of the male contact 53' is biased inwardly against the resilient auxiliary contact 52' by the displaced portion 54' to provide the low contact resistance required. Initial make, final break, and con-

sequently the arcing occurs between the auxiliary element 52' and the left side of the primary element 56'. The primary purpose of the displaced portion 54' now becomes apparent. Because of possible pitting carryover from the left leading edge to the right leading edge it becomes important that this area does not appear in the final current path. The displaced portion 54' serves this function.

While I have described above, the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention, as set forth in the objects thereof, and in the accompanying claims.

What is claimed is:

1. A pull-out switch comprising engageable male and female contacts; said male contact comprising electrically and physically parallel primary and auxiliary contact elements, said auxiliary contact element being of resilient material and being biased outwardly from said primary element; and a U-shaped female contact, the parallel arms of said U, extending towards said male contact and forming primary and auxiliary contact elements of sufficient proximity to each other to engage both said male contact elements upon full engagement therewith, forming a primary and auxiliary current path; said auxiliary contact elements being of relatively greater dimension in the engagement direction so that said auxiliary current path is formed first and breaks last; a puller and a tub; means for mounting the male contact in said puller; means for mounting the female contact in said tube at a location to permit engagement of said male and female contacts upon the seating of said puller in said tub; said male auxiliary contact element including a projecting portion at the end thereof, and a non-conducting lip in said tub adjacent the end of the female auxiliary contact element and disposed relative thereto to contact first the projecting end of the male auxiliary contact element and require additional force to seat and unseat said puller immediately before make and break, respectively of said male and female contacts.

2. A pull-out switch comprising engageable male and female contacts; said male contact comprising physically and electrically parallel primary and auxiliary contact elements, said auxiliary contact element being formed of resilient material and being dimensioned to be of lesser cross-section and of greater relative length than said primary contact for making first with said female contact and breaking last, absorbing any arc in a greater resistance path; a puller and a tub; means for mounting the male contact in said puller; means for mounting the female contact in said tub at a location to permit engagement of said male and female contacts upon the seating of said puller in said tub; said male auxiliary contact element including a projecting portion at the end thereof, and a non-conducting lip in said tub adjacent the end of the female contact element and disposed relative thereto to contact first the projecting end of the male auxiliary contact element and require additional force to seat and unseat said puller immediately before make and break, respectively, of said male and female contacts.

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