Feb. 2, 1943. E. W. LANDMEIER 2,310,096

SWITCH STRUCTURE

Filed March 25, 1941 2 Sheets-Sheet 1

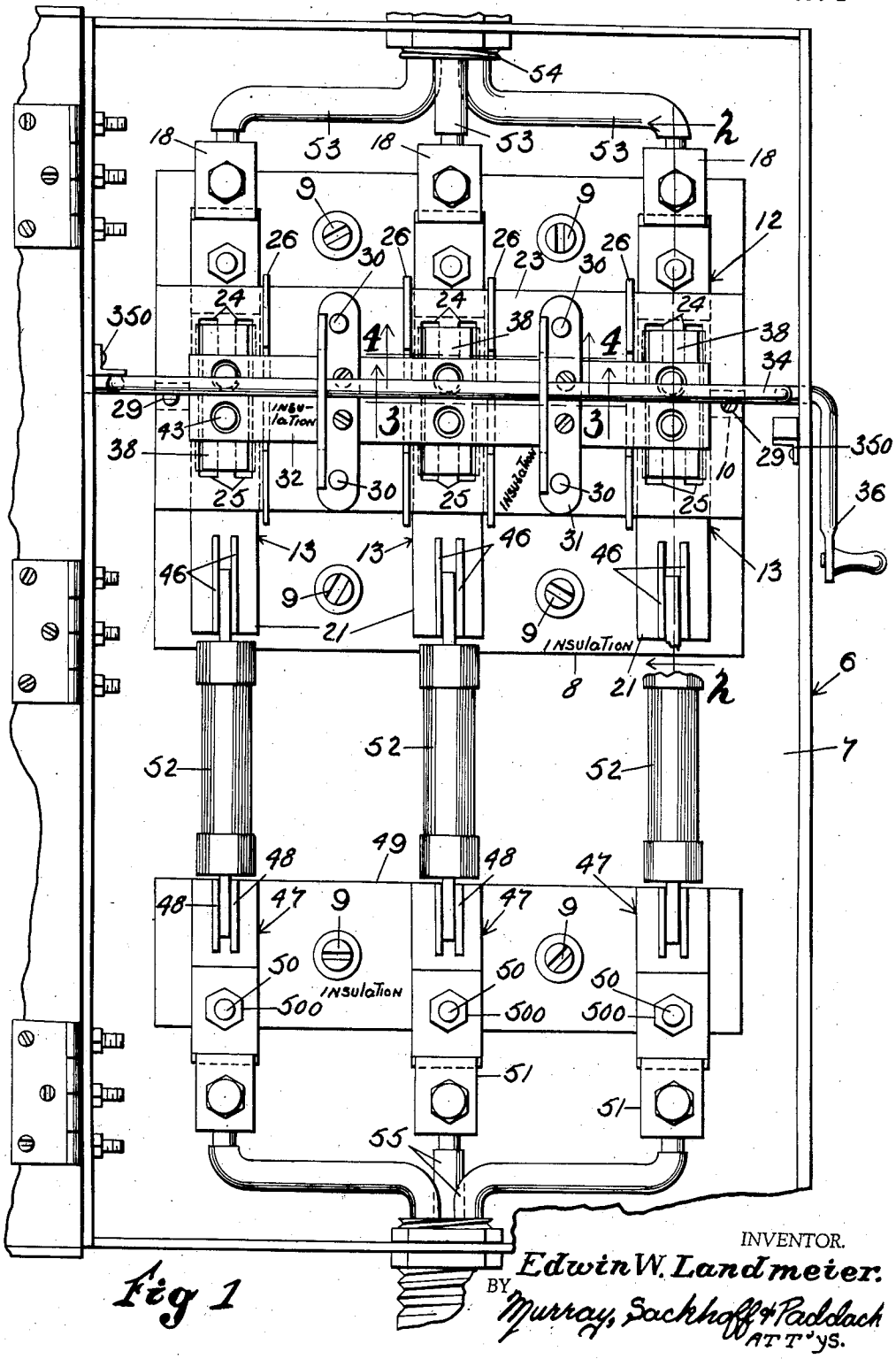



Fig 1

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Fig 2

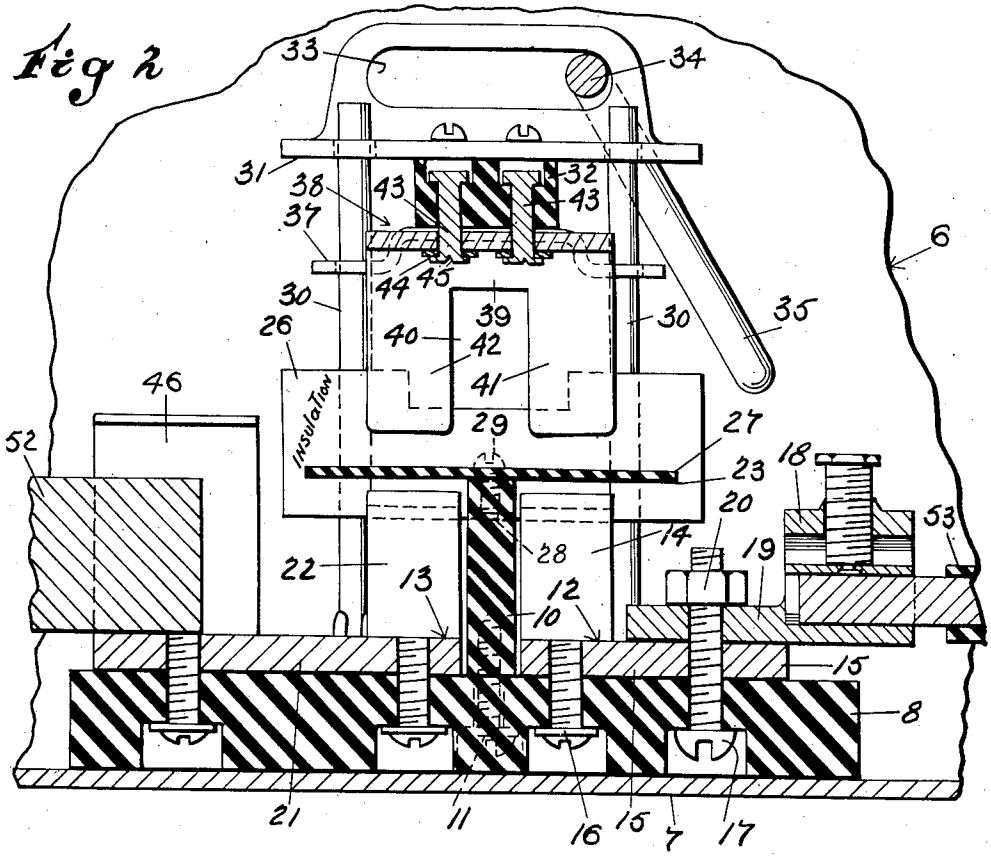



Fig 3

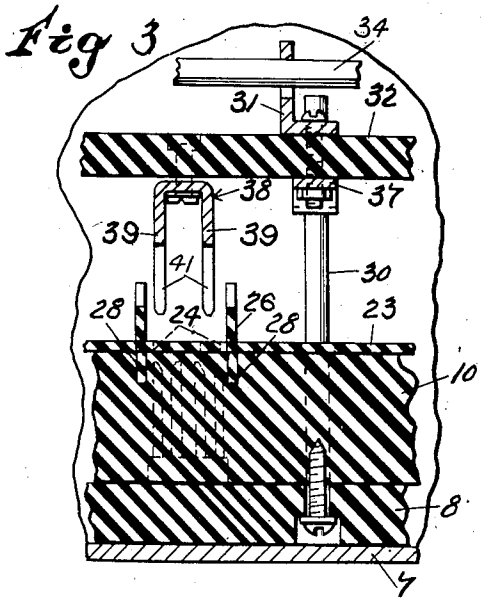
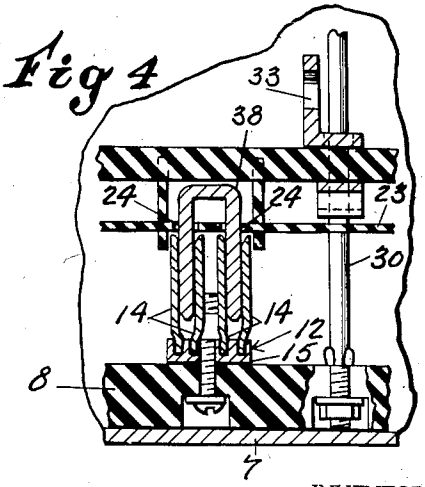



Fig 4




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2,310,096

# UNITED STATES PATENT OFFICE

2,310,096

## SWITCH STRUCTURE

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Application March 25, 1941, Serial No. 385,112

8 Claims. (Cl. 200—163)

The present invention relates to electrical switches and has for an object the provision of a compact and highly efficient electrical switch which is particularly adaptable for use in switching electrical currents of high amperage.

Another object of the invention is to provide, in a switch of this character, a simple and sturdy floating switch blade assembly cooperatively related to the switch jaws and to an insulating barrier structure in such manner as to minimize the arc produced in switching operations and to prevent the flashover of the arc which may be produced during operation.

A further object of the invention is to provide an easily assembled insulating barrier construction for electrical switches.

A still further object of the invention is the provision of actuating means of simple and compact construction which affords easy and accurate operation of the moving blade structure with relation to the switch jaws in a minimum of space.

These and other objects are attained by the means described herein and exemplified in the accompanying drawings, in which:

Fig. 1 is a top plan view of a switch embodying the invention mounted in a cabinet, part being broken away.

Fig. 2 is a cross-sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a cross-sectional view taken on line 4—4 of Fig. 1, with the switch in closed position.

The invention herein described is adaptable to switches of various kinds wherever compact arrangement or the avoidance of destructive arcing, or both, are desirable, and it is to be understood that the invention shall not be considered as limited to the exact structural details of the present example. As will be hereinafter more fully understood, the invention may be advantageously utilized in the so-called horse power rated switches.

In the illustrated structure a suitable switch cabinet 6 has fixedly mounted on the back wall 7 thereof an insulating base 8 by means of screws 9. The base 8 may be of slate or other suitable insulating material. An insulating barrier 10 is fixed in edgewise relation to the base 8 across the forward face thereof by means of screws 11 which pass into the barrier from the rear of the base. A plurality of switch connector assemblies 12 and 13 are secured to base 8 and the respective complementary parts are disposed on opposite sides of the barrier 10 with the fixed contacts or pairs of switch jaw members thereof aligned and disposed closely adjacent the opposite faces of barrier 10 so that they are effectively insulated from each other although spaced apart only by the thickness of the barrier 10. In the present embodiment there are three wires entering the cabinet; hence three of the switch connector assemblies 12 are mounted in spaced apart relation on one side of barrier 10 and the complementary switch connector assemblies 13 mounted on the other side of said barrier.

Switch connector assembly 12 has two fixed contacts or pairs of jaw members 14—14 suitably fixed in a conductor strip 15. The strip 15 is tapped and is secured to base 8 by a screw 16 entering from the rear of said base and by a bolt 17 which also passes through the base from the rear and passes threadedly through conductor strip 15. A suitable solderless connector 18 has a perforate lug 19 through which the bolt 17 passes, and a nut 20 serves to mount the solderless wire connector on the conductor strip 15. The switch connector assemblies 12 are alike; wherefore, the foregoing description of one will suffice for all.

The switch connector assembly 13 comprises a conductor strip 21 having two fixed contacts or pairs of switch jaw members 22 which are aligned with the switch jaw members 14 but on the opposite side of barrier 10 therefrom. Mounted on top of barrier 10 is an insulating shield 23 which overhands all of the switch jaw members 14 and switch jaw members 22. Slots 24 are provided in that part of shield 23 which overhangs the fixed contacts and each slot is positioned to register with an opening in a fixed contact, that is to say, the space between the pair of jaw members comprising the fixed contact. As can be noted in Figs. 2, 3 and 4, the top edges of jaw members 14 and 22 are but slightly spaced from the lower face of shield 23. As will be noted in Fig. 4, the adjacent top edges in each pair of switch jaw members may be chamfered or otherwise arranged to facilitate entry of the switch blades. Parallel pairs of slots 25 are provided in shield 23 in registry with the spaces between each pair of switch jaws 22.

In order to preclude the possibility of a flashover of the arc below shield 23, a suitable number of baffles 26 of insulating material, such as hard fiber, are mounted alongside the switch connector assemblies wherever they are deemed necessary. As can be seen in Fig. 2, the baffle 26 has a slot 27 of a shape and size to slidably

receive the shield 23 therein. The barrier 10 is slotted transversely, as at 28, to enable the baffle 26 to be seated therein deep enough to extend below the top edge of fixed contacts 14 and 22. By slidably inserting shield 23 into the slots 27 of a selected number of baffles 26 and positioning said baffles for entry into the proper slots 28 in barrier 10, the shield and baffle structure is fixed permanently in place by means of screws 29 which serve to secure the shield 23 to the barrier 10. (See Fig. 2.)

Suitably anchored to base 8 and extending upwardly through shield 23 are guideposts 30, which may be four in number, located intermediate adjacent baffles 26. Metal couplers 31 are slidably mounted on guideposts 30 and an insulating cross-bar 32 is connected to these couplers so that the cross-bar may be moved toward and away from shield 23. The coupler members 31 have transverse slots 33 through which the crank portion 34 of a switch operating member 35 passes. The member 35 is journalled in any desired manner at opposite sides of the cabinet 6, for example by journalling it in suitable holes in the cabinet walls. Member 35 is so mounted as to afford the necessary amount of guided movement of cross-bar 32 within a minimum of space in the cabinet above the shield 23. Stops 350 fixed on the cabinet walls limit the movement of member 35 and the cross-bar and its switch blade assembly are precluded from damaging impact by thus limiting the movement of said operating member. An exteriorly operable handle structure 36 is provided for the operating member 35. A quick make and quick brake mechanism (not shown) may be associated with operating member 35 in a manner well understood in the art.

Fixed on the underside of crossbar 32, beneath each coupler member 31, is a supplemental guide-clip 37 which is slidably mounted on a pair of the guide posts 30. The crossbar is thus kept in parallelism with shield 23 as it is moved by crank 34.

Switch blade members 38 are mounted transversely of crossbar 32, on the lower face thereof. Members 38 are of U-shaped cross-section (see Fig. 3) and the legs 39 thereof are bifurcated or notched as at 40 thus providing spaced, aligned tongues 41 and 42 (see Fig. 2). The blade member 38 thus has a pair of parallel tongues 41 which are movable through a pair of slots 24 in shield 23 on one side of barrier 10, and another pair of tongues 42 which are movable through a pair of slots 25 on the opposite side of said barrier 10. The tongues 41 are respectively received between corresponding pairs of jaw members 14 on the corresponding switch connector assembly 12 beneath the shield and in a corresponding manner the tongues 42 are received between pairs of jaw members 22 on the connector assembly 13. Each member 38 thus provides a four point make and break in the current passing through it.

If so desired, the switch blade members and the cooperating switch connectors may be constructed to provide a greater number of tongues and correspondingly greater number of pairs of switch jaws respectively. In such a construction the desired number of tongues may be set in a common conductor strip in the same manner that the jaw members 14 are embedded in conductor strip 15. In switching the heavier amperages, the current is actually divided simultaneously at a number of points at each blade member so that the possibility of destructive arcing is correspondingly reduced. At the same time the simple and effective arrangement of the barrier, shield and baffles prevents any flashover of such arcing as may occur.

The switch blade members 38 are desirably mounted on crossbar 32 in such manner as to maintain them in transverse relation to the crossbar while permitting a slight lateral rocking of the blades thereon. By so mounting the blades 38, the depending tongues 41 and 42 of one blade are capable of a limited degree of accommodation independently of the tongues on another blade and hence all of the tongues can be easily passed through their respective slots 24 and 25 in the shield even though the slots are formed with limited clearance to further minimize the possibility of any flashing over of an arc between the contact members.

The mounting of the switch blade members is inexpensively effected by means of rivets 43 having the heads thereof countersunk below the top surface of crossbar 32, and the ends passing through holes in the top (or inverted base) of the switch blade members and through square washers 44. The ends of the rivets are peened and burred over the washers as at 45 but the riveted connection is allowed to remain somewhat loose in order to permit the limited lateral rocking of the switch blades on said crossbar.

In the present embodiment the switch connector assemblies 13 carry suitable fuse jaws 46. Complementary fuse connector assemblies 47 are mounted in spaced relation to the switch connector assemblies 13 and are provided with fuse jaws 48. The assemblies 47 are of a construction somewhat similar to the switch connector assemblies 12 in that they are respectively mounted on insulating base 49 by a screw (not shown) and a bolt 50. A nut 500 on bolt 50 secures each solderless wire connector 51 in place. The fuse jaws 46—48 serve to receive blade-ended, cartridge-type fuses 52.

The switch of the invention is subject to modification adapting it to the use of other types of fuses or protective devices in association therewith within the cabinet, or such devices may be eliminated from the interior of the cabinet with a corresponding simplification of structure which will be readily understood by those conversant with the art.

The switch structure is connected into a circuit by bringing the current supply lines 53 into the cabinet 6 through conduit 54 in the cabinet wall and clamping the bared ends of said lines in the solderless connectors 18. The load circuit lines 55 are brought into the opposite end of the cabinet 6 in a similar fashion and are attached by means of the connectors 51.

In operation the crossbar 32 is lifted or lowered by means of the externally disposed handle 36. The four tongues on each switch blade may swing laterally to a limited degree relative to the tongues of the other switch blades to assure easy movement and instantaneous entry of all of the switch blade tongues into the respective switch jaws. The cooperative relation between the current carrying parts and the insulating structure affords long lived service in an unusually compact switching apparatus.

What is claimed is:

1. In a switch structure the combination of an insulating base, an insulating shield above and in spaced relation thereto, groups of electrically connected fixed contacts arranged in spaced rela-

tion on said base below the shield, a barrier extending between certain of said groups of contacts, baffles depending below the shield, transversely of said barrier and between certain of said contacts for a short distance below the tops thereof, the shield having openings coinciding with the location of the fixed contacts, and a plurality of groups of electrically connected bifurcated switch blades having depending tongues adapted to pass through the openings in the shield on opposite sides of the barrier to effect simultaneous multiple make and break of electrical connection between complementary groups of contacts on opposite sides of the barrier.

2. In a switch structure the combination of an insulating base, an insulating barrier projecting from the face of the base, complementary groups of electrically connected fixed contacts on the base against opposite sides of the barrier, a shield mounted over the barrier and extending over said fixed contacts and further having narrow openings therethrough above the respective fixed contacts, and a moving contact assembly comprising bifurcated switch blades for entering the narrow openings in the shield and simultaneously effecting multiple make and break between complementary fixed contacts on opposite sides of the barrier.

3. In a switch structure an insulating base, a shield in spaced relation to the base and having narrow slots therethrough, a moving contact structure comprising electrically connected groups of bifurcated blades forming tongues adapted to pass through the slots of the shield, complementary groups of electrically connected fixed contacts mounted on the base and so located as to receive said tongues as they pass through the slots in the shield, and insulating members between the base and shield separating certain of said complementary groups of fixed contacts from each other.

4. In a switch structure the combination of spaced pairs of switch jaws, a barrier spacing the pairs of jaws, and a floatingly mounted switch blade assembly comprising groups of electrically connected tongues in spaced relation for straddling the barrier and simultaneously entering respective pairs of jaws.

5. In a switch structure the combination of spaced pairs of switch jaws, a barrier filling the space between the pairs of jaws, a shield over the barrier and jaws and having openings over the respective pairs of jaws, and a guided and reciprocably mounted switch blade assembly comprising electrically connected projecting tongues for straddling said barrier and passing through said openings in said shield and electrically connecting certain pairs of said jaws.

6. In a switch structure the combination of an insulating crossbar, slotted coupler members fixed transversely of said bar, a crank member passing through the slots in the coupler members and lengthwise across the face of the crossbar, vertical guides disposed adjacent opposite sides of the cross bar and extending through the extended ends of said coupler members, switch blades connected to said crossbar and adapted for slight, free, relative movement, switch jaws for receiving said blades, and an interposed shield having slots therein to pass the blades and direct them into said jaws.

7. In a switch apparatus, a base, a shield above it and having switch blade receiving openings therein, a barrier connected at opposite edges to said base and shield and having transverse slots in the edge to which the shield is connected, and baffle members seating in the last mentioned slots and furthermore being provided with slots through which the body of said shield passes whereby substantially isolated switch jaw compartments are provided.

8. In a switch the combination of a base, a barrier mounted edgewise thereon, switch jaws on the base and against opposite faces of the barrier, a shield on the barrier closely overhanging said jaws and having restricted slot openings above the jaws, baffles traversing the barrier between certain of the jaws and extending above and below said shield, a crossbar movable toward and away from the shield and adapted to seat on the edges of said baffles above the shield as a stop, switch blades freely depending from the crossbar and having depending tongues for self-alignment with the restricted slot openings in the shield, and means coupled to the cross bar for effecting guided movement of thec rossbar in switch opening and closing movements.

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