Jan. 10, 1933. J. G. PETERSON 1,894,002

ELECTRIC SWITCH

Filed April 11, 1931

Fig. 1.

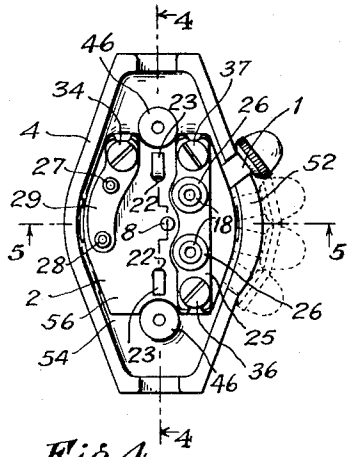


Fig. 2.

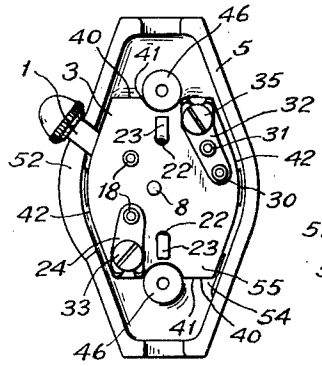


Fig. 3.

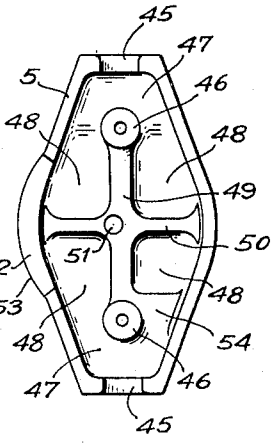


Fig. 4.

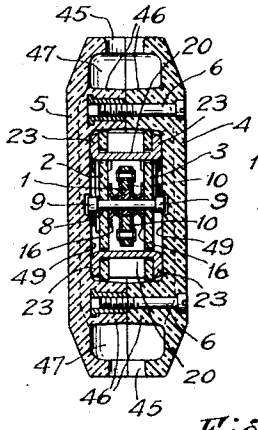


Fig. 5.

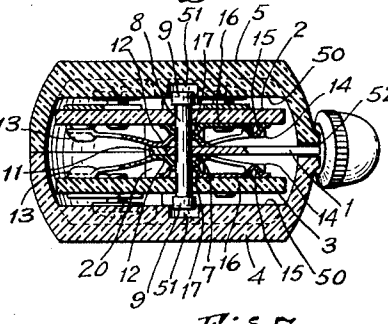


Fig. 6.

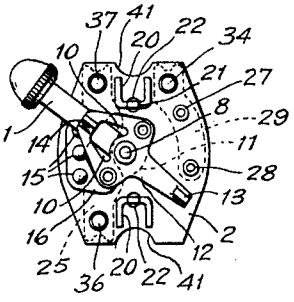


Fig. 9.

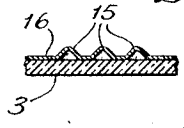


Fig. 7.

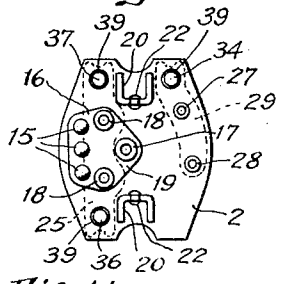


Fig. 8.

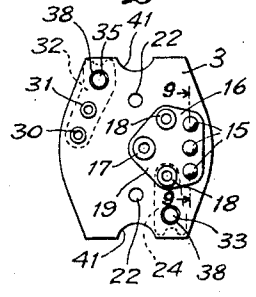


Fig. 10.

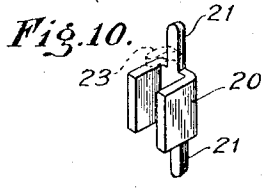
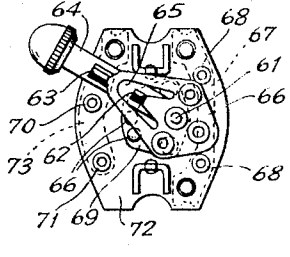


Fig. 11.



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Patented Jan. 10, 1933 1,894,002

UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH

Application filed April 11, 1931. Serial No. 529,510.

My invention relates to electric switches.

It has for its object to provide an improved electric switch, and more particularly an improved switch of the type adapted to use in connection with electric heating pads. Further objects of my invention are to provide such a switch of an improved and more compact construction and arrangement making the same more convenient, and a switch which is further of an improved construction adapted substantially to reduce the cost of manufacture. Still further objects of my invention are to provide such a switch having an improved arrangement and construction of the parts within the switch unit and externally thereof, including improved stationary cam means disposed in a new arrangement and co-operating in a new and improved manner with improved movable cam means, an improved construction of the unit, improved connecting means between the insulating plates of said unit, improved terminal and through connections on said unit, improved connecting means between the same and the cam and switch parts, and improved casing means also enclosing and positioning the unit in a new and effective manner. These and other objects and advantages of my improved construction will, however, hereinafter more fully appear.

In the accompanying drawing I have shown for purposes of illustration two embodiments which my invention may assume in practice.

In this drawing,—

Figure 1 is a plan view of a switch unit constructed in accordance with my improvement and seated in one of its casing members, one casing member being removed to facilitate illustration;

Fig. 2 is a reverse view of the unit shown in Figure 1 and seated in the other casing member;

Fig. 3 is an inside plan view of one of the casing members, with the switch mechanism removed;

Fig. 4 is a longitudinal sectional view of a switch unit assembled in its casing, the section being on line 4—4 of Figure 1;

Fig. 5 is a similar transverse sectional view, the section being on line 5—5 of Figure 1;

Fig. 6 is a plan view of the inside of the unit, one of the insulating plates thereof being removed to facilitate illustration;

Fig. 7 is a plan view of Figure 6, with the swinging cam and contact member also removed, the same showing the opposite side of the unit plate shown in Figure 1;

Fig. 8 is a plan view of the inner side of the unit plate which is removed in Figure 6 and has its exterior shown in Figure 2;

Fig. 9 is a detail sectional view through the stationary cams; the section being on line 9—9 of Figure 8;

Fig. 10 is a detail view of a connecting member with one of its end projections shown in dotted lines in its bent position; and

Fig. 11 is a plan view of a modified construction, one of the unit plates being removed to facilitate illustration.

In the construction shown in Figures 1 to 10, I have shown a switch of the general type described and claimed in my co-pending application, Serial No. 329,570, filed December 31st, 1928, but of an improved construction, hereinafter described, whereby it is possible to produce a more compact and inexpensive structure having the advantages enumerated above, and also others hereinafter more fully brought out.

Generally speaking, the structure herein, as in the above mentioned application, comprises an operating member 1, swinging longitudinally between insulating plates 2 and 3 to change a plurality of circuit connections and occupy the different positions shown in Figure 1, while the switch unit comprising the members 2 and 3 with the switch mechanism therebetween, is also disposed between, and operable to change the several circuits with a quick snap action from the exterior of, casing members 4 and 5. These are in turn connected by suitable means 6 when the line and pad conductors have been connected in a well known manner to binding posts on the opposite ends of the switch unit.

As in my above mentioned application, it will be noted that the actuating member 1 is provided with an aperture 7 in its inner

end through which extends the pivot pin 8 of the switch mechanism. The pin 8 herein, however, is located slightly to the right of the longitudinal center line of the device, as shown in Figure 1, in such manner as to shorten the member 1 slightly, and has usual heads 9 disposed on the opposite sides of the plates 2 and 3. Moreover, it will be noted that as in that application, the inner end of the member 1 is located between and engaged on opposite sides by, the walls of portions 10 on a horizontal body member 11 carrying combined cam and contact members 12 above and below the same and fixed thereto for rotation therewith about the axis of the pin 8. These members 12 each include a resiliently mounted contact member 13 projecting in one direction away from the pivot pin and a resiliently mounted movable cam member 14 extending in the opposite direction from the opposite side of the pin and having a cam of well known peaked type.

In my improved construction, it will be observed that the movable cam 14 which, as usual, is elongated and of uniform cross section throughout, and co-operates with improved stationary cam members 15, herein in the form of conical projections having slightly rounded peaks. It will further be noted that these stationary cams 15 are disposed in alignment longitudinally of the switch unit at one side of the pivot pin 8 and on opposite sides of the movable cam members 14 and actuating member 1 and between the ends of the latter. Thus, it will be observed that as each movable member 14 moves from one end of its travel to the other about its pivot 8, different longitudinally spaced portions of the movable cam successively engage different stationary cam members 15. Thus, while the movable contact member 11 will be successively actuated with a quick or snap action in the desired manner, it will be observed that the wear is distributed over the surface of the movable cam member in an improved manner at the same time that it is made possible to improve and simplify the construction and arrangement of the stationary cams.

Referring more particularly to the stationary cam plates, it will be observed that each set of improved stationary cams 15 is herein, as heretofore, formed on a plate 16 which also carries a bearing member 17 for the pivot pin 8 and is connected at spaced points to one of the plates 2, 3 by suitable connections 18, herein in the form of rivets. Herein, however, it will be noted that the bearing 17 is provided on a projection 19 on the inner end of the plate, while the connections 18 are aligned longitudinally at one side of the bearing 17 and between the latter and the cams 15. Also, the plate 16 is disposed relatively close to the edge of the insulating plate 2 with a straight outer edge spaced only slightly within the edge of the plate 2. Thus it will be noted that at the same time that the construction of each plate 16 is improved and simplified as regards the stationary cams 15, the construction is such as to provide additional space above and below the bearing member 17, while locating the plates 16 and their connections 18 nearer to the edges of the plates 2 and 3.

It also will be noted that improved and simplified connecting means for the insulating plates 2 and 3 are disposed in longitudinal alignment with the bearing 17. As shown, these connecting means are in the form of bent or stamped connecting members 20 of U shape cross section, and herein disposed back to back at opposite ends of a unit between the plates 2 and 3, with the opening of the U toward the adjacent end of the unit. Herein, it will also be observed that the opposite ends of these members 20 rest on the insulating plates 2 and 3 in such manner as to provide a rigid abutment means of substantial area. Moreover, it will be noted that the members 20 are provided with oppositely extending reduced portions 21, forming fingers projecting at each end, which extend through suitable apertures 22 provided in the plates 2, 3 and are bent over on the outside of the plates, as at 23, in a direction toward the adjacent extremity of the unit. Thus, it will be observed that at the same time that a rigid abutment means of ample area is provided, the U portions of the members 20 are so disposed as to provide ample space between the parts, while the plates 2 and 3 and mechanism therebetween are united into a rigid unit by the bent over members 23 on these members 20, and an exceedingly simple and inexpensive connecting means is provided as well as one providing a maximum of usable space on the exterior of the insulating plates.

Attention is here also directed to the improved and simplified terminal and through connections provided herein. By reason of the lateral displacement of the lower connection 18 for the cam plate 16 on the insulating plate 3, it will be observed that it is made possible not only to have this connecting means, herein in the form of a rivet, serve as a connecting means for the plate 16 and one of the terminals, herein indicated at 24, but also to reduce substantially the size of that terminal and enable a simple straight terminal member to be provided. It will also be observed that the connections 18 for the plate 16 on the insulating plate 2 are both utilized herein as a holding means for a through connection 25. The latter herein extends longitudinally of the exterior of the insulating plate 2 and is held in position by the same rivets forming the connections 18 for the plate 16. Also, it will be noted that suitable insulation 26 is provided to insulate

the through connection from the rivets 18 and plate 16.

Herein it will also be observed that in addition to the terminals and the through connection described, the rivets 27 and 28, forming the stationary contacts on the insulating plate 2, act to connect a third terminal plate 29, while the rivets forming stationary contacts 30 and 31 on the insulating plate 3 also serve to connect a fourth terminal plate 32. Attention is also directed to the fact that the various external terminal connections terminate at the extremities of the unit without projecting over the ends thereof, and that the terminal connections 24, 29 and 32 carry binding screws 33, 34 and 35 respectively, while the through connection 25 carries binding screws 36 and 37 at its opposite ends. It will also be noted that the threaded ends of the binding screws 33 and 35 are receivable in diagonally opposite apertures 38 in the insulating plate 3, while the binding screws 34 and 37 are similarly receivable in apertures 39 in one end of the insulating plate 2, and the binding screw 36 is received in a corresponding aperture 39 in the opposite end of that plate.

As regards the unit formed when the insulating plates 2 and 3 are connected together, it will be noted that by reason of my improved arrangement of the parts 16, 20, etc., it is made possible to make this both slenderer and shorter, in such manner as substantially to reduce the size and cost of the same and of the casing enclosing the same. It will further be noted that this unit herein is provided with transversely cut off ends 40 having notches 41 in the center thereof adapted to co-operate with positioning means on the casing, hereinafter described. As shown, the unit is also provided with curved sides 42 which are relatively quite close together throughout their length as compared with my previous construction, and while curved on each side, substantially less round in their side curvature than in my previous construction.

Referring more particularly to the casing, it will be noted that each of the casing members 4 and 5 is of substantially similar construction. More particularly, while not identical, it will be noted that each casing is provided in its ends with top and bottom conductor apertures 45 and with a rounded projection member 46, housing the casing connecting means 6 and adapted to provide a conductor passage 47 extending to each side of the member 46 and leading to the binding posts on the unit, and itself to be received in the cut away portions 41 in each end of the unit to position the latter longitudinally. It will also be observed that each casing is also provided with terminal receiving pockets or chambers 48 at opposite ends of the same. As shown, reinforcing ribs 49, 50 are also raised from the inner surfaces of these pockets, in such manner as to produce a strong construction while enabling a casing to be used which has a very thin wall and is accordingly inexpensive. While various arrangements of ribs may be provided, herein these ribs are disposed perpendicularly to one another in the form of a cross, with the ribs crossing at the axis of the switch and the rib 50 joined to the opposite edges of the casing, and rib 49 joined to the projections 46. Also it will be noted that these ribs not only function to strengthen the shell, but co-operate in positioning the unit laterally in the casing, being engaged by the portions 23, while near the junction of the ribs suitable apertures 51 are also provided therein to receive and locate the turned over ends 9 of the pivot pin 8. Attention is also directed to the fact that each of the casing members is provided with an arcuate slotted portion 52 protruding from one side thereof and so disposed as not only to limit the movement of the actuating member 1, but to extend close to the actuating portion or button of the actuating member 1 throughout the entire travel of the latter, the outer edge 53 of the slot herein being disposed in an arc swung about the axis of the pivot pin 8. It will also be noted that each of the casing members is provided with a shallow shelf portion 54 forming a continuation of the passageway 47 and adjacent the far side of lower projection 46 from the slot 52. Herein, these shelves co-operate to require the assembly of the unit in the casing in a single predetermined relation wherein opposite flat portions 55 and 56 on the outside corners of the insulating plates 3 and 2 engage these shelves, assembly in all other relations being prevented by the presence of one or more terminals and binding posts.

In the operation of my improved construction it will be evident that the circuit connections will be changed successively with quick snap actions as the actuating member is moved in either direction. More particularly, with the actuating member in the "off" position shown in Figure 1, the movable contact will be successively actuated with snap actions by reason of the co-operating movable and stationary cam members 14, 15 to establish successively "low", "medium" and "high" heat positions as the actuating member 1 is moved progressively downward into the several dotted line positions shown in Figure 1, while a similar reverse operation of the member 1 will result in a similar movement of the contact members from "high" to "medium", "low" and "off" positions, all in a usual manner common to switches of this type.

As a result of my improved construction and the new arrangement of the parts shown herein, it will be observed that a simple and compact construction is made possible enabling the switch to be put out in a substan-

tially smaller size than previously possible, while also simplifying and reducing the expense of various parts and enabling the current carrying parts to be spaced adequately from one another in such manner as to produce a safe construction.

More particularly, the disposition of the terminal and through connections is such as to be exceedingly convenient and accessible, while only four terminal members are required and an outside through connection is provided, as distinguished from five terminal members and the inside through connection of my previous construction. Moreover, through distributing the wear on the movable cam member, it is made possible to increase the life thereof while also simplifying the stationary cam construction. The improved connections for the plates 16 also enable the terminals and their connections to be of more inexpensive construction. The improved structure and arrangement of the connecting means between the plates 2 and 3 and the disposition of the other parts relative thereto on the plates is also such as to produce an exceedingly compact and inexpensive unit construction adapted to be quickly and inexpensively assembled. Moreover, it will be noted that I have improved and simplified the casing construction in such manner as to reduce the amount of material required therein and the consequent expense thereof, while still providing a strong construction definitely locating the unit against longitudinal and lateral movement therein and facilitating assembly in the correct manner. These and other advantages of my improved construction will, however, be apparent to those skilled in the art.

In Figure 11 I have shown a modified unit construction utilizing certain of the features and parts of the structure heretofore described, and which, while not preferred, may be used if desired. In this construction, which is shown with one insulating plate removed, it will be observed that I provide a combined contact and cam member 60 disposed on a pivot 61 displaced further laterally relative to the longitudinal center line of the device and on the opposite side of the longitudinal center line. This member 60 also has a resilient movable cam member 62 and a resilient contact member 63 both extending from the same side of the pivot 61 toward the free end of the actuating member 64, the member 62 being substantially wedge shaped with its cam at its apex and the member 63 being of substantially V shape and spaced therefrom by a suitable opening 65. In this construction it will also be observed that, as distinguished from in a straight line, the stationary cams 66 are disposed in an arc about the axis 61, and that an external through connection 67 is provided which is connected by rivets 68 independent of the connections for the plate 69 carrying the stationary cam 66. Also, it will be evident that the contacts 70 and 71 on the insulating base 72 carrying the through connection are so disposed as to require a longer terminal connection 73, and that a similar elongated terminal connection (not shown) will be required for the other contacts carried on the other insulating plate (not shown).

It will be understood that, while in both of these illustrative constructions I have shown a mechanism dependent for its snap action on the cams and the resilient mounting of the movable cam, I also contemplate the use when desired of a supplementary spring tensioned by the actuating member and, such for example, as is carried by the body between the two combined cam and contact members and described and claimed in my co-pending application mentioned above.

While I have in this application specifically described two embodiments which my invention may assume in practice, it will be understood that these forms of the same are shown for purposes of illustration and that the invention may be modified and embodied in other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:—

1. In a switch, stationary and movable contact members, and actuating means for said movable contact having a series of aligned stationary cams and a resiliently mounted cam successively engageable therewith.

2. In a switch, stationary and movable contact members, and actuating means for said movable contact having a series of aligned stationary cams and a resiliently mounted cam successively engageable therewith, said cam being pivoted at one side of said cams midway between the ends therof.

3. In a switch, stationary and movable contact members, and actuating means for said movable contact having a series of aligned stationary cams and a resiliently mounted cam successively engageable therewith, said cam being pivoted at one side of said cams midway between the ends thereof and said movable contact being movable about the same pivot and extending in the opposite direction from said cam.

4. In a switch having stationary and movable contact members and a pivoted actuating member, a resiliently mounted movable cam member movable in an arc and actuated by said actuating member and actuating the movable contact member, and a series of cooperating stationary cam members successively engaged by longitudinally spaced portions of said movable cam member as the latter moves in its arc.

5. In a switch, stationary and movable contact members, and actuating mechanism

for the movable contact member comprising a resiliently mounted movable cam member movable in an arc and having an elongated peaked cam and a series of co-operating stationary cam members disposed in alignment and having rounded tops successively engaged by longitudinally spaced portions of said movable cam.

6. In a switch having stationary and movable contact members and a pivoted actuating member, a resiliently mounted movable cam member movable in an arc and actuated by said actuating member and actuating the movable contact member, and a series of co-operating stationary cam members disposed in alignment and successively engaged by said movable cam member.

7. In a switch, insulating members, switch mechanism therebetween movable about an axis between the ends of said insulating members and having actuating means including a resiliently mounted movable cam member, a series of co-operating stationary cams between said members disposed and connected to one of the same at one side of the longitudinal center line of said members, and connecting means between said insulating members.

8. In a switch, insulating members, switch mechanism therebetween movable about an axis between the ends of said insulating members and having actuating means including a resiliently mounted movable cam member, a series of co-operating stationary cams between said insulating members disposed in alignment on and connected to one of said insulating members at one side of the longitudinal center line of said members, and connecting means between said insulating members.

9. In a switch, operatively connected spaced insulating members, switch mechanism therebetween movable about an axis between the ends of said insulating members and having a resiliently mounted movable cam member, and a co-operating stationary cam carrying plate fixed to one of said insulating members at one side of the longitudinal center line of said members and having its cams on the same side of said center line.

10. In a switch, insulating members, switch mechanism therebetween movable about an axis between the ends of said insulating members and having a resiliently mounted movable cam member, a co-operating stationary cam carrying plate both fixed to one of said insulating members and having its cams, on the same side of the longitudinal center line of said members, and means for connecting said insulating members adjacent said axis and in alignment with said center line.

11. In a switch, insulating members, switch mechanism therebetween movable about an axis between the ends of said insulating members and having a resiliently mounted movable cam member, a co-operating stationary cam carrying plate carried by one of said insulating members and having connections fixing said plate to said member at one side of the longitudinal center line of said members, and a plurality of terminal connections carried on said insulating members having certain of the same connected thereto by said connections for said plate.

12. In a switch, insulating members, switch mechanism therebetween movable about an axis between the ends of said insulating members and having a resiliently mounted movable cam member, a co-operating stationary cam carrying plate carried by one of said insulating members and having connecting means connecting said plate to said member, and a plurality of terminal connections carried on said insulating members including a through connection connected to said member by said plate connecting means.

13. In a switch, insulating members having stationary and movable contact members therebetween, actuating mechanism for the movable contact member comprising a resiliently mounted movable cam member electrically connected to said movable contact member and a co-operating stationary cam carrying plate engageable by said movable cam member, means for connecting said plate to one of said insulating members, a plurality of terminal connections carried on said insulating members including a through connection connected to said insulating member by said plate connecting means, and means for insulating said through connection from said connecting means.

14. In a switch, a plurality of insulating plates, switch mechanism therebetween movable about an axis between the ends thereof, and connecting members also therebetween and on opposite sides of said axis, each having a projecting finger extending through each plate and bent over on the outer surface thereof.

15. In a switch, a plurality of insulating plates, switch mechanism therebetween movable about an axis between the ends thereof, and connecting means also therebetween and on opposite sides of said axis, said connecting means including U-shaped members disposed with their closed portions toward said switch mechanism.

16. In a switch, a plurality of insulating plates, switch mechanism therebetween movable about an axis between the ends thereof, and connecting means also therebetween and on opposite sides of said axis, said connecting means including U-shaped members disposed with their closed portions toward said switch mechanism and having fingers projecting through said plates.

17. In a switch, a plurality of insulating members, terminal connections on the exterior thereof, switch mechanism between said members and connected to said terminal connections, and means for connecting said plates longitudinally spaced from said switch mechanism having connecting portions extending through each plate and substantially coincident with the longitudinal center line thereof.

18. In a switch, a plurality of insulating members, terminal connections on the exterior thereof, switch mechanism between said members and connected to said terminal connections, and means for connecting said plates longitudinally spaced from said switch mechanism having connecting portions extending through each plate and substantially coincident with the longitudinal center line thereof, said terminal members carrying binding posts and having the latter disposed within the longitudinal limits of said plates while laterally spaced from said portions.

19. In a switch, a plurality of insulating plates, switch mechanism therebetween movable about an axis between the ends thereof, combined spacing and connecting members therebetween substantially in the longitudinal center line of said plates and on opposite sides of said axis, each having reduced projecting portions on the outer surfaces of said plates, and terminal connections on the outer surfaces of said plates connected to said switch mechanism and adjacent said portions.

20. In a switch, a plurality of insulating plates, switch mechanism therebetween movable about an axis between the ends thereof, combined spacing and connecting members therebetween substantially in the longitudinal center line of said plates and on opposite sides of said axis, each having reduced projecting portions on the outer surfaces of said plates, terminal connections on the outer surfaces of said plates connected to said switch mechanism and adjacent said portions, and a through connection on the outer surface of one plate on the opposite side of said portions from one of said terminals, said terminals and through connection carrying binding posts disposed within the longitudinal limits of said plates.

21. In combination, a plurality of insulating plates, a stationary cam carrying plate on the inner surface of one of the same having connecting means at one side of the longitudinal center line thereof, switch mechanism pivotally mounted between the ends of said insulating plates having a resiliently mounted movable cam member co-operating with said cam plate, and connecting means for said plates disposed in the longitudinal center line of said plates.

22. In combination, a plurality of insulating plates, a cam plate having a series of stationary cams closely adjacent the outer edge of one of said plates, connecting means connecting said cam plate to one of said insulating plates at one side of the longitudinal center line of the latter, switch mechanism between said insulating plates having a co-operating resiliently mounted movable cam, and connecting means for said insulating plates in the longitudinal center line thereof.

23. In combination, a plurality of insulating plates, a stationary cam carrying plate, connecting means connecting it to one of said insulating plates, switch mechanism between said plates having movable contact means and a co-operating resiliently mounted movable cam, connecting means for said insulating plates, stationary contacts carried by said insulating plates, and terminal connections on the exterior of said insulating plates and connected thereto by connections for said cam plate and said stationary contacts.

24. In combination, a plurality of insulating members, a plurality of stationary cam carrying plates therebetween, connecting means for connecting said cam carrying plates to different insulating plates, switch mechanism between said insulating members having movable contact means and co-operating resiliently mounted movable cams co-operating with said cam carrying plates and operative to actuate said movable contact means, connecting means for said insulating members, stationary contacts carried by said insulating members, and terminal and through connections on the exterior of said insulating plates connected thereto by the connections for said cam plates and said stationary contacts.

25. In combination, a casing comprising a plurality of casing members presenting switch chamber means therebetween and having re-enforcing rib means on the interior thereof, and a switch unit in said casing positioned by said rib means and operable from the exterior of said casing.

26. In combination, a casing comprising a plurality of casing members having re-enforcing ribs on the interior thereof, and a switch unit in said casing positioned by said ribs and operable from the exterior of said casing, said ribs providing terminal apertures and said switch unit carrying terminals disposed in said apertures.

27. In combination, a casing comprising a plurality of casing members having re-enforcing ribs on the interior thereof, a switch unit in said casing positioned by said ribs and operable from the exterior of said casing, and means on the interior of said casing members for requiring assembly of said unit in a predetermined position in said casing.

28. In combination, a casing comprising a plurality of casing members having re-enforcing ribs on the interior thereof, and a switch unit in said casing positioned by said

ribs and operable from the exterior of said casing, said ribs comprising longitudinal and transverse re-enforcing ribs.

29. In combination, a casing comprising a plurality of casing members having re-enforcing ribs on the interior thereof, a switch unit in said casing positioned by said ribs and operable from the exterior of said casing, and unit locating projections at the opposite ends of certain of said ribs.

30. In combination, a casing comprising a plurality of casing members having re-enforcing ribs on the interior thereof, and a switch unit in said casing positioned by said ribs and operable from the exterior of said casing, unit locating projections at the opposite ends of certain of said ribs, and unit locating shelves adjacent certain of said projections.

31. In combination, a casing comprising a plurality of casing members and presenting a longitudinally extending slot, a switch mechanism disposed between said casing members having a projecting actuating member movable in said slot about a pivot in said casing spaced from the longitudinal center line of said casing toward the projecting end of said pivoted member, and means on said casing forming the outer wall of said casing slot and disposed in an arc struck from said pivot.

32. In a switch, a plurality of operatively connected insulating members carrying terminals and stationary contacts, switch mechanism therebetween having movable contact means, an actuating member movable about an axis between the ends of said insulating members at one side of the longitudinal center line thereof, a resiliently mounted movable cam member disposed coaxially with said movable contact means, a series of co-operating stationary cams successively engageable by said movable cam member and having said cams disposed wholly at one side of said center line, and connecting means for connecting said stationary cams to one of said insulating members disposed between said axis and said stationary cams.

33. In combination, a plurality of insulating members, connecting means therebetween, switch mechanism between said members having a plurality of movable contact means and a plurality of co-operating resiliently mounted movable cams, stationary cam plates having connections to said insulating members and each co-operating with a different movable cam, stationary contacts having connections to said insulating members and co-operating with different movable contact means, a terminal on the exterior of each insulating member connected thereto by the connections of said stationary contacts, a second terminal on one of said insulating members connected thereto by a connecting means for one of said cam plates, and a through connection on one of said insulating members connected thereto by and insulated from the connecting means for the other cam plate.

In testimony whereof I affix my signature.

JOHANN G. PETERSON.