March 1, 1938. G. H. HART 2,109,725

ELECTRIC SWITCH

Filed July 3, 1934 3 Sheets-Sheet 1

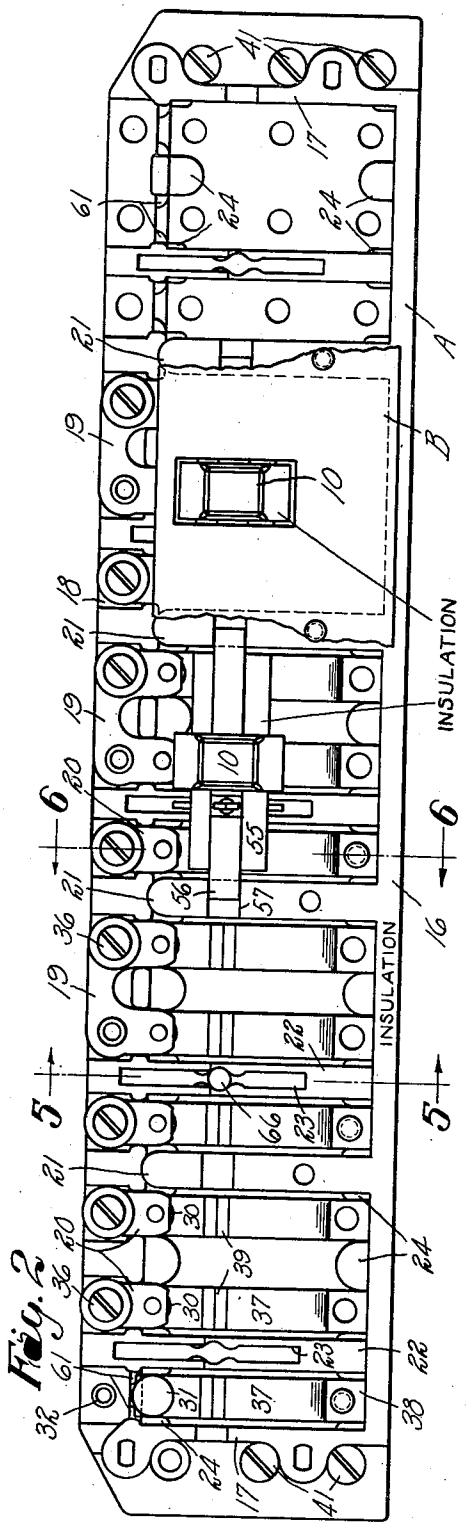


Fig. 2

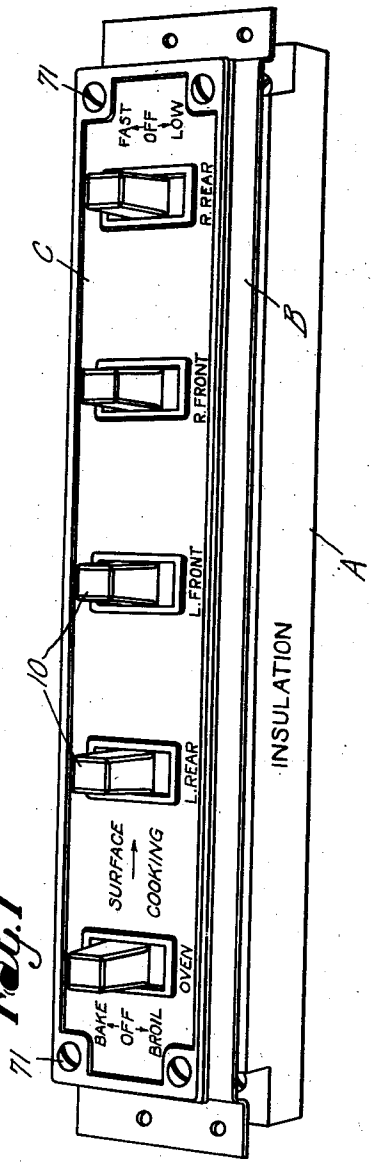


Fig. 1

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Fig. 3

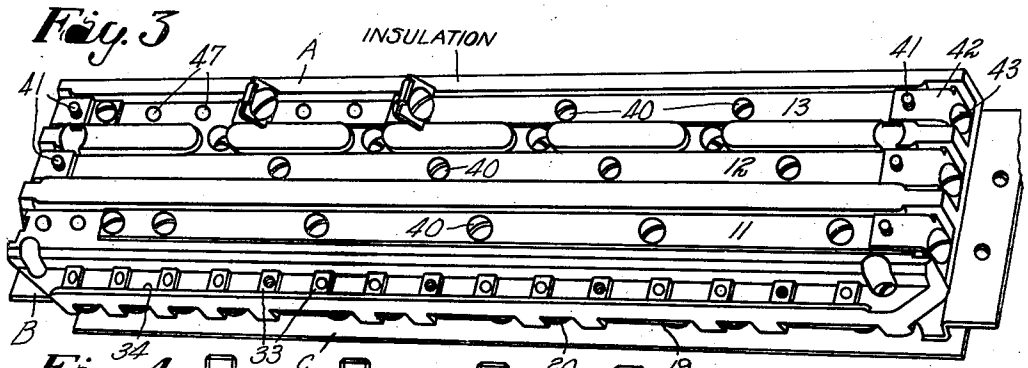


Fig. 4

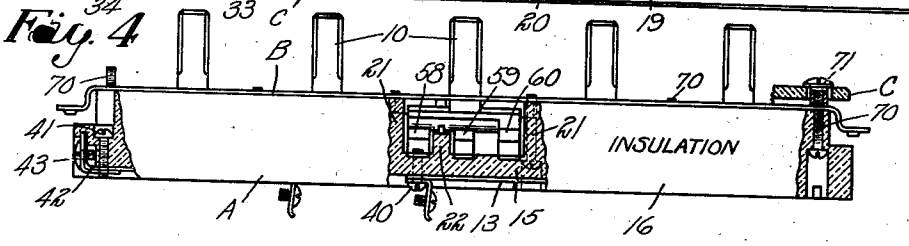


Fig. 5

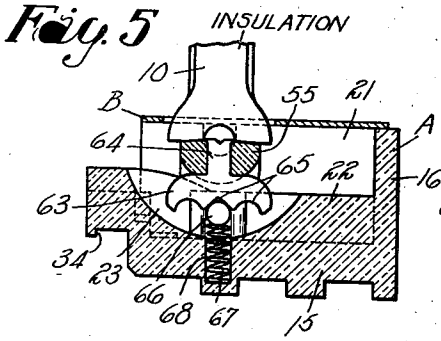


Fig. 6

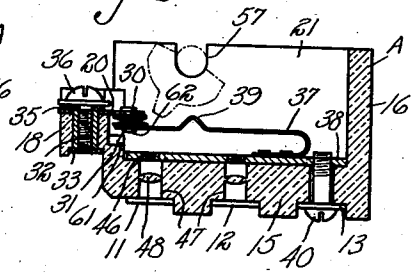


Fig. 8

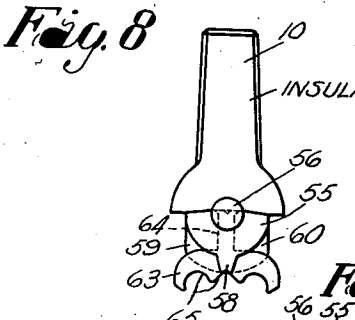


Fig. 9

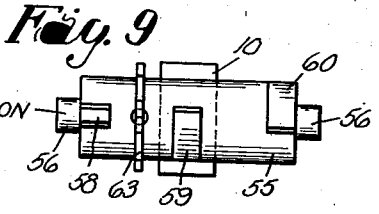
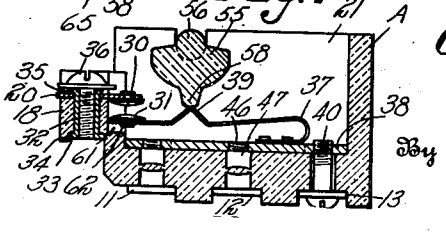


Fig. 7



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ELECTRIC SWITCH

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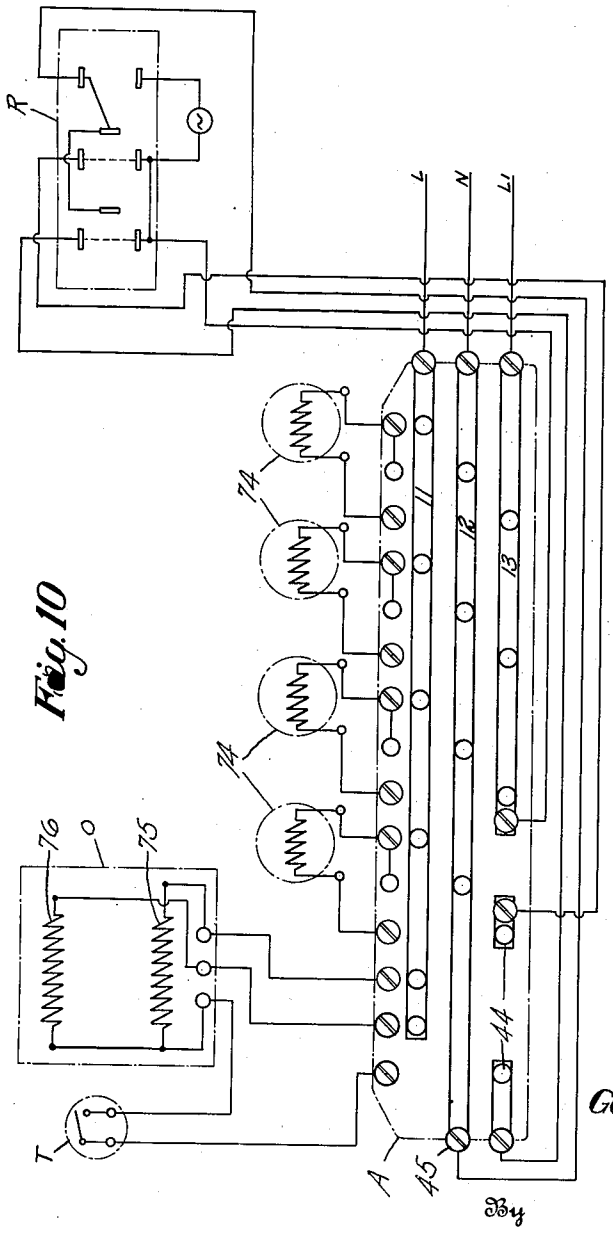


Fig. 10

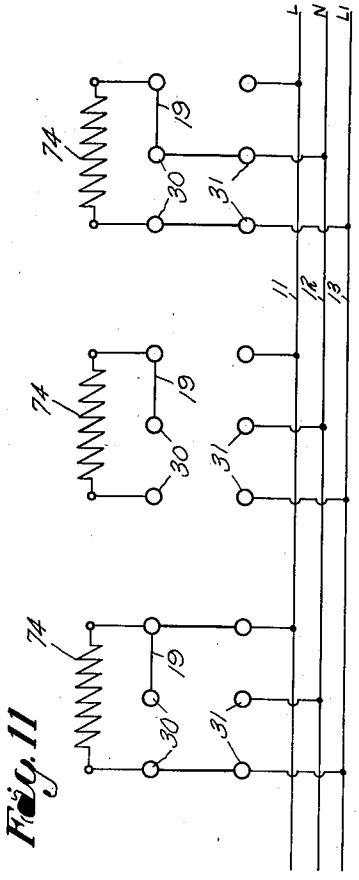


Fig. 11

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Patented Mar. 1, 1938 2,109,725

UNITED STATES PATENT OFFICE

2,109,725

ELECTRIC SWITCH

George Hegeman Hart, West Hartford, Conn.

Application July 3, 1934, Serial No. 733,649

5 Claims. (Cl. 175—369)

This invention relates generally to electric switches, and particularly to an improved arrangement of switches for use in connection with electric ranges and the like.

The aim of the present invention is to provide an improved electric switch mechanism having various features of novelty and advantage and which is particularly characterized by its extreme simplicity in construction, its economy in manufacture, its compactness in arrangement, its effectiveness in operation, its durability, and by the ease and facility with which the same may be installed and connected up to suit requirements.

Other objects will be in part obvious, and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawings, wherein is shown, for illustrative purposes, one of the embodiments which the present invention may take,

Fig. 1 is a perspective view of the complete assembly looking generally at the front thereof;

Fig. 2 is a front view of the base with the parts of the several switches shown in various stages of assembly thereon;

Fig. 3 is a perspective view looking at the rear end of the assembly;

Fig. 4 is a bottom view of the assembly, portions of the base being broken away;

Fig. 5 is a view taken substantially on line 5—5 of Fig. 2 and shows one of the indexing assemblies;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 2 and shows a contact arm assembly upon the base;

Fig. 7 is a view similar to Fig. 6 but illustrating the switch arm in open position;

Fig. 8 is an end view of one of the operating members;

Fig. 9 is a view looking at the rear end of one of the operating members;

Fig. 10 is a diagrammatic view showing, for illustrative purposes, my improved switching arrangement connected up to various instrumentalities of a range, the connections and bus bars being shown as viewed from the front of the switch; and

Fig. 11 is a schematic view showing the three positions of one of the switches in connection with a hot plate of a range.

Referring to the drawings in detail, A designates generally a base on which the several switches (in the present instance five) are mounted, B designates a shield or cap plate preferably formed of metal, and C designates a front panel bearing suitable indicia designating the several positions of the switches and the various heating elements of the range adapted to be controlled. Each switch, as hereinafter described in detail, has three contact arms and a pivoted operating member for controlling these arms. Each of the operating members has a handle 10 extending through suitable openings in the shield and front panel. On the rear face of the base are three bus bars 11, 12, and 13 adapted to be connected to the several line wires.

The base A is preferably made of bakelite, or other suitable moldable material. It has a rear wall 15 and a bottom wall 16, and end walls 17 extending forwardly from the rear wall. It also has a top wall 18 suitably grooved so as to receive the load terminals 19 and 20. The space within the base is divided into a plurality of compartments or chambers (in the present instance five in number) by vertically extending transversely spaced apart partitions 21 the front edges of which are flush with the front edges of the bottom wall 16 and end walls 17. Within each of the compartments or chambers is a vertical web 22 suitably slotted, as at 23, so as to accommodate the handle indexing means, as hereinafter described more in detail. On the rear wall are integral bosses 24 for properly locating the several supporting strips to which the contact arms are secured.

In the present illustrative disclosure, each of the switches is provided with three fixed contacts 30 and three movable contacts 31. These contacts are in the form of buttons of silver or other similar metal which will not be appreciably damaged by arcing during the making and breaking of the electrical circuit. In each of the switches, except the left-hand one, referring to Fig. 2, two of the fixed contacts are carried by a U-shaped load terminal plate 19, and the other fixed contact by a terminal plate 20. In the left-hand switch, each of the fixed contacts is carried by an independent terminal plate 20. It will be understood that other arrangements may be adopted without departing from the spirit of the invention. The load terminal plates may be secured in place on the top wall of the base by hollow internally threaded retaining studs 32, the rear ends of which have square heads 33 fitting in a groove 34 in the rear face of the base. The forward ends of the studs extend through openings in the terminal plates, and these ends are peened or staked, as indicated at 35. The wires leading to the several heating elements may be connected to the terminals by screws 36, the stems of which are threaded into the studs 32.

Each of the movable contacts 31 is carried by a respective contact arm 37 which, in the present illustrative disclosure, is in the form of a thin

resilient metal strip, one end of which is turned back upon itself and anchored by rivets or welding to a supporting strip 38. The supporting strips have their opposite ends located between the bosses 24 so that the strips are held against movement in the plane of the strips. The contacts 31 are suitably secured to the contact arms 37 adjacent the free ends of the latter, and each of these contact arms is provided between its ends with a forwardly extending hump or bend 39 with which a respective cam of the operating member is adapted to cooperate. The contact arm supporting strips 38, for the most part, are selectively connected to the bus bars 11, 12, and 13 by screws 40. The bus bars are mounted in suitable grooves in the rear face of the base and are secured in place by screws 41. Each bus bar is provided at one end with a line terminal 42 of right angular shape and having one arm overlying the end of a bus bar and secured in place by the screw 41. The other arm of each line terminal is located in an end wall of the base and is provided with a screw 43 for securing the line thereto. With this arrangement, it will be seen that the means for connecting the lines to the bus bars is located at the end of the base where access may be readily had thereto, thus greatly facilitating making the connections. In the arrangement shown in Fig. 10, the bus bars 11 and 12 are shown as being common to all of the switches while the bus bar 13 is shown as being common to the three right-hand switches. Each of the two left-hand switches is shown as having a separate terminal 44 adapted to be associated with a receptacle R, as illustrated. The left-hand end of the neutral bus bar 12 may also have a terminal 45 connected with the receptacle.

In order that each of the strips 38 may be connected to any desired bus bars, depending upon the required wiring connections to the several heating units, each of the strips is provided with three threaded openings 46 respectively positioned in front of the bus bars, and the base is provided with partially formed openings 47 adapted to respectively register with the openings 46. These openings 47 are provided, between their ends, with integral barriers or partitions 48 which may be readily removed by breaking them away by applying a tool, such as a screw driver, to the barrier and then giving the tool a sharp tap. It will be seen that with this arrangement each strip 38 may be connected to any one of the desired bus bars by merely breaking out the frangible barrier in the selected opening 47 and then passing the screw 40 through that opening and screwing it into the registering opening 46. Short circuiting between the strip and the other two bus bars through the other opening 47 is prevented by the barriers 48 in those openings. Thus the manufacturer or supplier may, from the same stock of bases and contact arm assemblies, build up switches to suit various requirements.

Referring now to the operating members for the several switches, each of these comprises, as most clearly shown in Figs. 8 and 9, a body portion 55 and a handle 10 preferably molded of insulating material in one integral piece. Extending from the opposite ends of the body portion are integral trunnions 56 adapted to seat in notches or bearings 57 provided in the forward edges of the partitions 21 and the end walls 17 so that the operating member may be rocked to its several positions. Integrally molded on the body portion 55 are three cams 58, 59, and 60 adapted to respectively cooperate with the three contact arms of the particular switch. The cam 58 is relatively short and is adapted to engage and depress the left-hand contact arm when the operating member is in the "mid" or "off" position shown in Fig. 5. The cam 59 has its lower end transversely aligned with the cam 58 and extends upwardly, while the cam 60 has its upper end transversely aligned with the cam 58 and extends downwardly. The circumferential surface of each cam is generally concentric to the axis about which the operating member is swung. In order to limit the extent of opening movement of each contact arm upon operation of the operating member and thus prevent the arc from being drawn out to such extent as to cause damage to the contact points, there is provided on the base, behind the free end of each contact arm, a stop or abutment 61 which may be notched to accommodate the rivet 62 by which the movable contact is secured to the arm 37. With the arrangement of cams described, it will be observed that when the operating member is in its central or "mid" position, the cams 58, 59, and 60 engage the respective bumps 39 on the three contact arms so that all of the contacts are broken and the switch is in "off" position. When the operating member is swung to one extreme position, the cams 58 and 60 are out of engagement with the two respective contact arms so the circuit is closed through those arms, and the cam 56 is holding its contact arm open. In the other extreme position of the operating member, the cam 60 is holding its contact arm open and the other two contact arms are in closed position. It is important to note that, while the extent of opening movement of the contact arms is limited by the abutments 61 in order to prevent excessive arcing, injury to the arms upon operation of the operating member is avoided. When any one of the cams is brought into engagement with a hump of the respective switch arm, the arm is forced back until its free end engages the abutments 61 and then the arm will continue to flex between its ends until the circumferential surface of the cam engages the high point of the hump, and thereafter there is no further flexing of the arm.

Each of the operating members is provided with indexing means for holding it in its several positions. In the present instance, the indexing means comprises a metallic member or plate 63 having a stem 64 extending through and anchored in the body portion of the operating member. The rear edge of this plate has three notches 65 adapted to selectively receive a ball 66 behind which is a spring 67. The plate 63 is accommodated by the slot 23 in the previously described web 22. The spring is located in a bore 68 in the base, and the ball is guided by complementary grooves 69 in the side walls of the slot 23.

The trunnions of the operating members are held in the seats 57 by the shield or cap plate B which is secured in place by the screws 70. The plate is provided with rectangular openings for accommodating the handles of the operating members. The front panel C is positioned upon the shield and is secured in place by screws 71.

Quite obviously, the several switches embodied in my improved arrangement may be connected up to the various heating instrumentalities of a range in any suitable manner, it having been observed that provision is made for selectively connecting the several contact arms to the several bus bars in order that various requirements of

the trade may be met from the same supply of bases and contact arm assemblies. However, in Fig. 10, I have shown, for illustrative purposes, one manner in which the several switches may be connected up to the heating elements of the range and also the receptacle B. In this figure, the four right-hand switches are shown as being respectively associated with four hot plate units 74, and the left-hand switch is associated with the heating elements within an oven O. The heating elements 75 and 76 may be a bake unit and a broil unit, for example. T designates a thermostat associated with these units. In Fig. 11, I have shown, in a schematic manner, the connections between one hot plate and its respective switch in the three positions of the switch.

From the foregoing description, taken in connection with the accompanying drawings, it will be observed that I provide a unit arrangement having a single base on which all of the parts are mounted and that the assembly may be easily mounted as a unit on the range. The load terminals are arranged along one edge of the base so that the connections to the several heating units may be easily made, and the line terminals are located at the end of the base where ready access may be had thereto. By providing the several openings 46 in the contact arm supporting strips and the openings 47 in the base, any desired combination of connections may be easily had to suit requirements. Owing to the arrangement of the contact arms and the cams, the extent of opening movement of the arms may be limited to avoid arcing while, at the same time, injury to the arms, due to straining thereof when engaged by the cams, is avoided. My improved arrangement comprises but a relatively few number of parts each of which may be economically manufactured, and the several parts may be assembled with facility, all of which result in a very simple, compact, and economical construction.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim as my invention:

1. In a switch of the character described, a base having a chamber provided with a wall at each side, the forward edges of said walls being provided with notches, a plurality of contact arms within said chamber and provided with movable contacts, a plurality of fixed contacts on the base arranged to respectively cooperate with said movable contacts, an operating member having a body portion provided at opposite ends with trunnions seated for rotary movement in said notches, said operating member also having a plurality of spaced apart cams adapted to respectively engage said arms for moving said contacts away from each other, said supporting member also having a handle, and a cover plate for said base closing said notches and holding the trunnions therein, said cover plate having an opening for accommodating said handle.

2. In a switch of the character described, an operating member comprising an integrally formed insulating member having a body portion provided at its opposite ends with trunnions, spaced apart cams on said body portion for operating contact arms, and a handle projecting from said body portion.

3. In a switch of the character described, a base having a chamber provided with a wall at each side the forward edges of said walls being provided with notches, a plurality of contact arms within said chamber and provided with movable contacts, a plurality of fixed contacts on the base arranged to respectively cooperate with said movable contacts, an operating member having a body portion provided at its opposite ends with trunnions seated for rotary movement in said notches, said operating member also having a plurality of spaced apart cams adapted to respectively engage said arms for moving said contacts away from each other, said operating member also having a handle, an index member secured to and extending rearwardly of said operating member and having notches in its rear edge, a spring mounted in a bore in said base behind said index member, a ball on the forward end of said spring adapted to engage the notched edge of said member, and a cover plate for said base closing said notches in said walls and holding the trunnions therein.

4. In a switch of the character described, a base having a bottom wall, side walls and end walls, a wall extending between the side wall and dividing the base into compartments, a plurality of fixed contacts mounted in each compartment, movable contacts in each compartment and respectively engageable with the fixed contacts to open and close circuits, an operating member journalled in each compartment and provided with cam means to control the opening and closing of said contacts, a handle on each operating member outside of said base, and a cover plate securing all of said members in operating position and common to and covering said compartments.

5. In a switch of the character described, an elongated insulating base having spaced side walls and end walls interconnected by a bottom wall and divided into a series of compartments by intervening walls extending between said side walls, a plurality of fixed contact members mounted within each compartment, a plurality of spring contact arms within each compartment respectively engageable with said fixed contacts and normally lying out of contact therewith, an operating member pivotally supported within each compartment, a plurality of spaced insulated cam portions on each operating member, and a control handle on each of said members located out of said compartments, said cams being adapted to move the switch arms into open and closed positions, and a cover plate having a series of apertures respectively receiving outwardly extending portions of said operating members and serving to maintain said members in operating positions.

GEORGE HEGEMAN HART.