June 14, 1938. E. E. FORSTROM 2,120,424

ELECTRIC SWITCH

Filed July 13, 1935

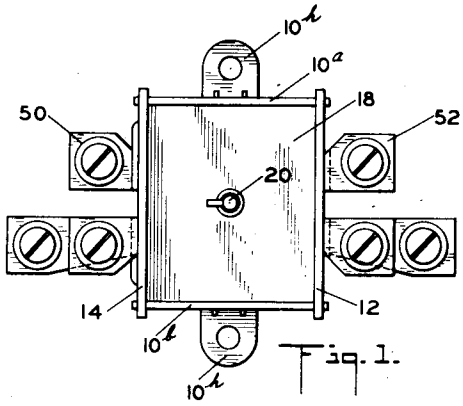


Fig. 1.

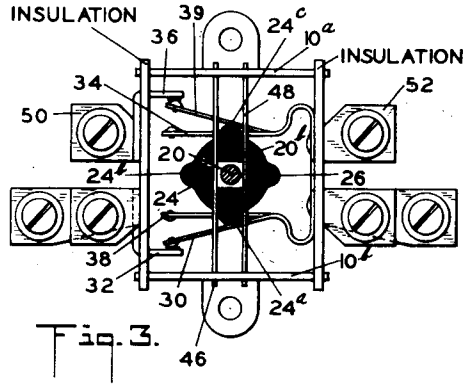


Fig. 3.

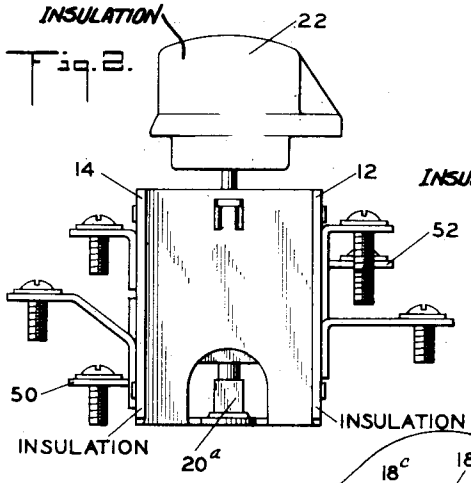


Fig. 2.

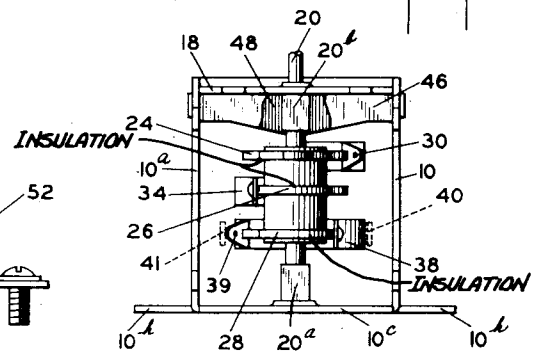


Fig. 4.

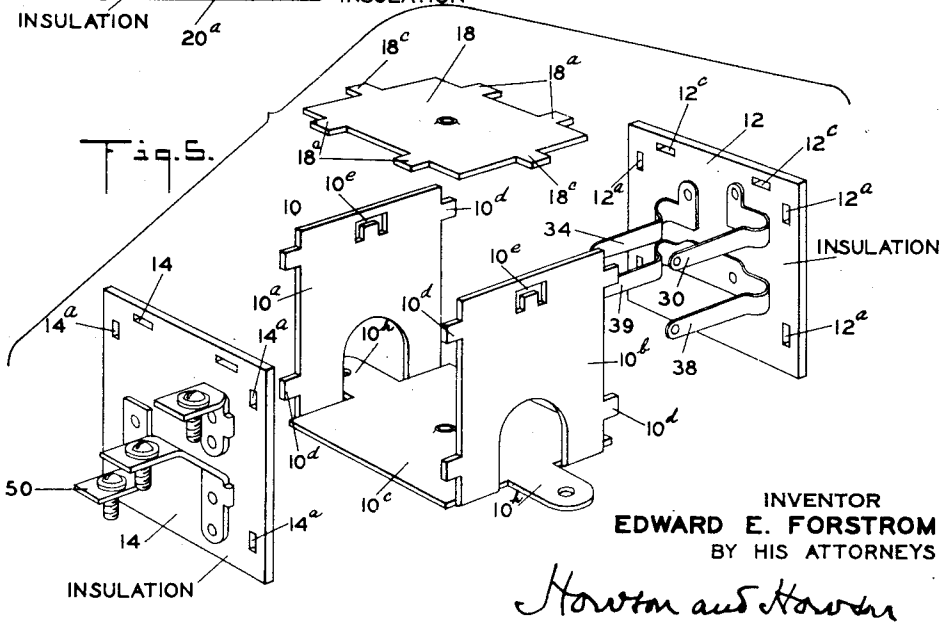


Fig. 5.

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ELECTRIC SWITCH

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9 Claims. (Cl. 200—6)

This invention relates to electric switches. More particularly it relates to multi-contact rotary electric switches in which the movable contacts are operated by cams to cause these movable contacts to engage with fixed contacts. This invention also relates to casings for electric switches in which the parts are mounted upon the walls of the casing.

It is an object of my invention to provide an improved electric switch in which the contacts are operated by cams and are readily subject to variation in number and position in the early stages of manufacture whereby the final construction of the switch may be determined to suit the requirements of particular usage at an intermediate stage of manufacture.

Another object of my invention is to provide an electric switch in which the contacts are mounted upon the side walls of the switch casing so that a wall and its set of contacts may be assembled and secured in position as a unit to decrease the time taken for the manufacture and to decrease the expense of manufacture of the switch.

Another object of my invention is to provide a switch construction in which conducting parts are all mounted upon a pair of parallel insulated plates that are securable to opposite sides of a main metallic casing member, whereby the number and position of the contacts may be varied to suit the requirements of different circuits in which the switch might be used, without the necessity of changing the principles of construction of the switch operating mechanism, or the main metallic casing member.

Another object of my invention is to provide a switch of the above type which is economical to manufacture and assemble and in which the minor details of construction may be varied readily in order to adapt the switch for use in various types of circuits without the necessity of redesigning the whole switch.

Another object of my invention is to provide a switch of the above type which is adapted for surface mounting or may be adapted for flush mounting. In pursuance of this object it is a further object of my invention to provide an operating mechanism which may be mounted in the switch casing in inverted position so that the casing may be inverted when the switch is to be adapted for flush mounting.

Other objects and advantages of my invention will become apparent as it is described in connection with the accompanying drawing.

In the drawing:—

Figure 1 is a plan view of a switch constructed according to the principles of my invention, but with the handle removed for the sake of clearness.

Figure 2 is a side elevation view of the switch shown in Figure 1.

Figure 3 is a plan view of the switch interior as seen when the cover plate and handle of the switch are removed.

Figure 4 is an elevation view of the interior of the switch as viewed when one of the insulating side walls is removed.

Figure 5 is an exploded perspective view of the switch casing showing more clearly the constructional details of the casing parts.

Referring to the drawing the switch casing comprises four members. The main casing member, or frame, designated generally by the numeral 10, is an integral metal stamping of U-shape having parallel side walls 10*a* and 10*b* joined together by a bottom connecting wall 10*c*.

The second and third members of the switch casing are parallel side walls 12 and 14 which may be made of sheet insulation. These side walls 12 and 14 are secured to the opposite side edges of the frame 10 by lugs 10*d* formed along the side edges of the side walls 10*a* and 10*b*, the ends of the lugs being peened over after passing through apertures 12*a* and 14*a* formed adjacent the edges of the insulating plates 12 and 14 for the reception of the lugs 10*d* upon assembly of the insulating plates with the main casing member 10.

The fourth casing part comprises a top wall 18 preferably stamped from sheet metal and provided with lugs 18*a* extending from opposite edges. For these lugs apertures 12*c* and 14*c* are provided adjacent the edges of the insulating plates 12 and 14. Lugs 18*c* may also be provided upon the other edges of the metal plate 18 and suitable apertures 10*e* may be provided in these walls 10*a* and 10*b* for the lugs 18*c*.

The switch housing just described houses a switch mechanism comprising switch spindle 20 upon the upper end of which the conventional handle 22 may be removably mounted for operating the spindle. Mounted upon the central portion of the spindle are three spaced cams of insulating material 24, 26 and 28 having cam surfaces such as 24*a*, 24*b*, and 24*c* which are adapted to engage with resiliently mounted movable contacts to cause them to engage with stationary contacts.

Mounted upon the insulatihg plate 12 are four movable contacts 30, 34, 38 and 39 formed of

spring metal and having contact buttons on their ends to engage with similar contact buttons which are secured upon four fixed contacts 32, 36, 40 and 41 which are mounted upon the insulating plate 14. These movable contacts are of somewhat similar shape, each having its main portion extending perpendicular to the side wall 12, and having a foot bent to lie flat against the wall 12 and secured thereto by rivets which also connect the contacts with wire terminals. The fixed contacts also are of somewhat similar shape to one another but are not identical. Each has a portion lying upon the surface of the plate 14 and a contact carrying portion extending inwardly of the casing perpendicular to the plate 14. The top movable contact 30 is in the same plane as the top fixed contact 32 so that these contacts may be engaged upon operation of the switch. The middle movable contact 34 is mounted in a single plane and engageable with the fixed contact 36 upon operation of the switch. The lower contacts 38 and 39 are mounted in a single plane but on opposite sides of the switch spindle 20 and are in the same plane as fixed contacts 40 and 41 whose position is shown in dotted lines in Figure 4. These contacts 40 and 41 are located directly below contacts 32 and 36, respectively and hence are not visible in Figure 3. The movement of the top movable contact 30 is controlled by the cam 24 while the movement of the middle movable contact 34 is controlled by the middle cam 26 and the movements of the lower movable contacts 38 and 39 are controlled by the bottom cam 28.

The spindle 20 has centrally located bearings in the bottom plate 10c and the top plate 18 and the portions of the spindle immediately adjacent these plates and within the casing are squared as shown at 20*a* and 20*b*. As illustrated, the side surfaces of the squared portion 20*b* are adapted to engage with a pair of resilient parallel steel plate springs 46 and 48 whose ends are mounted in parallel downwardly projecting extensions of the apertures 10*e* in the side walls 10*a* and 10*b* of the frame. The cooperation between the squared end 20*b* of the shaft and the steel springs tends to give somewhat of a snap movement to the operation of the contacts and also holds the contacts in position as they are rotated from one position to another.

By reason of the squared portion 20*a* being formed on the bottom of the spindle, the spindle may be assembled in the casing with its top portion extending through the top plate 18 or the spindle may be inverted and have its handle portion extending through the aperture in the bottom plate 10*c*. Whether or not the spindle is to be assembled in the casing one way or the other may be determined after the main casing member has been formed and at that time the positioning of the cams upon the spindle and the positioning of the movable contacts may be determined. By reason of this flexibility and variation in construction of the switch it is possible to make a switch for surface mounting or for flush mounting.

For mounting the switch, there are punched out from the side plates 10*a* and 10*b* of the main casing member mounting arms 10*h* forming extensions of the bottom wall 10c and these arms are provided with apertures for mounting screws. If the switch spindle is mounted in the casing with its handle portion extending through the top plate 18 then the switch is adapted for surface mounting with the lugs 10*h* lying upon the surface on which the switch is to be mounted. On the other hand if the handle portion of the spindle extends through bottom plate 10c then the switch is adapted for surface mounting with the lugs still lying upon the surface but with the main body of the switch casing beneath the surface.

Preferably, for economy of manufacture, I form wire terminals integrally with the fixed switch contacts. The details of the formation of these combined switch contacts and wire terminals may be varied within the scope of my invention, but preferably the wire terminal portion will extend perpendicular to the plane of the insulating plates 12 and 14 and securing screws will be mounted in these perpendicular portions with the heads of the screws facing all in one direction. The wire terminals for the movable contacts also are provided with binding screws whose heads all face in one direction. These later terminals are right angle sheet metal stampings with one portion lying upon the outer face of the plate 12 and riveted to it by the rivet which also connects them with the contacts. In the switch illustrated the fixed contacts 36 and 40 are formed integrally with each other and with the terminal 50, and the movable contacts 38—39 are stamped in one piece and are connected to the terminal 52.

From the foregoing it will be apparent that I have provided a switch which is adapted either for surface or flush mounting and the determination of whether or not the switch shall be a flush or surface type may be postponed until the intermediate operation in the manufacture of the switch. By reason of this it is possible to decrease the cost of manufacture of switches for the reason that a lesser number of tools and parts are required in the manufacture of switches for use in various types of circuits.

The switch which I have described is particularly useful in circuits for controlling the flow of current in heating units having one or more heating elements. It will be obvious that upon use of more or less contacts and that upon a rearrangement of the cams and repositioning of the fixed and movable contacts, this switch may be adapted for control of various types of heating circuits.

My invention is of particular practical value for the reason that a number of sets of plates 12 and 14 may be made up and kept in stock with the movable and fixed contacts mounted upon these plates in various arrangements. One arrangement may be that illustrated and described. Other arrangements may result from the eliminating of one or more of the movable contacts, or one or more of the fixed contacts, or separating the electrical connection of the movable contacts 38 and 39, or by providing additional contacts, either fixed or movable, as dictated by the different requirements of the various circuits in which it is desired to use the switch. Some arrangements may require repositioning of the movable cams on the switch spindle or the use of a cam having a slightly different configuration than the cams illustrated. It is possible, however, to get various combinations of circuit arrangements and sequences by merely using different sets of insulating contact plates 12 and 14 while the same switch spindle is used. Thus by selecting one or another set of these contacts and assembling it in the switch, a predetermined switching arrangement may be made

available without the necessity of changing the switch frame or spindle. The flexibility of use of my new switch which is brought about by the interchangeability or selection of different sets of contact plates is an important feature of my invention.

Many modifications within the scope of my invention will occur to those skilled in the art, therefore I do not limit myself to the details of the form of invention as herein described.

I claim:—

1. In a rotary switch, a casing comprising an integral metallic stamping having plane parallel walls and a plane connecting surface perpendicular to said walls, a plurality of sets of insulating plates any of which may be secured across the open sides of said stamping, fixed and movable contacts mounted on said plates, said fixed and movable contacts being secured on said sets of insulating plates in different arrangements whereby a choice of various switching combinations and sequences is available by the use of one or another of said plurality of sets of plates, and a cover plate, said cover plate and said connecting surface having aligned bearings, in combination with a spindle mounted in said bearings, and means on said spindle for operating said movable contacts.

2. In a rotary switch, a casing comprising two parallel sheet metal side walls and parallel sheet metal top and bottom walls, aligned bearings in said top and bottom walls, a plurality of sets of parallel sheet insulation walls any of which may be secured to said metal walls, fixed and movable contacts mounted on said insulating walls engageable and disengageable by operating means, said fixed and movable contacts being secured on said sets of insulating walls in different arrangements whereby a choice of various switching combinations and sequences is available by use of one or another of said plurality of sets of walls in combination with an operating spindle mounted in said bearings, and means on said spindle for operating said contacts.

3. In a rotary switch, a prismatic casing comprising parallel side walls and parallel end walls, each wall being perpendicular to the adjoining walls, a pair of opposite side walls being of insulating material, fixed and movable contacts mounted on said insulating walls, means to secure said side and end walls together, bearings in said end walls, in combination with a switch spindle mounted in said bearings and having a handle portion extending through one of said bearings, and means on said spindle to operate said contacts, said bearings and contacts and securing means being constructed and arranged whereby said spindle may have its handle portion extend through either the bottom or top end wall.

4. In a rotary switch, a casing comprising parallel side walls and parallel end walls each wall being perpendicular to the adjoining walls, parallel walls of insulating material secured to said side and end walls, fixed and movable contacts mounted upon said insulating walls, in combination with a spindle for operating said contacts and having non-circular portions thereon, and an extension for a handle at one end thereof, a pair of parallel plate springs adapted to engage with either one or the other of said non-circular portions and having their ends positioned in said parallel side walls, said non-circular portions being spaced equally distant from said end walls whereby said spindle may be placed in said casing with its handle extending through either the top or the bottom end wall of the casing.

5. In a rotary switch for flush or surface mounting, a casing having its opposite side and end walls parallel, one set of opposite walls being of insulating material, fixed and movable contacts mounted on said insulating walls, a spindle mounted in said end walls with a handle extension passing through one end wall, means on said spindle for maintaining it longitudinally in position in said casing, said means being so constructed and arranged that said spindle may be inverted so as to have its handle extension passing through the other end wall, and means on said spindle for actuating said movable contacts, mounting arms extending from said other end wall whereby said switch may be secured upon a surface when said handle extension passes through said one end wall, or whereby said switch may be mounted flush with the surface when said handle extension passes through said other end wall.

6. In a rotary switch, a casing comprising parallel side walls and parallel end walls each wall being perpendicular to the adjoining walls, a plurality of sets of parallel walls of insulating material any of which may be secured to said side and end walls, fixed contacts mounted upon one of said insulating walls, movable contacts mounted upon the other insulating wall, said fixed and movable contacts being secured on said sets of insulating walls in different arrangements whereby a choice of various switching combinations and sequences is available by use of one or another of said plurality of sets of walls in combination with an operating spindle, means on said spindle engaging with said movable contacts to cause them to engage said fixed contacts, said insulating walls being capable of assembly in their position in the casing after the other parts have been assembled.

7. In a rotary switch for flush or surface mounting, a casing having its opposite side and end walls parallel, one set of side walls and one end wall being parts of an integral sheet metal stamping, another set of opposite side walls being of insulating material, fixed contacts mounted on one of said insulating walls, movable contacts mounted on the other insulating wall, a spindle mounted in said end walls with a handle extension passing through one end wall, means on said spindle for maintaining it longitudinally in position in said casing, said means being so constructed and arranged that said spindle may be inverted so as to have its handle extension passing through the other end wall, and means on said spindle for actuating said movable contacts, mounting arms struck out of said one set of side walls in position for mounting said switch upon a surface when said handle extension passes through said one end wall and for mounting said switch flush with the surface when said handle extension passes through said other end wall.

8. In a rotary switch, a casing comprising a stamped sheet metal frame of substantially U-shape, a plate for the open end of said frame, bearings in said plate and the central portion of said frame, plurality of sets of parallel side plates of insulating material, fixed and movable contacts mounted on said plates, said fixed and movable contacts being secured on said sets of insulating plates in different arrangements whereby a choice of various switching combinations and sequences is available by use of one or another of said plurality of sets of plates, in combination with a rotary spindle mounted in said bearings and hav-

ing means for moving said movable contacts as the spindle is rotated.

9. In a rotary switch, a casing comprising a stamped sheet metal frame of substantially U-shape, a plate for the open end of said frame, bearings in said plate and the central portion of said frame, a plurality of sets of parallel side plates of insulating material, fixed and movable contacts mounted on said plates, said fixed and movable contacts being secured on said sets of insulating plates in different arrangements whereby a choice of various switching combinations and sequences is available by use of one or another of said plurality of sets of plates, in combination with a rotary spindle mounted in said bearings and having a handle extension projecting through the plate at the open end of the frame, and means on said spindle for maintaining it longitudinally in assembled position, said means being so constructed and arranged that said spindle may be inverted to have said handle extension project through the central portion of the frame.

EDWARD E. FORSTROM.