Nov. 23, 1948. F. P. GATES 2,454,646

ELECTRIC RANGE SWITCH

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Fig. 1.

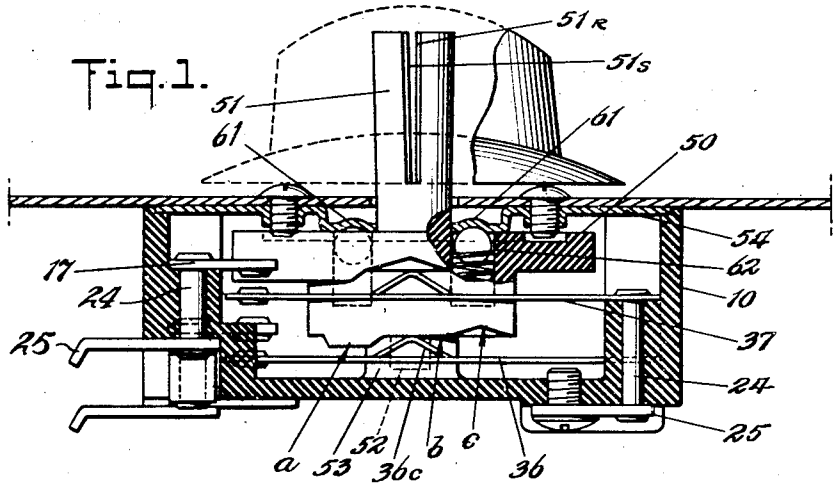


Fig. 2.

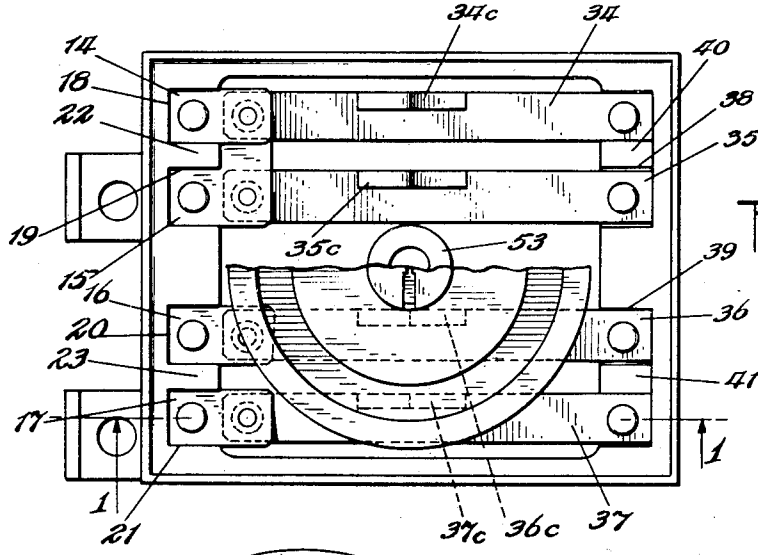
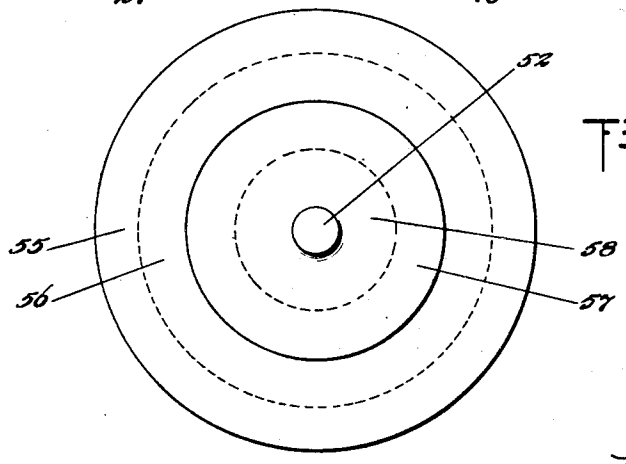


Fig. 3.



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Fig. 5.

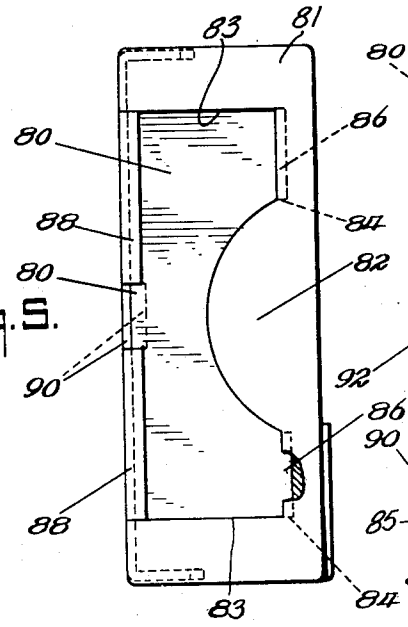


Fig. 6.

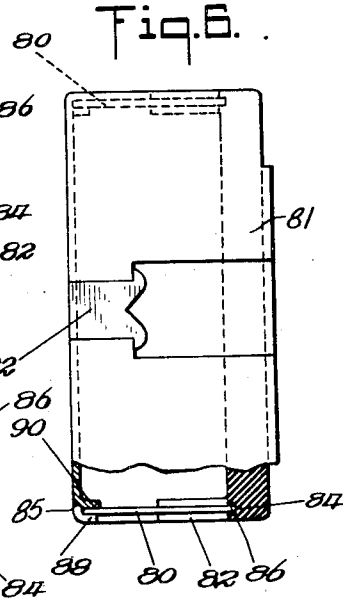
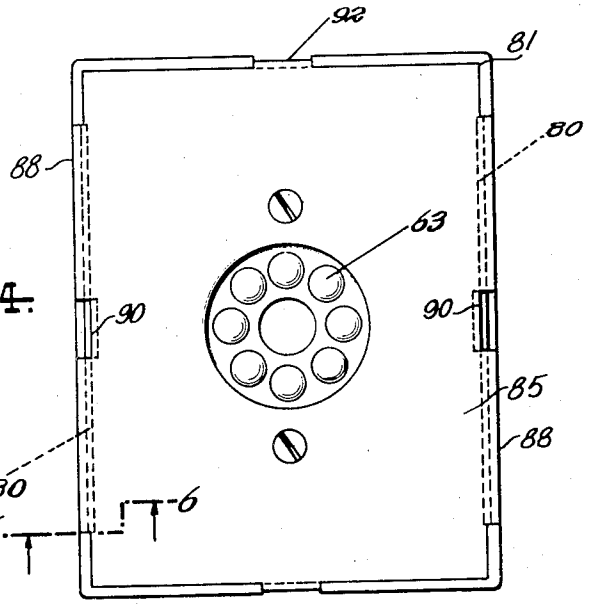


Fig. 4.



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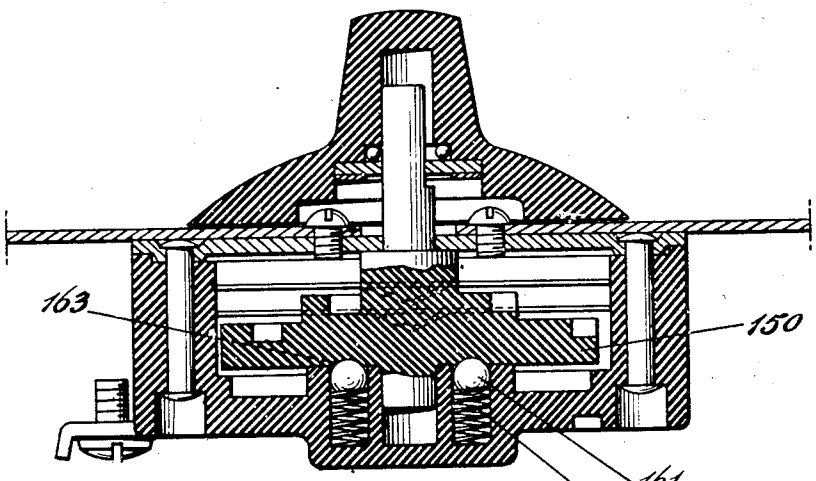


Fig. 7.

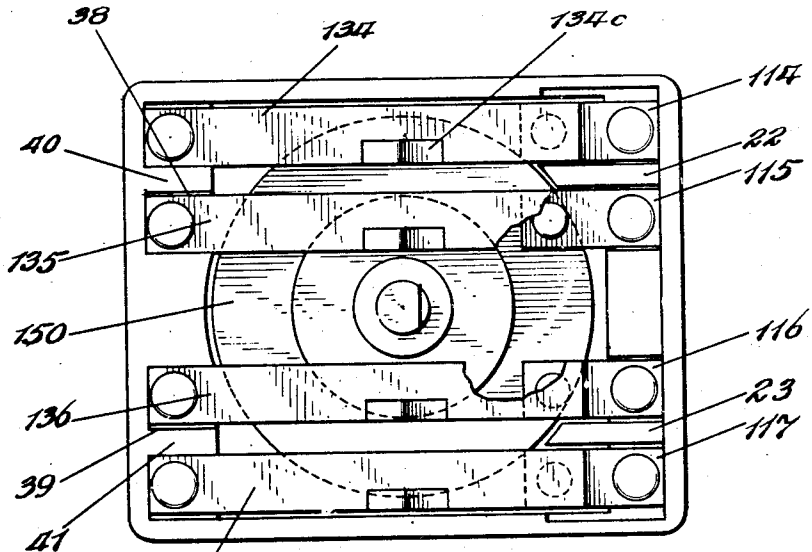


Fig. 8.

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UNITED STATES PATENT OFFICE

2,454,646

ELECTRIC RANGE SWITCH

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Application April 29, 1944, Serial No. 533,355

15 Claims. (Cl. 200—6)

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This invention relates to rotary switches for electric ranges, particularly of the type wherein a rotary cam element causes the engagement and disengagement of a plurality of movable and stationary switch contacts by a camming action exerted against resilient contacts which move parallel to the axis of rotation of the rotary element.

It is an object of my invention to provide a rotary switch of the foregoing type with certain improvements in structure of the rotary cam member and arrangement of contacts with relation thereto for enabling reduction in the size of the switch.

Another object of my invention is to provide improved form of rotary electric switch mechanism of the foregoing type, providing a switch spindle and cam member molded as a unit from insulating material.

Another object is to utilize the fixed contacts in a switch of the foregoing type to hold parts of the switch in place during assembly.

Another object is to provide for inspection of the interior contact parts after they are assembled, by the provision of removable casing walls.

Other objects and advantages of my invention will appear as it is described in connection with the accompanying drawings.

In the drawings—

Fig. 1 is a vertical section view of a switch embodying the invention;

Fig. 2 is a plan view of the casing and contacts, the cam and cover being removed;

Fig. 3 is a diagrammatic view of the bottom surface of the cam member used in Fig. 1;

Fig. 4 is a plan view of the switch casing;

Fig. 5 is a side view of the switch casing;

Fig. 6 is an end view of the switch casing, partly broken away;

Fig. 7 is a vertical section view of a second form of the invention; and

Fig. 8 is a plan view with the cover removed of the second form of invention.

Referring to the drawings, the invention comprises a base 10 of rectangular plan, hollowed out, in its central portion for the reception of operating parts. Fixed contacts 14, 15, 16 and 17, stamped from sheet metal into rectangular or other suitable shape, are preferably mounted in spaced rectangular recesses 18, 19, 20, 21, formed in the interior of one end wall of the switch base, with insulating barriers, such as 22, 23, molded integally with the base extending between adjacent contacts. The bottoms of inner recesses 19 and 20 are lower than the bottoms of 18 and 21,

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whereby the fixed contacts are mounted on different levels and extend toward the middle of the switch. The fixed contacts may be secured in position by metal rivets 24 passing through apertures suitably provided in one end of each contact and aligned with passages formed in the insulating base. These rivets may also serve to secure wire terminals, such as 25, on the bottom surface of the insulating base in conventional fashion.

Movable contacts 34, 35, 36, 37 are preferably stamped in the form of strips from thin spring sheet metal and extend in parallel relation from the opposite end of the switch casing a distance sufficient to underlie the ends of the fixed contacts 14, 15, 16, 17 respectively. The movable contacts are preferably secured at one end by rivets, in a similar manner to the fixed contacts. Outer contacts 34 and 37 are mounted on ledges 40 and 41, while inner contacts 35, 36 are mounted in recesses 38, 39, formed in the insulating base below the ledges 40, 41. The movable contacts each have cam projections, like 36c, pressed upwardly out from their central portions at one side-edge.

For moving the movable contacts, there is provided a molded rotary insulating member 50 having a split spindle portion 51, with its parts slightly resilient and divergent for insertion within a switch handle to frictionally hold it. The spindle portion extends through a metallic cover 54 secured over the upper face of the base by rivets, bolts, or in any other suitable fashion. The central portion of the rotary insulating member is provided with circular enlargements of different radii, each enlargement having on its under surface inner and outer concentric cam surfaces or tracks, such as 55, 56, 57, 58 at different radial distances from the axis of the spindle so as to co-act with cam portions 34c to 37c of the several movable contacts as the rotary member is turned to operate the switch. The cam surfaces in any track may be of hill and valley form, as may be observed in Fig. 1. There, the lower outer track has elevations *a*, *b* and *c*, whereby the contact 35 (see Fig. 2) can occupy an intermediate substantially level condition when cam 35c rests on level *b*, or can be moved to downward by hill *a*, or permitted to spring upward by valley *c*. In each of the up and down positions, the contact may engage a fixed contact, i. e., on the under side of 15, or with a contact (not visible) in the floor of the casing beneath the moving end of 35. The movable contacts are all slightly biased upwardly to normally tend to engage the fixed contacts overlying them. A boss portion 52 extends from

the bottom end of the cam member into the cylindrical bore in a boss 53 in the bottom of the casing 10.

Thus, as the rotary member 50 turns the movable contacts will engage their fixed contacts by inherent spring action when the cam portions enter a cam recess; and the movable contacts will be forced out of engagement with their fixed contacts when the cam portions ride upon the surface or on a hill on the rotary member.

To position the rotary member in several positions as it rotates, indexing means in the form of a pair of spring-pressed balls 60 working in pockets 61 within the rotary member 50 around the spindle portion 51 are provided, and the balls engage in a series of circularly-arranged spherical indentations 62 in the cover as the cam member turns into one position after another.

Because the inner set of movable contacts 35, 36 is operated by cam surfaces on a level below the cam surfaces that operate the outer set of contacts 34, 37, it is possible to move the fixed contacts 15, 16 in nearer to the axis of the spindle. This enables the switch casing to be made shorter than would otherwise be possible with contacts and operating parts of the same size, which is an important consideration in range switches where conditions of limited space are imposed.

In molding the spindle portion 51 of the rotary member, small opposed ribs 51*r* are provided within the split or slot 51*s*, so that the movement of the two halves of the spindle is limited to prevent breaking.

In Figs. 7 and 8 (in which like reference numerals refer to like parts of previous figures), a modified form of the invention is illustrated. In that form, the cam surfaces all face in the opposite axial direction, i. e., they are on the top of the central enlargements or cam portions of the rotary member 150. The movable contacts 134, 135, 136, 137 overlie the cam surfaces of the member 150 and have their own cam portions (such as 134c) downwardly pressed.

The stationary contacts 114, 115, 116, 117, on two different levels as before, underlie the contacting ends of the movable contacts and are engaged thereby when the cam portions (such as 134c) seat in cam recesses in the rotary member 150. At other times, the movable contacts are forced out of engagement with the stationary contacts. As in the first-described modification, the middle stationary contacts can extend over the lower cam surfaces, enabling the switch casing to be made shorter than heretofore.

Also, in assembling the switch after the fixed contacts are fastened to the base, the two overlapping contacts 115, 116 hold the rotary member 150 in position so that it does not fall out before the cover or bridge plate is assembled.

The indexing means in Figs. 7 and 8 comprises spring-pressed balls 61 located in pockets or cavities 162 in the bottom of the base and are pressed into one or another of a series of circularly-arranged indentations 163 in the bottom of the cam portion of the rotary member 150.

In both forms described, the molding of the rotary member as a unit with its operating spindle saves expensive metal and assembly costs and reduces the number of switch parts.

In switches of the type disclosed, it is particularly necessary to be able to inspect the action, alignment and engagement of the contacts

before the switch is passed on for use and sale. To enable this to be done, even though the contacts may be located beneath the cam portions of the rotary member, removable side walls 80 may be provided, which may be snapped into place after the inspection. Referring to Figs. 5, 6 and 7, the casing or base 81 there shown has its side walls open with a semi-circular upward extension 82 from the bottom edge of the opening 83 to provide additional rigidity to the casing. In the bottom edges of the opening are grooves 84 to receive the feet 86 of a thin wall plate of sheet insulation 80 whose outline is substantially the same as that of the opening 83. To hold the top edge of the wall plate 80, the side edges of a metal switch cover plate 85 may be bent over to provide flanges 88 divided at their center by tongue 90 bent parallel to the flanges but spaced therefrom a distance slightly greater than, but approximating the thickness of the wall plate 80. Because of slight resiliency of the wall plate, it is possible, after inserting feet 86 in grooves 84, to snap the upper edge between the flange 88 and the tongue 90, or vice versa.

Alternatively, grooves may be formed in the short side edges of the opening 83 and the plate 80 flexed to enable insertion of the short edges of the plate therein. In such case, the flanges 88 and tongues 90 and grooves 84 may be omitted, and the top and bottom edges of the plate 80 will abut the under side of the cover and the bottom edge of the opening 83, respectively.

The cover plate 85 may be held in place by bolts or secured by arms 92 of the shape shown in Fig. 6, extending from the ends of the cover and bent down into channels in the casing walls.

It will be understood that in the interest of simplicity of illustration, the casing details of Figs. 4–6 have been omitted from the remaining figures, but are or may be incorporated in the switch as made and used, for the reasons given. It is particularly important that the casing of Figs. 4–6 be used when the cam of Figs. 1, 2 and 3 is used, for in that form it is impossible otherwise to inspect the contacts after assembly.

The subject matter of the casing structure just described is claimed in a divisional application, S. N. 18,428, filed April 1, 1948, entitled "Electric switch casing."

Many modifications within the scope of my invention will occur to those skilled in the art. Therefore, I do not limit it to the specific embodiments disclosed.

I claim:

1. A rotary electric switch, comprising fixed and movable contacts, a rotary member for moving said movable contacts in directions parallel to the axis of rotation of said member, said rotary member having a plurality of cam tracks concentrically arranged at different distances from the axis of rotation, and all facing in one axial direction, certain of said tracks being located on one surface of said member and other of said tracks being located on another surface spaced axially from said first surface.

2. A rotary switch comprising fixed and movable contacts, a rotary cam member having a plurality of cam tracks on each of two different levels facing in the same axial direction and concentrically arranged at different distances from the axis of rotation, each of said tracks being cooperatively associated with a contact which is movable by its tracks separately from the other movable contacts, and said tracks causing engage-

ment and disengagement of said fixed contacts by said movable contacts by movement in different parallel planes.

3. A rotary switch comprising fixed and movable contacts, a rotary cam member molded from insulating material as an integral unit with a spindle, said member having enlarged central portions with a plurality of cam tracks on each of two different levels facing in the same axial direction and concentrically arranged at different distances from the axis of rotation, each of said tracks being cooperatively associated with a contact which is movable by its tracks separately from the other movable contacts, and said tracks causing engagement and disengagement of said fixed contacts by said movable contacts by movement in different parallel planes.

4. A rotary switch comprising fixed and movable contacts, a rotary cam member having a plurality of cam tracks on each of two different levels facing in the same axial direction and concentrically arranged at different distances from the axis of rotation, each of said tracks being cooperatively associated with a contact which is movable by its tracks separately from the other movable contacts, and said tracks causing engagement and disengagement of said fixed contacts by said movable contacts by movement in different parallel planes, certain of said fixed contacts and certain of said cam tracks being positioned in overlapping non-engaging relation.

5. A rotary switch comprising fixed and movable contacts, a rotary cam member having a plurality of cam tracks on each of two different levels facing in the same axial direction and concentrically arranged at different distances from the axis of rotation, each of said tracks being cooperatively associated with a contact which is movable by its tracks separately from the other movable contacts, and said tracks causing engagement and disengagement of said fixed contacts by said movable contacts by movement in different parallel planes, certain of said cam tracks on one level and certain of said fixed contacts which cooperate with movable contacts controlled by cam tracks on another level being arranged in overlapping non-engaging relation.

6. A rotary switch comprising fixed and movable contacts, a rotary cam member molded from insulating material as an integral unit with a spindle, said member having enlarged central portions with a plurality of cam tracks on each of two different levels facing in the same axial direction and concentrically arranged at different distances from the axis of rotation, each of said tracks being cooperatively associated with a contact which is movable by its tracks separately from the other movable contacts, and said tracks causing engagement and disengagement of said fixed contacts by said movable contacts by movement in different parallel planes, certain of said fixed contacts and certain of said cam tracks being positioned in overlapping non-engaging relation.

7. An insulating base, a rotary cam member mounted for rotation therein and having a plurality of concentric cam tracks some on one level and some on another level spaced axially from the first level and all facing in one axial direction, flexible contact members extending across said base and individually operated by said cam tracks, fixed contact members engaged and disengaged by said flexible contacts, certain of said fixed contacts and one of said cam tracks being arranged in overlapping non-engaging relation.

8. An insulating base, a rotary member mounted therein molded from insulating material with integral spindle and cam portions, said cam portions having a plurality of concentric cam tracks located on different levels and facing in the same axial direction, flexible contacts extending over said tracks and individually operated thereby, fixed contacts engageable and disengageable by said flexible contacts, and certain of said fixed contacts and tracks being arranged in overlapping non-engaging relation.

9. An electric switch part comprising a molded insulating one-piece member having cam portions, a spindle portion for reception of an operating handle and a bearing boss portion.

10. An electric switch part comprising a molded insulating one-piece member having cam portions, a spindle portion for reception of an operating handle and a bearing boss portion, said cam portions being of different diameters and having concentric cam tracks formed on faces of said cam portions facing in one axial direction.

11. An electric switch part comprising a molded insulating one-piece member having cam portions, a spindle portion slotted diametrically providing resilient arms receivable within and for frictionally holding an operating handle, and a bearing boss portion on the end of said member opposite said arms.

12. A rotary electric switch comprising a hollowed insulating base, a member overlying the base and secured thereto and having a plurality of indentations arranged around an opening, a rotary cam member within said casing, a spindle for rotating said cam extending through said opening, a plurality of pockets in said cam, indexing balls and springs in said pockets and pressed into said indentations selectively, cam tracks on a downwardly facing surface of said cam member, and movable contact members operated by said cam tracks for engagement with and disengagement from stationary contacts.

13. A rotary electric switch comprising a hollowed insulating base, a member overlying the base and secured thereto and having a plurality of indentations arranged around an opening, a rotary cam member within said casing, a spindle for rotating said cam extending through said opening, a plurality of pockets in said cam, indexing balls and springs in said pockets and pressed into said indentations selectively, and movable contact members operated by said cam for engagement with and disengagement from stationary contacts.

14. A rotary electric switch comprising a hollowed insulating base, a member overlying the base and secured thereto and having a plurality of indentations arranged around an opening, a one-piece molded insulation member having cam portions and having a spindle portion extending through said opening, spring-pressed indexing means located in a plurality of pockets in said cam portion and pressed into said indentations selectively, a plurality of concentric cam tracks on a downwardly facing surface of said cam member, and movable contact members operated by said cam tracks for engagement with and disengagement from stationary contacts.

15. A rotary electric switch comprising a hollowed insulating base, a member overlying the base and secured thereto and having a plurality of indentations arranged around an opening, a one-piece molded insulation member having cam portions and having a spindle portion extending through said opening, spring-pressed

indexing means located in a plurality of pockets in said cam portion and pressed into said indentations selectively, a plurality of concentric cam tracks on a plurality of downwardly facing axially-spaced surfaces of said cam member, movable contact members extending across said base beneath said surfaces and operated by said cam tracks, stationary contacts engageable by said movable contacts, certain of said stationary contacts and certain of said tracks being in overlapping relation.

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