

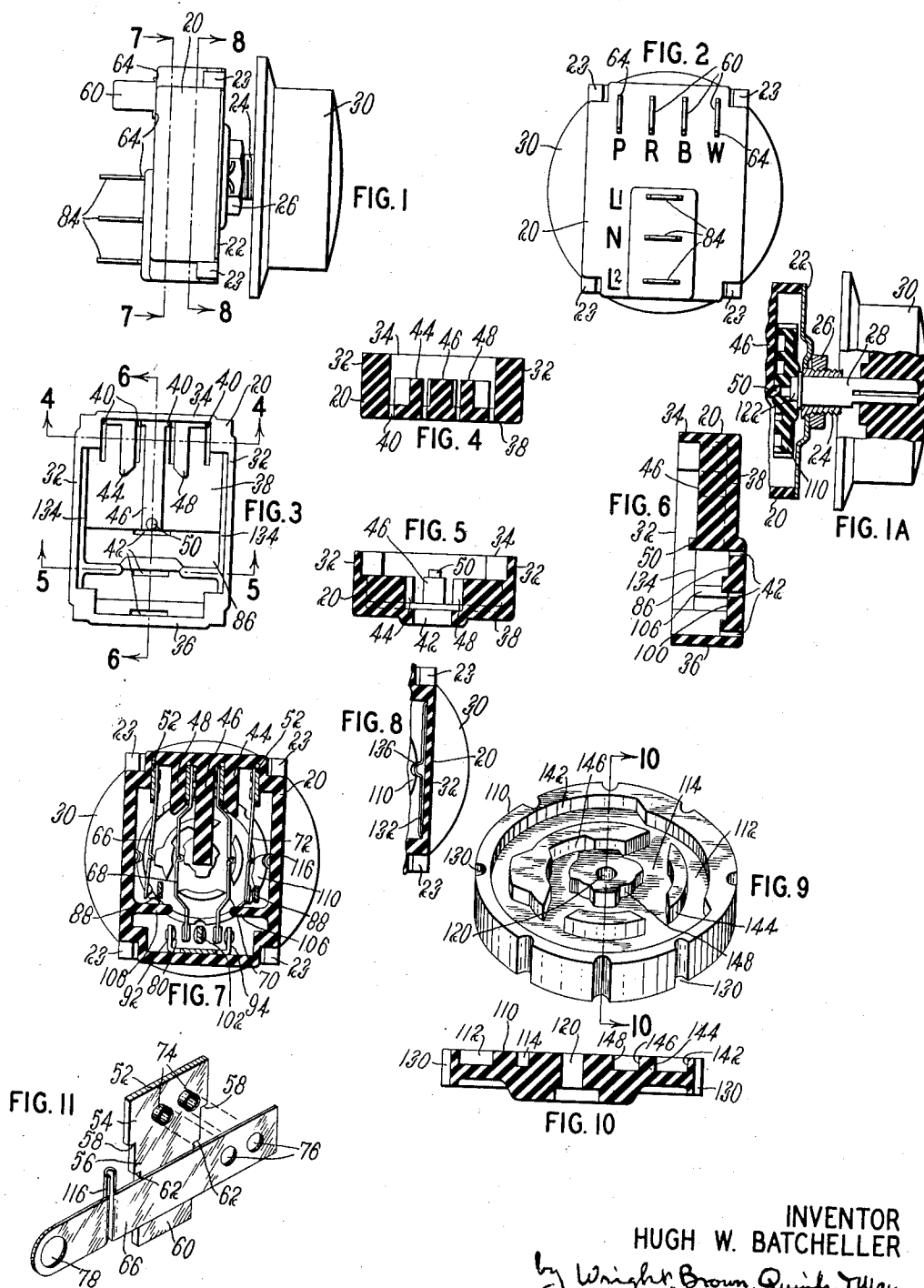
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H. W. BATCHELLER
SWITCH FOR ELECTRIC RANGES

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Filed Jan. 11, 1950

2 Sheets-Sheet 1



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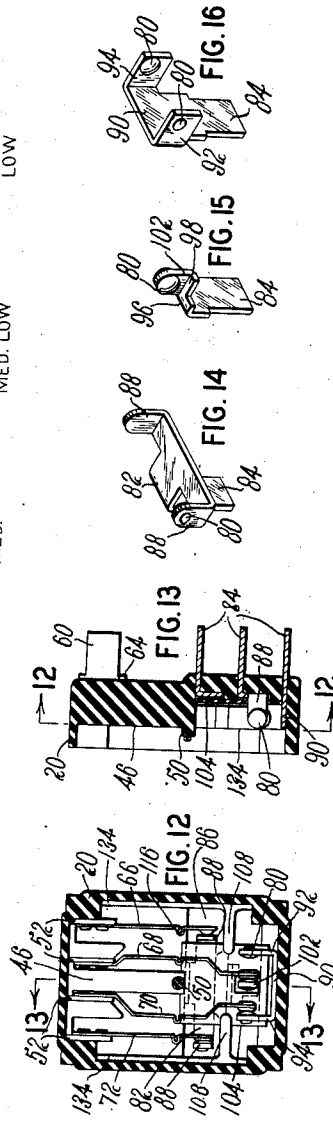
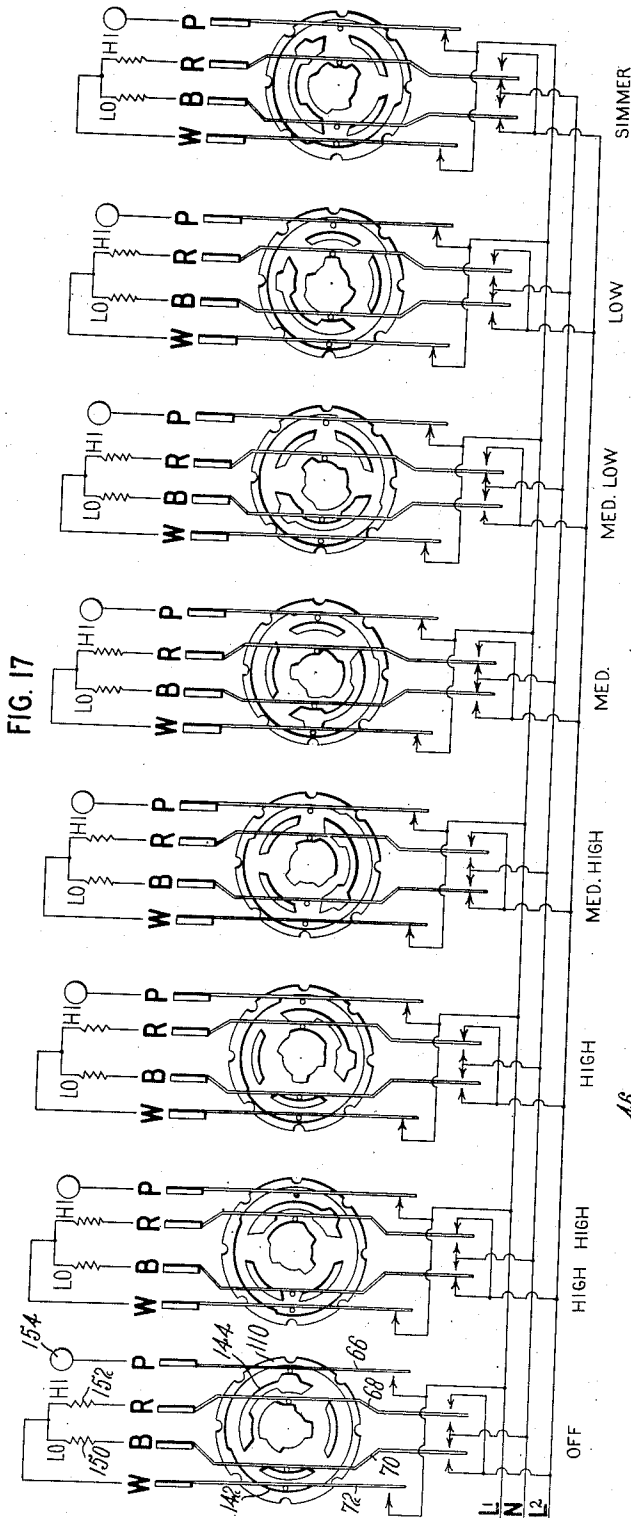
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SWITCH FOR ELECTRIC RANGES

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5 Claims. (Cl. 200—6)

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This invention relates to electric switches of the type suitable for service in electric ranges in which the heating units consist of two separate resistance elements adapted to be connected through the switch in various ways to power lines so as to make available several different degrees of heating. A considerable number of such switches have already been designed and produced. The object of the present invention is to provide a switch of compact structure to save space and materials without sacrificing any of the qualities necessary for satisfactory service.

As hereinafter described in more detail, a considerable saving of space is had by arranging a series of bridging conductors in a row within a housing member of insulating material, these conductors being strips of spring metal which are fixed at one end, their free ends normally pressing against fixed contact elements. These strips are arranged edgewise to the rear wall of the housing. The free ends of all the bridging conductors press in the same direction against their contact elements, from which they are selectively disengaged by a rotatable disc having cam elements on a face thereof cooperating with cam followers projecting from an edge of the bridging conductors.

Further economies in cost and required space are had by the complete elimination of separate fastening elements such as rivets, bolts and screws, except for the threaded hollow stem which projects from the cover plate and receives a nut by which the switch may be secured to a supporting wall or panel.

The metal parts within the housing are nearly all sheet metal stampings, the fixed conductors extending through slots in the rear wall of the casing to project as terminals to which wires are to be connected when the switch is installed in a range or elsewhere for use.

For a more complete undersanding of the invention, reference may be had to the following description thereof and to the drawings, in which—

Figure 1 is a side elevation of a switch embodying the invention;

Figure 1A is a fragmentary section view similar to Figure 1;

Figure 2 is a rear elevation of the same;

Figure 3 is a front elevation of the housing member which supports the switch elements;

Figure 4 is a section on the line 4—4 of Figure 3;

Figure 5 is a section on the line 5—5 of Figure 3;

Figure 6 is a section on the line 6—6 of Figure 3;

Figure 7 is a section on the line 7—7 of Figure 1;

Figure 8 is a fragmentary section on the line 8—8 of Figure 1;

Figure 9 is an isometric view of the rear side of the cam disc, on a larger scale;

Figure 10 is a section on the line 10—10 of Figure 9;

Figure 11 is an isometric view of a terminal

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member and bridging conductor to be secured thereto, shown on an enlarged scale;

Figure 12 is a sectional view of the complete switch, the section being taken on the line 12—12 of Figure 13;

Figure 13 is a section on the line 13—13 of Figure 12;

Figures 14, 15, and 16 are isometric views of three of the terminal members employed in the switch; and

Figure 17 is a diagram showing the off position and the seven on positions of the switch in connection with a three-wire power line and two heating units.

As indicated in Figures 1 and 2, the switch comprises a housing consisting of a rectangular housing member 20 and a front cover plate 22 which, with the member 20, encloses a chamber. The cover plate is provided with tongues 23 at its corners to be bent under exterior shoulders on the member 20 to hold the cover in place. Projecting through the front cover plate is a tubular stem 24 which is externally screw threaded to receive a nut 26 by which the switch may be secured to a vertical wall or panel (not shown) through which the stem 24 may project. Journalled in the stem 24 is an operating shaft 28 on the outer end of which is mounted a suitable knob 30.

The housing member 20 may be a single molded unit of insulating material, the front elevational view of this member being shown in Figure 3. This housing member is generally rectangular in shape and comprises side walls 32, a top wall 34, a bottom wall 36, and a rear wall 38. In the rear wall 38 are a series of narrow parallel slots 40 near one end of the member 20. Through these slots project a series of fixed sheet metal terminal members as hereinafter described. The rear wall 38 also has a second series of slots 42 through which project other sheet metal terminal members. Projecting down from the top wall 34 and forward from the rear wall 38 are a series of partition members 44, 46, and 48. These members are between successive slots 40 and serve as barriers between the conductors or terminal members which project through these slots. The central barrier 46 extends down a little over half the length of the member 20 and is provided with a short cylindrical button 50 which projects forward from the lower end of the front surface thereof. This button serves as a bearing element for a cam disc which is illustrated in Figure 9 and is hereinafter described in more detail.

Projecting through the slots 40 are a series of sheet metal terminal members 52, one of which is illustrated in Figure 11. This member consists of a portion 54 a little wider than the length of the slot 40 and an intermediate portion 56 having a width substantially equal to the length of a slot 40. In the side edges of these two portions of the terminal member 52 are a pair of

shoulders 58 which engage the inner face of the rear wall 38 when the small end 60 of the member is thrust through a slot 40 so as to project out behind the rear wall 38. This projecting portion 60 then serves as a terminal to which a wire is to be connected when the finished switch is installed. The width of the portion 60 is less than that of the intermediate portion 55 so that a pair of shoulders 62 are formed in the side edges between these portions. The length of the intermediate portion 56 is slightly greater than the thickness of the rear wall 38 at the slot 40. Hence when the member 52 is thrust through a slot 40, the shoulders 62 project slightly beyond the outside surface of the rear wall of the housing member. When the member 52 is in such position, it may be secured in place by staking. This is done by making wedge cuts at the shoulder 62 so as to spread the adjacent edge portions of the intermediate part 56 away from each other forming edge shoulders 64 which engage the outer surface of the member 20 so that the terminal is permanently secured in place.

To each of the four terminal members 52 is permanently secured an elongated resilient element. As shown, each such element is a bridging conductor consisting of a strip of spring metal such as bronze. As indicated in Figures 7 and 12, there are four such bridging conductors 66, 68, 70 and 72. Each of these conductors is permanently secured to its corresponding terminal member at right angles thereto so as to extend along the rear wall of the housing member 20 toward its other end. Any suitable means for securing the spring strips to their terminal member may be employed. For simplicity and convenience, a couple of tubular extrusions 74 may be made from the portion 54 of each terminal member 52 which is to be within the housing. Corresponding holes 76 are provided in each spring strip as illustrated in Figure 11 to receive the tubular extrusions 74. The portions of the latter which project through the holes 76 are then clinched like hollow rivets to secure the strip to the terminal member. The spring strips are each secured at one end, the other end being free. In a hole 78 in this free end is permanently fixed a suitable contact element 80 as is customary in switches to avoid excessive deterioration of the switch elements by sparking the points of contact.

Also mounted in the housing member 20 are a number of contact elements some of which are normally engaged by corresponding elements in the free ends of the spring strips. These contact elements are mounted in fixed terminal members such as are illustrated in Figures 14, 15 and 16. The terminal member shown in Figure 14 consists of a sheet metal member 82 having a portion 84 projecting through one of the slots 42 in the rear wall 38 of the housing member. The interior portion of the member 82 is T-shaped and lies against the bottom of a shallow depression 86 in the inner surface of the rear wall 38 and the arms of the T are bent up as at 88 so as to project forward, as indicated in Figure 12, for engagement by the free ends of the bridging conductors 66 and 72. A fixed terminal member 90 is shown in Figure 16, this member having a U-shaped portion within the housing member 20 which projects forward from the rear wall, the arms 92 and 94 of the U-shaped member each being provided with a contact element 96. A third fixed terminal 98 is mounted on the rear wall 38 with a portion 94 projecting through one of the

slots 42. The interior portion 96 of this member is bent at right angles to the projecting portion 94 so as to rest against the bottom of a recess 100 in the rear wall 38. The member also has an inner portion 102 which projects forward from the rear wall and is located midway between the arms 92 and 94 as shown in Figure 12. The spring strips 68 and 70 are so arranged that the contact element at the free end of the former is disposed between the arm 92 and the terminal element 102, and the free end of the strip 70 is between the arm 94 and the terminal element 102. All four of the spring strips 66, 68, 70 and 72 are in planes which are perpendicular to the rear wall 38 and extend from one end of the housing member toward the other end so that they flex in a plane parallel to that of the disc. These strips are biased to press against respective fixed contact elements in the same direction. As shown in Figure 12, this direction is toward the left. Thus the contact element at the free end of the spring strip 72 normally presses against one of the contacts 88. The free end of the strip 70 normally presses against the arm 94 but is movable therefrom over into contact with the contact 102. The end of the strip 68 normally presses against the contact 102 and is movable therefrom to engage the arm 92. The end of the strip 66 normally presses against the other contact 88. Displacement of any of these spring strips from engagement with the corresponding fixed contact elements requires, as in Figure 12, movement toward the right. This makes possible a very compact arrangement of bridging conductors and terminals. In order to insulate the interior portions of the terminal members 82, 90, and 98 from each other and from the spring strips, a thin plate 104 of insulating material is placed over the portions of the terminal members which are displaced in the recesses 86 and 100. Furthermore, partition elements 106 and 108 are provided to separate the arms 92 and 94 from the respective contact elements 88.

For the operation of the switch by moving the bridging conductors so that their free ends are selectively separated from the respective fixed contact elements which they normally engage, a cam disc 110 is provided. This disc has channels 112 and 114 in its rear face, these channels defining cam elements projecting from the rear face of the disc, the side walls of which elements are cam surfaces engaged by cam followers 116. The latter project forward from each bridging conductor at a point between the fixed and free ends thereof. As indicated in Figure 11, the cam follower of each bridging conductor may conveniently be integral therewith. This can be done by forming a projection from a side edge of the strip when the blank therefor is cut or punched from a sheet of metal. The strip is then reversely bent at the point where the lateral tongue projects from the side edge therefrom, the tongue also being reversely bent so as to be in the shape of a partial cylinder. This gives it stiffness. This partial cylinder 116 is the cam follower which bears against a corresponding cam surface on the disc 110. For rotatably supporting the disc a central bore 120 is provided therein, this bore being just large enough at the rear face of the disc to fit on the bearing pin 50. The other end of the bore is larger and is of a nonround shape to receive a similarly shaped end 122 of the operating shaft 28 which is journaled in the stem 24. Thus the disc is keyed to the shaft so as to be positively rotated thereby when the shaft is

turned by operation of the finger knob 30. As shown in Figure 1A, the disc is disposed immediately behind the cover plate 22. The spring strips are disposed between the disc and the rear wall 38 and edgewise to both. In the rim of the disc 110 are a series of eight notches 130 which are equally spaced around the circumference of the disc. These notches cooperate with a pair of spring elements 132 which are disposed within the side walls 32 of the housing member. The elements 132 rest against shoulders 134 within the side walls of the housing member and are formed with a central boss 136 adapted to enter the notches 130. When the disc is turned, the springs 132 yield to allow the bosses 136 to ride out of the notches 130 in which they are engaged. These notches thus serve to define eight angular positions of operation of the disc, these several positions being illustrated in Figure 17.

The grooves 112 and 114 in the rear face of the disc form four generally circular cam surfaces which are perpendicular to the plan of the disc, some of these surfaces being interrupted to save material and simplify the process of molding the disc. The sides of the outer groove 112 constitute cam surfaces 142 and 144. The shape of the cam surface 142 determines the operation of the bridging conductor 72. The shape of the cam surface 144 determines the operation of the bridging conductor 66. The sides of the inner groove 114 constitute generally circular cam surfaces 146 and 148, the cam surface 146 serving to operate the bridging conductor 78, the cam surface 148 serving to operate the bridging conductor 68. The cam surfaces 142 and 146 face radially inward. The cam surfaces 144 and 148 face radially outward. Figure 17 illustrates a typical circuit wherein the switch may advantageously be employed. This circuit includes a three wire power supply from which the usual 110 volts and 220 volts can be obtained. By means of the switch these power lines are selectively connected to one or both of a pair of resistance heating units 150 and 152. A pilot light 154 is also provided, this pilot light being on when either of the units 150 and 152 is connected to the power lines.

I claim:

1. An electrical switch comprising a housing member of insulation having a rear wall with a plurality of narrow slots therethrough, a front cover member secured to said housing member, a shaft journaled in said cover member, a cam disc keyed to said shaft within the housing, sheet metal members extending through said slots, the exterior portions of said metal members serving as terminals, each said metal member having shoulders against the inside and outside of said rear wall to secure the member in place, fixed contact elements on the inner portions of some of said metal members, spring strips secured at one end to other of said metal members, said strips being arranged between said disc and rear wall and edgewise thereto, each said strip having its other end normally pressing against a respective contact element, cam means on the rear face of said disc, and means on said strips cooperating with said cam means to move said strips selectively out of engagement with their contact elements when the disc is rotated.

2. An electrical switch comprising a housing member having a rear wall, a series of four conductors mounted in said housing near an end thereof in planes perpendicular to said rear wall, spring metal strips secured at one end to respec-

tive conductors and extending toward the other end of the housing member, a fixed terminal member near the other end of said housing having a U-shaped portion with contact elements in the arms of the U, a second fixed terminal member having a contact element between and in line with the contact elements of the first said terminal member, the free end of one of said spring strips being arranged to press normally against one of the contact elements of the first fixed terminal member and to be movable therefrom into contact with the contact element on the second fixed terminal, the free end of a second spring strip being arranged to press normally against the contact element of the second fixed terminal and to be movable therefrom into contact with the other contact element of the first fixed terminal, a third fixed terminal member having spaced contact elements normally engaged by the free ends of the third and fourth spring strips respectively, and cam means for selectively moving said free ends away from their respective contact elements.

3. An electrical switch comprising a housing member of insulation having a rear wall with a plurality of narrow slots therethrough, a front cover member secured to said housing member, sheet metal members extending through said slots, the exterior portions of said metal members serving as terminals, each said metal member having inner shoulders on its edge bearing against the inner face of said rear wall and outer shoulders on its edges bearing against the outer face of said rear wall, the points of engagement of said shoulders with the rear wall being at the ends of the slot through which the metal member projects, switch elements secured to said sheet metal members within the housing member, fixed contacts in said housing member engageable by said switch elements, and cam means operable to move said switch elements with reference to the respective contacts.

4. An electrical switch comprising a rotatable disc, a plurality of upstanding cam elements on a face of said disc having cam surfaces perpendicular to the plane of said face, said cam surfaces being generally circular and variously spaced from the axis of the disc, a plurality of elongated resilient members arranged in a plane parallel and adjacent to said disc and flexible in said plane, each said flexible member having a cam follower extending therefrom toward said disc and engageable by respective said cam surfaces as the disc rotates whereby to flex said flexible members, means rotatably supporting said disc and maintaining said flexible members in operative relation to said disc, and contact elements carried by said means and flexible members for mutual engagement and disengagement when said flexible members are flexed and unflexed.

5. An electrical switch as in claim 4, at least one of said cam surfaces facing radially inward and at least one facing radially outward.

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