

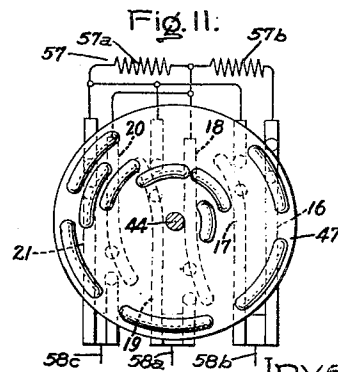
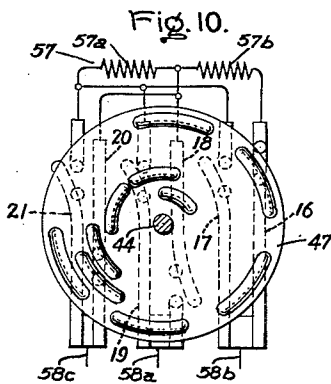
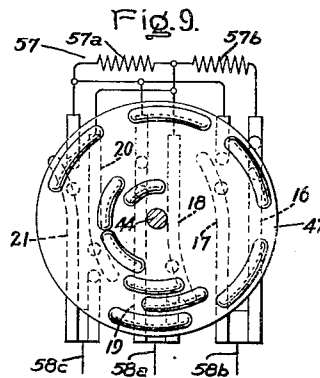
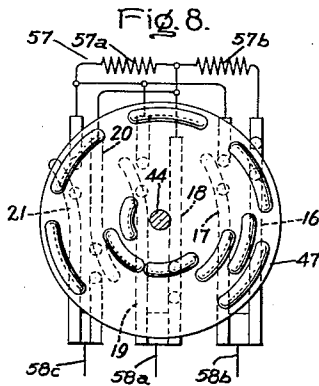
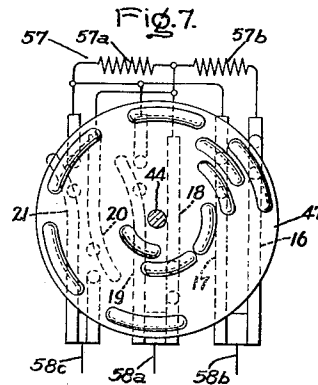
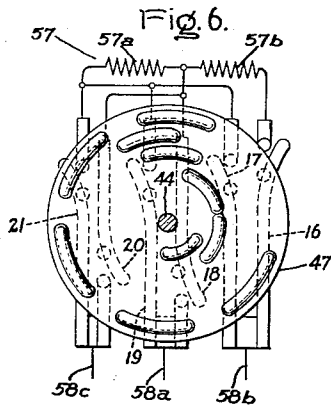
June 4, 1940.

C. P. RANDOLPH ET AL
ELECTRIC SWITCH

2,203,236

Filed April 26, 1938

4 Sheets-Sheet 2



Inventors:
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Their Attorney.

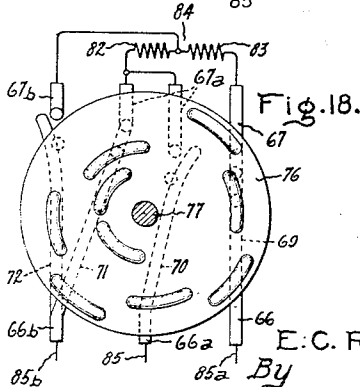
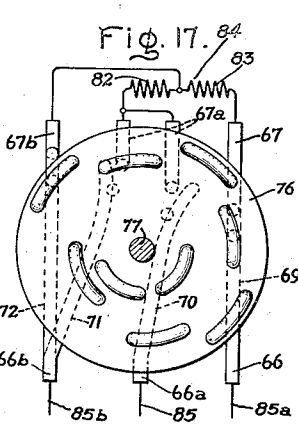
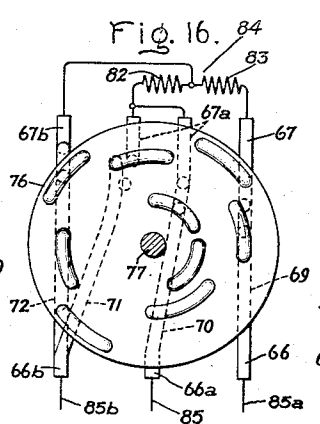
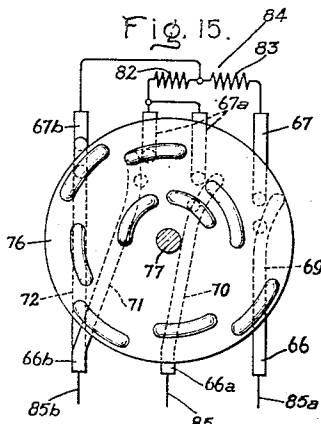
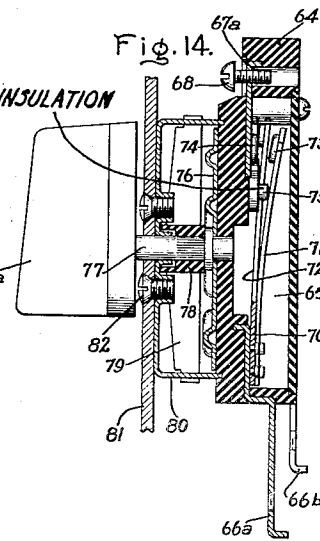
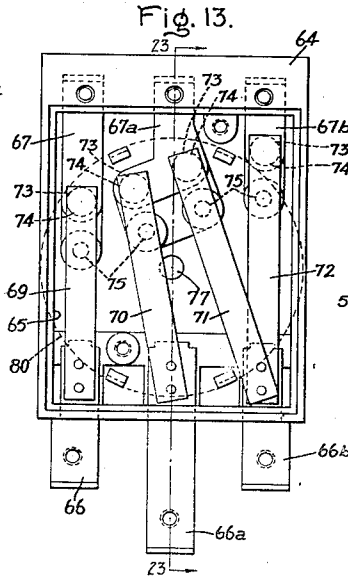
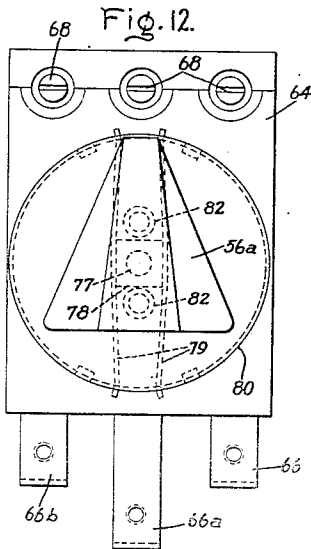
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C. P. RANDOLPH ET AL
ELECTRIC SWITCH

2,203,236

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4 Sheets-Sheet 3



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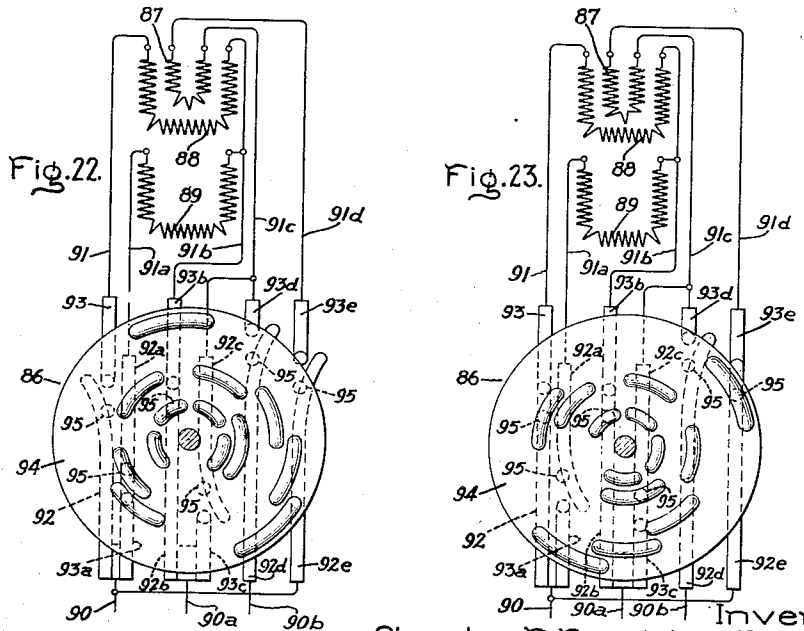
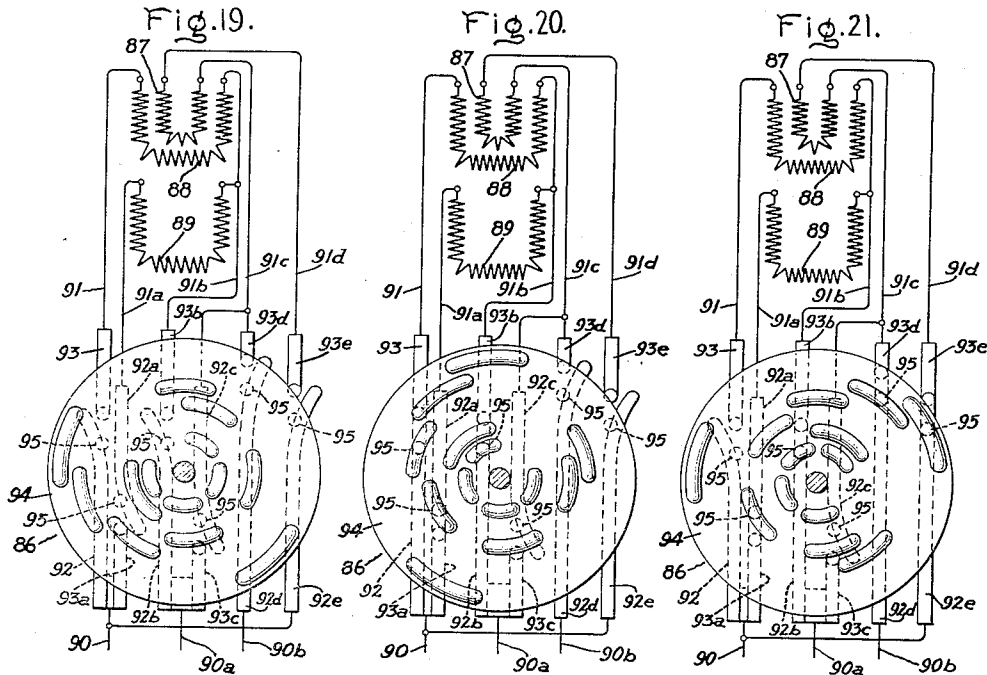
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C. P. RANDOLPH ET AL
ELECTRIC SWITCH

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,203,236

ELECTRIC SWITCH

Charles P. Randolph, deceased, late of Oak Park, Ill., by E. C. Randolph and Dorothy Saner, executors, Oak Park, Ill., and Leslie A. Kempton, Chicago, Ill., assignors to Edison General Electric Appliance Company, Inc., a corporation of New York

Application April 26, 1938, Serial No. 204,334

9 Claims. (Cl. 200-6)

This invention relates to electric switches, more particularly to multiple-position electric switches, and it has for its object the provision of an improved device of this character.

While not limited thereto, this invention is especially applicable to multiple-position electric switches for controlling electric range heating elements to provide a plurality of heating effects; and it contemplates an improved multiple-position switch which in its basic principles of construction and operation is adapted to a wide variety of uses and applications. For example, it can be used to control the surface hot plates to provide various degrees of heat, ranging from comparatively high to relatively low heat intensities; and also to control the heating means of an oven to provide preheat, bake and broiling heats.

For a more complete understanding of this invention, reference should be had to the accompanying drawings in which Fig. 1 is a front elevation of an electric switch embodying this invention; Fig. 2 is a rear elevation of the switch shown in Fig. 1 with a part removed so as to illustrate certain details of construction; Fig. 3 is a sectional view taken through the line 3-3 of Fig. 2 and looking in the direction of the arrows, the switch of Fig. 3 being shown mounted on a supporting panel; Fig. 4 is a sectional view taken through the line 4-4 of Fig. 3 and looking in the direction of the arrows; Fig. 5 is a fragmentary sectional view taken through the line 5-5 of Fig. 4 and looking in the direction of the arrows; Figs. 6-11 inclusive are diagrammatic representations of the switch of Figs. 1-5 showing the switch controlling a heating element having two resistances to provide various degrees of heat; Fig. 12 is a front elevation of a switch of modified form arranged in accordance with this invention; Fig. 13 is a rear elevation of the switch of Fig. 12 having a part removed so as to illustrate certain details of construction; Fig. 14 is a sectional view taken through the line 14-14 of Fig. 13 and looking in the direction of the arrows, the switch being shown mounted upon a supporting panel; Figs. 15-18 inclusive are diagrammatic representations of the switch of Figs. 12, 13 and 14 and showing the switch controlling a two resistance heating element to provide a number of degrees of heat less than the number effected by the switch of the first form shown in Figs. 1-11; and Figs. 19-23 inclusive are diagrammatic representations of another form of switch arranged in accordance with this invention, this switch being particularly intended to control the heating elements of an elec-

tric oven to provide preheat, bake and broiling heats.

Referring more particularly to Figs. 1-5, this invention has been here shown in one form as applied to a switch intended to control the hot plate of an electric range. This switch comprises a supporting panel 10 formed of a suitable electrically insulating material, such as a phenol condensation product. Preferably, the panel 10 will be molded of the insulating material. The panel 10 is provided with an upright peripheral flange 11 which defines a rectangular-shaped chamber 12. Mounted within the chamber 12 at one end thereof, the lower end as viewed in Fig. 2, and secured to the panel are a series of line terminals 13, 13a, and 13b. Preferably, the line terminals will be secured to the panel by molding sections of the terminals into the body of the panel, as shown more clearly in Fig. 3. The terminals, as shown, project through the lower end wall of the chamber 12 so that line connections can be made exteriorly of the chamber.

Mounted within the upper end of the chamber 12 and molded in the panel 10 are a series of terminals 14, 14a and 14b which are intended to be connected with the heating element or load being controlled. These terminals 14 have portions exposed at the upper end of the front wall surface of the panel 10, as shown in Figs. 1 and 2, and threaded into these exposed portions are binding screws 15.

Mounted within the chamber 12, and interposed between the line terminals 13, 13a and 13b and the load terminals 14, 14a and 14b are a series of contact fingers 16, 17, 18, 19, 20 and 21. The contact fingers 16 and 17 are rigidly secured at their lower ends, as viewed in Figs. 2 and 3, to the line terminal 13. At their opposite ends they carry contacts 22 and 23 that cooperate with fixed contacts 24 and 25. Contact 24 is mounted on the load terminal 14; contact 25 is mounted on a conducting bracket 26 which is rigidly secured to the panel 10 within the chamber 12 in any suitable manner, as by means of rivets 27. The bracket 26, as shown, extends transversely of the chamber from the contact 25 over to the opposite side of the chamber where it is mechanically and electrically connected with the load terminal 14b through the medium of the rivet 27.

The contact finger 18 is rigidly secured at its upper end to the central load terminal 14a and at its opposite end carries a contact 28 that cooperates with a fixed contact 29 mounted on the center line terminal 13a.

The next contact finger 19 to the right is rigidly

therefore, connects the two heating resistances 57a and 57b in parallel to the high voltage across the outside line wires 58a and 58b. This provides the highest heat generation in the system shown in Figs. 6-11, and will be designated the "Speed" heat.

Now if the knob 56a be turned another 60° in the clockwise direction to position of Fig. 8, the switch finger 17 is opened, while the switch fingers 18 and 19 are closed. This operation disconnects the resistance 57a from the supply source, but leaves the resistance 57b connected across the high voltage lines 58a and 58b. This will establish a lower heating rate which will be designated "Half" heat.

A lower heat generating rate, designated "Quarter" heat, is established by turning the knob 56a 60° farther in the clockwise direction to the position of Fig. 9. In this position of the switch, the fingers 16 and 19 only are closed, and therefore, the two resistances 57a and 57b are connected in series across the high voltage source 58a and 58b.

A still lower heat generation, which we will call "Thrifty" heat, is obtained by advancing the knob 56a 60° farther in the clockwise direction to the position of Fig. 10 wherein the contact fingers 16 and 20 only are closed. In this position of the switch, the resistance 57b only is connected to the low voltage across one outside wire 58b and the neutral wire 58c.

The lowest heat obtainable in the system of Figs. 6-11, designated "Warm" heat, is effected when the switch is moved to its position of Fig. 11 wherein the two fingers 16 and 21 only are closed. In this position, the two resistances 57a and 57b are connected in series to the low voltage across the outside wire 58b and the neutral wire 58c.

It will be understood that when the switch is used to control the hot plate of an electric range, the switch will normally be mounted in a panel 60 positioned vertically at the front of the range and that the shaft 44 will protrude through this panel, and the knob 56a so mounted as to be accessible at the front of the panel. The casing 41 is used to mount the switch on the panel, and for this purpose it is provided with a pair of threaded apertures 61 into which screws 62 in the panel are threaded, as clearly shown in Fig. 3.

In Figs. 12-18 there is shown a switch of modified form arranged in accordance with this invention and adapted to control a two resistance heating element to provide but three heats instead of five heats as in the first form. This switch comprises an insulating panel and housing 64 arranged in substantially the same fashion as is the panel and housing of the first form. Mounted within one end of the chamber 65 of the housing are three line terminals 66, 66a and 66b. Mounted in the opposite end are three load terminals 67, 67a and 67b. Attached to these three load terminals are binding screws 68. Mounted within the chamber 65 are four resilient switch fingers 69, 70, 71, and 72. The finger 69 is rigidly secured at its lower end to the line terminal 66, the finger 70 to the line terminal 66a, and the two fingers 71 and 72 to the line terminal 66b. At their upper ends, the contact fingers carry contacts 73 that cooperate with a series of fixed contacts 74. The contact on finger 69 is associated with a fixed contact mounted on the load terminal 67, those on fingers 70 and 71 with fixed contacts secured to the load terminal 67a,

and the contact on finger 72 with a fixed contact on load terminal 67b.

As before, the four contact fingers are biased to close the associated contacts by the inherent resiliency of the fingers. They are operated to open the contacts by a series of pins 75 mounted in a series of apertures provided for them in the switch panel and projecting through to the opposite side where they are operated by a cam 76. The cam 76 is provided with an operating shaft 77, with a positioning cam 78 on the shaft and with which resilient springs 79 are associated to position the shaft. The cam 76, positioning cam 78 and springs 79 are all housed in a casing 80 which supports springs 79, and also holds the positioning cam 78, shaft 77 and cam 76 in their proper assembled relation. The housing is attached to its supporting panel 81 by means of screws 82. In this case, the switch has four positions, and the positioning cam is formed with four equal sides.

In Figs. 15-18, this switch mechanism is shown diagrammatically as controlling the resistances 82 and 83 of a heating element 84, selectively connecting them to a three-wire supply source having two line wires 85 and 85a and a neutral wire 85b, these wires being connected respectively to the line terminals 66a, 66 and 66b. The load terminal 67a is connected to the left-hand end of the resistance 82, while the right-hand end of resistance 83 is connected to load terminal 67. The other ends of these resistances are connected together and to the load terminal 67b. Here also, the voltage between the outside wires 85 and 85a is substantially double that between each outside wire and the neutral 85b.

In Fig. 15, the switch is shown in its "Off" position. In this position only the finger 72 is closed, thereby connecting the connected ends of the resistances to the neutral wire 85b.

The switch is advanced 90° in a clockwise direction from the position of Fig. 15 to the position of Fig. 16 to effect the "High" heat condition in the heating element 83. When the switch is advanced to this position, the fingers 69, 70 and 72 are closed. This connects the outside ends of the two resistances 82 and 83 in parallel to the high voltage across the line wires 85 and 85a, while their common connection is connected to the neutral 85b.

"Medium" heat is effected by advancing the switch 90° farther in the clockwise direction, which operation establishes the connections shown in Fig. 17. Here the contact fingers 69 and 72 are closed to connect the resistance 83 only to the low voltage between the outside line wire 85a and neutral wire 85b.

"Low" heat is effected by advancing the switch another 90° turn in the clockwise direction to establish the connections shown in Fig. 18. Here the fingers 69 and 71 are closed to connect the two resistances 82 and 83 in series to the low voltage across the outside line wire 85a and the neutral 85b.

In Figs. 19-23 inclusive there is shown a five-position switch 86 of modified form arranged in accordance with this invention, and shown controlling the heating elements 87, 88 and 89 of an electric oven by selectively connecting them with a three-wire supply source having two outside wires 90 and 90a, and a neutral wire 90b; the voltage between the outside wires is substantially double that between each outside wire and the neutral. It is to be understood that the two heating elements 87 and 88 are positioned in the top

of the oven, while the heating element 89 is positioned in the bottom of the oven.

It is contemplated that the switch 86 will control the heating elements 87, 88 and 89 to provide a preheat, two baking heats, and a broiling heat. This switch has three terminals adapted to be connected with the line wires 90, 90a and 90b and with five load terminals adapted to be connected with the conductors 91, 91a, 91b, 91c and 91d which are connected with the terminals of the resistances 87, 88 and 89, as shown diagrammatically in Figs. 19-23. These line and load terminals are of the same form as the line and load terminals of the first two forms of this invention. There are six switch fingers 92-92e, the finger 92 is electrically connected to the load terminal of wire 90, finger 92a to load terminal of wire 91a, finger 92b to line terminal of wire 90a, finger 92c to load terminal of wire 91c, finger 92d to the line terminal of wire 90b and finger 92e to line terminal of wire 90. These fingers cooperate with fixed contacts 93-93e respectively; fixed contact 93 is connected to the load wire 91, contact 93a to line wire 90, contact 93b to load wire 91b, contact 93c to the line terminal of wire 90a, contact 93d to the terminal of load wire 91c, and contact 93e to the load terminal of wire 91d.

The switch is shown in its "Off" position in Fig. 19 in which all of the fingers are in their open switch positions. When the switch is advanced 72° in a clockwise direction from Fig. 19 to the position of Fig. 20, the fingers 92, 92a, and 92b are closed, while the remaining fingers are in their open positions. This effects "Preheat" of the oven by connecting the upper heating element 88 and the lower heating element 89 in parallel across the high voltage between the outside wires 90 and 90a.

"Preheat" may be used not only to preheat the oven, but may also be used for certain baking operations, such as baking biscuits, where it is desired promptly to obtain a fairly large radiant heat input at the top of the oven, without waiting for the oven lining to preheat by convection from the bottom heating element. This heat may also be used in meat roasting when it is desired to have the outside of the meat well-browned and the inside rare.

When the switch is advanced from the position of Fig. 20 to the position of Fig. 21 through an angle of 72° in the clockwise direction it establishes an oven heat which will be called "Bake I." In "Bake I" heat, there is provided a mild radiant heat in the top of the oven which is desirable in baking cakes and pies starting with a cold oven. This also provides a more even heat distribution throughout the oven. It will be observed that when the switch is in its position of Fig. 21, the fingers 92a, 92b, 92d and 92e are closed, while the fingers 92 and 92c are open. In this position of the switch, the lower heating element 89 is connected to the high voltage source across the line wires 90 and 90a, while the upper heating element 87 is connected to the low voltage source across the outside wire 90 and the neutral wire 90b. This provides heat in the lower part of the oven and the mild radiant heat at the top.

A second baking heat, which will be called "Bake II", provides heat only at the bottom. This is desirable at times, particularly when the oven is loaded to capacity, and where it is not desirable to brown the food too much. This heat is established by moving the switch to its posi-

tion of Fig. 22, which is 72° in advance of the position of Fig. 21. Here the fingers 92a and 92b are closed while the remaining fingers are open. This connects the lower heating element 89 to the high voltage source across the line wires 90 and 90a, while the remaining elements 87 and 88 are deenergized. This supplies heat to the lower part of the oven only.

A "Broiling" heat is established in the upper part of the oven only by moving the switch to its position of Fig. 23, which is 72° in advance of its position shown in Fig. 22. Here the fingers 92, 92b, 92c and 92e are closed, while fingers 92a and 92d are open. This connects the two upper heating elements 87 and 88 in parallel to the high voltage source between the outside line wires 90 and 90a.

It is to be understood that the arrangement of the line and load terminals and the contact fingers will be substantially the same as in the first forms of the invention described, except as to number, and that they will be mounted in a similarly arranged housing. They are operated by a cam plate 94 which actuates the fingers by means of pins 95 all arranged as are the corresponding elements of the first two forms, except of course that the cam plate will be provided with the properly arranged depressions to effect the cycle of operation described in connection with Figs. 19 to 23. The cam plate will further be provided with a positioning cam (not shown) having five sides, and an operating knob all as arranged in the manner previously described in connection with the first forms shown.

While we have shown particular embodiments of our invention, it will be understood, of course, that we do not wish to be limited thereto since many modifications may be made, and we, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of our invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A switch mechanism comprising an insulating supporting panel, contact fingers on one side of said panel biased to predetermined controlling positions, pins slidably mounted in said panel opposite said contact fingers adapted to engage them to operate them from said positions and extending through to the opposite side of said panel, a cam plate on said opposite side mounted to revolve to selected positions and to engage said pins to force them inwardly and thereby operate said fingers in a predetermined cycle of operations as the plate is revolved to said positions, said cam plate bearing against said side of said panel so that the panel functions as a bearing surface for said cam plate, and means for operating said cam plate to said positions.

2. A switch mechanism comprising an insulating supporting panel, contact fingers on one side of said panel resiliently biased to predetermined controlling positions, actuating members slidably mounted in said panel opposite said contact fingers adapted to engage them to operate them from said positions and extending through to the opposite side of said panel, a cam plate on said opposite side bearing on said side so that said side functions as a bearing surface for said cam, and said cam mounted to revolve to selected positions and to engage said actuating members to force them inwardly and thereby operate said fingers in a predetermined cycle of operations as the plate is revolved to said positions, and a housing for said cam plate

mounted on said opposite side of said panel and cooperating with said plate to hold it against said side.

3. A multi-position switch mechanism comprising a supporting panel, contacts on one side of said panel biased to predetermined controlling positions, pins mounted in a series of apertures in said panel opposite said contacts arranged when depressed to operate them from said positions and projecting through to the opposite side of said panel, a cam plate on said opposite side having a series of cam surfaces arranged when the plate is rotated to depress said pins to operate said contacts in a predetermined cycle of operation, a cup-shaped member on said opposite side of said panel housing said cam plate, an operating shaft for said cam plate having an inner bearing in said panel and an outer bearing in said cup-shaped member, a positioning cam within said cup-shaped member on said shaft secured to said cam plate and engaging said cup-shaped member so as to hold said cam plate in its operative position in said member, and springs in said cup-shaped member engaging said positioning cam resiliently to locate said shaft and cam plate in the controlling positions of the cam plate.

4. A switch comprising an insulating panel, a plurality of contact fingers mounted on one side of said panel, a metallic operating cam on the opposite side of said panel, insulating pins in said panel extending through it for operation by said cam and to operate said contact fingers, a shaft for operating said cam plate, a metallic member housing said cam plate, an insulating positioning cam within said housing connected to said shaft and engaging said cup-shaped member so as to hold said cam in its operative position in said member, flat springs in said housing extending from side to side having their mid-sections engaging said positioning cam to locate the cam and thereby the shaft and cam plate, and the springs having projections on their ends received in apertures in said casing to secure the springs within said housing.

5. A switch mechanism comprising an insulating housing member formed by bottom and side walls molded of an electrically insulating material, a first series of terminals molded in one end of said housing, a second series of terminals molded in the opposite end of said housing, resilient contact fingers within said housing connected with said first series of terminals extending across said housing for cooperation with said second series of terminals and biased into predetermined positions with relation to them, a series of actuating members mounted in a series of apertures provided for them in said bottom wall under said contact fingers arranged when moved inwardly to engage said fingers to move them into other predetermined positions with relation to said second series of terminals, a cam plate outside of said bottom wall arranged when rotated to move said actuating members inwardly in a predetermined order, a housing encasing said cam plate attached to said bottom wall, and an operating shaft for said cam plate protruding from said housing.

6. A switch mechanism comprising an insulating housing molded of an electrically insulating material having bottom and side walls defining a chamber, a first series of terminals molded in one end of said chamber, a second series of terminals molded in the opposite end, resilient contact fingers within said housing connected with

said first series of terminals extending across said chamber and biased into engagement with contacts on said second series of terminals, a series of insulating pins mounted in a series of apertures provided in said bottom wall of said housing under said fingers arranged when moved inwardly to engage said fingers to open said contacts, a cam plate outside of said bottom wall bearing on the outer surface of said wall and arranged when rotated to move said pins inwardly in a predetermined order, a metallic housing attached to said bottom wall encasing said cam plate, an operating shaft for said cam plate protruding from said metallic housing, a positioning cam in said housing attached to said shaft, resilient means in said housing engaging said positioning cam to position the shaft and cam plate, said positioning cam also bearing against said housing to hold said cam plate against said bottom wall, and an insulating cover enclosing the opposite side of said insulating housing.

7. A multi-position switch mechanism comprising a supporting panel, contacts supported by said panel on one side thereof biased to predetermined controlling positions, pins mounted in a series of apertures through said panel opposite said contacts arranged when depressed to operate them from said positions and projecting through to the opposite side of said panel, a cam plate on said opposite side having a series of cam surfaces arranged when the plate is rotated to depress said pins to operate said contacts in a predetermined cycle of operation, a cup-shaped member housing said cam plate and having a series of fingers projecting inwardly and received in apertures provided for them in said panel so that said panel is supported directly by said casing, and means mounted in said cup-shaped member for operating said cam plate.

8. A switch comprising a panel, switch fingers on one side of said panel, a cam on the opposite side provided with a cam surface that has a running clearance with said side, means operated by said cam controlling the operation of said switch fingers, an operating shaft, means securing said cam to said shaft, a casing secured to said opposite side housing said cam, the shaft protruding from the casing, operating means on the outside of the casing secured to said shaft, a collar within said casing secured to said shaft, and a spacer within said casing secured to said shaft and bearing both on said casing and collar so as to hold said shaft and cam in their operative positions.

9. A switch mechanism comprising an insulating housing molded of an electrically insulating material having bottom and side walls defining a chamber, a first series of terminals molded in one end of said chamber, a second series of terminals molded in the opposite end of said chamber, resilient contact fingers within said housing connected with said first series of terminals extending across said chamber and biased into predetermined positions with relation to contacts on said second series of terminals, a series of insulating members mounted in a series of apertures provided in said bottom wall of said housing under said fingers arranged when moved inwardly to engage said fingers to move them to other predetermined positions with relation to said contacts, a cam plate outside of said bottom wall bearing on the outer surface of said wall and arranged when rotated to move said insulating members inwardly in a prede-

terminated order, a closure member cooperating with said bottom wall to form an enclosure for said cam plate, an operating shaft for said cam plate protruding from said closure member, a
5 positioning cam in said enclosure attached to said shaft between said closure member and said cam plate, and resilient means in said enclosure en-

gaging said positioning cam to position said shaft and cam plate.

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June 4, 1940.

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2,203,251

MACHINE FOR CLEANSING AND TREATING

Filed May 3, 1939

4 Sheets-Sheet 1

