Feb. 22, 1949. J. F. BEAL 2,462,594

MULTIPOSITION SWITCH

Filed June 19, 1945 5 Sheets-Sheet 1

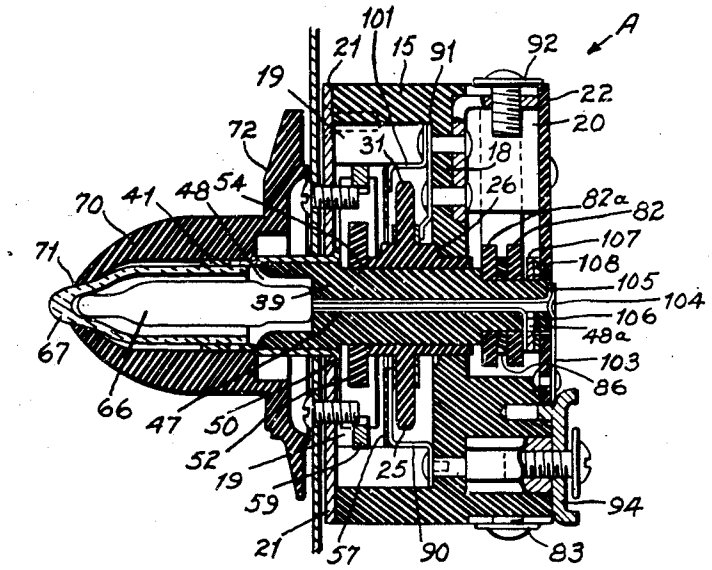


Fig. 3.

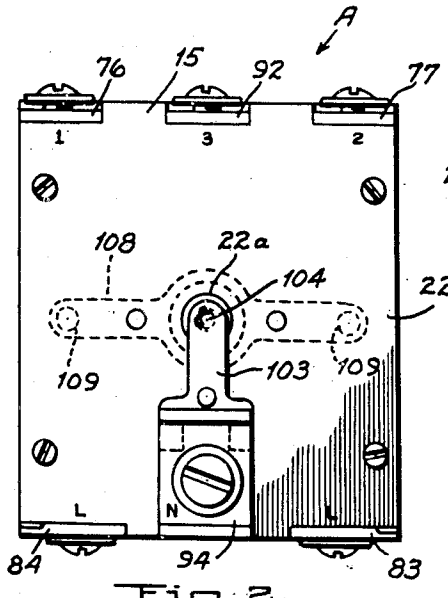


Fig. 2.

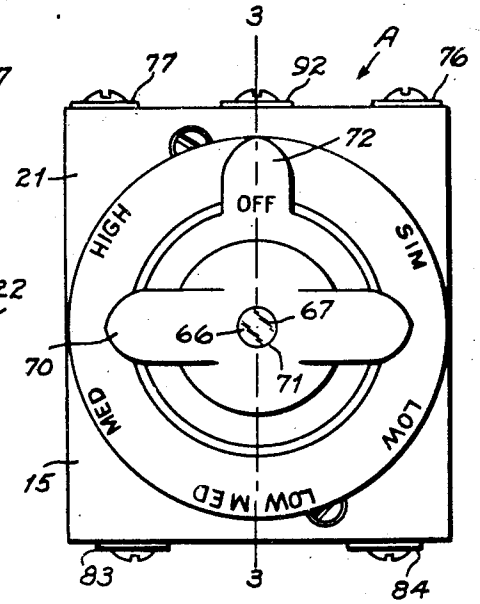


Fig. 1.

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Feb 22, 1949. J. F. BEAL 2,462,594

MULTIPOSITION SWITCH

Filed June 19, 1945 5 Sheets-Sheet 2

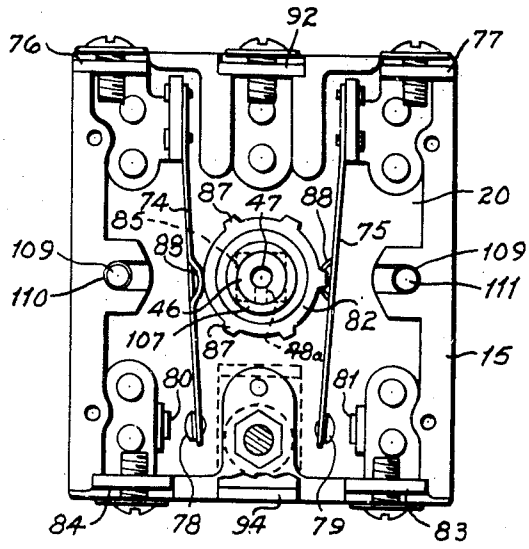


Fig. 6.

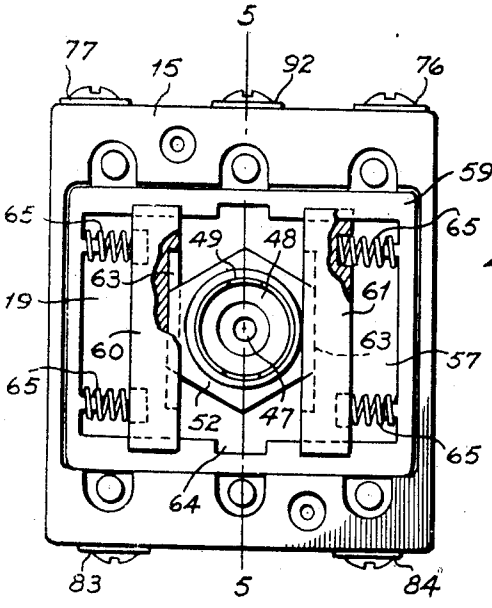


Fig. 4.

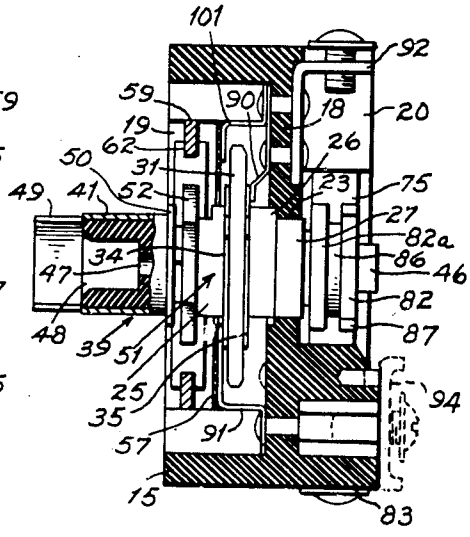


Fig. 5.

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Feb. 22, 1949. J. F. BEAL 2,462,594

MULTIPOSITION SWITCH

Filed June 19, 1945 5 Sheets-Sheet 3

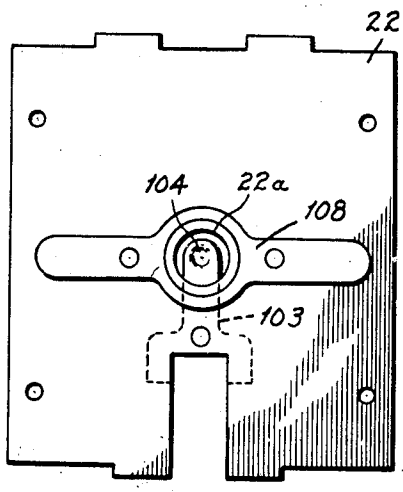


Fig. 9A.

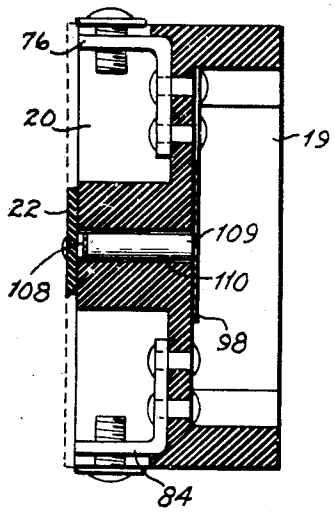


Fig. 9.

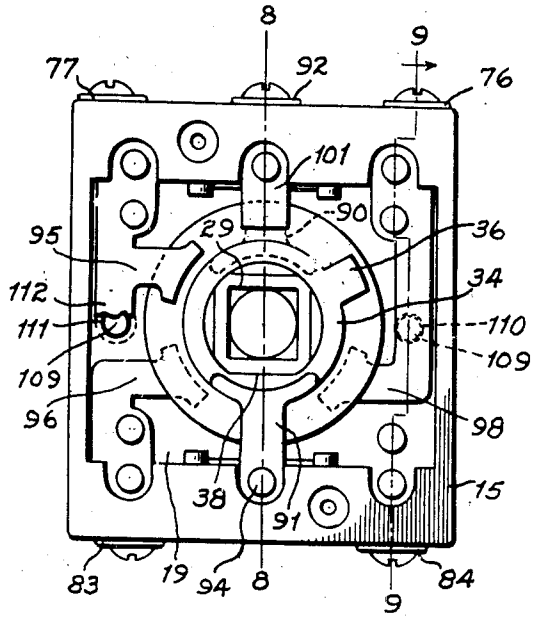


Fig. 7.

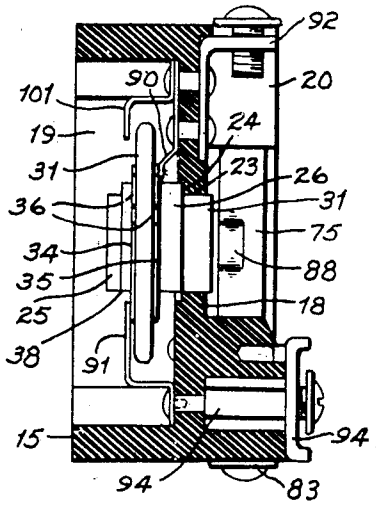


Fig. 8.

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Feb. 22, 1949. J. F. BEAL 2,462,594

MULTIPOSITION SWITCH

Filed June 19, 1945 5 Sheets-Sheet 4

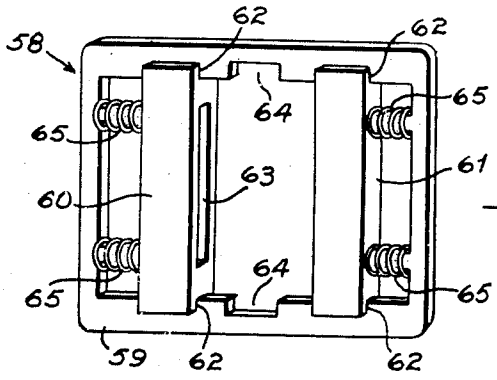


Fig. 16.

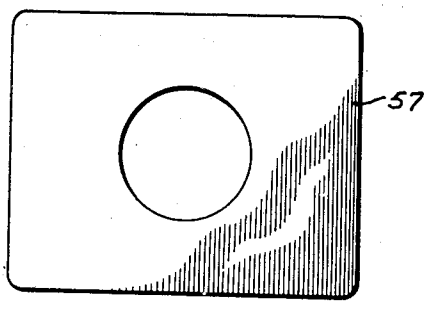


Fig. 14.

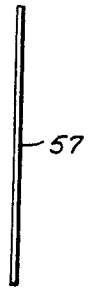


Fig. 15.

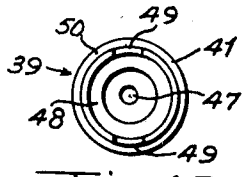


Fig. 12.

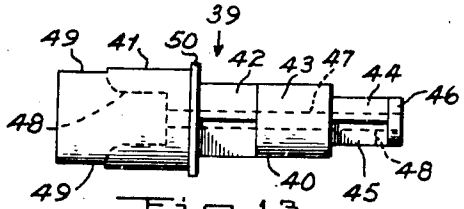


Fig. 13.

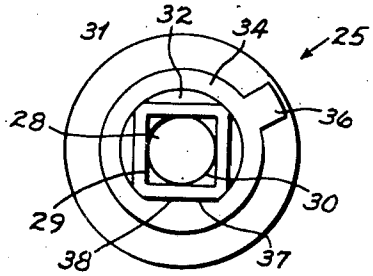


Fig. 10.

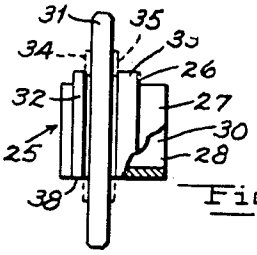


Fig. 11.

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Feb. 22, 1949. J. F. BEAL 2,462,594

MULTIPOSITION SWITCH

Filed June 19, 1945 5 Sheets-Sheet 5

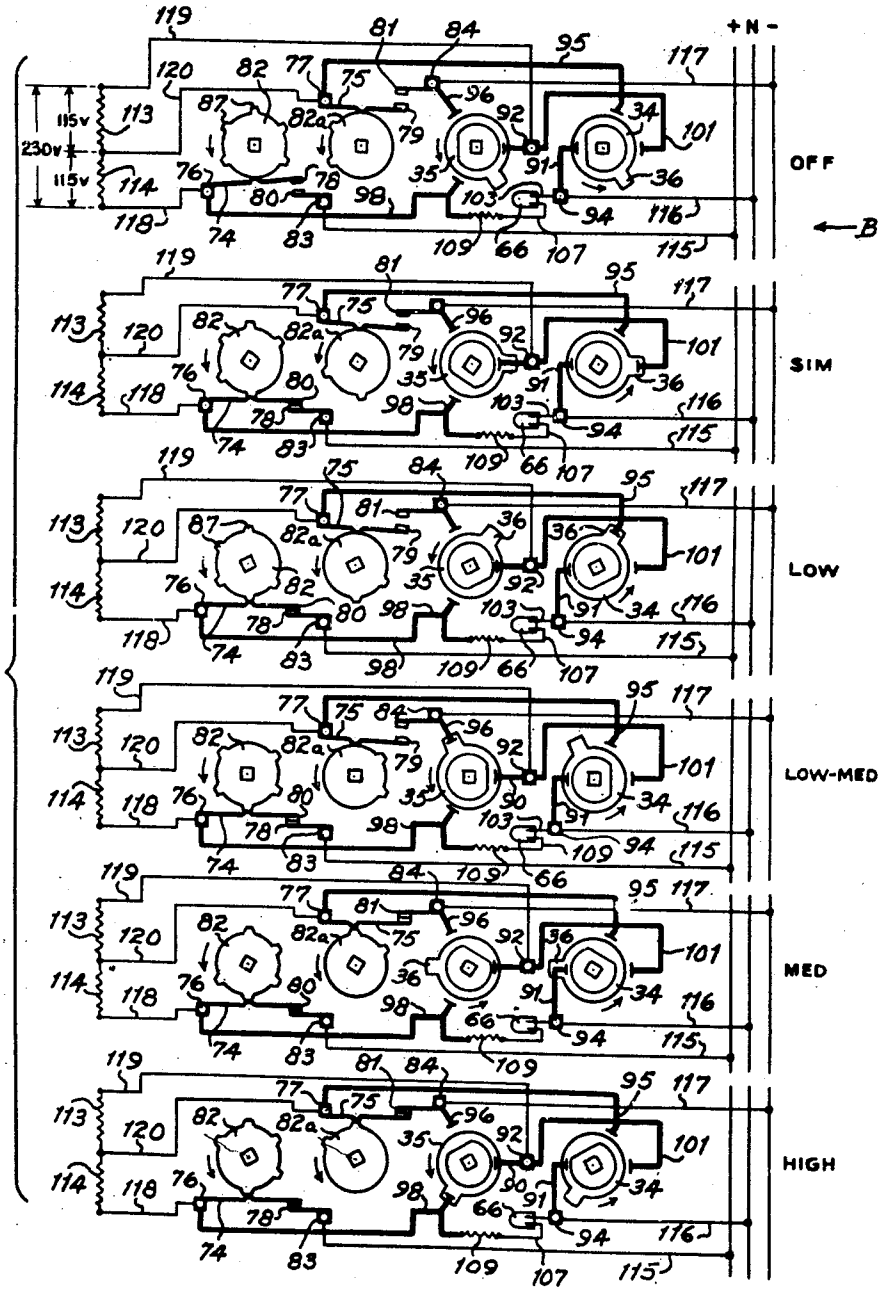


Fig. 17.

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Patented Feb. 22, 1949

2,462,594

UNITED STATES PATENT OFFICE

2,462,594

MULTIPOSITION SWITCH

James F. Beal, Renfrew, Ontario, Canada, assignor to Renfrew Electric & Refrigerator Company Limited, Renfrew, Ontario, Canada, a corporation of Canada

Application June 19, 1945, Serial No. 600,338

9 Claims. (Cl. 200—6)

1

This invention relates to multi-position switches and has more particular reference to switches of this character for controlling the flow of electrical energy to electric stoves, heaters and like appliances and apparatus.

In the art of electric heating apparatus, especially where stoves, ranges, water heaters, room heaters and the like are concerned, it is highly desirable as well as economical to so regulate and control the current supply to such apparatus that rates of heating of a wide range may be readily and conveniently obtained.

It is one of the objects of the present invention therefore to provide a switch of this character wherein the design is substantially universal in nature and one that may be employed in single pole or double pole circuits with either two wire or three wire supply.

Another object of the present invention is to provide a switch of this character that is safe, small and compact in form and wherein a single operating means selectively operates to control the flow of electrical energy to one or more of a multiplicity of circuits through the heating element or load unit.

A further object of the present invention is to provide a device of this character which is capable of a wide range of different heat controls by interchangeable registrations or positionments.

Another object of the present invention is to provide a device of this character wherein a basically independent and full-floating unit is provided for the registration or positioning of the switch operating mechanism.

Still another object of the present invention is to provide a switch of this character which includes a "pilot light" and pilot light circuit wholly within the switch structure and wherein the "pilot light" is energized only during actual circuit closure on each and all of the several heats.

Yet a further object of the present invention is to provide a switch of this character wherein the simple rearrangement or substitution of parts, rather than the addition of parts in appreciable number, enables the device to be adapted to (1) the control of different types of heating elements including different circuit arrangements, (2) different numbers of heats, and (3) different physical elements.

Another and further object of the present invention is to provide a device of this character which may conveniently be mounted on the front, side, splash shield or other appropriate part of a range or other heating appliance.

Having regard to the foregoing and other objects and advantages which will become apparent as the description proceeds and the details and the operation of the switch become known and understood, the invention consists essentially in

2

the novel combination and arrangement of parts hereinafter described in detail and illustrated in the accompanying drawings in which;

Fig. 1 is a front elevational view of an embodiment of the present invention.

Fig. 2 is a rear elevational view of Fig. 1.

Fig. 3 is a section taken on the line 3—3 of Fig. 1.

Fig. 4 is a front elevational view of the present invention with the switch handle, pilot light shield, pilot light bulb and front switch cover removed.

Fig. 5 is a section taken on the line 5—5 of Fig. 4 with the rear cover member also removed.

Fig. 6 is a rear elevational view of the present device with the rear cover member removed.

Fig. 7 is a front elevational view of the present invention with the switch handle, front cover, center post, registration unit and insulating shield removed.

Fig. 8 is a section taken on the line 8—8 of Fig. 7 with the rear cover member also removed.

Fig. 9 is a section taken on the line 9—9 of Fig. 7.

Fig. 9A is an elevational view of the inside of the rear cover member.

Fig. 10 is a front end view of the rotor shown in detached form.

Fig. 11 is a side view of Fig. 10.

Fig. 12 is a front end view of the switch center post shown in detached form.

Fig. 13 is a side view of Fig. 12.

Fig. 14 is an elevational view of the insulating shield.

Fig. 15 is an end view of Fig. 14.

Fig. 16 is a perspective view of the full-floating registration unit assembly shown in detached form with registration cam removed.

Fig. 17 is a schematic wiring and switch circuiting diagram showing an adaptation of the present invention to a switch having six different operating positions and designed to produce five different heats with the pilot light included in the diagram.

In the accompanying drawings wherein the present invention is disclosed and wherein like letters and numerals of reference designate corresponding parts and elements in the different illustrations, the letter A indicates the switch as a whole and the letter B the circuit controlled by the switch.

Treating first with the switch structure, the various units and elements and their arrangement is such that through a predetermined rotative movement of a single operating member, circuit set-up contacts are operated to selectively establish predetermined circuits to permit current to flow therethrough to produce different rates of heating or temperatures. Additionally, the same rotative movement of the operating

member causes cooperating elements to make and break the circuits independent of the circuit set-up contacts, thus eliminating arcing at the circuit set-up contacts. Further, when a predetermined circuit is established and energized, a pilot light circuit is simultaneously energized, thus the pilot light is operative only during that period of time when power is being consumed by the load.

Referring now to the structural details, the housing, casing or switch body is designated by the numeral 15 and is composed of insulating material possessing high dielectric and heat-resistant properties and is adapted to house and support the various operating units, elements, connections and fitments. The housing is provided with closed side, top and bottom walls and formed with open front and rear walls and while a partition or dividing wall 18 is disposed substantially midway of the housing thus forming spaced front and rear compartments 19 and 20 within the housing. Front and rear cover members 21 and 22 respectively close their respective compartments.

Substantially centrally in the dividing wall 18 I provide an annular opening 23 having a recess 24 concentric therewith. The opening 23 is designed to permit the contact carrying rotor assembly to extend through the wall 18 while the recess 24 forms accommodation and bearing for the shoulder of the rotor later described.

In the following I conveniently illustrate the rotor assembly as comprising two separately formed sections, i. e., a rotor and a center post. It is to be understood however that this structure may take the form of a single unit in molded form. As illustrated then the rotor member is designated by the numeral 25 and is of moulded, heat resistant insulating material and in structure includes a shoulder 26 which engages recess 24 and a hub or shaft like body member 27 having a central bore 28 extending therethrough. The front end of the bore may be of square or other non-circular formation, as indicated at 29, and extends part way therethrough while the remaining portion of the bore is cylindrical in form as indicated at 30. Formed integral with the hub 27 is a disc member 31 while disposed on opposite sides of the disc and in spaced relationship thereto are shoulder members 32 and 33. The shoulder member 32 is designed to maintain the annular rotor ring contact 34 against the outer face of the disc 31 while the shoulder 33 is adapted to maintain the annular rotor ring contact 35 against the opposite face of the disc member 31.

The contact rings 34 and 35 observed in Figs. 7 and 10 may each be provided with one or more integral tongues 36 which extend outwardly from the ring proper. The interior of each contact ring is formed with a non-circular portion 37 and such portion is adapted to engage the non-circular portions 38 of members 32 and 33, thus when the contact rings are mounted on the hub with the non-circular portions 37 and 38 in engagement, one with the other, and the rotor 25 operated, the contact rings 34 and 35 will move therewith.

The center post 39 upon which the rotor 25 is mounted (see Figs. 3 and 13) comprises a shaft 40 of heat-resistant insulating material with or without a metallic switch handle receiving sleeve 41 fixedly connected thereto. As more clearly observed in Fig. 13, the inner portion of the shaft 40 is provided with a square or non-circular section 42 and a cylindrical section 43. Extending

outwardly from section 43 is a reduced portion 44 the inner part of which is also of square or other non-circular formation as indicated at 45 while the outer extremity of the reduced portion is cylindrical in form as indicated at 46 in order that it may extend through a center opening 22a in the rear cover member 22. A center bore 47 extends through shaft 40 and communicates with the pilot light lamp receiving cavity or socket 48, while a lateral opening 48a communicates with the center bore. Opening 48a is provided for the accommodation of a conductor or lead from the light source which will be later referred to. Longitudinal recesses 49 are provided in the switch handle receiving member 41 to key the switch handle to the center post while a protruding flange 50 formed integral with the metallic sleeve is provided to maintain and secure the position of the center post 39 in the switch housing. From the foregoing it will be seen that complementary non-circular formations 29 and 42 and complementary circular formations 30 and 43 enable the rotor 25 to snugly fit the center post 39 upon which it is mounted, so that the members 25 and 39, generally indicated in assembly form at 51, are rotatable as a unit.

For purposes of effecting the registrative movement of the unit 51 I provide cam means which is best observed in Figs. 3, 4 and 5. The cam means comprises a disc type cam member 52 formed with a non-circular center opening 54. The cam is adapted to be mounted on the non-circular section 42 of the shaft 40, and is therefore rotatable with the unit 51.

By reference to Fig. 4 it will be observed that the cam member 52 is provided with a series of equidistantly spaced angular cam surfaces, each such surface representing a registration point or limit of the relative rotative movement of the unit 51 by the switch operating handle between switch positions. In the present instance, and for purposes of illustration, the cam member 52 is shown as hexagonal in form and as such will afford six different registrative positions. It is to be clearly understood however that such illustration does not imply restriction since other multiple surfaces such as square, pentagonal, octagonal, etc., affording different numbers of registrative positions, may be employed without departing from the spirit or scope of the invention.

Positioned in the front compartment 19 and disposed directly in front of the rotor 25 is a centrally apertured shield 57 of insulating material, while arranged between the insulating shield and the front cover member 21 is the substantially full-floating registration unit 58 which is designed to position and regulate the movement of the rotor assembly 51 as controlled by registration of the cam 52.

As more particularly exemplified in Figs. 4 and 16, the unit 58 comprises a skeleton-like frame 59 upon which bar members 60 and 61 are slidably movable. Each end of the bar members are provided with a recess 62 which enable them to straddle the frame while the inner or adjacent faces of each bar member is provided with a longitudinal recess 63 for the reception of cam 52. Cut-outs 64 in the frame 59 enable the bar members to be assembled or removed as circumstances may require. Mounted between the inside of the frame 59 and the outside faces of the bar members 60 and 61 are coil springs 65, the springs being retained in operative position by means of inwardly projecting tongues on the

frame and annular recesses in the bar members. The purpose of the coil springs just referred to is to urge the bar members one toward the other and into engagement with the surfaces of the cam member 52, thus regulating the self-positioning of cam member 52 and maintaining it in a definite predetermined registrative position.

By reference to Fig. 4 it will be observed that in outline the unit assembly 58 conforms substantially with the general outline of the interior of the compartment 19, but more intimately with the top and bottom walls than with the side walls. Thus the frame as a whole is supported by the compartment and restrained against rotative movement by the top and bottom walls, while free to shift slightly laterally in order to compensate for unbalance of effort as may be afforded by differences in springs 65.

The pilot lamp or light source indicated at 66 is mounted wholly within the switch unit and is carried by the portion 48 of the center post 39. Enclosure means for the light source comprises a protecting sheath or envelope 67 of transparent material which protrudes outwardly from the switch handle receiving member 41 in enveloping form and is connected to the rotor assembly by suitable and appropriate fitting and locking means.

For operative purposes the switch is provided with an operating handle which is designated by the numeral 70. The operating handle may be of the "push-on" or other appropriate type and is provided at its outer end with an opening 71 to receive a conforming end portion of the transparent sheath 67. With this form of structure light from the source 66 is therefore made visible at and externally of the switch operating handle. In addition to the foregoing a raised portion or the like 72 is provided on the switch operating handle as a means for indicating the different switch positionments.

By reference to Figs. 3, 5 and 6 it will be seen that the rear compartment 20 is provided with movable arcing contact arms or brushes 74 and 75. These brushes are of resilient material and are mounted in operative relation to the cam members later referred to. One end of each of the members 74 and 75 is fixedly secured to an appropriate part such as the up-turned portions of terminals 76 and 77 respectively while the opposite or free ends thereof are provided with suitable arcing contacts 78 and 79. A companion pair of arcing contacts 80 and 81 are mounted on integral portions of terminals 83 and 84. From the foregoing it will be clear that contacts 80 and 81 are stationary while resilient arms 74 and 75 carrying contacts 78 and 79 are movable, the movable arms normally maintaining their contacts in spaced relationship to their companion arcing contacts.

As previously mentioned, the resilient members 74 and 75 are operated by cam means. This cam means comprises a pair of cam members 82 and 82a of disc-like form each provided with a non-circular opening 85 and between which I interpose a spacer member 86 with similar non-circular opening. These cam members and the spacer disc are mounted upon the non-circular portion 44 of the shaft 40 and are thus rotatable with the unit 51.

Arranged around the outer periphery of the members 82 and 82a are a series of projections or cam points 87, the cam 82 carrying a series of five cam points and the cam 82a carrying a series of two such points. It is then these projections

or cam points 87 which engage the bosses or raised portions 88 of the resilient members 74 and 75 and causes these resilient members to move their contacts into circuit closing position upon rotative movement of the unit 51. The bosses or raised portions 88 of the members 74 and 75 are arranged in staggered relationship to one another so that while the cams are arranged closely to one another, they operate the respective resilient arms without interfering one with the other. From the foregoing it will be apparent that as the switch is operated to rotatably move the unit 51, the points 87 determine the time and sequence of movements of members 74 and 75 for moving arcing contacts 78 and 79 into and out of contact engagement with arcing contacts 80 and 81.

For purposes of establishing different circuits through the medium of the several contacts carried by the rotor 25, I provide a series of conductor members and brushes. As illustrated in Figs. 3, 5, 6, 7, 8 and 17, rotor wiper contacts 90 and 91 are fixedly mounted in the housing or casing 15 and are in constant but independent contact with the rotor rings 34 and 35 respectively. These rotor wiper contacts or brushes, through rivets or like means, are fixedly and conductively connected to terminal members 92 and 94 respectively in the upper and lower sections of the rear of housing 15.

In addition to the foregoing a further set of rotor engaging contacts 95, 96, 98 and 101 are disposed in such a manner in the housing that they are free of constant contact with the rotor ring contacts 34 and 35 but are engageable by the tongues 36 of what may be termed outer and inner or upper and lower level rotor ring contacts 34 and 35 as determined by the rotative movement of the rotor 25. These rotor contacts 95, 96, 98 and 101 are also fixedly mounted in the housing and conductively connected to terminals 77, 84, 76 and 92 respectively.

In further relation to the aforementioned rotor contacts and rotor wiper contacts, it is pointed out that rotor contact 101 is mounted in conductive connection with rotor wiper 90 and terminal 92. Contact 101 is designed to be contacted by the tongue 36 of the outer or upper level rotor ring contact 34 as determined by the rotative movement of the unit 51 as already mentioned. Here it can well be mentioned that the switch terminals herein illustrated are of substantially standard form and each provided with conventional lugs, fitments, terminal screws or the equivalent through which means the line and load leads are connected.

From what has thus far been described with respect to the rotor contact and wiper contact arrangement, it will be observed that the various rotor and wiper contacts are conductively connected through terminals 83, 84 and 94 with the supply or line leads while terminals 76, 77 and 92 connect the load leads to establish circuits upon operation of the switch as will be later described.

By referring now to Figs. 2 and 9 it will be seen that conductor member 103 is mounted externally upon the rear cover 22, such member being designed to be conductively connected to terminal 94 when the rear cover is in assembled position on the housing. The conductor 103 is provided with an indent or depression 104 which registers with the opening 22a in the rear cover member 22 and the end of the center bore 47 of the center post 39 and is designed to contact the terminal end of lead 105 of the light source

66. Lead 106 from the light source extends through center bore 47 and lateral opening 48a of shaft portion 44 where it engages a metallic spacer and contact washer 107 which in turn conductively contacts the ring portion of contact 108 mounted interiorly upon the rear cover.

As observed in Figs. 9 and 17, one or more ballast resistors 109 are interposed in the light source circuit and as desired are assembled in one or both of the housing openings or wells 110 and 111. The wells 110 and 111 are open to both sides of the partition wall of the housing and therefore one end of the ballast resistor 109 is conductively connected to contact 108 when the rear cover 22 is in position while the opposing end of the ballast resistor 109 is conductively connected to rotor contact 98. From the foregoing it will be seen that as the rotor contact 98 is conductively connected with load terminal 76 and such load terminal is energized at all "on" positions of the switch, the pilot light circuit is energized at all "on" positions of the switch and always at the same potential.

In certain circuit arrangements no single rotor contact member is energized at all "on" positions of the switch as is the case with rotor contact member 95 in the circuit presently shown. In required circumstances however a second or additional ballast resistor 109 may be provided in companion well 111. This second or additional ballast resistor is then conductively connected in circuit between rear cover contact member 108 and extension 112 of rotor contact 95 (see Fig. 7). With this type of arrangement the two ballast resistors 109 are connected in series and may be across the line potential at certain "on" position of the switch where the circuiting conditions might require the simultaneous closure of both arcing contact members or brushes 74 and 75.

The circuit schematically shown in Fig. 17 is designed to illustrate one embodiment of the present invention with the different relative positions of the mechanism operated to establish five heats and six positions. It will be understood however that such schematic showing is illustrative rather than restrictive since modification may be made within the spirit and scope of the invention and the circuit illustrated.

Proceeding now with a description of the switch and circuit hook-up, reference is made to Fig. 17. In this illustration the load or heater element is represented as being composed of two sections which are designated by the numerals 113 and 114, each such section being individually suitable for operation at the maximum potential difference available from three-wire supply line leads.

The three wire sources of supply illustrated represents, for example, 230 volts between outside or positive and negative conductors and approximately half that value of potential difference between either outside or positive or negative conductors and the grounded neutral conductor.

For purposes of convenient reference Fig. 17 exemplifies the six different circuiting conditions that exist in my switch to produce the five different heats, i. e., "simmer," "low," "low medium," "medium" and "high," when used with the above described heater element or load and connected for power supply with a three wire source as above mentioned.

At the top or uppermost portion of Fig. 17 I have illustrated the "off" position circuiting

wherein it will be found that all the current paths of travel through the switch from outside or positive and negative line conductors to the load are open at one point or another by reason of the fact that circuit closing contact parts therein are separated.

In the following, I shall describe the sequence of movements of the switch handle 70 in a counter-clockwise direction in order to conveniently follow the illustrations of Fig. 17. It will be understood however that the sequence of movements of handle 70 may be clockwise or counter-clockwise at any point in circuit establishment to produce the next successive heat or to resume the "off" position.

Immediately below the "off" position then I illustrate the fifth or lowest circuiting heat condition, termed "simmer." At this heat or with the switch handle rotated to the "simmer" position, the circuit through the switch will follow from the positive conductor of the three-wire supply through conductor 115 to terminal 83, thence through resilient contact arm 74, terminal 76, conductor 118, load sections or resistances 114 and 113 in series connection, conductor 119, terminal 92, rotor contact 101, rotor ring contact 34, rotor wiper contact 91, neutral connecting stud and terminal 94 and finally through conductor 116 to the grounded neutral conductor of the power supply circuit. This circuiting provides substantially half maximum line potential or say 115 volts potential difference across the seriesed load resistances 113 and 114. This circuiting then produces the minimum degree of heat available over the five different heat positions by reason of the fact that the resistance sections of the heating element or load are in series and present the maximum resistance available from such sections and they in turn are energized at a minimum potential difference available from the three wire supply line.

The "low" heat circuiting condition is indicated just below the "simmer" condition so that by turning the switch handle further in a counter-clockwise direction, a fourth or "low" heat is provided. At this heat the circuit through the switch follows through the positive line wire to conductor 115, terminal 83, arm 74, terminal 76, conductor 118 and load resistance 114. From resistance 114 the circuit is then completed through conductor 120, terminal 77, rotor contact 95, rotor ring contact 34, rotor wiper contact 91, terminal 94 and conductor 116 to the grounded neutral of the three wire supply line. In the switch position of "low," only one resistance or load section is across one half the line potential or say 115 volts.

The next switch circuiting condition is illustrated just beneath the "low" condition and is obtained by the further counter-clockwise rotation of the switch handle to the third or "low medium" heat. At this heat the circuit through the switch is from the positive line wire to conductor 115, terminal 83, arm 74, terminal 76, conductor 118 and load resistances 114 and 113 in series. The circuit completion is thence through conductor 119, terminal 92, rotor wiper contact 90, rotor ring contact 35, tongue 36, rotor contact 96, terminal 84 and conductor 117 to the negative line of the three wire supply source. In this switch circuiting condition both resistance or load sections are in series across the maximum line potential of 230 volts.

From the "low medium" switch position, counter-clockwise rotation of the switch handle pro-

vides a second or "medium" heat condition and the circuiting for this heat is illustrated immediately below the "low medium" circuiting. In this heat, the circuit through the switch is from the positive line wire through conductor 115, terminal 83, arm 74, terminal 76 and conductor 118 to one end of the load resistance 114. From the other end of resistance 114 the path is through conductor 120, terminal arm 75, terminal 84 and conductor 117 to the negative line of the supply circuit. In this switch circuiting condition, only one load section or resistance is connected across the maximum line potential of 230 volts.

The first or "high" heat circuiting condition of the switch appears at the bottom of the diagram and further counter-clockwise rotation of the switch handle produces the "high" heat condition. In this heat the circuiting through the switch is from the positive line wire through conductor 115, terminal 83 and arm 74 to terminal 76 where the circuit divides into parallel paths. One of these paths is through the conductor 118 to the outside end of load resistance section 114 while the other path is through rotor contact 98, tongue 36, rotor ring contact 35, rotor wiper contact 90 and thence through terminal 92 and conductor 119 to the outside end of resistance or load section 113. This circuiting arrangement through the switch places positive line potential on both outside ends of the load sections 113 and 114 and since the opposite ends of the load sections are common, they are afforded a common return to the negative line wire over conductor 120, terminal 77, and arm 75 by way of terminal conductor 84 and conductor 117. In this switch position it is observed that both resistance or load sections 113 and 114 are in parallel across the maximum line potential of 230 volts.

Upon further counter-clockwise rotation of the handle 70 the switch is restored to the "off" position and in the "off" position all circuit establishing means are again in open load position at one point or another. From what has been said it will be clear that counter-clockwise rotation of handle 70 from "off" through the several heats to "off" again, produces various heat values in ascending order. Conversely, clockwise rotation of the handle 70 from "off" through the several heats to "off" again, produces heat values in descending order.

During the operation of the switch to produce different heat conditions, contacts that function as "arcing" and "non-arcing" contacts always operate in a definite sequence, that is to say, in all positions of the switch "non-arcing" contacts always "make" prior to the "arcing" contacts being closed and the "arcing" contacts always open or "break" prior to the separation or "break" of the "non-arcing" contacts.

For purposes of describing the "arcing" and "non-arcing" more in detail I refer now to Figs. 1 and 7 from which it will be observed the following sequence of operations occur. Rotative movement of the handle 70 in a clockwise direction will move tongue 36 of rotor ring contact 35 approximately thirty-five degrees from zero or "off" position. At this stage the tongue 36 will commence to engage contact 98 as a preliminary step in setting up the "non-arcing" high heat circuiting condition. As rotative movement progresses (see Fig. 6), the cam members 82 and 82a are simultaneously advanced until at a point approximately fifty degrees from zero the immediate cam points 87 of cam members 82 and

82a engage the raised portions 88 of arms 74 and 75 to effect closure of the "arcing" contacts 78 with 80 and 79 with 81 to fully close the "high" heat circuit.

In order to "break" the "high" heat circuiting condition, further rotation of the handle 70 causes cam points 87 to become disengaged from portions 88 of arms 74 and 75 enabling the "arcing" contacts 78 and 79 to separate from "arcing" contacts 80 and 81 respectively to "break" the circuit. With the "arcing" operation completed, the preliminary circuit set-up remains unaffected and further rotative movement is required to move the tongue 36 out of contact with contact 98 to the next phase of operation.

From the foregoing it is manifest that the load circuit is first set-up by the closure of the "non-arcing" contacts and then completed by the closure of one or both "arcing" contacts as the case may be. In successive order the completed circuit is first "broken" by the "arcing" contacts after which the "non-arcing" contacts are moved to "break" the preliminary circuit set-up. The same sequence of operations follow throughout in the operation of the switch, the only difference being that different contact elements are disposed in different positions over a range of three-hundred and sixty degrees in order to obtain the five heat six position operation within the radius of a circle.

Reference is now made to the pilot light circuit. In this circuit the pilot light or light source 66 is energized only while closed circuit conditions exist at any heat. In every "heat" position therefore positive line conductor potential is fed over conductor 115 to terminal 84 and by way of arm 74 to terminal 76. Thus as rotor contact 98 is permanently and conductively connected to terminal 76, rotor contact 98 carries positive potential at every "heat" or "on" position of the switch.

The circuit through the pilot light then is by way of rotor contact 98, ballast resistor 109, through contact 108 on the inside of rear cover 22 and metallic spacer and contact washer 107, lead 106 to the light source 66. From the light source 66 the path is through lead 105, contact 104 and conductor 103 exteriorly of the rear cover to terminal 94 and thence over conductor 116 to the neutral conductor of the three wire supply line.

From the foregoing it will be seen that the invention is characterized by its novelty, simplicity and practicability. Many changes however may be made in the above and many apparently widely different embodiments constructed without departing from the spirit or essential characteristics of the invention. It is intended therefore that the disclosure herein be interpreted in an illustrative rather than a restrictive sense and that all changes coming within the meaning and range of equivalency of the claims are intended to be embraced therein.

What I claim as my invention is:

1. In a multi-position switch, an insulated support member provided with a series of fixed contacts arranged in different planes, a movable insulated member provided with a series of spaced contacts arranged in different planes and selectively movable into and out of contact engagement with the fixed contacts arranged in different planes to establish a series of different load circuits, registrative means for indicating the different circuit establishing positions of the movable member and means for maintaining constant contact between at least one pair of the fixed contacts and movable contacts.

2. In a multi-position switch, a stationary insulated support provided with a series of fixed contacts arranged in different planes, a movable insulated member provided with a series of spaced oppositely disposed contacts arranged in different planes and selectively movable into and out of contact engagement with the fixed contacts to establish a series of different load circuits, handle means for operating the movable member, a light device mounted within the handle for transmitting light rays therefrom and means for conducting energy to the light device only during the loading of the switch.

3. In a multi-position switch, an insulated housing provided with a series of fixed contacts arranged in different planes, a rotor member provided with spaced contacts arranged in different planes and selectively movable into and out of contact engagement with the fixed contacts to establish a series of different load circuits, a handle member operatively connecting the rotor, a light device carried by the rotor for transmitting light rays through the handle, registration means for indicating the different sequence of circuit establishing positions of the rotor and means for conducting energy to the light device only during the loading of the switch.

4. In a multi-position switch, an insulated housing provided with dividing wall structure having a series of arcing contacts and a series of non-arcing contacts arranged in different planes on opposite sides of the said wall, a rotor member rotatably mounted between the contacts in the different planes having fixed contacts thereon movable into and out of engagement with the non-arcing contacts to establish different load circuits through the switch, a handle for operating the rotor and means carried by the rotor for causing the arcing contacts to be actuated subsequent to the engagement of the non-arcing contacts and for causing the arcing contacts to be actuated prior to the disengagement of the non-arcing contacts.

5. In a multi-position switch, an insulated housing provided with wall structure dividing the housing into separate compartments, a series of fixed non-arcing contacts arranged in different planes in one of the said compartments and a series of arcing contacts arranged in said compartment, an insulated rotor member rotatably mounted in the housing, a series of contacts arranged in different planes carried by the rotor member selectively movable into and out of engagement with the fixed non-arcing contacts for establishing different load circuits, terminal means for connecting the non-arcing and arcing contacts with a source of energy and means carried by the rotor for actuating the arcing contacts subsequent and prior to contact engagement of the non-arcing contacts.

6. In a multi-position switch, an insulated housing provided with closure cover means and a dividing wall dividing the housing into separate compartments, a series of non-arcing contacts arranged in different planes in one compartment, a series of arcing contacts arranged in the other compartment, an insulated rotor member extending through the wall structure and rotatable within the compartments, a series of contacts carried by the rotor selectively movable into and out of circuit establishing contact with the non-arcing contacts for establishing different load circuits, registration means for indicating the relative position of the rotor in different load positions comprising a pair of slidably movable bar members and means carried by the rotor for engaging the bar members to determine the registrative movement of the rotor, and means for actuating the arcing contacts subsequent and prior to engagement of the non-arcing contacts individually and simultaneously.

7. In a multi-position switch having electrical connection with a three wire supply circuit and a series of load devices, a movable device provided with selectively arranged contacts in different planes movable in different rotatable directions into and out of engagement with a series of fixed contacts in different planes to open and close selected circuits with the load devices in which at least one pair of the contacts are non-arcing contacts and at least one pair of the contacts are arcing contacts and in which the non-arcing contacts effect contact engagement prior to the arcing contacts and the arcing contacts become deenergized prior to the non-arcing contacts when the circuit is opened and a light device carried by the movable member energizable only during the energizing of the load devices.

8. In a multi-position multi-pole switch, an insulated support, a series of spaced contacts including at least one pair of arcing contacts mounted in the support and arranged in different planes, a rotor member provided with a series of spaced contacts in different planes movable to different positions to open and close a series of different load circuits to effect multi-pole switching and in which the circuit is closed by the arcing contacts subsequent to contact engagement of the non-arcing contacts and the circuit is opened by the arcing contacts prior to the disengagement of the non-arcing contacts to eliminate arcing at the non-arcing contacts and a light device carried by the movable member adapted to be energized only during the closed position of the switch in different load positions.

9. In a multi-position switch, an insulated rotor member comprising a center post provided with a light receiving socket and a communicating center bore, the said socket and center bore being adapted to receive a light medium and conductor leads, an insulating disc carried by the rotor having a series of spaced contacts arranged in different planes on opposite sides thereof, a series of fixed contacts arranged in different planes engageable by the rotor contacts to independently close different load circuits and to conduct energy to the light medium only during circuit loading, means carried by the rotor for actuating the arcing contacts subsequent and prior to contact engagement with the non-arcing contacts, registrative means for determining the rotative movement of the rotor for closing predetermined load circuits, and terminal means for connecting the contacts with a source of energy.

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