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ELECTRICAL SWITCH

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This invention relates to improvements in electrical switches and refers more particularly to plug switches arranged at the end of a flexible cable and to line switches adapted to connect two flexible cables together. Switches of this kind are frequently used with electrical appliances as cooking utensils, flat irons, heating devices and the like and very often are adapted to vary the amount of electrical energy supplied to the appliances.

The object of the invention is to provide a switch so constructed that no switch operating part as knobs, levers and the like project from the casing, whereby the disadvantage of the known switches, as breakage and other damages of these parts caused by the use of the electrical appliance is overcome.

To this end the switch of the invention comprises two cylindrically shaped members which are rotatably connected with each other. One of said members carries on its inner face concentrically arranged contacts connected with the leads of the supply line, and the other member carries on its inner face correspondingly arranged contacts slidably connectable with a pin-socket of an electrical appliance or connected with the outgoing wires leading to a remotely arranged electrical device and adapted to be brought in and out of engagement with the contacts on the first named member. The contacts on one of said members preferably are provided with yielding portions adapted to enter into cavities of the contacts of the other member, whereby always a proper conductive connection is secured. Said yielding contact portions in combination with the cavities in the companion contacts form a very effective locking means to prevent accidental relative rotation of said cylindrical members after the desired adjustment of the switch has been made. The outer faces of the switch are perfectly smooth and not obstructed by projecting parts of any kind. The whole operating mechanism is arranged in the interior of the switch members and is actuated by merely rotating one portion of the switch relatively to the other.

The novel construction and arrangement of the switch members lends itself very read-

ily to various modifications in the arrangement of the contacts. The switch may be an ordinary cut-out switch or a multiple series switch. The outer appearance of all switches for various purposes is substantially the same, only the combinations of contacts in the interior of the switch are different. To distinguish the various switches from each other, they are preferably provided with graduations and an indicating mark on the circumference of the relatively rotatable members to indicate the various "on" and the "off" positions.

Other objects will become more apparent from the following specification, in which reference is made to the accompanying drawing.

In the drawing:

Figure 1 is a side elevation of a plug switch of this type.

Figure 2 is a cross sectional view on the line II—II of Figure 1.

Figure 3 is a plan view on the line III—III of Figure 1.

Figure 4 is a cross sectional view on the line IV—IV of Figure 1.

Figure 5 is a sectional view on the line V—V of Figure 4.

Figure 6 is a plan view of one of the terminal plates on an enlarged scale.

Figure 7 is a side elevation of a line switch in accordance with the invention, and

Figure 8 is a fragmentary plan view on the line VIII—VIII of Figure 7.

The plug switch as shown in Figures 1 to 5 inclusively is for instance adapted to control the current supply to an electrical heating element, not shown, which by means of an intermediate connection may be divided in two sections. These sections upon proper manipulation of the switch may be selectively energized in various combinations to produce various degrees of heat or they may be disconnected entirely from the supply line without pulling the switch out of its socket. Switches of this kind are usually provided with two incoming leads and three outgoing leads connected with three contacts of the heating element. It will be obvious, however, that the invention is not limited to

control switches of the described order, but may be used in connection with any other switch provided with two or more contacts adapted to be separated or connected at the will of the operator.

Generally the switch of the invention comprises two members A and B relatively rotatable about the same axis and made of some insulated material. One of said members carries arcuate contacts of similar curvature and a common center each connected with a lead of the supply line.

The other member B carries properly spaced contacts connected with the electrical appliance and adapted to engage the supply line contacts. Upon rotation of either member relatively to the other, the contacts also will be moved to different relative positions, whereby the current may be controlled within predetermined limits. The contacts of the first named member A are preferably provided with a yielding portion adapted to engage the contacts on the other member B.

The member A comprises a circular base portion 1 and a circular disc portion 2, both made of insulating material and arranged coaxially to each other and rigidly connected by means of two diametrically disposed screws 9. The base portion 1 is on its outer face provided with a central circular recess 7 and on its inner face with two segmental recesses 4 and 4a of equal radius and having their center in the axis of member 1. Each recess 4, 4a is connected with the circular recess 7 by means of a bore 7a and is also provided with a segmental terminal plate 5 and 5a which are held in place by screws 6.

These screws also are adapted to clamp the leads 8 and 8a respectively of the supply cable C to the terminal plates.

The circular disc portion 2 is provided with a plurality of apertures 10 which are positioned on the same circular line as the recesses 4 and 4a in the base portion 1. The terminal plates 5, 5a are provided with metal sleeves 11 extending into the apertures 10 of the disc 2. One end of each sleeve 11 has lugs 11a thereon which pass through marginal slots or notches 5b in the terminal plates and are then bent inward against the undersides of said plates to hold the sleeves 11 in position. The other end of each sleeve 11 is provided with projections 11b which are bent slightly inwardly to limit the outward movement of a ball 13 positioned within each sleeve. A helical spring 12 is arranged in each sleeve 11 to yieldingly press the ball 13 outwardly against said projections 11b. The terminal plate 5 is longer than the terminal plate 5a and is provided with a sleeve 11 at each end, said two sleeves being electrically connected by said plates. The terminal plate 5a has one sleeve only near one of its ends. The three sleeves are arranged at the corners of an isosceles triangle, whose base inter-

sects the axis of the member A and all of the sleeves are equally spaced from said axis.

The member B consists of a cylindrical portion 3 of insulating material which by means of an axially disposed screw 14 is rotatably secured on the disc 2 of the member A.

The screw 14 has an enlarged stem portion which extends loosely through a central bore of the cylindrical portion 3 and has a threaded end portion in engagement with a centrally arranged tapped bore in the disc 2. The outer face of the portion 3 has a recess accommodating the head of the screw 14. The cylindrical portion 3 is provided with a plurality of circularly arranged apertures 15 for the reception of contact elements 16 and which are in the same relation to each other as the sleeves 11 on the member A. Hence in a certain position of the member B relatively to the member A all of the contact elements of one member are in engagement with those of the other member.

The contact elements 16 of the portion 3 are constructed as tubular contacts or sleeves 16, each having an inner enlarged head 16a adapted to engage the balls 13 yieldingly protruding from the sleeves 11. Said balls 13 partly enter the bore of the sleeves 16 and this engagement serves also as a yielding locking means to prevent accidental relative rotation of the members A and B. The members A and B, therefore, are always maintained in their adjusted position relatively to each other without any other locking means.

The contact sleeves 16 are adapted to be slidably connected with contact pins 17 which may be arranged in a socket (not shown) of an electrical appliance, as cooking utensil, flat iron or the like. Either the sleeves 16 (as shown at 16b) or the contact pins 17 or both may be slotted longitudinally to afford a firm yielding engagement between these parts.

Figures 7 and 8 show the invention in connection with a line switch, i. e., a switch which is not directly connected with a socket of an electrical appliance, but which is arranged for instance in a flexible cable leading to the electrical appliance to permit a remote control of the same. The member A' of the line switch is of the same construction as the member A of the above described plug switch. The member B', however, instead of having contact sleeves is provided with terminal plates 30 which by means of screws 31 are secured in suitable shallow recesses on the inner face of the cylindrical portion 3'.

The terminal plates 30 are substantially flush with the inner face of the portion 3' and are provided with cavities 32 adapted to receive the protruding portion of the balls 13'. The screws 31 also serve for securing the outgoing wires 33 to the terminal plates 30. The wires 33 pass outwardly through a

bore 34 formed in the portion 3' and are connected with the electrical appliance in any desired manner, either permanently or detachably by means of a three pin plug. The member B' is similarly rotatably mounted relative to the member A' as described with reference to the plug switch.

The operation of both switches is alike. Upon rotation of either member A or B relatively to the other, the various contacts come in and out of engagement with each other, whereby the desired control is obtained. The illustrated embodiments of the invention are adapted to regulate the current supply in four different stages, including one stage in which the supply is cut-off entirely, without the plug being necessarily pulled out of its socket.

The circumference of the portions 2 and 3 may be provided with graduations and an indicating line respectively to indicate the "on" and "off" positions of the switch.

It is, of course, obvious that the contact combinations may be altered to suit particular requirements and that the construction and arrangement of the various parts are susceptible to some changes and modifications without departing from the scope of the invention.

Having thus described my invention, what I claim is:

1. An electrical switch comprising a base, a disc portion secured thereto, said base and said disc portion being formed of insulating material, a member of insulating material, terminal plates on the face of said base adjacent said disc, said base having an aperture formed therethrough for the introduction of leads to said plates, said member and said disc being axially and relatively rotatably connected, said disc, having circularly spaced passages therethrough, springs in said passages one extremity of each of which rests on one of said terminal plates, balls housed at least partly within said passages, said member having circularly arranged openings therein, and contact sleeves in said openings held against axial movement and terminating substantially flush with the inner face of said member, said balls being adapted to rotate against the inner face of said member and to seat on the extremities of said contact sleeves when said member and disc are rotated relative to one another.

2. In an electrical switch, three disc-like members of insulating material, one member having terminate plates secured to its inner face, the intermediate member being secured to said first member so that the two are rigidly held together, the third member being centrally and rotatably connected to said intermediate member so that they may be turned relatively about a common axis, said intermediate member having a plurality of circularly spaced passages therethrough,

one extremity of each spring resting on one terminal plate, balls against which the opposite extremities of said springs bear, said third member being circularly apertured, and contact sleeves in said apertures terminating substantially flush with the inner face of said third member, said balls being rotatable against the adjacent face of said third member and being adapted to seat against said sleeve.

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