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Nadaguchi

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[54] **SWITCH WITH ARC-PREVENTION GROOVES BETWEEN PLATE SUPPORTED CONTACTS**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.**.....**200/11 R,** 200/11 J, 200/11 K, 200/144 R, 200/166 R

[51] **Int. Cl.**.....**H01h 9/30,** H01h 19/58

[58] **Field of Search**.....200/11, 24, 26, 16 C, 200/147 B, 144 R, 166 R

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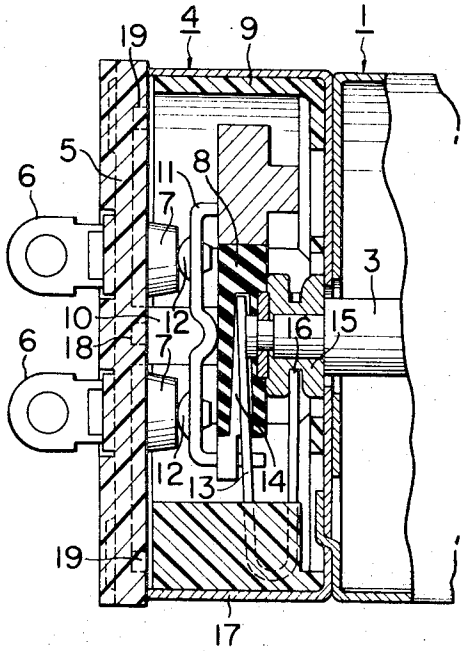
Primary Examiner—J. R. Scott

Attorney—Burgess, Ryan & Wayne

[57] **ABSTRACT**

A variable resistor-switch having a plurality of pairs of contacts wherein a plurality of grooves are formed in order to increase the surface insulation length, thereby improving the insulating effect to higher rated voltages.

4 Claims, 5 Drawing Figures



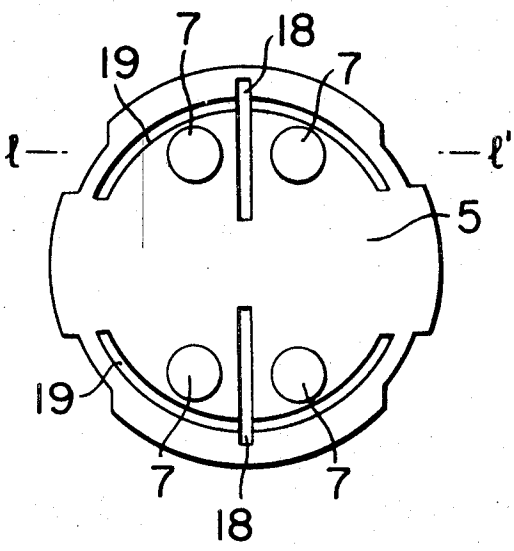


FIG. 1

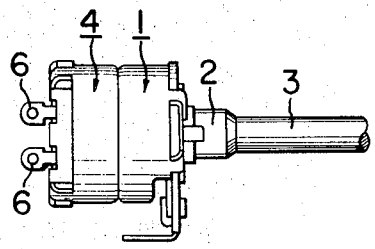


FIG. 2

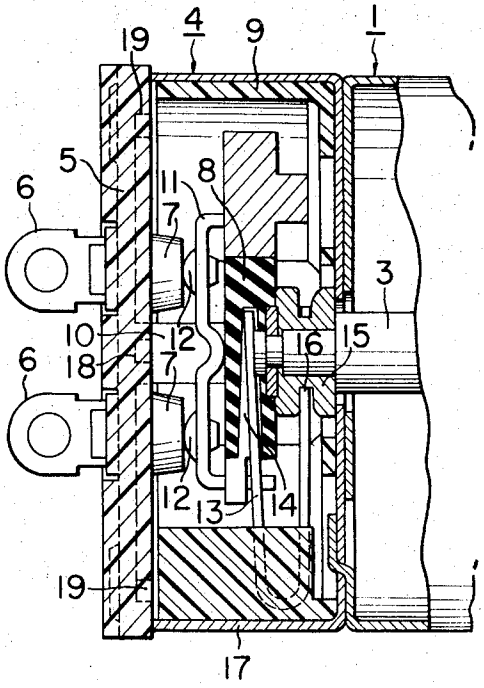


FIG. 3

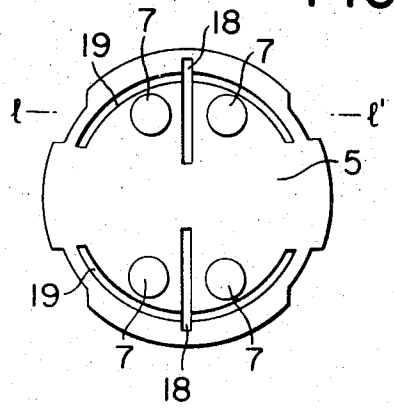


FIG. 4

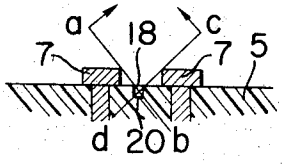
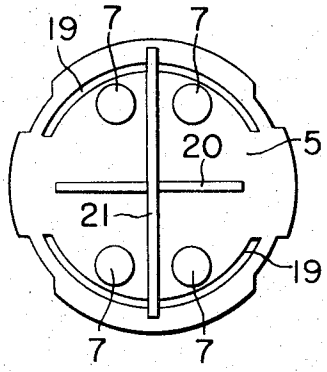


FIG. 5



SWITCH WITH ARC-PREVENTION GROOVES BETWEEN PLATE SUPPORTED CONTACTS

BACKGROUND OF THE INVENTION

The present invention relates to generally a variable resistor-switch and more particularly a variable resistor-switch in which grooves are formed between the contacts fixed to the switch plate and also between the contacts and the switch cover.

In the prior art variable resistor-switch, that is a variable resistor incorporating a switch or switches, arcs are produced between the contacts when the contacts are opened or closed so that the soot-like arc-burn products accumulate between the contacts and between the contacts and the switch cover. Insulation between the contacts and between the contacts and the switch cover becomes significantly degraded as a result thereof. This phenomenon is pronounced as the interrupted current is increased.

One of the objects of the present invention is therefore to provide an improved variable resistor-switch which may overcome the problem encountered in the prior art variable resistor-switch.

Another object of the present invention is to provide a switch in which grooves are formed in the switch plate between the contacts fixed thereto, thereby enabling the switch to withstand higher rated voltages.

Another object of the present invention is to provide a variable resistor-switch in which grooves are also formed between the contacts and the switch cover, thereby enabling the switch to withstand higher rated voltages.

A further object of the present invention is to provide a variable resistor-switch in which grooves are formed in the switch plates between the contacts fixed thereto and also between these contacts and the switch cover, thereby preventing the accumulation of the soot-like arc burn products between the contacts and also between the contacts and the switch cover in order to enable the switch to withstand higher rated voltages.

Still a further object of the present invention is to provide a variable resistor-switch in which grooves are formed in the switch plate between the contacts fixed thereto and also between these contacts and the switch cover, these grooves having a sufficient depth to be protected from arc burn when the switch contacts are opened or closed.

Further object of the present invention are to provide a switch in which grooves are formed between a plurality of pairs of contacts fixed to the switch plate and also between these contacts and the switch cover in such a manner that these grooves may have a sufficient depth to be protected from arc burn produced when the switch contacts are opened or closed in order to prevent the accumulation of the soot-like arc burn products between the contacts and also between these contacts and the switch cover, thereby preventing the degradation or deterioration of the insulation between the contacts and also between these contacts and the switch cover.

The above and other objects, advantages and features of the present invention will become more apparent from the following description of the preferred embodiments thereof taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING:

FIG. 1 is a side view of a variable resistor-switch to which the present invention is applied;

FIG. 2 is a fragmentary sectional view thereof, on enlarged scale, illustrating a switch portion or section;

FIG. 3 is a top view of a switch plate thereof having two pairs of fixed or stationary contacts;

FIG. 4 is a fragmentary sectional view taken along the line $l-l'$ of FIG. 3; and

FIG. 5 is a top view similar to FIG. 3 illustrating the second embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS:

Referring to FIG. 1, a variable resistor-switch of the present invention is shown comprising a variable resistor portion 1, a shaft bearing 2, a rotary shaft 3 and a switch portion 4 to which the present invention is specifically applied. The resistance of the variable resistor portion 1 varies as the rotary shaft 3 which is supported by the shaft bearing 2 rotates. The rotary shaft 3 terminates in the switch section 4 and functions in a manner to be described in more detail hereinafter.

Next referring to FIG. 2 illustrating the detail of the switch section 2, a pair of switch terminals 6 and a pair of fixed contact members 7 are fixed to a switch plate 5 by caulking, and a U-shaped actuating member 8 is so arranged as to slide along guides 10 formed in the side wall of a case 9 of insulating material, in the horizontal direction in FIG. 2. A pair of moving contacts 12 carried by a bridging member 11 which in turn is securely fixed to the actuating member 8 make contact with the fixed contacts 7 fixed to the switch plate 5. One end of a U-shaped spring is fitted into a slot 14 formed in the U-shaped actuating member 8 while the other end, into an annular groove formed around the periphery of a ring member 15 carried at the inner end of the rotary shaft 3. It is noted that the U-shaped spring is reversed and warped in a certain point when the external force is applied. The component parts of the switch section 2 described above are enclosed in a switch cover or case 17.

According to the present invention, as best shown in FIG. 3, a plurality of grooves 18 are formed between the pair of fixed contacts 7, and arcuate slots 19 are also formed radially outwardly of them in order to enable the switch to withstand higher rated voltages or to prevent the arc accumulation in the bottom.

Next the mode of operation of the variable resistor-switch with the above construction will be briefly described. When the rotary shaft 3 is moved to the left in FIG. 2 while the movable contacts 12 make contact with the fixed or stationary contacts 7, the U-shaped spring 13 is reversed and warped so that the U-shaped actuating member 8 which carries the bridging member 11 having the contacts 11 is caused to move toward the right. As a consequence the movable contacts 12 are moved away from the fixed contacts 7, and the switch is opened. On the other hand, when the rotary shaft 3 is moved toward the right, the above steps are reversed so that the switch is closed. When the switching operation is being performed, the arc is struck out between the contacts so that the soot-like arc-burn products tend to accumulate between the contacts and also between the

switch cover and the contacts. Therefore unless the grooves are formed in accordance with this invention, the insulation between the contacts is deteriorated or degraded so that the rated voltages cannot be withstood. The same is true for the insulation between the contacts 7 and the switch cover 17. The higher the interrupted current becomes, the more the soot-like arc-burn products accumulate. The present invention provides the groove 18 between the contacts 7 and the annular slot 19 between the contacts 7 and the switch cover 17 having appropriate depths, so that the bottoms 20 of the grooves 18 and 19 are isolated from the arcs which are struck out from the contacts 7 in the directions indicated by the lines *ab* and *dc* respectively as shown in FIG. 4. As a consequence no soot-like arc-burn products will accumulate on the bottoms 20. Therefore, it is seen that when the depths of these slits are sufficient, the insulation between the contacts and also between the contacts and the switch cover may withstand higher rated voltages.

Next referring to FIG. 5; another embodiment of the present invention will be described. Long straight grooves 20 and 21 are formed crosswise between two pairs of contacts 7 in addition to the arcuate grooves 19.

In summary, the slots having appropriate depths and lengths are formed in the switch plate between the contacts and between the contacts and the switch cover so that the lengths between the contacts and between the contacts and the switch cover may be increased. As a consequence the arcs do not reach the bottoms of these grooves so that the soot-like arc-burn products will not adhere to them. Therefore, the best insulation may be maintained between the contacts and between the contacts and the switch cover so that the switch may withstand higher rated voltages.

While there have been described and illustrated specific embodiments of the invention, it will be obvious that various changes and modifications may be made therein without departing from the spirit of the invention.

What is claimed is:

1. A variable resistor-switch of the type having a switch unit including contacts, a switch plate, a switch portion operatively associated with said switch plate and a switch cover covering said switch characterized in that grooves are formed in said switch plate and between said contacts, said contacts being fixed to said switch plate with electrical arcs being generated between said contacts when the switch contacts are opened and closed, said arcs having a directional orientation, said grooves having a sufficient depth respectively to be free from the direction of the arcs when the switch contacts are opened or closed.

2. A variable resistor-switch of the type having a switch unit including contacts, a switch plate, a switch portion operatively associated with said switch plate and a switch cover covering said switch characterized in that grooves are formed between said contacts, said contacts being fixed to said switch plate and said switch cover with electrical arcs being generated between said contacts when the switch contacts are opened and closed, said arcs having a directional orientation, said grooves having a sufficient depth respectively to be free from the direction of the arcs when the switch contacts are opened or closed.

3. A variable resistor-switch of the type having a switch unit including contacts, a switch plate, a switch portion operatively associated with said switch plate and a switch cover covering said switch characterized in that first grooves are formed between said contacts, said contacts being fixed to said switch plate, and second grooves are formed between said contacts and said switch cover with electrical arcs being generated between said contacts when the switch contacts are opened and closed and further electrical arcs are generated between the contacts and switch cover when the switch contacts are opened and closed, said arcs having a directional orientation, said first and second grooves having sufficient depth respectively to be free from the direction of the arcs formed when the switch contacts are opened and closed.

4. A variable resistor-switch of the type having a switch unit including a plurality of pairs of contacts, a switch plate, a switch portion operatively associated with said switch plate and a switch cover covering said switch, characterized in that grooves are formed in said switch plate between said plurality of pairs of contacts fixed thereto and between said plurality of pairs of contacts and said switch cover, with electrical arcs being generated between said contacts when the switch contacts are opened and closed and further electrical arcs being generated between said plurality of pairs of contacts and said switch cover when said switch contacts are opened and closed, said arcs having a directional orientation, said grooves having a sufficient depth respectively to be free from the direction of arcs formed when the switch contacts are opened or closed.

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