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J. CLAVEL

3,098,130

ELECTRIC SWITCHES

Filed June 15, 1959

FIG. 1

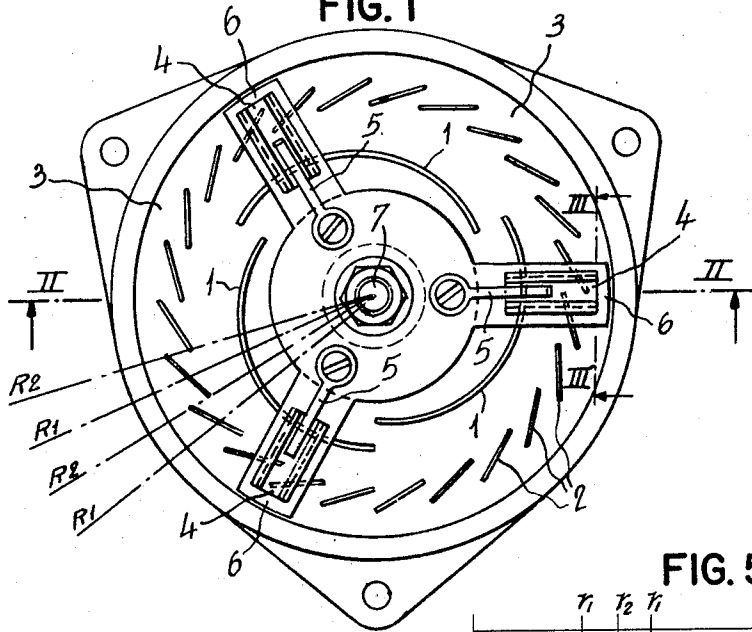


FIG. 5

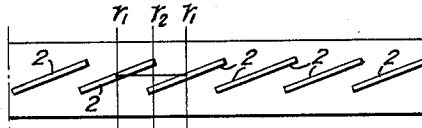


FIG. 2

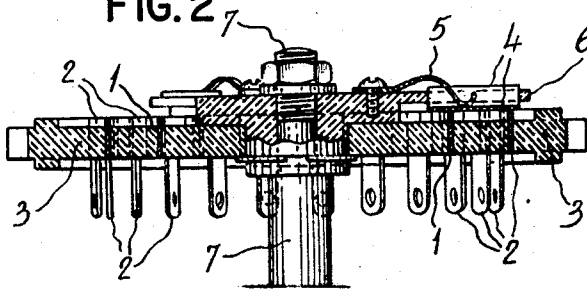


FIG. 3

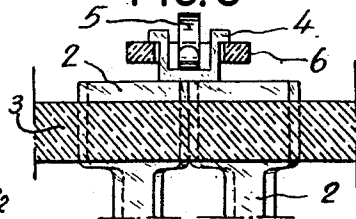
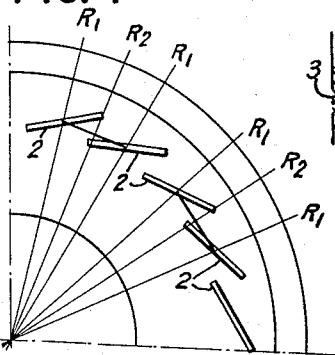


FIG. 4



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**ELECTRIC SWITCHES**

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8 Claims. (Cl. 200—11)

The present invention relates to electric switches for effecting one or several simultaneous electric connections, each by means of a conducting bridge having a plane contact surface which is mounted for sliding movement and can be moved at the same time on to rectilinear or circular tracks assembled on a fixed insulating support, one of these tracks being electrically continuous over plural switch positions, the other being electrically discontinuous and constituted by a sequence of conducting contacts successively insulated from one another.

In most hitherto known switches of this type, the discontinuous track of any one of the switching sections is constituted by a sequence of contacts having each a certain surface which is suitable for contact and sliding, these contacts being arranged in rectilinear or circular sequence on a fixed insulating support, and separated by distances which intersect the sliding plane along the whole of its width and which the movable contact must pass over to move from one fixed contact to another.

The dimension of this distance between fixed contacts depends essentially on certain electrical characteristics which must be fulfilled by the switch and depends especially on the dielectric strength, on the insulation resistance and on the electrostatic capacity. In the case of apparatus of small size, the use of which becomes more and more widespread, this distance may assume, owing to the above mentioned characteristics, a large relative value in relation to other dimensions, for example in relation to those of the contact cross section, and if the movable contact rocks when passing over this distance, it may produce a rapid deterioration of the contact surfaces. It is even possible that the electrical conditions which have just been mentioned cannot be reconciled with the mechanical conditions of sliding movement and hence a solution becomes practically impossible.

This contingency has been recognised and it has been proposed, in order to remedy it, to give to the contacts a shape which enables them to fit successively one into the other, but this arrangement does not provide a solution of the problem because it results in contacts of excessively large dimensions and in switches whose production cost is prohibitive in many cases. Moreover, economic drawbacks are not the only ones to this arrangement which also involves a considerable increase of the capacity between contacts which is a major drawback for a great number of applications, in particular at high frequencies.

In its most general aspect the invention uses for the discontinuous tracks suitably shaped contacts which are disposed in a sawtooth or inclined manner such that whilst ensuring a suitable spacing between neighbouring contacts, this track provides for the movable contact sliding and continuity characteristics which are very good. Besides the advantages arising out of such an arrangement may be added the further advantages of a particularly effective self-cleaning action, the sliding parts are less subject to wear, smaller dimensions, and lower cost of production.

In order that the invention may be more fully understood, reference will now be made to the accompanying drawings showing a non-limiting embodiment of the invention, consisting of a multi-position rotary switch comprising three switch sections each having eight contacts or poles, the electrical connection being effected in each

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section by means of a movable conducting bridge member. In the drawings:

FIGURE 1 is a plan view of the switch from the contact surfaces side,

FIGURE 2 is an elevational view, partly in section, taken along line II—II of FIGURE 1,

FIGURE 3 shows a sectional view along line III—III in FIGURE 1 showing the movable contact applied against the fixed contacts,

FIGURE 4 is a plan view of part of the switch of FIGURE 1 on a larger scale, and

FIGURE 5 is a plan view of part of a switch in which the contacts are arranged in a rectilinear fashion.

Referring to FIGURES 1 to 4, for each of the three switch sections, the contact 1 constituting the continuous track in that section and the series of contacts 2 constituting the discontinuous track, are concentrically assembled on the fixed insulating support 3 by any suitable means. The contacts 2 which are preferably cut out of a thin strip of suitable metal are disposed edgewise in the insulating support 3, in such a manner that the contact surfaces constituted by their upper faces effect the desired concentric distribution in the same plane, parallel to the supporting faces 3, as the contact surface of the continuous track. The lower ends of the contacts 1 and 2, which project below the lower face of the support 3 are socket-shaped and to these can be secured, e.g. by soldering the electrical conductors to be connected to the switch.

FIGURE 1 shows clearly the arrangement of the contacts which is a characteristic feature of the invention and which has been briefly defined above as a sawtooth or inclined arrangement. Explaining this arrangement in greater detail with reference to FIGURE 4, it will be seen that the greatest dimension of each of the contact faces 2 is inclined relative to the radius R1 which passes through its geometrical centre in such a manner that between two neighbouring contacts the successive ends of said faces each meet at points spaced away from the other (either going beyond these points or not going beyond them), the radius R2 which passes at an equal distance from the two geometrical centres. It is then easily seen that the plane contact surface of the movable contact 4 will always meet a continuous plane for sliding. The movable contact 4 comprises a rigid conducting bridge member having a flat contact surface which is urged by means of the pressure spring 5 on the one hand against the faces of the contacts 2 and on the other hand against the contact 1 and is rotated in one direction or the other by rotation of the driving member 6, itself receiving its motion from the shaft 7. As can be seen in FIGURES 2 and 3, the conducting bridge member 4 is freely mounted with respect to the driving member 6.

Although the invention has been illustrated as applied to a rotary switch, it may also be applied to rectilinearly sliding switches as shown diagrammatically in FIGURE 5. In the case of such switches, the three continuous tracks 1 become rectilinear, the centres of the contacts 2 are uniformly distributed along a line parallel to the rectilinear tracks 1 and the radiuses R1 and R2 are replaced by perpendiculars r1 and r2 to this line. In such an embodiment the largest dimension of each of the studs 2 is inclined relatively to the perpendicular r1 which passes through its geometrical centre in such a manner that between two neighbouring contacts the successive ends of the faces each meet at spaced points thereon the perpendicular r2 which passes at an equal distance from the two geometrical centres (either going beyond these points or not going beyond them).

I claim:

1. A sliding contact rotary electric switch having at least one switch section consisting of an insulating support

carrying a series of spaced fixed contacts having flat elongated rectangular contact surfaces arranged on a circular path and a common fixed contact having a flat contact surface with all of the contact surfaces being arranged in the same plane, and a rigid conducting bridge member having a continuous flat contact surface disposed in said plane and mounted for sliding movement over the flat contact surfaces of said fixed contacts and rotatable about the centre of the circular path on which are located the spaced fixed contacts, whereby any of the series of spaced fixed contacts can be selectively and individually connected to the common fixed contact by the continuous flat contact surface of said conducting bridge member and spring means urging the flat contact surface of said bridge member into engagement with the flat contact surface of said fixed contacts, said spaced fixed contacts being disposed to minimize capacitance therebetween with the longest dimensions of their rectangular contact surfaces oblique relative to the radius which extends from the centre of rotation of the bridge member and which is located equidistantly from the geometric centres of two adjacent contacts and with the neighbouring ends of adjacent ones of said spaced fixed contacts being spaced apart by a distance which is large in relation to the contact cross-section, but meeting said radius so that said bridge member is always in electrical contact with at least one of said spaced fixed contacts when passing from one of said spaced fixed contacts to the next adjacent spaced fixed contact.

2. A sliding contact electric switch having at least one switch section consisting of a series of spaced fixed contacts and a common fixed contact and a rigid conducting bridge member arranged to contact at the same time the common fixed contact and one of the series of spaced fixed contacts and mounted for sliding movement over said contacts whereby any one of the series of spaced fixed contacts can be selectively and individually connected to the common fixed contact and each of said spaced fixed contacts having a flat contact surface of elongated rectangular cross-section for contact by a flat continuous contact surface on the bridge member, wherein the fixed contacts are mounted in an insulating support member and their flat contact surfaces are disposed in the same plane and in the sliding plane of the flat continuous contact surface of the bridge member, said spaced fixed contacts being disposed to minimize capacitance therebetween with their longest dimension inclined relative to that perpendicular to the line joining the geometric centres of two adjacent spaced fixed contacts which is equidistant from said centres and with the neighbouring ends of said adjacent contacts meeting said perpendicular but spaced apart by a distance which is large in relation to the contact cross-section, a driving member for said bridge member, means connecting said bridge member freely to said driving member and spring means for urging the flat continuous contact surface of said bridge member into engagement with the flat contact surface of said fixed contacts so that said bridge member is always in electrical contact with at least one of said spaced fixed contacts when passing from one of said spaced fixed contacts to the next adjacent spaced fixed contact.

3. A switch as claimed in claim 1, in the form of a rotary switch wherein the spaced fixed contacts are arranged on a circular or part-circular path traversed by the bridge member and the perpendicular constitutes a radius of said path, said radius extending from the centre about which said bridge member rotates.

4. A switch as claimed in claim 1, in the form of a rectilinear sliding switch wherein the geometric centres of the spaced fixed contacts are in alignment and the bridge member travels along a straight path.

5. A switch as claimed in claim 1 in which the neighbouring ends of the adjacent spaced fixed contacts pass beyond said perpendicular.

6. A switch as claimed in claim 1 in which said spring

means bears on said bridge member at a point between said series of spaced contacts and said common fixed contacts substantially equidistant from both.

7. A sliding contact electric switch having at least one switch section consisting of an insulating support carrying a series of spaced fixed contacts having elongated flat rectangular contact surfaces arranged on a straight path and a common fixed contact having a flat contact surface with all of the contact surfaces being arranged in the same plane, a rigid conducting bridge member having a continuous flat contact surface disposed in said plane and freely mounted for sliding movement over the flat contact surfaces of said fixed contacts, and spring means urging the flat contact surface of said bridge member into engagement with the flat contact surface of said fixed contacts, whereby any of the series of spaced fixed contacts can be selectively and individually connected to the common fixed contact through the continuous flat contact surface of said bridge member, said spaced fixed contacts being disposed to minimize capacitance therebetween with the longest dimensions of their rectangular contact surfaces oblique relative to the perpendicular line joining the geometric centres of two adjacent spaced fixed contacts which is equidistant from said centres with the neighbouring ends of said adjacent spaced fixed contacts being spaced apart by a distance which is large in relation to the contact cross-section, but meeting said perpendicular so that said bridge member is always in electrical contact with at least one of said spaced fixed contacts when passing from one of said spaced fixed contacts to the next adjacent spaced fixed contact.

8. A sliding contact rotary electric switch having at least one switch section consisting of an insulating support carrying a series of spaced fixed contacts having elongated flat rectangular contact surfaces arranged on a circular path and a common fixed contact having a flat contact surface with all of the contact surfaces being arranged in the same plane, a rigid conducting bridge member having a continuous flat contact surface disposed in said plane and freely mounted on a driving member for sliding movement over the flat contact surfaces of said fixed contacts, spring means urging the continuous flat contact surface of said bridge member into engagement with the flat contact surfaces of said fixed contacts and said driving member being rotatable about the centre of the circular path on which are located the spaced fixed contacts, whereby any of the series of spaced fixed contacts can be selectively and individually connected to the common fixed contact through the continuous flat contact surface of said bridge member, said spaced fixed contacts being disposed to minimize capacitance therebetween with the longest dimension of their rectangular contact surfaces oblique relative to the radius which extends from the centre of rotation of the bridge member and which is located equidistantly from the geometric centres of two adjacent spaced fixed contacts and with the neighbouring ends of adjacent spaced fixed contacts being spaced apart by a distance which is large in relation to the contact cross-section, but meeting said radius so that said bridge member is always in electrical contact with at least one of said spaced fixed contacts when passing from one of said spaced fixed contacts to the next adjacent spaced fixed contact.

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