Feb. 16, 1965 J. CLAVEL 3,170,049

ELECTRIC SLIDING-CONTACT SWITCH WITH NON-TILT OPERATION OF SLIDING CONTACT

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Fig.1

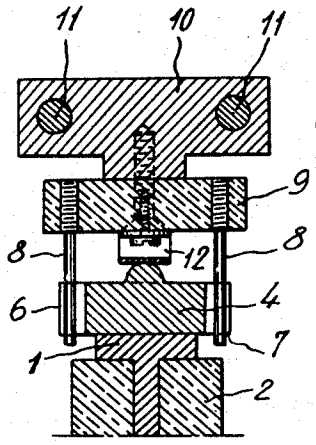


Fig.2

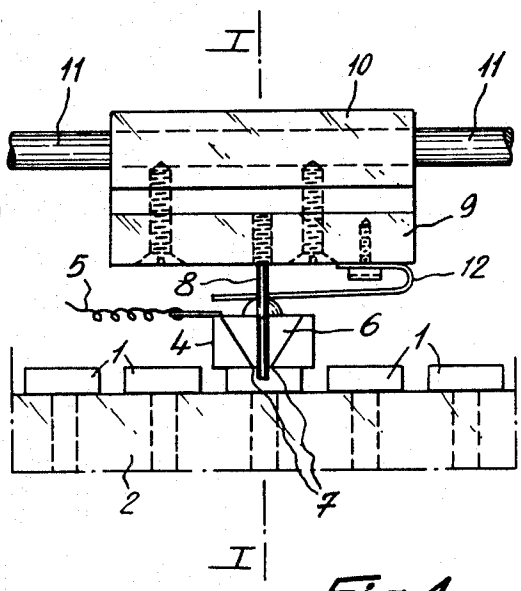


Fig.3

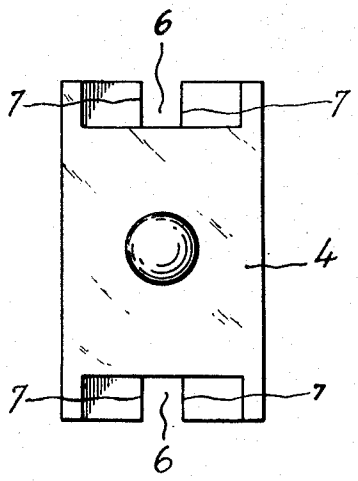
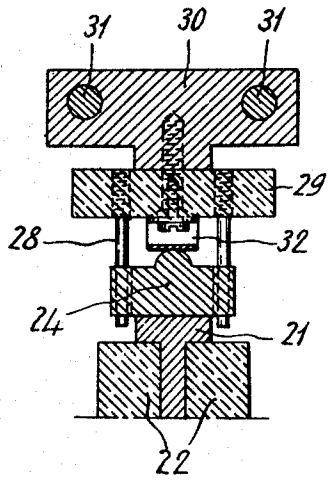


Fig.4



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Fig.5

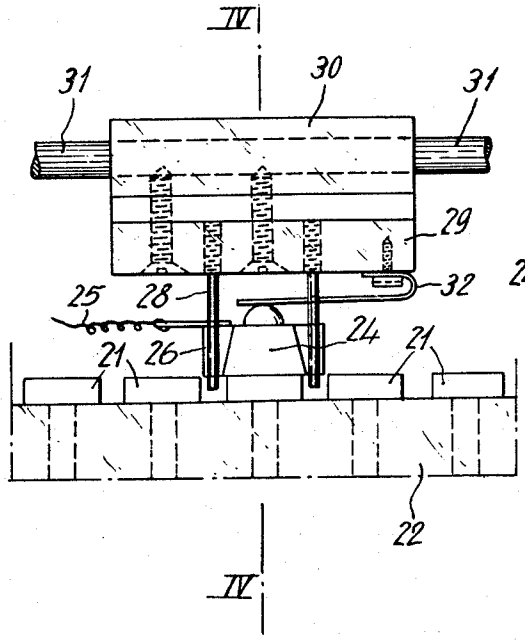


Fig.6

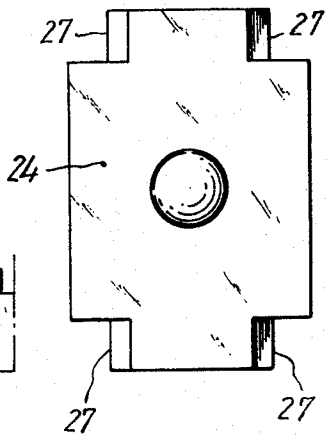


Fig.8

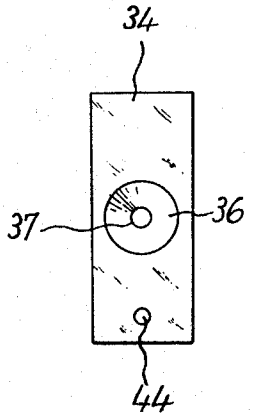
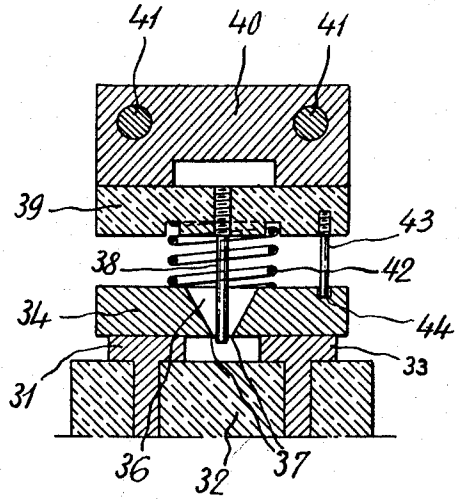


Fig.7



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ELECTRIC SLIDING-CONTACT SWITCH WITH NON-TILT OPERATION OF SLIDING CONTACT

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4 Claims. (Cl. 200—16)

The present invention relates to electric sliding-contact switches to establish or interrupt connections in one or more circuits the connection being effected through a movable conductive bridge having one or more moving contact studs supported by suitable moving means so that they have a certain degree of freedom of movement, and having a plane contact surface, which, under the action of a driving member and a pressure member, slides and is applied at several points on one or two surfaces which are also plane, the latter being integral with fixed elements such as studs.

In previously manufactured switches of this kind, the thrust that causes the sliding movement of the movable bridge is always applied along a plane which is spaced from the plane of sliding movement and this inevitably causes in combination with the frictional resistance which is actually produced in the plane of sliding movement, the creation of a tilting torque which tends to separate the surfaces in contact, thus modifying the distribution of pressure applied in the effective area of contact, and this may even go so far as to cause the contact stud to tilt when it passes above a gap separating two of the fixed contact studs.

It is the principal object of the present invention to remedy this drawback and to provide a switch in which the driving thrust of the moving means is applied actually along the plane of sliding movement in order to avoid the creation of a tilting torque.

According to the invention there is provided an electric sliding-contact switch having a conductive bridge incorporating at least one moving-contact stud which is supported for movement by a driving member to effect switching by sliding over a track consisting of a plurality of fixed contact studs, in which the moving contact stud has at least one portion projecting beyond the plane of the contact area of a cooperating fixed contact stud, said projecting portion being shaped with a shoulder, recess, or the like which makes an acute angle with the said plane to form an edge in the said plane for engagement by an operating finger or the like secured to the driving member, said moving-contact stud being free to move with respect to said driving member and being applied to a selected fixed contact stud by spring means provided between itself and said driving member.

In order that the invention may be more clearly understood, reference will now be made to the accompanying drawings which show three embodiments thereof by way of example only, and in which:

FIGURE 1 shows a transverse section of a first embodiment of switch along the line I—I of FIGURE 2,

FIGURE 2 shows a side view of the switch of FIGURE 1,

FIGURE 3 shows an upper plan view of one of the two contact studs of the movable conductive bridge,

FIGURE 4 shows a transverse section of a second embodiment of switch along the line IV—IV of FIGURE 5,

FIGURE 5 shows a side view of the switch of FIGURE 4,

FIGURE 6 shows an upper plan view of one of the two contact studs of the movable conductive bridge,

FIGURE 7 shows a transverse section of a third embodiment of switch, and

FIGURE 8 shows an upper plan view of a single contact stud constituting the movable conductive bridge.

The three embodiments shown all relate to a switch having a rectilinear sliding movement of the movable conductive bridge. In the two first embodiments of FIGURES 1 to 6, this bridge comprises two independently mounted contact studs which are electrically connected together by a flexible connection, and each co-operating with a fixed contact surface.

In the switch according to FIGURES 7 and 8, the movable conductive bridge comprises only a single moving contact stud, co-operating simultaneously with each of the surfaces offered by two series of fixed studs.

Referring now to FIGURES 1, 2 and 3 a series of fixed contacts is formed by studs 1 which are assembled on an insulating support 2. A flexible connection, part of which is shown at 5, is used to connect the moving-contact stud 4 and a similar member at another part of the switch, but the said similar member is not shown in the figures. The two moving-contact studs 4 and associated supports form the complete movable conductive bridge.

The moving-contact studs 4 project laterally on each side of the actual area of contact between the contacts 1 and 4 as is clearly shown in FIGURE 1, and each projecting extremity is formed in its thickness with a V-shaped recess 6 whose side walls make an acute angle with the plane surface representing the contact surface of the stud, in order to form two thrust edges 7, which are parallel to one another and perpendicular to the direction of sliding movement. A finger 8 passes freely through each of the recesses 6 and projects slightly beyond the surface of contact, each finger 8 being directed perpendicularly to the plane of sliding movement and forming an operating member. The fingers 8 are preferably cylindrical and secured by means of a small insulating plate 9, to a driving member or carriage 10 which slides along two cylindrical rods 11. A similar carriage 10 and rods 11 is provided for the other part of the movable contact bridge.

Each moving-contact stud 4 is applied to a fixed contact stud 1 by a pressure spring 12. When the carriage 10 is moved in one direction or the other, each finger 8 comes to rest against one of the thrust edges 7 of the corresponding recess 6, in such a manner that the thrust exerted on the contact stud 4 is strictly contained in its plane of sliding and no overturning torque may result from such thrust.

Referring now to FIGURES 4, 5 and 6, studs 21 form a series of fixed contacts, similar to studs 1 of FIGURES 1 to 3, and studs 21 are similarly assembled on an insulating support 22. A co-operating moving-contact stud 24, which is electrically connected to another contact stud (not shown) to form a conductive bridge, by means of a flexible connection, part of which is shown at 25, projects laterally on each side of its effective area of contact with a contact stud 21, and the projecting parts are provided with inwardly directed acute-angled recesses, so as to provide four thrust edges 27, as can be seen in FIGURES 5 and 6, arranged in pairs. Four fingers 28, forming driving members, pass freely through the recesses 27 whereby each moving-contact stud 24 is freely mounted inside a space limited by the four fingers, said fingers 28 are preferably cylindrical, and are directed perpendicularly to the plane of sliding movement, beyond which they slightly project. The fingers 28 are moreover secured to a carriage 30, forming a driving member, by means of a small insulating plate 29, said carriage 30 sliding on two guide rods 31 similar to the arrangement of FIGURES 1, 2 and 3. Each moving-contact stud 24 is applied to a fixed contact stud 21 by means of a pressure spring 32, and when the carriage 30 is moved in one direction or the other, two of the fingers 28 which

are situated at the rear with respect to the direction of movement, are applied against the two adjacent thrust edges 27, so that a thrust is exerted on the contact stud 24 which is strictly contained in the plane of sliding movement and cannot create any tilting torque.

Referring now to FIGURES 7 and 8, two tracks of fixed contact studs are provided which are respectively designated by 31 and 33 and are assembled in parallel at a predetermined spacing, on an insulating support 32. In this embodiment, a single moving-contact stud 34 covers two fixed but laterally-spaced contacts 31, and has a conical recess 36, whose smaller opening comes between the contact studs 31 and 33. The recess 36 thus exhibits in the plane of contact a circular edge 37 having an acute angle. A cylindrical finger 38 passes freely through the recess 36, but projects slightly beyond the surface of contact. The finger 38 is directed perpendicularly to the plane of sliding movement and is secured to a driving member or carriage 40 through a small insulating plate 39. Any desired means may be provided to prevent rotation of the contact stud 34 about the finger 38; the means shown comprise a retaining lug 43, which is secured to the small insulating plate 39, and extends into a small cavity 44 provided in the contact stud 34. When the movable contact stud 34 is applied to the fixed contact studs 31 and 33 by means of the pressure spring 42, on movement of the carriage 40 in one direction or the other, the finger 38 exerts on the contact stud 34 at the edge 37, a thrust which is strictly contained in the plane of sliding movement without creating any tilting torque.

Although the specific embodiments referred to all relate to switches in which the sliding of the conductive bridge is rectilinear, it is obvious that the sliding conductive bridge may be moved in a circular direction without departing from the invention.

I claim:

1. An electric sliding-contact switch having a conductive bridge incorporating at least one moving-contact stud, comprising a plurality of fixed contact studs forming a track, a driving member, means for supporting said moving-contact stud for sliding movement thereof along said track by said driving member, the contact plane of said moving-contact stud being larger than the contact area of any one of said fixed contact studs whereby a part of said moving-contact stud projects beyond the plane of contact when said moving-contact is in a position over a fixed contact stud, said projecting part being shaped with a recess making an acute angle with said plane of contact to form an edge in the said plane, an operating member secured to said driving member and passing through said recess beyond said plane of contact to apply pressure to said edge on movement of said driving member, and spring means between said driving member and said moving-contact member to urge said moving-contact member against a fixed contact member, said moving-contact member being otherwise free of said driving member.

2. An electric sliding-contact switch having a conductive bridge incorporating at least one moving-contact stud, comprising a plurality of fixed contact studs forming a track, a driving member, means for supporting said moving-contact stud for sliding movement thereof along said track by said driving member, the contact plane of said moving-contact stud being larger than the contact area of any one of said fixed contact studs whereby said moving-contact stud projects beyond the plane of contact when said moving-contact is in a position over a fixed contact stud, two oppositely disposed portions of the projecting part of said moving-contact member each being provided with a V-shaped recess the narrow part of said recess being located in the said plane of contact, two operating members secured to said driving member and each respectively passing through one of said recesses to apply pressure to an edge of its recess on movement of said driving member, and spring means between said driving member and said moving-contact member to urge said moving-contact member against a fixed contact member, said moving-contact member being otherwise free of said driving member.

3. An electric sliding contact switch having a conductive bridge incorporating at least one moving-contact stud, comprising a plurality of fixed contact studs forming a track, a driving member, means for supporting said moving-contact stud for sliding movement thereof along said track by said driving member, the contact plane of said moving-contact stud being larger than the contact area of any one of said fixed contact studs whereby a part of said moving-contact stud projects beyond the plane of contact both in the direction of sliding movement and in a direction at right angles thereto when said moving-contact is in a position over a fixed contact stud, both ends of said moving-contact stud being shaped at each side with a recess making an acute angle with said plane of contact to form an edge in the said plane, four operating members secured to said driving member and each respectively passing through one of said recesses to apply pressure to said edge of its recess on movement of said driving member, and spring means between said driving member and said moving-contact member to urge said moving-contact member against a fixed contact member, said moving-contact member being otherwise free of said driving member.

4. An electric sliding contact switch having a conductive bridge incorporating at least one moving-contact stud, comprising two sets of fixed contact studs forming two tracks located side by side, a driving member, means for supporting said moving-contact stud for sliding movement thereof along said tracks by said driving member, said moving-contact stud extending across said tracks, the part of said moving-contact member between said tracks being shaped with a conical recess whose narrow diameter is located in the plane of contact between said moving and said fixed contacts to form an edge in the said plane, an operating member secured to said driving member and passing through said conical recess to apply pressure to said edge on movement of said driving member, and spring means between said driving member and said moving-contact member to urge said moving-contact member against a fixed contact member, said moving-contact member being otherwise free of said driving member.

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