Oct. 20, 1931. L. ROEBEL 1,827,765

ELECTRICAL SWITCH

Filed March 20, 1926

Fig. 3.

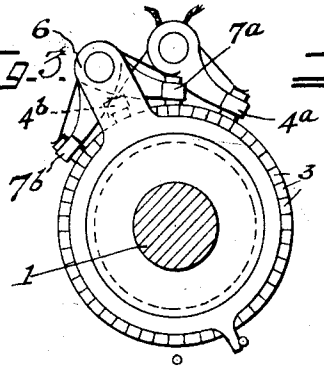


Fig. 4.

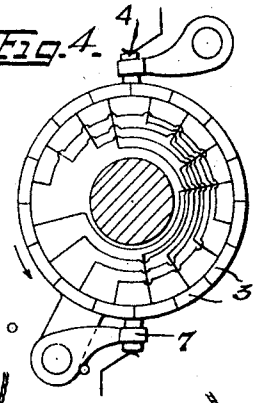


Fig. 5.

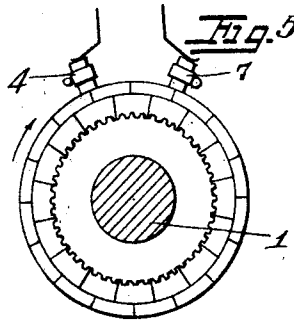


Fig. 1.

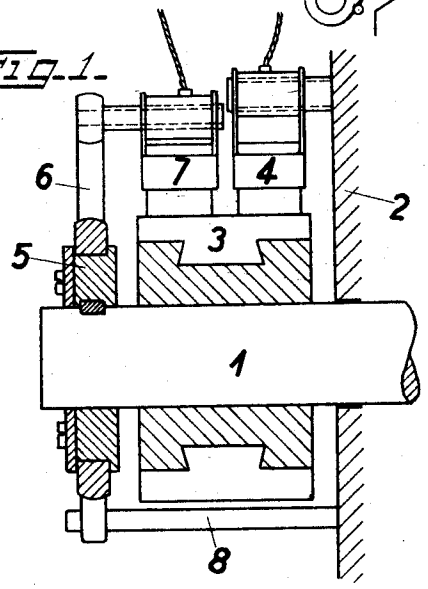


Fig. 2.

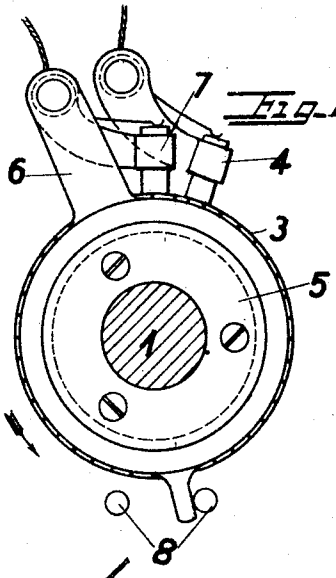


Fig. 6.

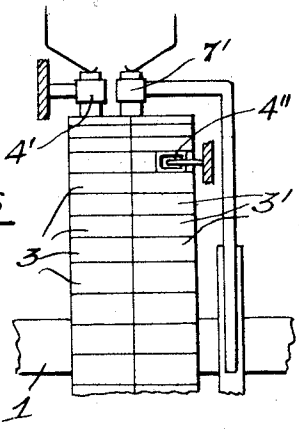
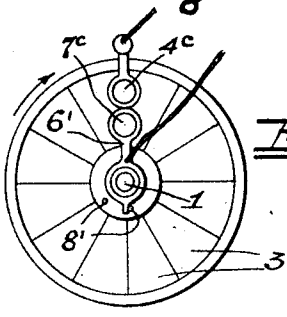


Fig. 7.



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UNITED STATES PATENT OFFICE

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ELECTRICAL SWITCH

Application filed March 20, 1926, Serial No. 96,120, and in Germany April 3, 1925.

This invention relates to electrical switch apparatus and pertains to the type of switch which is operated incident to the rotation of a shaft or the like, for the purpose of setting the switch in different positions to open or close the circuit or to change from one circuit to another. Switches of this type are usually operated from the rotated portion of the machine by means of some kind of friction clutch. A condition for the correct operation of such switch is that the force transmitted through the friction of the clutch should always be greater than the frictional or other resistances of the moving parts of the switch. Although there is usually no difficulty in obtaining this condition when the switch is in proper working order, there is always a danger that deterioration of the contacts during service may gradually increase the resistance to motion of these parts until the force transmitted by the clutch is exceeded, when the switch ceases to operate.

The general object of the invention is the provision of a switch mechanism of the type described which is accurate and reliable in operation, and not subject to functional derangement through the contemplated use or wear.

Another object is the provision of a construction in which the friction between the switch contacts assists in the movement of the switching members from one switching position to another.

A further object is the provision of a construction which is simple in design and lends itself to economical manufacture.

Other and further objects will be pointed out hereinafter, indicated in the appended claims or obvious to one skilled in the art upon an understanding of the present disclosure.

In the drawings forming a part of this specification I illustrate several embodiments of the invention, but the same are presented for illustration only and are not to be construed in any fashion as limiting the claims short of the true and most comprehensive scope of the invention in the art.

In the drawings,

Fig. 1 is a longitudinal sectional elevation of a form of switch mechanism illustrating the invention;

Fig. 2 is an end elevation of same;

Fig. 3 is an end elevation of a switch employing multiple brushes;

Fig. 4 is a diagrammatic illustration of a modified form wherein the diametrically opposite segments are conductively connected;

Fig. 5 is a diagram of a construction wherein the switch is arranged to cut resistances in and out of the circuit controlled by the brushes;

Fig. 6 is a part side elevation of a construction employing one shiftable and two stationary brushes, and

Fig. 7 is a top view of a modified construction wherein the segments are disposed in the same plane.

Reference numeral 1 represents the shaft of a machine from which it is intended to control the switch and 2 designates a stationary portion of the machine such as a bearing housing. A commutator 3 is fixed on the shaft and may be of the same general design as adopted for small D. C. machines. Two contacts, which may be ordinary carbon brushes, are arranged to run on the commutator. One of these, 4, is attached to the stationary part of the machine 2, while the other, 7, is mounted on a brush rocker 6. The latter is mounted on the shaft 1 by means of some device such as the collar 5, allowing rotation of the rocker thereon. The rotation of the brush rocker is limited by two stops 8 arranged so that in one of the two limit positions the brushes 4 and 7 are side by side, while in the other limit position one brush is in advance of the other.

The brush rocker 6 carrying the brush 7 is only in contact with parts which are mounted on the shaft 1, and consequently its motion does not entail friction with any stationary portion of the machine. When the shaft rotates, therefore, the brush rocker will always be carried round to one or the other of the two limit positions. Any increase in friction at the brush contact surfaces or in the brush rocker due to irregularities such as projecting insulation etc., will only serve to render the operation of the device more certain.

If the shaft 1 rotates in the direction indicated by the arrow (Fig. 2) the brush rocker will be brought to the position shown. In this position there is no electrical connection between brushes 4 and 7 through the commutator segments, and therefore a circuit including the two brushes will be interrupted. On rotating the shaft contrary to the direction of the arrow, the brush rocker is displaced so that the brush 7 will be moved from the position seen in Fig. 2 to a position in which it engages the same commutator segment as brush 4. In this position the brushes are electrically connected by the commutator segment passing beneath them, and the circuit therefore closed through the brushes.

The arrangement is naturally capable of many modifications. Certain segments of the commutator, for example those at opposite ends of a diameter, may be electrically connected as illustrated in Fig. 4. If this is done both the fixed brush 4 and the movable brush 7 may be arranged in one plane perpendicular to the axis of the shaft and space in the axial direction of the shaft thus conserved. The stops are then located so that in one limit position the brushes may lie at opposite ends of a diameter. Instead of one fixed and one movable brush there may be as many as desired, in which case the apparatus would be capable of performing a large number of switching operations simultaneously. Such an arrangement is illustrated in Fig. 3, wherein the movable carrier 6 carries movable brushes 7^a and 7^b in proper operative relationship to fixed brushes 4^a and 4^b. By suitably spacing the brushes and their stops these operations can be made to take place in a definite order. It is also possible, by suitably locating the stops, to obtain a momentary contact only on a reversal of the shaft.

Furthermore the whole arrangement may be modified in such a way that no flexible leads to the movable brushes are required. This is done by making the connections to two fixed brushes and allowing the circuit to be opened and closed by two movable brushes which are in rigid mechanical and electrical connection. Such an arrangement is illustrated in Fig. 4. Finally it is possible to subdivide the commutator segments in the direction of the axis by insulating layers, and arrange one of the movable brushes so that it covers the two halves of a segment, as illustrated in Fig. 6. Here the movable brush is designated 7′ and is arranged for co-operation with two fixed brushes 4′ and 4″, which co-operate with respective series of commutator segments, while the movable brush co-operates with segments of both series.

In certain circumstances it may be desirable to insert resistance in any given circuit when the rotation reverses in a certain direction. This is very simply accomplished with the apparatus described, it being merely necessary to connect certain of the commutator segments through resistances as shown in Fig. 5.

Instead of being cylindrical, the commutator may be of the disc type or can be given a form differing considerably from that customarily adopted for dynamo machines. An arrangement of the disc type is shown in Fig. 7, same presenting a top view in which the segments extend radially from the shaft 1, the movable brush holder 6′ being mounted on the latter and its movement controlled by stops 8′, so that the movable brush 7^c may occupy a position for cooperation with a segment simultaneously with the fixed brush 4^c, or on reverse movement of the disc, be shifted to a position wherein there is no electrical connection between the brushes through a segment.

What I claim is:

1. A switch mechanism comprising revolving contact members and terminal contact members arranged for engagement with the revolving contact members, one of said terminal contact members being adjustable relative to the other by movement of the revolving contact members.

2. In switch mechanism, the combination with a rotary shaft, of revolving contact members carried thereby, and relatively adjustable terminal contact members cooperating with the revolving contact members, one of said terminal contact members being mounted upon and movable by the shaft.

3. A switch mechanism comprising the combination with a rotary shaft, of revolving contact members carried by the shaft, of terminal contact members for cooperation with the revolving contact members, one of said terminal contact members being carried by the shaft and being adjustable relative to the other terminal contact member, and means for limiting movement of said adjustable terminal contact member.

4. A switch mechanism comprising brushes, one of which is movable relative to the other, revolving contact members for conductively connecting the brushes when the latter are in one relative position, the movable brush being shiftable to a disconnecting position by the revolving contact members.

5. Switching mechanism comprising, in combination, relatively movable brushes and a commutator for conductively connecting the brushes, one of the brushes being movable to different positions relative to the other by operation of the commutator in opposite directions.

6. In switch apparatus, contact elements insulated and supported for relative movement into different positions with respect to each other, and means frictionally engaging such elements and being supported for movement in a given direction and being operable upon such movement and by virtue

of such frictional engagement to effect a given relative positioning of such elements with respect to each other and to maintain the same electrically-insulated, said means being supported for movement in a different direction and being operable upon such movement and by virtue of such frictional engagement to effect a different relative positioning of such elements with respect to each other and to provide an electrical connection between the latter upon such different relative positioning thereof.

7. In switch apparatus, a member supported for rotary movement and provided with electrical conductive segments insulated with respect to each other, a contact element supported in fixed position and against rotary movement with said member and for contacting engagement with each of said segments upon rotary movement of said member, and a second contact element supported for contacting engagement with each of said segments upon rotary movement of said member and for movement into a given position with respect to said first-named element upon rotary movement of said member in one direction and for movement into a different position with respect to said first-named element upon rotary movement of said member in the opposite direction, said member providing for open-circuit condition between said elements when said second contact element is in one of such positions and for closed-circuit condition between said elements when said second contact element is in the other of such positions.

In testimony whereof I have hereunto subscribed my name at Stuttgart on the 2nd day of March A. D. 1926.

LUDWIG ROEBEL.