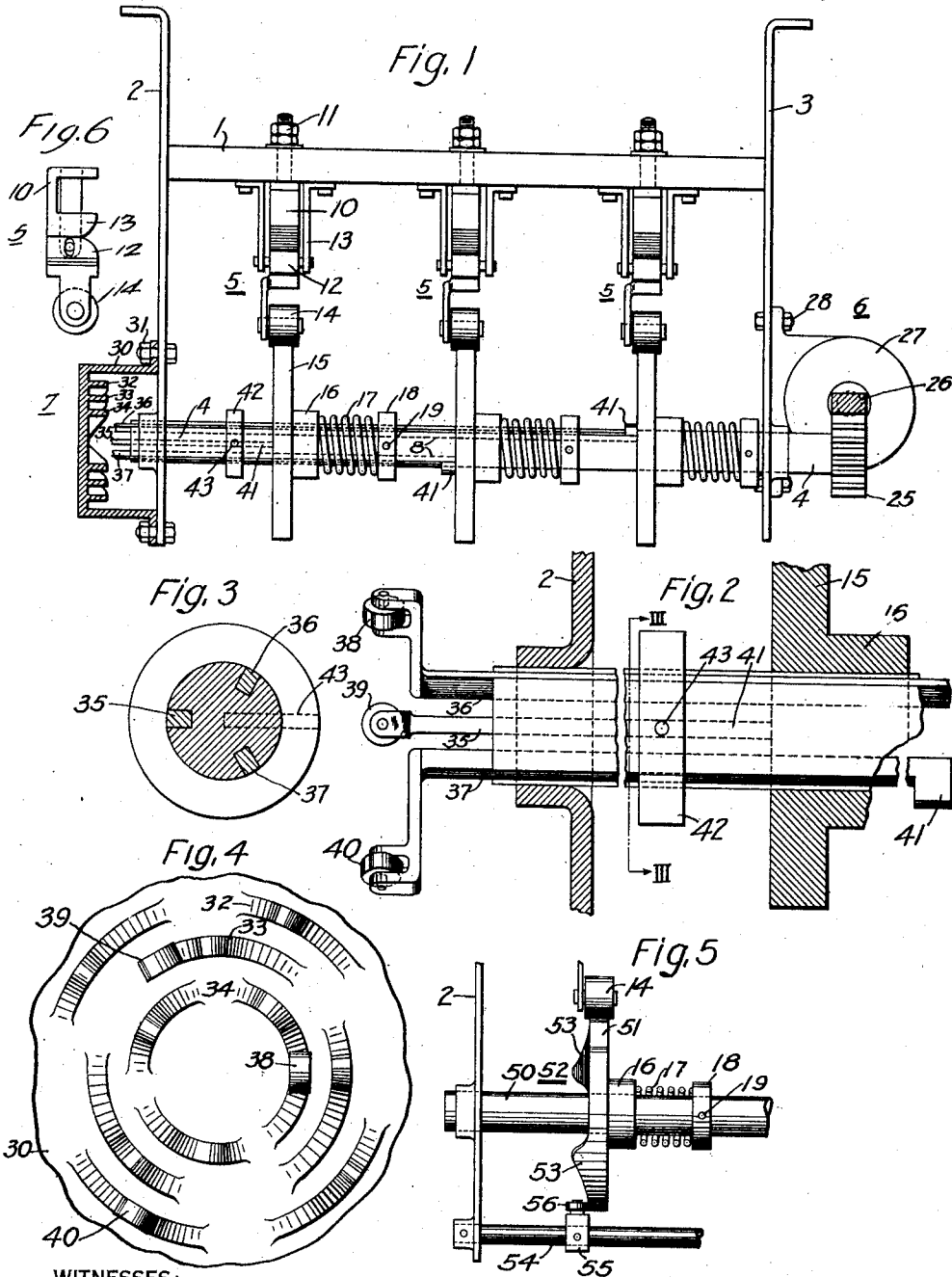


O. P. HIPPLE.
CONTROL APPARATUS.
APPLICATION FILED JULY 6, 1917.

1,392,160.

Patented Sept. 27, 1921.



WITNESSES:

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CONTROL APPARATUS.

1,392,160.

Specification of Letters Patent. Patented Sept. 27, 1921.

Application filed July 6, 1917. Serial No. 178,909.

To all whom it may concern:

Be it known that I, OLIVER P. HIPPLE, a citizen of the United States, and a resident of Wilkins township, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Control Apparatus, of which the following is a specification.

My invention relates to control apparatus for dynamo-electric machines and especially to controllers of the "switch-group" type.

The object of my invention is to provide an apparatus of the above-indicated character having a rotatable member together with sets of stationary and movable contact members governed thereby, and auxiliary apparatus for selectively effecting longitudinal disengagement of certain contact members, dependent upon the extent of rotative movement of the rotatable member.

More specifically stated, it is the object of my invention to provide a plurality of contact-directing members that are rotatable with, and longitudinally movable on, an operating shaft, in conjunction with cam means for producing predetermined longitudinal movement of the contact-directing members to open the corresponding electric circuits.

My invention may best be understood by reference to the accompanying drawing, wherein Figure 1 is a view, chiefly in front elevation and partially in section, of control apparatus constructed in accordance with my present invention; Fig. 2 is an enlarged elevational view, partially in section, of a portion of the apparatus that is shown in Fig. 1; Fig. 3 is a transverse sectional view taken on the line III—III of Fig. 2; Fig. 4 is an interior view, in end elevation, of another part of the structure that is illustrated in Fig. 1; Fig. 5 is a fragmentary view, in side elevation, of a modified form of the invention; and Fig. 6 is a view in side elevation of a further portion of the apparatus that is shown in Fig. 1.

Referring to Fig. 1 to Fig. 4, inclusive, of the drawings, the apparatus shown comprises a suitable frame or incasing member having an upper shelf or supporting plate 1 and end brackets or plates 2 and 3 of the general class that is familiar in "switch

groups" of the railway type; and a rotatable shaft 4 that is mounted in the lower portion of the end-plate and between which shaft and the supporting plate 1 a plurality of sets of stationary and movable contact members 5 are positioned; an actuating mechanism 6 for the rotatable shaft 4; and stationary cam means 7 for a governing purpose to be set forth.

The shaft 4 is provided with a plurality of suitably spaced longitudinal grooves or key-ways 8 that correspond to the respective sets of contact members 5 and are employed in conjunction therewith, in a manner to be hereinafter fully set forth.

The sets of contact members 5 severally comprise a stationary terminal or tip 10 which is rigidly secured to the supporting plate 1 by means of bolts and nuts 11, for example, and a movable terminal or tip 12 which is preferably provided with slotted guiding brackets 13 and with a roller member 14 on the side near the shaft 4 for the purpose of engaging a suitably configured cam plate or disk 15. The cam plate is shown as provided with an integral hub 16 against which bears a coil spring 17 that surrounds the rotatable shaft 4, the other end of the spring being held stationary through the agency of a collar 18 which is pinned to the shaft 4 at 19. The cam plate 15 is adapted for rotative movement with the shaft 4, either by means of a key-and-slot connection or by being rigidly secured to the spring 17, and is also longitudinally movable on or slidable along the shaft 4, being normally biased to the illustrated operative or contact-permitting position by the spring 17.

The actuating mechanism 6 forms no material part of my present invention and may be of any familiar type, or, if desired, the shaft 4 may be manually actuated. The preferred mechanism is that set forth and claimed in a patent granted to N. W. Storer and A. J. Hall, No. 1,229,543, dated June 12, 1917, and assigned to the Westinghouse Electric & Manufacturing Company, and comprises, in general, a pinion 25 which is rigidly secured to the shaft 4 outside of the bracket 3 and meshes with a horizontally-movable rack member 26 which is actuated

by pistons (not shown) that travel within suitable cylinders or inclosing members 27. The actuating mechanism 6 may conveniently be positioned upon the end-bracket 3 by means of bolts 28.

The cam means 7 is shown as embodying a cylindrical incasing member or box 30 which may be attached to the outer side of the end-bracket 2 by bolts 31 and is interiorly provided with a plurality of annular cam surfaces 32, 33 and 34 of wave-like edge contour, the cam surfaces being of dissimilar shape or angular position, dependent upon the desired action thereof, and being equal, in number, to the illustrated sets of contact members 5.

The purpose of the cam surfaces 32, 33 and 34 is to actuate a plurality of rods or slidable members 35, 36 and 37, respectively, that are located in the circumferentially-disposed grooves or key-ways 8 of the shaft 4. The contact between the cam surfaces and the rods is preferably effected through the medium of rollers 38, 39 and 40, respectively, for the familiar purpose of reducing friction. The slidable rods 35, 36 and 37 correspond in length to the distance between the respective cam surfaces 32, 33 and 34 and the respective sets of contact members 5, each rod being provided with an outwardly-projecting tip 41 for positively bearing against the respective cam plates 15, as clearly shown in Fig. 1.

For holding the several slidable rods in the respective grooves and still permitting ready longitudinal movement thereof, an inclosing collar or band 42, secured by a pin 43 to the shaft 4, may be provided. The other stationary collars 18 also serve a similar function, as will be evident from Fig. 1.

Assuming the various parts of my control apparatus to occupy the illustrated positions, the operation thereof may be set forth as follows: Upon rotative movement of the shaft 4, through the agency of the actuating mechanism 6, or otherwise, the several cam plates 15 are rotated with the shaft to effect a predetermined sequence of closure of the respective movable contact members 12 in accordance with the contour of the cam plates, as will be understood, thereby closing any desired electrical circuits which it is unnecessary to illustrate or describe here. Upon a predetermined extent of rotative movement of the shaft 4 and, therefore, of the several slidable rods 35, 36 and 37, one or more of the rod-rollers 38, 39 and 40 is engaged by a longitudinally-extending or crest portion of the wave-like cam surfaces 32, 33 and 34, respectively, to thereby longitudinally actuate the corresponding slidable rod and the associated cam plate 15 along the shaft 4 in opposition to the action of the spring 17, until the cam plate 15 is

completely disengaged from the allied roller 14, thereby effecting a quick separation of the corresponding stationary and movable contact members 5.

As the shaft 4 is further rotated, the other slidable rods are similarly actuated by the corresponding stationary cam surfaces 32, 33 and 34, and the associated cam plates 15 are similarly moved in a longitudinal direction to produce an interruption of the electrical circuits governed by the corresponding contact members 5.

Although, for the sake of simplicity and clearness, I have illustrated only three sets of contact members and three stationary cam surfaces in the cam means 7, it will be understood that neither the number, nor the relative nor actual contour of the cam surfaces, nor the number of switching devices is material to the present invention. Furthermore, any other type of contact-directing member, such as the familiar arcuate contact segments of the drum controller may be affixed to the rotatable shaft 4 in lieu of the cam plates to serve a similar purpose to that set forth.

Reference may now be had to Fig. 5, wherein the modification shown comprises a rotatable shaft 50, corresponding to the previously-described shaft 4, which is journaled in the end-brackets 2 and 3. The contact-directing member or cam plate 51, in the present instance, is provided with a lateral cam surface 52 comprising one or more curved lugs or wave-like portions 53 for a purpose to be set forth. The cam plate is provided with a hub 16 and a biasing spring 17, which is positioned by a stationary collar 18, as in the structure shown in the preceding figures and already described.

A longitudinally-extending stationary rod 54 is mounted in the end-brackets 2 and 3, and a suitable number of guides or blocks 55, which are preferably provided with contact rollers 56, are affixed along the rod 54 for the purpose of engaging the cam surfaces 52 of the respective cam plates 15, only one of which is shown.

As the operation of the structure shown in Fig. 5 is similar to that previously set forth, only a brief description thereof will be necessary. Normally, the cam plate 51 is biased by the spring 17 to the illustrated contact-permitting or roller-engaging position, corresponding to the position illustrated in Fig. 1. Under such conditions, a depression or trough of the cam surface 52 engages the contact roller 56 of the guide 55. Upon a predetermined degree of rotative movement of the shaft 50, however, a longitudinal projection or crest 53 of the cam surface 52 engages the contact roller 56, whereby the cam plate 51 is actuated toward the right, in opposition to the action of the spring 17, to effect disengagement of the cam plate from

the roller 14 and thus produce a quick separation of the corresponding contact members.

I do not wish to be restricted to the specific structural details or arrangement of parts herein set forth, as various modifications thereof may be effected without departing from the spirit and scope of my invention. I desire, therefore, that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. Control apparatus comprising a plurality of sets of stationary and movable contact members, means for actuating said movable contact members in a certain direction, and means for selectively effecting disengagement of said contact members by moving said actuating means in a direction transverse to said certain direction.

2. In control apparatus, the combination with a rotatable member, and a plurality of sets of stationary and movable contact members associated therewith, of means for actuating said movable contact members, and means for selectively effecting longitudinal movement of said actuating means to disengage said contact members, under predetermined conditions.

3. In control apparatus, the combination with a rotatable member, and a plurality of sets of stationary and movable contact members associated therewith, of means adapted for both rotative and longitudinal actuation for actuating said movable contact members, and means dependent upon the extent of rotative movement thereof for effecting such longitudinal actuation.

4. In control apparatus, the combination with a rotatable member, and a plurality of sets of stationary and movable contact members associated therewith, of means adapted for both rotative and longitudinal actuation for actuating said movable contact members, longitudinally-acting means rotatable with the actuating means, and stationary means cooperating with said longitudinally-acting means for effecting disengagement of certain contact members.

5. In control apparatus, the combination with a rotatable member, and a plurality of sets of stationary and movable contact members associated therewith, of means adapted for both rotative and longitudinal actuation for actuating said movable contact members, a slidable member for longitudinally engaging one of said actuating members,

and stationary cam means cooperating with said slidable member for effecting longitudinal movement thereof, under predetermined conditions.

6. In control apparatus, the combination with a rotatable member, and a plurality of sets of stationary and movable contact members associated therewith, of means adapted for both rotative and longitudinal actuation for actuating said movable contact members, a plurality of circumferentially-spaced slidable members for longitudinally engaging the respective actuating means, and stationary cam means cooperating with said slidable members for selectively effecting longitudinal movement thereof.

7. In control apparatus, the combination with a rotatable shaft having a longitudinal groove, of a contact-directing member rotatively movable with the shaft and longitudinally movable thereon, a rod slidable in said groove for engaging said member, and stationary cam means cooperating with said rod for effecting longitudinal movement thereof, upon a predetermined extent of rotative movement of said shaft.

8. In control apparatus, the combination with a rotatable shaft having a plurality of spaced longitudinal grooves, of a plurality of contact-directing members rotatively movable with the shaft and longitudinally movable thereon, means for biasing said members to operative positions, a plurality of rods slidable in the respective grooves for engaging the respective members, and stationary cam means cooperating with said rods for selectively effecting longitudinal movement thereof against the action of the corresponding biasing means.

9. In control apparatus, the combination with a rotatable shaft having a plurality of spaced longitudinal grooves, of a plurality of contact-directing members rotatively movable with the shaft and longitudinally movable thereon, means for biasing said members to operative positions, a plurality of rods slidable in the respective grooves for engaging the respective members, and a plurality of stationary dissimilar cam surfaces cooperating with the respective rods for effecting longitudinal movement of the respective members at predetermined points during the rotative movement of said shaft.

In testimony whereof, I have hereunto subscribed my name this 28th day of June, 1917.

OLIVER P. HIPPLE.