T. S. PUKERUD.

CONTROLLER.

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1,336,582. **Patented Apr. 13, 1920.**

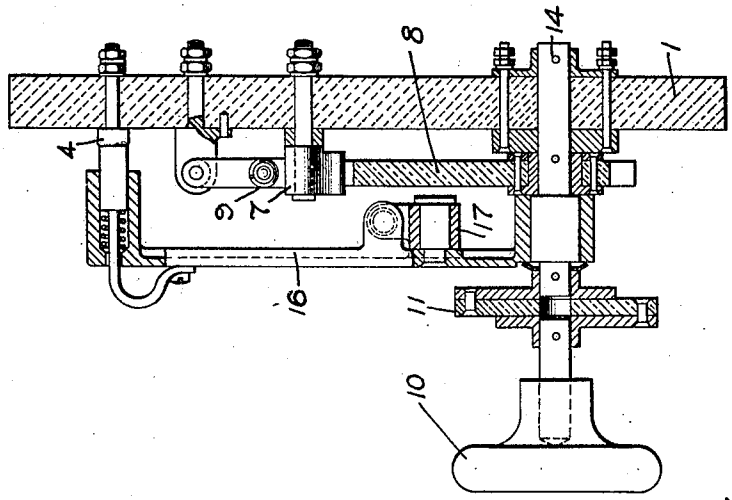


Fig. 2.

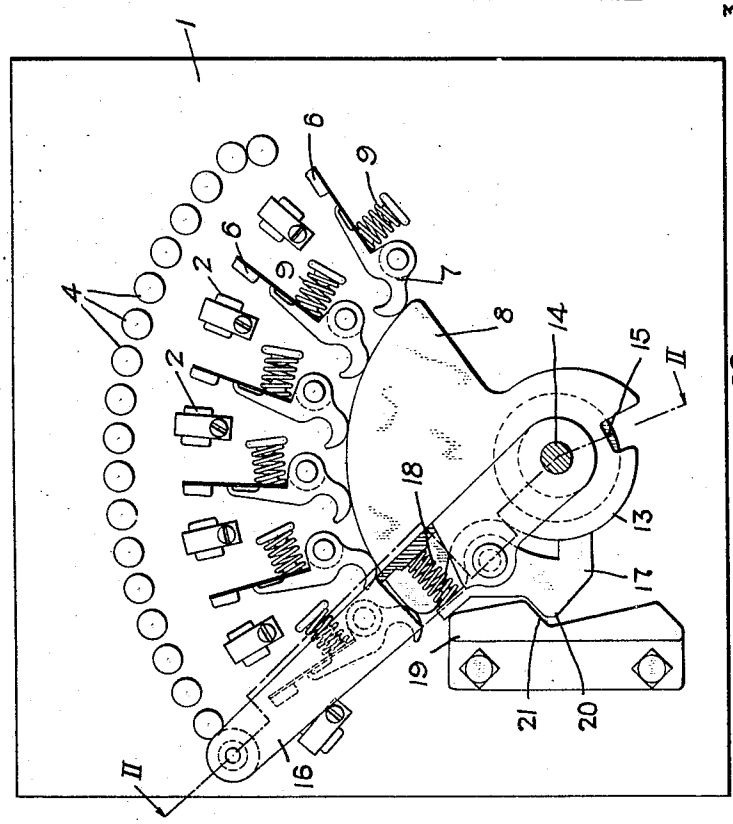


Fig. 1.

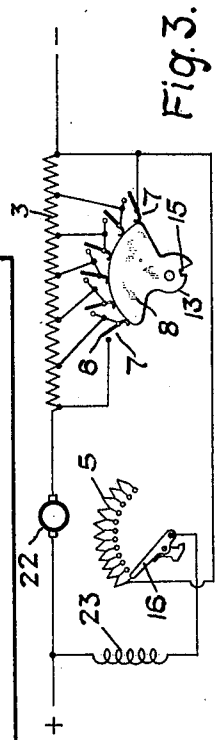


Fig. 3.

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CONTROLLER.

1,336,582. Specification of Letters Patent. Patented Apr. 13, 1920.

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To all whom it may concern:

Be it known that I, THOMAS S. PUKERUD, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Controllers, of which the following is a specification.

My invention relates to controllers and particularly to controllers that are employed in connection with the armature resistors and field resistors of dynamo-electric machines.

My invention has for its object to provide a device of the character indicated above having a single actuating member which operates successively to control the armature resistor and the field resistor of a dynamo-electric machine.

Controlling devices embodying a plurality of relatively movable arms for controlling the armature resistors and the field resistors of dynamo-electric machines have been provided, heretofore, but such arrangements usually comprise two series of stationary contact members which are successively engaged by the corresponding arms. Such arrangements possess the disadvantage that the contact members for controlling the armature resistor are engaged and disengaged by relatively slow movements of the controller arm and arcs of considerable magnitude occur upon the separation of the arm and the contact members. The controlling devices of the prior art also embody more or less complicated mechanism for insuring that the operation of the respective controlling arms shall occur successively.

According to the present invention, the armature resistor is controlled by a series of switches having butt contact members and adapted to operate with quick movements to make and break the circuits controlled by them. A single actuating member is employed which is permanently connected to one of a pair of movable arms and is detachably connected to the other of the movable arms by a latching mechanism during a predetermined portion of the path of movement of the actuating member.

In the accompanying drawing, Figure 1 is a view, partially in plan and partially in section, of a controller constructed in accordance with my invention. Fig. 2 is a sectional view taken on line II—II of the mechanism of Fig. 1. Fig. 3 is a diagrammatic view of circuits and apparatus embodying my invention.

A base member 1 of slate, or other suitable insulating material, supports a series of stationary contact members 2, which are connected to sections of an armature resistor 3, and a series of stationary contact members 4 that are similarly connected to a field resistor 5. A series of movable contact members 6, which are carried by pivotally mounted levers 7, are controlled by a cam member 8 of insulating material and of substantially fan-shape. The contact members 6 are actuated into engagement with the stationary contact members 2 by springs 9 when the levers 7 are released by the cam member 8.

The cam member 8 is permanently connected to a hand-wheel 10 and together with the below-mentioned arms 16, is insulated therefrom by means of an insulating coupling 11. The cam member 8 is provided with a curved portion 13 that is substantially concentric with a rotatable shaft 14 by which the cam member is supported. At one extremity of the circular portion 13, is a recess 15 for a purpose to be later described.

An arm 16, which is loosely mounted on the shaft 14, coacts with the stationary contact members 4 for controlling the field resistor 5. The arm 16 carries a pawl 17 which is pressed into engagement with the portion 13 by a spring 18 when the arm 16 is in its inoperative position. The position of the pawl 17 or latching member relative to the arm 16 is controlled at certain times by a stationary cam member 19 which operates also as a stop member to limit the movement of the arm 16 in one direction.

The pawl 17 is provided with a projecting portion 20 which coacts with a shoulder portion 21 on the stationary cam member 19. By means of this arrangement, any movement of the arm 16 is prevented until the recess 15 registers with the pawl 17 and permits the latter to rotate about its pivotal support to occupy the recess. The shoulder 21 is then withoutt he path of movement of the projection 20.

Referring particularly to Fig. 3, an electric motor, the armature winding of which

is indicated at 22, is provided with a shunt field-magnet winding 23 that is in series with the field resistor 5. The armature resistor 3 is in series with the armature winding 22 of the motor. The cam member 8 and the arm 16, which respectively control the resistors 3 and 5, are shown in separate positions in the diagrammatic view for the sake of clearness.

It may be assumed that the motor is at rest and that it is desired to start the same. It may be assumed, further, that the controlling mechanism occupies its illustrated or inoperative position in which the switches for controlling the armature resistor are open and the arm 16 occupies its illustrated position in which the entire field resistor 5 is removed from the circuit of the field-magnet winding 23.

The main circuit of the motor may be closed in any suitable manner, and current traverses a circuit comprising the armature winding 22 and the armature resistor 3. The shunt field-magnet winding is energized to a maximum degree because of the low resistance of its circuit. To accelerate the motor, the hand-wheel 10 and the cam member 8, to which it is connected, are actuated in a clockwise direction, as viewed in Fig. 1. As the levers 7 are released successively during the movement of the arm, they are actuated by the springs 9 to effect the engagement of the corresponding contact members 6 and 2 with a quick movement. The armature resistor is thus gradually shunted and the speed of the motor is correspondingly increased.

During the entire operation of the cam member to effect the closing of the several switches, the arm 16 remains in its illustrated position because it is loosely mounted on the shaft 14 and the projection 20 is in engagement with the shoulder 21. When the cam member has rotated to such point in its path of movement that the notch 15 registers with the pawl 17, the spring 18 actuates the latter into engagement with the recess and further actuation of the hand-wheel 10 causes the arm 16 to move over the series of stationary contact members 4 to gradually insert the resistor 5 in series with the shunt field-magnet winding 23. The motor is further accelerated by the resultant weakening of its magnetic field.

When it is desired to stop the motor, the hand-wheel 10 is actuated in the opposite, or counter-clockwise, direction to bring the arm 16 gradually to its illustrated position and thereby remove the field resistor 5 from the exciting circuit. The effect of strengthening the field of the motor is to decrease its speed materially. When the arm 16 approaches its illustrated position, the rearward projection of the pawl 17 is engaged by the stationary cam member 19 and the pawl 17 is rocked out of engagement with the cam member 8. Further movement of the hand-wheel 10 and the cam member 8 in a counter-clockwise direction operates to successively open the armature resistor controlling switches, and the armature resistor 3 is gradually inserted in series with the motor to effect a corresponding reduction in speed.

The advantages of a controller constructed in accordance with my invention will be appreciated by those skilled in the art. A single actuating member operates to effect the successive operation of the respective controlling members. The armature resistor controlling switches operate with a quick or snap movement which prevents the formation of destructive arcs and thus prolongs the life of the switch mechanism. The controller is neat in appearance and compact in arrangement.

I claim as my invention:

1. In combination, a plurality of resistors, a plurality of relatively movable members for controlling the resistors, means for positively connecting said members for simultaneous movement in opposite directions, and a member adapted to be continuously operated to actuate first one member to control one resistor and then another member to control another resistor.

2. In a controller, the combination with a plurality of resistors and a plurality of members for controlling said resistors, of an actuating element permanently connected to one of said members, and means comprising a slot-and-projection mechanism for connecting the other of said members to said element after said element has traversed a predetermined portion of its path of movement from an inoperative position.

3. In a controller, the combination with a pair of movable members, and an actuating element therefor, of latching means for connecting said element to one of said members at a predetermined point in the path of movement of the element from an inoperative position and a cam for effecting the disengagement of said latching means when the element returns to said predetermined point.

4. In a controller, the combination with a movable element having a recess, a movable member, and a latch member carried by said member for coacting with said recess at a predetermined point in the path of movement of said element from an inoperative position, of a cam member for effecting the disengagement of said coacting parts when the movable member is returned to the predetermined point.

5. In a controller, the combination with a plurality of resistors, a plurality of switches for controlling one of said resistors, a movable member for controlling the

other of said resistors, and a cam member for actuating said switches, of an actuating element connected to said cam member and a latching mechanism for connecting said movable member to said actuating element after the latter has operated to effect the closing of said switches.

6. In a controller, the combination with a plurality of resistors, a plurality of switches for controlling one of said resistors, a movable member for controlling the other of said resistors, and a cam member for actuating said switches, of an actuating element connected to said cam member and a latching mechanism for connecting said movable member to said actuating element after the latter has operated to effect the closing of said switches, and for disconnecting said movable member from said element before said switches have been opened by said cam member.

7. In a controller, the combination with a plurality of switches located in substantially the same plane and a series of stationary contact members, of a cam member in the plane of said switches for controlling them, a movable member for coacting with said contact members and means for successively actuating said cam member to control said switches and said movable member to engage said contact members.

8. The combination with armature and field resistors and a switch for controlling each of said resistors, of means for effecting relatively quick actuation of said armature-resistor switch and relatively slow actuation of said field-resistor switch.

9. In a controller, the combination with a pair of resistors and a pair of relatively movable members for controlling said resistors, of means for moving one only of the members to control one of the resistors and for moving both of the members in the same direction to control said other resistor, and means comprising a latching mechanism for locking said members together for the latter movement and for the return movement through the same path.

10. The combination with armature and field resistors and a plurality of switches for controlling each of said resistors, of a controller arm for said switches and means whereby relatively slow movements of said arm effect quick actuation of said armature-resistor switches and relatively slow actuation of said field-resistor switches.

11. The combination with a pair of movable members, of means comprising a latch member and an actuating spring therefor for connecting said members together at a predetermined point in their path of movement and means comprising a stationary member which coacts with said latch member for effecting the disconnection of said movable members at said predetermined point upon the reverse movement of said members.

12. The combination with a plurality of relatively movable members and means comprising a spring-actuated latch member for connecting said members to render them relatively immovable, of a stop member adapted to engage said latch member and thereby render said connecting means ineffective.

13. The combination with a plurality of relatively rotatable members, of latching means for positively connecting said members to insure their operation as a unit, and a single means coöperating with said latching means to positively prevent the rotation of one of said members and to render said connecting means ineffective.

14. In a controller, the combination with a set of stationary contact members and a movable contact member for coöperating therewith, of a second set of stationary contact members, a spring-pressed movable contact member for coöperating with each stationary contact member of said second set, a movable cam member for normally maintaining said spring-pressed contact members in inoperative positions, means for actuating said cam member to release said spring-pressed contact members and means for thereupon actuating said first-named movable contact member.

In testimony whereof, I have hereunto subscribed my name this 27th day of May, 1916.

THOMAS S. PUKERUD.