H. W. CHENEY.

CONTROLLER.

APPLICATION FILED SEPT. 13, 1909.

995,438.

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Fig. 1

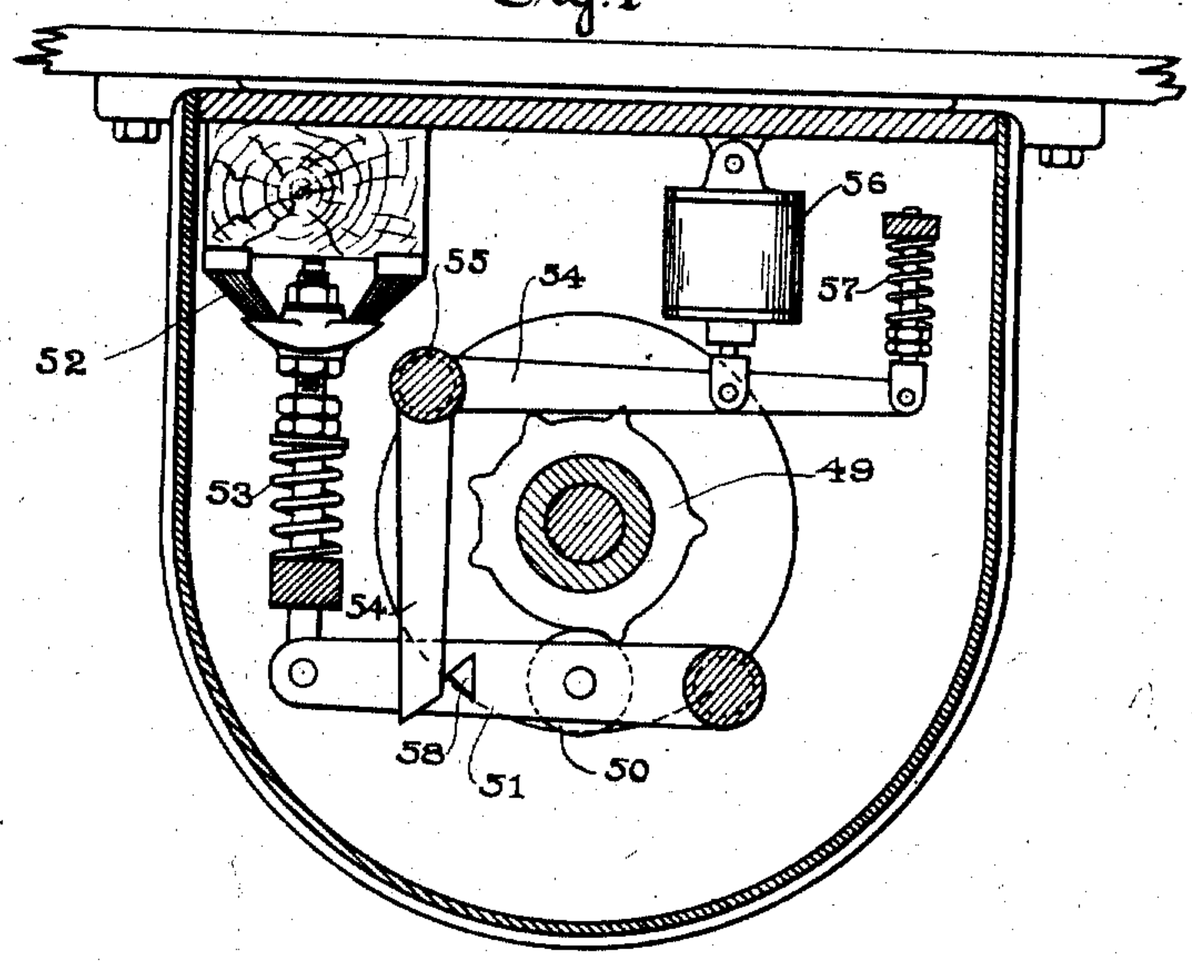
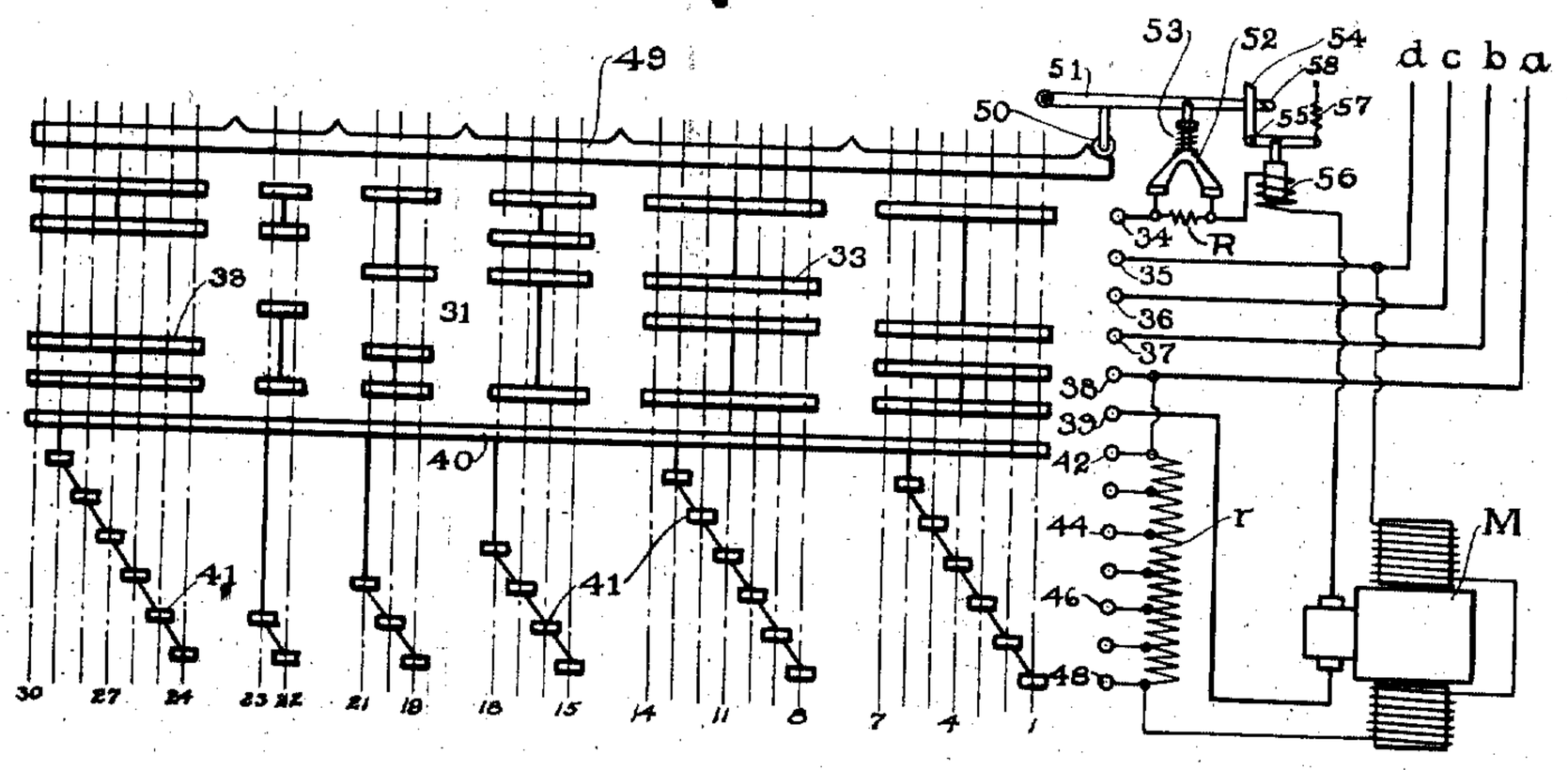


Fig. 2



Witnesses

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UNITED STATES PATENT OFFICE.

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CONTROLLER.

995,438. Specification of Letters Patent. Patented June 20, 1911.

Application filed September 13, 1909. Serial No. 517,487.

To all whom it may concern:

Be it known that I, HERBERT W. CHENEY, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Controllers, of which the following is a full, clear, and exact specification.

My invention relates to multiple voltage controllers.

In the patent to Dunn No. 797,271, granted Aug. 15, 1905, there is described a multiple voltage controller in which a fixed resistance is temporarily cut into the armature circuit of a motor whenever the connections of the armature are changed from one set of mains to another. This resistance, now commonly known as a buffer resistance, serves to prevent excessive surges of current through the armature when the impressed voltage thereon is either increased or decreased. In the Dunn patent, this buffer resistance, after having been inserted in circuit, is cut out again after a predetermined time. While this arrangement is generally entirely sufficient, it sometimes happens that the buffer resistance is cut out before the armature current has dropped to a safe value, or is retained in circuit for some time longer than is required for the armature current to drop to such safe value, the variations in the armature current not always being the same for the same period of time.

It is the object of my present invention to provide an arrangement whereby a buffer resistance, after having been cut into circuit, is cut out of circuit as soon as the armature current has dropped to a predetermined value and not before. In attaining this object I provide a device such as an electromagnet, responsive to the current in the armature circuit, and so arrange this device that while the current in the armature circuit exceeds a predetermined value, it prevents a buffer resistance, if in circuit, from being cut out, but allows such resistance to be cut out as soon as such current falls below such predetermined value. This is preferably done by providing a latch to hold open a switch which normally short-circuits the buffer resistance, and releasing such latch when the armature current falls below a predetermined value.

The various novel features of my invention will appear from the description and drawings, and will be particularly pointed out in the claims.

Figure 1 is a section through a controller embodying my invention, showing the operating mechanism for a buffer resistance switch; and, Fig. 2 is a diagram showing a development of such controller.

For the sake of simplicity, the controller drum 31 is here illustrated with its connections approximately the same as those in the patent to Dunn aforesaid, but it is obvious that my invention is applicable to any other form of controller in which the voltage impressed on a motor is varied and especially applicable to any form of multiple voltage controller. The controller drum has contact segments 33 arranged to coöperate with contact fingers 34 to 39 inclusive to connect the armature of a motor M to different sets of the mains *a*, *b*, *c*, and *d*. The drum also has a ring 40 and segments 41 arranged to coöperate with contact fingers 42 to 48 inclusive to vary the resistance *r* in the field circuit of the motor M.

Mounted on the shaft of the controller drum is a cam wheel 49, on the periphery of which rides a roller 50 carried by a lever 51. The cam wheel 49 is shown developed in Fig. 2, but in order to show more clearly the operation of the device it is there shown as if its cam projections were on its upper surface instead of on its periphery. These cam projections are so located that they engage with and move the roller 50 as the motor armature connections are being changed from one set of mains to another. The lever 51 is connected to a switch 52, which is biased to closed position by an adjustable spring 53. A bell-crank lever 54, pivoted at 55, is movable by a solenoid 56 against the action of an adjustable spring 57 into engagement with a projection 58 on the lever 51 to hold the switch 52 in open position if while the switch is in such position the current in the solenoid 56 exceeds a predetermined value. This solenoid is connected in the armature circuit of the motor M, and the switch 52, when closed, short-circuits the buffer resistance R, also in the armature circuit of the motor M.

When the controller is moved to change the armature connections from any set of mains to another, whether to increase or decrease the voltage impressed on the arma-

ture, the cam projections on the cam wheel 49 move the lever 51 to open the switch 52 and cut the resistance R into the motor armature circuit. As soon as the change of armature connections has been made, the spring 53 begins to expand to force the switch 52 toward closed position. However, if because of the change of armature connections the current in the motor armature circuit exceeds a predetermined value, the solenoid 56 moves the bell-crank lever 54 to engage the projection 58 and hold the switch 52 in open position. As the motor changes in speed due to the change of armature connections, the current in the motor armature circuit decreases. When the armature current has dropped to a predetermined value the solenoid 56 allows the spring 57 to disengage the bell-crank lever 54 from the projection 58, which permits the switch 52 to close to cut out the buffer resistance R. In the controller shown the resistance R is cut into circuit when the controller passes between positions 7 and 8, 14 and 15, 18 and 19, 21 and 22, and 23 and 24, and also when it passes to or from off position. Between the positions just mentioned the armature connections are changed from one set of mains to another. Between any other two adjacent positions the controller merely varies the resistance r in the field circuit of the motor. This field resistance is arranged to be increased as the controller is moved forward between those adjacent positions when the armature connections are not varied, thus increasing the speed of the motor, but to be cut out whenever the armature connections are changed from mains of a lower voltage to mains of a higher voltage, thus insuring a strong field whenever a higher voltage is impressed on the armature.

It is obvious that the part of the controller which controls the field resistance may be varied as desired, and that the part which controls the armature connections may be adapted to any multiple voltage system and arranged, if desired, to reverse the armature connections. These modifications, as well as many others which will readily occur to one skilled in the art, may be made without departing from the spirit and scope of my invention, and are intended to be covered in the following claims.

What I claim as new is:

1. In combination, a motor, a circuit therefor, a resistance in the circuit, means for effecting changes in potential on the leads of the armature circuit of the motor, mechanically operated means for cutting said resistance into said circuit, and a device responsive to the current in the armature circuit of the motor for controlling the cutting of said resistance out of circuit.

2. In combination, a motor, multiple voltage mains, means for connecting the motor armature across different sets of said mains, a resistance, mechanically operated means for inserting said resistance in circuit with the motor armature when the latter is changed from one set of said mains to another, and means responsive to the current in the armature circuit for controlling the cutting out of said resistance.

3. In combination, multiple voltage mains, a motor, means for connecting the motor armature to different sets of said mains, a resistance in the motor armature circuit, a switch normally short-circuiting said resistance, means for opening said switch as the motor armature connections are changed from one set of said mains to another, and means responsive to the current in the motor armature circuit for holding said switch open while the current in the motor armature circuit exceeds a predetermined value.

4. In combination, a controller arranged to connect a motor armature to different sets of multiple voltage mains, a resistance, a switch arranged to be operated to cut said resistance into the motor armature circuit when the armature connections are changed from one set of the multiple voltage mains to another, and means for holding said switch in the position in which said resistance is cut into the motor armature circuit until the current in such circuit is below a predetermined value.

5. In combination, multiple voltage mains, a motor, a controller arranged to connect the armature of said motor to different sets of said mains, a resistance, a switch arranged to be operated to cut said resistance into the motor armature circuit as the controller is moved to change the armature connections from one set of said mains to another, and an electro-magnet in the motor armature circuit arranged to hold said switch in the position where such resistance is in the armature circuit until the current in such circuit is below a predetermined value.

6. In combination, a controller arranged to connect a motor armature to different sets of multiple voltage mains, a resistance, a switch biased to a position to cut said resistance out of circuit but arranged to be operated to cut said resistance into the motor armature circuit when the armature connections are changed from one set of the multiple voltage mains to another, and means for holding said switch in said latter position until the current in the motor armature circuit is below a predetermined value.

7. In combination, multiple voltage mains, a motor, a controller arranged to connect the armature of said motor to different sets of said mains, a resistance in the motor armature circuit, a switch biased to p ition to short-circuit said resistance, means for

opening said switch as the motor armature connections are changed from one set of said mains to another, and means responsive to the current in the motor armature circuit for preventing the closing of said switch while the current in the motor armature circuit exceeds a predetermined value.

8. In combination, multiple voltage mains, a motor, means for connecting the motor armature to different sets of the multiple voltage mains, a resistance in the motor armature circuit, a switch normally short-circuiting said resistance, means for opening said switch as the motor armature connections are changed from one set of said mains to another, and an electromagnet in the motor armature circuit for controlling the cutting out of said resistance.

9. In combination, a controller arranged to connect a motor armature to different sets of multiple voltage mains, a resistance for the motor armature circuit, a switch which normally short-circuits said resistance, means for opening said switch by a movement of the controller changing the motor armature connections from one set of multiple voltage mains to another, and a single coil electromagnet for controlling the closing of said switch.

10. In combination, a controller arranged to connect a motor armature to different sets of multiple voltage mains, a resistance, a switch arranged to be mechanically operated to cut said resistance into the motor armature circuit when the armature connections are changed from one set of multiple voltage mains to another, and a single coil electromagnet for controlling the movement of said switch to a position to cut said resistance out of the motor armature circuit.

Milwaukee, Wis., Sept. 1, 1909.

In testimony whereof I affix my signature, in the presence of two witnesses.

HERBERT W. CHENEY.

Witnesses:
CHAS. L. BYRON,
ROB. E. STOLL.