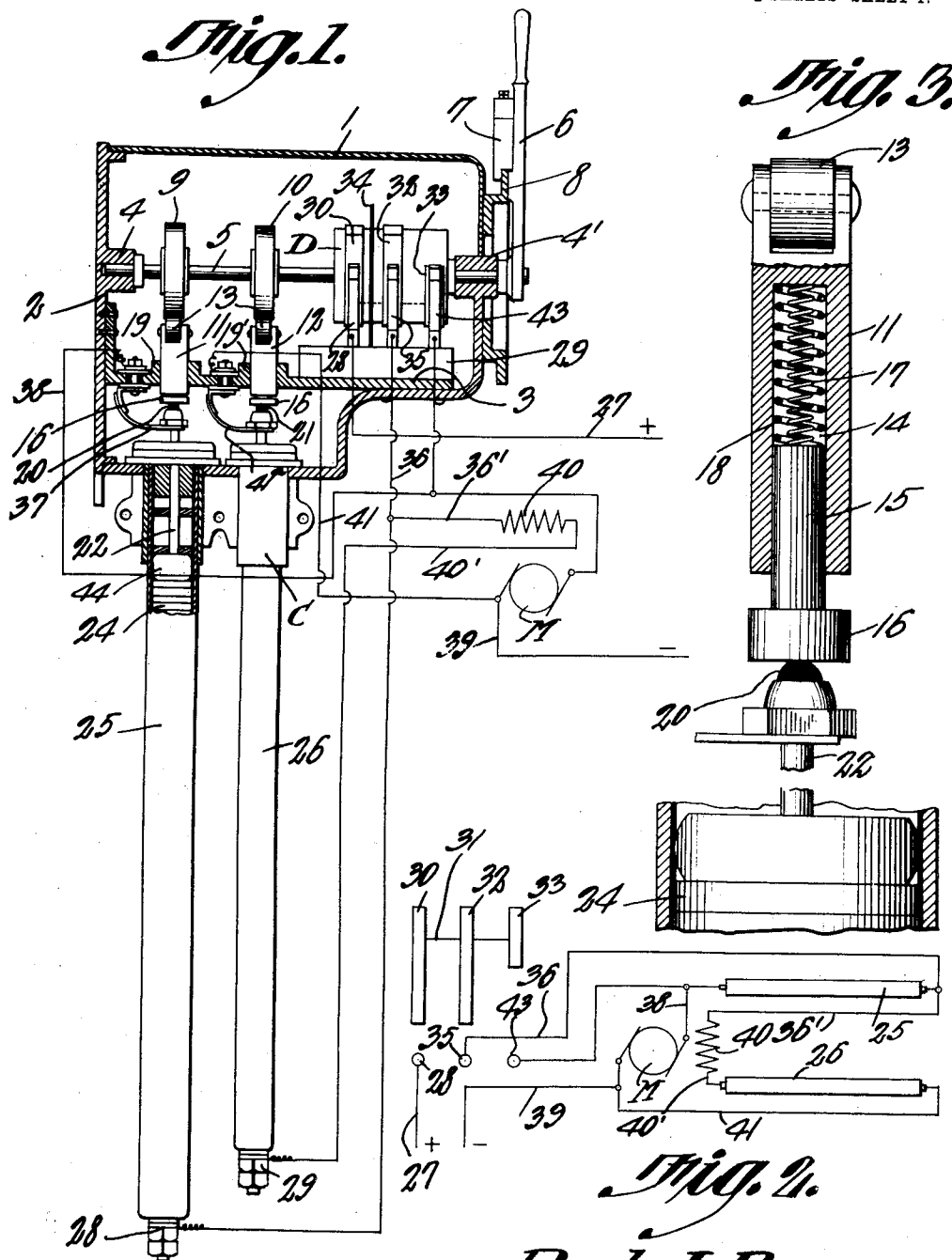


P. J. RAY.
ELECTRIC CURRENT CONTROLLER.
APPLICATION FILED MAY 21, 1913.

1,089,081.

Patented Mar. 3, 1914.

2 SHEETS—SHEET 1.



Witnesses

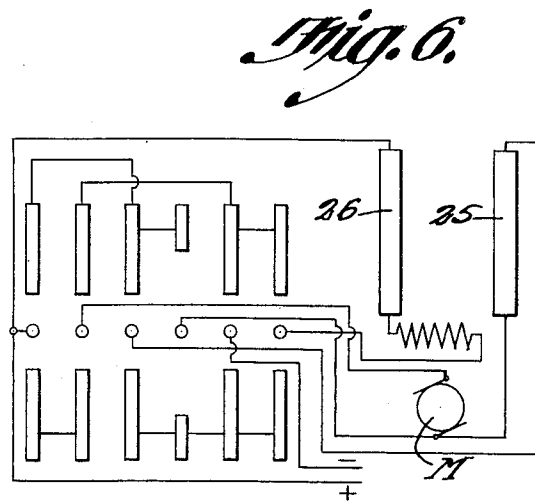
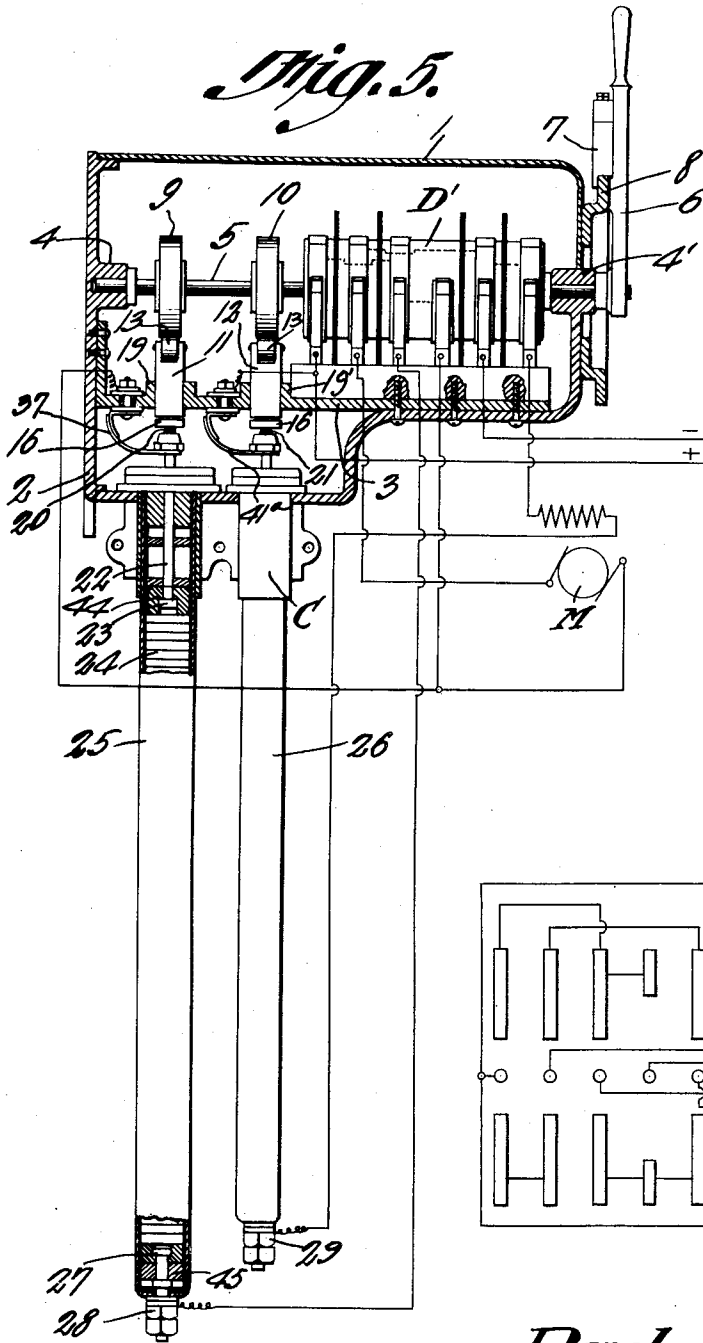
J. P. Taylor
L. Wilcox

Paul J. Ray Inventor
by *C. A. Snow & Co.* Attorneys

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J. P. Tomlin
D. Willcox

Paul J. Ray Inventor
by *C. A. Snow & Co.* Attorneys

UNITED STATES PATENT OFFICE.

PAUL J. RAY, OF LAKEWOOD, OHIO.

ELECTRIC-CURRENT CONTROLLER.

1,089,081.

Specification of Letters Patent.

Patented Mar. 3, 1914.

Application filed May 21, 1913. Serial No. 769,112.

To all whom it may concern:

Be it known that I, PAUL J. RAY, a citizen of the United States, residing at Lakewood, in the county of Cuyahoga and State of Ohio, have invented a new and useful Electric-Current Controller, of which the following is a specification.

The present invention relates to improvements in electric current controllers, and more particularly to that type of controller, in which a resistance medium, whose electrical conductivity is increased when it is subjected to pressure, is employed, there being provided manually controlled means which operates a drum type switch to vary the pressure upon the resistance medium and to cut out or short circuit when the maximum current is permitted to flow through the resistance medium, one object of the present invention being the provision of means to prevent the formation of air gaps between the members or parts of the resistance medium when the mechanism for compressing the same is at release position.

A further object of the present invention is the provision of a drum type controller, either of a single direction or non-reversible type, or of a reversible type, in which the shaft controls means for increasing pressure upon a resistance medium whose electrical conductivity is increased when subjected to pressure, as for instance, a plurality of carbon disks.

A still further object of the invention is the provision of a means disposed between the mechanism carried by the drum shaft and the resistance disks, for exerting a normal resilient tension upon the disks to maintain the same against separation when not subjected to the pressure from the drum shaft.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings—Figure 1 is a longitudinal sectional view through the casing of a non-reversible type drum controller, the parts being in the position they assume when the resistance mediums are fully compressed.

Fig. 2 is an electrical diagram of the circuit employed when the non-reversible controller is connected for operating a motor. Fig. 3 is an enlarged detail sectional view of the means interposed between the cams of the shaft and the compressible resistance medium. Fig. 4 is an enlarged detail view of one of the cams operated by the controller shaft. Fig. 5 is a view similar to Fig. 1 of a reversible type controller. Fig. 6 is an electrical diagram of the circuit used with the reversible type of controller.

Referring to the drawings, and more particularly to Figs. 1 through 4, and to the main carrying portion and the mechanism of the controller shown in Fig. 5, the numeral 1 designates the casing which may be made in any desired manner to permit of the accessibility to the parts of the controller, a portion 2 thereof being so constructed that a partition 3 is disposed within the casing to carry the means for operating the compression units as will presently appear. The journaling bases 4—4' have mounted therein the oscillatory shaft 5, which is controlled through the hand lever 6, said lever being provided with the retaining device 7, disposed in coöperative relation with the disk or plate 8, all of usual construction in a drum type controller. Keyed upon the shaft 5 within the casing are the two cams 9 and 10, which are disposed above the respective slidably mounted plungers 11 and 12, mounted in the bosses 19—19' of the partition 3. The plungers 11 and 12, as clearly shown in Fig. 3, both of which are constructed identically, carry at their upper ends the anti-friction rollers 13, which are disposed in the path to be engaged by the respective cams 9—10, there being provided a socket 14, in which is slidably mounted the stud 15 carrying the contact head 16. A light spring 17 is disposed within the socket 14 and exerts a normal tension to hold the stud 15 and head 16 downwardly, while a heavier spring 18 is disposed concentrically about the spring 17 within the socket 14 and offers a greater resistance to the pressure upon the roller 13, the spring 18 being at its full limit of extension when the parts are in the position as shown in Fig. 3, while the spring 17 is still exerting a slight pressure thereupon, the purpose of which will presently appear. The couplings C are connected to the casing 1 and mounted concentrically above the

respective ends thereof within the casing are insulating buttons 20—21 of the vertically slidable rods 22. Each rod 22 as clearly shown in detail in Figs. 1 and 5, carries upon its inner end a heavier terminal disk 44 fixed to the rod 22 by a screw 23, within the respective internally insulated tubes 25 and 26. Disposed within each of the tubes are a plurality of disks 24, which are preferably of carbon or may be of any material, the electrical conductivity of which increases due to pressure being exerted thereupon. Disposed in the lower end of each of the tubes of insulation 25 and 26 is a button or stud 27, carried by the binding posts 28 and 29 respectively. Connected to each one of the respective rods 22 adjacent the buttons 20—21 thereof are the flexible leaf terminal conductors 37 and 41^a which as will presently appear are included in the electrical circuit to control the motor M.

From the foregoing description, taken in connection with the drawings, it is evident that when the respective handles 6 of either type are rotated, that the cams 9 and 10 are also rotated, and consequently exert a pressure upon the members 11 and 12 and that the initial pressure is then exerted upon the heaviest spring 18, and finally upon the stud 15 and head 16 to the rods 22. This action causes the disk 44 to be placed in compressive relation to the disks 24 so that as the shaft 5 is rotated, and the cams are gradually brought into play, and the conductivity of the conduction disk 24 will be increased as the pressure is exerted thereupon. When the pressure is entirely relieved due to the cams, and the spring 18 assumes a position as shown in Fig. 3, the tension of the spring 17 is such as to cause the plunger 15 and head 16 to exert pressure upon the rods 22 and hold the disks 24 against separation, thereby preventing an open circuit when the compression due to the cams 9 and 10 is released. It is also apparent that in a drum type controller as herein set forth, that the compression resistance units will give a slight positive temperature co-efficient, that is the resistance for any definite amount of compression, the same increasing a trifle as the temperature of the resistance units rises and when the controlling lever is set in any position, the current passing through the resistance units will have a tendency to decrease a trifle rather than to increase, thus relieving a great objection to this form of controller. It is also apparent that the lever 6 may be set in any desired position to obtain initially the current value in such position that will not increase as the temperature of the compression resistance changes.

It will be noted that the present structure of controller is especially adapted for use where a definite current value is desired

which is to be maintained for a certain period of time, or for continuous service, as for instance for storage battery chargings and for carrying the speed of a shunt wound motor, by inserting resistance in series with the shunt field coils or for varying the speed of a motor by resistance inserted in the armature circuit where a certain speed is desired to be maintained.

As shown in the present instance, two resistance units as 25 and 26 are shown, but it is evident that the number may be increased or decreased.

In the form of controller as shown in Fig. 1, the insulating drum D is divided into practically three segments 30, 32 and 33, an insulating disk 34 being interposed as shown in Fig. 1, while the insulating block 29 carries the three contact fingers 28, 35 and 43.

In the non-reversible type of controller, the current is led through the conductor 27 to the finger 28, through the segment 30 of the drum, through the conductor 31 to the segment 32, the finger 35, the conductor 36, the resistance medium 25, the conductor strip 37, the conductor 38, the motor M, and the negative lead 39. The conductor 36' is led from the conductor 36, to the resistance 40, and the conductor 40' to the resistance medium 26, a conductor 41 being led from the resistance medium 26 to a conductor 39, at the opposite side of the motor M. It will thus be seen that with this wiring, that the resistances 25 and 26 are gradually shunted from the motor circuit or may be maintained therein according to the speed at which it is desired to operate the motor.

The diagram, as shown in Figs. 1 and 2, is simply given as indicative of one of many installations of the present device.

In the form of device shown in Fig. 5, the drum D' is provided with a plurality of segments, there being double the number shown in Fig. 1, thus providing a type of drum that is reversible, such structure being of well known character, and not needing detailed description.

What is claimed is:—

1. In an electric current controller, a compressible resistance medium having a zero or positive temperature co-efficient, means for exerting a resilient tension upon the medium to prevent separation of the members thereof, and manually operated means for compressing the resistance medium to reduce the resistance thereof.

2. An inner electric current controller, a compressible resistance medium having a zero or positive temperature co-efficient and composed of a plurality of conductive disks, the conductivity of which is increased due to the pressure placed thereupon, means for exerting a pressure upon the disks to hold the same against separation, and manually

operated means for compressing the disks to reduce the resistance thereof and increase the conductivity.

3. In an electric current controller, a compressible resistance medium having a zero or positive temperature co-efficient, and whose electrical conductivity is increased when it is subjected to pressure, means for maintaining a slight pressure thereupon to prevent the separating of the members of such medium, and means for compressing the medium to increase its conductivity.

4. A controller, including a manually controlled shaft, a current controlling drum thereupon, a compressible resistance medium having a zero or positive temperature co-efficient, means carried by the shaft for controlling the compressibility thereof, and means for exerting a slight pressure upon the compressible resistance units to hold the members thereof against separation when not under mechanical compression.

5. An electric current controller, including a compressible resistance medium, having a zero or positive temperature co-efficient, whose electrical conductivity is increased when it is subjected to pressure, a plunger disposed to engage the medium, a resilient member carried thereby for holding the resistance medium against separation, and manually operated means for exerting a pressure upon the plunger to compress the resistance medium to increase the conductivity thereof.

6. A current controller, including a casing, a resistance medium having a zero or positive temperature co-efficient mounted therein, said resistance medium being com-

posed of a material whose electrical conductivity is increased when subjected to pressure, a two-membered plunger slidably mounted in the casing and disposed to engage the resistance medium, means for holding one of the members resiliently in engagement with the resistance medium to prevent the separation of the members of such medium, and manually operated means mounted in the casing for engaging the plunger to slide the same to compress the medium to increase the electrical conductivity thereof.

7. A current controller, including a casing, a resistance medium having a zero or positive temperature co-efficient mounted thereon, said resistance medium being composed of a material whose electrical conductivity is increased when subjected to pressure, a two-membered plunger slidably mounted in the casing and disposed to engage the resistance medium, means for holding one of the members resiliently in engagement with the resistance medium to prevent the separation of the members of such medium, a drum carrying shaft journaled in the casing, and a cam mounted upon the shaft and disposed to engage the plunger, whereby the oscillation of the shaft operates the plunger to compress the resistance medium.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

PAUL J. RAY.

Witnesses:

E. D. RAY,

H. R. CROW.