H. P. MacLAGAN.

RESISTANCE ADJUSTING DEVICE.

APPLICATION FILED APR. 24, 1907.

907,831. Patented Dec. 29, 1908.

Fig. 1.

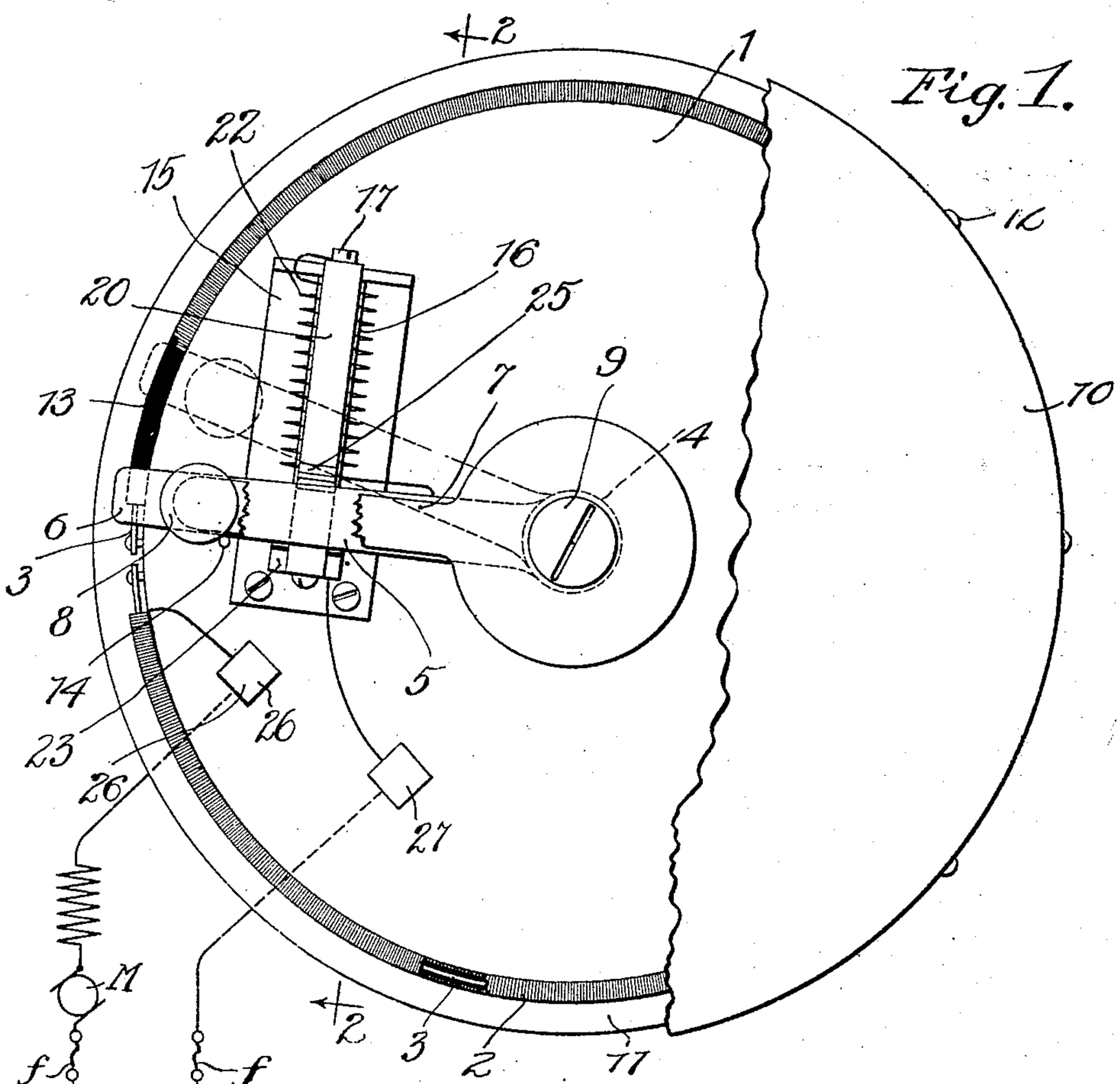
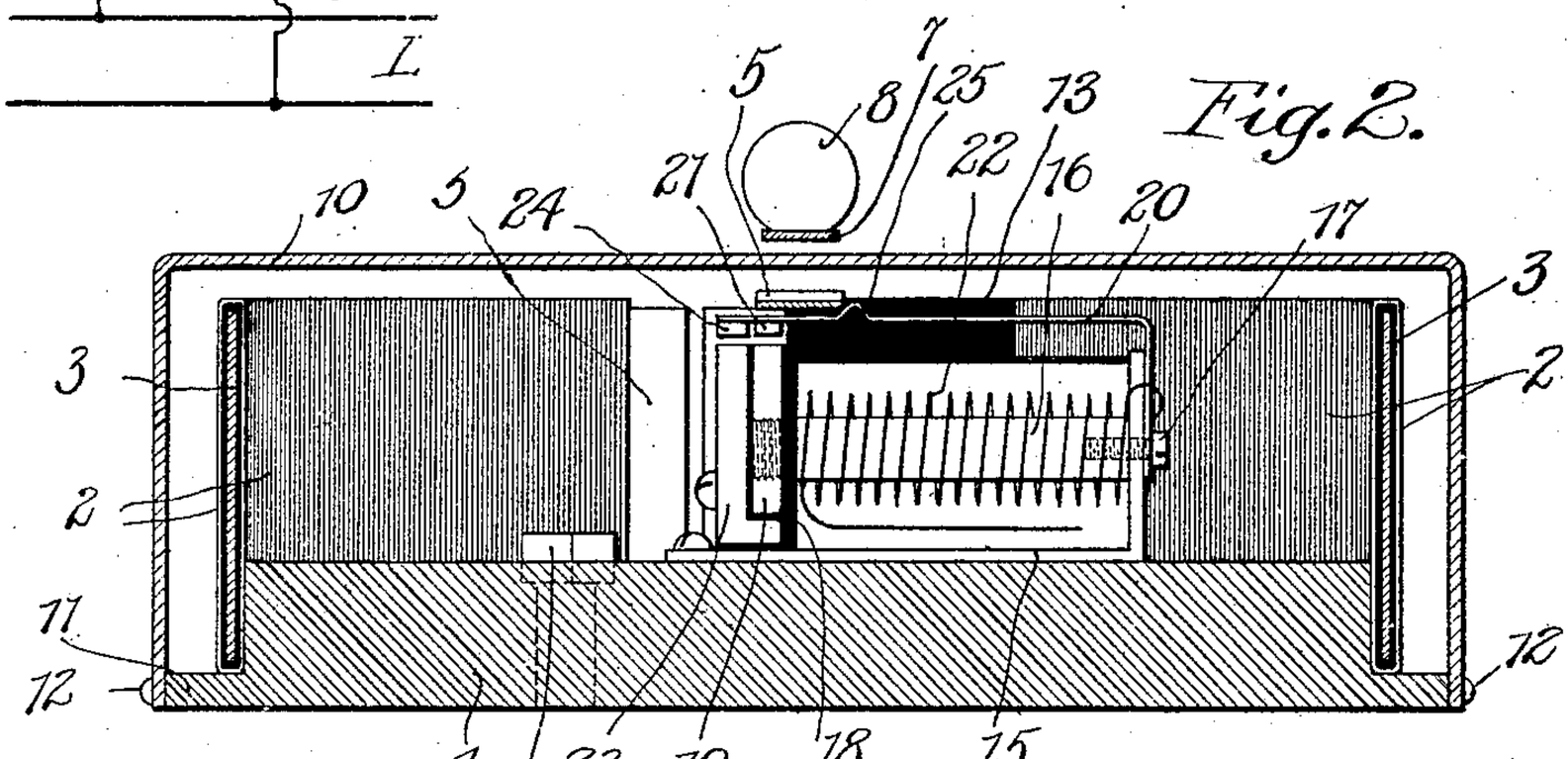


Fig. 2.



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UNITED STATES PATENT OFFICE.

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RESISTANCE-ADJUSTING DEVICE.

No. 907,831. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed April 24, 1907. Serial No. 369,992.

To all whom it may concern:

Be it known that I, HECTOR P. MacLAGAN, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Resistance-Adjusting Devices, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to circuit adjusting and protecting devices for electrical machinery such as motors and the like.

My invention is of particular importance when used in connection with resistance adjusting devices in which an operating handle is associated with a resistance medium or winding where the movement of the operating lever with respect to the resistance causes variation in the effect of the resistance when the device is connected with an electrical circuit to be controlled.

I have shown my invention as applied to the resistance adjusting device described and claimed in my application, Serial No. 282,282, filed October 11, 1905, and allowed April 9, 1907, but I do not wish to be limited to the adaptation of my invention to this particular device, as it may be applied with equal facility and advantage to other resistance adjusting devices.

In devices of the class like those in my application referred to, the operating lever travels to cut resistance into and out of circuit, and the contact lever may travel in direct engagement with the windings as in my device referred to, or it may travel over contact buttons suitably connected with the resistance winding. When, for example, a motor controlled by a resistance device of this kind is in operation and the contact lever is in engagement with the resistance at some point as, for instance, at the end of the resistance with all the resistance cut out, and the motor circuit should suddenly be interrupted at any point, the motor, of course, will stop. If the break in the circuit is repaired without returning the contact lever to its initial position in which the circuit is usually open, the motor will be subjected to a sudden rush of current which might be detrimental. If, however, the lever is returned to its normal starting position before the break is repaired, the motor may again be started in a gradual and safe manner. In view of this, the main object of my invention is to provide means which will insure a return of the contact lever to its original starting position upon the occurrence of a break in the circuit or other circuit disturbance. I, therefore, provide an electromagnetic contact controlling apparatus or attachment which is associated with the resistance device and which is applied to the resistance device so that its contacts are associated with the contact lever and controlled by the movements thereof. The contacts of the electromagnetic controlling device are normally open, but upon current flow through the energizing winding for the attachment, the contacts are closed to close the circuit to be protected at that point. The operating lever normally is disconnected from the resistance and is adapted for passing engagement with the contacts so that these contacts will be mechanically brought together when the lever is first moved, and the lever is immediately disengaged from the contacts as soon as it comes into contact with the resistance winding. This contact of the lever with the resistance winding causes final closure of the circuit to be protected, and the contacts are then maintained in connection by virtue of the energization of the electromagnetic device winding which is serially or otherwise suitably included in the circuit. As soon as the lever becomes dissociated from the contacts, these contacts are free to open upon deënergization of the winding, and this occurs should a break or other similar disturbance occur in any part of the circuit to be protected. If a break, for instance, is repaired, the motor will not start and cannot start until the contacts are again brought together, but this can be acccomplished only by returning the controlling lever to its normal position, as the lever must be in this position before the contacts can be mechanically closed.

My invention will be better understood when described with reference to the accompanying drawing in which—

Figure 1 is a top view of the resistance device to which my invention is applied, and Fig. 2 is a sectional view taken on line 2—2 of Fig. 1.

The resistance adjusting device comprises the base 1 of porcelain, wood or other suitable material. The resistance winding 2 is supported from a cylindrical shell 3 which is

secured at its lower end about the edge of the cylindrical block 1. The resistance is most readily formed by first winding a band of suitable material with a resistance wire and then bending this band into cylindrical form, as shown, this being fully described in my copending application referred to. Extending upwardly from the center of the block 1 is the post 4 upon which is pivoted the contact lever 5 whose end 6 engages the upper edge of the resistance winding. An actuating lever 7 is also pivoted to the post 4 and connected with the contact lever 5 so that rotation of the actuating lever will cause corresponding rotation of the contact lever, the actuating lever being provided at its front end with a button or knob 8. Both levers are pivoted to the post by means of a screw 9. Surrounding the entire winding is a cylindrical inclosing casing 10 whose lower edge engages about the edge of the flange 11 extending from the block 1, the casing being secured to the flange as by means of screws or nails 12. The upper wall of the casing is disposed between the contact lever and the actuating lever, the contact points being, therefore, inclosed and protected. The actuating lever may be also insulated from the contact lever in any well known manner. The section 13 at the beginning of the cylindrical shell 3 is not provided with windings, being preferably insulated, and this section is normally engaged by the contact lever, this lever normally resting against the stop or post 14.

Mounted on the base or block 1 and under the contact lever when the lever is in its starting position is an electromagnetic mechanism comprising the supporting frame 15 from which extends a core 16, shown as secured by means of a screw 17. The front end of this core is supported by a washer 18, and the core end is threaded and engaged by a magnet pole or shoe 19. Also secured at its rear end to the core and under the screw head 17 is a spring 20 of magnetic material, this spring extending upwardly and forwardly parallel with the core and carries at its front end an armature 21 situated above the pole 19 and normally held away therefrom by the force of the spring. Surrounding the core is a winding 22 which upon energization causes magnetic flow including the core, the screw, the spring, the armature, and the pole piece 19, the armature being then drawn to the pole piece. In front of the pole piece 19 but insulated therefrom is a contact piece 23, and directly above this contact piece and secured to the end of the spring 20 is a contact piece 24 which upon attraction of the armature 21 is brought into electrical engagement with the contact piece 23. The spring also is bent, as best shown in Fig. 2, to form a ridge or cam 25 which cam is directly in advance of the contact lever 5, as shown, so that when the contact lever is started, it will engage this ridge or cam and depress the spring to carry the contact 24 against contact 23. The position of the ridge is also such that the left edge of the contact lever will just leave the ridge when the right edge of the contact lever comes into electrical engagement with the terminal of the resistance winding, as shown in dotted lines in Fig. 1. The circuit conditions are made such that when the spring is first depressed by the lever, the circuit will be closed at one point, and when the lever engages the resistance winding, the circuit will be finally closed and the energizing winding included in this circuit becomes energized to maintain contact between contacts 24 and 23, and although the contact lever upon further movement releases the spring, the spring will not restore, but the armature 21 will be attracted toward the pole 19 and contact 24 will be held against contact 23 to maintain closure of the circuit.

In Fig. 1 I have shown diagrammatically one circuit arrangement which may be used.

26 and 27 are binding posts supported from the base 1.

M is the motor whose circuit is to be protected.

L represents the supply circuit. The circuit may be traced from one line limb through the motor to binding post 26, through one terminal of the resistance winding, through the resistance winding, and the circuit is normally open at this terminal. When the contact lever, however, reaches this terminal, the current will flow through the contact lever, through the energizing winding, through spring 20, contacts 24 and 23 to binding post 27 and to the other line limb. When the contact lever is in its normal position, the circuit is open at contacts 23, 24 and also at the entrance terminal of the resistance winding. When the lever is started, it first mechanically engages the ridge or spring 25 and depresses the spring to bring contacts 23 and 24 together to close the circuit at that point, and just before the lever reaches the ridge, it electrically engages the entrance terminal of the resistance winding to finally close the circuit, and the electromagnetic device thereupon becomes energized to retain engagement between contacts 23 and 24, and the contact lever may then be further rotated to any point of the resistance winding to cause proper resistance conditions for the motor circuit. If for any reason this circuit should become broken, as, for instance, by blowing of one of the fuses *f* the current flow becomes interrupted and the electromagnetic device deënergized to release the armature 21 and the spring whereupon contacts 23 and 24 become disengaged. Even though the attendant replaced the fuse, the circuit would remain broken and he cannot

restart the motor until the contact lever has been brought around to its starting position in order that it may be again operated to mechanically close contacts 23 and 24, and this is true no matter at what point the contact lever engaged the resistance winding when the fuse blew. If my protective device were not applied and the attendant replaced the fuse, the circuit would be restored and the motor subjected to a sudden inrush of current which would be very apt to be injurious. If the attendant thought of it, of course, he would restore the contact lever to its normal position before replacing the fuse, but this is very likely to be forgotten, and the importance of my arrangement, therefore, becomes manifest in that it is absolutely impossible for him to restore the circuit by replacing the fuse, but he is forced to restore the contact lever to its normal out of circuit position before he can restart the motor, and the closure of the circuit is automatically accomplished.

My protective arrangement may, of course, be applied to resistance adjusting devices of different construction.

I do not wish to be limited to its application to the resistance adjusting device herein shown and described in my copending application referred to. I also do not wish to be limited to the exact construction of the electromagnetic operative mechanism and its manner of association with the contact lever, as changes may here also be readily made without departing from the scope of my invention.

I claim as new and desire to secure by Letters Patent:

1. In a resistance device, the combination of a resistance winding, a contact lever pivoted so that upon rotation it will pass over said resistance winding, an electromagnet having a winding included in circuit with said resistance winding, a spring armature for said electromagnet, controlling contacts also included in circuit with the winding and the electromagnet upon attraction of said armature, said armature being in the path of the contact lever, said contact lever being normally disengaged from the resistance winding to open the circuit, and a cam ridge on said armature engaged by the contact lever to carry said armature against the electromagnet frame upon rotation of the lever, said lever after actuation of said armature engaging with the winding to close the circuit, and disengaging from said cam after engagement with the winding whereby said circuit is closed and the armature held attracted by the electromagnet to maintain closure of the circuit.

2. In a resistance adjusting device of the class described, the combination of a resistance winding arranged in a circle, a contact lever pivoted in the center of said circle to be associated at its end with said resistance winding, said lever being normally disconnected from said winding, an electromagnet, a spring armature for said electromagnet normally below the contact lever, contacts controlled by said armature, a cam ridge on said armature normally disengaged from the contact lever, adapted upon rotation of said contact lever to be engaged thereby and to be carried against the electromagnet frame, said lever after engagement with the cam mechanism coming into contact with the winding, and a circuit closed upon actuation of the armature and connection of the lever with the winding, said circuit including said winding, said lever, said contacts and the electromagnet winding, energization of the electromagnet after mechanical closure of the contacts by engagement of the lever with the armature causing said contacts to be magnetically retained in closed position by the electromagnet after said contact lever leaves the cam ridge.

In witness whereof, I hereunto subscribe my name this 20th day of April A. D., 1907.

HECTOR P. MacLAGAN.

Witnesses:

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CHARLES J. SCHMIDT.