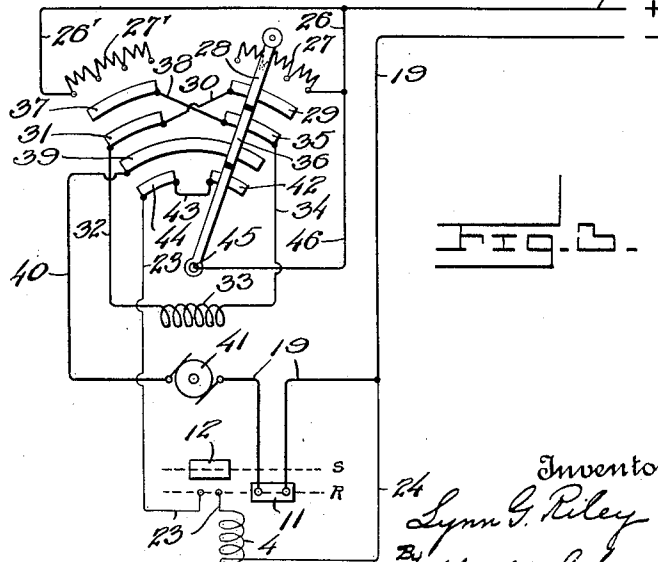
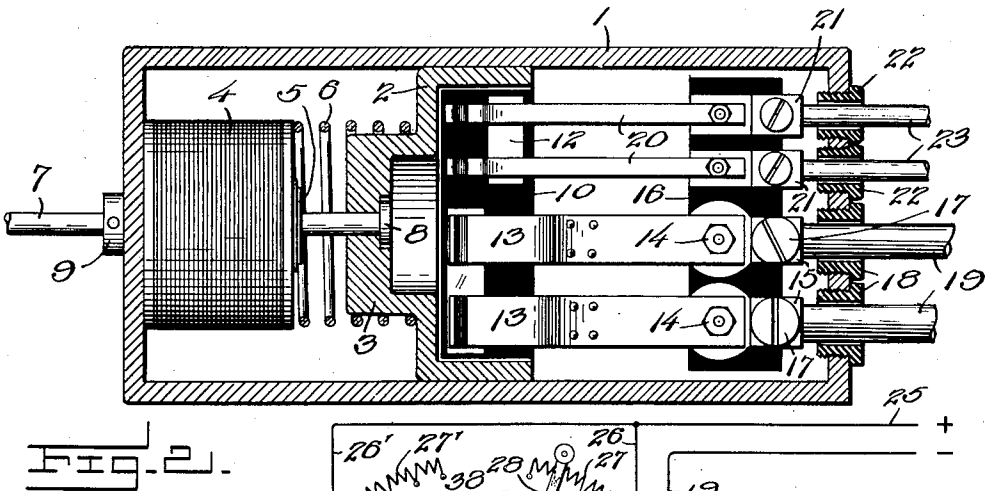
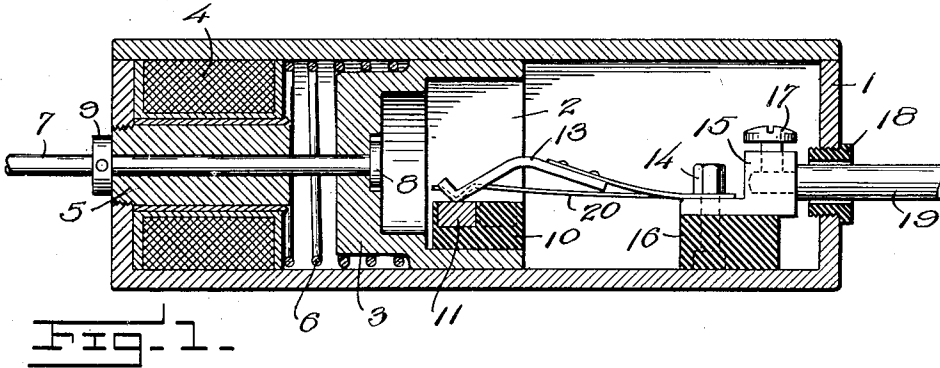


L. G. RILEY.
MOTOR CONTROL SYSTEM.
APPLICATION FILED NOV. 5, 1913.

1,238,337.

Patented Aug. 28, 1917.



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MOTOR-CONTROL SYSTEM.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, LYNN G. RILEY, a citizen of the United States, and a resident of Wilkesburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Motor-Control Systems, of which the following is a specification.

My invention relates to electrically propelled vehicles, and more particularly to an interlock arrangement between the brake and the controller of such vehicles.

In this class of apparatus it is, to some extent, the practice to provide means for opening the armature circuit of the motor when the brake is applied, so as to facilitate the stopping of the vehicle. After the vehicle has been brought to a stop, however, the operator may neglect to move the controller back to "off" position, and, therefore, when the brake is released, the motor circuit is again closed, and, if the controller is in running position at the time, the motor may be injured by the sudden rush of current which results.

It is the object of the present invention to provide an automatic means for positively preventing the motor circuit being reestablished when the brake is released, so long as the controller remains in any running position. In other words, with my improved arrangement, it is necessary for the operator to move the controller back to the "off" position before the armature circuit can be completed so as to supply current to the motor. The armature circuit having been opened by the application of the brake, is held open, regardless of the position of the brake, until the controller is moved back to the "off" position.

To this end, the invention contemplates the provision of a switch in the armature circuit and a lost-motion connection between such switch and the brake lever, and a holding magnet governed by the controller for maintaining such switch open.

In order that the invention may be readily understood, reference is had to the accompanying drawing forming a part of this specification and illustrating one embodiment of the invention.

In the drawings:—

Figure 1 is a central longitudinal section

through my improved armature switch and holding magnet.

Fig. 2 is a plan view thereof with the top of the casing removed, parts being in section.

Fig. 3 is a conventional diagram, illustrating the method of connecting my improved switch with an ordinary controller.

Referring to the drawings in detail, 1 designates a casing in which is a slidably mounted piston-shaped switch member 2. The switch member 2 has a projecting circular boss 3, which also serves as an armature for the holding magnet. Such magnet is mounted in the end of the casing 1 and comprises a coil 4 and a core 5 preferably screwed into the end of the casing. A helical spring 6 is interposed between the holding magnet and the switch member and surrounds boss 3, as clearly shown in the drawings.

A rod 7, connected at one end to the brake lever (not shown) passes loosely through the center of the core 5 and also loosely through an opening in the boss 3. The rod 7 has a head 8 at its inner end which engages the switch member 2, and is provided with a fixed collar 9 outside of the casing, which serves to limit its inward movement.

Secured to the switch member 2 is a block of insulation 10, upon which is mounted a pair of contact plates 11 and 12, arranged in staggered relation, as shown in Fig. 2. A pair of spring fingers 13 are arranged to engage and be bridged by the contact plate 11, and a similar but smaller pair of spring fingers 20 are arranged to engage and be bridged by the contact plate 12.

The spring fingers 13 are secured, by means of binding posts 14, to terminal blocks 15, which, in turn, are mounted upon a block of insulation 16. To the terminal blocks 15 are secured, as by means of screws 17, the terminals of cables 19, which pass through insulating bushings 18 set into the wall of the casing 1.

The spring fingers 20 are similarly secured to terminal blocks 21, to which are attached the ends of conductors 23, which likewise pass through insulating bushings 22.

It will be observed that, when the switch member 2 is in such position that the con-

tact 11 bridges the spring fingers 13, as shown in Fig. 2, the circuit between the spring fingers 20 is open and, when this latter circuit is closed by means of the contact plate 12, the circuit between the fingers 13 is open. In other words, when either of the circuits is closed, the other is always open. The spring fingers 13 and plate 11 constitute a switch in the armature circuit of the motor, while the spring fingers 20 and plate 12 constitute a switch which controls the circuit of the holding magnet 4.

In Fig. 3, I have shown conventionally, an ordinary form of reversing controller. In this diagram, one side of the line is shown as connected to the cable 19, which is connected directly with the armature 41 of the motor, the switch 11 being interposed. The other side of the motor armature is connected by cable 40 with the contact plate 39. The conventional controller illustrated comprises a pivoted handle or arm formed of insulated sections, and two banks of resistance 27 and 27', which are connected by means of conductors 26 and 26' with one side of the line 25. The usual reversing contacts 29, 31, 35, and 37, cross connected respectively by means of the wires 30 and 38 are provided and are arranged concentric with a contact plate 39.

The controller handle is shown as in one running position and, in this position, current enters from the positive side of the line 25, flows over conductor 26, through resistance 27, over insulated section 28 of the handle, plate 29, wire 30, plate 31, wire 32, field winding 33, wire 34, plate 35, section 36 of the controller handle, plate 39, wire 40, armature 41, and conductor 19, and switch 11, to the other side of the line. This is the ordinary arrangement.

In connection with my improved holding magnet, however, I provide additional contacts, such as 42 and 44, connected by wire 43, and arranged to be engaged by a section of the controller arm adjacent the pivot 45, which pivot is connected with the positive side of the line by means of a wire 46. From the plate 44 extends a wire 23 to one side of the coil 4, the switch 12 being interposed in this connection, and the other side of the coil 4 is connected by means of a wire 24 with the negative side of the line 19.

It will be observed that the contacts 42 and 44 are so located that they will be engaged, and the coil 4 energized, whenever the controller arm is in any running position whatever. In order to disengage these contacts it is necessary to move the controller arm to the central "off" position. However, I do not wish to limit myself to the use of a controller having the additional contact members 42 and 44, as the device is designed to be employed in connection with standard controllers now in use, and any

suitable means to accomplish the same result may be substituted for the contact members.

The operation of my improved device will be apparent. When the brake is applied, the rod 7 is pulled to the left, and this draws the switch member 2 in the same direction until the boss 3 engages the core 5 of the holding magnet. This movement of the switch member removes the plate 11 from engagement with the spring fingers 13, thus opening the armature circuit, and at the same time moves plate 12 into engagement with the spring fingers 20, thus completing the circuit of the holding magnet. If therefore, when the brake is applied, the controller is in some running position, such as illustrated in Fig. 3, current will flow from the positive side of the line 25, over conductors 26 and 46, through controller arm and plates 42 and 44, through wire 23, switch 12, holding coil 4, conductor 24, to the other side of the line, thus energizing the holding magnet, and retaining the switch member in the shifted position against the tension of the spring 6. It will be observed that this circuit will be maintained so long as the controller is in any running position. If now the brake be released, the rod 7 can move freely through the boss of the switch member without in any way disturbing the position of the switch. In other words, after the parts have once been moved by the application of the brake, the switch member will be held in its shifted position by the magnet 4, regardless of the position of the brake lever. When, however, the operator moves the controller handle to the central or "off" position, the coil 4 is no longer energized, and the magnet therefore releases the armature 3 and the spring 6 throws the switch member back to normal position. Upon moving the controller handle, current is supplied to the motor in the usual manner.

It will thus be seen that I have provided a control or safety switch which is primarily set by the brake lever, but which, after having been set, is wholly governed by the position of the motor controller, independent of the brake lever, and it is thought that the many advantages of the invention will be obvious without further discussion.

What I claim is:

1. In an electrically propelled vehicle, the combination with a motor and a controller thereof, of a switch in the motor circuit, a brake rod for mechanically operating said switch under predetermined conditions to open the motor circuit, and means for maintaining the motor circuit open while the controller occupies any running position, said means including a member movable with said switch.

2. In an electrically propelled vehicle, the combination with a motor and a controller

therefor, of a brake rod, a switching device mechanically operated by the brake rod for opening the motor circuit upon predetermined actuation of the rod, and electromagnetic means governed by the controller and said switching device for maintaining said circuit open upon opposite actuation of said rod.

3. In an electrically propelled vehicle, the combination with a motor and a controller therefor, of a brake rod, a switch in the motor circuit, means directly connected to the brake rod and mechanically operated thereby for operating said switch to open the motor circuit, electro-magnetic means for maintaining said circuit open while the controller occupies any running position, and independent means for actuating said first means to automatically reestablish said circuit when the controller is moved to the "off" position.

4. In an electrically propelled vehicle, the combination with a motor and a controller therefor, of an independent switch in the armature circuit of the motor, means for mechanically opening said switch, and a holding magnet for maintaining said switch open under certain conditions.

5. In an electrically propelled vehicle, the combination with a motor and a controller therefor, of a brake rod, a switching device directly movable with the rod upon the actuation thereof to brake-setting position, a plurality of contact members disposed on said device to break the motor circuit upon said actuation, a holding magnet coil, and a plurality of contact members disposed on said device to close the circuit of said holding coil, upon said actuation, to maintain the motor circuit open while the controller occupies any running position, irrespective of the release of said brake rod.

6. In an electrically propelled vehicle, the combination with a motor and a controller therefor, of an independent switch in the armature circuit of the motor, means for opening said switch, a holding magnet for maintaining such switch open, and means for energizing said magnet so long as the controller remains in any running position.

7. In an electrically propelled vehicle, the combination with a motor and a controller therefor, of a brake rod, and a device comprising an incasing member, a switching member movable therein and directly with the rod upon the actuation thereof to brake-setting position, a plurality of contact members disposed on said switching member to break the motor circuit upon said actuation, a holding magnet coil disposed within said incasing member and adapted, when energized, to magnetically hold the switching member in said position, a plurality of contact members disposed on said switching member to close the circuit of said holding

coil upon said actuation, means disposed on the controller for maintaining the energization of said coil while the controller occupies any running position, irrespective of the release of said brake rod, and a spring member acting between said switching member and said coil for automatically effecting the reengagement of said first contact members when the controller is moved to "off" position.

8. In an electrically propelled vehicle, the combination with a motor, and a controller therefor, of a switch in the armature circuit of the motor, means for opening said switch, independent means for holding said switch open, and means for automatically closing said switch when such holding means is released.

9. In an electrically propelled vehicle, the combination with a motor, and a controller therefor, of a switch in the armature circuit of the motor, means for opening said switch, a magnet coil for holding said switch open, means associated with the controller for governing the flow of current through said coil, and means associated with said switch for completing the circuit of said coil only when said switch is open.

10. In an electrically propelled vehicle, the combination with a motor, and a controller therefor, of a brake rod, a switch in the armature circuit of the motor, means connected with the brake rod for opening said switch whenever the brake is applied, a holding magnet, means associated with the controller for maintaining said magnet energized and said switch open so long as the controller remains in any running position, and a spring for closing said switch when the controller is moved to "off" position.

11. In an electrically propelled vehicle, the combination with a motor and a controller therefor, of an independent switch in the circuit of said motor, means for mechanically opening said switch, and electrical means for maintaining said switch open under certain conditions.

12. In an electrically propelled vehicle, the combination with a motor and a controller therefor, of a switch in the circuit of said motor, a brake rod for mechanically opening said switch under predetermined conditions, and means for maintaining said circuit open when the controller occupies any running position.

13. In an electrically propelled vehicle, the combination with a motor and a controller therefor, of a brake rod, an independent switch in the circuit of the motor, said switch being directly connected to, and adapted to be opened by, said brake rod, and electrical means for maintaining said switch open under certain conditions.

14. In an electrically propelled vehicle, the combination with a motor and a con-

troller therefor, of a brake rod and two
switches connected thereto, said rod being
adapted to open one of said switches and to
close the other switch when operated, and
5 means controlled by the switch closed by the
brake rod for maintaining the second switch
open under predetermined conditions.

In testimony whereof, I have hereunto
subscribed my name this 31st day of Oct.,
1913.

LYNN G. RILEY.

Witnesses:

WALT SIMMON,
B. B. HINES.