Nov. 24, 1942. S. S. STOLP 2,302,898

CONTROL FOR ELECTRIC TRACK SWITCHES

Filed May 18, 1940

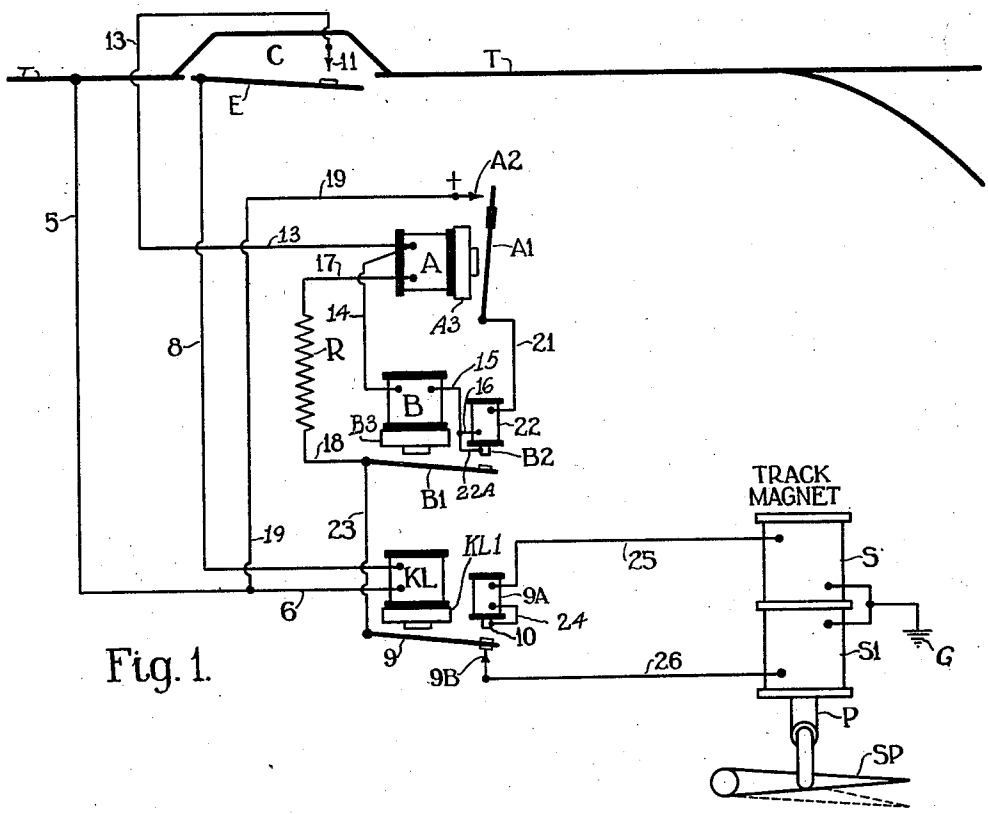

Fig. 1.

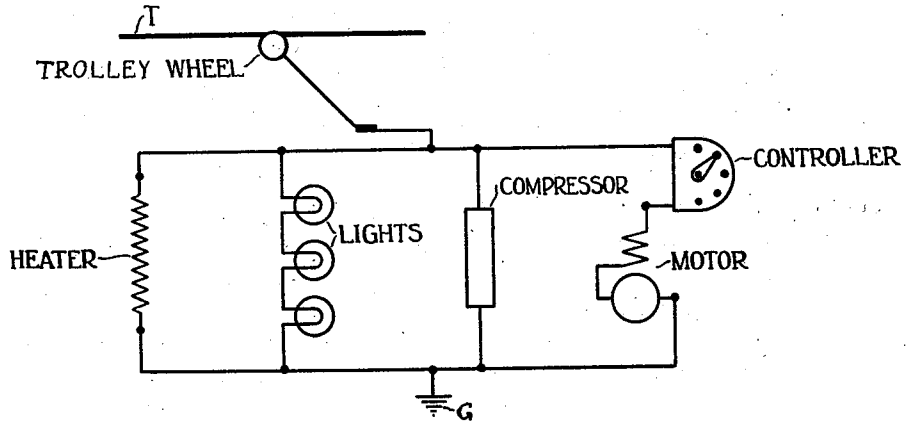

Fig. 2.

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CONTROL FOR ELECTRIC TRACK SWITCHES

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4 Claims. (Cl. 246—227)

My invention relates to electric railway switch tongue electrically actuated operator and particularly to the automatic control of the electric apparatus governing the operation therefor after the motorman has set the apparatus to guide his vehicle in the selected course.

An object of my invention is to provide an improved electric control system to insure more definite operation of all apparatus affected by the system.

Another object resides in providing enduring control apparatus so as to minimize service calls and to reduce the time required to effect repairs when necessary. This embraces reducing electrical erosion at the trolley contactor and providing competent electrical contacts and relays for operating same.

This invention should be regarded as an improvement in relation to the electrical control system disclosed in United States Patent No. 1,736,801. It can be used also in connection with the trolley frog tongue operators.

In the accompanying drawing:

Figure 1 is a circuit diagram illustrating an electrical control system embracing the incident invention as applied to an electric railway track switch tongue operator such as is commonly used for electric railways, some of the mechanical parts and apparatus being represented by conventional symbols.

Figure 2 is a diagrammatic representation of the electrical equipment carried by a vehicle.

This apparatus is preferably used in connection with the conventional system known as "power on" or "power off," which means the current flowing to the motor of the propelling vehicle while a collector, such as a trolley wheel or shoe carried by the vehicle, engages a trolley contactor C with "power off" to operate the switch point in one direction, usually the straight ahead course, or for the curve course with "power on," while the trolley wheel is in engagement with the contactor during course of travel thereover.

Two inter-connected cooperating switch relays A, B are employed for applying, controlling the time period for application of current for the switching operation after a trolley wheel or current collector has passed through the contactor C, and for interrupting said current. Although the basic principle of this apparatus, considered as a whole, is the same as that employed in Patent No. 1,736,801, the operation of these relays differs principally from the corresponding ones of the patent in that magnetic blowout armature A1 engages contact A2, in advance of the operation of armature B1, and impresses positive potential on armature A1, wire 21, solenoid 22, contact B2, terminals 171, 172 and solenoid of relay B, and terminal 15 to which positive potential has been applied through wire 13, contact 11, strip E, wire 8, winding of KL, wires 6 and 5 connected permanently to trolley T. Thus relay B has been and remains shunted out until contactor strip E is dropped, incident to the passing of the trolley wheel, and when armature B1 is picked up, as explained hereinafter, and impresses positive potential from contact B2, armature B1, wire 23, armature 9 and then through either wire 25 and solenoid S or wire 26 and solenoid S1 to ground or negative potential. Note should be made that the solenoid of relay A, is always in series with armature 9 of relay KL and one or the other of the solenoids of the ground magnet through a normally open circuit and that the solenoid of relay B is inactive or shunted out while A1 and A2 are engaged, and in series with solenoid of A when strip E and contact 11 are disengaged. Solenoid 22 and the magnetic core thereof constitute a holding magnet for retaining contact between B2 and B1 until armature A1 has separated from contact A2. It should also be noted that this armature is controlled by a slow release relay by reason of choke or slug A2. Slugs B3, KL1 are applied to relays B, KL respectively, primarily to prevent surges of current from disturbing established contacts.

After strip E has separated from contact 11 the circuit traced in the preceding paragraph to terminal 15 now extends through solenoid of A, terminal 16, wire 17, resistor R, wires 18 and 23, armature 9 and then to ground as explained above, thus armature B1 is picked up and applies current to S or S1 of the track magnet.

The contactor C is suspended adjacent and in definite relation to the trolley conductor T and is organized so that during the first engagement of the trolley wheel with movable strip E of the contactor, as it travels from left to right, with the controller set for drawing power to the vehicle motor, a heavy current passes through wires 5, 6, solenoid of relay KL, wire 8, strip E, trolley wheel, and the motor to the negative side of the circuit as shown in Fig. 2. This causes armature 9 of relay KL to be raised into engagement with front contact 10, thereby selecting the circuit for the energization of track solenoids S for operating switch point SP by establishing a circuit, described hereinafter. As the trolley wheel progresses along strip E, the latter is raised to make contact between itself and contact point 11,

which places positive potential on wire 13, terminal 15 of relay A and terminals 171, 172 of relay B. Since terminal 16 of relay A is connected through wire 17, resistor R, wires 18, 23, armature 9, contact point 10, holding magnet 9A, and wire 25, through the track solenoid S to ground, slow release relay A, equipped with a magnetic blowout, is energized and armature A1 will be picked up to effect contact with contact point A2. Since this contact point is connected through wires 19 and 5 with the trolley wire T, a positive potential is established through armature A1, wire 21, holding magnet 22, contact point B2. Thus, it will be noted that relay B is inactive by reason of its terminals being subjected to positive potential, however, upon the trolley wheel passing from contact strip E, the latter will be dropped, which disengages it from contact point 11 thereby removing positive potential from the terminals of relay B. At this juncture, by reason of positive potential being impressed on terminal 171, and terminal 172 being connected to terminal 15 of relay A, the latter remains energized, since energizing current is now flowing through auxiliary slow release relay B, armature B1 is picked up and effects contact with contact point B2. Concurrently therewith a flow of positive potential current passes through armature B1, wire 23, armature 9, contact point 10, holding magnet 9A, wire 25 and solenoid of the track magnet S to ground, thereby actuating plunger P, which in turn moves switch point SP to effect travel of the vehicle to the turnout or curve track.

When the trolley wheel engages strip E without drawing power, i. e. power off, relatively low amperage current flows through the circuit including wires 5, 6, solenoid of KL having only a few turns of heavy wire, wire 8, contact strip E, trolley wheel to ground or negative potential through the lights, compressor and/or heater. Since a current of low value will be flowing through the KL relay armature 9 will not be raised from the lower or back contact 9B. The track solenoid actuating current will flow from trolley T, wires 5, 19, contact A2, armature A1, wire 21, solenoid 22, contact B2, armature B1, wire 23, armature 9, contact 9B, wire 25 through solenoid S1 of the track magnet to ground thereby actuating the plunger P of the switch point for the straight track course of the vehicle carrying the trolley wheel. In the event a preceding vehicle has also operated the track magnet and the switch point to the straight track, the latter operating with power off will not change the position of the switch point.

It will be perceived from the foregoing description that I have provided a simple and positive arrangement of electrical units organized into a complete system for throwing the point of a track switch in response to the engagement and disengagement of the collector of a vehicle. Also, that the system embraces a control, which accomplishes, not only the stated objectives, but protects the solenoid of the switch point throwing element against excessive application of current.

It will be evident to those skilled in the incident art that various modifications may be made in the parts herein described and still fall within the scope of my invention, as for instance, a conventional rotary motor may be employed to actuate the switch point in place of the reciprocating solenoid actuated plunger, and the contactor with its lifting beam, or strip E may be replaced by any one of a number of other suitable contactors, consequently, I wish to be limited only by the claims presented herein.

I claim:

1. A switch operating system comprising, in combination, a track switch; electrically-operated means for actuating the said track switch; a trolley conductor T; a source of power including the trolley conductor T; a trolley contactor C located adjacent the trolley conductor T and having a normally-open switch E—11 adapted to be closed by a current collector passing the said contactor; a first retarded-release relay having a normally-open switch A1—A2 and a relatively high-resistance operating coil which, when energized, closes the switch A1—A2; a second retarded-release relay having a normally-open switch B1—B2, a relatively high-resistance operating coil B which, when energized, closes the switch B1—B2, and a relatively low-resistance coil 22, which, when energized, retains the switch B1—B2 closed; a first circuit for energizing the coil A to close the switch A1—A2 including, the source of power, the switch E—11 of contactor C and the coil A of the first relay; a second circuit for energizing the coil B to close the switch B1—B2 including, the source of power, the switch A1—A2 of the first relay, the coil 22 of the second relay, the coil B of the second relay and the coil A of the first relay; a third circuit for energizing the electrically-operated means of the track-switch and for energizing the coil 22 of the second relay including, the source of power, the switch A1—A2 of the first relay, the coil 22 of the second relay, the switch B1—B2 of the second relay, and the said electrically-operated means; means operatively associated with the switch E—11 of the contactor C, and the coil B of the said second relay, for retaining the coil B deenergized during the closure of the switch E—11; and means operatively associated with the switch B1—B2 of the said second relay, and the coil A of the said first relay, for deenergizing the coil A upon closing of the switch B1—B2, whereby the electrically-operated means of the track-switch is energized for a predetermined time as determined by the closing of the switch B1—B2 and the subsequent opening of the switch A1—A2 a predetermined time after the closing of the said switch B1—B2.

2. A switch operating system comprising, in combination, a track switch; electrically-operated means for actuating the track switch; a trolley conductor; a source of power including the trolley conductor; a trolley contactor located adjacent the trolley conductor and having a normally-open switch adapted to be closed by a current collector passing the said contactor; a first relay having a normally-open switch and an operating coil, which, when energized, closes the normally-open switch of the said first relay; a second relay having a normally-open switch and an operating coil which, when energized closes the normally-open switch of the said second relay; a normally-deenergized holding-coil operatively associated with the switch of the second relay which, when energized, retains the switch of the second relay closed; a first circuit for energizing the coil of relay A including, the source of power, the switch of the trolley contactor, and the coil of the first relay; a second circuit for energizing the coil of the second relay including, the source of power, the switch of the said first relay, the holding coil, the coil of the second relay and the coil of the first relay; a third circuit for energizing the electrically-operated means of

the track-switch and for energizing the said holding coil including, the source of power, the switch of the first relay and the said electrically-operated means; a shunt circuit operatively associated with the switch of the contactor and the coil of the second relay, for retaining the coil of the second relay deenergized during the closure of the switch of the said contactor; and a shunt circuit operatively associated with the operating coils of the first and second relays and the switch of the said second relay, for deenergizing each of the said operating coils upon closing of the switch of the said second relay, thereby to open the switch of the first relay for deenergizing the holding coil for the switch of the second relay and for deenergizing the electrically-operated means of the track switch.

3. A switch operating system comprising, in combination, a track switch; electrically-operated means for actuating the said track switch; a trolley conductor; a source of power; a trolley contactor located adjacent the trolley conductor and having a normally-open switch closed by a collector passing the said contactor; a first relay having a normally-deenergized operating-coil and a normally-open switch closed by the energization of the said operating coil of the said first relay; means operatively associated with the switch of the first relay, for delaying opening of the said switch of the first relay for a predetermined time after the deenergization of the operating coil of the said first relay; a second relay having a normally-deenergized operating-coil and a normally-open switch closed by the energization of the operating coil of the said second relay; a normally-deenergized holding-coil operatively associated with the switch of the second relay which, when energized, retains the switch of the said second relay closed; means operatively associated with the switch of the trolley contactor and the operating coil of the first relay, for energizing the operating coil of the said first relay in response to the closing of the switch of the said contactor; means operatively associated with the switch of the first relay and the operating coils of the first and second relays, for energizing the operating coils of the said first and second relays in response to the closing of the switch of the said first relay; means operatively associated with the switch of the trolley contactor and the coil of the said second relay, for retaining the coil of the second relay deenergized during the closure of the swtch of the said contactor; a circuit for energizing the electrically-operated means of the track switch during the closure of the switches of the first and second relays including the source of power, the normally-open switches of the first and second relays and the electrically-operated means of the track switch; means operatively associated with the switches of the first and second relays, and the said holding coil, for energizing the said holding coil during the closure of the switches of the first and second relays; means operatively associated with the operating coils of the first and second relays and the switches of the first and second relays, for deenergizing the operating coils of the first and second relays during the closure of the switches of the said first and second relays, thereby to open the switch of the first relay for deenergizing the said holding coil and thus to open the switch of the said second relay, whereby the electrically-operated means of the track-switch is energized for a predetermined time as determined by the closing of the switch of the second relay and the subsequent opening of the switch of the first relay.

4. A switch operating system comprising in combination, a track switch; electrically-operated means for actuating the said track switch; a source of power including positive and negative conductors; a trolley contact located adjacent the positive conductor and electrically connected to the positive conductor by a collector passing the said contactor; a first relay having a normally-deenergized operating-coil and a normally-open switch closed by the energization of the operating coil of the said first relay; means operatively associated with the switch of the first relay, for delaying opening of the said switch of the first relay for a predetermined time after the deenergization of the operating coil of the said first relay; a second relay having a normally-deenergized operating coil and a normally-open switch closed by the energization of the operating coil of the said second relay; a normally-deenergized holding-coil operatively associated with the switch of the second relay which, when energized, retains the switch of the said second relay closed; a first wire connection electrically connecting the said trolley contact and one terminal of each of the said operating coils; a second wire connection electrically connecting the other terminal of the operating coil of the first relay, one terminal of the switch of the second relay, and one terminal of the electrically-operated means of the track switch; a third wire connection electrically connecting the other terminal of the electrically-operated means of the track switch and the negative conductor; a fourth wire connection electrically connecting one terminal of the switch of the first relay and the positive conductor; a fifth wire connection electrically connecting the other terminal of the switch of the first relay and one terminal of the said holding coil; and a sixth wire connection electrically connecting the other terminal of the switch of the second relay, the other terminal of the operating coil of the second relay, and the other terminal of the said holding coil, whereby the operating coil of the first relay is energized when the trolley contact is electrically-connected to the positive conductor, and the operating coils of the first and second relays energized when the said trolley contact is subsequently disconnected from the positive conductor, thereby to close for a predetermined time the switches of the first and second relays to energize the electrically-operated means of the track switch.

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