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ELECTRIC SWITCH

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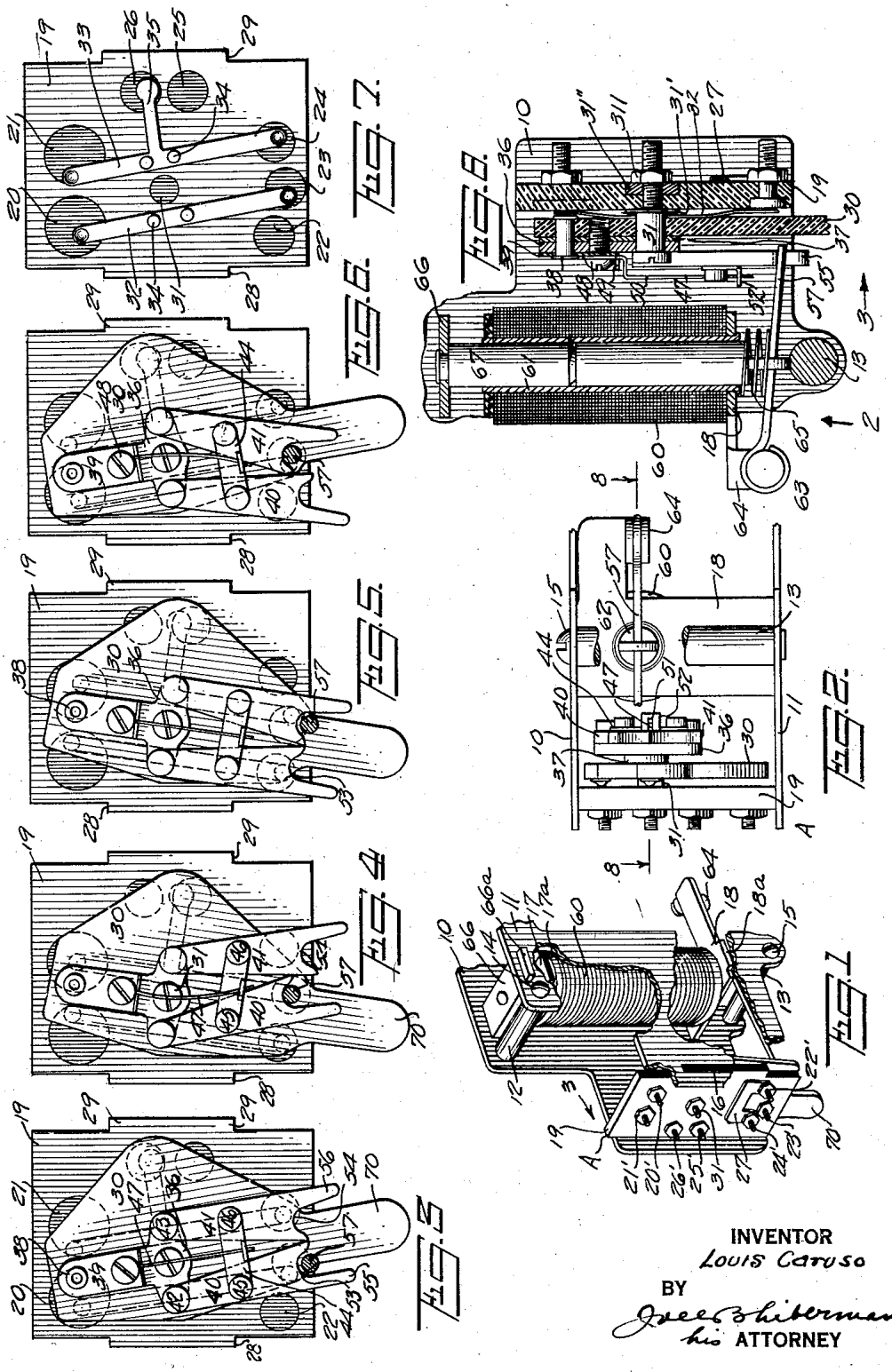

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ELECTRIC SWITCH

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The present invention relates to electric switches and is more particularly directed toward an electromagnetic switch suitable for use as a reversing switch in toy electric locomotives.

In my former application, Serial Number 123,684, filed July 20, 1926, I have shown a reversible toy electric locomotive adapted to be controlled by opening and closing a switch in the power supply line. This locomotive is provided with a reversing switch interconnected with the motor field and motor armature for reversing the direction of rotation of the motor and a shunt circuit having an electro-magnet for actuating the reversing switch. This shunt circuit includes a normally closed circuit controlling device placed adjacent the motor field and which remains closed for a sufficient time after the closing of the main switch in the supply leads to permit the electro-magnet to actuate the reversing switch. The circuit for the controlling device is then opened by the stray field built up by the motor and held open thereby. As soon as the power supply is cut off, the stray field disappears and the shunt circuit is again established.

The invention forming the subject matter of the present application is more particularly directed toward this reversing switch and the electromagnetic means for operating the same.

An object of the present invention is to provide a switch which can be conveniently assembled as a unit and mounted in the sub-frame of the electric motor.

Another object of the invention is to provide suitable mounting means for supporting from said sub-frame, the magnet coil and armature, and operating connections between the armature and switch.

Another object of the invention is to provide an electric switch of this type which can be readily brought to one position when the magnet is energized and to another position when the magnet is again energized, the switch position remaining unchanged upon de-energization of the magnet.

A further object of the invention is to provide an oscillating contact carrier with a pair of links preferably parallel and biased by a spring to a pre-determined position relative to the contact carrier and so arranged that the contact carrier may be shifted by pushing on the end of the particular link which has been placed in a pre-determined position.

Other and further objects of the invention will appear as the description proceeds.

The accompanying drawings show for purposes of illustration, one of the many possible embodiments in which the present invention may take form, it being understood that the drawings are illustrative of the invention rather than limiting the same.

In the drawings:

Figure 1 is a perspective view at an enlarged scale of one end of the sub-frame of an electric reversing toy locomottive showing the reversing switch, parts being broken away to show the construction;

Figure 2 is an inverted plan view of the same taken in the direction of the arrow 2 of Figure 8;

Figure 3 is a view taken in the direction of the arrow 3 of Figures 1 and 8, showing the reversing switch and operating parts in one position, the sub-frame for supporting the switch being omitted;

Figures 4, 5 and 6 are views similar to Figure 3 showing the reversing switch in the other positions of its cycle of operation;

Figure 7 is a view illustrating the fixed and movable contacts of the switch; and

Figure 8 is a sectional view taken on the line 8—8 of Figure 2.

When the switch is made for the purpose above referred to, the parts are preferably mounted between two sub-frame members, portions of which are indicated at 10 and 11. These sub-frame members are held in position by a plurality of distance pieces, two of which are shown at 12 and 13, screws 14 and 15 being used to fasten the parts together. The stationary contact carrying part of the reversing switch A is adapted to be mounted in slots 16 near the ends of the sub-frame parts 10 and 11. The magnet coil and armature to be described below, are supported on distance or cross pieces 17 and 18 having

reduced ends 17ª and 18ª respectively, adapted to pass through slots in the sub-frame members 10 and 11.

As here shown, the stationary part of the reversing switch is in the form of a fixed contact carrier such as a block of insulation 19, on which a plurality of stationary contacts, numbered 20, 21, 22, 23, 24, 25 and 26 are mounted. These contacts are preferably molded in place in the insulating body and are connected with binding posts 20′ to 26′ inclusive. Binding posts 22′ and 24′ are connected by a strap 27. The insulating body is also provided with extensions 28 and 29 to fit the slots 16 in the sub-frames 10 and 11.

The movable contact carrier 30 is mounted on a pivot post 31 passing through a washer 31′ and threaded into a metal member 31″ anchored in the stationary contact carrier 19. It is secured in place by a lock nut 311. The inner face of this movable carrier supports a pair of contact strips 32 and 33 shown more clearly in Figure 7. These contact strips are preferably held in place by means of hollow rivets indicated at 34. The contact strip 32 is adapted to connect the stationary contact 20 with either of the stationary contacts 22 or 23, while the contact strip 33 is adapted to connect the stationary contact 21 with either of the stationary contacts 23 or 24. The contact strip 34 is, as here shown, provided with a lateral extension 35 which is adapted to engage with either the stationary contact 25 or the stationary contact 26.

When the switch is wired up, as indicated in the application above referred to, the post 20′ will be connected with the field coil of the propulsion motor, the binding post 21′ will be connected with the current collector on the locomotive. The binding posts 22′ and 24′ are connected together by a strap 27, and one of these binding posts will be connected to one brush of the motor while the other brush will be connected to the binding post 23. The other side of the motor field is grounded.

It will thus be seen that when the parts are moved from the position shown in Figure 3 to the position shown in Figure 4, the circuit connections for the motor armature will have been reversed relative to the connections of the motor field, and that the direction of the rotation of the motor will therefore be changed. The direction of the rotation will again be changed when the parts are moved from the position of Figure 5 to the position shown in Figure 6.

The binding posts 25′ and 26′ are adapted to be connected to the headlights at the opposite ends of the locomotive so that the appropriate headlight will be illuminated while the other headlight is extinguished.

A mechanism for actuating the movable contact carrier is mounted on the side of the movable contact carrier opposite the movable contacts. A T-shaped member 36 is spaced away from the face of the insulating member by a narrow strap 37. The pivot post 31 passes through the T-shaped member and the spacing strap so as to mount each of these parts on the movable carrier, while the opposite ends of these parts are held in place by a hollow rivet 38. This rivet also fastens an L-shaped strip of thin sheet metal 39 in place on the exposed side of the T-shaped member 36. The spacing member 37 brings the T-shaped member far enough away from the face of the insulating contact carrier so that the ends of the T-shaped member do not engage the rivets 34 used for holding the contact strips in place. Links 40 and 41 are mounted on pivot posts 42 and 43 carried on the T-shaped member as indicated. The links 40 and 41 are cross connected by a link 44 mounted on pivot posts 45 and 46. A wire spring 47 is fastened at one end under the head of a screw 48 which screw passes through the L-shaped member 39 and is threaded into the T-shaped member 36. The spring 47 passes through a slot 49 in the L-shaped member 39 and is then bent as indicated at 50 so as to pass by the head of the pivot post 31. The free end of the spring 47 is passed through a hole 51 in an upturned ear or lug 52 carried by the cross link 44. The lower ends of the links 40 and 41 are provided with pockets 53 and 54 and with downwardly extending tips 55 and 56. These pockets and tips or extensions are adapted to receive a reciprocating operating member, here shown in the form of a pivoted arm 57. This arm may be moved up and down by any desired mechanism such as the magnet and armature above referred to and which will now be described.

A magnet coil 60 is mounted on a brass sleeve 61 supported between distance pieces 17 and 18. A movable armature, in the form of a plunger 62, is carried in the sleeve 61. The operating arm 57 passes through a hole in the lower end of the armature 62 and is pivoted at 63 on a downwardly bent ear 64 carried by the cross piece 18. A small coiled spring 65 is placed between the arm 57 and the cross piece 18 so that the plunger will always be urged down. The distance piece 13 may be used as a stop to limit the downward movement of the plunger. To improve the magnetic circuit, an iron cross piece 66 having a reduced end 66ª is mounted in the sub-frame, and this cross piece is provided with a pin 67 extending down through the spool 61 adjacent the upper end of the armature 62. If desired, one of the reduced ends 66ª of this cross piece may extend beyond the sub-frame member 11 to facilitate aligning the sub-frame in the motor frame.

One terminal of the magnet coil 60 is connected to the powder supply through the

binding post 21', while the other end of the coil 60 is connected to the normally closed circuit controlling device placed adjacent the motor field so that the circuit for the coil 60 may be opened shortly after the motor is energized and held open as long as the motor is energized.

Assuming that the parts are in the position shown in Figure 3, and that the power supply is connected to a toy locomotive carrying the switch, it will be seen that the coil 60 will be energized attracting the armature 62 and thereby lifting or raising the operating arm 57. This arm will move from the position shown in Figure 3 to the position shown in Figure 4, exerting a force on the end of link 40 and causing the contact carrier to swing to the position of Figure 4 thereby reversing the motor connections. As soon as the motor field has been built up, the circuit for the coil 60 will be opened and the armature released, whereupon the arm 57 will move down to the position shown in Figure 5. The spring 47 which was bent from the position in Figure 3 to the position shown in Figure 4 by the raising of the operating lever 57 will now swing the links 40 and 41 to the position shown in Figure 5. The next time the armature 60 is energized, the arm 57 will move from the position shown in Figure 5 to the position shown in Figure 6 exerting force on the end of link 41 and shifting the parts to the position shown in Figure 6 thereby again reversing the motor connections. Upon the release of the armature, the links are swung to the position shown in Figure 3.

In some cases, it is desirable to operate the reversing switch manually and in this event, the circuit for the magnetic control is permanently opened, and one may shift the switch back and forth by taking hold of the extension 70 on the insulating contact carrier 30. The dimensions of the parts control the amount of throw given to the movable contact carrier when operated by the electromagnet and the manual movement is limited by the engagement of the movable contact carrier with the sub-frame.

The electromagnetic switch herein shown and described is one which can be operated by either alternating or direct current of the potential ordinarily used for operating toy electric outfits. The parts are so designed and arranged that the reversing switch is actuated before the propulsion motor starts the locomotive and therefore the locomotive reversal is effected before the locomotive is in operation. As the coil 60 is removed from the circuit while the motor is in operation, there is no tendency of this coil to overheat and no current is drawn through it while the motor is running.

It will of course be understood that the arrangement of contacts herein shown is merely a convenient arrangement for reversing a grounded motor, and that the switch operating mechanism may be used with various circuit controlling contacts.

It is obvious that the invention may be embodied in many forms and constructions, and I wish it to be understood that the particular form shown is but one of the many forms. Various modifications and changes being possible, I do not limit myself in any way with respect thereto.

What is claimed is:

1. In an electric switch, an insulating contact carrier, a pivotal support therefor, a plurality of contacts supported by the movable carrier, and a pair of links pivoted to the carrier on opposite sides of the pivotal support, each link extending at substantially right angles to the line connecting the pivotal support of the carrier and the pivot for the link.

2. In an electric switch, an insulating contact carrier, a pivotal support therefor, a plurality of contacts supported by the movable carrier, a pair of links pivoted to the carrier on opposite sides of the pivotal support, each link extending at substantially right angles to the line connecting the pivotal support of the carrier and the pivot for the link, and means to maintain the links parallel with one another.

3. In an electric switch, an insulating contact carrier, a pivotal support therefor, a plurality of contacts supported by the movable carrier, a pair of links pivoted to the carrier on opposite sides of the pivotal support, each link extending at substantially right angles to the line connecting the pivotal support of the carrier and the pivot for the link, and spring means to normally maintain the links in this position.

4. In an electric switch, an insulating contact carrier, a pivotal support therefor, a plurality of contacts supported by the movable carrier, a pair of links pivoted to the carrier on opposite sides of the pivotal support, each link extending at substantially right angles to the line connecting the pivotal support of the carrier and the pivot for the link, a cross link interconnecting the two links, and a spring acting on the cross link to bias the links to said position.

5. In an electric switch, an insulating contact carrier, a pivotal support therefor, a plurality of contacts supported by the movable carrier, and a pair of links pivoted to the carrier on opposite sides of the pivotal support, each link extending at substantially right angles to the line connecting the pivotal support of the carrier and the pivot of the link, the lower ends of each link having a pocket to receive a switch actuating member.

6. In an electric switch, a flat insulating contact carrier, a pivotal support therefor, a plurality of contacts supported on one face of the movable carrier, and a pair of links

pivoted on the other face of the carrier on opposite sides of the pivotal support, each link extending at substantially right angles to the line connecting the pivotal support of the carrier and the pivot for the link.

7. In an electric switch, a stationary insulating support carrying a plurality of stationary contacts, an insulating contact carrier, pivoted on the support, and a pair of links pivoted to the carrier on opposite sides of the pivotal support, each link extending at substantially right angles to the line connecting the pivotal support of the carrier and the pivot for the link, the movable contacts engaging different sets of fixed contacts depending upon the position of the carrier.

8. In an electric switch, a stationary insulating support carrying a plurality of stationary contacts, an insulating contact carrier pivoted on the support, a plurality of contacts supported by the movable carrier, a pair of links pivoted to the carrier on opposite sides of the pivotal support, each link extending at substantially right angles to the line connecting the pivotal support of the carrier and the pivot for the link, and means for actuating the movable carrier, said means including a reciprocable member positioned when moved in one direction to engage the free ends of the links, the link engaged depending upon the position of the carrier.

9. In an electric switch, a stationary insulating support carrying a plurality of stationary contacts, an insulating contact carrier pivoted on the support, a plurality of contacts supported by the movable carrier, a pair of links pivoted to the carrier on opposite sides of the pivotal support, each link extending at substantially right angles to the line connecting the pivotal support of the carrier and the pivot for the link, means for actuating the movable carrier, said means including a reciprocable member positioned when moved in one direction to engage the free ends of the links, the link engaged depending upon the position of the carrier, and an electromagnetic device for actuating the reciprocable member in said direction.

10. In an electric switch, an insulating contact carrier, a pivotal support therefor, a plurality of contacts supported by the movable carrier, a pair of links pivoted to the carrier on opposite sides of the pivotal support, each link extending at substantially right angles to the line connecting the pivotal support of the carrier and the pivot for the link, a cross link interconnecting the two links, a spring acting on the cross link to bias the links to said position, and means for actuating the movable carrier, said means including a reciprocable member positioned when moved in one direction to engage the free ends of the links, the link engaged depending upon the position of the carrier.

11. In an electric switch, an insulating contact carrier, a pivotal support therefor, a plurality of contacts supported by the movable carrier, and a pair of links pivoted to the carrier on opposite sides of the pivotal support, each link extending at substantially right angles to the line connecting the pivotal support of the carrier and the pivot for the link, the lower ends of each link having a pocket, and actuating means for the movable carrier, said means including a reciprocable member positioned, when moved in one direction, to engage the pockets of the links, the link engaged depending upon the position of the carrier.

12. In an electric switch, an insulating contact support, a plurality of fixed contacts carried thereby, an oscillating contact carrier pivoted relative to the support, a plurality of contacts on the carrier for cooperation with the fixed contacts, a pair of links pivotally supported by the carrier on opposite sides of the pivot of the carrier, spring means for biasing said links in a predetermined position relative to the movable carrier, and an operating member engageable with the free end of one link to move the link and carrier to another position, the spring moving the other link into position to be engaged by the operating member.

13. An electric switch comprising, a plurality of fixed contacts, a contact carrier, pivoted relative to the fixed contacts, contacts on the carrier for cooperation with the fixed contacts, and means for moving the contact carrier, said means comprising links pivoted to the contact carrier on opposite sides of the pivotal mounting thereof, spring means biasing the links to predetermined positions relative to the carrier, and a movable member engageable with the free end of one or the other of the links depending on the position of the carrier.

14. An electromagnetic switch comprising, a stationary magnet coil, a movable armature, an operating arm connected to the armature, a pivoted contact carrier having a plurality of movable contacts, a stationary contact support having a plurality of fixed contacts cooperative with the movable contacts, and a pair of links carried by the contact carrier, the arm being engageable with one or the other of the links to oscillate the contact carrier.

15. An electric switch comprising two frame members each having slots, a block of insulation having extensions entering into the slots and carrying a plurality of contacts on one face thereof, a pivot post fastened to the block of insulation, a movable contact carrier mounted on the pivot post, a plurality of distance pieces between the frame members, a magnet coil and armature mounted on said distance pieces, and links interconnecting the contact carrier and arma-

ture for actuating the contact carrier upon energization of the magnet coil.

16. An electric switch comprising two frame members each having slots, a block of insulation having extensions entering into the slots, means to clamp the insulating block in the frame members, a plurality of stationary contacts on one face of the insulating block, a pivot post fastened to the insulating block, a movable contact carrier mounted on the pivot post, and contacts on the carrier for cooperation with the fixed contacts, the movement of the carrier being limited by engagement with the frame members.

17. An electric switch comprising two frame members each having slots, a block of insulation having extensions entering into the slots, means to clamp the insulating block in the frame members, a plurality of stationary contacts on one face of the insulating block, a pivot post fastened to the insulating block, a movable contact carrier mounted on the pivot post, contacts on the carrier for cooperation with the fixed contacts, the movement of the carrier being limited by engagement with the frame members, a pair of links pivotally supported on the opposite sides of the pivot post and extending downwardly, a spring for biasing the link to a predetermined position on the movable carrier, and a swinging arm pivotally supported between the frame members and engageable with the free ends of the links.

18. An electric switch comprising two frame members each having slots, a block of insulation having extensions entering into the slots, means to clamp the insulating block in the frame members, a plurality of stationary contacts on one face of the insulating block, a pivot post fastened to the insulating block, a movable contact carrier mounted on the pivot post, contacts on the carrier for cooperation with the fixed contacts, the movement of the carrier being limited by engagement with the frame members, a pair of links pivotally supported on the opposite sides of the pivot post and extending downwardly, a spring for biasing the link to a predetermined position on the movable carrier, a swinging arm pivotally supported between the frame members and engageable with the free ends of the links, and an electromagnet mounted between the frame members for actuating the swinging arm.

19. An electric switch having a pivoted contact carrier, a pair of links pivoted to the contact carrier in opposite sides of the pivot and extending alongside one another, a movable cross link bodily carried by and connecting the pair of links so that they swing simultaneously, spring means for biasing the first two links to a predetermined position on the contact carrier, and a movable member engageable with the end of a link of the pair to move the carrier, the link engaged depending upon the position of the carrier.

20. An electric switch having a pivoted contact carrier, a pair of links pivoted to the contact carrier in opposite sides of the pivot and extending alongside one another, a movable cross link bodily carried by and connecting the pair of links so that they swing simultaneously, spring means for biasing the first two links to a predetermined position on the contact carrier, and a movable member engageable with the end of a link of the pair to move the carrier, the link engaged depending upon the position of the carrier, the ends of the links being so shaped that the carrier may be manually moved independent of the movable member.

Signed at Irvington, in the county of Essex, and State of New Jersey, this 22 day of November, 1926.

LOUIS CARUSO.