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# UNITED STATES PATENT OFFICE.

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## SWITCH.

Original application filed April 28, 1920, Serial No. 377,169. Divided and this application filed September 17, 1921. Serial No. 501,324.

*To all whom it may concern:*

Be it known that I, FRANK HORNBY, a subject of the King of Great Britain, residing at Liverpool, England, have invented a new and useful Improvement in Switches, of which the following is a specification.

This invention relates to improvements in switches and particularly to switches which are primarily intended to be employed as starting and reversing switches for toy motors designed for use with constructional toys made up of interchangeable parts, the various parts after being utilized for building up a toy or other model being capable of being taken apart and built up into other models. In such constructional toys it is desirable that each part should be interchangeable and fulfill several functions so as to reduce the total number of parts required in an outfit for building many models. The present invention relates to a switch embodying such standard parts.

This invention has been disclosed in the application for improvements in motors, Serial No. 377,169, filed by applicant April 28, 1920, of which the present application is a division. In accordance with the present invention there is provided a sheet of insulation suitable for attachment to one of the perforated supporting plates of a toy motor, a pin projecting laterally from the insulating sheet, a relatively long strip of insulation pivotally mounted on the pin and perforated at its free end for engagement with other parts of a constructional toy outfit, and a conducting strip secured to the insulating strip to interconnect a fixed contact electrically connected with the pivot end of the conducting strip and either of two contacts fixed to the insulating sheet near the free end of the conducting strip.

One embodiment of the invention is illustrated in the accompanying drawing in which:

Fig. 1 is a perspective view of a toy motor embodying a switch of the present invention;

Fig. 2 is an elevation of the switch; and

Fig. 3 is a section on the line 3—3 of Fig. 2 presenting an edge view of the switch.

In these drawings there is shown a toy motor comprising the oppositely disposed supporting plates 1 having perforations 2 uniformly spaced in accordance with the

standard pitch of other parts of a constructional toy outfit. The plates 1 may also be provided with flanges 3 having perforated slots 4 of standard pitch for attaching the motor to various toy models. A field core 5 is shown as a U-shaped laminated member supported on spacing sleeves 6 carried by bolts 7, which are threaded through corresponding perforations in the two plates 1 and are secured thereto as by nuts 8.

In order to control the operation of the motor there is provided a sheet 9 of suitable insulating material, such as fibre, which may be secured to one of the supporting plates 1 as by rivets or bolts 10. Projecting laterally from the insulating sheet is a pin 11 upon which is pivotally mounted a relatively long thin strip 12 of rigid insulating material having a perforation at either end. Two fixed contacts 13 are secured in any desired manner to the face of insulating sheet 9, somewhat farther apart than the width of the strip 12. Each contact 13 is adapted to receive a terminal connected to one of two oppositely wound field windings of the motor, while the pin 11 serves as a terminal to be connected to one of the commutator-brushes of the motor. If the other commutator-brush be connected through a source of power to the united terminals of the two field coils it is obvious that, in order to run the motor in one direction, it is merely necessary to connect pin 11 with one of the fixed contacts 13 while to reverse the direction of the motor, it is only necessary to connect the pin to the other contact 13. If there is no interconnection of the pin and either contact, the motor will remain at rest. To accomplish the interconnection aforesaid there is provided a conducting strip 14 which is most desirably of a T-shape, having arms wrapped about insulating strip 12 while the opposite end of conducting strip 14 is perforated to allow it to be pivotally mounted on pin 11 and preferably is wrapped about the pivoted end of strip 12, both to more firmly secure it in place and to provide a convenient conducting surface for the conductor 16 leading to one of the commutator-brushes. In order to maintain the insulating strip 12 and its conducting strip 14 on its mounting 11 there may be provided a nut 17 beneath which conductor 16 may be clamped to the end of strip 14 and the strips clamped

to the insulating sheet 9, or the end of pin 11 may be upset or riveted down and conductor 16 soldered in place.

To limit the to and fro movement of strip 12 a strap 18 of sheet metal or other suitable material is secured at either end near the edge of sheet 9 in any suitable manner. The strap 18 presses the strip 12 firmly against sheet 9 throughout its movement thereover, the resulting friction being sufficient to maintain strip 12 in any position to which it may be moved. Thus for example connections might be arranged so that with strip 12 in the position shown in Fig. 2, in which conducting strip 14 interconnects brush-conductor 16 with lower contact 13, the motor would run in one direction. If now strip 12 were raised until conducting strip 14 no longer contacted with said lower contact 13 but not far enough to contact with the upper contact 13, the circuit of the motor would be interrupted so that the motor would remain at rest. To reverse the direction of operation, it would only be necessary to still further raise the free end of strip 12 until strip 14 engages upper contact 13, the friction between strap 18 and strip 12 being sufficient to retain said strip in any of the described positions regardless of the position of the motor as a whole.

It is thus seen that there has been provided by this invention an extremely simple and economical switch for starting and reversing a toy electric motor, the switch being adapted to cooperate with other parts of a constructional toy outfit as by a strip secured to the free end of strip 12 through the perforation therein provided or otherwise. While the switch has been described in connection with one particular motor, it is to be understood that the invention is not limited to such specific embodiment, but may be employed for many other purposes within the scope of the appended claims and without departing from the spirit of the invention.

What I claim is:

1. In a switch, a sheet of insulation, a binding post mounted thereon, an elongated insulating arm operatively pivoted at one end on the post, a pair of fixed contacts also disposed on the sheet, said insulating arm being operable to bridge the post and either of said contacts with its free end extending therebeyond, an elongated conducting strip secured to and carried by the insulating arm and having one end in engagement with said post and pivoting thereabout with the arm, said conducting strip having its other end extending to and engaging either of said fixed contacts when the insulating arm is moved to bridge the post and the same, and means engaging the free end of the insulating arm at a point

beyond the outer end of the conducting strip and causing the same to frictionally engage the insulating sheet.

2. In a switch, an insulating base, a pin projecting laterally therefrom, a relatively long strip of insulation pivoted on the pin, a T-shaped conducting strip shorter than the insulating strip having one end-portion wrapped about the pivoted end of the insulating strip and the arms of the T wrapped about the mid-portion of the insulating strip, and means for retaining the strips on the pin.

3. In a switch, a movable element comprising a strip of insulation and a strip of conducting material, one end of the conducting strip being folded about one end of the insulating strip and the other end being provided with arms which are folded about the insulating strip intermediate its ends.

4. In a switch, an insulating base, a movable element comprising a strip of insulation, a strip of conducting material, one end of the conducting strip being folded about one end of the insulating strip and the other end being provided with arms which are folded about the insulating strip intermediate its ends, and a pivot post passing through the insulating base, the insulating strip, the conducting strip and the folded end of the conducting strip.

5. In a double-throw switch, an insulating base, a movable element comprising a strip of insulation, a strip of conducting material, one end of the conducting strip being folded about one end of the insulating strip and the other end being provided with arms which are folded about the insulating strip intermediate its ends, a pivot post passing through the insulating base, the insulating strip, the conducting strip and the folded end of the conducting strip, and a pair of fixed contacts cooperating with the said other end of the conducting strip.

6. In a double-throw switch, an insulating base, a movable element comprising a strip of insulation, a strip of conducting material, one end of the conducting strip being folded about one end of the insulating strip and the other end being provided with arms which are folded about the insulating strip intermediate its ends, a pivot post passing through the insulating base, the insulating strip, the conducting strip and the folded end of the conducting strip, a pair of fixed contacts cooperating with the said other end of the conducting strip, and a strap through which the free end of the insulating strip passes, which strap limits the movement of the movable element and holds the conducting strip against one or the other of the fixed contacts.

FRANK HORNBY.