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2,816,977

CONTROL SWITCH

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FIG. 1.

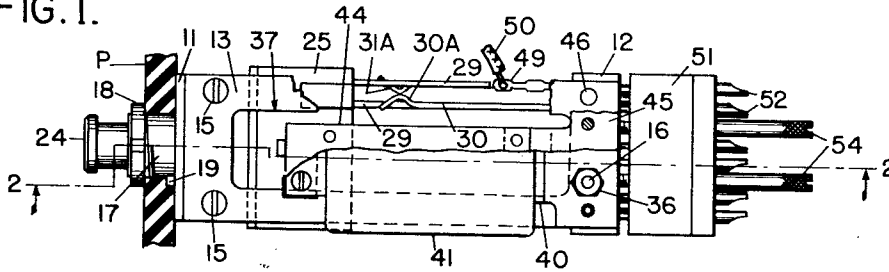


FIG. 2.

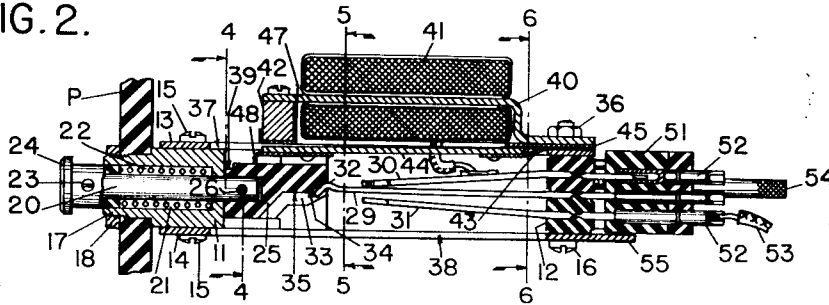


FIG. 3.

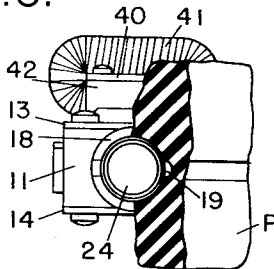


FIG. 4.

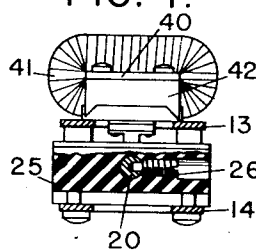


FIG. 5.

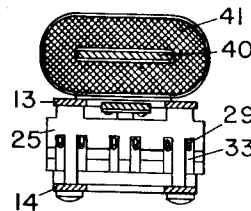


FIG. 6.

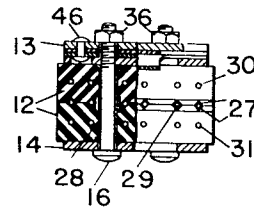


FIG. 7.

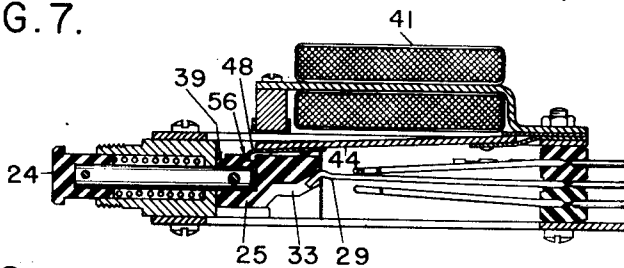
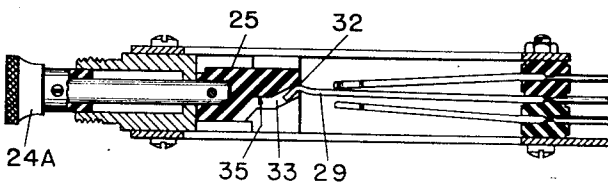


FIG. 8.



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2,816,977

CONTROL SWITCH

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2 Claims. (Cl. 200—106)

This invention relates to control switches and more particularly to a type of switch which has a large complement of contacts and is still compact in design so far as mounting space is concerned.

As an example, control panels for railway traffic control machines are usually marked out with various track diagrams and illustrate various track switch and signal locations, each of these locations having a control switch mounted adjacent thereto on the panel for controlling the apparatus located at the actual track location in the field. These track diagrams are of necessity small and crowded close together on the panel, and the control switches are mounted so that only the control button appears on the front of the panel while the contacts and wiring connections are located in the rear. This requires a control switch which is small in cross section to permit the required number to be mounted on the panel.

One of the objects of the invention is to provide such a switch which is easily accessible for facilitating adjustments of the contact fingers and making wiring connections.

A further object of the invention is the provision of a spring latch locking means with an electro-magnetic release whereby the control button operating means may be latched in one or both extreme positions by a separate means for a selected interval of time.

A still further object of the invention is the provision of a switch structure which can be assembled or altered to present different combinations of functions merely by adding or removing some of the parts, the basic assembly remaining the same in all cases.

In describing the invention in detail, reference will be made to the accompanying drawing in which like reference characters refer to like parts, and in which:

Fig. 1 is a top plan view of a push button switch which is provided with an electric latch, certain parts being broken away for clearness, and shown mounted on a control panel;

Fig. 2 is a side sectional view of the switch shown in Fig. 1 and taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a front view with the panel partly broken away to show the switch mounting;

Fig. 4 is an end sectional view taken on the line 4—4 of Fig. 2 and shows the mounting for the contact operating cam block;

Fig. 5 is an end sectional view taken on the line 5—5 of Fig. 2 and shows the spacing of the cam grooves in the contact operating cam block;

Fig. 6 is an end sectional view taken substantially on the line 6—6 of Fig. 2 and shows the contact block structure and mounting means;

Fig. 7 is a view similar to Fig. 2 except modified to show the spring latching means operable for both extreme positions, and;

Fig. 8 is another modification of Fig. 2 showing the spring latching means and the push button spring return removed to present a push-pull type of switch.

Referring now more particularly to Figs. 1 to 6 inclu-

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sive, the main body structure of the push button switch consists of a front bearing block 11 and a rear contact block 12, an upper frame member 13 and a lower frame member 14. The four units form a boxlike structure fastened together by screws 15 and tap bolts 16.

The front bearing block 11 provides the mounting means for the control switch and houses the push button means. A circular threaded portion 17 of this bearing block 11 passes through a hole in the panel P and the switch is held in place by means of a clamp nut 18. A key portion 19 is provided which fits into a keyway in the panel P to locate the switch properly in an upright position and prevent it from turning. The bearing block 11 is also provided with a hole to provide a bearing for the push button rod 20. This hole is enlarged as shown at 21 to provide space for a compression spring 22 and the shank part of the push button 24. The push button 24 is fastened to the rod 20 in any suitable manner, such as by a set screw 23. The compression spring 22 surrounds the small portion of the push button rod 20, one end bearing against the shoulder formed by the shank part of the push button 24 while the other end bears against a shoulder formed at the inner end of the enlarged hole 21.

A contact operating cam block 25 of insulating material is located between the upper and lower frame members 13 and 14 and next to the bearing block 11. This cam block 25 is substantially rectangular in shape and is fastened to the push button rod 20 by means of a set screw 26 (see Fig. 4). In the normal position of the push button, the compression spring 22 would cause the cam block 25 to bear against the bearing block 11. The enlarged head of push button 24 will limit the movement of the push button and cam block 25 in the other direction when operated, by reason of the enlarged head coming to a stop against the circular portion 17 of the bearing block 11. The cam block 25 is provided with upper and lower bosses or pads which act as guides and space the cam block 25 between the upper and lower frame members 13 and 14 in a manner to allow a sliding fit.

The contact supporting block 12 is made up of two interchangeable blocks of insulation, each having a complement of round wire type contact fingers molded therein and are provided with a complement of V-shaped notches 27 on one side thereof, each notch located directly in line with a contact finger. These two blocks are fastened together with hollow rivets 28 (see Fig. 6) in such a manner that the V-shaped notches face each other and serve to clamp an intermediate wire type contact finger 29 in place between the two blocks. This method of assembly provides a group of contact units each having a front contact finger 30 and a back contact finger 31 with an intermediate movable contact finger 29 located between them. The assembled contact block 12 also forms a part of the frame work as previously mentioned and is held in place by the tap bolts 16 which pass through the lower frame member 14 and the hollow rivets 28 of the contact block 12 and are threaded through the upper frame member 13.

The contact fingers 29, 30 and 31 pass through the contact block 12 and are provided with small flat portions within the molded block 12 to prevent any loosening and turning. The short ends of the contact fingers 29, 30 and 31 which protrude from the rear of the block 12 are used to facilitate wiring connections or plug coupling as will be explained hereinafter. The long ends of the contact fingers protruding from the front end of the contact block 12 constitute the contacting means for making and breaking circuits. The contacting tips of the front and back contact fingers 30 and 31 are formed hook shaped as shown at 30A and 31A so that they

overlap the movable contact finger 29. This also provides a convenient place for adjusting contact pressures which is done by bending these tips either away or towards the movable contact finger 29.

In the normal position of an intermediate movable contact finger 29 it is biased against a front contact finger 30. Its extreme end is bent to form a curved cam surface 32 which cooperates with a stepped cam groove 33 formed in the contact operating cam block 25, a groove 33 being provided for each contact finger 29. As shown on the drawing, when the push button 24 is pushed inward, the contact finger cam surface 32 would strike the slanted portion 34 of the cam groove 33 and be forced downward until the cam surface 32 came to rest against the flat portion 35 of the cam groove 33. In this position the movable contact finger 29 will have broken contact with the front contact finger 30 and made contact with the back contact finger 31. Upon return of the push button 24 and the cam block 25 to their normal positions, the movable contact finger 29 would move from its back contact position to its front contact position by reason of its normal bias.

Referring now to the spring latching means and the electro-magnetic release as provided in Figs. 1 to 6 inclusive, it can be seen by reference to the drawing that this is a separate sub-assembly which is fastened to the framework of the control switch by means of the tap bolts 16 and nuts 36. A rectangular shaped opening 37 is provided in the upper frame member 13 to facilitate the mounting of the latch assembly. A similar opening 38 is made in the lower frame member 14 to permit adjustments to be made on the contact fingers, etc. A groove 39 is also provided in the top surface of the cam block 25 to form a shoulder which will cooperate with the spring latching means.

In general, this spring latch structure and electro-magnetic release comprises a main magnetic yoke and support 40 on which is mounted a coil 41 and a pole shoe 42, also a non-magnetic spring type bronze armature hinge 43 to which is mounted an armature 44 of magnetic material. A bronze shim 45 is placed between the armature hinge 43 and the mounting end of the yoke 40 and the three parts are riveted together with rivets 46 (see Fig. 6) to form one unit to facilitate mounting and handling. This bronze shim 45 acts both as a residual air gap means and also as a part of the hinge means. A non-magnetic bronze shim 47 is also placed over the bottom face of the pole shoe 42 to form a residual air gap between the pole shoe 42 and the armature 44 when the armature is in a closed position. A hook shaped latch member 48 is fastened to the free end of the armature 44 and is positioned to cooperate with the shoulder formed by the groove 39 in the cam block 25.

The armature 44 is normally biased to an open downward position by means of a force exerted by its bent spring hinge support 43 and in this position, the hook on the end of the latch member 48 will bear against the top face of the cam block 25, acting as a stop for the armature 44. When the push button 24 is pushed inward to the limit of its travel, the cam block 25 would operate the contact fingers 29 as previously described. This movement of the cam block 25 would place the groove 39 directly under the hook shaped end of the latch member 48 so that the downward bias of the armature 44 would drop the hook into the groove 39. Upon release of the push button 24, the compression spring 22 would tend to return the push button 24 to its normal position but this would be prevented because the hooked end of the latch member 48 would catch on the shoulder formed by the groove 39. In this position the back contacts 29—31 would remain closed until such time as the coil 41 became energized through some external control circuit, whereupon the armature 44 would pick up and release the cam block 25. The compression spring 22

would then return the push button and its associated contact fingers to their normal positions.

As shown in the drawings, there has been chosen as a standard a supply of six front and back contact combinations although it should be understood that this is merely typical. In most cases, this would be found to be more than adequate and where desired, the two outside front contact fingers 30 may be cut off and flattened as shown at 49 to furnish terminals to which the coil wires 50 may be soldered, thus conducting the current to the outside terminal where it may be connected to external wires or plug coupled the same as the contact fingers.

As previously mentioned, the terminal block ends of these wire type contact fingers 29, 30, 31 may be of any desired form to meet the particular requirements for making external wire connections but in the drawings they have been shown pointed to receive a plug coupler.

The plug coupler unit comprises a block of insulation 51 which is fitted with hollow receptacles 52, the inner part of the receptacles 52 cooperating with the ends of the contact fingers 29—30—31 and the outer part of the receptacles 52 receiving the ends of the external wires 53 which are soldered therein. A knurled screw 54 is provided which threads into the contact block 12 to hold the plug coupler in place after contact has been made. The upper half of the insulation block 51 is larger than the lower half so that the plug coupler can only be plugged in one way, the extension 55 on the lower frame member 14 preventing the block 51 from being inserted when turned around 180°.

Referring now to the modified Fig. 7, in some uses of the push button switch it may be desired to lock up or latch the push button 24 in its release position or even both the release position and the operated position. By merely adding an additional groove 56 in the top surface of the cam block 25 and locating said groove 56 directly under the hooked end of the latch member 48, it can be seen that the normal downward bias of the armature 44 would force the hooked end of the latch member 48 into groove 56. This would prevent movement of the push button 24 and its associated cam block 25 so that the movable contact fingers 29 would not be operated until such time as the coil 41 became energized by a proper time delay circuit. The armature 44 would then pick up, the latch 48 releasing the cam block 25 to allow normal operation of the movable contact finger 29.

Referring now to the modification shown in Fig. 8, there has been illustrated a simple form of a push-pull switch wherein the compression spring 22 has been eliminated and the push button head 24A has been slightly modified to provide a control knob with a grip. In this form of the invention, the control knob is first pushed inward to cause movement of the movable contact finger 29 to its back contact position whereupon the cam face portion 32 of the movable contact finger 29 will assume and hold a position wherein it will dwell against the flat portion 35 of the cam groove 33 in the cam block 25. When the push button 24A is pulled out to its original position, the bias of the movable contact finger 29 will return it to its front contact position.

It should be understood, of course, that the push-pull type of operation could also be used on the other modifications already shown and described which incorporate the electric latching means. It should also be noted that all the forms have the same general construction with regard to frame work, mounting means, contact structures, etc.; and that they differ merely to the extent to which certain parts are removed or added to obtain the structure desired to perform the functions required for a particular installation.

Having thus shown and described several forms which the invention can assume, it is desired to be understood that other modifications could be made to obtain the

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same results without departing from the spirit or scope of the invention.

What I claim is:

1. A push button control switch comprising in combination, a box-like structure consisting of an upper and a lower frame member each fastened to a bearing block at one end and a contact block at the other end, a cam block slidable longitudinally within said box-like structure, said block having a groove in its upper surface normal to its direction of movement and having a plurality of longitudinal stepped grooves in its lower surface, an operating rod journaled in said bearing block and connected at one end to said cam block, the other end of said rod having a push button knob secured thereto protruding from said bearing block, a compression spring surrounding the midposition of said rod within said bearing block biasing said rod in a particular direction axially, a plurality of groups of contacts mounted in said contact block, each of the groups of contacts having at least one fixed contact finger and a cooperating movable contact finger, each of said movable contact fingers extending into and cooperating with one of said stepped cam grooves, a latch disposed above said cam block, said latch having a central magnetic portion secured at one end to a strip of resilient nonmagnetic material, said strip of nonmagnetic material being secured to said box-like structure and being effective to bias said latch against said cam block, said latch having a detent secured at the other end directed downwardly for engagement with said slot formed in the upper portion of said cam block, and an electromagnet secured to said box-like structure above said latch and having a U-shaped core structure cooperating with said central magnetic section of said latch for actuation of said latch to disengage said latch from said slot in the upper portion of said cam block.

2. A push button control switch comprising, a framework consisting of upper and lower longitudinal frame members fastened at their ends to a bearing block and a contact block respectively, a cam block slidable longi-

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tudinally within said structure, said block having a transverse groove in its upper surface and having a plurality of longitudinal stepped grooves in its lower surface, an operating rod journaled in said bearing block and connected at one end to said cam block, the other end of said rod having a push button knob secured thereto and protruding from said bearing block, a compression spring surrounding the mid-position of said rod within said bearing block biasing said rod in a particular direction axially, a plurality of groups of contacts extending through said contact block and secured therein, each of the groups of contacts having at least one fixed contact finger and a cooperating movable contact finger, each of said movable contact fingers extending into and cooperating with one of said stepped cam grooves at one end, plug coupling means comprising an insulating block having receptacles arranged therein to cooperate with ends of the contacts protruding from said contact block, a latch disposed above said cam block for cooperation with said transverse slot in said cam block, said latch having a central magnetic portion secured at one end to said contact block by a strip of resilient material, said latch having a detent secured at the other end thereof disposed downwardly for engagement with said transverse slot in said cam block, and an electromagnet secured to said contact block above said latch and having a U-shaped core cooperating magnetically with the magnetic portion of said latch for actuation of said latch to disengage said latch from said transverse slot in the upper portion of said cam block.

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