March 8, 1949. J. S. GARVIN ET AL 2,463,609

SWITCHING DEVICE

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FIG. 1

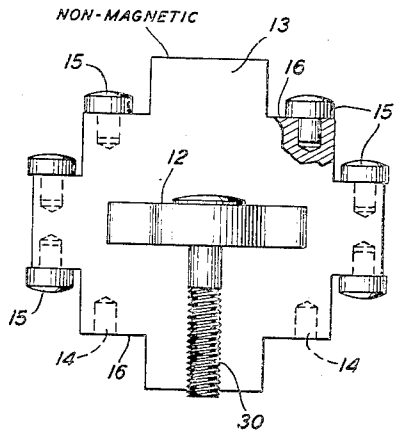


FIG. 2

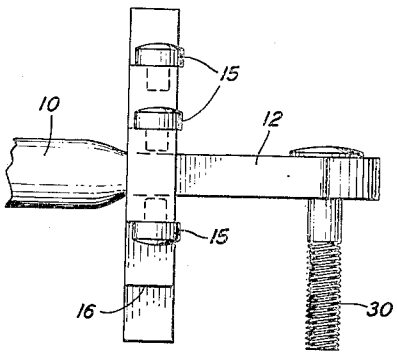


FIG. 3

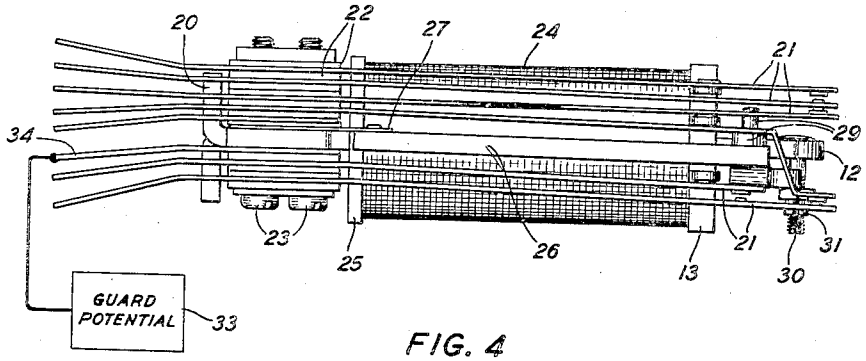
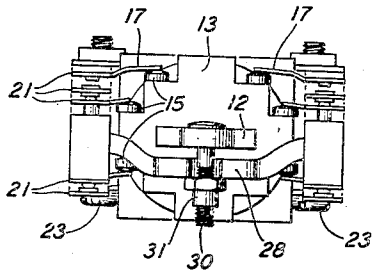


FIG. 4



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SWITCHING DEVICE

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8 Claims. (Cl. 200—104)

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This invention relates to electric circuit controllers and particularly to electromagnetic relays.

The electromagnetic relay, in general, comprises a core, an energizing coil mounted on the core, an armature and a plurality of circuit controlling contact springs. In a conventional design of relay the energizing coil is provided at each end with an insulating spool head, one of which is configured in such a manner as to provide rests upon which the forward or active ends of the contact springs normally rest. It has been discovered that this insulating spool head constitutes a relatively high impedance leakage path to ground for currents which traverse the springs and therefore is objectionable, particularly in systems, of electrical control where such high impedance leakage paths result in faulty operation of the circuits controlled by the switching device.

Attempts have been made heretofore to eliminate current leakage in such devices by utilizing a guard located in the leakage path and maintaining the guard at such a potential as to reduce to zero the potential drop in the leakage path. An arrangement of this general character is disclosed, for example, in P. G. Edwards Patent 2,399,213 of April 30, 1946.

It is the object of this invention to provide an electromagnetic switching device in which the insulating rests for the contact springs are maintained at a predetermined guard potential applied to the frame of the device and to thereby eliminate current leakage between the springs of the switching device.

This object is attained in accordance with a particular feature of the invention by providing individual insulating rests for each contact spring of a switching device, and by conductively associating each of the rests with a particular element of the device to which the guard potential is applied. More particularly, a non-magnetic metallic spool head is provided for the switching device or relay, and is welded to or otherwise contiguously associated with the relay core. The metallic spool head has embedded therein a plurality of individual insulating plugs each of which furnishes a rest for a projecting tab of a contact spring. The core is integrally formed with a mounting bracket or frame to which is applied a guard potential so that each individual insulating rest is maintained at the potential of the frame and the possibility of current leakage between springs is eliminated.

The invention will be better understood from

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the following detailed description when read in connection with the accompanying drawing, in which:

Fig. 1 is an enlarged end view of the core of an electromagnetic switching device to which is affixed the metallic spool head of this invention;

Fig. 2 is a side elevation of the core and spool head illustrated in Fig. 1;

Fig. 3 is a side elevation of an electromatic relay embodying the features of this invention; and,

Fig. 4 is an end view of the relay shown in Fig. 3.

At 10 in Fig. 2 is shown a relay core of soft iron having an enlarged pole piece 12. This general configuration of the relay core is not critical in so far as the present invention is concerned and may take other forms than the one illustrated. Near the forward extremity of the core 10 and preferably at the junction of the coil supporting portion thereof and the pole face 12 there is welded or otherwise fixed a metallic member 13 of non-magnetic material. The plane of the member 13 is at right angles to the longitudinal axis of the core 10. As illustrated, the member 13 is given a stepped configuration, the number of steps 16 varying with the number of contact springs carried by the switching device in the structure of which the core 10 and the member 13 are included. Each step of the member 13 is provided with a hole 14 into which a plug 15 of insulating material is force fitted. The plugs 15 are provided with enlarged heads upon each of which rests an integral projection, or tab 17 of a contact spring as clearly shown in Fig. 4. The non-magnetic member 13 may be of solid metal or of sheet metal as desired.

Referring particularly to Fig. 3 and 4, the relay core 10 terminates at one end in the pole piece 12 and at the other end in a mounting bracket 20 by means of which the relay may be mounted on any suitable support. The bracket 20 supports spring pile-ups in the usual manner, each pile-up consisting of a group of contact springs such as indicated at 21, and insulating spacers 22, the latter being interposed between consecutive springs and the whole being secured to the bracket 20 by screws 23. The core portion between the bracket 20 and the pole piece 12 supports the usual coil 24 which, in turn, is interposed between the insulating spool head 25 and the metallic member 13, the latter, as hereinbefore indicated, being welded or otherwise fixed to the core. A substantially U-shaped armature 26 extends forwardly from the bracket 20 and is hinged

thereto by means of the metal hinge 27 which appears in Fig. 3.

The two parallel arms of the U-shaped armature 26 are in substantial alignment with the core 10; the bridging piece 28 thereof occupying a lower plane than that of the two side arms so as to be located in spaced relation to the pole piece 12. Through the medium of studs 29 the movement of the armature 26 is transmitted to the contact springs when the coil 24 is energized as is usual in this type of relay. The screw 30 fixed to the end of the core 10 and the nut 31 serve in the usual manner to adjust the armature air-gap.

It will be observed that the projections or tabs 17 of the contact springs normally rest upon the insulating plugs 15 and that each plug 15 is embedded in the non-magnetic metallic spool head 13, which, in turn is in electrical engagement with the core 10, the core terminating, at one end, in the mounting bracket 20. It will be further noted that the leakage path between any two contact springs extends from the tab 17 of one spring, over the insulating plug 15 upon which the tab rests, the body of the metallic member 13, the insulating tab 15 of an adjacent contact spring, and the corresponding tab 17. Included in the spring pile-ups mounted on the bracket 20 is a metal guard segment 34 which makes surface contact with the bracket and projects rearwardly to provide means for connecting a source of guard potential thereto. This source is schematically shown at 33.

It will be further noted that the guard potential 33 is applied directly to each of the insulating rests 15 by way of the spring segment 34, bracket 20, core 10 and the non-magnetic metal spool head 13. Thus there is no difference of potential between the several insulating rests 15 and no current will flow therebetween. Thus it is that current leakage between springs of the switching device is eliminated.

If desirable the insulating elements included in the pile-ups mounted on the bracket 20 may be further guarded against leakage by the interposition of guard springs therebetween. In practice all such guard springs may be provided with tabs which, in any suitable manner, may be electrically connected to the spring segment 34.

What is claimed is:

1. An electromagnetic switching device comprising a magnetizable core, an energizing coil mounted on said core, an armature, contact springs operable by said armature upon energization of said coil, an insulating rest for each of said contact springs, and means for maintaining said insulating rests at the potential of said core comprising a non-magnetic metallic element contiguously mounted on said core and supporting said insulating rests.

2. An electromagnetic switching device comprising a core having rear end extensions, contact springs insulatively mounted on said core extensions and extending longitudinally therefrom towards the forward end of said core, an armature for actuating said springs, a coil carried by said core and energizable to effect the operation of said armature, a metallic spool head for said coil conductively mounted on said core near its forward end, and insulating rests for the forward ends of said springs mounted on said metallic spool head.

3. An electromagnetic switching device comprising a core having a rear end extension, contact springs insulatively mounted on said core extensions and extending therefrom in the direction of the forward end of said core, an armature for actuating said springs, a coil carried by said core and energizable to effect the operation of said armature, a non-magnetic metal member conductively mounted on said core near its forward end, and insulating plugs embedded in said metal member and projecting therefrom to constitute rests for said contact springs.

4. In an electromagnetic switching device, a magnetizable core, a coil, an armature operable upon energization of said coil, contact springs operable by said armature, and means for insulating said springs from said core comprising a metallic member mounted on said core and insulating plugs carried by said metallic member and interposed between said member and said springs.

5. The combination in an electromagnetic switching device, of a magnetizable core, a coil mounted on said core and energizable to magnetize said core, a plurality of contact springs mounted on said core near one end thereof and extending therefrom in superposed relation towards the other end of said core, an armature mounted on said core and operable upon energization of said coil to operate said contact springs, a stepped metallic member mounted near the said other end of said core in conductive relation thereto, an insulating plug mounted on each step of said metallic member, and an integral projection on each of said contact springs normally engaging a different one of said insulating plugs.

6. An electromagnetic relay having contact springs and a coil-supporting core and in which the springs thereof are insulated from said core by means of insulators, and said insulators are conductively supported on said core.

7. In an electromagnetic switching device, a magnetizable core, a coil mounted on said core, an armature, contact springs having one end of each thereof insulatively fixed to said device and the other ends thereof operably disposed relative to said armature whereby the said other ends of said springs are operated by said armature upon energization of said coil, insulating rests for the said other ends of said springs, and means conductively connecting said insulating rests to said core comprising a metallic support for said rests mounted on said core.

8. In a relay structure, a core, a coil mounted on said core, a mounting bracket, contact springs insulatively fixed to said mounting bracket and extending forwardly therefrom substantially parallel to the longitudinal axis of said core, a metallic member mounted on said core near its forward end, and insulating rests for the forward ends of said springs mounted on said metallic member, said bracket, core and metallic member constituting a current conducting path between said bracket and said insulating rests.

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