Aug. 5, 1947. F. E. WOOD 2,425,275

RELAY STRUCTURE

Original Filed Sept. 21, 1942

FIG. 1

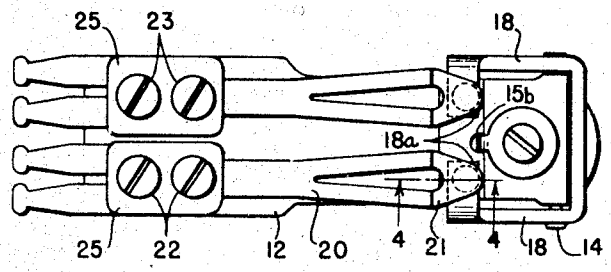


FIG. 2

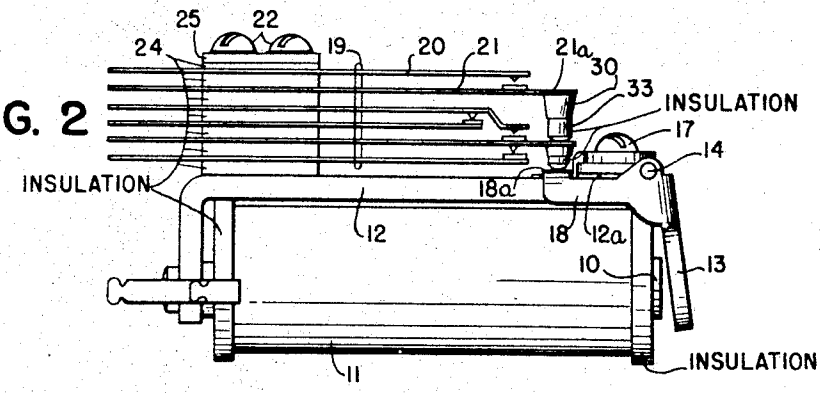


FIG. 4

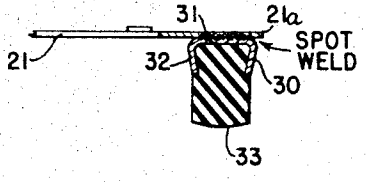
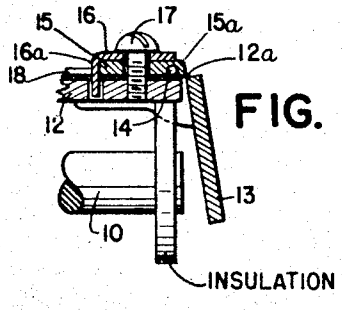


FIG. 3



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RELAY STRUCTURE

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4 Claims. (Cl. 175—336)

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This invention relates to improvements in relay structures and the present application is a division of a copending original application Serial No. 459,121, filed September 21, 1942, now Patent No. 2,401,213, granted May 28, 1946.

The principal object of the present invention is to provide an improved method of and means for mounting a movable armature upon the field core of a switch of the electromagnetic type. A further object is to provide a switch of this type comprising a movable armature which is mounted upon and insulated from the field structure of the switch by improved fastening means. Still another object is to provide an improved switch of the electromagnetic type comprising a magnetic core and a field element in combination with a movable armature which is pivotally mounted upon the field element by a novel arrangement including a single fastening member. Other objects relate to various features of construction which will appear more fully hereinafter.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawing. In the drawing,

Figure 1 is a plan view of an electromagnetic relay incorporating switch structure embodying the present invention;

Fig. 2 is a side elevational view of the relay shown in Fig. 1;

Fig. 3 is a fragmentary side elevational view, partly in section, of the relay; and

Fig. 4 is an enlarged sectional view, taken along the line 4—4 in Fig. 1, of a portion of the switch structure incorporated in the relay.

Referring now more particularly to Figs. 1 to 4, inclusive, of the drawing, the electromagnetic relay there shown comprises a magnetic core 10 carrying a winding 11, a substantially L-shaped magnetic field element 12 secured to the core 10, and a movable magnetic armature 13 pivotally mounted on the outer end of the field element 12 and cooperating with the outer end of the core 10. More particularly, a nonmagnetic shim 12a formed of bronze or the like is carried on the upper surface of the field element 12 adjacent the outer end thereof, and a pivot pin 14 is rotatably mounted on the upper surface of the shim 12a by an arrangement comprising a clamping member 15, a washer 16 and a screw 17, the pivot pin 14 being arranged in a transverse slot 15a formed in the clamping member 15. The screw 17 extends through aligned holes provided in the

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washer 16, the clamping member 15 and the shim 12a, and the outer end thereof is received in an aligned tapped hole provided in the field element 12 adjacent the outer end thereof. Also, a downwardly bent tab 16a is formed integrally with the washer 16 and extends through a recess 15b formed in the clamping member 15 into aligned openings provided in the shim 12a and the field element 12, thereby positively to prevent relative motion between the clamping member 15 and the field element 12. Preferably, the pivot pin 14, the clamping member 15, the washer 16 and the screw 17 are all formed of non-magnetic material in order to prevent these elements from interfering with the magnetic flux path between the field element 12 and the armature 13.

Further, the armature 13 carries a pair of spaced-apart and inwardly directed arms 18 disposed on the opposite sides of the field element 12 and provided with aligned holes therein which receive the opposite outer ends of the pivot pin 14, the opposite outer ends of the pivot pin 14 being flanged over in order rigidly to secure the pivot pin 14 to the arms 18 and consequently to the armature 13. Also, the arms 18 are provided with inturned operating projections 18a which overlie the upper surface of the shim 12a and cooperate with switch structure 19 carried by the field element 12. More particularly, the switch structure 19 comprises a plurality of individual flexible metallic switch or contact springs 20, 21, etc., arranged in two stacks and respectively secured to the field element 12 by two pairs of screws 22 and 23. More specifically, the base ends of the springs 20, 21, etc., in each stack are spaced apart and insulated from each other by a plurality of interposed insulating sheets 24 which are retained in clamped position between a clamping plate 25 and the field element 12 by the two pairs of screws 22 and 23. For example, the pair of screws 22 extends through two sets of aligned holes formed in the clamping plate 25, the insulating sheets 24 and the base ends of the contact springs 20, 21, etc.

Preferably, in each stack, the two adjacent contact springs constituting a cooperating pair, such, for example, as the individual contact springs 20 and 21, are constructed and arranged in the manner disclosed in U. S. Patent No. 2,272,496, Fredric E. Wood, granted February 10, 1942. Accordingly, the contact spring 20 has a substantially Y configuration, the outer free end thereof being split to provide two diverging arms; while the contact spring 21 has a closed ovate-lanceolate slot formed therein near its free end in

order to provide diverging and converging arms, the converging arms being connected together at the extreme free end of the switch spring by a curved operating portion 21a. Also, the two diverging arms of the switch spring 20 carry two metallic contacts which are arranged in cooperating relationship with two metallic contacts carried by the two diverging arms carried by the contact spring 21, the two pairs of cooperating contacts being arranged in crossing relationship as illustrated.

As illustrated in the drawings, the invention also comprises cup-shaped metallic fixtures 30 each of which is made up of a flat bottom wall 31 and an annular side wall 32, the bottom wall 31 of each fixture being securedly fastened to the adjacent lower surface of the curved operating portion 21a of a contact spring 21. The bottom wall 31 of the fixture is welded or secured by fused metal to the portion 21a of the contact spring. A substantially cylindrical insulating operating element or bushing 33 is arranged within each fixture 30 and is frictionally held in place by the side wall 32 thereof. Preferably, one end of each bushing 33 is provided with a frustoconical section which is inserted into the cup-shaped fixture 30, and then the side wall 32 of the fixture is spun or pressed into firm engagement with the conical side wall of the received portion of the bushing 33. The bushing 33 cooperates directly either with the operating section of an adjacent one of the contact springs or directly with the inturned operating projection 18a of one of the arms 18 of the armature 13. The construction and mounting of the insulating bushings on the switch springs are described and claimed in said copending original application above referred to.

Considering now the operation of the relay, when the winding 11 is deenergized the contact spring 21 urges the bushing 33 carried thereby into engagement with the operating portion of the adjacent contact spring; while the bushing carried by the last-mentioned contact spring engages the inturned operating projection 18a carried by the arm 18 of the armature 13, whereby the armature 13 and the pivot pin 14 secured thereto are rotated in the counterclockwise direction, in an obvious manner. More particularly, the pivot pin 14 rotates in the transverse slot 15a formed in the clamping member 15, the adjacent upper surface of the shim 12a serving also as a bearing therefor. Also, at this time, the various metallic contacts carried by the contact springs 20, 21, etc., are moved into normal circuit positions. When the winding 11 of the relay is energized, the armature 13 is attracted toward the core 10 by the magnetic flux produced in the field structure, whereby the armature 13 and the pivot pin 14 secured thereto are rotated in the clockwise direction, in an obvious manner. This rotation of the armature in the clockwise direction causes the inturned operating projection 18a carried by the arm 18 to act upon the bushing carried by the associated contact spring and through the operating portion of the contact spring mentioned upon the bushing 33 and consequently upon the contact spring 21. Accordingly, the contact springs mentioned are flexed,

whereby the various metallic contacts carried by the contact springs 20, 21, etc., are moved into operated circuit positions.

It is noted that the end of the shim 12a underlying the projections 18a carried by the arms 18 of the armature 13 prevents the projections mentioned from sticking to the adjacent surface of the field element 12 due to leakage magnetic flux therebetween.

While one embodiment of the invention has been disclosed, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

I claim:

1. In an electromagnet having a core and a field member, a non-magnetic shim seated on said field member adjacent one end of said electromagnet, a clamping member mounted on said shim, an armature having a pivot pin mounted between said clamping member and said shim, and means for securing said clamping member and said shim to said field member.

2. In an electromagnet having a core and a field member, a non-magnetic shim seated on said field member adjacent one end of said electromagnet, a clamping member seated on said shim and having a transverse recess on its inner side, a pivot pin mounted in said recess, an armature mounted on said pin and arranged to cooperate with said core, and means for securing said clamping member and said shim to said field member.

3. In an electromagnet having a core and a field member, a non-magnetic shim seated on said field member adjacent one end of said electromagnet, a clamping member mounted on said shim, an armature pivotally mounted on said clamping member, said field member having an aperture therein, a washer seated on said clamping member and having a part extending over the end of said clamping member and engaging said aperture, and a fastening means for securing said washer and said clamping member to said field member.

4. In an electromagnet having a core and a field member, a non-magnetic shim seated on said field member adjacent one end of said electromagnet, a clamping member seated on said shim and having a transverse recess on its inner side, a pivot pin mounted in said recess, an armature mounted on said pin and arranged to cooperate with said core, said field member having an aperture therein, a washer seated on said clamping member and having a part engaging said aperture, and a single fastening means for securing said washer, said clamping member and said shim to said field member.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
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