Nov. 21, 1939. J. R. FRY 2,180,705

RELAY

Filed Aug. 5, 1937

FIG. 1

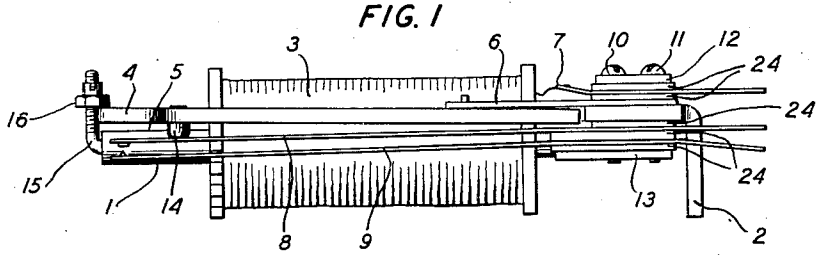


FIG. 2

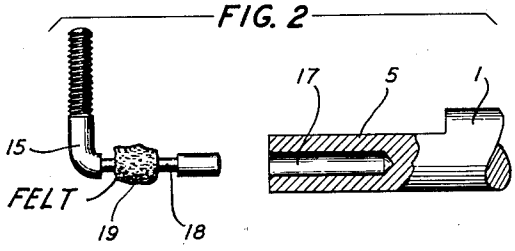


FIG. 3

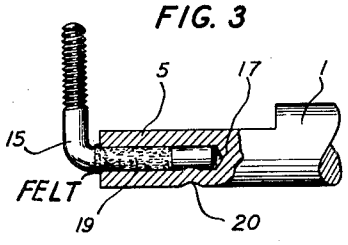
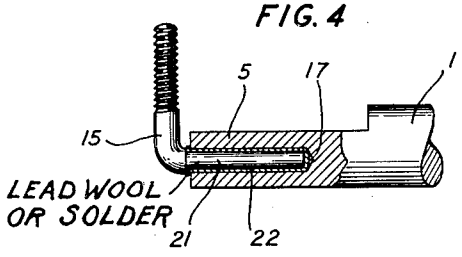


FIG. 4



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RELAY

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8 Claims. (Cl. 175—336)

This invention relates to relays and more particularly to relays for use in the circuits of telephone systems.

In electric circuits generally and in telephone circuits particularly, electromagnetic relays are extensively employed. In such circuits the functions to be performed are numerous and varied and it is often very essential that relays employed in such circuits shall positively make and break the circuits controlled over their contacts. If the contacts of a relay do not make firmly or break cleanly, or in other words, if the contacts have a tendency to chatter when they make or break, false operation in the circuits controlled thereover will result.

It has been found that one of the factors which contributes to the tendency of relay contacts to chatter upon the release of the relay armature, is the bouncing or rebound of the armature from the back stop structure which is employed to limit the releasing movement of the armature and to adjust the normal air-gap between the relay armature and the pole face of the core. It has further been determined through experimentation that the rebound of the armature from the back stop structure may be materially reduced and the consequent chattering of the relay contacts controlled by the armature substantially eliminated by the provision of cushioning means in association with the back stop structure.

It is therefore the object of this invention to improve the design of an electromagnetic relay so as to reduce the tendency of the relay contacts to chatter. This object is attained in accordance with the present invention by the provision of a cushioning means for the screw which carries the usual back stop nut at its point of attachment in the end of the relay core.

Specifically, the back stop screw which is threaded upon one of its ends to receive the usual back stop nut with which the relay armature engages upon its release, is engaged at its other end in a hole in the end of the relay core and is cushioned at the point of engagement by a shock absorbing packing, such as felt or lead. By the provision of the cushioning means, when the armature engages the back stop nut, the energy of impact is largely absorbed by the cushioning means and the tendency of the armature to rebound from the back stop nut is thereby materially reduced and consequently the armature having slight or no rebound movement does not disturb the closed or open condition of the contacts controlled thereby to introduce a chattering thereof.

The invention will be more readily understood from the following detailed description taken in connection with the accompanying drawing in which:

Fig. 1 is a side elevational view of a well-known type of relay in which the invention is embodied;

Fig. 2 is an enlarged view, partly in cross-section, of the back stop screw and the end of the relay core in disassembled position showing one embodiment of the invention;

Fig. 3 shows the elements of Fig. 2 in their assembled positions; and

Fig. 4 is an enlarged view, partly in cross-section, of the back stop screw and the end of the relay core assembled in accordance with a further embodiment of the invention.

The relay disclosed in Fig. 1 of the drawing is of a well-known type consisting of a core 1 secured at its rear end to a mounting bracket 2, an energizing coil 3 surrounding the core 1, an armature 4, the forward end of which cooperates with the pole face 5 of the core 1 and the rear end of which is pivoted by pivot pins on ledges 6, coil terminal lugs 7 and a spring pile-up on each side of the relay coil and each comprising the contact springs 8 and 9. The ledges 6, coil terminal lugs 7 and springs 8 and 9 are suitably clamped to the mounting bracket 2 by screws 10 and 11 which pass therethrough and through the clamping plates 12 and 13. For insulating the terminal lugs and contact springs from each other, from the mounting bracket 2 and from the clamping plates 12 and 13, strips 24 of insulating material are interposed. For engaging the contacts of springs 8 and 9 upon the attraction of the armature 4 to the core 1, the armature is provided with operating studs 14 of insulating material.

To limit the movement of the armature 4 away from the core 1 upon the deenergization of the coil 3 and to afford means for adjusting the normal air-gap between the end of the armature 4 and the pole face 5 of the core 1, the back stop screw 15 carrying the back stop nut 16 is provided. The back stop screw is L-shaped having its vertical arm threaded to receive the back stop nut 16 and having its horizontal arm seated in a hole 17 in the end of core 1 as most clearly shown in Figs. 3 and 4.

The manner in which the back stop screw is engaged in the end of the core whereby it is cushioned in accordance with one embodiment of the invention, is disclosed in Figs. 2 and 3. As

disclosed in Fig. 2, the horizontal arm of the back stop screw is provided with a reduced portion 18 around which is placed a thimble 19 of felt or other suitable flexible and compressible material. This thimble is of larger diameter than the diameter of the horizontal arm of the back stop screw, but of less length than the length of the reduced portion 18 of the screw. In assembling the back stop screw in the end of the core 1, the horizontal arm of the screw is forced into the hole 17 in the end of the core into the position shown in Fig. 3, in which position the flexible thimble 19 is compressed to entirely fill the space between the reduced portion 18 of the screw and the walls of the hole 17 in the core. After assembling the screw in the end of the core, the end of the core is staked at 20 to hold the screw in place with its vertical arm perpendicular to the pole face 5 of core 1.

With the back stop screw 15 thus secured in the end of the core and cushioned from the core by the flexible thimble 19, it will be apparent that the energy of impact, incident to the armature striking against the back stop nut 16 carried by the screw 15, will be absorbed by the flexible thimble 19 and that therefore the tendency of the armature 4 to rebound from the back stop nut 16 will be materially reduced. By thus reducing or practically eliminating the rebound of the armature, the armature will not impart any material vibration through the stud 14 to the springs 8 and 9 and their tendency to chatter due to such vibration of the armature is thereby eliminated.

In Fig. 4 a further embodiment of the invention is disclosed. According to this modification, the entire horizontal arm of the back stop screw is reduced in diameter as indicated at 21 and the space between it and the walls of the hole 17 in the end of the core 1 is packed with lead wool 22, or alternatively, the horizontal arm 21 of the screw is coated with lead solder and secured within the hole 17 of the core by sweating. The lead wool or lead sweating functions in the manner hereinbefore described to afford a cushioned support for the back stop screw whereby the energy of impact between the armature and the back stop nut is effectively absorbed.

While the applicant has elected to disclose two methods by which the back stop screw may be cushioned in the end of the core, it is to be understood that the applicant's invention is not so limited, but contemplates such modifications as may fall within the limits of the appended claims.

What is claimed is:

1. In an electromagnetic structure having a core and an armature, a back stop for adjusting the air-gap between the core and the armature, said back stop comprising an L-shaped screw, one end of which is positioned in a longitudinal hole in the end of said core and secured therein by cushioning means interposed between the walls of said hole and said screw, and a back stop nut threaded on the other end of said screw for engagement by said armature.

2. In an electromagnetic structure having a core and an armature, a back stop for adjusting the air-gap between the core and the armature, said back stop comprising an L-shaped screw, one end of which is positioned in a longitudinal hole in the end of said core, a thimble of compressible material surrounding said end of said screw and engaging the walls of said hole for securing said end of said screw to said core, and a back stop nut threaded on the other end of said screw for engagement by said armature.

3. In an electromagnetic structure having a core and an armature, a back stop for adjusting the air-gap between the core and the armature, said back stop comprising an L-shaped screw, one end of which is positioned in a longitudinal hole in the end of said core, a thimble of felt surrounding said end of said screw and engaging the walls of said hole for securing said end of said screw to said core, and a back stop nut threaded on the other end of said screw for engagement by said armature.

4. In an electromagnetic structure having a core and an armature, a back stop for adjusting the air-gap between the core and the armature, said back stop comprising a screw, one end of which is secured in the bottom of a hole in the end of said core and is provided with an intermediate portion of reduced diameter, a thimble of compressible material surrounding said reduced portion and entirely filling the space between said reduced portion and the walls of said hole, and a back stop nut on said screw for engagement by said armature.

5. In an electromagnetic structure having a core and an armature, a back stop for adjusting the air-gap between the core and the armature, said back stop comprising an L-shaped rod having one of its arms threaded and having its other arm seated in a hole in the end of said core, cushioning means interposed between said other arm and the walls of said hole for securing said other arm to said core, and a back stop nut on the threaded arm of said rod for engagement by said armature.

6. In an electromagnetic structure having a core and an armature, a back stop for adjusting the air-gap between the core and the armature, said back stop comprising an L-shaped screw, one end of which is positioned in a longitudinal hole in the end of said core, a layer of lead surrounding said end of said screw and forming a cushion between said end of said screw and the walls of the hole in said core, and a back stop nut threaded on the other end of said screw for engagement by said armature.

7. In an electromagnetic structure having a core and an armature, a back stop for adjusting the air-gap between the core and the armature, said back stop comprising a screw, one end of which is positioned in a hole in the end of said core, a layer of lead wool surrounding the end of said screw and forming a cushion between the end of said screw and the walls of the hole in said core, and a back stop nut threaded on the other end of said screw for engagement by said armature.

8. In an electromagnetic structure having a core and an armature, a back stop for adjusting the air-gap between the core and the armature, said back stop comprising an L-shaped screw, one end of which is positioned in a longitudinal hole in the end of said core, a layer of lead solder surrounding said end of said screw and forming a cushion between said end of said screw and the walls of the hole in said core, and a back stop nut threaded on the other end of said screw for engagement by said armature.

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