

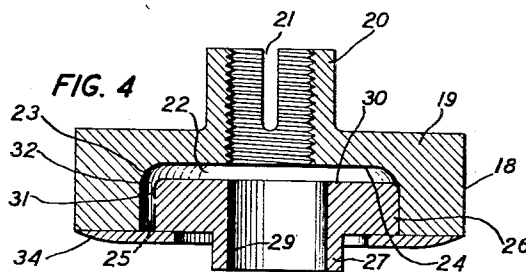
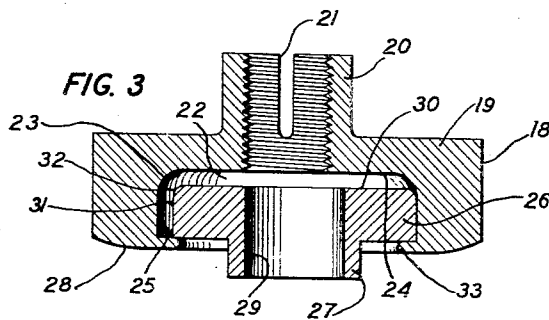
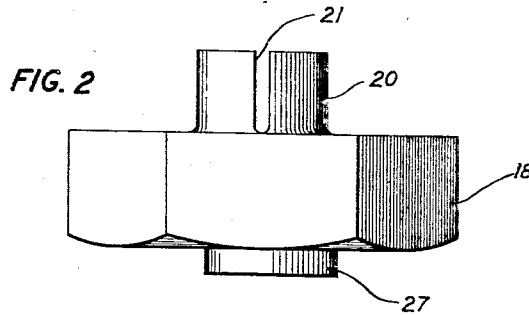
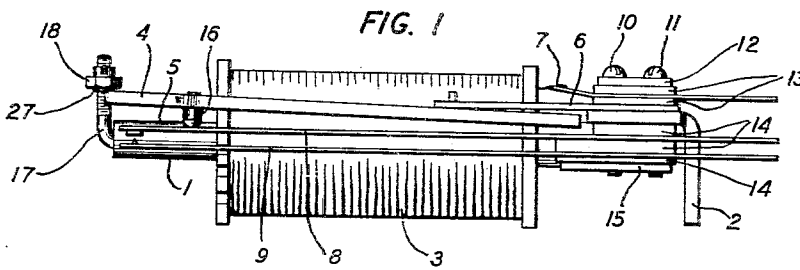
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RELAY

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RELAY

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4 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 and particularly in telephone circuits, large numbers of electromagnetic relays are employed for performing numerous and varied circuit switching functions. 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 means for absorbing the shock of impact of the armature within the back stop structure.

It is therefore the object of this invention to improve the design of the back stop structure of an electromagnetic relay so as to reduce the armature rebound and to consequently eliminate contact chatter. This object is attained in accordance with the present invention by the provision of an insert in the face of the back stop nut with which the relay armature engages upon its releasing movement and which, due to its frictional engagement within the body of the nut, absorbs the energy of impact.

Specifically, the back stop nut is provided with a recess in its face within which an insert of smaller diameter and less depth than the recess is retained by swaging the lower rim of the recessed portion, or by the application of a retaining ring to the lower face of the nut. The outer face of the insert projects beyond the outer face of the nut for engagement with the relay armature and the edge of the inner face of the insert is rounded off to make a sliding engagement with the inner coved wall of the recess whereby, when the outer face of the insert is engaged by the relay armature, the insert is pushed into the recess with a lateral sliding movement. The friction produced by the sliding and inward movement of the insert is sufficient to materially absorb the energy of impact of the armature therewith thereby reducing the tendency of the

armature to rebound from the stop nut. When the armature has completed its travel toward the stop nut, the insert rests with its inner face against the bottom of the recess and thus limits the further releasing travel of the armature. Incidentally, when the armature is again attracted away from the stop nut, the insert is free to follow the armature from its position of rest and the armature readily breaks away from the insert under any tendency of the armature to stick to the outer face of the insert and thus any retarding action in the operation of contacts controlled thereby is eliminated.

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 to which the invention has been applied;

Fig. 2 is an enlarged side elevational view of the stop nut constructed in accordance with the invention;

Fig. 3 is a cross-sectional view of the stop nut disclosed in Fig. 2; and

Fig. 4 is a cross-sectional view of a stop nut showing an alternative mode of construction.

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 ledge 6, coil terminal lugs 7 and a spring pile-up on each side of the relay coil 3, each comprising suitable contact springs such as 8 and 9. The ledges 6, coil terminal lugs 7 and springs 8 and 9 of each spring pile-up are suitably clamped to the mounting bracket 2 by screws 10 and 11 which pass through the clamping plate 12, insulating strips 13, the ledges 6, the bracket 2, insulating strips 14 and the springs 8 and 9 into threaded holes in the clamping plate 15. The terminal lugs 7 and springs 8 and 9 are insulated from each other and from the bracket 2 by the interposed insulating strips 13 and 14. 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 16 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 17 carrying the back stop nut 18 is provided. The back stop screw 17 is L-shaped having its vertical arm threaded to receive the back stop

nut 18 and having its horizontal arm seated in a hole in the end of the core 1.

The back stop nut 18 comprises a body 19 having a hub portion 20 internally threaded and provided with a slot 21 whereby the two portions of the hub portion 20, thus formed, may be pinched together to insure that when the nut has been threaded upon the threaded end of the back stop screw 17 to adjust the air-gap between the armature 4 and the pole-face 5 of the core 1, as disclosed in Fig. 1, the adjustment will be maintained. Formed centrally in the lower face of the nut is a recess 22 having a coved corner 23 between its bottom wall 24 and its cylindrical wall 25.

Positioned within the recess 22 is an insert 26 having a hub portion 27 extending beyond the lower face 28 of the body of the nut and provided with an axial opening 29 of sufficient diameter to freely admit the back stop screw 17 therethrough and to permit lateral movement of the insert 26 within the recess 22 of the nut. The inner edge of the insert formed by the junction of the inner face 30 and the cylindrical wall 31 thereof, is rounded off as disclosed at 32, for engagement with the coved corner 23 of the recess for a purpose to be later described.

To retain the insert within the recess of the nut, the lower face of the body of the nut may be swaged as shown in Fig. 3, to form an inwardly extending lip 33, or a retaining ring 34 may be brazed or otherwise secured to the lower face of the nut, as shown in Fig. 4.

With the back stop nut 18 assembled upon the screw 17 and adjusted to the position requisite for limiting the releasing travel of the relay armature 4 to a position in which the required air-gap between the armature and the pole-face 5 of the core is attained, as disclosed in Fig. 1, when the armature is attracted to the core by the energization of the operating coil 3, the insert 26 will assume the position within the recess 22 of the nut as disclosed in Fig. 3. When thereafter the energizing coil 3 is deenergized to release the armature 4, the armature under the influence of the springs 8 and 9 will travel toward and into engagement with the face of the hub 27 of the insert 26 forcing it inwardly into the recess 22 in the body 19 of the nut. As the insert moves inwardly, the engagement of its rounded edge 32 with the coved corner 23 of the recess will cause it to also move laterally within the recess until its inner face 30 abuts the bottom wall 24 of the recess. When this occurs the release travel of the armature 4 is arrested in the position in which the required air-gap between it and the pole-face 5 of the core is attained.

Due to the sliding and frictional engagement between the cylindrical wall and rounded corner of the insert and the cylindrical wall and coved corner of the recess, the energy of the impact incident to the armature striking the hub 27 of the insert is largely dissipated and the tendency of the armature to rebound from the stop nut is thereby reduced and, since the armature controls the engagement between the contact springs 8 and 9 of the spring pile-ups through the studs 16 carried by the armature, the tendency of the armature to impart such vibration incident to its impact with the stop nut to the contact springs as to cause them to chatter is materially reduced.

The insert 26 being loosely supported within the body of the nut 18 is also effective in over-

coming the sticking of the armature 4 to the back stop nut when the armature is attracted toward the core 1 since the insert will follow the travel of the armature until it is arrested by its engagement with the retaining lip 33 or ring 34 and thereafter, the armature will easily break away from the outer face of the hub portion 27 of the insert. The outer face of the hub portion 27 being of small area and the insert having a tendency to slightly vibrate due to the movement of the armature in its releasing motion, the suction which may exist between the face of the hub portion and the surface of the armature due to sticky deposits thereon or due to the fact that such surfaces are worn smooth will be so reduced that no appreciable delay in the attraction of the armature toward the core and the consequent operation of the relay contacts will result.

What is claimed is:

1. In an electromagnetic structure having a core and an armature cooperating therewith, a back stop for adjusting the air-gap between said armature and said core comprising a screw and a nut thereon, said nut having a cylindrical recess therein, the junction between the bottom and cylindrical walls of which is coved, and a cylindrical captive insert in said recess with which said armature engages having the junction between its inner face and cylindrical wall 30 rounded off for sliding engagement with the coved portion of said recess.

2. In an electromagnetic structure having a core and an armature cooperating therewith, a back stop for adjusting the air-gap between said armature and said core comprising a screw and a nut thereon, said nut having a cylindrical recess therein, the junction between the bottom and cylindrical walls of which is coved, and a cylindrical captive insert in said recess with which said armature engages, the junction between the inner face and cylindrical wall of which is rounded for producing in conjunction with the coved portion of said recess a lateral movement of said insert within said recess, and said insert having a central opening therein through which said screw passes of sufficient diameter to permit the lateral movement of said insert.

3. In an electromagnetic structure having a core and an armature cooperating therewith, a back stop for adjusting the air-gap between said armature and said core comprising a screw and a nut thereon, said nut having a recess therein, an insert movable inwardly and laterally within said recess, and a ring secured to the outer face of said nut for retaining said insert within said recess.

4. In an electromagnetic structure having a core and an armature cooperating therewith, a back stop for adjusting the air-gap between the armature and said core comprising a screw and a nut adjustable thereon, said nut having a recess therein provided with a constricted opening through the face of said nut and a plug having a head portion larger than said constricted opening movably positioned in said recess and having a shank extending through said opening with which said armature engages when said armature is released to its normal position, said plug having a central opening therethrough through which said screw passes of sufficient diameter to permit lateral movement of said plug within said recess.

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