Jan. 23, 1951 B. A. WALLACE 2,538,814

ELECTROMAGNETIC RELAY ARMATURE RETAINING CLIP

Filed Dec. 20, 1946

FIG. 1

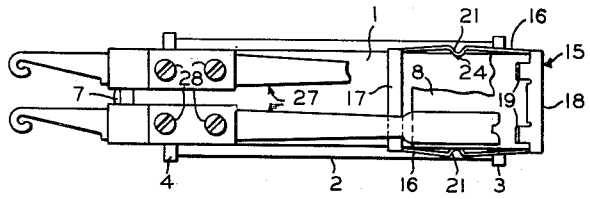


FIG. 2

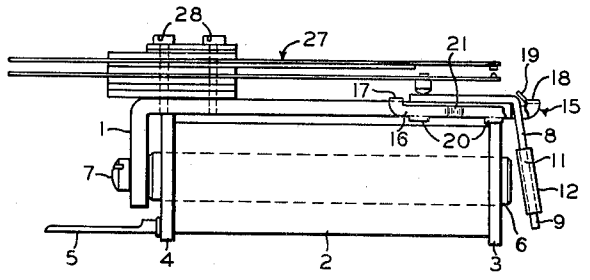


FIG. 3

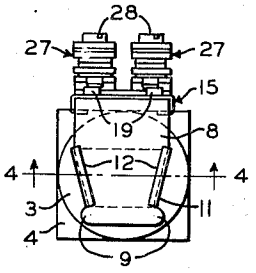


FIG. 4

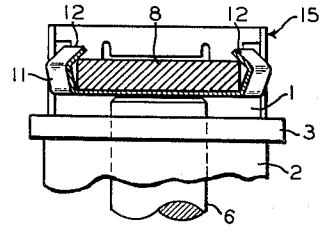
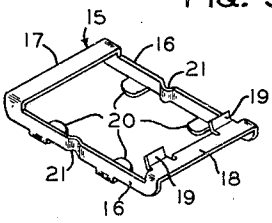


FIG. 5



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ELECTROMAGNETIC RELAY ARMATURE RETAINING CLIP

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2 Claims. (Cl. 175—336)

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This invention relates to electromagnetic relays, particularly of the general type commonly used in telephone switchboards. Its general object is to provide an improved relay which is of sturdy construction, is reliable in operation, and may be economically produced.

A specific object is to provide a simple and reliable arrangement for pivotally securing a bell-crank armature to the end of the magnetic return plate.

A further object is to provide a simple and reliable so-called residual air-gap arrangement for stopping the forward motion of the armature when it reaches a predetermined position short of completely closing its operating air gap, whereby the tendency for the armature to remain operated by residual magnetism may be controlled.

According to one feature of the invention, the improved electromagnetic relay is provided with an armature-retaining clip which, on being slid into position, grips the return plate to hold the armature pivotally in position thereon.

According to another feature, a so-called residual plate of the desired thickness is detachably secured to the forward side of the armature. Integral portions of the plate grippingly embrace the armature to retain the plate, the plate structure being flexible to permit it to be slid on and off the armature.

Other objects and features of the invention mainly incidental to the foregoing, will appear as the description progresses.

The accompanying drawings, comprising Figs. 1 to 5, show views of an electromagnetic relay embodying the invention.

Figs. 1 to 3 are respectively a top view, a side view, and a front view of the relay.

Fig. 4 is an enlarged view with parts sectioned along line 4—4 of Fig. 3.

Fig. 5 is a perspective view of the armature-retaining clip.

Referring to Figs. 1 to 3, the relay has a pair of switch assemblies 27 mounted thereon. The remaining parts include L-shaped magnetic return plate 1, electromagnet 2, bell-crank armature 8, with attached residual plate 11, and armature-retaining clip 15.

Electromagnet 2 includes the usual magnetic core 6, tapped at the rear to receive screw 7 which secures it to the vertical portion of return plate 1. The electromagnet is illustrated as having a round front spool head 3 and a square rear spool head 4, seen in profile in Fig. 2. As many winding terminals 5 as desired may be located along the lower edge of rear spool head 4.

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The upper limb of return plate 1 extends parallel with electromagnet 2 and is provided with an armature-retaining clip 15 for pivotally securing an L-shaped armature 8 to its fulcrum, the upper front edge of the return plate. Sideward motion of the armature is limited by side members 16 of retaining clip 15. Tabs 19 restrain upward and forward movement of the armatures away from its illustrated position, leaving it free to turn through the small angle required for operation and restoration of switch assemblies 27. Switch assemblies 27, held to plate 1 by screws 28, include spring blades of usual construction tensioned to stand in normal position, and to move to alternate position responsive to an upward thrust imparted by the horizontal arm of the armature. As illustrated, each assembly includes a pair of normally open contacts closed incident to armature operation.

When electromagnet 2 of the relay is energized, the generally vertical, but outwardly inclined, lower limb of armature 8 is attracted toward its pole member, thereby rotating the armature (clockwise as seen in Fig. 2) about the front end of plate 1 as a fulcrum, to actuate the switch assemblies 27 in the usual manner, against the tension of the contact springs therein. The armature movement is stopped at a predetermined position short of complete closure of its operating air-gap (between parts 8 and 6) by non-magnetic residual plate 11. Deenergization of electromagnet 2 permits the armature to be returned to its illustrated normal position by the spring tension stored in switch assemblies 27.

Referring to Figs. 1, 2, and 5, the armature-retaining clip 15 may be made of a single piece of relatively thin non-magnetic sheet material. Its two side members 16 are interconnected by a rear cross member 17 and a front cross member 18. The rear cross member 17 rests on the top surface of return plate 1, while side members 16 extend along the edge of the return plate and are provided with two pairs of positioning tabs 20 which engage the under side of the return plate. Side members 16 are provided with rounded rib portions 21 which spring inwardly into notches 24 in return plate 1 when the retaining clip is slid longitudinally into position. The upward and rearwardly extending tab portions 19 are preferably tangent to the curved portion of the armature, and so positioned as to lie nearly in contact therewith along a line parallel to the fulcrum line but located upwardly and outwardly therefrom.

Parts 19 are thus normally out of contact with

the armature, but act to stop either upward or outward movement thereof away from its normal position with respect to the upper front edge of return plate 1.

Armature 8 is readily removed by sliding clip 15 forward, as when the armature is to be replaced by another one, or when it is to be adjusted as to the angle, to increase or decrease the stroke.

Non-magnetic residual plate 11, interposed between the armature and magnetic core member 6, has side portions 12 bent up therefrom to engage the armature to hold the residual plate in place. To facilitate installation and removal of plate 11, the depending limb of armature 8 has a tapered profile above retaining ears 9. The residual plate 11 has a similar taper. Side portions 12 are formed inwardly to grip the front edge of the armature.

Plate 11 is readily assembled to the armature by first placing the upper portion of the plate at the lower portion of the armature taper, and moving the plate upwardly and outwardly until it snaps into its illustrated position. Plate 11 is readily removed by forcing it rearwardly away from the armature.

Residual plate 11 is required to be provided in each of several thicknesses to meet the varied relay requirements as to release characteristics. Moreover, the exact plate thickness required often has to be determined by trial for a specific relay. The disclosed construction, besides providing an economical arrangement for relays where the required thickness is known in advance, permits several plates 11 of varying thickness to be tried successively until the desired release characteristic is obtained.

I claim:

1. In combination, an electromagnet and a support plate overlappingly fixed therewith, a bell-crank armature fulcrumed on the front edge of the support plate with its first arm extending downwardly into operative relationship with the electromagnet and its second arm extending rearwardly in overlapping relationship with the upper face of the support plate, the two arms of the armature joining along the front edge of the support plate, and an armature-retaining clip and means fixing it with the support plate in parallel relationship thereto, the clip having a forwardly extending portion providing a lower surface generally parallel to the upper face of the support plate, said lower surface progressing in a smooth curve to merge with a retaining surface for the armature opposed to the armature-supporting edge of the support plate and lying at similar angles to the two arms of the armature.

2. A clip, for retaining a bell-crank armature on its fulcrum, comprising a single-piece structure including side arms rigidly interconnected at the front by a front cross member and at the rear by a rear cross member, the side arms extending along respective lines lying in the same plane and being spaced to receive the armature, said cross members lying in a common plane disposed above the side members and said first plane, said front cross member having a portion disposed parallel to the first said plane and a further portion disposed at a substantial angle with respect to such plane and so located as to restrain the armature from moving bodily away from its fulcrum.

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