Oct. 29, 1957 E. L. EARLE 2,811,681

ARMATURE KEEPER FOR AN ELECTROMAGNETIC RELAY

Original Filed Oct. 26, 1950

FIG. 1

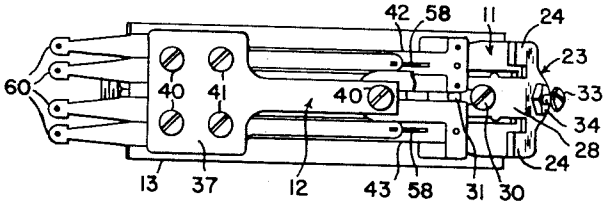


FIG. 2

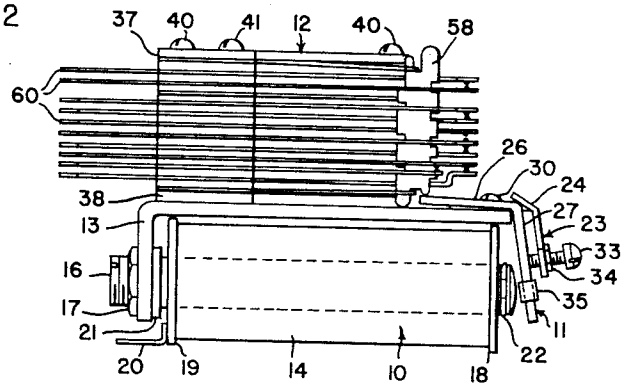


FIG. 3

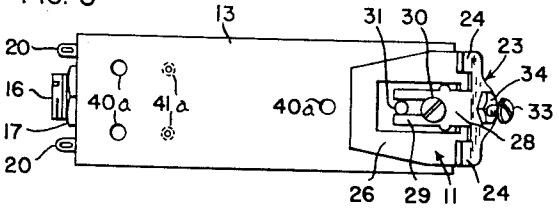
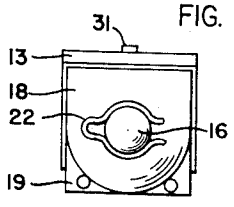


FIG. 4



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2,811,681

ARMATURE KEEPER FOR AN ELECTRO-MAGNETIC RELAY

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Original application October 26, 1950, Serial No. 192,260. Divided and this application December 2, 1953, Serial No. 395,717

1 Claim. (Cl. 317—198)

This invention relates to an armature keeper for an electromagnetic relay, particularly of the type used in telephone switchboards. Its principal object is to provide a new and improved retaining structure which facilitates maintenance of the armature keeper aligned in its desired adjusted position while being secured in that position.

General description

This application constitutes a division of my prior application, Serial No. 192,260, filed October 26, 1950, for a General Purpose Relay, now Patent No. 2,686,850.

In the relay construction to which this invention is directed, a relay comprises essentially (1) a spring stack, (2) an armature for operating it, and (3) an electromagnet for controlling the armature. The electromagnet has a return plate on the end of which the armature is rotatably held by an armature keeper secured to the return plate by a screw. A specific object of the invention is to maintain the keeper aligned in its desired adjusted position while its securing screw is being tightened.

In carrying out the stated specific object, the upper surface of the magnetic support plate has a raised guide aligned with the securing screw, and the armature keeper has a notched-out portion, or slot, which receives both the screw and the guide. A feature of this construction is that approximate alignment of the keeper with the armature is assured in addition to the prevention of rotation of the keeper out of its position of adjusted alignment when the securing screw is being tightened.

Other objects and features will appear as the description progresses.

Fig. 1 is a plan view of a relay embodying the invention.

Fig. 2 is a side elevation view of the relay of Fig. 1.

Fig. 3 is a plan view of the device with the switch assembly removed.

Fig. 4 is a front elevation view of the structure of Fig. 3 with the armature assembly removed.

Referring particularly to Figs. 1 and 2, the relay includes an electromagnet **10**, its armature **11**, a twin stack switch assembly **12** both stacks of which are actuable by the electromagnet through the armature, and an L-shaped return plate **13** on which the switch assembly and armature are mounted.

The electromagnet **10** includes a coil **14** and a cylindrical magnetic core **16** extending therethrough. The rear end of the core is threadedly received within an opening in the vertical portion of the return plate **13**, rendering it longitudinally adjustable. A locknut **17** is provided to retain the core in a desired longitudinal position of adjustment.

The electromagnet **10** has a rounded front spoolhead **18** flat on its upper edge, and a square rear spoolhead **19** which may be seen in profile in Fig. 4. The flat edges of the spoolheads retain this coil against rotation by reason of the squared relation of one edge of each with the under surface of the horizontal portion of the return plate **13**.

Rearwardly extending winding terminals **20** for coil **14** are located in a row along the lower edge of the rear spoolhead **19**. The upstanding base portions of the terminals are kept out of engagement with the vertical rear portion of the return plate **13** by an insulating spacing collar **21**, which encircles the core **16** between the return plate **13** and the spoolhead **19**.

The coil is retained in its longitudinal position at the front of the electromagnet by a spring clip **22** engaged within an annular groove in the front portion of the core.

As shown in Figs. 1, 2, and 3, the armature is held in position at the front of return plate **13** by a keeper-member **23**. The keeper-member **23** is provided with a pair of arms **24** preferably disposed, as shown in Fig. 2, so that they make about equal angles with parts **26** and **27** which comprise the angularly disposed arms of the bell-crank armature **11**. The smooth working surfaces of such arms bear against the bent portion of armature **11** to prevent its upward or forward displacement. As shown in Figs. 1 and 3, lateral movement of the armature is prevented by the rounded side portions of portion **28** of the keeper. This method of mounting the armature insures its reliable operation when mounted in any desired altitude.

To enable the keeper-member **23** and armature to be mounted on the return plate, an aperture or cut-out portion is provided in the arm **26** of armature **11** through which a flat bifurcated extending portion **28** of the keeper may be fastened to the return plate **13**. The bifurcated extension portion comprises a pair of arms **29** defining a slot within which a fastening screw **30** is snugly accommodated for threaded engagement with a hole in the top of the return plate **13** so that the arms **29** can be either tightened against the return plate or slidably disengaged from the return plate upon loosening the screw **30**.

A raised cylindrical guide portion **31** is formed on the upper surface of the return plate just behind the screw **30** and underlying the front part of the switch assembly by a semi-perforating operation on the under side of the return plate. The raised portion **31** cooperates with the slot in the armature keeper to key it against rotation while the retaining screw **30** is being tightened in place. Besides keying the keeper against rotation the raised portion **31** is also used as a guide to locate the keeper in proper position for association with the armature **11**. That is, while the keeper **23** is being mounted, the screw **30** and the raised perforation **31** both act to automatically align the keeper laterally by reason of their fixed location one behind the other on the return plate **13** and their snug fit within the slot formed in the keeper extension **28** by the arms **29**. The length of the slot may be made such that the keeper can be longitudinally positioned by merely sliding it rearwardly until the end of the slot hits the screw **30**. With such an arrangement, mounting and removal of the keeper and armature may be effected without complete removal of the screw **30**, and both parts may be mounted on the return plate without the need for special lateral or longitudinal aligning procedures.

In its deenergized state, the normal or back-stop position of the armature is regulated by the setting of the screw **33** in the keeper-member **23**, while a locknut **34** associated therewith locks the screw **33** in a desired position. A U-shaped residual plate **35**, shown in Fig. 2, is applied to the armature and then crimped in place to appear as shown. Such plate, when employed, lies between the core and the armature. By striking the core, it holds the armature out of contact therewith to insure that a desired amount of operating air gap remains unclosed with the armature in fully operated position. This is commonly referred to as the residual gap which has a length determined by the thickness of plate **35**, and controls the release characteristic of the relay, as is commonly known.

The twin-stack switch assembly of Figs. 1 and 2 includes a cap-plate 37, base plate 38, and parts clamped between them by screws 40 which pass through openings in the cap-plate and intervening parts to the base plate, wherein they are threadedly received. Two opposed columns 42 and 43 of the contact sets are included in the same unitary assembly 12. This construction enhances rigidity and reduces the number of assembly and clamping screws required. The switch assembly is readily installed in position on return plate 13 and are simply secured by two mounting screws 41 which pass through the assembly for threaded engagement with apertures 41*a* in the upper surface of the return plate. The switch assembly lies flatly upon the return plate with the protruding ends of clamping screws 40 thereof being received in provided clearance openings 40*a* in the return plate.

The traveling blades of both columns are moved by a pair of similar actuating ladders 58, as shown in Figs. 1 and 2, which move the blades into and out of electrical contact with the fixed blades of their respective contact sets in response to movement of the associated armature. The ladder 58 which is provided for column 42 is actuated simultaneously with the ladder 58 of column 43 by the armature 11. Each of the contact blades of columns 42 and 43 has a terminal portion 60 for the attachment of circuit wires. The terminals are staggered as shown in Fig. 1 for wiring convenience.

Upon energization of the electromagnet 10, the associated armature 11, turns about its axis to bring its lower attracted portion 27 into contact with the dome end of the core 16 which provides an adjustable front stop for the armature.

Upon deenergization of the electromagnet, the downward tension, of the associated traveling blades of the switch assembly serve to return the armature to its normal position, and as indicated, the normal or back stop position of the armature is regulated by the setting of screw

33. Turning the screw in the opposite direction permits a more expanded return movement of the armature. Locknut 34, when tightened, locks screw 33 in the desired position which in many instances will be dependent upon the residual gap which will provide the operating timing desired.

I claim:

In an electromagnetic device, a return plate, an electromagnet, means securing said electromagnet to said return plate, an armature pivotally supported on said plate, said armature having an aperture therein through which said plate is made accessible, an armature keeper for holding said armature in operative relation with said electromagnet, said keeper having an elongated portion extending through said armature aperture for engagement with said plate, the last said portion having a relatively long open-end slot extending longitudinally inwardly from the end thereof, said plate having a raised portion snugly engageable within the outer end portion of the said slot, means for securing said elongated keeper portion to said plate, said keeper securing means being adapted to make association with said plate through the inner end portion of said slot and in alignment with said raised portion, thereby providing means for aligning both said keeper and armature in predetermined operative relation in said device and permitting removal and replacement of the keeper by merely loosening the keeper securing means without removal thereof.

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