Sept. 11, 1934. D. D. MILLER 1,973,090

ELECTROMAGNETIC SWITCHING DEVICE

Filed March 29, 1933

FIG. 1

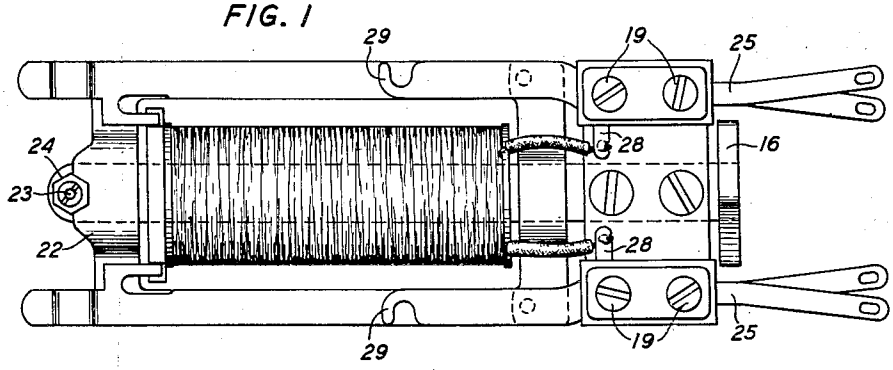


FIG. 2

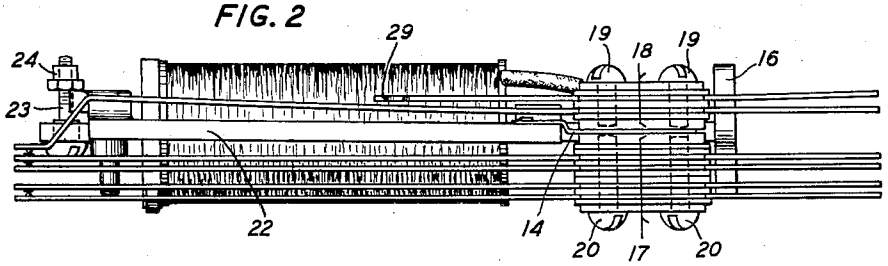


FIG. 3

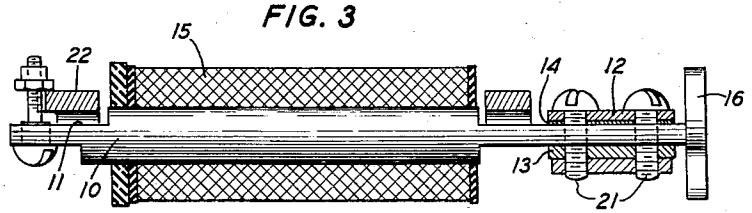


FIG. 5

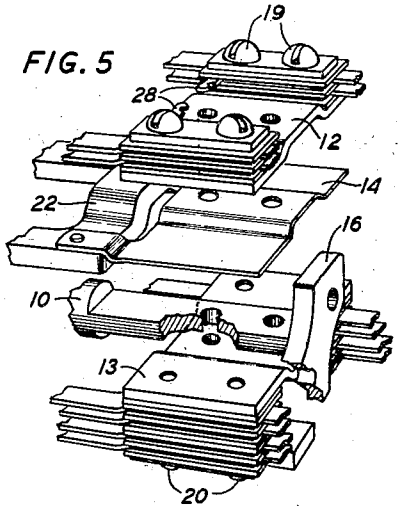
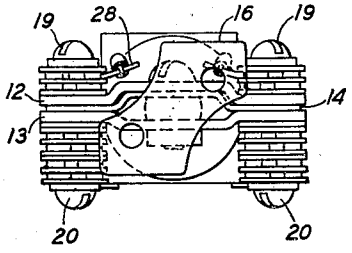


FIG. 4



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ELECTROMAGNETIC SWITCHING DEVICE

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12 Claims. (Cl. 200—104)

This invention relates to electric switching devices and more particularly to electromagnetic relays.

In electrical systems generally and in telephone systems particularly, the electromagnetic relay plays an important part and is one of the most extensively employed switching devices in communicating systems.

In all modern industries, for example, the automobile industry, where the manufactured product is constituted of a plurality of independently and separately developed parts, it has been found practicable to design the independent parts in such a manner that they readily adapt themselves to straight-line assembly methods.

The electromagnetic relay is essentially made up of a core, coil, armature, contact springs and mounting bracket, the last serving to support the contact springs. To adopt straight-line assembly methods in the manufacture of relays, it is therefore necessary that each of the constituent parts be designed as a separate unit and in such a manner that such parts may be carried in stock as complete entities, to be selected and assembled in progressive steps to form the final desired structure.

Heretofore, in the design of the well known flat-type relay, it has been impossible to effect a complete assembly by progressive assembly methods. Owing to the particular conformation of the flat-type relay core, which is provided at one end with an enlarged pole-face area and at the other end with integral lateral projections forming mounting means for the contact springs, it was impossible to provide for the use of form-wound coils or coils which were wound prior to their assembly on the core.

Another difficulty heretofore experienced in connection with straight-line assembly methods as applied to relay construction was the fact that it was desirable to pre-assemble various contact spring combinations so that they could be mounted as units on the relay rather than build the combination on the relay, one spring element at a time.

It is, accordingly, the object of this invention to improve the design of flat-type relays to permit the use of form-wound coils, and pre-assembled spring combination units and to provide for the complete assembly of the relay parts in accordance with modern progressive assembly methods.

This object is attained in accordance with features of the invention by the provision of a relay core having a flattened or cut-away front end portion to provide a relatively large pole-face area and to permit a form-wound coil to be slipped over the core from the front end, and a pair of contact-spring-supporting plates provided with centrally disposed and opposing recessed portions which cooperate to form a housing for the rear end portion of the core. The provision of two contact-spring-supporting plates renders it possible to pre-assemble and mount the contact springs on the relay and to permit the removal of either the upper or lower spring combination without disturbing the entire contact spring assembly.

Another feature of the invention resides in the use of forwardly extending short spring members mounted on one side of the relay which serve as terminals for the relay coil winding. These springs are provided near their forward ends with projecting lugs or test clip prongs, and nearer their rear ends with upturned lugs to which the coil ends are soldered. The provision of the test clip prongs on the forward end of the terminal spring permits relay tests to be made in front of the relay rack and provides a convenient means of supporting the test clips.

These and other features of the invention will be readily understood from the following detailed description made with reference to the accompanying drawing in which:

Fig. 1 is a top plan view of a flat-type relay embodying the features of this invention;

Fig. 2 is a side elevation of the relay structure shown in Fig. 1;

Fig. 3 is a view similar to that of Fig. 2 with certain elements of the relay omitted and partially in section to more clearly illustrate the front and rear end construction of the core and the manner in which the separate spring-supporting brackets are supported thereon; and

Fig. 4 is a rear elevation of the relay structure shown in Figs. 1 and 2.

Fig. 5 is an exploded view of the relay rear end showing the manner in which the spring mounting brackets are mounted on the relay core.

The body portion of the core 10 is cylindrical in shape being cut away at the front end to provide a relatively large pole-face area 11 and with its rear end portion flattened out to serve as a seat upon which the two spring-supporting elements 12 and 13 are supported and between which a reed-type armature hinge 14 is clamped. A form-wound coil 15 is slipped over the core from the front end, the rear end of the core having welded thereto a mounting bracket 16.

Each of the brackets 12 and 13 independently

supports a plurality of springs, the lower bracket 13 being shown supporting the spring pile-up 17 and the upper bracket 12 supporting the spring pile-up 18. It will be noted that each pile-up has its independent set of fastening screws such as 19 and 20 and that the two brackets or plates 12 and 13 are secured to the core 10 by means of screws 21. By this construction the spring pile-ups 17 and 18 may be pre-assembled and secured to their respective plates 12 and 13 to be carried in stock as separate entities, so that when a particular spring combination is desired, the two plates 12 and 13, carrying the spring sub-combinations which cooperate to form the desired combination, are taken from stock and secured to the core end by means of the screws 21. It will also be observed that should it be found necessary to remove the lower pile-up 17 to replace it with a different sub-combination it is only necessary to remove screws 21 and lift the bracket 13 off the core. This act though freeing the upper bracket from the core does not in any way disturb the relationship of the springs which constitute the upper pile-up 18.

As seen in Figs. 4 and 5 the plates 12 and 13 are centrally arched to allow for the rear end of the core 10 to which the plates are secured.

Interposed between the upper plate 12 and the core 10 is a reed-type hinge 14 to which is secured the armature 22.

On the front end of core 10 is mounted a well known type of air-gap adjusting device comprising screw 23 and its associated nut 24.

The terminals for the coil winding consist of the two spring members 25. Each member 25 is provided with an upturned lug 28 to which is soldered one end of the coil winding. At their front ends, the terminal springs 25 are provided with an extending portion 29 which constitute test-clip prongs by virtue of which the relay may be tested conveniently by one person while in a position to observe the armature and contact spring action. Heretofore the relay was tested by means of the lugs 28 which are not accessible to the test man from the front of the relay rack so that it was necessary during tests for the test man to first apply test clips to the lugs 28 at the rear of the rack and then go to the front of the rack to observe the relay operating or else the test required the services of two men. The test clip prongs 29 provide a convenient means for permitting the relay to be tested and observed by one person.

What is claimed is:

1. An electromagnet having a cylindrical core provided at one end with a flattened pole-face and at the other with a reduced portion, a coil adapted to be slipped over the core, a pair of contact-spring-supporting brackets having opposing recessed portions which cooperate to form a housing for the reduced portion of the core, each of said brackets supporting an independent pile-up of spring contacts and an armature actuated upon energization of said coil for operating said spring contacts.

2. An electromagnet comprising a core, a coil carried by said core, a plurality of spring pile-ups, an armature for actuating said springs upon energization of said coil and a bracket for each of said spring pile-ups, said brackets being supported on said core.

3. An electromagnet comprising a core, a coil carried by said core, a plurality of spring pile-ups, an armature for actuating said springs upon energization of said coil, a bracket for each of said spring pile-ups mounted on said core, and independent fastening means for securing each of said pile-ups to its respective bracket.

4. An electromagnet comprising a core, a coil carried by said core, a plurality of spring pile-ups, an armature for actuating said springs upon energization of said coil, a bracket for each of said spring pile-ups mounted on said core, independent fastening means for securing each of said pile-ups to its respective bracket, and means for securing said brackets on said core so as to effect a single spring combination of said plurality of spring pile-ups.

5. An electromagnet comprising a core, a coil carried by said core, a plurality of spring pile-ups, an armature for actuating said springs upon energization of said coil, a bracket carried by said core and supporting a spring pile-up on one side of said electromagnet, a second bracket carried by said core and supporting a spring pile-up on another side of said core, said brackets being separately removable from said core and said pile-ups cooperating to effect a single spring combination when mounted on said core and independent fastening means for securing each of said pile-ups to its respective bracket and for securing said brackets to said core.

6. An electromagnet comprising a core, a coil carried by said core, a plurality of spring pile-ups consisting of alternate spring members and insulating separators, each of said pile-ups constituting a spring sub-combination, an armature for actuating said springs upon energization of said coil, a bracket supporting one of said spring sub-combinations on one side of said electromagnet, a second bracket supporting another of said spring sub-combinations on another side of said electromagnet, said spring sub-combinations being separately removable from said core and serving, when mounted on said core, as a single spring combination, independent fastening means for securing said spring pile-ups to their respective bracket, an armature hinge secured to said armature and interposed between said brackets, and means for securing said brackets and said armature hinge to said core.

7. An electromagnet having a core, a coil mounted on said core and terminal springs for said coil, said springs being provided with upturned lugs to which the ends of said coil are secured and with test prongs extending forwardly from said lugs and integrally formed with said springs, said forwardly extending prongs providing means for conveniently testing said coil.

8. In a relay, a magnetic core having a head portion disposed at one end thereof and a shank portion disposed at the other end thereof, a form wound coil disposed upon said core, a second head portion of magnetic material having an aperture therein for receiving said shank, and spring contacts and terminals mounted upon said second head portion and electrically connected to said coil.

9. In a relay, a magnetic core arranged to receive a form wound coil and having a head disposed at one end thereof and a shank disposed at the other end thereof, a head portion of magnetic material composed of members secured together and having diametrically opposed grooves forming an aperture for receiving said shank, and contact springs, terminals and an armature secured to said detachable head portion, the terminals being electrically associated with said coil.

10. In a relay, a core having a head portion disposed at the end thereof and a shank disposed at

the other end thereof, a form wound coil disposed upon said core, an attachable head composed of members having diametrically opposed recesses forming an aperture for receiving said shank, said attachable head portion being secured in place upon said shank, and spring contacts, terminals and an armature mounted upon said attachable head portion, the terminals being electrically connected to said coil, and said armature having a pole face disposed adjacent to one face of said first mentioned head portion.

11. In a relay, a magnetic core arranged to receive a form wound coil and having a shank integral at one end thereof and a pole face at the other end thereof, a head portion of magnetic material arranged to be clamped upon said shank and an armature secured to said head portion and having a portion extending over and facing said pole face.

12. In a relay, a magnetic core having a shank integral at one end thereof, a form wound coil mounted upon said core, a head portion of magnetic material arranged to be disposed upon and secured to said shank, and spring contacts and terminals mounted upon said head portion and electrically connected to said coil.

DANIEL D. MILLER.