

Aug. 8, 1933.

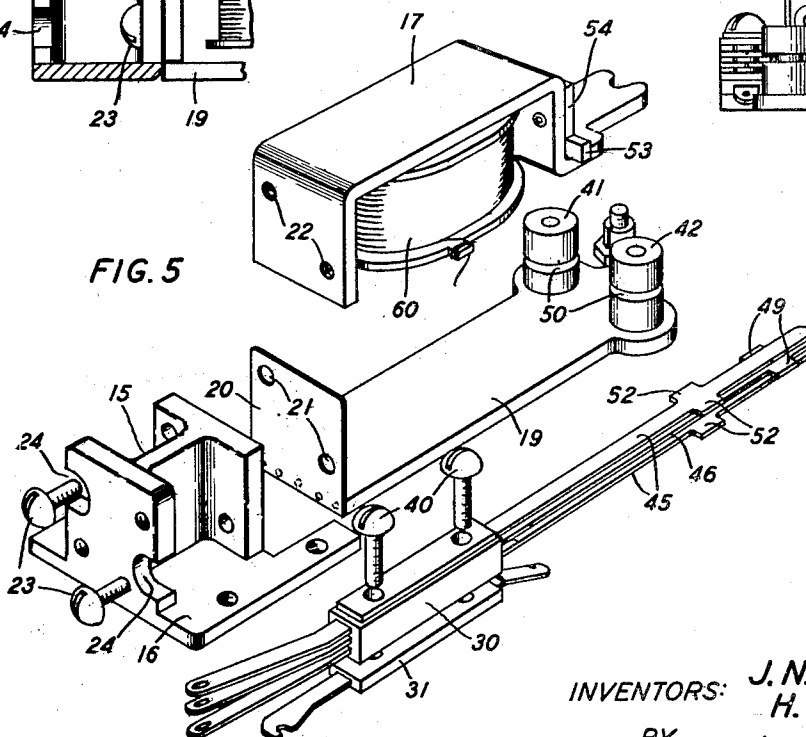
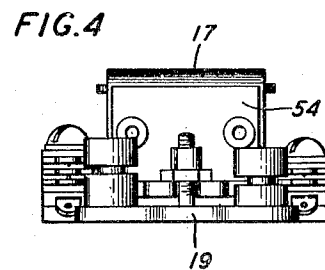
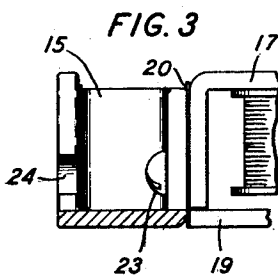
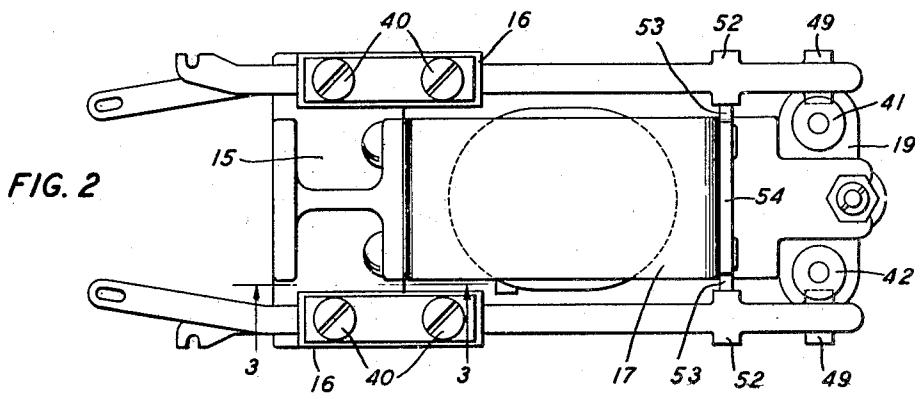
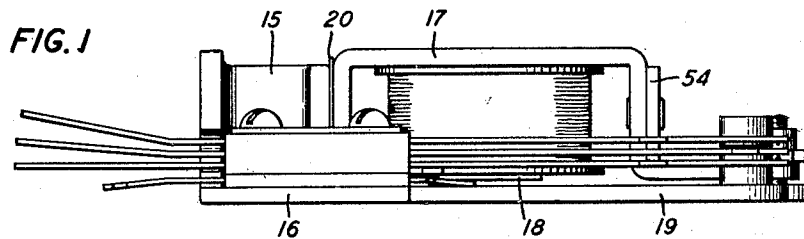
J. N. REYNOLDS ET AL

1,921,430

ELECTROMAGNETIC SWITCHING DEVICE

Filed June 19, 1930

2 Sheets-Sheet 1



INVENTORS: **J. N. REYNOLDS**
H. F. DOBBIN

BY John A. Hall
ATTORNEY

Aug. 8, 1933.

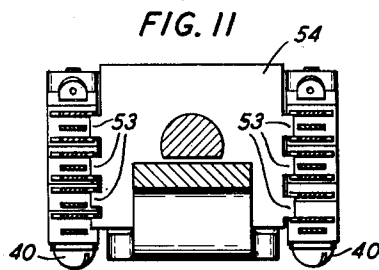
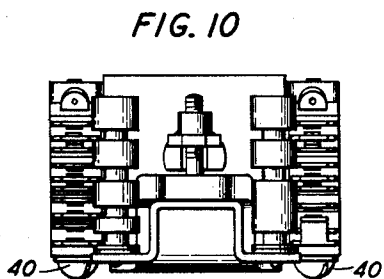
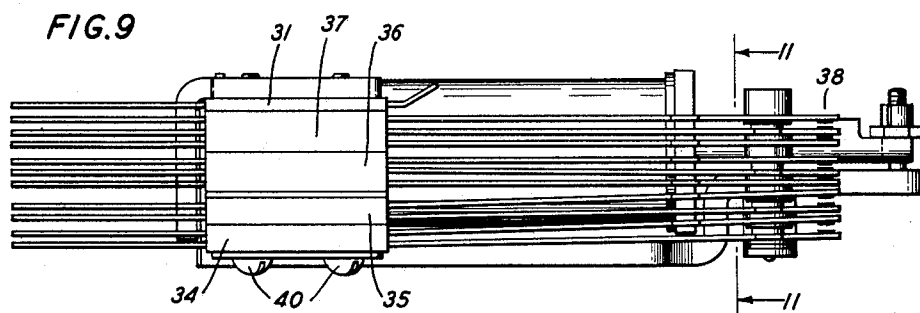
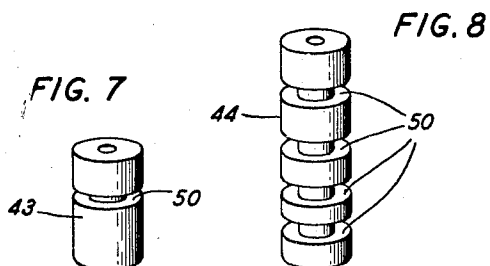
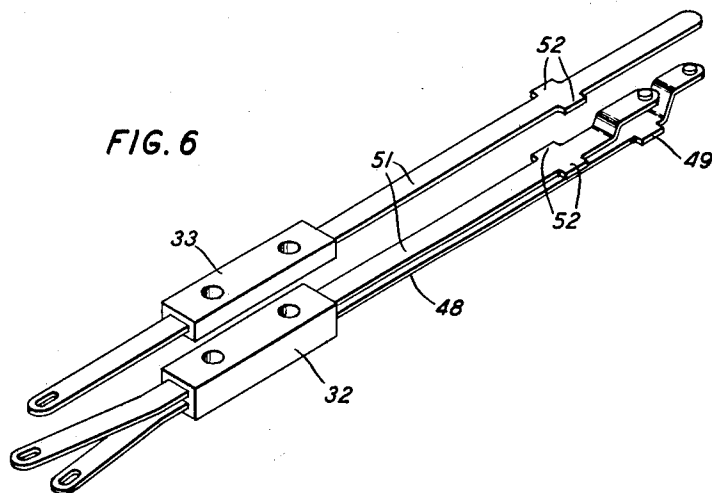
J. N. REYNOLDS ET AL

1,921,430

ELECTROMAGNETIC SWITCHING DEVICE

Filed June 19, 1930

2 Sheets-Sheet 2



INVENTORS: J. N. REYNOLDS
H. F. DOBBIN

BY *John Attall*
ATTORNEY

UNITED STATES PATENT OFFICE

1,921,430

ELECTROMAGNETIC SWITCHING DEVICE

John N. Reynolds, Princeton, N. J., and Henry F. Dobbin, New York, N. Y., assignors to Bell Telephone Laboratories, Incorporated, New York, N. Y., a Corporation of New York

Application June 19, 1930. Serial No. 462,166

9 Claims. (Cl. 200—104)

This invention relates to switching devices and more particularly to electromagnetic switching devices, commonly known as relays.

In electrical systems generally, and in telephone systems particularly the electromagnetic relay plays an important role. In the latter systems, the operations to be performed by the relay are numerous and varied and as it is necessary to provide a distinct type for each different switching function to be performed, it follows that the number of distinct types of relays employed in the telephone art is very great.

Heretofore, the theory of relay design in the telephone art has been to ascertain the circuit requirements to be met in each individual case and design a relay to satisfy these requirements, building up the complete relay on the core assembly, a part of which usually formed the mounting. This particular form of construction has resulted in the necessity of solving a new and distinct problem for each particular circuit requirement encountered, it being possible obviously, to duplicate the different designs where similar circuit requirements were encountered. However, no attempt has been made heretofore, as far as applicants are aware, to adopt a universal design of the various elements which constitute a relay structure in such a manner that, irrespective of the requirements to be met, a plurality of distinct types of relays may be assembled from a common stock of piece parts and partial-assembly units, a procedure very desirable from modern manufacturing and straight line assembly view points, so essential where quantity of production as well as quality is necessary.

It is, accordingly, an object of this invention to produce relay piece parts and partial assembly units which readily adapt themselves to be associated in various combinations to effect a plurality of relay designs having distinct operating characteristics.

This object is attained in accordance with a feature of this invention by the provision of an irregularly formed mounting bracket provided with oppositely disposed lateral shelf-like extensions which serve as seats for the spring pile-ups. The main body portion of the mounting bracket is of an I-beam section which readily permits the assembly of the relay core or yoke thereto and its own assembly to the relay rack.

Another feature of the invention resides in the provision of unit type molded springs. The springs are molded in units of one, two or three

so that any desirable spring combination may be effected by superposing the units one on top of the other in various combinations.

A further feature of the invention is embodied in the spring design. Each spring is provided with a set of stop tangs or operating tangs on each side thereof, thereby rendering the spring units interchangeable and readily adaptable to service on either side of the relay structure.

A still further feature resides in the provision of grooved armature studs secured to either side of the armature and cooperating with the operating tangs on the contact springs to transmit the movement of the armature to the active or movable springs.

Still another feature of the invention resides in the provision of individual stop cards each provided with a plurality of projections which cooperate with the stop tangs on the stationary springs and serve as spacing elements for the springs.

Another feature of the invention is embodied in a reed type armature mounting in which the reed extends at right angles to the long axis of the armature and is clamped between the relay heel piece and the mounting bracket. This method of mounting the armature precludes the possibility of any longitudinal axial rotation of the armature heretofore experienced with the usual reed type armature mountings.

A further feature provides for the use of form wound coils mounted on the relay cores which may vary in size depending upon the electrical characteristics desired.

These and other features not heretofore specifically identified will readily appear from the following detailed description made with reference to the accompanying drawings in which Fig. 1 is a side elevation of a flat type relay embodying the features of the invention;

Fig. 2 is a plan view of the relay disclosed in Fig. 1;

Fig. 3 is a fragmentary view showing the method employed in mounting the relay armature;

Fig. 4 is a front end view of the relay in Fig. 1;

Fig. 5 is an exploded perspective of the relay shown in Fig. 1 showing the various units of which the relay is composed;

Fig. 6 is a perspective view of two of the molded spring units;

Figs. 7 and 8 show two distinct types of armature studs;

Fig. 9 is a side elevation of a round type re-

lay embodying the features of the invention; Fig. 10 is a front end view of the relay shown in Fig. 9; and

Fig. 11 is a section taken along the line 11—11 in Fig. 9 and looking in the direction of the arrows.

The following description is directed to the flat type relay, reference being made to Figs. 1 to 5 inclusive.

10 An irregularly shaped mounting bracket 15 may be considered as consisting of two integrally formed portions, a main body portion of an I-beam section and a flat base portion constituting two lateral shelf-like projections 16.

15 The magnetic circuit of the relay is made up of a substantially U-shaped yoke 17 with which is integrally associated the magnet core 18 located mid-way of the yoke ends and in alignment therewith, and the armature 19. The

20 armature 19 is provided with a reed-type hinge 20, preferably spot-welding to one edge thereof, and extending at right angles to the longitudinal axis of the armature 19. In assembling the elements of the magnetic circuit, the armature

25 hinge 20 is placed up against one face of the main body portion of the mounting bracket 15 with the diagonally disposed holes 21 aligning with corresponding holes in the mounting bracket 15. In this position the edges of the armature fit between and are in alignment with the inner edges of the shelf-like extensions 16. The

30 yoke unit is then placed in position, with the holes 22 aligning with the holes 21 in the armature hinge 20, and screws 23 are drawn up, joining the elements of the magnetic circuit to the mounting bracket. It will be noted that the notches 24 in the mounting bracket 15 are large enough to allow the heads of screws 23 to pass and to permit a crew driver to be readily applied thereto to secure the elements of the magnetic circuit to the mounting bracket.

The shelf-like extensions 16 of the mounting bracket 15 serve as seats for the unit spring pile-ups 30 and 31. Each spring unit, such as 30, constitutes a distinct molded spring combination, interchangeable with respect to the side of the armature with which it functions and also with respect to its position relative to the other units with which it is combined. Each

45 unit comprises one or more contact spring elements thereby constituting a sub-combination, a plurality of which may be associated in various ways to effect any desired predetermined spring combination. This feature is more clearly exemplified in Figs. 6 and 9. The spring combination 38 shown in Fig. 9 is made up of four sub-combinations 34, 35, 36 and 37, each a unit in itself, independently molded. It has been determined that substantially every spring combination (such as 38), heretofore finding application in the telephone art, may be effected by combining units of one, two and three springs, as shown in 32, 33, and 37 in various combinations. When a predetermined spring combination is desired, it is only necessary to determine what sub-combinations must be employed and how they are to be relatively disposed. The required sub-combinations are then placed upon

60 the shelf-like extensions 16 and the screws 40 made up, it being understood that the extensions 16 are tapped to receive these screws. The molded units 31 serve as terminal springs for the coil windings.

75 Each spring combination has a corresponding

armature stud such as 41, 42, 43 (Fig. 7) and 44 (Fig. 8) which is riveted to the end of armature 19 as shown in Fig. 5. The spring sub-combinations consist of an active or movable contact spring such as 45, or a passive or stationary contact spring such as 46 or a combination of movable and stationary springs. The movable springs, such as springs 46 and 48, are each provided with a set of operating tangs 49 which are housed in the grooves 50 of the armature studs. The purpose of the double tang is to render the spring units interchangeable, the tang on one side of the spring fitting into the groove in the stud regardless of on what side of the structure the spring unit is mounted.

The use of a single armature stud on either side of the armature obviates the necessity of providing each spring with an individual stud as has been the practice heretofore and provides each movable spring with a direct connection with the armature. Heretofore, but one spring was actuated directly by the armature, the other movable springs receiving their motion indirectly from the armature through the medium of a superimposed spring and its associated individual stud, a practice which necessitated the punching of a hole in the intermediate stationary contact spring to permit the free passage of the spring stud therethrough. This feature of applicants' invention simplifies the manufacture of the spring elements and readily adapts itself to straight line assembly methods which is a desirable characteristic of the unit type design.

The stationary spring elements such as 45 and 51 are also provided with a double set of stop tangs 52 which render the stationary springs also interchangeable. The stop tangs 52 engage lateral projections 53 which are integral portions of the insulating stop cards 54. The stop card shown in Figs. 1, 2, 4 and 5 is riveted to front face of the yoke 17. It is understood that each spring combination requires a different design of stop card, the number of projections 54 depending upon the number of stationary spring elements, such as 45, required by the spring combination desired.

The means for adjusting the air-gap may be any of the well known types, the screw and nut combination disclosed being preferred.

Form wound coils 60 are employed with this type of relay design as being desirable from an assembly viewpoint as well as from a viewpoint of efficiency.

In the flat type design disclosed in Figs. 1 to 5 inclusive the yoke ends and the end of the core opposite the armature are put through a single grinding operation to perfectly align these surfaces which increases the efficiency of the relay from a magnetic viewpoint.

The relay design shown in Figs. 9 to 11 inclusive, is of the round type and distinguishes from the flat type, hereinbefore described, only in the arrangement of the elements which constitute the magnetic circuit, the core in the round type occupying a position immediately above the armature and its axis being in a plane parallel to the plane of the longitudinal axis of the armature. The molded spring units and the armature studs are common to both types.

In both relay designs large pole areas have been resorted to with a view towards increasing the operating efficiency of the devices.

From the foregoing description it is apparent that applicants have not only perfected a high-

ly efficient electromagnetic relay but have resorted to certain novel structural details which are interchangeable throughout and which readily lend themselves to modern manufacturing and progressive assembly methods, structural details which are made up as units and which may be stored in large quantities and readily associated in various combinations to effect various types of relays having different operating characteristics.

What is claimed is:

1. In a relay the combination of a magnetic circuit comprising a core, yoke and armature, a mounting bracket consisting integrally of a main body portion and a plurality of shelf-like extensions, a resilient mounting member secured to one end of said armature and extending at right angles to the longitudinal axis thereof and interposed between the main body portion of said mounting bracket and a portion of said yoke, means for clamping said resilient mounting member in position and securing the elements of said magnetic circuit as a unit to the main body portion of said mounting bracket, and a plurality of contact spring units supported by and secured to the shelf-like extensions of said mounting bracket.

2. In a relay, the combination of a mounting bracket, a magnetic circuit comprising an armature, core and yoke supported by said bracket, a plurality of contact springs mounted on said bracket and extending in a plane parallel to the longitudinal axis of said armature, tangs on said contact springs, an insulating member permanently secured to said armature and provided with a plurality of circular grooves into which the tangs on said springs fit, said insulating member serving to transmit the movement of said armature to said contact springs and means for effecting the movement of said armature.

3. A relay having a substantially closed magnetic circuit comprising a yoke, core and armature, a mounting bracket supporting the elements of said magnetic circuit as a unit, a plurality of interchangeable molded contact spring units secured to said mounting bracket, certain of the contact springs being provided with laterally extending tangs on both sides thereof for cooperation with said armature when said springs are placed on either side thereof, and means for energizing said core to effect the operation of said armature and the resulting actuating of said springs.

4. In a relay, the combination of a mounting

bracket comprising a main body portion and a shelf-like projection extending from either side of the main body portion, a U-shaped yoke, a core extending midway of the ends of said yoke and in alignment therewith, an armature operatively associated with said core and the ends of said yoke, mounting means for said armature extending at right angles therefrom and clamped between one end of said yoke and said mounting bracket and a plurality of interchangeable molded contact spring units mounted on the shelf-like projections of said mounting bracket and operatively associated with said armature.

5. In a relay, the combination of a U-shaped yoke, a core integrally formed therewith extending in alignment with the ends of said yoke and midway thereof, an armature extending over the end of said core and the aligned ends of said yoke, a mounting bracket having a main body portion and a plurality of shelf-like projections extending therefrom and in alignment with said armature, a reed type hinge secured to one end of said armature and extending at right angles to the longitudinal axis of said armature interposed between the main body portion of said mounting bracket and one end of said yoke and a plurality of contact springs mounted on the shelf-like projections of said mounting bracket.

6. A contact spring assembly for use in electric switching devices comprising a plurality of independently assembled spring sub-combinations and all of said independently assembled spring sub-combinations cooperating to form a single major spring combination.

7. A contact spring assembly for use in electric switching devices comprising a plurality of independent spring combinations placed in superposed relation to form a single major spring combination.

8. A contact spring assembly for use in electric switching devices comprising a plurality of independent spring combinations, each of said spring combinations being molded as a separate unit and all of said units combined to form a single major spring combination.

9. A contact spring assembly for use in electric switching devices composed of a plurality of contact springs, said contact springs being subdivided into a plurality of separately removable and distinct spring combinations.

JOHN N. REYNOLDS.
HENRY F. DOBBIN.