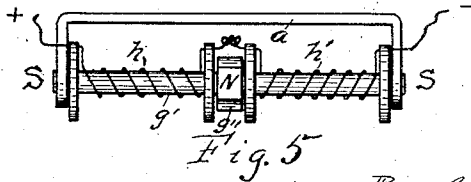
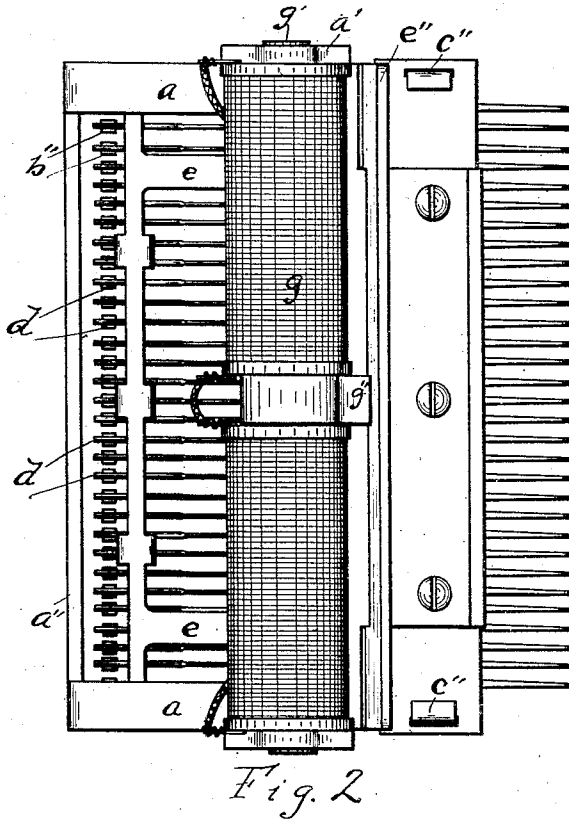
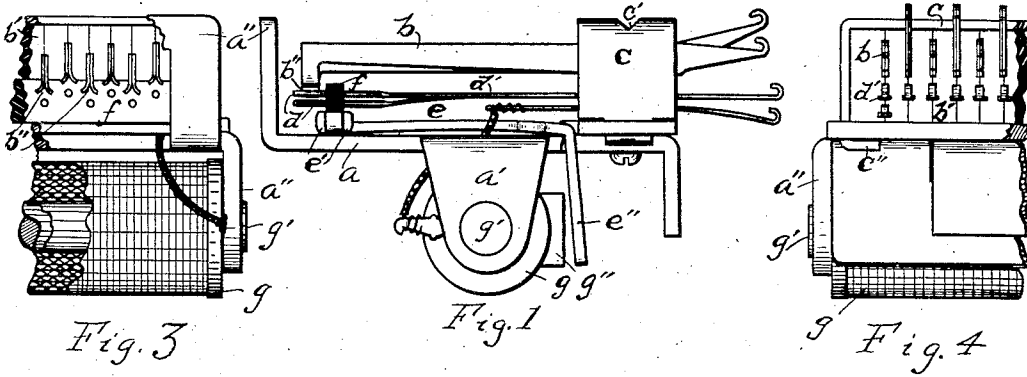


G. BABCOCK.
RELAY DEVICE.
APPLICATION FILED OCT. 6, 1913.

1,133,787.

Patented Mar. 30, 1915.



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RELAY DEVICE.

1,133,787.

Specification of Letters Patent.

Patented Mar. 30, 1915.

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To all whom it may concern:

Be it known that I, GARRISON BABCOCK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Relay Devices, of which the following is a specification.

My invention relates to improvements in multiple contact relays, and has for its object the provision of a relay device, which will combine a maximum efficiency, certainty of operation and extreme compactness in a switching device simultaneously actuating a large number of electrical contacts.

The present improvement is based upon an earlier relay device, also of my invention, wherein a single electro-magnet is employed for actuating the armature positioned parallel with the core of the electro-magnet. Terminal pole-pieces mounted at the ends of the magnet-core, substantially bridge the air gaps between said core and the adjacent armature.

In the construction above referred to, it has been found in telephone practice, to which my relay device is particularly well adapted, that the air gaps between the two terminal pole-pieces and the armature, interpose unnecessary resistance to the magnetic flux induced by normal common-battery currents. Accordingly, I have devised means for materially reducing the air-gap by confining the flux therethrough adjacent to a single area of the armature. This preferably is accomplished by winding the magnet-core to produce a consequent pole intermediately thereof and forming a closed magnetic circuit from the terminal poles, which are of like sign, through the frame and into the armature.

Another feature of my improvement present in the relay about to be explained, is a guard and skeleton-frame for the contacts, so positioned as to protect the contact springs, while rendering them freely accessible for adjustment and repair.

Details of my said improvements will be explained in connection with the accompanying drawings, wherein:—

Figure 1 is a side view in elevation, of a relay device embodying my invention. Fig. 2 is an underside plan view of the relay, Figs. 3 and 4 respectively are fragmentary

front and rear views of said relay, and Fig. 5 is a diagrammatic view illustrating the preferred winding and magnetic circuits of the relay magnet.

Throughout the several figures of the drawing, I have employed the same character of reference to indicate similar parts.

The magnet-frame is stamped from paramagnetic sheet metal, and in cross-section is approximately of Z-shape. The body *a* of said frame mounts the core of the electro-magnet by means of lateral lugs *a'*, while the forward portion of said frame is bent at right angles with the body and affords a guard *a''* positioned in front of and above the contact springs. These contact springs *b* are rearwardly mounted between insulating blocks *b'*, secured to the frame by a binding strip *c* longitudinally grooved at *c'* to engage and securely hold the insulating blocks. The contact springs are arranged in paired relation, being of L-shape in outline, with their terminals *b''* widely divergent, as best shown in Fig. 3. The ends *c''* of the binding strip are forced through openings in the frame and are bent down to hold the parts in their assembled relation. Co-acting contacts *d*, which preferably are formed of short lengths of phosphor-bronze wire rearwardly flattened to afford spring-like bodies *d'*, are also mounted between the insulating blocks *b'*, immediately below their corresponding paired contact springs. Preferably the contact springs and their co-acting contacts are mounted in staggered relation, in order to obtain compactness and permit the separation of the paired springs without short circuiting the same.

The armature *e* is of a bell-crank type, as best shown in Figs. 1 and 2, and carries at its outer extremity, a strip of insulating material *f*, bored to receive and hold the terminals of the contacts *d* in position immediately beneath the divergent ends of their respective paired contact springs. This insulating strip is held in position by means of the ears *e'*, which are pressed about said strip and closely embrace the lower portion thereof, as best shown in Fig. 1. The electro-magnet *g* is disposed parallel with the depending bar *e''* of the armature, which is pivoted upon frame *a*. The core *g'* of said electro-magnet is inserted within the perforated lugs *a'* of the frame, while a pole

piece g'' is centrally mounted thereon with its face closely adjacent to the bar e'' of the armature. The electro-magnet is differentially wound, as indicated in Fig. 5, to produce a consequent north pole, we may assume, within pole piece g'' ; windings h and h' being opposite in direction, whereby the extremities of the core will have a south polarity induced therein. Consequently, the armature and its electro-magnet have interposed therebetween; merely the single air gap separating pole piece g'' and the bar armature e'' , inasmuch as the integral frame and lugs afford negligible resistance for the flux of the magnetic lines from the south poles of the electro-magnet.

The relay constructed in accordance with my improvements is of materially higher efficiency than one employing two electro-magnets or one which affords the double air gap between pole pieces of opposite polarity and the armature, thereby better adapting the same to telephone practice, wherein currents of fixed voltage are required. Upon the excitation of the electro-magnet, armature bar e'' is attracted to the pole piece g'' and the outer extremity of the armature is raised, to enter the rounded terminals of the contacts d between the divergent extremities b'' of their co-acting contact springs. The flattened spring-like bodies d' of said contacts afford tension which retracts the armature and separates the contacts from between the paired springs, immediately the electro-magnet is deenergized.

From an inspection of Figs. 2 and 3, it will be seen that the contact-making terminals of the relay are readily accessible for inspection and adjustment, although amply protected by the guard a'' which is integral with the frame. Moreover, the electro-magnet is rigidly held in position with respect to the frame and armature, by means of the integral lateral lugs embracing the core of said electro-magnet. Again, the contact-making members are rearwardly mounted in the simplest manner possible, by means of the binding strip and the insulating blocks clamped thereby about the springs and contacts, as well illustrated in Fig. 4.

As best shown in Figs. 1 and 2, the actuating member of the bell-crank armature is slightly convex, in order to seat the extremity thereof directly upon the frame. In addition, the central portion of said member is cut away or of open construction, as is the adjacent frame, not only to render the device somewhat lighter, but permit access to the under side of the banks of contacts and contact springs.

Having now described the preferred embodiment of my invention, I claim as new and desire to secure by Letters Patent the following:—

1. In a relay device, the combination with

a frame, of a plurality of contact springs insulatingly mounted upon said frame, an electro-magnet mounted upon said frame, the windings thereon being adapted to produce a consequent median pole, an armature controlling said contact springs positioned with its axis parallel with said electro-magnet, and a pole-piece extending between the electro-magnet and the armature in the position of the consequent pole, substantially as set forth.

2. In a relay device, the combination with a paramagnetic frame, of contact springs insulatingly mounted thereon, an electro-magnet mounted upon the frame with its core in closed magnetic circuit therewith, the windings of said electro-magnet being differential and adapted to produce a consequent intermediate pole, an armature controlling said contact springs and positioned upon the frame parallel with said electro-magnet, and a pole-piece substantially bridging the gap between the armature and the intermediate magnetic pole, substantially as set forth.

3. In a relay device of the class described, the combination with a paramagnetic frame, of a plurality of contact springs thereon, a straight-core electro-magnet having differential windings positioned to produce a consequent pole intermediately of the core, a bell-crank armature pivoted upon the frame and having its conductive member positioned parallel with said electro-magnet, means associated therewith for actuating the contact springs, and an extension pole-piece bridging substantially the distance between the consequent magnetic pole and the armature, substantially as set forth.

4. In a relay device, the combination with an electro-magnet and its armature, of an integral paramagnetic frame mechanically and magnetically connected with the extremities of the electro-magnet core, and pivotally mounting the armature in closed magnetic circuit with the core, a pole-piece bridging substantially the distance between the armature and the core, and contact springs connected for actuation by the armature, substantially as set forth.

5. In a multiple-contact relay, the combination with an actuating electro-magnet, of its armature, a plurality of contact springs controlled by said armature, and an integral frame mounting the foregoing members in operative position; said frame having an integral protective guard bent up adjacent to the free ends of the contact springs, substantially as set forth.

6. In a multiple-contact relay, the combination with an actuating electro-magnet, of its armature, a plurality of contact springs controlled by said armature, and an integral frame mounting the foregoing members in operative position; said frame being cut

away beneath the contact springs and having a protective guard positioned adjacent to their free ends, substantially as set forth.

7. In a multiple-contact relay, the combination with a plurality of banks of contact terminals, of an electro-magnet disposed at right angles to said terminals and positioned at a distance from their free ends, an armature connected to flex the banks of contact terminals into and out of electrical engagement and pivoted adjacent to the fixed ends of said banks of terminals, and a pole-piece bridging substantially the space between the armature and electro-magnet-core, substantially as set forth.

8. In a multiple-contact relay, the combination with an actuating electro-magnet, of its armature, a plurality of contact springs controlled by said armature, and a sheet metal frame having a protective guard positioned adjacent to the full ends of the contact springs and integral lugs from which said electro-magnet is supported, substantially as set forth.

9. In a multiple-contact relay, the combination with a sheet metal frame comprising a body portion, an open skeleton guard bent up therefrom and supporting lugs oppositely bent from said body portion, of an electro-magnet secured between said lugs, its armature, and a plurality of contact springs

insulatingly mounted upon the frame with their ends protectively positioned adjacent to the guard, substantially as set forth.

10. In a multiple contact-relay, the combination with a sheet-metal frame comprising a body portion, and an open skeleton guard formed therefrom, of an electro-magnet and its armature mounted upon said frame, an insulating mounting, and a plurality of contact springs secured to said frame by the insulating mounting with their free ends protectively positioned adjacent to said guard, substantially as set forth.

11. In a multiple contact-relay, the combination with a sheet-metal frame angularly bent to form a forwardly positioned guard, of an armature mounted for actuation upon said frame; the said frame and armature being centrally cut away to afford skeleton parts permitting ready access and inspection of the relay, an actuating electro-magnet, and a plurality of contact springs insulatingly mounted upon the frame with their free ends protectively positioned adjacent to the guard, substantially as set forth.

In testimony whereof I do now affix my signature in the presence of two witnesses.

GARRISON BABCOCK. [L. S.]

Witnesses:

NORRIS W. NORTH,
C. H. NORTH.