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No. 822,968.

PATENTED JUNE 12, 1906.

R. H. MANSON.

RELAY.

APPLICATION FILED MAY 25, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

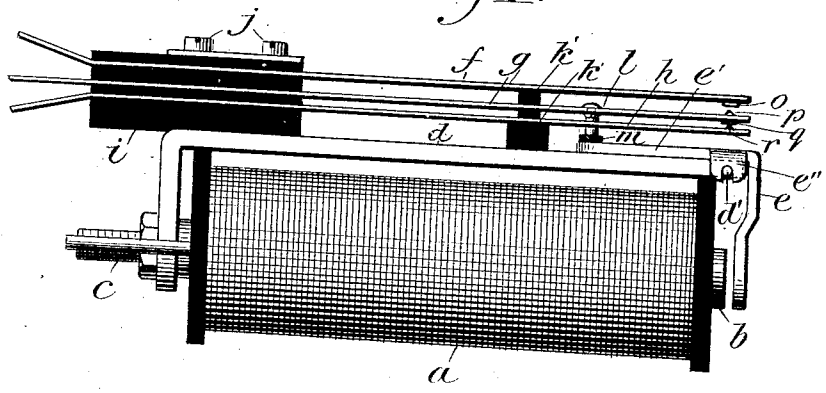


Fig. 2.

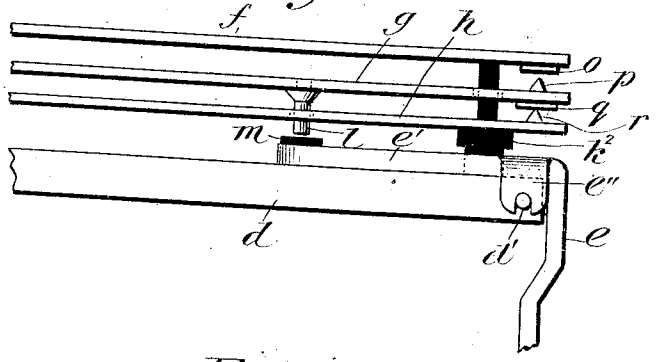
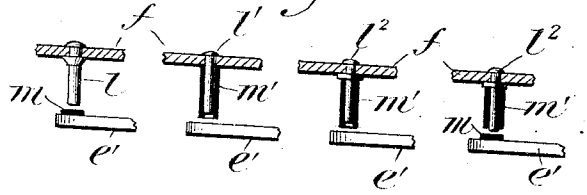


Fig. 3.



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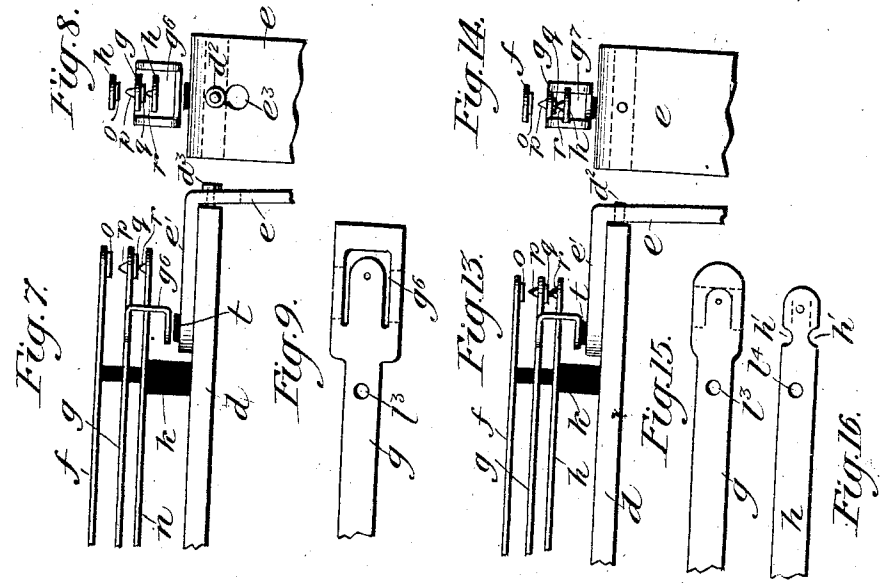
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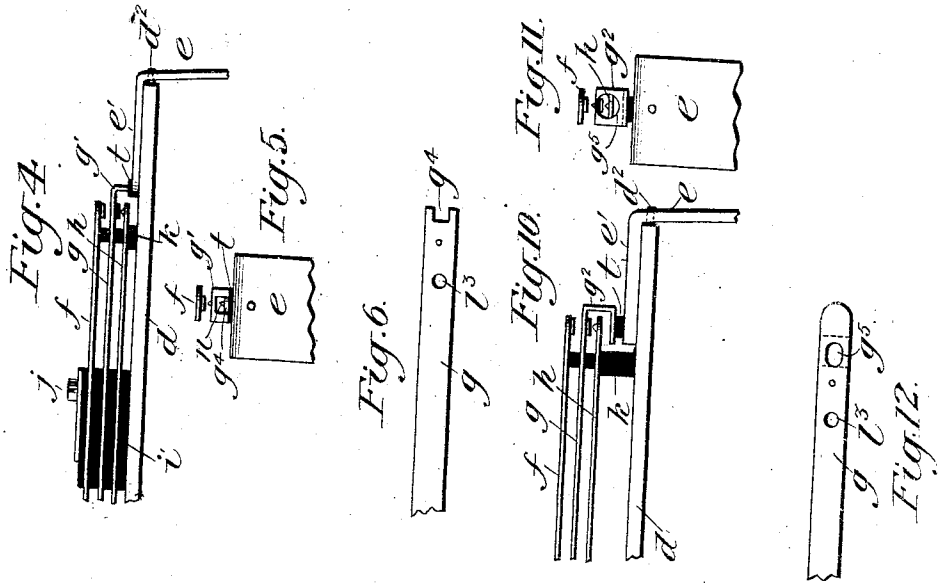
R. H. MANSON.

RELAY.

APPLICATION FILED MAY 25, 1904.

2 SHEETS—SHEET 2.





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UNITED STATES PATENT OFFICE.

RAY H. MANSON, OF ELYRIA, OHIO, ASSIGNOR TO THE DEAN ELECTRIC COMPANY, OF ELYRIA, OHIO, A CORPORATION OF OHIO.

RELAY.

No. 822,968. Specification of Letters Patent. Patented June 12, 1906.

Application filed May 25, 1904. Serial No. 209,615.

To all whom it may concern:

Be it known that I, RAY H. MANSON, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented a certain new and useful Improvement in Relays, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to electrical relays, and particularly to the type commonly known as "spring-contact" relays—that is, to those in which the armature of the actuating-magnet acts upon springs or pivoted contacts to make and break connections without itself being necessarily included in any circuit thus formed. In such relays it has become standard practice to fasten the contact-springs along the upper side of the magnet frame or tube and to provide an angular armature pivoted at one end of the magnet structure, so that its upper or horizontal portion will engage the springs or some one of them. When such an armature is swung to and fro by the attraction of the electromagnet-pole and its release, the connected spring or springs will be lifted and lowered to alter the relations in the group. Such relays have come into general use in telephone practice as line and cut-off relays, and as such they are usually mounted on racks which have extended strips to which the relays are screwed or bolted end on. The amount of clearance between successive relays on a rack is usually small of necessity, and hence the trouble men and inspectors can only get access to the ends thereof for inspection, adjustment, and repairs. Heretofore this has been the cause of frequent complaint, because the contacts between some of the pairs of springs in the groups on the relays were not visible from the end, the armature interfering with a direct view. As between a single pair of springs the problem solved itself, because the armature if made straight on the upper end lay beneath the pair, out of the line of sight; but with the groups frequently employed this is not so.

It is the purpose of my invention to provide such an arrangement of the armature and contact-springs in connection with the structure of a relay that the contacts will all be exposed for inspection and repair, that the contacts will be positive and exact both as to their touch and as to their time of touching, and that the full advantage due to the use of springs may be realized by employing their whole length, or a large part thereof, in operation, gaining in resilience thereby and reducing the liability to deterioration by setting. These and other features of my invention, to be more particularly described in the specification, are illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a complete relay. Fig. 2 is an enlarged view of the right-hand upper portion thereof, showing a modified arrangement of the stop-post. Fig. 3 shows four arrangements of the insulation between the lifting-pin and the armature. Figs. 4, 5, and 6 are detail views showing a modified form of lifting connection between the intermediate spring and the armature. Figs. 7, 8, and 9 are similar views of another modification. Figs. 10, 11, and 12 illustrate a still further modification. Figs. 13, 14, 15, and 16 show in detail another form of intermediate spring.

Referring to Fig. 1 of the drawings, *a* indicates the relay-magnet coil, having a central core projecting slightly from the front end thereof and a screw-threaded extension *c* at the rear, by which the relay is secured to the usual rack or frame. An angular soft-iron bar *d*, mounted on the screw-threaded core end, overlies the magnet and forms the frame thereof for completing the magnetic circuit and also for supporting the other elements of the relay. The forward end of said bar *d* is provided with two laterally-projecting pivot-pins *d'*, upon which is loosely and liftably mounted the armature by means of two depending lugs or ears *e''*, having open slots engaging said pivot-pins. The armature is generally rectangular in side elevation, having a depending member *e* coöperating with the pole *b* and a horizontal end *e'* extending rearwardly along frame *d*. Mounted between insulating-blocks *i*, secured to the frame *d* by means of screws *j*, are contact-springs, preferably three in number, and indicated by reference-letters *f*, *g*, and *h*, respectively, which extend longitudinally of said bar and substantially parallel therewith, and the ends of said springs adjacent to the forward end of the relay are provided with contact-points *o*, *p*, *q*, and *r*, which by reason of their location are in plain sight and are readily accessible for adjustment and re-

pair. Loosely mounted on the frame d is a stop-post k, formed of a cylindrical section of insulating material having a reduced upper portion k', which passes through registering openings in springs h and g and abuts against the under side of spring f. Said springs f, g, and h have a downward set, tending to move them toward the bar d, and the downward movement of spring h is limited by the shoulder formed by the larger lower portion of post k, and the corresponding movement of the upper spring f is restrained by the upper end of section k'. The intermediate spring g rests with its contact-point q engaging contact r on spring h, and in order to disengage these contacts and establish connection between contact o on spring f and contact p on spring g the intermediate spring g is provided with a projection extending in the path of movement of the end of the armature-section e', so that as the latter rises when the armature is attracted it engages the projection and lifts the free end of spring g. In the particular form of relay shown in Fig. 1 this projection takes the form of a pin l, riveted to spring g, passing through a hole in spring h and engaging a block of insulation m on the armature end. Several modified modes of applying the insulation between the lifting-pin and the armature are shown in Fig. 3 and are so clearly illustrated as to require no particular description.

It is to be particularly observed that all of the movable parts of the relay that are susceptible of accidental derangement—namely, the contact-points of the springs and the armature—are located at the forward part of the relay, where they are clearly visible and accessible to the person having charge of the installation, and because of this especially advantageous arrangement the parts may be inspected, adjusted, and repaired without removing the relay from the supporting rack or frame. Furthermore, the arrangement of the lifting-pin l on the middle spring secures a direct and positive action between the armature and said spring without interfering with the view of the contact-points. The insulation stop-post k serves to hold the upper and lower springs in their normal position and also prevents the middle spring from accidentally swinging enough to one side to allow the pin l to come in contact with the lower spring. The loose pivotal connection between the armature and the magnet-frame permits the former to be readily removed. In Fig. 2 a preferred arrangement of the stop-post k is illustrated, said post being located near the forward end of frame d and having a reduced lower portion which passes through an opening in the horizontal member e' of the armature and an intermediate swell or flange k^2, which serves as a detent to prevent the armature from being accidentally displaced from its pivots or lifted into contact with the lower spring h. The armature may readily be removed, however, by lifting the group of springs and post k sufficient to allow the lugs e'' to clear the pivot-pins d'.

In the form illustrated in Figs. 4, 5, and 6 the springs f, g, and h are somewhat shorter than those previously described, but are still brought sufficiently far forward to permit them to be clearly seen and easily reached from the front. Also in this form lifting-pin l is replaced by the depending end g' of spring g, said end being bent to engage the insulating-block t on the armature end and having its central portion cut away at g^4 to leave a free sight-opening to contacts q and r. The armature is pivoted in this case to a forwardly-projecting pin d^2 on the frame d, which pin engages an orifice in the depending armature member e. Another form of the lifting connection between intermediate spring g and the armature end is that shown in Figs. 7, 8, and 9, in which the forward end of the spring g has stamped out of it a U-shaped slot, which permits the end to be bent over a central tongue, carrying contact-points p and q and also to embrace the lower contact-spring h. The extreme end of spring g is bent back horizontally to form a foot g^6, engaging insulation t on the armature end.

As shown in Figs. 10, 11, and 12, the spring g is carried beyond the ends of springs f and h and is bent downward and backward, as shown at g^7, to engage insulation t on the armature, by means of which said spring g is lifted. To give free and ready access to contact-points q and r, the depending end of said spring g is provided with an orifice g^5 in line with said contact-points.

The construction shown in Figs. 13, 14, 15, and 16 is substantially similar to that shown in Figs. 7, 8, and 9, with this exception: The spring h is provided with notches h' on its sides, adapted to prevent accidental engagement of the springs as the middle spring g moves upward.

In addition to the particular advantages inherent in the generic structure of the relay and particularly referred to above, it may be mentioned that the long armature-springs, with the lifting effect of the armature applied at an intermediate point, give an increased contact-pressure for a given relatively small air-gap between the armature and the pole-face, thereby producing an increase in the sensitiveness of the relay, as the leverage on the springs varies in direct proportion to the magnetic pull on the armature, and the armature-pull varies inversely as the square of the length of the air-gap.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A relay comprising an electromagnet, an armature pivoted thereto, contact mem-

bers secured thereto, one of which is provided with a depending portion forming an open foot extending in the path of said armature, and contact-points visible through the opening in said foot.

2. A relay comprising an electromagnet, an armature pivoted thereto, contact members secured thereto, one of which is provided with a depending extension forming an open foot extending in the path of movement of said armature, contact-points visible through said open foot, and a stop-post removably mounted on the magnet and adapted to support two of said springs.

3. A relay comprising an electromagnet, an angular armature pivoted thereon, and contact-springs extending longitudinally of said magnet and having visible and accessible contact-points near the front end of the magnet, the intermediate contact-spring having an open depending portion at its forward end extending in the path of movement of said armature, substantially as described.

4. A relay comprising an electromagnet, an angular armature pivoted thereon, and contact-springs extending longitudinally of said magnet and having visible and accessible contact-points near the front end of the magnet, the intermediate contact-springs having a depending member extending in the path of movement of said armature.

In testimony whereof I have affixed my signature in presence of two witnesses.

RAY H. MANSON.

Witnesses:
F. M. BABCOCK,
S. A. BEYLAND.