E. E. CLEMENT.

ELECTRICAL RELAY.

APPLICATION FILED SEPT. 10, 1906.

969,759. **Patented Sept. 6, 1910.**

Fig. 1.

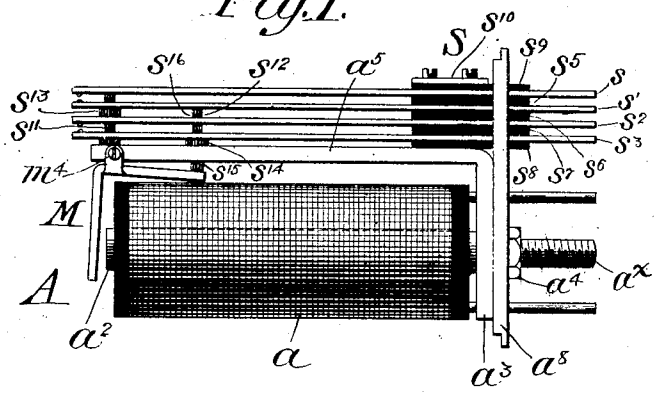


Fig. 2.

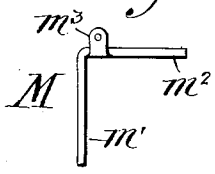
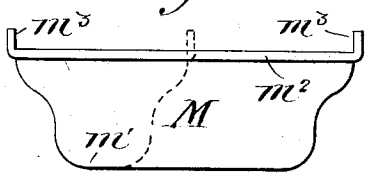


Fig. 3.



Witnesses

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ELECTRICAL RELAY.

969,759. Specification of Letters Patent. Patented Sept. 6, 1910.

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To all whom it may concern:

Be it known that I, EDWARD E. CLEMENT, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Electrical Relays, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to electrical relays, and has for its object the provision of a relay suitable for use in certain types of telephone exchanges as well as in other systems requiring a multiplicity of contacts to be made and broken.

Heretofore it has been difficult to design a relay which would make and break more than one or two pairs of contacts satisfactorily, and so far as I know it has never been possible to construct a visible contact relay with the armature entirely independent of the contact springs and other parts so that to remove it would require no bending of the springs or interference with other parts, the principal object of this being in accordance with an old and well known rule which negatives the idea of bending contact springs after they have once been adjusted and have their proper set. Again, it has been almost impossible to adjust the springs so that one member of a common part would make or break them all satisfactorily, some might make and others not, and vice versa.

According to the present invention I suspend the armature below the flux or return bar and run connections therethrough from the springs to the armature and then make all the contacts self-adjusting so that the armature which is common to and operates them all, need not be adjusted to them, but they adjust themselves individually to it as well as to each other.

Other advantages and objects will appear in detail as I proceed with my description, and in the appended claims.

My invention is illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation showing a single core relay. Fig. 2 is a side elevation of the armature, and Fig. 3 is a rear elevation thereof, showing in full lines an armature for double or wide core magnets, and in dotted lines for single or narrow core magnets.

Referring to Fig. 1, A is an electromagnet comprising a spool, a, whose core a^2 is secured to the rear yoke piece a^3, of iron or other suitable material, by means of the nut a^4 which engages a threaded extension a^x of the core, or in any other suitable manner. This rear yoke piece a^3 has a longitudinally extending portion or flange a^5 which lies over the top of the magnet winding and reaches to a point approximately flush with the projecting end of the core a^2, and constitutes a flux or return bar. Upon the rear end of the flux bar a^5 are mounted the sets of contact springs S. The end of the core is reduced so as to form a shoulder which abuts against the yoke a^3, and a back plate a^8 is secured by the same nut a^4 which secures the yoke piece upon the core. This back plate is provided with an aperture through which pass the sets of contact springs S, and is also provided with a projecting flange adapted to receive the shell or casing for inclosing the magnet within a dust and moisture proof chamber. This shell is not shown herein but is preferably drawn up out of sheet metal continuous except for its open mouth, and is slid over the relay from the outer end until its edges engage the flange on the back plate a^8 where it may be secured in any suitable manner.

The armature M which is of angular formation comprises a depending leg m' and a horizontal leg m^2 together with ears m^3 projecting vertically from either edge of the horizontal leg m^2. These ears m^3 are apertured to receive pivot screws m^4 which take on to either side of the flange or bar a^5 and hold the armature suspended underneath said bar, with its depending leg m' held adjacent to the core a^2, and its horizontal leg m^2 resting above the winding s, where it is engaged by the operating studs s^{12}, to be hereinafter described.

I have illustrated only one set of springs but it will be clearly understood that I may use any number of sets which I may deem desirable or necessary, each of the sets being duplicates of those illustrated, and each comprising individual members, s, s', s^2, s^3, which are separated by strips of insulating material, s^5, s^6 and s^7, and as a set are further separated from the bar a^5 by the insulating strip s^8. All of the sets are separately secured to the bar a^5 by the screws s^9 whose heads rest upon the metal plates s^{10}. In the use to which I apply this relay at

present, that of cutting on a metallic circuit to its extension, it is requisite to have two pairs of contacts, one pair for each side of the metallic circuit in each set. Both of these sets are made and broken at once and as before stated there may be as many sets as there are circuits to be controlled. In each set the springs s', s^3 are the movable or working springs, and the springs s, s^2 are the fixed or anvil springs. As shown, I make all these springs self-adjusting by a very simple expedient, that is, by the use of two little studs s^{11}, s^{13}, one for each pair. The stud s^{11} rests with its base upon the forward end of the bar a^5 as nearly as possible over the pivotal point of the armature M, its reduced portion or stem extending through a hole in the spring s^3. The stud s^{10} has its base resting upon the spring s^2 and its reduced portion or stem extending through a hole in the spring s' and supporting the spring s. The bases of all the studs s^{11}, where a plurality of sets are used, rest upon the bar a^5 and all of the springs have a downward set so that the studs s^{11} and s^{13} are always held in proper position. The operating studs s^{12} comprise each a relatively long shank having a shouldered portion s^{14} about the middle of its length, which rests upon the bar. The lower reduced portion s^{15} passes through a hole in the bar a^5, and has its end resting upon the rear leg m^2 of the armature M. The reduced portion s^{16} above the shoulder s^{14} passes through holes in the springs s^2, s^3, and has its upper end abutting the spring s' and the shoulder formed by the collar abutting the spring s^3. The spring s^3 and s' rest therefore, upon the collar s^{14} and the top s^{16} of the shank, and when the armature is tilted by having its leg or flange m' drawn to the pole of the magnet the stud s^{12} is lifted, lifting the springs s^3 and s^5 to engage with the springs s and s^2. By noting the shape and arrangement of the studs it will be obvious that each set of springs is self-adjusting and that all the sets of springs have their contact points visible and accessible from the front of the relay to permit inspection and repair.

Although I have herein described a single core relay and have shown an armature in dotted lines in Fig. 3, adapted for the change, I wish it clearly understood that I do not limit myself to a single core magnet but may with equal propriety use a double core magnet, substituting for the iron flux bar a^5 a brass return flange, and allowing the magnetic circuit to go around through the separate cores and through the armature and back plate a^8 which, in this instance, would be of iron. I also might use a wide flat magnet having the core elongated in width so as to exert a magnetic pull upon the entire width of the armature. With either of the constructions just described I may use a plurality of sets of contact springs arranged side by side with their adjusting studs resting upon the return or supporting flange, and it is obvious that the side view of Fig. 1 would illustrate a two core or a widened core magnet as well as it does the single core magnet described.

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

1. An electrical relay comprising an electromagnet, a return bar carried by the core of said magnet, and extending to a point approximately flush with the front end of the core, circuit changing devices, an armature supported on the bar and an operating connection from the circuit changing devices through the bar to the armature.

2. An electrical relay comprising an electromagnet, a return bar secured to the core of said electromagnet, an armature pivotally carried by said bar, contact springs carried by said bar and an operating connection between the armature and the contact springs passing through the bar.

3. An electrical relay comprising an electromagnet, a return bar carried by the core of said electromagnet, contact springs mounted upon said bar, an armature pivotally suspended from the front end of said bar, and an operating connection between the contact springs and the armature which extends through the bar.

4. An electrical relay comprising an electromagnet, a return bar secured to the core of said electromagnet and extending forward to a point approximately flush with the front end of the core, contact springs secured upon the rear of said bar and extending forward so as to have their contact points visible and accessible from the front of the relay, an angular armature pivotally supported upon the front end of said bar, and an operating connection between the contact springs and the armature which extends through the bar.

5. An electrical relay comprising an electromagnet, a return bar secured upon the rear end of the core thereto and extending forward to a point approximately flush with the front end of the core, contact springs secured upon the rear end of said bar and extending forward parallel with the same so as to have their contact points visible and accessible from the front of the relay, an angular armature having a depending portion extending in front of the core and a substantially horizontal portion extending over the magnet spool and beneath the bar, with operating connections between the horizontal portion of the armature and the several contact springs.

6. An electrical relay comprising an electromagnet, a return bar carried upon the core thereof, circuit changing devices sup-

ported and adjusted upon the bar, an armature pivotally suspended beneath the bar and operating connections between the armature and the circuit changing devices.

7. An electrical relay comprising an electromagnet, a return bar secured thereto, circuit changing devices mounted upon the top of said bar and adjusted thereon, and an armature pivotally suspended beneath said bar with operating connections through the bar to the circuit changing devices.

8. An electrical relay comprising an electromagnet, a return bar secured at the rear end of said magnet to its core, contact springs mounted upon the top of said bar and extending forward so as to have their contact points visible and accessible from the front of the relay, an angular armature having a depending portion extending in front of the core of said electromagnet and provided with a substantially horizontal portion extending over the top of said magnet spool and underneath the bar, and operating connections between the contact springs and the armature extending through the flux bar.

9. In a relay, the combination of a magnet structure having a core and a return bar lying parallel with said core, a plurality of contact springs mounted on one side of the bar, an armature mounted upon the other side of the bar, and operating studs resting upon the bar under pressure from the springs, with ends extending through the bar into position to be operatively affected by the armature.

10. In a relay, a supporting bar, contact springs secured at one end of said bar and extending parallel therewith, an operating stud underlying said springs, having a shouldered portion resting upon the bar to form a stop for the stud and springs, and a reduced portion of the stud extending through the bar, together with an armature adapted to engage the end of the stud and thereby actuate the springs.

11. In a relay, a supporting structure having contact springs secured upon one side, an armature lying upon the other side, and a stud for the springs underlying the same and having a portion extending through the bar into operative relation with the armature.

12. In a relay, a supporting structure, contact springs secured upon one side of said structure, an armature lying upon the other side of said structure, and a stud for the springs underlying the same and having a portion extending through the structure into operative relation with the armature, together with means for limiting the movement of the stud.

13. In a relay, the combination of an electromagnet, a return bar secured thereto, circuit changing springs carried by said bar, secured thereto at one end, extending along the clear and unobstructed upper surface thereof to the other end, supporting means and operating means engaging the springs near said end, the operating means extending to a point away from said upper surface of the bar, and an armature secured upon the magnet structure, positioned so as to be acted upon by the electromagnet when energized, and to itself act upon said operating means at the point mentioned.

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

EDWARD E. CLEMENT.

Witnesses:

E. EDMONSTON, Jr.,

JAMES H. MARR.