Jan. 16, 1951 C. LOMHOLT 2,538,020

RELAY

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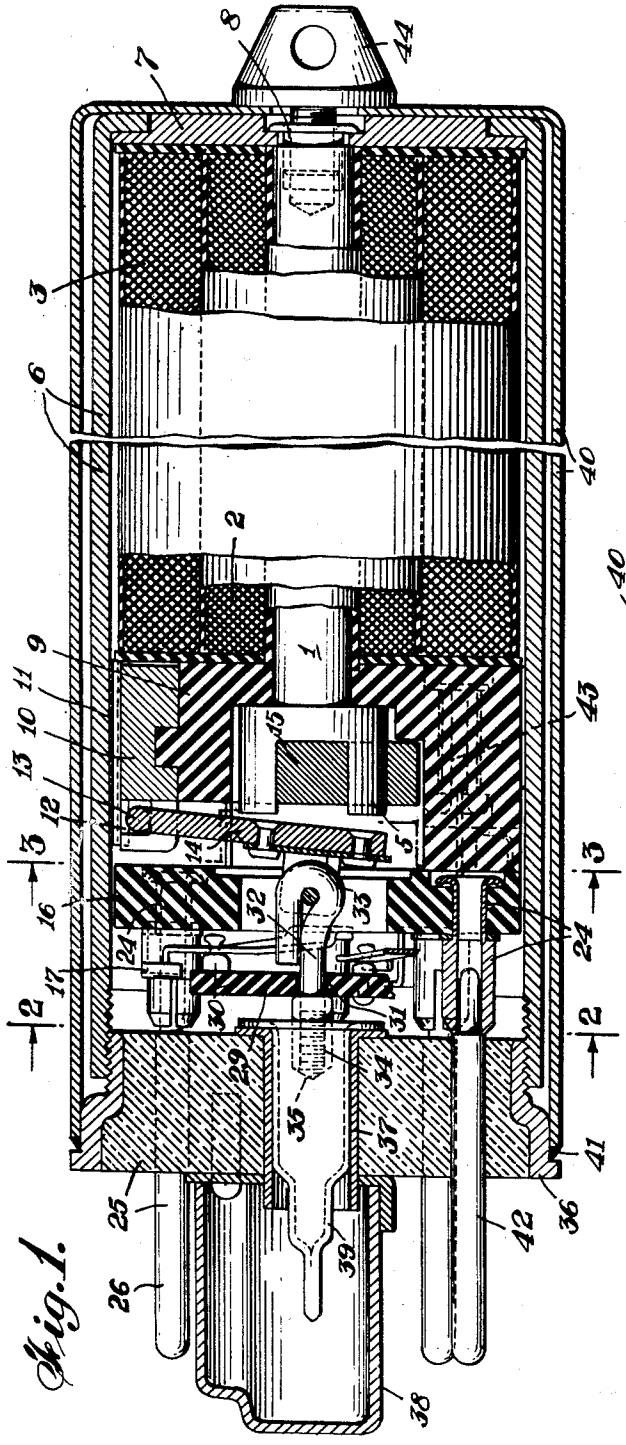

Fig. 1.

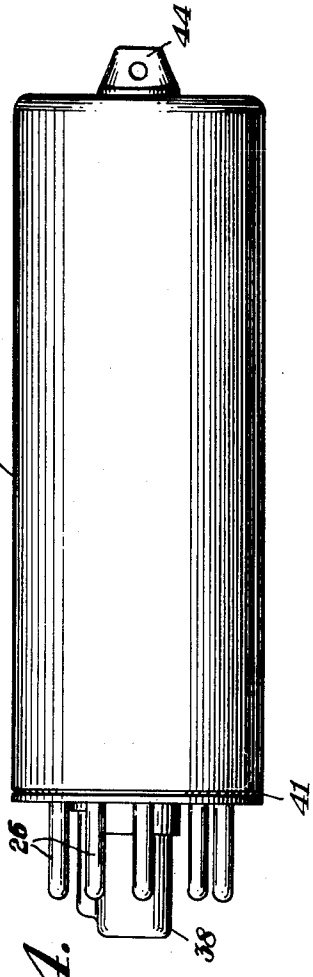

Fig. 4.

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Fig. 3.

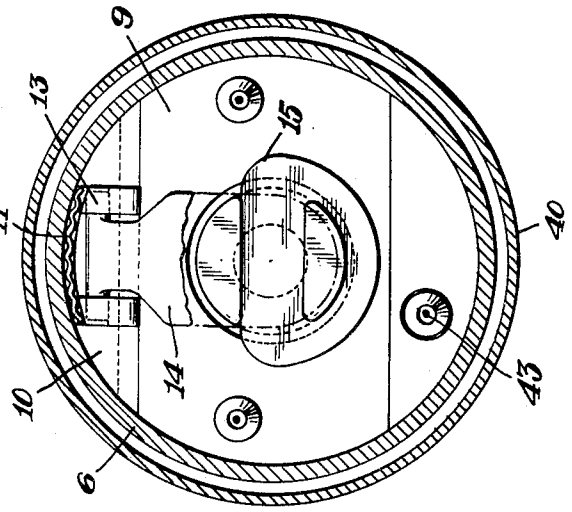
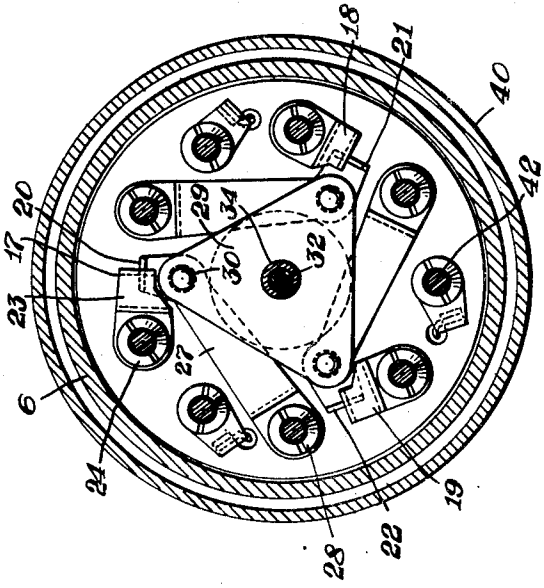


Fig. 2.



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2,538,020

RELAY

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1 Claim. (Cl. 200—104)

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This invention relates to relays and more particularly to a relay for telephone exchanges and other electrical circuits.

Relays heretofore used in telephone circuits have been shielded against crosstalk and other magnetic disturbances by providing the relay with a special metal container. It is an object of this invention to construct relays in a manner to eliminate such special shielding arrangements.

Another object is to provide a small sturdy compact relay which is capable of withstanding vibrations and shocks that usually damage or cause relays of ordinary construction to operate erroneously.

An important feature of this invention is the structural arrangement of the electromagnet, the movable contact arrangement, the actuating member and the inherent magnetic shielding of the relay. When the electromagnet is energized the movement of the armature exerts an actuating force on a plate which translates the action substantially equally to several spring contacts causing them to move relative to fixed contacts. When the electromagnet is de-energized, the spring contacts return the armature and the associated actuator plate to the unenergized condition.

Another important feature is the inherent magnetic shielding that is provided by the relay construction. The relay is enclosed by a metal tube which forms a part of the magnetic circuit of the relay and at the same time shields the coils and armature of the electromagnet against crosstalk and other magnetic disturbances in associated equipment. This metal tube also serves as a jig during assembly.

The relay is encased in a hermetically sealed container which is provided with a base similar to that of a vacuum tube whereby it may be plugged into a socket for use. The relay thus encased is evacuated or filled with an inert gas so as to eliminate the occurrence of condensate on the relay parts due to changes in temperature and humidity; also by removal of oxidizing gases, the contacts are maintained clean of oxides.

The above-mentioned and other features and objects of this invention and the manner of attaining them will become more apparent and the invention itself will be best understood, by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, wherein;

Fig. 1 is a longitudinal cross-sectional view of the relay in accordance with my invention;

Figs. 2 and 3 are cross-sectional views taken

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substantially along lines 2—2 and 3—3 respectively, of Fig. 1; and

Fig. 4 is a view in perspective of the relay encased in its hermetically sealed container.

Referring to Figs. 1 and 2 of the drawings, the relay comprises the usual core 1 containing thereon a primary coil 2 and a secondary coil 3 each of which is capable of operating the relay. The forward end 5 of the core is bifurcated (Figs. 1 and 3) for a purpose hereinafter described. Surrounding the coils and extending forward thereof to shield the same is a metal tube 6, the rear end of which is turned inwardly to engage and plate 7 to which the core 1 is secured at 8. Mounted on the forward end 5 of the core is an insulating block 9 which in turn supports a metallic hinge block 10. Disposed between the hinge block 10 and the tube 6 is a corrugated metallic shim 11 which insures metallic connection between the tube 6 and the hinge block 10. The hinge block includes recess portions 12 which receive the ends of an armature pintle, 13 the armature 14 being suspended therefrom for attraction by the core portion 5.

Particular attention is called to tube 6. It not only acts as an effective shield during use of the relay but also forms a part of the magnetic circuit and during assembling of the relay is used as a base or jig for the other parts.

The core portion 5 is bifurcated to receive on one leg thereof a copper piece or coil 15. The purpose of the copper piece or coil is to retain sufficient flux during the change of the A. C. cycle should an alternating current be employed to avoid shattering of the armature. In the case of direct current, this form of core and the application of the copper coil piece 15 may be omitted. The relay as shown, however, will function equally well on both A. C. and D. C.

The contact assembly for the relay includes an annular insulating block 16 onto which the contacts, both movable and stationary are mounted. As shown in Fig. 2 there are three fixed contacts 17, 18 and 19 and three corresponding spring contacts 20, 21 and 22. The fixed contacts each comprises an S-shaped member 23, of which the edge of one end forms the contact surface while the other end is secured to a metallic sleeve 24 secured to the block 16 and extending to a point adjacent an insulated base block 25. Each of the movable contacts comprise a spring leaf 27, one end of which is anchored to the block 16 by a sleeve 28 similar to the sleeve 24. The spring leaf extends to a point adjacent the member 23,

the leaf being turned sharply so that the contact edge thereof is crosswise of the contact 17. The fixed and movable contacts, such as 17 and 20, are equally spaced in a circle on the annular block 16. The base block 25 has embedded therein a plurality of conductor pins 26 and those connected to the fixed and movable contacts are received by metallic sleeves 24 and 28.

Adjacent the springs of contacts 20, 21 and 22 is a triangular actuator plate 29 which has at each corner thereof a stud 30 loosely connected to one of the contact spring leaves. The plate 29 is provided with a centrally located opening 31 to receive a link 32 which is pivotally connected to a plate 33 carried by the armature 14. The end of the link is threaded to receive a threaded sleeve 34 which after assembly may be pinched off, as indicated at 35. The threaded sleeve 34 overlies the plate 29 so that when the armature is attracted by the electromagnet the plate 29 is pulled to actuate the spring contacts. As shown in Figs. 1 and 2 the spring contacts 20, 21 and 22 are moved away from the fixed contacts 17, 18 and 19 upon energization of the relay. When the relay is de-energized the spring leaves of the movable contacts exert force against the plate 29 to pull the armature away from core 5 and to reengage the fixed contacts 17, 18 and 19.

While the fixed and movable contacts have been shown arranged for normally engaged relation for use as a cut off relay, the contacts may obviously be arranged for normally open relation by extending the fixed contacts to the other side of the spring contacts and reversing the contact portions of both.

The plate 29 being actuated by the connecting link 32 at the center thereof provides an equalizing action with respect to the movable contacts. While the plate has been shown to be triangular in shape, it will be recognized that it may be made circular or otherwise shaped so long as the action of the link 32 is substantially centralized. It will also be recognized that while three contact arrangements have been shown in the present embodiment that a greater or lesser number of contact arrangements may be provided, whichever is desired.

The end block 25 is of insulating material such as glass and is mounted between metallic sleeves 36 and 37. The sleeve 36 is threaded for connection with tube 6 while sleeve 37 is employed in known practice to mount a central post 38, Fig. 4, to the base. Centrally of the base block 25 is an exhaust tube 39 which is pinched off prior to the mounting thereover of post 38.

Surrounding the tube 6 in spaced relation thereto is a casing 40 which is secured to the sleeve 36 by solder 41 to provide a hermetically sealed unit. The unit is then exhausted through the tube 39 which is thereupon pinched off, as indicated.

The casing 40 may also have shielding properties but in practice the casing 40 is often omitted and in such cases the shielding characteristic of tube 6 is of utmost importance.

In addition to the pins for the fixed and movable contacts, additional pins, such as pin 42, Fig. 1, are provided for circuit connections to the coils 2 and 3, the block 8 being provided with passageways, such as indicated at 43, for the electrical connections.

From the foregoing description it will be clear that the relay of my invention is compact in construction, is easily handled and may be applied to a socket similarly as in the case of vacuum tubes. The relay being evacuated removes moisture and oxidizing gas, thereby insuring improved and prolonged operation. The unit being evacuated avoids the occurrence of corrosion and oxidation of the parts. This fact renders the relay operative with less current than would be required where the contacts are subjected to corroding atmosphere.

Referring particularly to Fig. 4, attention is called to the fact that my construction makes it possible to give the relay a slender tubular outer configuration. This is important for use on panels where the components must be compact in arrangement. Further, to permit easy removal or replacement in such compact arrangements, the outer end of the relay is provided with a pull element 44.

While I have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention.

I claim:

In an electromagnetic relay including an electromagnet comprising a coil and core, an armature element pivotally mounted proximate the electromagnet core and movable toward said core by energizing of the electromagnet coil, an insulative block, a plurality of fixed contact elements mounted on said block in substantially a common plane and disposed in substantially uniformly spaced relationship, a plurality of leaf spring movable contact elements each attached at one end to the insulative block and capable of making contact at the opposite end with one of the fixed contact elements, an insulative plate attached to each of said movable contact elements near the contact-making end thereof, the improvements that comprise a link connecting the armature element with the plate at a place on the plate approximately equidistant from all the places of attachment thereto of the movable contact elements, with the said plate connected to the link so as to have movement relative thereto whereby movement of the armature applies force uniformly distributed among all the movable contact elements to cause simultaneous and equal movement thereof.

CARL LOMHOLT.

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