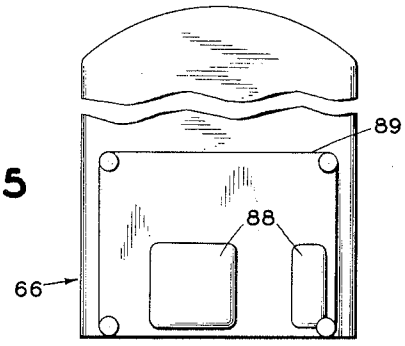
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RELAY

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FIG. 5



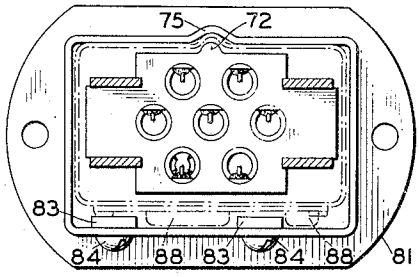


FIG. 8

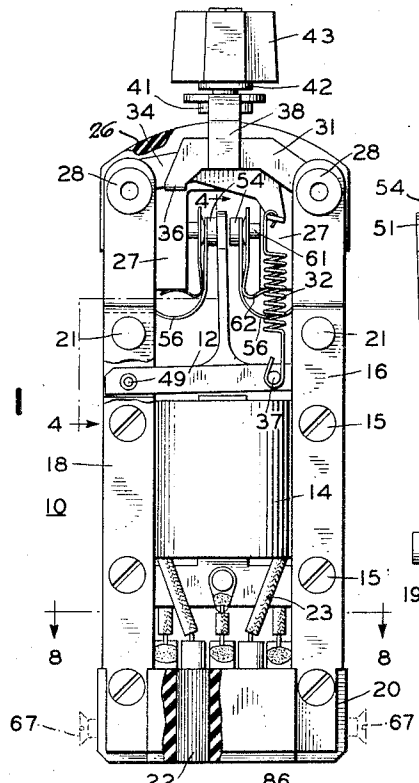


FIG. 1

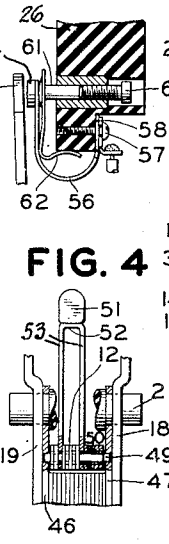


FIG. 3

FIG. 4

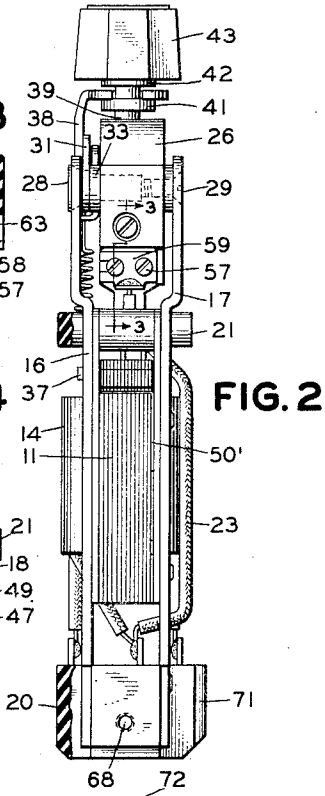


FIG. 2

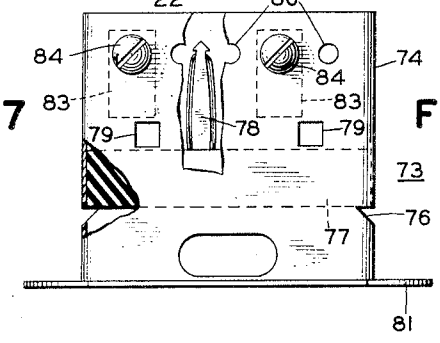


FIG. 7

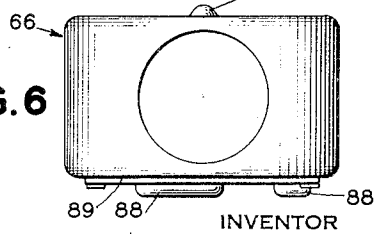


FIG. 6

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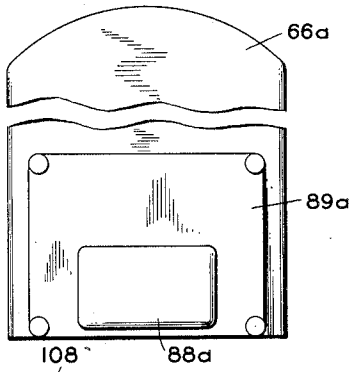
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FIG. 13



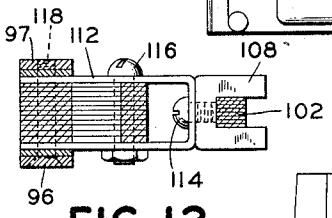


FIG. 14

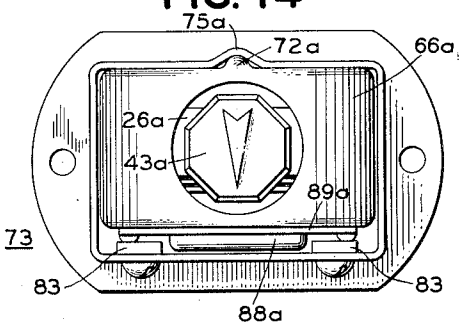


FIG. 12

FIG. 9

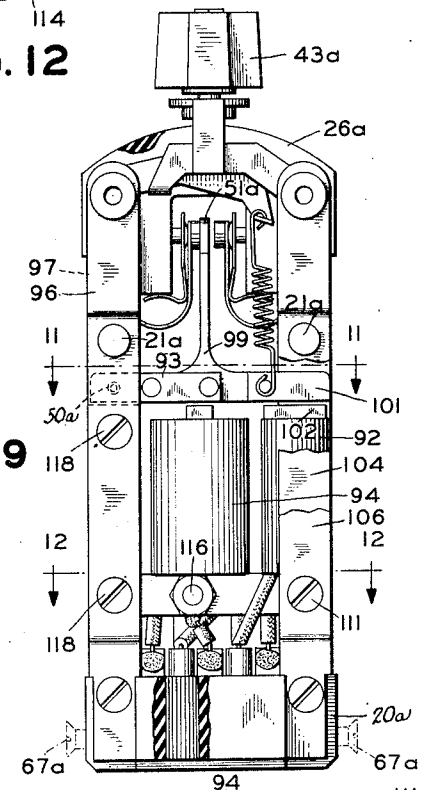


FIG. 10

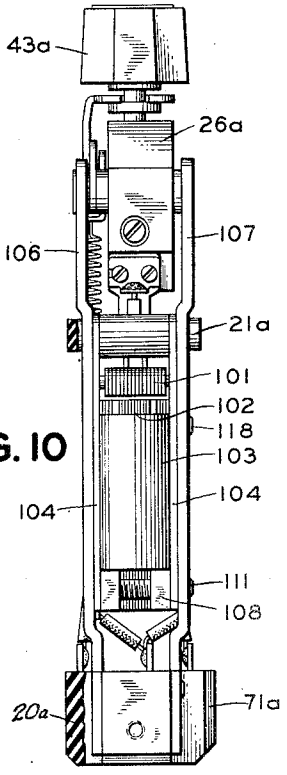
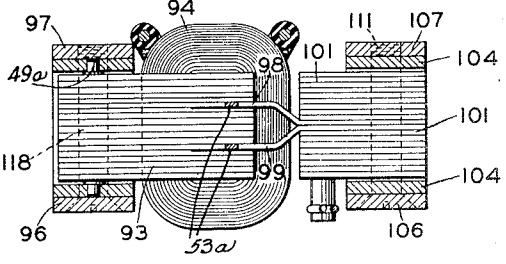


FIG. 11



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UNITED STATES PATENT OFFICE

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RELAY

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Application November 11, 1937, Serial No. 173,997

5 Claims. (Cl. 200—166)

This invention relates to relays and more particularly to electromagnetic relays adapted for use in telegraph systems in conjunction with other telegraphic apparatus.

The primary object of the present invention is to provide a relay which has relatively high armature torque whereby to decrease contact travel time and to substantially eliminate contact bounce.

Another object is to provide a relay of compact construction.

A further object is to provide a relay having the magnetic parts thereof made from a material such as to minimize distortion losses.

A still further object is to provide a relay constructed in a novel manner from corrosion resisting materials.

Still another object is to provide a novel mounting for the movable armature of an electromagnet whereby to increase the area of the air gap.

A still further object is to provide novel adjusting means for relay contacts.

A still further object is to provide novel means for accurately adjusting the retractile force on the armature.

Still another object is to provide a relay armature with novel means for carrying a contact.

A still further object of the present invention is to provide a mounting base or receptacle with means adapting it to receive only electrical instruments of the same type designated by code markings on the name plate or on the shell or casing of the instrument.

The foregoing and more specific objects will appear from the following complete disclosure of the invention. Referring to the drawings:

Fig. 1 is a front elevational view of a relay constructed in accordance with the invention;

Fig. 2 is a view in elevation taken from the right side of Fig. 1;

Fig. 3 is a fragmentary view in section taken on line 3—3 of Fig. 2;

Fig. 4 is a fragmentary view partially sectioned on line 4—4 of Fig. 1;

Fig. 5 is a view in side elevation of a shell or casing adapted to fit over a relay of Fig. 1;

Fig. 6 is a view in top plan of the casing in Fig. 5;

Fig. 7 is a view in front elevation of a mounting base adapted selectively to receive a relay constructed as shown in Fig. 1;

Fig. 8 is a view in plan of the mounting base of Fig. 7;

Fig. 9 is a side elevational view of a modified relay constructed in accordance with the invention;

Fig. 10 is an elevational view taken from the right of Fig. 9;

Fig. 11 is a view in section on line 11—11 of Fig. 9;

Fig. 12 is an enlarged view in section on line 12—12 of Fig. 9;

Fig. 13 is an elevational view of a slightly modified form of casing or shell; and

Fig. 14 is a view in plan of a relay assembled with a mounting base.

A specific example of a relay constructed in accordance with the present invention is disclosed in Figs. 1 to 4. This relay is a compact self-contained piece of apparatus provided with means in accordance with the invention whereby it may readily be connected in the system in which it is to be used by inserting it in a separate base or receptacle shown in Fig. 7. The base or receptacle of Fig. 7 can be adapted to receive different relays or other instruments constructed in accordance with the invention but each having special characteristics or special operating features, and when the base of Fig. 7 is wired or otherwise arranged to receive an instrument or relay of a given type, no other instrument, although of similar appearance, can be inserted in the receptacle or base by accident.

Referring to Figs. 1 and 2, the relay designated in its entirety by reference character 10, comprises an electromagnetic core structure 11 and a pivoted armature 12 cooperating therewith. The core or stationary structure 11 is E-shaped and is built up of nickel iron laminations, the middle leg of which is passed through the magnet coil 14. The laminations are secured together in any suitable manner but preferably by rivets of a magnetic grade of stainless steel. The magnetic nickel iron alloy referred to throughout this specification is one containing approximately 45% nickel having a high permeability and a high resistance. The core 11 is clamped along one edge by screws 15 between two frame members 16 and 17 formed preferably from strips of nickel chrome stainless steel. The opposite edge of the core structure 11 is clamped by screws 15 between similar frame members 18 and 19. The frame members 16 to 19 extend downwardly beyond the core structure and are secured to a base member 20 of any suitable insulating material. The base member is relatively wide as viewed in Fig. 2 and cooperates with a pair of pins 21, one of which is retained between frame members 16 and 17 and the other between members 18 and

19, to space the cover of Fig. 5 from the metal parts of the relay. The pins 21 are preferably of insulating material. Embedded in the body of this base member are socket terminals 22, in the present instance seven, which are suitably connected by the leads 23 to the relay contacts to be described and the coil 14 or subdivisions thereof in the event that the coil is especially wound to adapt the relay for use on duplex telegraph circuits.

The upper ends of the frame members 16 to 19 are offset as shown in Fig. 2 and carry a block of suitable insulating material 26 which is roughly in the form of an inverted U comprising two downwardly extending legs 27. The means for securing the frame members to the block 26 comprise an internally threaded stud 28 and a screw 29, the former of which has an enlarged portion serving as a bearing or pivot for a link 31 of the tension adjusting mechanism for the armature retractile spring 32. A filler in the form of a washer 33 lies between the member 31 and the insulating member 26. A lever member 34, to which one end of the spring 32 is secured, is pivoted on the enlarged portion of a second stud 28 between the frame member 18 and the block 26. A filler, similar to the washer 33, lies against the frame member 18 thereby maintaining the lever 34 in position beside the lever 31. A screw 29 similar to the one previously mentioned cooperates with the last named stud 28 to clamp the frame members 18 and 19 to the insulating member 26. The link or lever 31 is provided with an inturned end 36 which engages under the lower edge of the lever 34 so that as the lever 31 swings in a clockwise direction, the lever 34 will swing in a counter-clockwise direction but with an amplified movement thereby stretching the spring 32 to increase the tension on the armature 12 to which the spring 32 is secured at 37. In order conveniently to impart swinging movements to the lever 31 for purposes of adjustment, a member 38 is rigidly secured thereon and is slotted to embrace an adjusting screw 39 between collars 41 and 42. The screw 39 is threadedly engaged in an aperture in the block 26 and is provided with a conveniently shaped thumb piece 43. The shank of the screw 39 is preferably of spring material and split lengthwise to provide tight engagement with the bore in the cap 26 to avoid the possibility of loss of adjustment due to vibration. The levers 31 and 34 at their point of engagement are preferably so arranged that the effective length of the spring can be doubled by approximately two turns of the knob 43.

The armature 12 is pivoted between two nickel iron strips 46 and 47 (Fig. 4) by means of a pivot pin 49 which serves as a journal for a sleeve 50 non-rotatably secured to the armature and extending laterally from the armature filling the space between the strips 46 and 47 whereby to prevent lateral movement of the armature. The magnetic flux passing through the central leg of the core 11 is divided, a portion passing through each of the two outer legs and entering the armature at its extreme ends. The method of mounting the armature just described provides an increase in the area of the air gap between the core structure 11 and the armature. A strip 50' of German silver or other non-corrosive non-magnetic material prevents the armature from touching the core. The movable contact 51, which is actuated by the armature, is carried in a novel manner by the flattened portion 52 of a loop including two upstanding legs 53 which are integrally joined to spaced laminations of the laminated armature structure. The contact 51 is secured to the flattened portion 52 of the loop bar in any suitable manner such as by welding or brazing. The adjustable stationary contacts 54 are brazed or otherwise secured to spring members 56 (Figs. 1 and 3) and each spring member is secured by means of screws 57 against a shoulder 58 formed underneath the cap 26. An appropriate terminal 22 in the base of the relay is connected by one of the leads 23 to one of the contacts 56 by means of a terminal clip 59 which is clamped beneath the heads of the screws 57. In order to provide for accurate adjustment of the contacts 54 without any lateral shifting, a guide pin 61 is secured to a spring member 62 which is guided on the bottom of the block 26 as shown to prevent rotation of the pin 61. The pin 61 is moved for adjustment of the contact by means of a set screw 63 preferably having a pitch of thread such that a one-quarter turn corresponds to contact movement of .006 inch.

It is believed that operation and adjustment of the relay of Figs. 1 and 2 will be obvious from the foregoing. Briefly, however, when the coil or coils 14 are energized to produce flux in the core structure 11, the armature 12 is attracted toward the core structure moving the contact 51 from out of engagement with one of the contacts 54 and into engagement with the other. The tension of the spring 32 which opposes the torque of the armature 12 is conveniently adjusted by turning of the knob 43 which, when turned in a counter-clockwise direction as viewed from the top of the instrument, swings the lever 31 in a clockwise direction and the lever 34 in a counter-clockwise direction, elongating the spring 32 and increasing its tension. Adjustment of the contacts 54, as pointed out above, by means of screws 63, results only in reciprocation of the contacts 54 without lateral shifting or rotation about any axis.

The relay structure 10 is covered for protection by means of a shell or casing 66 (Figs. 7 and 8) which may be conveniently slipped downwardly over the relay structure and secured thereon by means of screws 67 engaged in apertures 68 in the base 21. To prevent reversal of the casing when it is applied over the relay, the base 21 is provided with a tongue 71 which is adapted to engage a recess or slot 72 formed interiorly of the casing adjacent its lower edge. The receptacle or sub-base 73 (Fig. 9) which receives the relay in use may be constructed in a simple manner by forming a shell 74 from relatively thin-gauge, light weight material, such as aluminum, and providing interior protuberances as shown by reference character 76 at the corners thereof to support a plate or shelf of insulating material 77, which carries contact plug members 78 engageable with the terminals 22. Tongue members 79 which hold the shelf 77 in position are struck out from the walls of the shell 74. The base is provided with a recess 75 which cooperates with the key-like projection on the cover 66 which results from formation of the recess 72. It will be obvious, however, that the key-like projection on the cover may be formed in any suitable manner. An outwardly turned flange 81 preferably integral with the shell 74 provides for securing the sub-base in a stationary manner upon a table or other support. By omitting the flange 81 from the bottom of the shell 76, the sub-base 73 may be inserted in a suitable socket in panel or other support. A flange similar to the flange 81

is then preferably formed adjacent the top of the shell 76 to maintain the shell in position in the socket.

In order that only a certain type of instrument or one wired in a certain way may be inserted in the base 73, key members 83 (Fig. 8) are provided. They are secured to the shell of the sub-base 74 by means of screws 84 receivable in a plurality of apertures 86 in accordance with the type of instrument to be accommodated in the base. In the specific example shown, two keys are provided which may be connected to the base in ten combinations. The keys 83 cooperate with protuberances or lugs 88 which may be formed from the material of the shell 66 or as shown from the material of the plate 89 secured to the shell 66. The plate 89 is conveniently available as a name plate bearing the number or other designating mark to identify the particular type of instrument.

By the means just described, it will be seen that the cover 66 can be applied to the relay only in a certain way, thus insuring that the terminal members 22 will be engaged only with the proper plug members 78 and that by proper placing of the keys 83, only the type or kind of relay which is to be used at a given time in the base 74 can be inserted therein.

Figs. 9 to 12 show a modified form of relay embodying the invention in which an additional electromagnet 92 is provided for holding the relay armature 93 in its actuated position after movement under the influence of the coil of the main magnet 94. The terminal base 20*a*, the contact mounting block 26*a* and the contact parts and contact adjusting parts including the adjusting knob 43*a* are substantially identical with those already described in connection with Figs. 1 to 4 of the drawings. The electromagnetic structure of the relay of Figs. 9 to 12 differs somewhat from that disclosed in Fig. 1 and will now be described.

The main magnet 94 comprises a substantially U-shaped laminated core member formed of a nickel iron alloy on one upstanding leg of which is mounted the main magnet coil. The remaining leg of the U-shaped member is clamped between two frame members 96 and 97 which are similar in design and function to the members 18 and 19 of Fig. 1. The armature 93 shown in detail by Fig. 11 includes a sleeve 50*a* which is pivoted on a pin 49*a* in a manner similar to that already fully described in connection with Fig. 4, between two nickel iron strips which extend above the laminated core structure so as to provide an increased area of the air gap as has already been described in connection with Fig. 4 of the drawings. The movable contact 51*a* is carried by the upper end of a loop-shaped member comprising two legs 53*a* which are integrally joined to two non-magnetic strips 98 and 99, the latter being included between the laminations of the armature 93. Carried by the free ends of the members 98 and 99 is a rectangular body of laminations 101 of nickel iron material which cooperates with an upstanding T-shaped magnet core 102, the latter being surrounded by the auxiliary or locking coil 103. The magnetic circuit which includes and acts upon the armature 101 is completed by a pair of magnetic alloy strip members 104 which are clamped between each of the side frame members 106 and 107 and a centrally disposed U-shaped member 108, the latter being formed of a nickel iron alloy. This magnetic circuit, it will be noted, is in a plane substantially perpendicular to that of the main magnet to minimize possibility of interference. The side frame members and the magnetic strip members 104 are spaced apart above the armature 101 by a cylindrical member 21*a* of insulating material which extends laterally beyond each of the frame members so as to position a cover 66*a* out of contact with metallic parts of the relay.

The core 102 is recessed adjacent its lower end to accommodate a clamping screw 111 which passes through the U-shaped member 108 and threadedly engages the side frame member 106. Rigidity is imparted to the entire structure of the relay and the member 108 is rigidly mounted in position by means of a non-magnetic bracket member 112 (Fig. 12) which is secured to the member 108 by suitable fastening means 114. The bracket member 112 embraces the yoke or lower part of the core of the main magnet 94 to which it is secured by a bolt or other suitable fastening means 116. The vertical leg of the core structure of the main magnet 94 has certain of its laminations shortened adjacent their lower ends to permit the member 112 to be accommodated between the frame members 96 and 97, and the remaining laminations of the core structure. A screw or other fastening means 118 clamps the frame members together at this point. The non-magnetic armature pieces 98 and 99 and the bracket 112 are used to prevent transfer of flux between the main and auxiliary magnets.

The rectangular T-shaped head of the magnet core in combination with the magnetic strips 104 provides an air gap of greatly increased area since the flux appearing in the members 104 will provide the armature 101 with the same flux distribution regardless of whether the armature is at its upper or lower limit of travel. Also, should the armature be displaced laterally, as viewed in Fig. 10, the increased reluctance of the path from one strip 104 to the armature is compensated for by the decreased reluctance from the other strip 104 to the armature.

The casing 66*a*, previously referred to, is used to enclose and protect the mechanism of the relay and when in position it is secured to the base 21*a* by fastening means 67*a*. The insulating members 21*a* previously described, which protrude beyond the side frame members 96 and 97 and the corresponding members 106 and 107, prevent the casing 66*a* from touching any of the metal parts of the relay structure.

Fig. 14 shows a relay of the kind described in connection with Figs. 9 to 12 accommodated in a sub-base 73 of the kind shown in Fig. 7 of the drawings. The key or stop members 83 are placed in a different position so as to accommodate the protuberance or lug 88*a* formed from the material of the name plate 89*a* secured to the shell 66*a*. It will be noted that when the key members 83 of the receptacle or sub-base 73 are positioned as shown in Fig. 12, only a relay or instrument like that disclosed in Figs. 9 to 12 can be inserted therein. In order to insure proper assembly of the case 66*a* to the relay structure, a key member 71*a* is formed on the block of insulating material 21.

From the foregoing it will be seen that the present invention provides a novel and compact form of relay which may be conveniently interconnected into a system of associated electrical apparatus, and further that a relay constructed in accordance with the present invention may be readily adjusted and the maintenance thereof is reduced to a minimum because of the non-corrosive character of the parts thereof.

I claim as my invention:

1. In a circuit making and breaking device, an adjustable mounting for a contact comprising resilient means for supporting the contact, a reciprocable member axially aligned and in engagement with said contact and said contact supporting means, and means axially aligned with and independent of said reciprocable means to impart a movement of reciprocation thereto.

2. In a circuit making and breaking device, a flexible contact support, a contact carried by said support, a non-rotatable pin member axially aligned with said contact and reciprocable to adjust the working position of said contact and means for fixing the position of said pin member to render said member effective to provide a fixed stop for said contact in axial alignment therewith to maintain said contact in its plane of operation by preventing rotation thereof about any axis.

3. In a circuit making and breaking device, an insulating member, an initially flat spring bent into U-shape secured on said insulating member, a contact carried by said spring, a reciprocable pin member slidably mounted in said insulating member for adjusting said contact against the action of said spring in a longitudinal direction, said reciprocable member being axially aligned with said contact and means for fixing the position of said pin whereby the position of said contact is fixed.

4. In a circuit making and breaking device, an adjustable mounting for a contact comprising an insulating member, a U-shaped spring secured to said insulating member, a contact secured to said spring, a contact adjusting member slidably mounted in said insulating member for engaging said contact and being axially aligned therewith, and a screw axially aligned with said contact and said pin member and having threaded engagement with said insulating member to impart sliding movement to said contact adjusting member.

5. In a circuit making and breaking device, an insulating member and a contact supported from said insulating member by an initially flat spring bent into U-shape, said insulating member being provided with a bore, a reciprocating member received in said bore and engaging said U-shaped spring at the axis of said contact, a resilient member connected to said reciprocable member and engaging a shoulder on said insulating member to prevent rotation of said reciprocable member, and a screw threaded member having threaded engagement with threads in said bore whereby to move said reciprocable member when said screw threaded member is turned and to impart a movement of reciprocation only to said contact member.

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