

July 5, 1932.

E. F. WESTON

1,866,436

ELECTRICAL RELAY AND THE LIKE

Filed July 17, 1930

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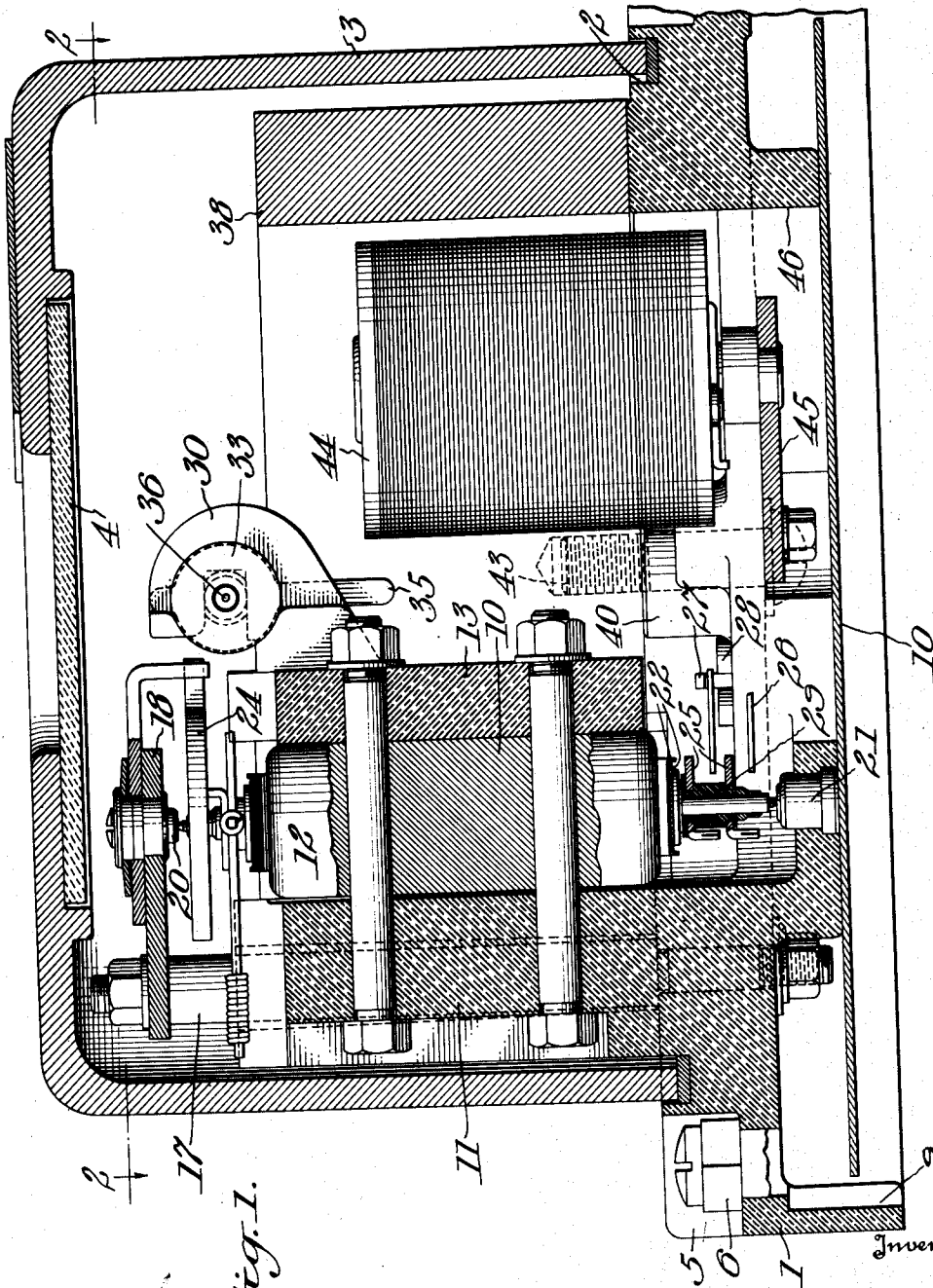


Fig. 1.

Inventor:

Edward F. Weston,

By *Byrne, Townsend & Potter,*
Attorneys.

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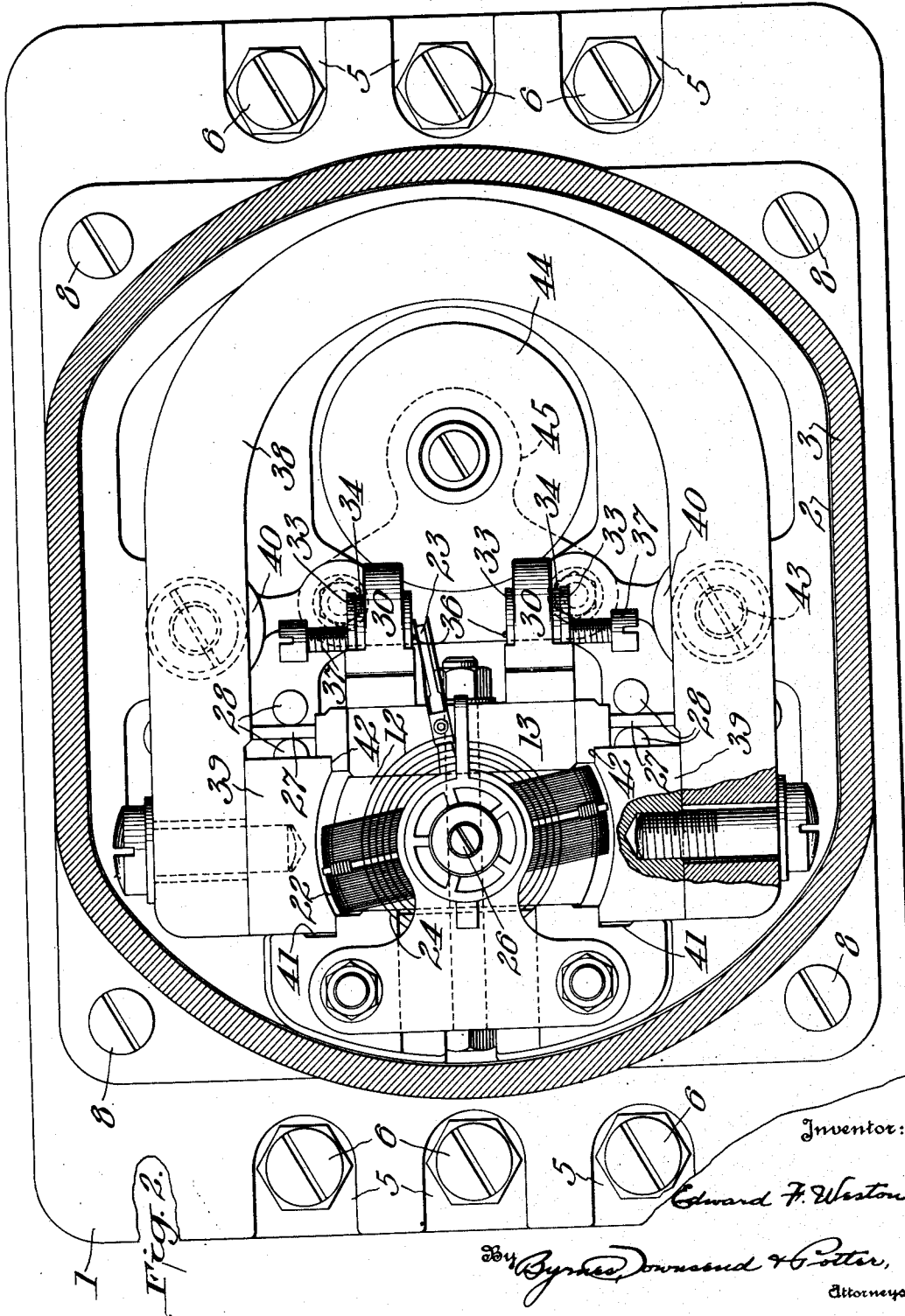
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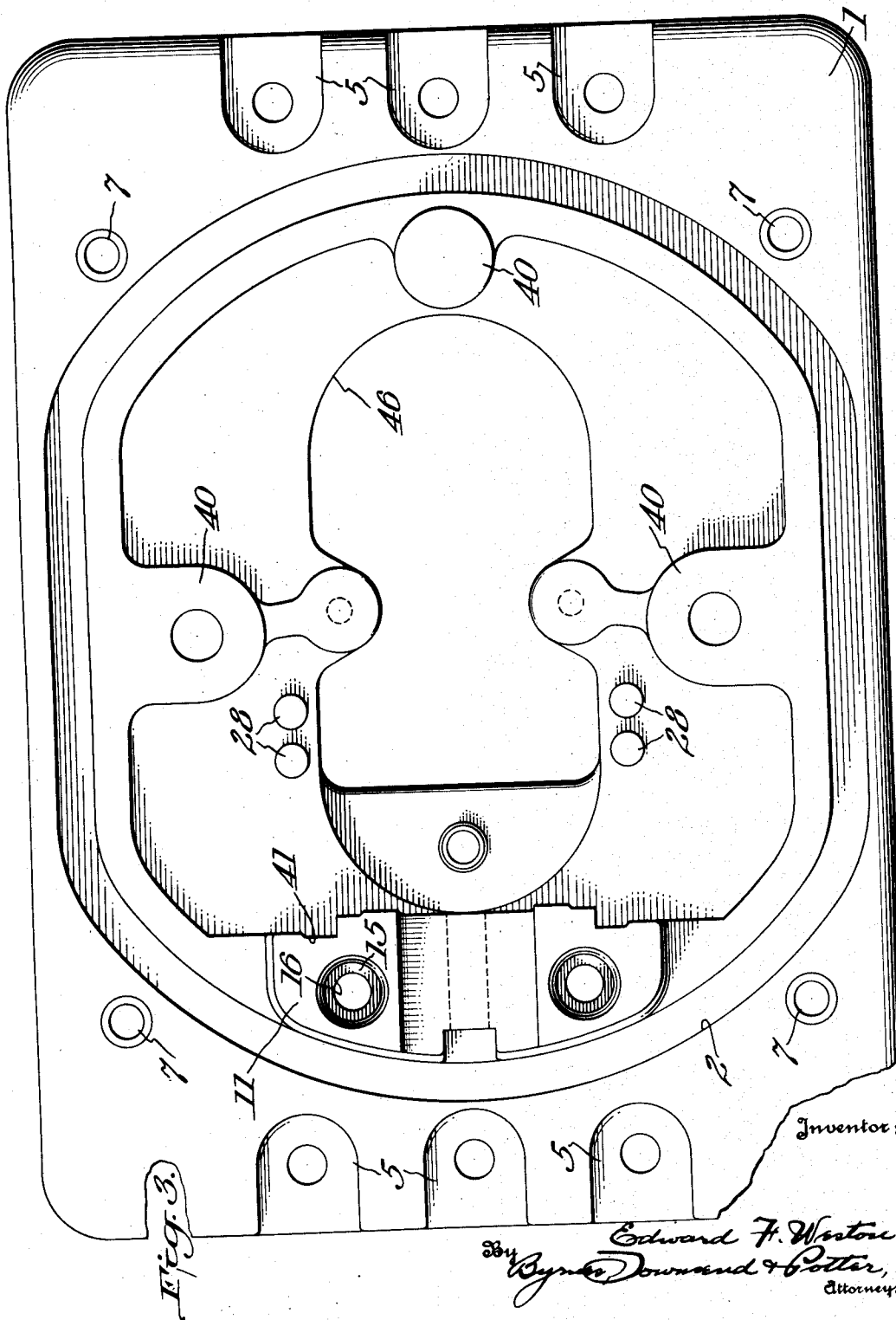
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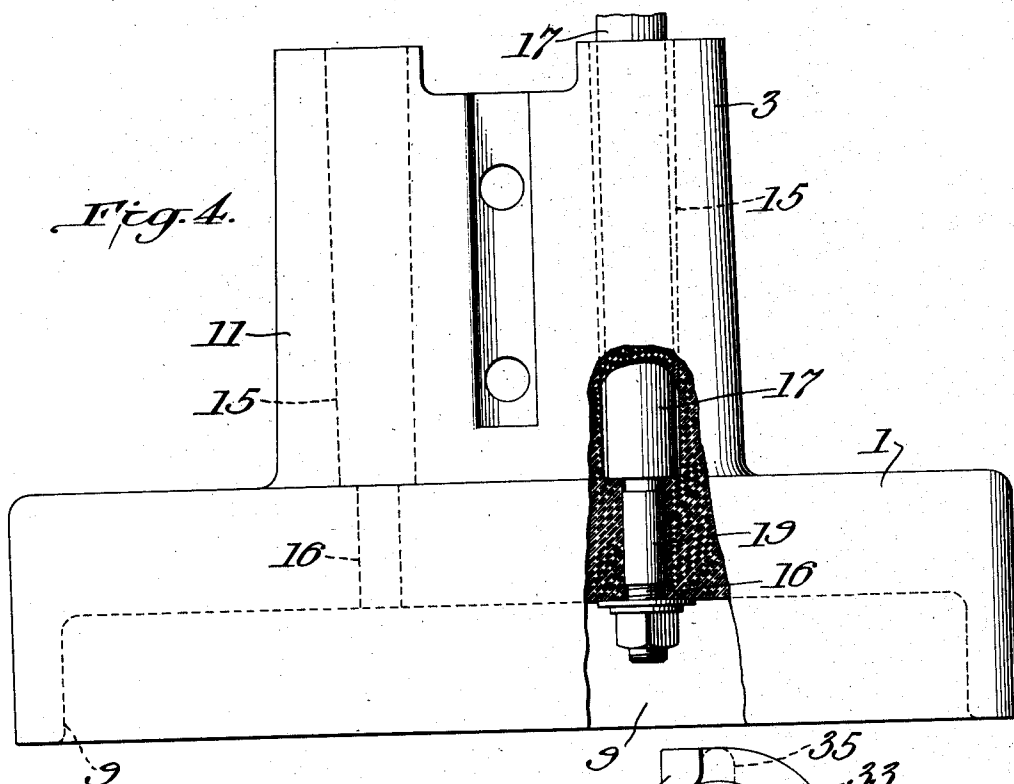
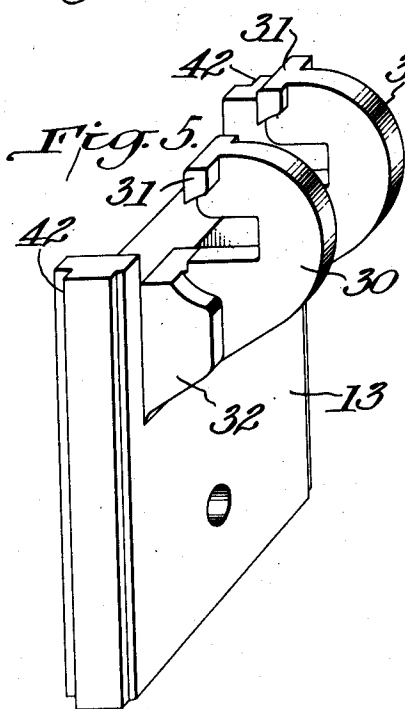
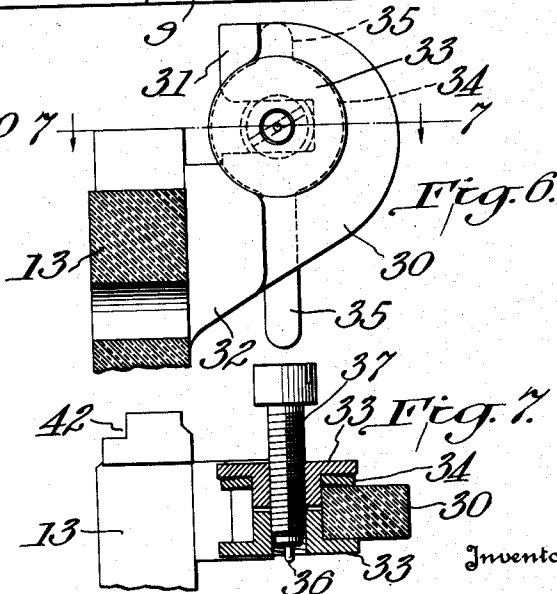
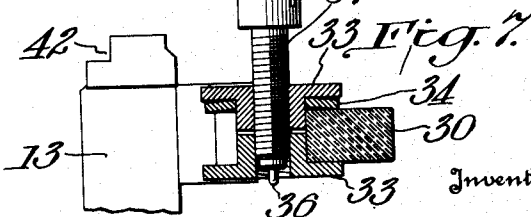
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4 Sheets-Sheet 4



Inventor:

Edward F. Weston,

By *Byrne, Downes and Potter*
Attorneys.

UNITED STATES PATENT OFFICE

EDWARD F. WESTON, OF NEWARK, NEW JERSEY, ASSIGNOR TO WESTON ELECTRICAL INSTRUMENT CORPORATION, OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY

ELECTRICAL RELAY AND THE LIKE

Application filed July 17, 1930. Serial No. 468,584.

This invention relates to electrical instruments of the known type which includes a coil movable in the field of a permanent magnet.

The invention is particularly useful in connection with instruments, such as relays or measuring instruments, of relatively large size but certain features may be advantageously employed with instruments of any size.

10 An object of the invention is to provide an instrument which may be readily assembled and from which the principal parts of the assembly may be removed, for inspection or repair, without disturbing other parts of the instrument. A further object is to provide an instrument having a moving coil system of substantial axial length and in which the bearings for mounting the coil are substantially unaffected by temperature changes.

15 Further objects are to improve and simplify various structural details of a moving coil relay, such as, for example, the relay contacts and the mountings therefor.

These and other objects of the invention will be apparent from the following specification, when taken with the accompanying drawings in which:

Fig. 1 is a central longitudinal section through a relay embodying the invention,

30 Fig. 2 is a transverse section taken on line 2—2 of Fig. 1,

Fig. 3 is an interior plan view of the relay base,

35 Fig. 4 is an end elevation, with parts shown in section, of the relay base,

Fig. 5 is a perspective view of the insulating plate upon which the relay contacts are mounted,

40 Fig. 6 is a fragmentary side view, partly in section, of a relay contact and adjacent portions of the mounting plate, and

Fig. 7 is a transverse section on line 7—7 of Fig. 6.

45 As shown in Fig. 1, all parts of the relay assembly are mounted directly upon or supported from a base 1 of molded insulating material which may be, and preferably is of the phenolic resin type. The base may be of any appropriate shape, usually rectangular as shown in Fig. 3, and is preferably

provided with a shallow groove 2 at its upper surface to receive a cover 3 which, with the base 1, forms a housing for the relay. To permit inspection of the moving system and contacts, the cover 3 may be provided with an opening which is closed with a glass plate 4. The portions of the base 1 which lie outside of the groove 2 may be recessed and apertured, as indicated at 5 in Fig. 3, to receive binding posts 6 and other apertures 7 are provided for receiving screws or bolts 8 by which the relay may be secured to a panel or other appropriate support.

The outer edge of the base 1 is provided with a depending flange 9 which provides a clearance space beneath the lower face of the base 1. A panel 10 is secured to the base to cover or protect the electrical connections and bolt heads, terminals or the like which extend through or into this clearance space. With the exception of the supporting of all parts of the relay from the base 1, as will be explained in further detail hereinafter, the various structural features noted above may be varied at will to satisfy the general design requirement for any particular instrument or relay.

In accordance with the present invention, an integral abutment or projection 11 extends above the base 1 within and closely adjacent one edge of the space defined by the groove 2 and cover 3. One flat face of a cylindrical core 12 which has the form, in cross-section, of a zone of a circle, rests against the inner face of the abutment 11, and the insulating plate 13 rests against the flat face of the core, the core and plate being secured to the abutment 11 by bolts 14 which pass transversely through these elements.

As best shown in Fig. 4, the abutment 11 is provided with two passages 15 whose axes preferably are parallel to each other and to the axis of the core 12. The passages 15 are continued through the base 1 by passages 16 of smaller diameter. The pillars 17 that carry the bridge member 18 are arranged in and have radial faces which bear against the lower ends of passages 15, the reduced ends 19 of the pillars extending through the passages 16 to receive nuts for securing the pil-

lars to the base. The pillars 17 do not contact with the walls of the passages 15 but the reduced ends 19 preferably fit tightly within the passages 16 of the base.

The bridge member 18 provides a support for the upper jewel bearing 20 and a similar bearing 21 is mounted directly in the base 1. The moving coil system is mounted in bearings 20, 21 and includes the winding 22, the contact arm 23, appropriate means for anchoring the inner ends of an upper torsion spring 24 and anchors 25 for a pair of oppositely wound lower torsion springs 26. The outer ends of the respective springs 26 are secured to metal straps 27 that are accurately positioned on the base 1 by the pairs of lugs 28. The springs 26 are insulated from each other and from the coil pivot by the bushing 29 and may therefore be employed as the leads to the winding 22.

The insulating plate 13 is provided, adjacent its upper inner edges, with integral hooked arms 30, see Figs. 5 and 6, for receiving the relay contacts. Abutments 31, 32 extend laterally from the upper and lower portion of each hooked arm 30, the opposed surfaces of each pair of abutments comprising portions of the surface of a right cylinder and the inner surfaces of all of the abutments lying substantially in a single plane.

The circular heads of the pairs of bushings 33 rest against the cylindrical surfaces of abutments 31, 32 and the spring washer 34 which forms a part of each contact assembly has radial projections 35 which bear against the plane surfaces of a pair of abutments to prevent rotation of the washer. The contact point 36 is mounted upon the end of a screw 37 that is threaded through the bushings 33. In assembling the parts, the bushings 33 and washer 34 are placed on a hooked arm, the bushings having flat sides which engage the opposite faces of the slots in the arm 30 to prevent rotation of the bushings. The bushings are pressed towards each other to compress the spring washer 35 and the contact screw 37 is threaded the desired distance into the bushings. Upon releasing the pressure on the bushings, the spring washer 35 expands to eliminate any backlash in the assembly and to prevent inadvertent rotation of the screw 37.

The magnetic field in which the winding 22 is located may be provided by a permanent magnet in the form of a U-shape bar 38 having attached pole pieces 39. To facilitate the location of the permanent magnet in a definite predetermined relation to the moving system of the relay, the upper face of base 1 is preferably countersunk to leave lugs 40 that provide a three-point support for the bar 38 and the corners of the abutment 11 and insulating plate 13 are notched, as indicated at 41 and 42 respectively, to form guide channels for the edges of the

pole pieces 39. The permanent magnet assembly is secured to the base by bolts 43.

Instruments of this type usually include a resistance for determining the voltage to be impressed across the winding 22, and when one is required the resistance winding or spool 44 may be supported in the space within the bar magnet 38 by a plate 45 that is secured to the lower face of the base 1.

To facilitate the assembly of the instrument, an opening 46 is provided in the central portion of the base.

In assembling the instrument, the pillars 15 are fixed in place and the bridge member 18 is mounted on the pillars. The moving system is then placed in position on the jewel bearings. Thorough inspection and/or adjustment of the moving system are possible since none of the other parts are in place and the opening 46 in the base 1 is not obstructed. The core 12 and insulating plate 13, with the contacts assembled thereon, are then secured to the abutment 11 and the resistance spool 44 is mounted on the base. The appropriate electrical connections are then made. As stated above, the connections to the winding 22 of the moving system are made through the lower springs 26, and, similarly, the connection to the contact arm 23 may be made through the upper spring 24. The radial projections 35 on spring washers 34 serve as electrical terminals for the respective contact points 36. When the wiring is completed, the permanent magnet is slipped into place, being guided by the recessed edges of abutment 11 and plate 13, and secured by bolts 43. After the final inspection and adjustment, the cover 3 and sub-panel 10 are secured to the base to complete the assembly.

The pillars 17 are formed of a metal or alloy which has substantially the same coefficient of expansion, for temperature changes, as the moving coil system. Since the pillars 17 are spaced from the abutment 11, the spacing of the bridge member and upper jewel bearing from the lower jewel bearing is not affected by the expansion of the abutment 11 which, if formed of a phenolic resin, has a relatively high coefficient of expansion. This feature is of primary importance when instruments having relatively long coil systems are subjected to a wide range of temperature. By mounting the upper bearing upon pillars which have the same coefficient of expansion as the moving system, the adjustment of the bearings remains substantially independent of temperature changes.

It will be apparent that the invention is not limited to electrical instruments of the relay type but may be embodied in measuring instruments in which the pivoted coil moves a pointer over a scale.

I claim:

1. In an electrical instrument of the permanent magnet and movable coil type, a base of insulating material, an abutment rising
5 above said base, a core secured to said abutment, a lower jewel bearing mounted in said base, pillars secured to said base and passing through but not contacting with said abutment, a bridge member mounted on said pillars,
10 an upper jewel bearing carried by said bridge member, and a coil system pivotally supported by said bearings.
2. The invention as set forth in claim 1, wherein the temperature coefficients of expansion of said pillars and said coil system
15 are substantially equal.
3. The invention as set forth in claim 1, wherein the said insulating base is provided with an aperture adjacent the said lower
20 jewel bearing, said aperture being of a size to permit access to the moving system through the insulating base.
4. In a relay of the permanent magnet and pivoted coil type, a base of insulating material having an integral abutment extending
25 above the same, a core, an insulating plate carrying contacts, means securing said core and contact plate to said abutment, a moving system including a contact arm and a coil
30 mounted for angular movement about the axis of said core, and a permanent magnet secured to said base and having poles cooperating with said core to establish a magnetic field in which said coil is positioned.
- 35 5. The invention as set forth in claim 4, wherein the opposed faces of said abutment and contact plate provide channels for guiding said magnet, as it is assembled on or removed from said base, to prevent the same
40 from contacting with said moving system.
6. The invention as set forth in claim 4, wherein the lower bearing for said moving system is mounted in said base, and the upper bearing is supported by metal pillars
45 having substantially the same temperature coefficient of expansion as said moving system, whereby temperature change will not affect the adjustment of said moving system in said bearings.
- 50 7. In an electrical relay of the permanent magnet and pivoted coil type, a base, a contact plate of insulating material supported from said base, said plate having hooked arms, metal bushings extending into the apertures provided by each of said hooked arms,
55 said bushings and arms having cooperating portions preventing rotation of said bushings, a spring washer between each of said arms and a bushing mounted therein, and
60 contact screws threaded through the pair of bushings mounted on the respective arms.
8. The invention as set forth in claim 5, wherein each of said washers is provided with a radial extension which serves as an
65 electrical terminal for the contact screw.
9. In an electrical relay, the combination with a base of insulating material, and a permanent magnet supported on said base and having opposed poles, of an abutment integral with said base and extending above the
70 same adjacent the space between said poles, a core positioned between said poles, an insulating plate at the side of said core opposite said abutment, bolts passing through said insulating plate and core to secure the same
75 to said abutment, a moving coil system, a lower bearing mounted on said base, and means independent of said magnet providing an upper pivotal support for said moving
80 system; the space defined by the opposed faces of said poles being larger, as viewed axially of the moving system, than the space occupied by said moving system and upper support therefor, whereby the magnet may be removed from said base without disturbing
85 said moving system.
10. The invention as set forth in claim 9, wherein said abutment and said insulating contact plate have surfaces cooperating with
90 said magnet poles to guide the magnet as it is assembled on or removed from said base.
11. A contact assembly for use in an electrical relay of the type including a magnet, a core between the poles of said magnet, and a
95 coil pivotally supported for angular movement in the air gaps between said core and the poles of said magnet; said contact assembly comprising a plate of insulating material adapted to be supported against one face
100 of said core, a pair of metal bushings mounted on said insulating plate, a contact screw threaded through said bushings, and cooperating means on said plate and bushings to prevent rotation of the latter.
12. The invention as set forth in claim 11,
105 in combination with a spring washer tending to effect relative movement of said bushings axially of said contact screw, whereby backlash is eliminated.

In testimony whereof, I affix my signature.
EDWARD F. WESTON.

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