Sept. 2, 1947. R. L. TRIPLETT 2,426,800

DIAL MOUNTING FOR ELECTRICAL MEASURING INSTRUMENTS

Filed July 28, 1943

Fig. 1.

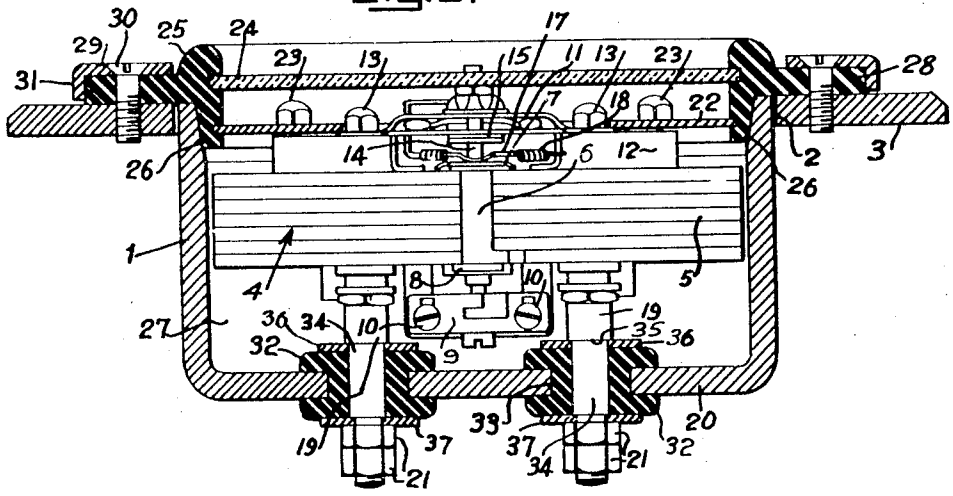


Fig. 2.

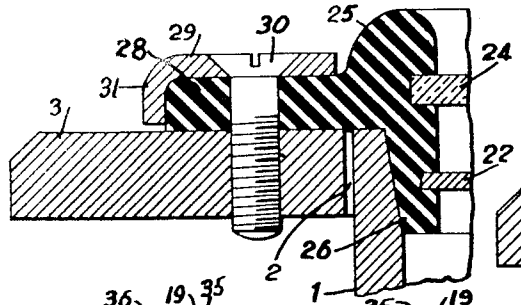
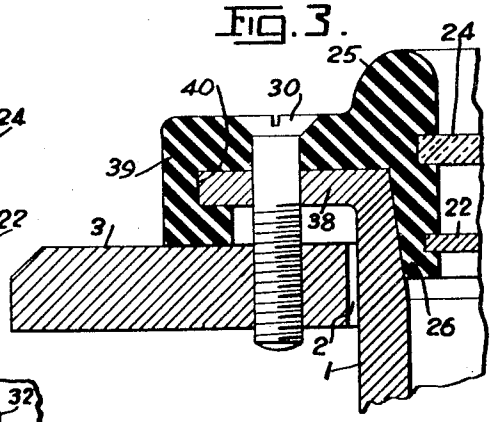


Fig. 3.



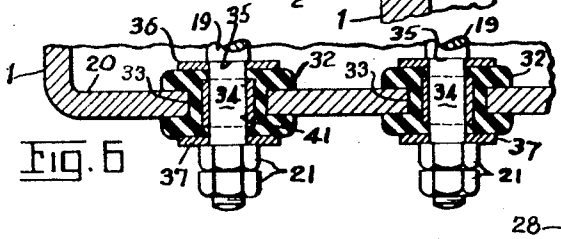
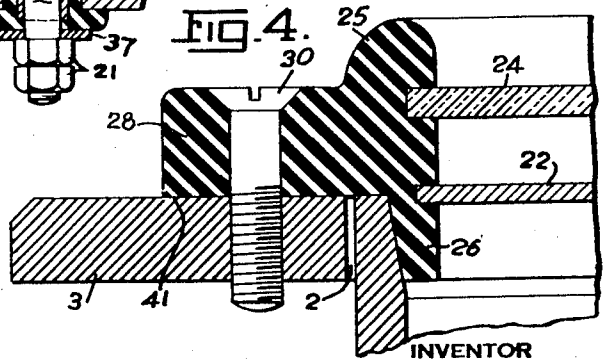


Fig. 6

Fig. 4.



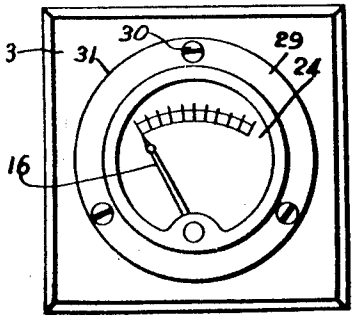


Fig. 5

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Patented Sept. 2, 1947 2,426,800

UNITED STATES PATENT OFFICE

2,426,800

DIAL MOUNTING FOR ELECTRICAL MEASURING INSTRUMENTS

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Application July 28, 1943, Serial No. 496,374

2 Claims. (Cl. 171—95)

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The present invention relates to electrical instruments, more particularly to improved methods and apparatus for mounting an instrument movement within its casing.

In the manufacture of ammeters and voltmeters it is customary to mount the unit with the dial plate in position on a base which forms the back cover plate of the instrument casing. The latter is usually formed as an open ended cylinder of metal, hard rubber or a phenolic condensation product such as "Bakelite" and one of the ends is closed by said closure plate and the other end is closed by a window which extends over the dial of the contained movement. In order to prevent the entry of dust and moisture into the casing, the glass window is usually calked to the casing. While this general construction is satisfactory, it has been found that considerable labor and expense is involved in this calking operation and even when this has been carefully done there is still some tendency for dust and moisture to leak into the casing. In accordance with one aspect of my invention there is provided an improved sealing means between the glass window and the casing which requires no calking whatsoever and the arrangement is such that a hermetic seal is automatically effected between the window and the casing when the instrument movement is secured in position. Thus the sealing means serves not only to prevent the ingress of moisture and dirt into the casing but also serves to support one end of the instrument movement within the casing. It has been found, particularly in the case of movements of considerable depth, necessitating an equally deep casing, that some provision must be made for supporting the opposite or lower end of the movement in the casing.

In accordance with another aspect of my invention, a mounting of this character is provided in which both ends of the movement are supported from the casing and the mounting is formed of flexible material in order to permit the movement to float within the casing. In the event that the casing is formed of metal, the mounting elements are made of an insulating material such as soft rubber which serves satisfactorily not only to introduce flexibility into the supporting elements, but also serves electrically to insulate the movement from the metal casing and from any extraneous electric disturbances. Thus the instrument movement is flexibly supported at both ends from the casing in such a manner that it will withstand severe shock and the ingress of moisture and dust is precluded and furthermore the

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movement is isolated both electrically and magnetically from the casing.

The primary object of the invention is to provide an improved shock-proof electrical measuring instrument which is sealed against moisture and dust.

Another object is to provide an instrument in which the movement is flexibly mounted at both ends within the casing.

Still another object is flexibly to support the movement of an electrical measuring instrument within its casing and electrically to insulate the movement from the casing.

The more general object is to provide an improved mount or support for the movement of an electrical measuring instrument within its casing, said support being inexpensive and capable of being placed readily in position so as to minimize the cost of fabricating devices of this sort.

The invention will be better understood when reference is made to the following description in connection with the accompanying drawings.

In the drawings:

Figure 1 is a sectional view of an instrument improved in accordance with the invention and showing in particular the flexible mount at the dial side of the unit or movement and the flexible support at the base of the unit.

Figure 2 is a fragmentary view, somewhat enlarged, of a modified form of the mount at the dial side of the instrument.

Figures 3 and 4 show still other forms of this mount or support.

Figure 5 is a plan view, in diminutive size, of the improved instrument.

Figure 6 is a fragmentary, sectional view showing a modified form of the flexible support by which the instrument movement is carried by the bottom of the casing.

Referring more particularly to Figure 1, reference numeral 1 designates a cylindrical member made of metal or an insulating material such as hard rubber or a phenolic condensation product, the member being open at the top and closed at the bottom. The member 1 has an external diameter which is slightly less than the size of an opening 2 provided in a panel 3. The latter may form part of a switch board or as is most usual constitutes the top cover plate of a meter-containing box. The instrument movement is designated generally by the reference numeral 4 and may include a magnetic assembly formed of a plurality of relatively thin magnetic plates 5 which take the general shape of a horseshoe having an air gap indicated at 6. This air gap is

provided with curvilinear opposed surfaces, in which the rotative element 7 of the instrument is mounted and adapted to rotate. This element may comprise a coil wound on a hollow rectangular frame and surrounding a stationary core 8. The coil is mounted at each end on jewel bearings, one of the bearings being illustrated as a bridge support, the parts of which may be removed by loosening the screws 10. The jewel bearing for the other end of the coil is carried on a transversely extending truss 11 which is seated on a plate 12 of insulation material, and bolted to the magnetic assembly as indicated at 13. A shaft 14 extends between the jewel bearing and the front end of the rotative element 7.

The shaft 14 is provided with a hairspring 15 or spiral filament which gives the shaft and its coil a biased position of rotation, and also serves to conduct current from the source of supply to the rotating coil. One end of the spring, usually the inner end, is secured to the shaft 14, thus rotating therewith, and the other end of the spring is secured through a connecting pivoted element to a stationary part of the casing. This connecting element (not shown) is usually carried through the casing at any suitable point and terminates in a so-called "zero adjustment" (not shown). Thus by turning the screw the tension on the hairspring or filament may be controlled to increase or decrease the force which tends to restore the pointer of the instrument to zero, and against which the pointer operates as it moves over the dial.

The pointer of the instrument is indicated at 16 (Figure 5) and forms part of a cross-shaped member 17 which is mounted on the shaft 14. Three legs of this member are provided with small counterweights 18 to assist in balancing the weight of the pointer, as is well known in the art. Connections for the two ends of the rotating coil are taken through the bottom portion 20 of the casing 1 and are held in position by the nuts 21. The dial over which the pointer 16 sweeps is shown at 22, this dial being secured to the plate 12 by the bolts 23 or in any other suitable manner. There is a glass protecting plate indicated at 24, through which the position of the pointer on the dial may be observed.

Whereas in the prior art it is customary to form the back plate 20 as a separate element from the casing 1 and to mount the entire instrument movement on the removable back plate, which is thereafter secured by screws to the casing, in accordance with one of the features of the present invention, the movement is introduced from the front or open end of the casing so that the back plate may be formed integral with the casing. There is therefore no joint between the back plate and the casing, and hardly any possibility of moisture or dust being introduced through the rear side of the casing into the movement.

As shown in Figures 1 and 2, the glass plate 24 and the dial plate 22 are of somewhat smaller diameter than the internal diameter of the casing 1 and the peripheral edges of these two circular elements are introduced into rectangular grooves which extend around the interior surface of a bezel 25 which is effectively interposed between the edges of these two elements and a tapered portion 26 of the casing interior indicated at 27. The bezel is made of any flexible material preferably an insulator such as soft rubber in order to present a wedging effect when in position and to facilitate the introduction of the glass member 24 and the dial 22 into the internal peripheral grooves.

In order conveniently to secure the bezel to the panel 3 the bezel is provided with a radially extending flange portion 28, the lower surface of which abuts and rests upon the upper surface of the panel. This flange portion is preferably positioned about midway of the width of the bezel and provides an upper clamping surface which is adapted to receive a circularly shaped flanged metal ring 29 which extends over the radial surface and the outer peripheral edge of the bezel as shown on the drawing. The ring 29 is preferably made of metal and is provided with equidistantly spaced openings for receiving screws 30, the latter passing through the flanged portion 28 of the bezel and are adapted to be received by threads in the panel 3. Thus, by tightening the screws 30, the metal ring 29 is forced downwardly against the panel 3 to compress the radial portion of the bezel, thereby assuring a moisture and dust tight joint between the lower flat surface of the bezel and the upper surface of the panel. It is apparent that the interior width of the lip 31 should preferably be less than the thickness of the rubber flange 28 in order to permit a clamping or compressing action when the ring is tightened at the screws 30. Inasmuch as the glass plate 24 is held tightly within the bezel 25 and the latter in turn is clamped against the panel 3, the top or open end of the casing 1 is effectively sealed against moisture and dust so that the instrument contained within the casing is effectively protected. The rubber bezel 25 also serves the important function of providing a flexible support between the upper end of the instrument movement and the upper edge of the casing 1 and to that extent prevents damage to the delicate operating parts including the jewel bearings in case the instrument were subjected to shock during shipment or while in use.

In accordance with another feature of my invention, the lower end of the instrument movement is also provided with a shock-proof support in the form of grommets 32 which are preferably of circular configuration. These grommets are made of flexible and resilient material such as soft rubber and are provided with a circular groove indicated at 33 which fits snugly within openings provided in the bottom portion 20 of the casing. There is a central opening in each grommet for receiving the rod portion 34 of each terminal or binding post 19, and in order to insure a clamping effect at each grommet when the nuts 21 are tightened each terminal is provided with a shoulder 35 against which is forced a metal washer 36. The latter rests on the interior surface of the grommet as indicated and there is a corresponding washer 37 interposed between the inner nut 21 and the lower surface of the grommet. It is apparent that as the nuts 21 are tightened, the movement as a whole is drawn downwardly into the casing 1, causing the bezel 25 to strike against the tapered portion 26 of the casing, in addition causing each grommet 32 to be compressed and thus forming a strictly moisture and dust tight seal at the bottom. The grommets 32 also serve the important function of flexibly mounting the binding posts 19 in the casing 1 and therefore together with bezel 25 constitute a floating mount for the entire instrument movement. In view of the fact that the bezel and grommets are made of an insulating material such as soft rubber, the movement being

electrically insulated from the casing 1 in the event that the latter is made of metal.

However, when the casing is formed of a non-metallic material such as Bakelite or other plastic material so that it is not necessary electrically to insulate the movement from the casing, the bezel and grommets provide effectively their other important function of flexibly supporting the movement within the casing. Thus, the improved instrument is entirely immune to shock which may be caused either during shipment of the instrument or when in use, so that the instrument offers a longer life insofar as reliability of measurement is concerned than a device in which the upper and lower ends of the movement are rigidly secured to the casing.

A metal casing has a number of advantages over one made of insulating material in that the metal, if properly selected, will magnetically isolate the movement including the magnetic assembly and the actuating coil from extraneous electric and magnetic disturbances. The improved form of support including the soft rubber bezel 25 and the grommets 32, serve to permit the use of metal casings for instruments and to that extent provide an instrument which is immune to electrical and magnetic disturbances, which normally affect the accuracy of measurement.

The grommets 32 may be readily placed in position notwithstanding the fact that the interior portion of each grommet is of larger size than the opening 33 by simply wedging or forcing the grommet through the opening, temporarily distorting the rubber mass until the member has been placed in position, at which time it will return to its original shape. The hand operation in pressing these grommets in position, is therefore very simple and it will be understood in this connection that the binding posts 34 are threaded through the grommets after the latter are placed in position and then the outer washers 37 are placed in position together with the nuts 21.

Figure 3 shows a modified form that the bezel 25 may take. In this case the casing is provided with an upper outwardly extending flange indicated at 38 and the bezel has a downwardly extending lip portion 39 of a width almost as large as the width of the interior portion of the bezel. The lip portion 39 of the bezel is provided with an interior circular groove indicated at 40 into which the flange portion of the casing is forced and held in position. Screws 30, similar to those explained in connection with Figure 1 but of somewhat longer length, are employed for securing the bezel 25 to the panel plate 3. It will be noted in this connection that the heads of the screws 30 are countersunk into the rubber bezel instead of into the metal plate 29 of Figure 1. Under these conditions the bezel 25 in Figure 3 would preferably be made of harder rubber than the bezel of Figure 1 in order to permit a grip with the screws 30 but it will be understood that the bezel in Figure 3 as in the case of the similar element in Figure 1 is adapted to introduce both flexibility and insulation qualities to the support which holds the upper end of the movement in position. The lower end of the movement may be supported from the casing in the manner shown and described in connection with Figure 1, also if desired and in the case of a casing of electrically insulating material, as plastics, the terminal posts 19 may be secured directly to the casing so that a flexible support need be provided only at the upper end of the movement. In other words, the bezel shown in Figure 3 and also the bezel shown in Figure 1 offer their own advantages by way of flexibility of support and insulation to the upper end of the movement regardless of the manner in which the lower end of the movement is supported from the casing. The added advantage of the lower flexible support is that it permits all parts of the movement to be floatingly and insulatingly mounted within the casing.

Figure 4 shows still another from that the bezel 25 may take. In this case the upper edge of the casing is flush with the upper edge of the panel 3 and for this reason is given a lower flat surface indicated at 41 which firmly abuts the upper surface of the panel when the screws 30 are tightened. The structure shown in Figure 4 offers some advantages over that illustrated in Figure 1 in that the metal ring 28 has been discarded and offers the advantage over the structure shown in Figure 3 in that it is not necessary to provide the casing 1 with the radially extending flange 38. It has been found that when the bezel 25, shown in Figures 3 and 4, is made of rubber of the proper degree of firmness and resiliency, the screws 30 will securely hold the bezel to the panel 3 with little or no sacrifice of resiliency or flexibility. It is entirely possible, regardless of the type of bezel employed to pull the instrument movement into the casing by the nuts 21 and to effect a moisture and dust proof joint at the upper end of the casing.

While I have described a bezel in which both the glass plate and the dial plate are held within grooves formed in the bezel, if desired only one of these elements need extend into the bezel and a perfect seal will still be maintained at the upper end of the casing.

The bezel 25, in all of its forms, may be molded in a peripherally complete circular shape, or if desired, the bezel may be formed as a strip and wrapped around the glass and dial plates because when the nuts 21 are tightened the ends of the bezel are effectively pressed together due to the wedging action of the tapered surface 26. It will also be understood that if the bezel 24 were employed solely for closing the upper end of the casing 1, i. e. when flexibility of support or an insulating support is not required, the bezel may be made of metal, either in the form of a strip or as a peripherally complete element. In the latter case, assuming the rubber grommets 32 are also used, a certain amount of floatability of the instrument movement will still be afforded due to the resiliency of the grommets.

Figure 6 shows a modified form of the grommet 32 by which the lower end of the instrument movement is flexibly carried by the bottom portion of the casing 1. In this figure, a metal cylinder 41 fits tightly about the rod portion 34 and is received by an annular recess formed in the grommet 32. The purpose of the member 41 is to act as a stop for the washers 36, 37 in order to predetermine the extent of compression when the grommet 32 is depressed by tightening the nuts 21.

From the foregoing it is evident that I have disclosed a flexible mounting for both ends of the contained instrument movement. The upper end of the casing is suspended from the panel 3 solely by means of the resilient block of rubber 25 or other elastic material and any degree of elasticity or resiliency may be obtained by simply varying the thickness and the material of the bezel.

Having thus fully described my invention, what

I claim as new and desire to secure by Letters Patent, is:

1. As an article of manufacture, a bezel for an electrical measuring instrument including a casing and a contained dial and movement mechanism, said bezel being adapted to receive the peripheral edge of said dial and having a radially extending flange portion which is adapted to rest on a panel from which the casing is supported.

2. As an article of manufacture, a bezel for an electrical measuring instrument including a casing and a contained dial and movement mechanism, said bezel being adapted to receive the peripheral edge of said dial and having a radially extending flange portion which is adapted to rest on a panel from which the casing is supported, the radially extending portion of said bezel being adapted to receive an edge of said casing.

RAY L. TRIPLETT.

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