June 12, 1956 H. H. ANDERSEN ET AL 2,750,585

INSTRUMENT STRUCTURE

Filed April 27, 1955

Fig.1

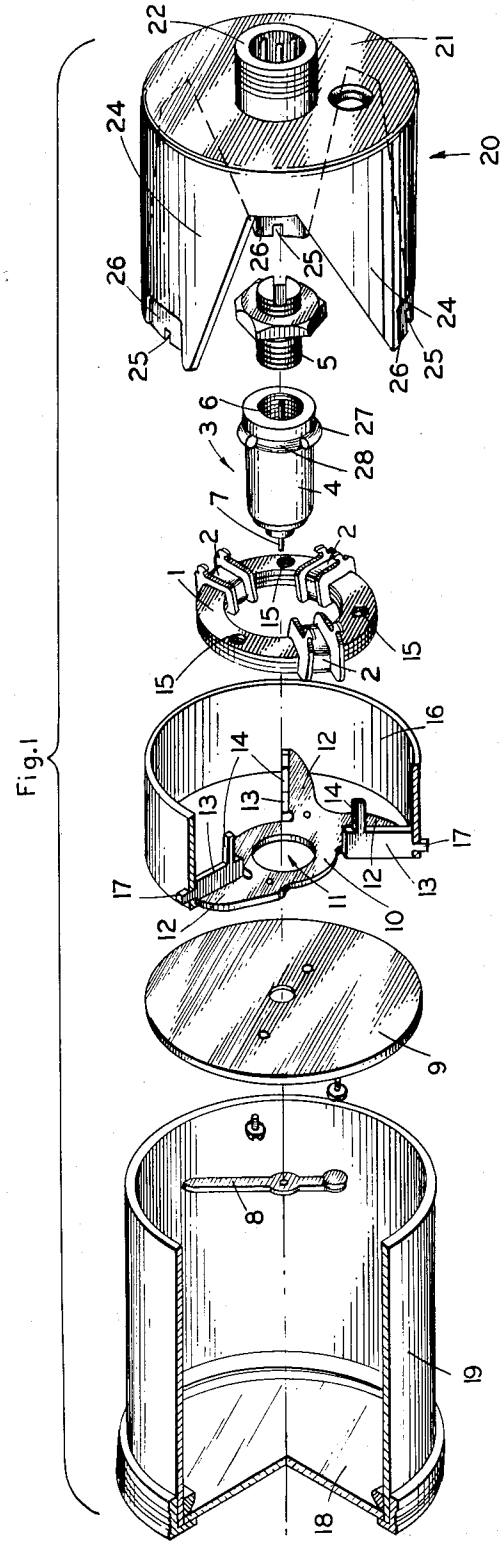
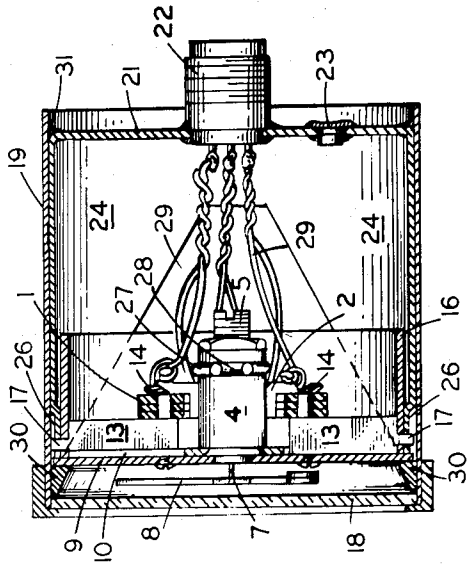


Fig.2



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United States Patent Office 2,750,585 Patented June 12, 1956

2,750,585

INSTRUMENT STRUCTURE

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Application April 27, 1955, Serial No. 504,231

8 Claims. (Cl. 340—378)

The present invention relates to instrument assemblies and, more particularly, to small panel-type instruments having improved casing and internal support structures.

Manufacture of delicate and sensitive instrument mechanisms has commonly been faiclitated by initially assembling the operating parts on a suitable frame in their final interacting relationships and, after this, the frame and the parts mounted thereon can be enclosed within a protective housing or container. In the usual case, a multitude of fasteners, such as screws and bolts, and a number of miscellaneous elements, such as brackets, clamps, shims, and vibration dampers, are required to complete the assembly of the operating mechanisms within their housings. The resulting instruments thus prove to be rather complex and expensive to manufacture, and assembly and disassembly for repair and modification purposes, can prove to be particularly difficult.

In accordance with the teachings of the present invention, one part of an instrument casing is adapted to serve as a frame and support for the operating parts, and the construction is such that the operating elements can be fully attached and adjusted as part of a sub-assembly, together with such electrical connections as may be required, before the remaining part of the instrument casing is fitted to complete the assembly. Instruments which are relatively small, such as the common panel-mounted type, may be fabricated with sheet metal frame and support elements, as presently taught, the need for cast or machined frames being obviated and the various components being adapted for assembly without the use of numerous items of fastening hardware.

Accordingly, it is one of the objects of the present invention to provide simplified and low-cost instrument assemblies.

A further object is to provide improved instruments of the encased type wherein assembly and disassembly operations may be performed readily without entailing sacrifice of mechanical characteristics of such instruments.

By way of a summary account of one aspect of this invention, there is provided a sensitive operating mechanism mounted on a stamped metal support plate from which extend three radial projections. The cylindrical casing for this instrument includes a back plate having three integral and forwardly-extending legs each slotted to receive the support plate projections. A cylindrical casing member fits tightly about the back plate and the back plate legs, forcing the back plate legs radially inward and into a firm holding relationship with the mechanism support plate. Tight frictional engagement of the back plate and the back plate legs with the main portion of the instrument casing tends to hold the instrument parts in their assembled relationship.

Although the features of this invention which are believed to be novel are set forth in the appended claims, the details of the invention itself and further objects and advantages thereof may be most readily comprehended through reference to the following description taken in connection with the accompanying drawings, wherein:

Figure 1 illustrates one instrument construction in conformity with this invention, the elements thereof being represented in a pictorial and exploded view; and

Figure 2 is a partly cross-sectional representation of the same indicating instrument depicted in Figure 1, the elements being shown in their fully assembled relationships.

The embodiment appearing in Figures 1 and 2 of the drawing includes the operating mechanisms of a D.-C. Selsyn-type position indicator. The repeater element is shown as comprising an annular stator core 1, carrying three delta-connected field coils 2 spaced 120° apart, and cooperating with a rotor structure 3. In accordance with known practices, rotor structure 3 includes a permanently magnetized cylindrical rotor element (not visible) within the outer damping cylinder and frame 4. Bearing screw 5 is threaded into frame 4 to provide a low friction support for the rotor shaft 6, and the other end 7 of the rotor shaft projects forwardly from the cylinder 4 to actuate the instrument pointer 8 which is mounted thereon. Operation of Selsyn apparatus of this nature is generally well known: D.-C. signals from a remote potentiometer-type transmitter are applied to the field coils 2, establishing a resultant unidirectional diametric field across the stator core 1, and the magnetized receiver rotor aligns itself angularly with the angular orientations of the diametric field. Indicator 8 is angularly positioned by the rotor of the selsyn receiver and may be read against appropriate indicia on its operating scale plate 9.

One of the principal support elements for the selsyn indicator components is a front support plate 10, which preferably is fabricated from a single metal sheet. Support plate 10 is provided with central aperture 11 which permits the rotor cylinder 4 to be fitted therein, and the end thereof is peened over to form a rigid coupling, as appears more clearly in Figure 2. Support plate 10 is also shaped to possess three radially-extending arms 12, lying in the plane of the plate, and each of these arms supports an integral bent-over projection 13 extending rearwardly and perpendicular to the plane of the support plate. Each of the projections 13 possesses a rearwardly-extending tab 14 which passes through a corresponding opening 15 in the selsyn stator core 1. Referring to Figure 2, it is observed that the rearmost surfaces of projections 13 abut the stator core 1 when it is positioned on tabs 14, thereby providing a plurality of locating surfaces, and the ends of the tabs 14 which project through the stator core may be bent to hold the core in place without recourse to additional fastening hardware.

Instruments such as the selsyn repeater illustrated in the embodiment of Figures 1 and 2 commonly require magnetic shielding to prevent interaction of the operating mechanisms with external fields. Cylindrical shield 16, of magnetic material, is thus provided, and is conveniently located and mounted on the support plate 10 by the radially-extending tabs 17 which project from surface of the support plate and through correspondingly-shaped apertures in the shield. The instrument dial plate 9 may be affixed to support plate 10 by the screws shown in Figure 2, or by any other convenient fastening arrangement.

When the elements thus far described have been assembled in the aforesaid relationships, they must be adjusted for accuracy, provided with suitable electrical connections, and encased for panel mounting and protection against environmental conditions. The casing provided in accordance with these teachings is of essentially two parts: a front-end part of the casing, which includes the usual front window glass 18 and which has a generally cylindrical body portion 19 extending rearwardly from the window glass; and a second portion of the casing 20, which also has a generally cylindrical configuration and has its rearmost end closed with a back

plate 21. Casing portion 20 is preferably formed from a single piece of sheet metal, although a separate electrical connector 22 and a sealing plug 23 may be fitted onto this back plate for the customary purposes.

The cylindrical body portion of the casing part 20 projects in the forward direction from back plate 21 and is cut or otherwise shaped to have three distinct legs 24, each of the legs 24 including a short longitudinal slot 25 in its frontmost end and preferably being located in a radially recessed cylindrical surface 26. Sheet metal of which the casing part 20 is made preferably is somewhat resilient, for purposes appearing more fully hereinafter.

Slots 25 in casing part 20 are arranged to make a tight-fitting engagement with the support plate tabs 17, such that the support plate 10 and its attached instrument operating mechanism may be fitted onto casing part 20 after final adjustments are made. One instrument adjustment includes the angular positioning of pull-off magnet 27, which serves to attract the selsyn rotor to a predetermined zero or null position. This pull-off magnet comprises a C-shaped member of permanently magnetized material which may be snapped into self-retaining position in an annular groove 28 on the cylindrical rotor frame 4. Electrical wiring 29 between the selsyn stator coils and the electrical connector may be completed before the instrument mechanism is fitted into casing part 20. With the instrument mechanism thus fully mounted in the casing part 20, the other cylindrical casing part 19 is then slipped over this sub-assembly. The inner cylindrical dimensions of casing part 19 are about the same as or slightly smaller than the outer cylindrical dimensions of casing part 20, such that the three legs 24 will be compressed radially inward during the last mentioned assembly operation. The ends of legs 24 then clamp the shield 16 and support plate 10 very rigidly, the outer radial surface of support plate 10 serving to limit the radial compression of arms 24 and to establish this rigid support. An annular spacing member 30, within casing part 19, insures that the casing parts cannot be telescoped to an extent which would force the pointer 8 against the front window glass. The two casing parts are thus joined with a tight fit which resists their separation and preserves any set angular relationship between them. Soldering of the back plate 21 to the casing part 19, as illustrated in Figure 2 and identified by reference character 31, may provide a hermetic seal and further strengthen the desired union between the casing parts. Disassembly of the instrument is readily accomplished by breaking seal 31 and withdrawing part 20 from within casing part 19.

Although a preferred embodiment of this invention has been referred to in connection with its disclosure here, it should be apparent that the teachings are applicable to instruments of other designs as well. For example, instrument casings of a common rectangular cross-section may utilize the described features, it merely being necessary that the configurations of the two casing parts be similar and dimensioned to yield the desired press fit. Legs projecting forward from the back plate of the instrument casing may have any number greater than one, and these legs may be distributed in any locations where their binding and holding effects will be most pronounced. Support plate configurations may be circular or may otherwise vary from the one illustrated, in accordance with design requirements, and the rearwardly-extending projections from such support plates may exceed three if additional supporting surfaces are required. In an alternative construction the casing legs and support plate may have a different fastening arrangement; for example, the mating radial tabs 17 and slots 25 may be reversed in position, that is, the casing legs 24 may be provided with tabs extending radially inward and adapted to mate with slots or other openings in a suitably bent-down part of the support plate 10. Also, open-ended slots 25 in legs 24 may be replaced by small holes through which the radial tabs 17 project, thereby providing a greater locking effect between the casing legs 24 and support plate 10.

While a particular embodiment of this invention has been shown and described herein, it will occur to those skilled in the art that various changes and modifications can be effected without departing either in spirit or scope of the invention as set forth in the appended claims.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. An instrument structure comprising a first casing member open at one end, a second casing member having an end plate shaped for closure of said one end and having a plurality of flexible leg members integral therewith, said leg members extending from said end plate about the periphery thereof, a mechanism support plate dimensioned to span and to be held by the free ends of said leg members, and an instrument mechanism mounted on said support plate, said second casing member being telescoped within said first casing member to close said one end and having said flexible leg members dimensioned to be flexed inward by said first casing member into firm holding engagement with said support plate when said casing members are telescoped together.

2. An instrument structure comprising a first casing member open at one end, a second casing member having an end plate shaped for closure of said one end and having a plurality of flexible leg members integral therewith, said leg members extending from said end plate about the periphery thereof and each having a locating slot at its free end, a mechanism support plate having locating tabs projecting through said slots in said leg members, and an instrument mechanism mounted on said support plate, said second casing member being telescoped within said first casing member to close said one end and having said flexible leg members dimensioned to be flexed inward by said first casing member into firm holding engagement with said support plate when said casing members are telescoped together.

3. An instrument structure comprising two telescoped casing members, the first of which has an end opening closed by an end plate of the second, and the second of which includes a plurality of flexible legs integral therewith and extending from edges of said end plate and along the inner surfaces of said first casing member, a mechanism support member dimensioned to span and to be held by the free ends of said legs, and an instrument mechanism mounted on said support member, said flexible legs being dimensioned to be flexed inwardly of said structure by the inner surfaces of said first casing member into firm holding engagement with said support member within said structure when said casing members are telescoped together.

4. An instrument structure comprising two telescoped casing members, the first of which has a window glass at the front end and a back end opening closed by a back plate of the second, and the second of which includes a plurality of flexible legs integral therewith and extending forward along the inner surfaces of said first casing member toward said front end, an instrument mechanism support member spanning the free ends of said legs and shaped to be held and located thereby near said front end, an instrument mechanism supported by said support member, and an indicator carried and actuated by said mechanism and visible through said front window glass, said flexible legs being proportioned to be flexed inwardly of said structure by the inner surfaces of said first casing member to hold said support member fixed within said structure when said casing members are telescoped together.

5. An instrument structure comprising two telescoping casing members, the first of which has a window glass at the front end and a back end opening closed by a back

plate of the second, and the second of which includes a plurality of flexible legs integral with said back plate and extending forward along the inner surfaces of said first member toward said front end, a support plate dimensioned to span and to be held by the free ends of said legs in a parallel relationship to said back plate, a plurality of integral bent-over projections from said support plate forming locating surfaces for an instrument mechanism, an instrument mechanism mounted on said support plate and located by said projections, and an indicator actuated by said mechanism and visible through said front window glass, said flexible legs being proportioned to flex into tight holding engagement with said support plate when said casing members are telescoped together.

6. An instrument structure comprising two telescoping casing members, the first of which has a window glass at the front end and a back end opening closed by a back plate of the second, and the second of which includes a plurality of flexible sheet-metal legs integral with said back plate and extending forward along the inner surfaces of said first member toward said front end, a sheet-metal support plate dimensioned to span and to be held by the free ends of said legs in a parallel relationship to said back plate, a plurality of integral bent-over projections from said sheet-metal support plate forming locating surfaces for an instrument mechanism, an instrument mechanism located by said projections, an indicator actuated by said mechanism and visible through said front window glass, and tabs integral with and extending from said projections and bent to mount and hold said mechanism on said support plate, said flexible legs being proportioned to flex into tight holding engagement with said support plate when said casing members are telescoped together.

7. An instrument structure comprising two cylindrical telescoping casing members, the outer member having a window glass at the front end and a back end opening closed by a back plate of the inner member, and the inner member having at least three flexible sheet-metal legs integral with said back plate and extending forward along the inner surfaces of said outer member toward said front end, the free ends of said legs having narrow slots therein, a sheet-metal support plate spanning and held by the free ends of said legs in a parallel relationship to said back plate and near said front end, said support plate having a plurality of integral locating tabs extending radially within said cylindrical members through said slots and having a plurality of integral bent-over projections extending normal to said support plate and forming locating surfaces for an instrument mechanism, an instrument mechanism located by said projections, an indicator actuated by said mechanism and visible through said front window glass, and tabs integral with and extending from said projections and bent to mount and hold said mechanism on said support plate, said flexible legs being proportioned to flex into tight holding engagement with said support plate when said casing members are telescoped together.

8. An instrument structure comprising a first casing member open at one end; a second casing member having an end portion shaped for closure of said one end and having a plurality of flexible leg members extending from said end portion; an instrument mechanism support member dimensioned to span and to be held by selected portions of said leg members spaced from said end portion; an instrument mechanism mounted on said support member; said second casing member being telescoped within said first casing member to close said one end and having said flexible leg members dimensioned to be flexed inward by said first casing member into firm holding engagement with said support member when said casing members are telescoped together.

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