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Evans et al.

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[54] **ELECTRIC LAMP HOLDERS**

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[73] Assignee: **Smiths Industries Limited,** London, England

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Nov. 10, 1970 Great Britain.....53,351/70

[52] **U.S. Cl.**.....**240/2.1,** 340/381
[51] **Int. Cl.**.....**G01d 11/28**
[58] **Field of Search**.....240/2.1, 8.16; 340/381

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Attorney—William D. Hall et al.

[57] **ABSTRACT**

An electric lamp holder comprises an electric lamp support and a housing therefor. The housing is of cylindrical form, one end and an adjacent cylindrical wall portion of the housing being of glass, and the remainder of the housing being of a metal having a coefficient of expansion which is substantially the same as that of the glass. Electrical connection to the electric lamp carried by the support is provided by a pair of resilient electrical contacts extending through the glass end wall of the housing. A plurality of these holders are mounted within a casing of a pressurized indicating instrument to illuminate from the rear a display face of the instrument. The housings are air-tight and are mounted in apertures in the casing, air-tight seals being provided between the housings and the instrument casing so as to enable the electric lamps to be replaced without depressurizing the instrument.

12 Claims, 4 Drawing Figures

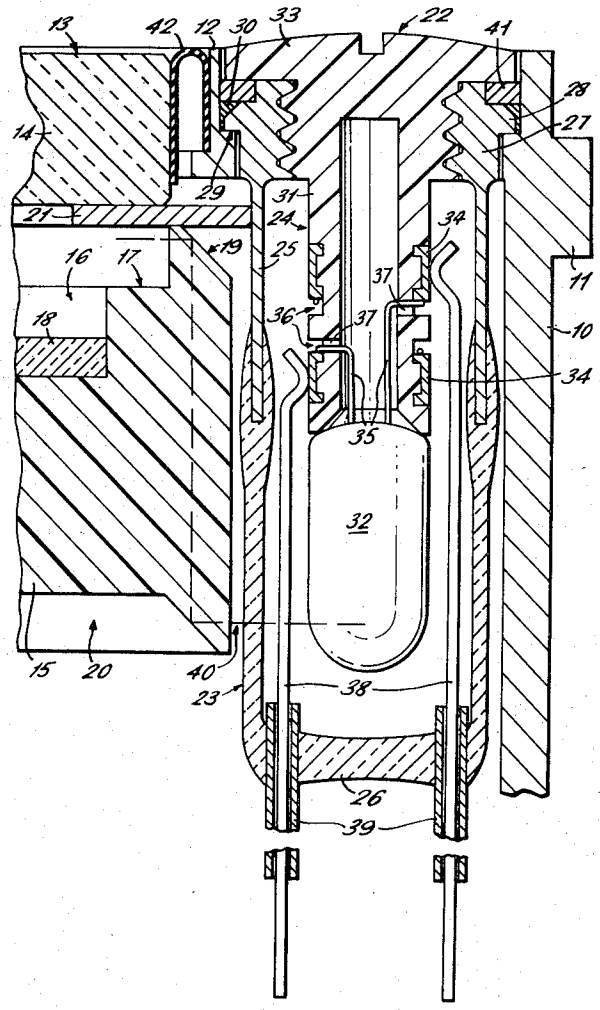


FIG. 1.

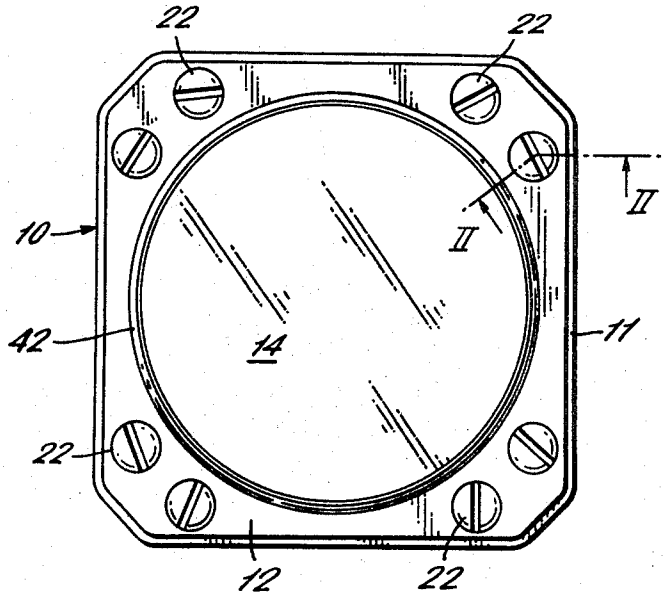

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FIG. 4.

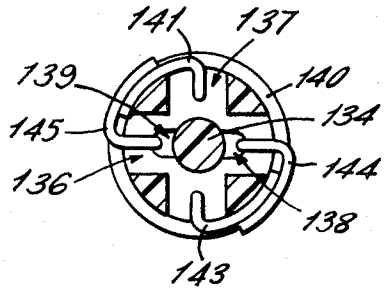

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FIG. 2.

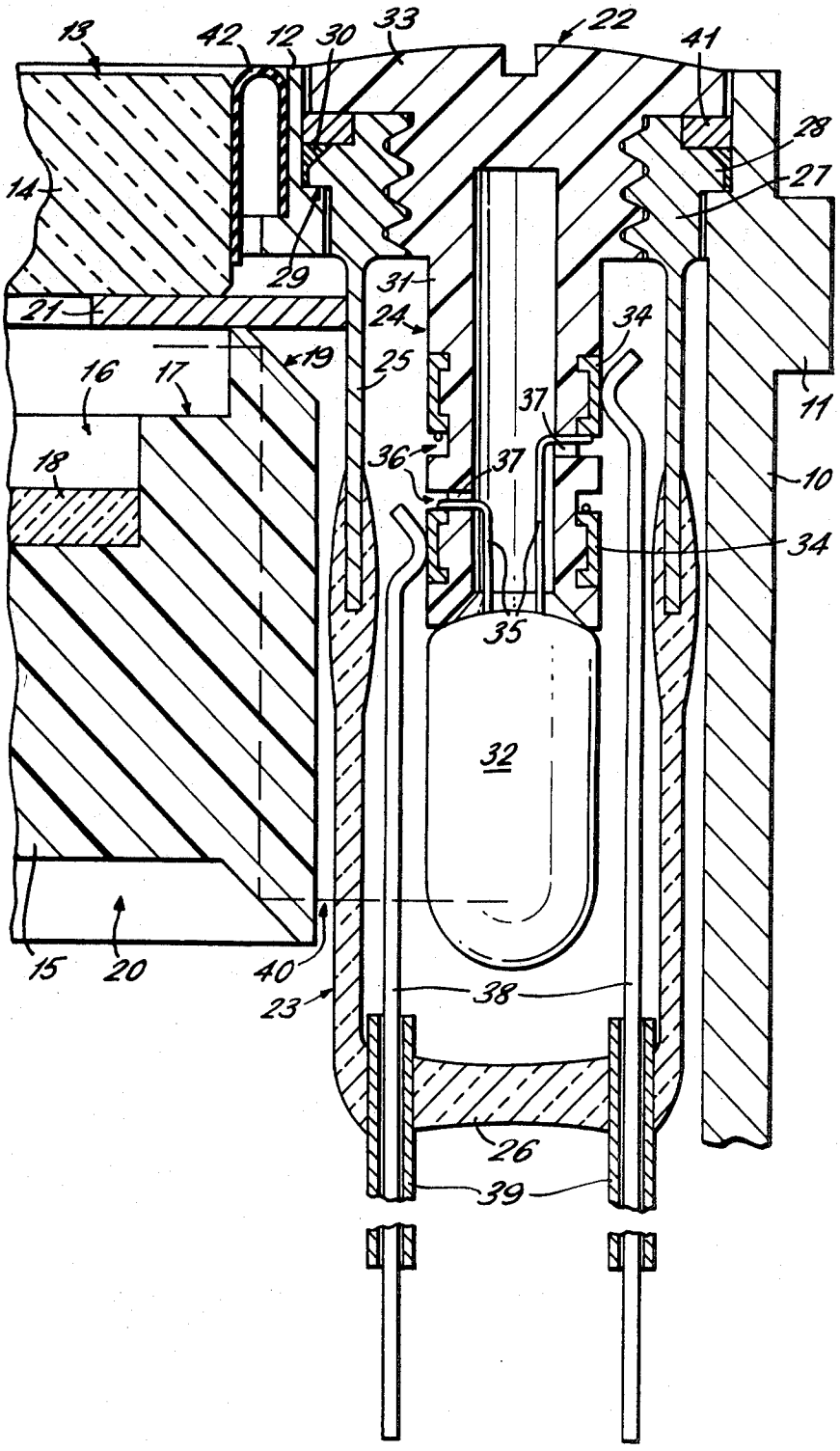
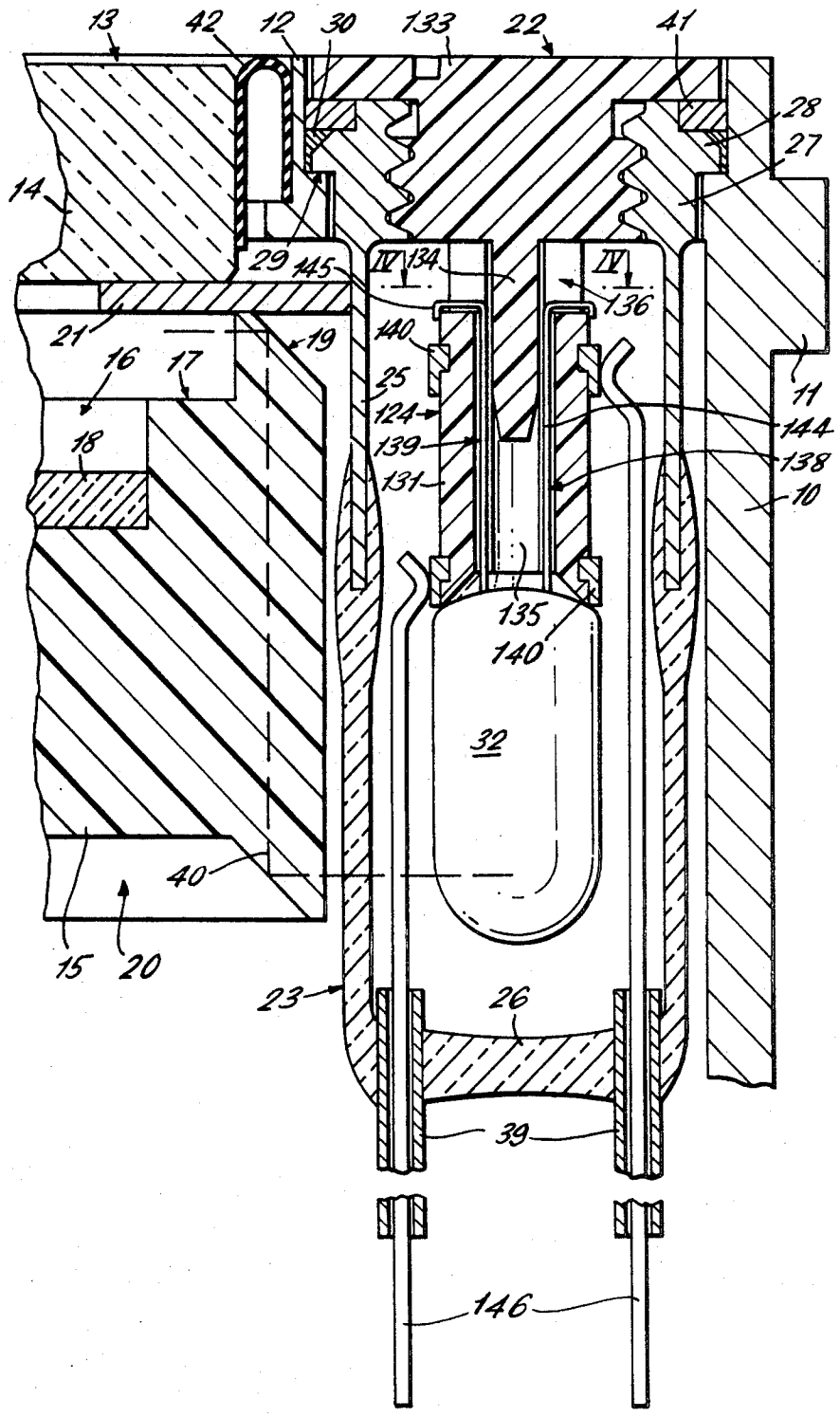

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FIG. 3.


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ELECTRIC LAMP HOLDERS

This invention relates to electric lamp holders.

According to one aspect of the present invention there is provided an electric lamp holder comprising a member which is arranged to support an electric lamp, a first pair of electrical contacts mounted on the support member for connection to respective electrical terminals of an electric lamp, a housing having an aperture to receive the support member and in which the support member is to be removably mounted to dispose within the housing both an electric lamp and the pair of electrical contacts, the housing comprising a first wall section of opaque material, and a second wall section integral with the first wall section and of light transmitting material for transmitting light-rays from an electric lamp disposed within the housing, and a second pair of electrical contacts which extend through the wall of the housing and which are arranged resiliently to engage respective ones of the first electrical contacts, there being an air-tight seal between the first and second wall sections, and between the wall of the housing and the second pair of electrical contacts.

Preferably the housing is in the form of a cylinder which is closed at one end and which at its other end includes the said housing aperture, the said second wall section being constituted by the said closed end and a cylindrical wall portion of the cylinder adjacent thereto, and the said first wall section being constituted by the remaining cylindrical wall portion and the said other end of the cylinder.

The said first wall section may be of metal and the said second wall section may be of glass, and, in such a case, the metal may have a coefficient of expansion which is substantially the same as that of the glass.

At least the part of the cylindrical wall portion of metal immediately adjacent to the cylindrical wall portion of glass may have a wall thickness which is substantially less than the wall thickness of the cylindrical wall portion of glass.

The said first wall section may be fused to the said second wall section.

The support member may include a tube, and, in such a case, the first pair of electrical contacts are constituted by a pair of slip-rings mounted on the exterior of the tube and spaced apart axially thereof.

The housing aperture may be screw-threaded and, in this case, the support member may include a cap having a screw-thread which co-operates with the screw-threaded aperture to mount the support member in the housing.

According to a further aspect of the present invention, there is provided an indicating instrument comprising a casing which is arranged to be pressurized and a plurality of electric lamp holders as aforesaid which are arranged to carry electric lamps for illuminating a display face of the instrument, the housings of the holders being mounted in respective apertures in the casing, and air-tight seals being provided between the housings and the casing.

The said first wall sections of the housings may be of metal, and, in such a case, the air-tight seals between the housings and the casing may be constituted by metal joints between the casing and the respective first wall sections.

A pressure indicating instrument incorporating various forms of electric lamp holder, in accordance with the present invention, for illuminating a dial of the instrument from the rear, will now be described, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a front elevation of the instrument;

FIG. 2 is a fragmentary sectional view on the line II—II of FIG. 1 showing one form of electric lamp holder;

FIG. 3 is a fragmentary sectional view of the instrument showing an alternative form of the electric lamp holder; and

FIG. 4 is a fragmentary sectional view on the line IV—IV of FIG. 3.

Referring to FIGS. 1 and 2 of the drawings, the instrument includes a rectangular metal case **10** having a peripheral mounting flange **11**. The case **10** includes a front-panel **12** having a central, circular aperture **13** in which is mounted a glass window **14**. The annular space between the front-panel **12** and the window **14** is sealed by a resilient ring **42** of inverted U-shape in cross-section, one wall of the ring **42** resiliently bearing against the peripheral edge of the window **14** while the other wall of the ring **42** resiliently bears against the edge of the front panel **12** bounding the aperture **13**. The metal case **10** and the glass-window **14** together constitute an air-tight casing of the instrument. The temperature of the instrument will vary considerably during use, because the metal case **10** and the glass window **14** have widely different coefficients of expansion, the consequent variation in width of the annular space between the window **14** and the front-panel **12** could be sufficient to break the glass window **14**. However, since the ring **42** is of U-shape in cross-section, the ring **42**, in addition to providing an airtight seal in the space between the window **14** and the front-panel **12**, will also flex with changes in the width of the annular space and thereby reduce the likelihood of breakage of the window **14**.

The case **10** houses a disc **15** (shown in FIG. 2) which is of transparent plastic material (for example that sold under the trademark 'Perspex') and is spaced from and extends parallel to the window **14**. The front of the disc **15** has a central, circular hole **16** formed therein whose depth is approximately equal to one-third of the thickness of the disc **15**. The circumferential edge of the hole **16** is stepped at **17** so that the portion of the hole **16** lying adjacent the front of the disc **15** is of slightly larger diameter than the remainder of the hole **16**. A translucent dial **18**, having a thickness less than the depth of the portion of the hole **16** of smaller diameter, is mounted in the bottom of the hole **16**. A pointer (not shown) is mounted within the portion of the hole **16** of larger diameter, by a spindle extending through an axial hole in the disc **15**. At the front of the disc **15** the outer circumferential edge has a bevelled surface **19** which is inclined at an angle of forty-five degrees to the front of the disc **15**. A tapered, circular hole **20** is formed in the rear of the disc **15**. The hole **20** has a maximum diameter which is slightly less than the diameter of the disc **15** and the degree of taper of the hole **20** is selected so that the circumferential edge of the hole **20** extends parallel to the bevelled surface **19**. An annular, masking ring **21** is clamped between the window **14** and the disc **15**.

In order to illuminate the dial **18** from the rear and to illuminate the pointer, the front-panel **12** carries, at each corner, a pair of electric lamp holders **22**. One such electric lamp holder **22** is shown in detail in FIG. **2** and comprises a housing **23** and an electric lamp support **24** disposed within the housing **23**. The housing **23** is of tubular construction and is supported at one end in an aperture in the front-panel **12**, the housing **23** extending rearwardly in the instrument case **10** just beyond the disc **15**. The front portion of the housing **23** is constituted by a metal sleeve **25** and the remainder of the housing **23** is constituted by a glass envelope **26** which is fused to the metal sleeve **25** and has an end-wall which closes the rear-end of the housing **23**. The metal sleeve **25** has a portion **27** of increased thickness disposed within the aperture in the front-panel **12**. The portion **27** has an outer circumferential flange **28** which abuts a shoulder **29** within the aperture in the front-panel **12** and which is welded at **30** to the front panel **12**. This weld extends completely round the flange **28** so as to provide an airtight seal between the housing **23** and the front panel **12**. The sleeve **25** is of a nickel-alloy material having a coefficient of expansion which is substantially the same as that of the glass used in the envelope **26**.

The electric lamp support **24** is of plastic material and comprises a tube **31**, which at its rear end carries an electrical lamp **32**, and a screw-threaded cap **33** which is disposed at the other end of the tube **31** and which co-operates with a screw-threaded aperture in the portion **27** to mount the lamp **32** within the glass envelope **26**. The tube **31** carries in its outer circumferential surface a pair of axially-spaced slip-rings **34** of brass which are moulded as inserts in the tube **31**. The slip-rings **34** are electrically connected to wires **35** which extend from the base of the lamp **32** and are electrically connected to the lamp filament. To this end, the tube **31** has a pair of grooves **36** in its external surface, the grooves **36** being axially spaced between the slip-rings **34** and disposed adjacent to the edges of respective ones of the slip-rings **34**. The grooves **36** communicate with the bore of the tube **31** through respective holes **37**. In order to effect the electrical connection, the wires **35** are inserted into the bore of the tube **31** and then outwardly through the respective holes **37**, the wires **35** then being bent round the tubular portion **31** within the grooves **36** and soldered to the slip-rings **34**. By such an arrangement the wires **35**, in addition to providing the electrical connections between the lamp **32** and the slip-rings **34**, also serve to mount the lamp **32** on the rear-end of the tube **31**.

The electrical supply to the lamp **32** is effected through a pair of resilient arms **38** which engage respective slip-rings **34** when the electric lamp support **24** is mounted in the housing **23**. The arms **38** are conveniently of phosphor bronze wire and extend through metal tubes **39** fused into the end wall of the glass envelope **26**. The arms **38** are soldered into the metal tubes **39** to provide an air-tight seal between the arms **38** and the tubes **39**.

When the lamps **32** are energized the light rays emitted there-from pass through the envelope **26** and into the disc **15** to illuminate the dial **18** and also the pointer mounted on the disc **15**. This latter illumination is effected by those light-rays which enter the disc **15** normal to its circumferential edge and strike the circumferential edge of the hole **20**. Such a light-ray is represented by a dotted line **40**. These light-rays, after reflection at the circumferential edge of the hole **20**, are reflected at the bevelled surface **19** and pass into the hole **16** to illuminate the pointer. In order to prevent "flare" on the dial **18** it is desirable to prevent any light-rays striking the face of the dial **18**. This is achieved by painting the circumferential edge of the portion of the hole **16** of reduced diameter.

A sealing washer **41** is provided between the cap **33** and the flange **28** to prevent ingress of moisture into the housing **23**.

An alternative form of lamp support **24** is shown in FIGS. **3** and **4**. For simplicity, instrument components common to both FIGS. **2** and **3** have been designated with the same reference numerals. Referring to FIGS. **3** and **4**, the lamp support **124** in this arrangement comprises a tube **131**, which at its rear end is shaped to provide a seating for the electric lamp **32**, and a screw-threaded cap **133** mounted on the other end of the tube **131**. To this end, the cap **133** carries a pin **134** which projects into a longitudinal hole **135** in the tube **131** and is secured therein by an epoxy resin adhesive. The cap **133** cooperates with a screw-threaded aperture in the portion **27** of the housing **23** to mount the lamp **32** within the glass envelope **26**. The end of the tube **131** adjacent to the cap **133** has formed therein a pair of slots **136** and **137** (FIG. **4**) which extend transversely of the tube **131** at right angles to one another. A pair of diametrically-opposed longitudinal slots **138** and **139** are formed in the inner circumferential surface of the tube in alignment with the slot **136**. The tube **131** carries in its outer circumferential surface a pair of contact-rings **140** for electrical connection to the lamp **32**. The contact-rings **140** are connected to respective electric cables **141** and **143**. The contact-rings **140** and the electric cables **141** and **143** are, after appropriate electrical connection, moulded as inserts in the tube **131** so that the ends of the cables **141** and **143** remote from the contact-rings **140** extend into the slot **137** on opposite sides of the longitudinal hole **135**. These ends of the cables **141** and **143** are then bent to extend radially outwards in the slot **137** and round respective parts of the outer circumferential surface of the tube **131** in an anti-clockwise direction as shown in FIG. **4**. In order to effect the electrical connection between the electric lamp **32** and the contact-rings **140**, the electric lamp **32** is firstly secured to the rear-end of the tube **131** by an epoxy resin adhesive, with its electric leads **144** and **145** extending through the slots **138** and **139** respectively into the transverse slot **136**. The ends of the leads **144** and **145** are then bent to extend radially outwards in the slot **136** and round the outer circumferential surface of the tube **131** in a clockwise direction to abut the ends of the cables **143** and **141** respectively, and, finally, the abutting ends of the cables **141** and **143**, and the leads **144** and **145** are soldered to one another. The electric lamp **32** is mounted on the tube **131** and the electrical connections between the lamp **32** and the contact-rings **140** are established prior to mounting the cap **133** on the tube **131**.

The electrical supply for the lamp **32** is connected to a pair of resilient arms **146** which engage respective contact-rings **140** when the electric lamp support **124** is mounted in the housing **23**.

The portions of the housings 23 disposed within the case 10 each constitute an air-tight assembly and, therefore, it is possible to withdraw the lamp supports 24 from the housings 23 to facilitate replacement of the electric lamps 32 without depressurizing the indicating instrument.

As previously mentioned, the temperature of the case 10 will vary considerably during use and it is necessary, therefore, to ensure that this change in temperature will not cause the glass envelopes 26 to fracture. This is achieved by arranging that the lengths of the sleeves 25 between their portions 27 and the glass envelopes 26 have a wall thickness which is very much smaller than the wall thickness of the glass envelopes 26, so that any strain caused by differential expansion of the case 10 and the sleeves 25 is substantially confined to the thin-walled lengths of the sleeves 25.

Although the electric lamp holders 22 have been described with reference to pressurized indicating instruments, it is visualized that the electric lamp holders 22 may, if desired, also be used on unpressurized indicating instruments.

We claim:

1. An indicating instrument comprising:
a. a casing;
b. display means mounted in the casing;
c. means for illuminating said display means within the casing, said illuminating means comprising an electric lamp holder mounted to extend into the casing from outside thereof, said lamp holder comprising
i. a member for supporting an electric light-emitting lamp,
ii. a pair of electrical contacts mounted on the support member for connection to respective electrical terminals of the electric lamp carried by said support member,
iii. a lamp housing having an aperture therein for receiving the support member with the lamp and said contacts located wholly within the housing, said housing comprising an end-part defining said aperture, an opaque wall section integral with said end part, a light-transmitting wall section extending from said opaque wall section for transmitting said light through the housing wall, and means for providing an air-tight seal between the opaque and light-transmitting wall sections,
iv. a pair of electrical leads that extend through the said light-transmitting wall section of the housing for resiliently engaging respective ones of the said contacts, and
v. an air-tight seal between the wall of the housing and the said electrical leads; and
d. means sealing the said end-part of the lamp-holder housing to the casing with said opaque and light-transmitting wall sections projecting into the casing.

2. An electric lamp holder comprising: a member for supporting an electric light-emitting lamp; a first pair of electrical contacts mounted on the support member for connection to respective electrical terminals of the electric lamp carried by said support member; a cylindrical lamp-housing having an aperture therein for receiving the support member with the lamp and said first pair of contacts located wholly within the housing, said housing comprising a first end-part defining said aperture for receiving said support member as aforesaid and adapted to co-operate with said support member for retention of said support member in said aperture, and a cylindrical wall which extends from said first end-part for embracing the lamp within the housing and which includes a second end-part at the opposite end of the housing from said first end-part to close the housing at that end, said housing having an opaque section constituted by a portion of the said wall extending from said first end-part, a light-transmitting section constituted by the remainder of the wall for transmitting said light through the housing wall, and a first air-tight seal sealing said light-transmitting section to said opaque section; a second pair of electrical contacts that extend through the said wall of the housing for resiliently engaging respective ones of the said first pair of electrical contacts; and a second air-tight seal between the wall of the housing and the second pair of electrical contacts.

3. A holder according to claim 2, wherein the said second pair of electrical contacts extend through the said end-part of said housing.

4. A holder according to claim 2, including a pair of spaced metal sleeves carried by the housing to extend through said wall, and wherein respective ones of the said second pair of electrical contacts extend through said sleeves and are soldered therein.

5. A holder according to claim 2, wherein the said opaque section is of metal and the said light-transmitting section is of glass, the metal having a coefficient of expansion which is substantially the same as that of the glass.

6. A holder according to claim 5, wherein the said opaque section is fused to the said light-transmitting section.

7. A holder according to claim 2, wherein the said opaque section is of metal and the said light-transmitting section is of glass, and wherein at least the part of the said opaque section immediately adjacent to the said light-transmitting section has a wall thickness which is substantially less than that of the said light-transmitting section.

8. A holder according to claim 2, wherein the said support member includes a tube, and wherein the said first pair of electrical contacts are constituted by a pair of slip-rings mounted on the exterior of the tube and spaced apart axially thereof.

9. A holder according to claim 2, wherein the said housing aperture is screw-threaded, and wherein the said support member includes a cap having a screw-thread for co-operating with the said screw-threaded aperture to mount the support member in the housing.

10. An indicating instrument comprising:
a. an air-tight casing;
b. display means sealed into the casing;
c. means for illuminating said display means within the casing, said illuminating means comprising a plurality of electric lamp holders mounted to extend into the casing from outside thereof and each lamp holder comprising
i. a member for supporting an electric light-emitting lamp,
ii. a first pair of electrical contacts mounted on the support member for connection to respective

electrical terminals of the electric lamp carried by said support member,

iii. a cylindrical lamp-housing having an aperture therein for receiving the support member with the lamp and said first pair of contacts located wholly within the housing, said housing comprising a first end-part defining said aperture for receiving said support member as aforesaid and adapted to co-operate with said support member for retention of said support member in said aperture, and a cylindrical wall extending from said first end-part for embracing the lamp within the housing, said wall including a second end-part at the opposite end of the housing from said first end-part to close the housing at that end, said housing having an opaque section constituted by a portion of the said wall extending from said first end-part, a light-transmitting section constituted by the remainder of the wall for transmitting said light through the housing wall, and a first air-tight seal sealing said light-transmitting section to said opaque section,

iv. a second pair of electrical contacts that extend through the said wall of the housing for resiliently engaging respective ones of the said first pair of electrical contacts, and

v. a second air-tight seal between the wall of the housing and the second pair of electrical contacts; and

d. air-tight sealing means sealing the said housings of the said lamp holders into the casing.

11. An instrument according to claim **10**, wherein the said opaque sections of the housings are of metal, and wherein the air-tight seals between the housings and the casings are constituted by metal joints between the casing and the respective said opaque sections.

12. An instrument according to claim **10**, wherein the said casing includes a front panel, and wherein the front panel has apertures therein to receive said lamp holders respectively.

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