

[72]	Inventor	Dana J. Blackwell Naugatuck, Conn.
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[73]	Assignee	The Lewis Engineering Company Naugatuck, Conn.

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Primary Examiner—Louis J. Capozzi
Attorney—H. Gibner Lehmann

[54] **ILLUMINATED INDICATOR MEANS AND INSTRUMENT**
10 Claims, 11 Drawing Figs.

[52]	U.S. Cl.....	116/129, 240/2.1
[51]	Int. Cl.....	G09F9/00
[50]	Field of Search.....	116/129, 129 (L), 129 (E); 73/431; 240/2, 2 (S), 2.1, 1.2

ABSTRACT: An electrical instrument movement having miniature incandescent lamps which illuminate the instrument dial and pointer, the lamps being removable and replaceable without requiring removal of the dial, mask or pointer. The lamps are carried in clearance openings in a reflector ring disposed behind the dial, and are mounted for removal in lateral directions away from the axis of the instrument.

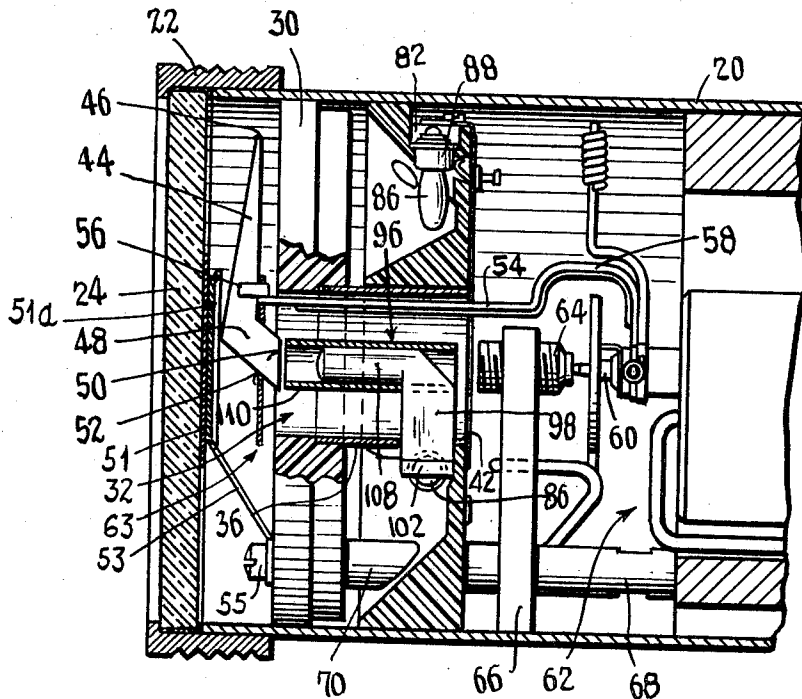


Fig. 1

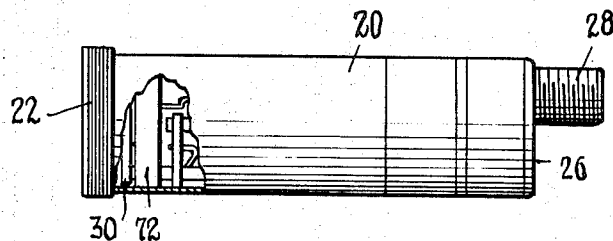


Fig. 3

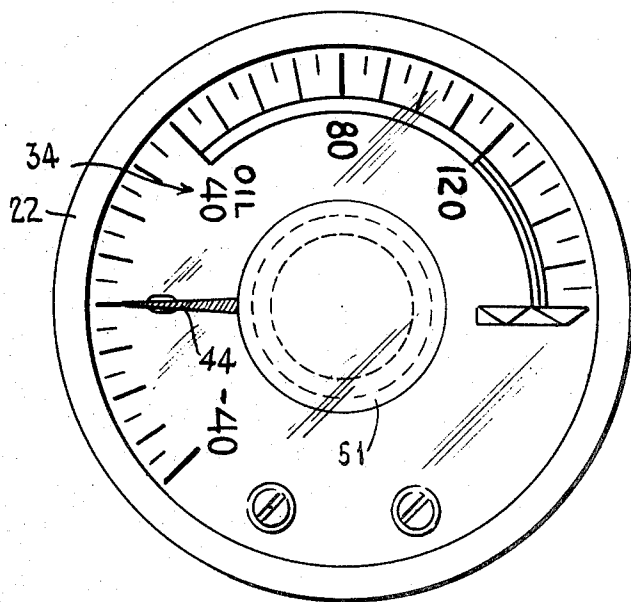
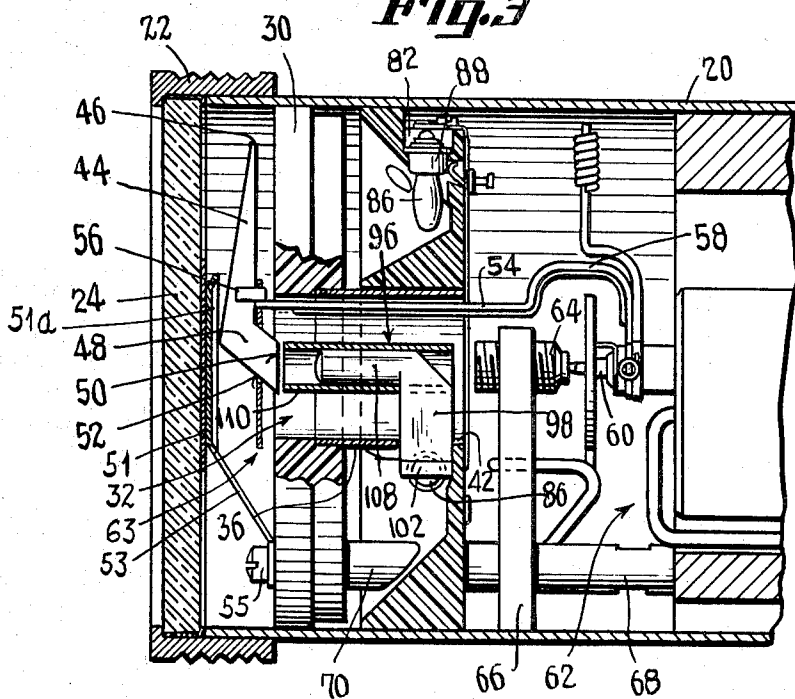
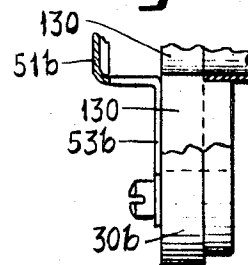


Fig. 2

Fig. 11



INVENTOR
Dana J. Blackwell

BY
H. J. Gibson
AGENT

Fig. 4

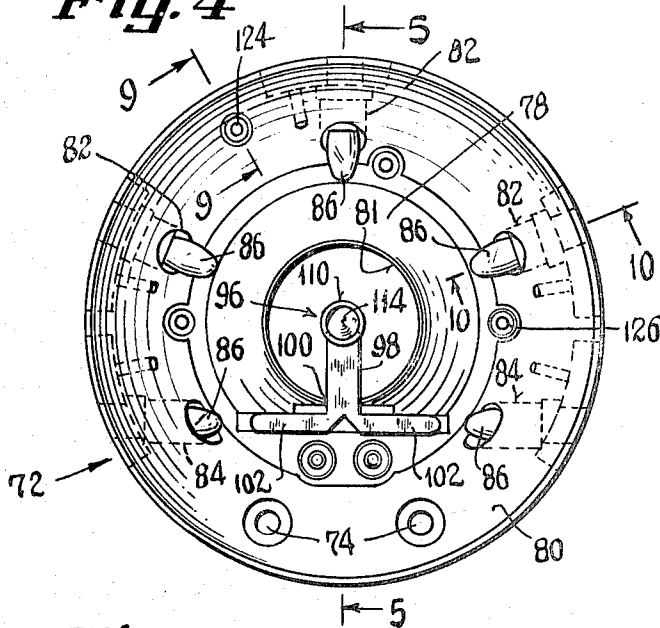


Fig. 5

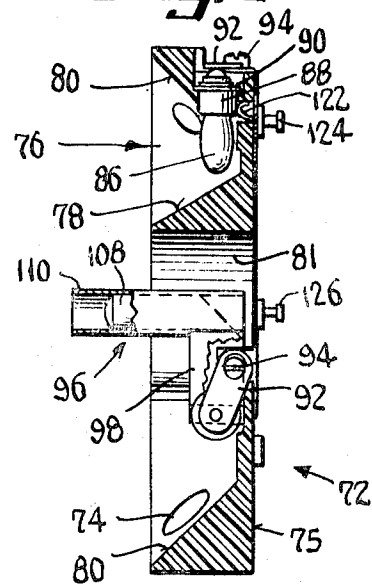


Fig. 6

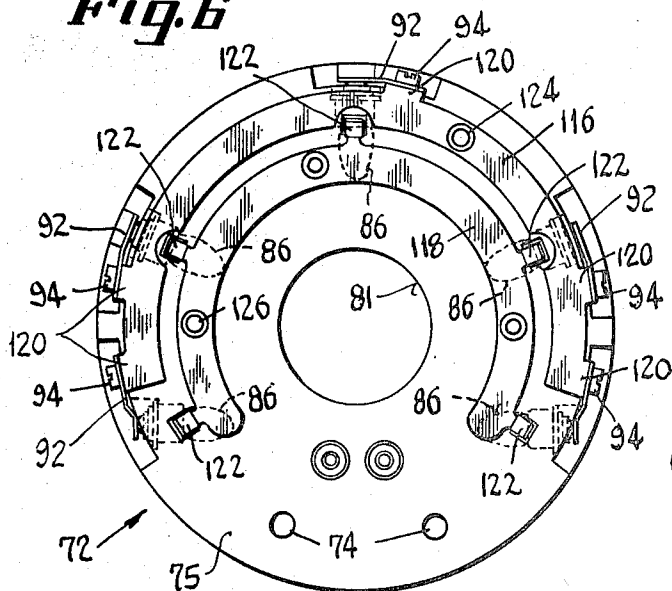


Fig. 7

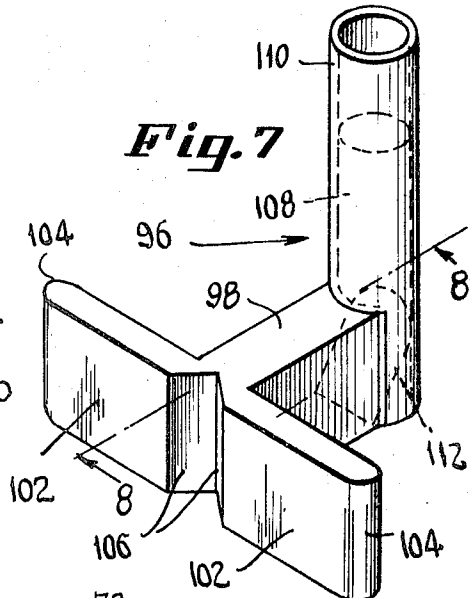


Fig.10

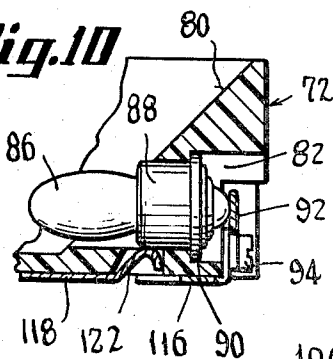


Fig. 8

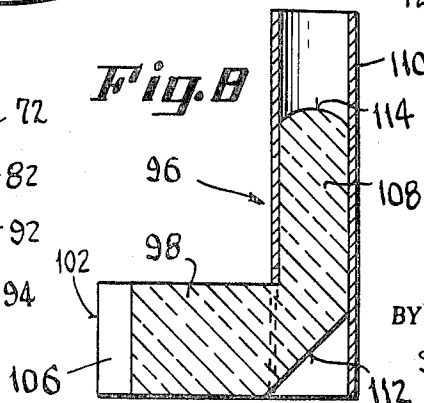
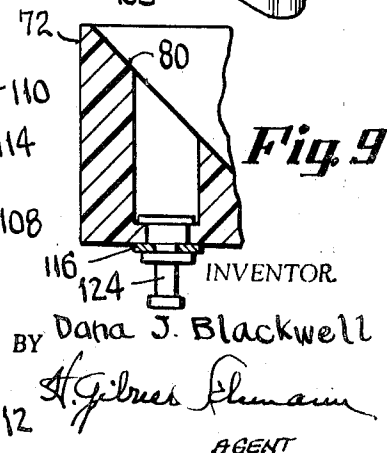


Fig. 9



INVENTOR.

BY Dana J. Blackwell

H. Gibbs Elmira

AGENT

ILLUMINATED INDICATOR MEANS AND INSTRUMENT

CROSS-REFERENCES TO RELATED APPLICATIONS

1. Copending application of Dana J. Blackwell entitled "Illuminated Indicating Instrument With Replaceable Lamps," Ser. No. 716,189, filed Mar. 26, 1968 and having common ownership with the present application.

2. Copending application of Dana J. Blackwell entitled "Illuminated Indicating Instrument With Front Replaceable Lamps" Ser. No. 718,097, filed Apr. 2, 1968 and having common ownership with the present application.

BACKGROUND

This invention relates to incandescent lighting of electrical instruments, and more particularly to the arrangement of the incandescent lamps, associated reflectors, lamp-mounting and light-piping components, in lighted instruments.

Heretofore, where the dial and pointer portions of an electrical instrument were lighted from their rears, using a multiplicity of miniature incandescent lamps of the type commonly referred to as a "grain of wheat," the arrangement was such that replacement of the lamps involved not only removal of the instrument from the casing but also removal of other critical parts such as the dial, mask, and/or pointer. This procedure was time consuming and costly, and often resulted in damage to the components or misadjustment of the instrument, or both.

SUMMARY

The above drawbacks and disadvantages of prior pointer-and-dial lighting arrangements in an electrical instrument are obviated by the present invention, one object being the provision of an improved illuminated instrument having incandescent lighting, wherein removal and replacement of the incandescent lamps may be effected without first requiring removal of the dial, mask or pointer. This is accomplished by arranging the lamps and lamp mountings, and also the reflector means in such a manner that the lamps can be removed radially or substantially radially from the peripheral area of the reflector, which latter is, in the preferred form of the invention, shaped like a ring or annulus. Also, in the preferred form of the invention the lamps are of the based type and are disposed in clearance openings of the reflector member, with contact being made by spring members attached to concentric contact rings which are carried at the back of the annular reflector.

Other objects and advantages of the invention reside in the provision of an improved instrument-lighting structure as above set forth, which is small and compact, simple in construction and assembly, involves relatively few components, is economical to produce, and especially effective and reliable in its operation whereby it is well suited to aircraft and like equipment.

Still other features and advantages will hereinafter appear.

In the drawings:

FIG. 1 is a side elevational view of an electrical indicating instrument embodying the invention, a portion of the instrument casing being broken away to reveal interior details.

FIG. 2 is a front elevational or face view of the instrument of FIG. 1.

FIG. 3 is a fragmentary axial sectional view of the front portion of the instrument, showing the dial and pointer assemblage and the lighting means associated therewith.

FIG. 4 is a front elevational view of the incandescent lighting assemblage of the instrument.

FIG. 5 is a diametric section, taken on the line 5-5 of FIG. 4.

FIG. 6 is a rear elevational view of the lighting assemblage of FIGS. 4 and 5.

FIG. 7 is a perspective view of the light-piping member or lens of the lighting assemblage.

FIG. 8 is a central sectional view, taken on the line 8-8 of FIG. 7.

FIG. 9 is a fragmentary sectional view, taken on the line 9-9 of FIG. 4.

FIG. 10 is a fragmentary sectional view, taken on the line 10-10 of FIG. 4.

FIG. 11 is a fragmentary view of the lower portion of an instrument dial and light shield, illustrating another embodiment of the invention.

Referring first to FIGS. 1-3, the instrument in its preferred embodiment comprises a casing 20 having at its front end a bezel 22 and a transparent window 24, through which latter the indicator means of the instrument may be viewed.

At the rear of the casing 20 there is a transverse backwall 26 which may have any usual type of multipronged separable connector fitting 28, by which electrical connections are established to the instrument.

Within the front of the casing 20, directly behind the transparent window 24 there is located a translucent circular dial 30 having a relatively large central opening 32 and having on its face indicia such as graduations and numbers 34, adapted to be illuminated by light which strikes the dial from the rear.

Extending rearward from the central opening 32 of the dial 30 is a light-impervious cylindrical shield 36 which may be advantageously formed from a metal cylinder or tube. The shell 36 has a cutout 42 for purposes to be later described.

Movable over the front surface of the dial 30 is an elongate translucent pointer 44 tapering to a point 46 at its indicating end, said pointer having a light-receiving portion 48 at its other end, which latter is located at the axis of turning of the pointer, coinciding with the axis of the instrument movement.

The light-receiving end 48 of the pointer has a flat surface 50 which the light first strikes in illuminating the pointer, said surface being preferably disposed at right angles to the axis of turning. Adjoining the light-receiving surface 50 and angularly disposed with respect thereto is a light-reflecting surface 52, said reflecting surface being adapted to redirect or reflect the light received through the surface 50, sending such light longitudinally along the pointer 44 so as to illuminate the same along its entire length.

The inner end 48 of the pointer 44 may be masked by providing an opaque ceramic coating 51 on the back of the window 24. Or, it may be masked by means of a metal disc 51a disposed behind the window, such disc being supported by an arm 52 secured to mounting screws 55 for the dial 30. The disc 51a is between the pointer 44 and the window 24, as seen in FIG. 3.

In order to prevent the light which is being directed to the pointer 44 from undesirably illuminating the front of the dial 30, the light-receiving surface 50 is disposed in back of the plane which contains the front face of the dial, as seen in FIG. 3.

The pointer 44 is movably mounted by means of an elongate actuating or supporting arm 54 which passes forward through the light-impervious shield 36 and is secured to the pointer by means of a clip 56 at its front end. The actuating arm 54 at its rear has U-shaped offset portion 58 the extremity of which is secured to the movable shaft or spindle 60 of an electrical instrument movement indicated generally by the numeral 62.

In place of the masks 51 and 51a, an apertured masking disc 63 may be provided at the rear of the pointer 44, mounted thereon by means of the clip 56. With this arrangement the entire length of the pointer 44 is visible while at the same time the opening 32 is concealed.

As shown in FIG. 3, the spindle 60 is carried in a bearing socket 64 mounted on a transverse fixed wall 66 secured in place by fixed posts 68. The dial 30 may be supported in the usual manner, by posts 70 constituting continuations of the posts 68, as indicated in FIG. 3. By the above construction, the pointer 44 is mounted for turning movement through an arc of virtually three right angles, as clearly seen in FIG. 2 wherein this arc represents the extent of the scale 34 of the dial 30.

In accordance with the present invention there is provided a novel and improved, simple yet effective illumination means between the dial 30 and the instrument movement 62, said il-

lumination means including miniature incandescent electric lamps which may be removed and replaced without requiring removal of the dial 30, pointer 44, or adjoining components and therefore obviating the attendant disadvantages of such removal. In effecting this I provide a novel reflector member or prism 72, see FIG. 6, constituted as a ring or annulus, said member having mounting holes 74 adapted to accommodate the studs or posts 70 whereby the member is disposed transversely in the casing 20 in front of the instrument movement 62 and to the rear of the dial 30. The ring 72 has a flat rear surface 75, and has at its front face a deep annular V-section groove 76 the walls of which comprise reflective surfaces. As seen in FIGS. 4 and 5, the groove 76 has an inner conical reflective wall 78 and an outer conical reflective wall 80. The large central bore or opening 81 of the reflector ring provides clearance for the supporting arm 54 of the pointer 44, as seen in FIG. 3.

The reflector prism or ring 72 has a plurality of clearance openings or sockets 82 and 84, the openings 83 extending substantially radially whereas the openings 84 are aligned with each other and generally parallel to a diameter, all as illustrated in FIG. 4. Carried in the clearance openings or sockets 82, 84 are miniature incandescent lamps 86 shown, in this preferred embodiment of the invention, as having bases 88 formed with flanges 90. The base flanges 90 position the lamps 86 in the sockets 82, engaging circular shoulders therein. The lamps 86 are retained in these operative positions by spring contact arms 92 held in place by clamping screws 94 which are threaded into the ring 72.

The upper three lamps 86 shown in FIGS. 4, 5 and 6 have their filaments fully located in the V-section groove 76 whereby light from the lamps will be reflected forward by the conical surfaces 78, 80, as well as such light passing directly forward from the filaments. All of this light will strike the rear of the dial 30 so as to illuminate the indicia thereon. Also, the filaments of the two lower lamps 86, while not positioned as fully in the V-groove 76 as the upper three lamps, will still be located so as to direct light forwardly toward the dial and in addition against the inner reflective surface 78, thereby to provide still more illumination for the dial.

The pointer illumination is effected by an annular light-piping member or lens 96, see FIGS. 4, 5, 7 and 8, preferably constituted of clear plastic substance. The light-piping member 96 has an intermediate or body portion 98 which extends through a clearance slot 100 in the reflector member or prism 72. At one end, the body portion 98 has aligned light-collecting arms 102 provided with curved end surfaces 104, said arms having adjoining angular reflector surfaces 106 adapted to direct light (which has been collected and received at the curved end surfaces 104) into and through the body portion 98. Such light is provided by the two lower lamps 86 shown in FIG. 4.

At the other lamp; of the body portion 98 there is a single angularly extending arm 108 carrying and surrounded by a light-impervious tube 110. The body portion 98 and arm 108 have a flat reflective surface 112 by which light that has been directed through the body portion 98 from the collector arms 102 is redirected along the single delivery arm 108. At its free extremity, the arm 108 as a lens surface or configuration 114 adapted to concentrate such light and direct it against the flat rear surface 50 of the pointer 44. Accordingly, with such organization, light from the two lower lamps 86 as seen in FIG. 4 will be directed against the pointer surface 50 to illuminate the pointer, in addition to light from these lamps also directly illuminating the rear of the dial 30 and indirectly illuminating the dial by means of the inner conical reflective surface 78 of the reflector member or prism 72. The light-piping member 96 is attached to and carried by the reflector member 72 in any suitable manner, as by the use of an adhesive for example.

For the purpose of effecting electrical connections to the incandescent lamps 86, a pair of concentric conductor rings 116, 118 is provided on the rear of the member 72 as seen in FIG. 6, the outer ring 116 having angular fingers 120 which are clamped under the spring contact arms 92 by the clamping

screws 94. Accordingly, such spring contact arms are all electrically joined to the outer ring 116; they engage the tip contacts of the lamp bases 88 to effect one set of electrical connections to the filaments. The inner conductor ring 118 has a plurality of spring fingers 122 adapted to engage the metal bodies of the bases 88, thereby to effect another set of electrical connections to the lamp filaments. Terminal studs 124, 126 connected respectively to the outer and inner conductor rings 116, 118 enable electrical connections to be established thereto.

The radial or substantially radial disposition of the clearance openings or sockets 82, 84 in the reflector member 72 enable the lamps 86 to be withdrawn substantially radially from the member after the screws 94 have been loosened and the spring contact arms 92 swung aside to permit such removal. Accordingly, replacement of the lamps 86 may be easily and quickly effected after the instrument assemblage has been taken out of the casing 20. It will be readily understood that for such lamp removal it is not necessary to remove the dial 30, pointer 44 or any other associated components of the movable system of the instrument.

FIG. 11 shows a dial 30b having a keyhole-shaped opening 130 which is masked by a disc 57b and support arm 53b, preventing light originating at the rear of the dial and passing forward through said opening, from striking the viewer.

The construction as above set forth is seen to be especially simple and straightforward. Relatively few components are involved, these constituting a small and compact assemblage which may be economically fabricated and assembled. There is no possibility of the lamps 86 working loose or vibrating in such a manner as to cause loose or inoperative connections to the bases thereof. It is further noted that the light from each lamp is utilized to the maximum extent, for the purpose of effecting the dial and pointer illuminations.

Variations and modifications are possible without departing from the spirit of the invention.

I claim:

1. An illuminated indicator means for use with an instrument movement, comprising in combination:

- a. an illuminable indicator member located in front of and adapted to provide information related to said movement;
- b. a reflector member located at one side of the axis of the instrument movement and between the same and the illuminable member, said member having reflective surfaces which are angularly disposed with respect to the axis of the instrument movement and having a clearance opening;
- c. a lamp disposed in the clearance opening of the reflector member and arranged to direct light against an angularly disposed reflective surface thereof and against the rear of said indicator member to illuminate the same; and
- d. means mounting said lamp for removal from said clearance opening in a direction away from the axis of the instrument movement.

2. The invention as in claim 1, and further including:

- a. a second illuminable indicator member adjacent and cooperable with the first indicator member; and
- b. a light-piping member associated with said second indicator member and lamp to conduct light from the latter to said second indicator member.

3. The invention as in claim 2, wherein:

- a. the light-piping member comprises a body portion and a pair of arms respectively connected to the ends of the body portion and extending at right angles thereto in intersecting normal planes containing the body portion at the intersection thereof; and
- b. said arms extending respectively toward said second indicator member and said lamp.

4. The invention as in claim 3, and further including:

- a. a second lamps;
- b. said reflector member having a second clearance opening in which the second lamp is disposed;
- c. said second lamp providing direct and indirect illumination of said first-mentioned indicator member;

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- d. means mounting said second lamp from removal from said second clearance opening in a direction away from the axis of the instrument movement; and
- e. said light-piping member having a third arm extending from an end of the body portion toward said second lamp to pick up light therefrom. 5
5. The invention as in claim 4, wherein said third arm is colinear with one of said pair of arms.
6. The invention as in claim 2, and further including:
- a. a second lamp; 10
- b. said reflector member having a second clearance opening in which the second lamp is disposed;
- c. said second lamp providing direct and indirect illumination of said first-mentioned indicator member; and
- d. means mounting said second lamp for removal from said second clearance opening in a direction away from the axis of the instrument movement. 15
7. The invention as in claim 6, wherein the reflector member comprises a ring having in one side a deep annular V-section groove the walls of which comprise said reflective surfaces. 20

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8. The invention as in claim 7, and further including:
- a. a plurality of additional lamps;
- b. said reflector member having a plurality of additional clearance openings in which the additional lamps are respectively disposed;
- c. said additional lamps directly and indirectly illuminating said first-mentioned indicator member;
- d. all said lamps projecting into said V-section groove; and
- e. means mounting said additional lamps for removal from their respective clearance openings in directions away from the axis of the instrument movement.
9. The invention as in claim 8, wherein:
- a. said lamps are disposed in a circle; and
- b. a pair of concentric insulated conductor rings carried by said reflector member and connected with said lamps to conduct current therethrough.
10. The invention as in claim 9, and further including spring arms connected to the conductor rings and engaged with bases on the lamps, to effect electrical connection thereto.

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