April 7, 1942. N. J. SMITH ET AL 2,278,951

ILLUMINATED DIAL INSTRUMENT

Filed March 23, 1939 2 Sheets-Sheet 1

Fig. 1

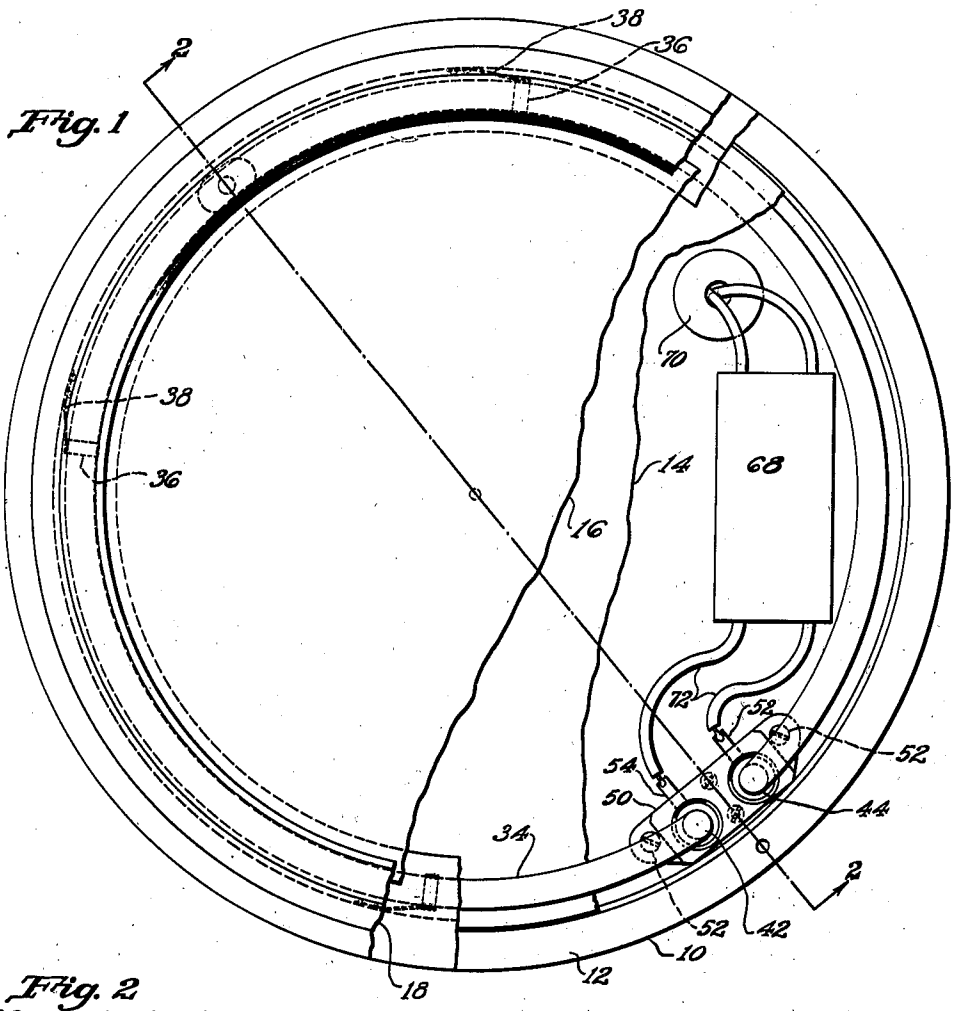
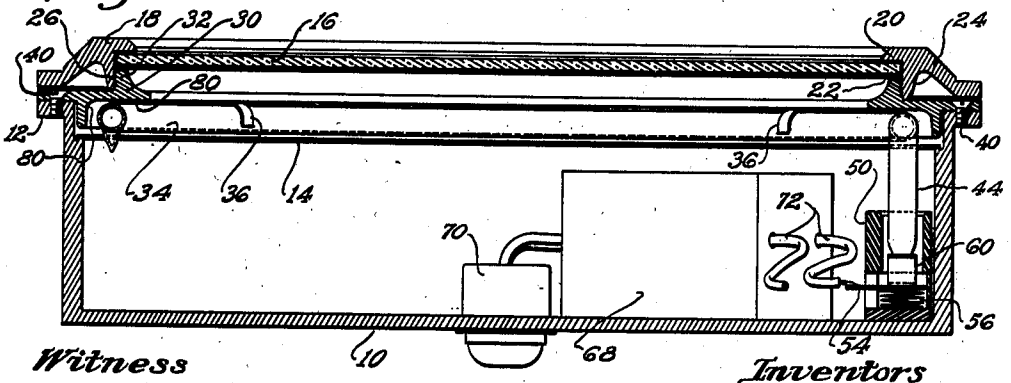


Fig. 2



Witness

Paul F. Bryant

Inventors

Norman J. Smith

Walter L. Thomas

by their Attorneys

Fish, Richardson, Carey & Duncan

April 7, 1942. N. J. SMITH ET AL 2,278,951

ILLUMINATED DIAL INSTRUMENT

Filed March 23, 1939 2 Sheets-Sheet 2

Fig. 3

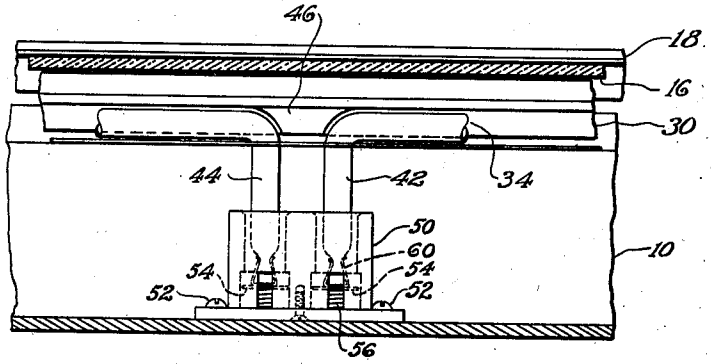


Fig. 4

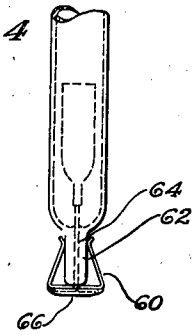
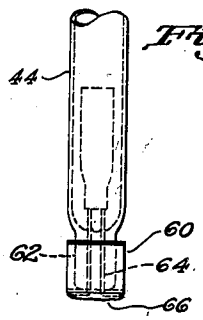


Fig. 5



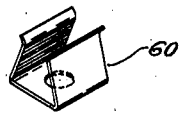
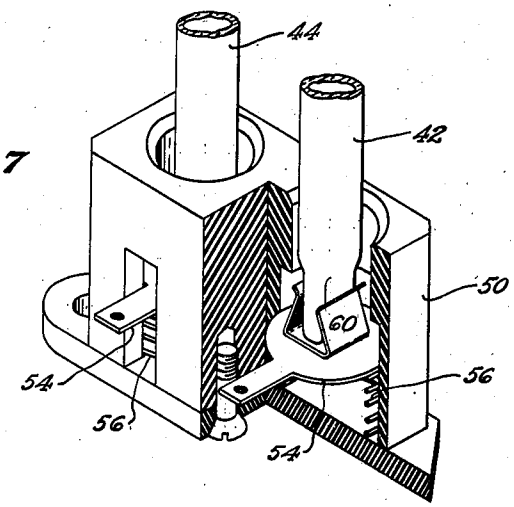


Fig. 6

Fig. 7



Witness

Paul F. Bryant

Inventors

Norman J. Smith

and

Wallie L. Thomas

by their Attorneys.

Fish, Richardson & Carey, Jr.

Patented Apr. 7, 1942 2,278,951

UNITED STATES PATENT OFFICE

2,278,951

ILLUMINATED DIAL INSTRUMENT

Norman J. Smith, Medfield, and Walter L. Thomas, Lynn, Mass., assignors to Crosby Steam Gage & Valve Company, Boston, Mass., a corporation of Massachusetts

Application March 23, 1939, Serial No. 263,710

1 Claim. (Cl. 240—2.1)

The present invention is concerned with means for effectively illuminating dial instruments such as gauges, recorders, clocks, and instruments of all sorts employing an indicating or recording dial generally of circular form.

The purpose and object of the invention is to provide for effective and generally uniform illumination of a circular dial on the order of ten or twelve inches in diameter, and to accomplish this result in such a manner that the source of illumination may be changed or substituted without hazard or the necessity for trained or skilled electricians.

With this and other objects in view, we have provided for the illumination of such dials through a gaseous or gas-filled tube of the type commonly referred to as a Neon tube. We propose to arrange this tube in a generally circular form surrounding the dial to be illuminated circumferentially at its outer margin. The illuminating tube is yieldingly supported and connected to a holder, which in turn is detachably but rigidly connected in a predetermined relation to the case of the instrument. The tube is provided with two connecting legs extending rearwardly from the plane of the tube, and provided with terminal clips designed for cooperation with terminal contacts mounted upon the case when the holder and supported tube are attached to the case, the precise location of the holder with respect to the case causing the legs of the tube to properly register with the contact members, the yielding connection permitting sufficient lateral movement of the tube to avoid undue strains thereon.

The dial is illuminated by direct rays from the tube, and in addition through reflection from the inner and surrounding face of the holder together with the inner surface of the glass front which is in reasonably close proximity to the plane of the tube. The result is an effective and uniform illumination over the entire area of the dial, the illumination at the interior portion of the dial comparing favorably with that at the outer margin closely adjacent to the illuminating tube, and producing a dial surface entirely free from contrasting lights and shadows or reflections which interfere with the visibility. The substitution of the illuminating tube may be readily effected without disconnecting the source of current supply by merely removing the holder with the connected tube which automatically disconnects the tube from the source of supply, the contact members being so located within the case that they are normally inaccessible to accidental engagement of the operator. This feature is of importance where high voltages such as normally employed in the operation of this type of tube are conducted into the case.

In the accompanying drawings illustrating the preferred form of the invention, Fig. 1 is a plan of a dial instrument such as a gauge, with a portion cut away and shown in section, and with the operating hands removed; Fig. 2 is a section of the same instrument on the line 2—2 of Fig. 1; Fig. 3 is a detail illustrating the means for locating the tube, together with the contact connections; Figs. 4 and 5 are details illustrating the contact legs of the tube; Fig. 6 is a detail illustrating one of the metallic terminals of the tube; and Fig. 7 is a detail illustrating the structure of the contact terminals supported within the case cooperating with the tube.

The structure shown in the illustrated embodiment of the invention, with more particular reference to Figs. 1 and 2, illustrates a metallic case 10 having the usual attaching flange 12. Within this case is located the usual operating instrumentalities, not shown, and at the outer or front portion of the case is located a dial 14, having the usual graduations thereon and preferably coated or painted to give a flat white surface readily illuminated without annoying reflection. Overlying the dial is a transparent front of glass or similar material 16, mounted in a ring 18 and held between a shoulder 20 of the ring and a gasket 22. The ring, as is usual in this general type of structure, has an attaching flange 24 threaded at 26 for securing the ring to the instrument. In the present construction this front ring, instead of being attached to the case, is threaded directly upon an intermediate holder 30, provided with a threaded boss or shoulder 32, as indicated in Fig. 2, to which the ring is secured. The holder serves as a unitary means for supporting a gas-filled illuminating tube 34 which is bent into circular form to extend circumferentially about the outer margin of the dial, this tube ordinarily being composed of glass or similarly semi-fragile material, and being secured to the holder by spring clips 36 which, as shown more particularly in Fig. 1, are connected to the holder through spring arms 38, there being a plurality of these clips uniformly spaced about the holder to support the tube in a generally fixed position with respect to the holder and to permit limited movements therein.

The holder prior to attachment of the ring is secured to the case of the instrument by a plural-

ity of holding and locating screws **40**, which serve to rigidly connect the holder to the case in a predetermined and precise relation to the case, serving at the same time to locate the illuminating tube with respect to its operating connections. As indicated more particularly in Fig. 3, the illuminating tube is of generally circular conformation, and has connecting legs **42** and **44** extending outwardly from the plane of the tube. The holder is also provided with a locating boss **46**, normally intended to be positioned between the legs when the tube is in place on the holder, and to approximately position the tube with respect to the holder.

When the holder is assembled with and secured to the case, the illuminating tube is connected with a source of current supplied through engagement of the legs with terminal contacts. To this end, as indicated in Figs. 2, 3 et seq., the case has secured thereto a contact assembly having a housing of insulating material **50** secured to the case at **52**. The housing of the contact is hollow, and is provided with flat sliding contacts **54** normally urged toward the plane of the tube by springs **56**. Each leg of the tube is provided with a metallic contact clip **60**, designed to frictionally slip over the reduced end **62** of the tube and permanently connected electrically with the lead wires **64** of the tube through solder or equivalent means **66**. When the holder together with its supported tube is assembled with and connected to the case, the contact legs **42** and **44** generally register with the spring contacts **54** and are held thereagainst by securing of the holder. Any slight displacement of the illuminating tube is readily accommodated by the yielding support. Because of the voltage required for operating this type of tube the case may be provided with a transformer **68** connected to a source of low voltage alternating current power through the plug **70**, and having leads **72** respectively connected with the spring-actuated contacts.

From an inspection of the drawings, more particularly Fig. 2, it will be evident that the dial closely adjacent to the plane of the illuminating tube is directly illuminated thereby, which illumination is amplified by forming the inner face of the holder which overlies the tube and surrounds it with a light or white reflecting surface, this face being indicated generally at **80**. Illumination of the inner area of the dial, that is to say, the central area removed from the margin, is effectively aided by deflection of rays emanating from the tube against the inner surface of the glass front **16** and thence redirected against the dial to provide effective and uniform illumination throughout the entire dial area. The extension of the holder inwardly beyond the tube is such that light rays passing directly from the tube and normally engaging the glass front immediately adjacent to the tube around the outer margin are intercepted by the reflecting surface of the holder and redirected against the dial, so that the latter is illuminated at its outer margin by direct rays from the tube and the reflecting surface of the holder, this illumination being amplified throughout the inner area of the dial by reflection from the inner surface of the transparent front.

What is claimed is:

An illuminated dial instrument, comprising a case, a transparent front for the case, an indicating dial, an illuminating tube of generally circumferential form located between the dial and transparent front, a circumferential holder to which the tube is yieldingly clamped, the holder having a face extending inwardly and overlying the tube closely adjacent thereto and shielding it from the direct vision of the observer, the inner face of the holder adjacent the tube having a reflecting surface, means for rigidly securing the holder to the case, terminal legs projecting outwardly from the plane of the tube, means upon the holder for engagement with the terminal legs and accurate positioning of the tube, and terminal contacts located behind the dial within the case and designed to be engaged by the terminal legs of the tube when the holder is connected to the case.

NORMAN J. SMITH.
WALTER L. THOMAS.