

Dec. 8, 1942.

M. PENNYBACKER
ILLUMINATING APPARATUS
Filed Aug. 13, 1940

2,304,594

2 Sheets-Sheet 1

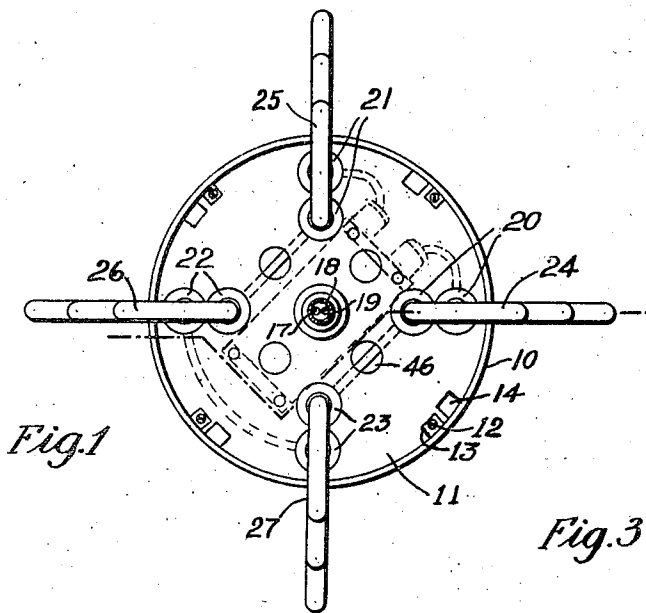


Fig. 1

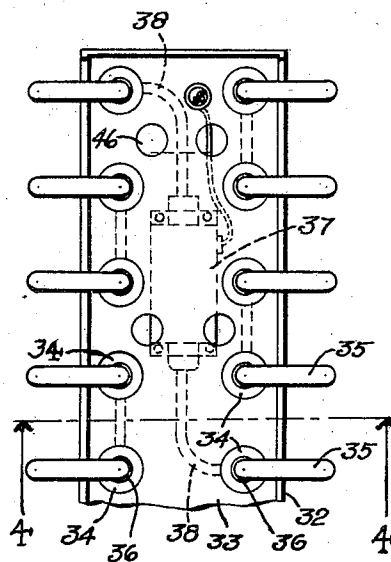


Fig. 3

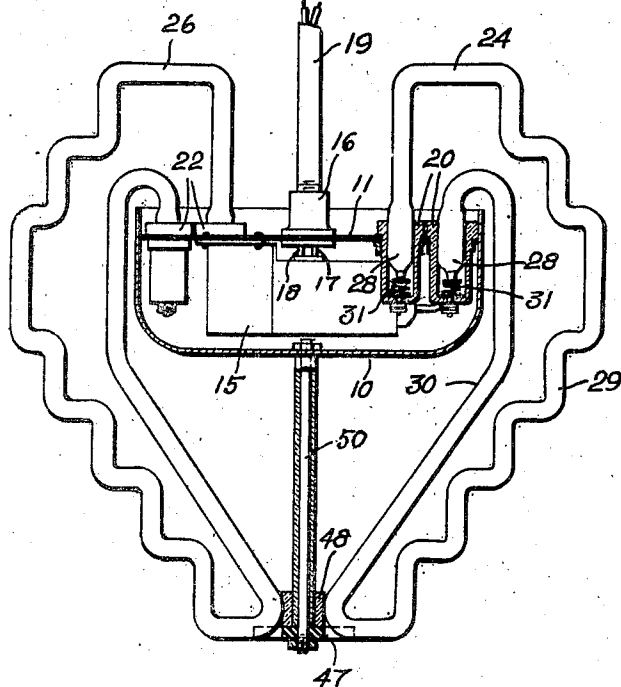


Fig. 2

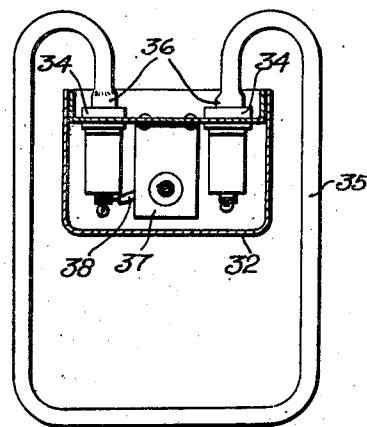


Fig. 4

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Fig. 5

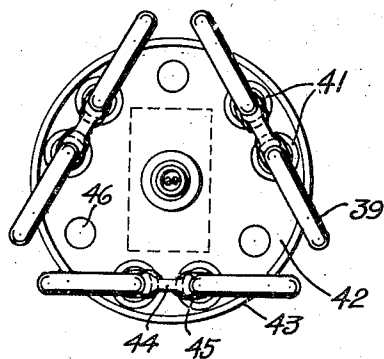


Fig. 6

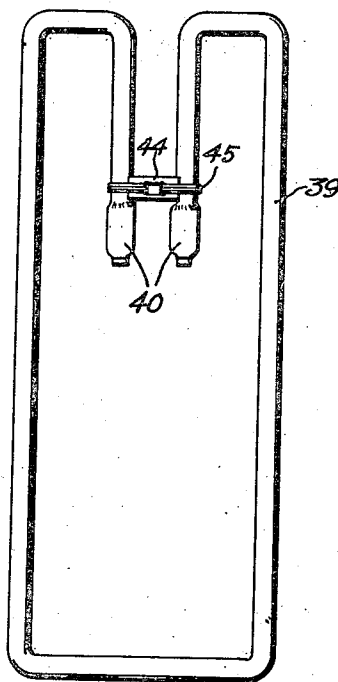
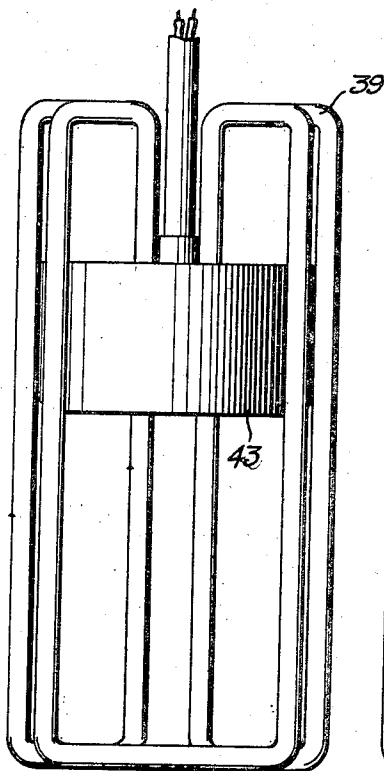


Fig. 7

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UNITED STATES PATENT OFFICE

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ILLUMINATING APPARATUS

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Application August 13, 1940, Serial No. 352,355

2 Claims. (Cl. 240—78)

The present invention pertains to improvements in illuminating apparatus.

An object of the invention is to provide an illuminating fixture for luminous discharge tubes in which no diffusing means need be interposed between the tubes and the observer, the tubes themselves forming a pleasing decorative exposed design and having their terminals located out of the normal observer line of vision.

Another object is to provide an improved type of luminous tube unit particularly adapted for use with the above fixtures.

A further object is to provide a tubing unit of the above nature having re-entrant terminal electrodes.

Another object of the invention is to provide a luminous tube lighting structure having one or more pairs of inverted electrode sockets in which the electrodes are disposed and in which the center of gravity of the tubing elements is below the sockets.

Another object is to provide a luminous tube lighting fixture in which the electrode sockets are open upward and the luminous tubing extends from the socket outward and downward, whereby a portion of the light is directed above the fixture, a portion laterally, and a portion downward.

A further object is to provide a luminous tube lighting fixture in which a maximum amount of the emitted light is made available for useful illumination over a desired field.

Another object is to provide a lighting fixture of the above type which may be readily assembled, disassembled, and transported, and in which all tube terminals, transformers and wiring are fastened to and entirely supported from a top plate so that the sides and bottom may be free from holes and readily removable from the top plate without disturbing the electrical connections.

Other objects and advantages of the invention will become evident in the course of the following description in connection with the accompanying drawings, in which—

Figure 1 is a plan view of one embodiment of the invention;

Figure 2 is a vertical sectional view of the same on the lines 2—2, Figure 1;

Figure 3 is a plan view of a second embodiment;

Figure 4 is a cross sectional view of the same on the line 4—4, Figure 3;

Figure 5 is a plan view of a third embodiment of the invention;

Figure 6 is a side elevation of the same; and Figure 7 is a detail view of a tubing unit illustrating the re-entrant electrodes characteristic of tube units of the type used in these fixtures.

Referring to Figures 1 and 2, the numeral 10 designates a bowl-shaped casing. A plate 11, forming the top of the casing 10, is secured in any suitable manner, for example by means of small screws 12 extending through tabs 13 welded or otherwise fastened to the inside of the casing. Notches 14 in the plate 11 permit the latter to be dropped past the tabs 13, then revolved to fastening position as shown in Figure 1.

A transformer 15 is secured to the bottom of the plate 11. Mounting means of any desired type, herein shown as a pipe socket 16, may be secured to the top of the plate. The primary wires 17 and 18 of the transformer 15 are brought out through the socket 16 and the supporting pipe 19 screwed therein.

A plurality of pairs of electrode sockets 20, 21, 22 and 23 are secured in the plate 11, in circumferentially spaced relation, and are adapted to cooperate respectively with luminous tubing units 24, 25, 26 and 27.

Each tubing unit in preferred form, for example unit 24, comprises a single tube length having inverted terminal electrodes 28 and leg portions 29 and 30 directed outwardly and downwardly from the electrodes so that the center of gravity of the unit is below the sockets 20. The electrodes 28 are re-entrant—that is, directed inwardly with respect to the general pattern of the tubing unit instead of outward therefrom as in the usual construction of luminous tubing units.

The weight of the unit 24 is preferably suspended on the points of contact of electrodes 28 with the spring-supported terminals 31 in the sockets 20.

A vertical rod 50, secured to the bottom center of the casing 10, carries on its lower end a small spider 47, of insulating material, surmounted by a glass bushing 48. The tube units 24, 25, 26 and 27 are so proportioned that when suspended in the sockets 20, 21, etc., as described above, the lower portions of the units bear inwardly against the bushing 48, the spider 47 maintaining them in spaced relation but not supporting their weight.

It will be seen from the foregoing description that the units 24, 25, etc., are held in position entirely by gravity without requirement for any fastening means, and the support of the tubing weight on the electrode terminals assures good

electrical contact at all times. In normal assembly, the units 24, 25, etc., are simply lifted to bring their electrodes above the sockets 20, 21, etc., and lowered into place as shown. Similarly, if any unit needs replacement, re-pumping, etc., removal and replacement is quickly and readily carried out without the use of tools and without disturbing other units.

In the type illustrated, the outer leg portions 29 of the four tubing units are bent in stepped or zig-zag shape, this structure giving a large effective illuminating length and area in relatively small space, as well as presenting an attractive appearance.

However, the device is not limited to this exact number or shape or tubing units, since obviously any suitable number of units may be used and the tubing may be bent with any desired contour so long as the proper relationship between electrodes and centers of gravity are maintained as described.

Figures 3 and 4 illustrate an application of the invention especially adapted to elongated lighting fixtures. In this embodiment the casing 32 may be trough-shaped. The plate 33, secured in the upper portion of casing 32, carries the inverted electrode sockets 34 disposed in rows adjacent the sides of the casing. The tubing units 35 are formed with their reentrant electrodes 36 directed downwardly and spaced to register with and hang in corresponding pairs of sockets 34. This type of unit is preferably symmetrical laterally and may have any desired shape, herein illustrated as a substantially square-bottomed U-shape.

As in the case of Figures 1 and 2, the centers of gravity of the units 35 normally are below the contact portions of the sockets 34, so that the units hang vertically on their electrodes without fastenings or braces and maintain good electrical contact by gravity, as previously set forth.

However, with this type as well as the others illustrated, when it may be desired in order to assure against vibration or when the fixture is to be used in inverted position as in certain low level installations, fastening means of any well-known type may be used to secure the electrodes in their sockets.

The fixture may be as long and employ as many units 35 as desired, a suitable transformer or transformers 37 being secured to the bottom of plate 33 and connected to the electrode sockets 34 in the usual manner, as by means of high tension conductors 38. It is obvious that if desired the pairs of electrode sockets 34 may be arranged across the ends of the trough instead of along the sides, in case it is desired to employ tubing units disposed longitudinally instead of laterally.

Figures 5 and 6 illustrate a form of the invention incorporating tubing units 39 having the general structure shown in Figure 7. In this form, the inverted electrodes 40 are spaced fairly close together, and when the electrodes are inserted in corresponding pairs of upwardly opening sockets 41 in the plate 42, each symmetrical unit 39 hangs clear of the convex exterior of the casing 43 on one side thereof instead of spanning the latter as in Figures 3 and 4. As in the case of the other forms illustrated, the units are located and retained by the electrode sockets and gravity, thereby maintaining a position of stable equilibrium without the necessity of additional fastening means.

Referring to Figure 7, a glass brace member 44

is secured between the sides of unit 39 adjacent the electrodes 40, preferably by means of non-conducting cord 45 such as spun glass. The use of non-conducting cord, such as spun glass, avoids the formation of darkened spots common to tubing in contact with the usual wire fastening.

The above cross bracing structure, which obviously may be similarly applied to various forms illustrated, renders the tubing units strong and rigid, thus adding to the ease and safety of handling, shipping and assembling. The ease and safety of packing and shipping is further augmented by the fact that in all forms illustrated, the tubing units may be made uniplanar, that is, with all bends in a single plane. While, as previously noted, in normal applications the individual tubing units hang entirely independently of each other, in installations involving heavy vibration or swinging, such as on shipboard, interbracing between units may be applied by means of braces similar to brace 44, or the like.

In all forms, especially as illustrated in Figure 2, the considerable amount of tubing extending outwardly from above the re-entrant electrodes allows for large upward illumination above the fixture, preventing heavy shadow spots on the ceiling, while the inwardly extending lower portions similarly prevent shadows on the floor. Thus, it will be seen that the invention provides for a highly advantageous distribution of illumination upward and downward as well as laterally, better than is obtained with straight tubes spaced parallel to one another, illustrating that the use of re-entrant electrodes permits exposure directly of a maximum amount of the tube surfaces for illumination in any desired direction. For example, the proportion of illumination above the fixture may be made relatively great by extending the tubing a substantial distance upward from inverted electrodes, as shown in Figures 2 and 6.

The plates 11, 33 and 42, Figures 1, 3 and 5, may be provided with any desired number of ventilating openings 46.

Obviously, the fixtures may be constructed with reflecting surfaces, and the use of the concealed re-entrant electrodes permit such surfaces to be provided behind substantially the entire effective lengths of the tubing units without holes or other interruptions of the reflecting surfaces.

Luminous tubing units have greatest efficiency and life when employing long lengths of tubing, and it will be seen that with the present invention the fixture is adapted to receive comparatively long tubing lengths, for example four feet and more, without the fixture itself having nearly so great a dimension in any direction. The tubing units may be made in standardized types, each type of which may be used with one or more types of fixtures. The effect of various combinations, as herein illustrated, permits a much more decorative effect than the straight tubing heretofore widely used in illuminating devices, and no external diffusing means is required.

While the invention has been described in preferred forms, it is not limited to the exact structure illustrated, as various modifications may be made without departing from the scope of the appended claims.

What is claimed is:

1. In an illuminating fixture, in combination, an elongated casing, two longitudinal rows of upwardly opening electrode sockets in said cas-

ing, and a plurality of luminous tubing units each having a pair of downwardly directed electrodes engaging sockets in said rows and tubing portions extending upwardly and outwardly from said electrodes, downwardly beside said casing, and across underneath said casing, the centers of gravity of said units being below said electrode sockets.

2. In an illuminating device, in combination, a

substantially rectangular casing, two rows of upwardly directed electrode sockets in the top of said casing, and a plurality of luminous tubing units, each unit having terminal electrodes engaging sockets in said rows and a luminous tube portion extending from said electrodes upwardly, outwardly, downwardly and under said casing.

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