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(54) **Low pressure discharge lamp assembly**

Entladungslampenanordnung

Lampe à décharge à basse pression

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Description

BACKGROUND TO THE INVENTION

This invention relates to a low pressure discharge lamp assembly, and in particular to a low pressure mercury vapour discharge lamp assembly.

Low pressure mercury vapour discharge lamps, such as that described in European patent application EP 00274870, have, owing to their significantly reduced power consumption, become increasingly popular as replacements for conventional incandescent filament lamps. A lamp of this type comprises an H-shaped discharge tube terminating at one end in a connector which can be plugged into a base. The connector may contain starter circuitry, and the base usually houses a ballast The base in turn terminates in a bayonet or screw connector for coupling with a light fitting.

An entire discharge lamp assembly of the type described above is usually too long to fit into a conventional light fitting which has been designed to house an incandescent filament light bulb. As a result, many light fittings need to be changed to accommodate such a low pressure discharge lamp assembly.

EP-A-0447957 discloses a low pressure discharge lamp assembly comprising a base terminating in a fitting. An elongate cylindrical control circuit housing extends from the middle of the base and is removably mounted on the base opposite the fitting. A plurality of discharge tubes extending parallel to the axis of the control circuit housing flank the latter.

SUMMARY OF THE INVENTION

According to the invention there is provided a low pressure discharge lamp assembly comprising a base terminating in a fitting, an elongate control circuit housing removably mounted to the base opposite the fitting, and at least a pair of discharge tubes flanking the control circuit housing, the discharge tubes extending away from the base and being splayed away from one another.

In a preferred form of the invention, the control circuit housing is provided with a reflective outer surface for reflecting light outwardly from the discharge tubes.

Preferably, the discharge tubes extend away from the base in a vee-shaped configuration.

Conveniently, the control circuit housing houses both ballast and electronic starter circuitry.

Advantageously, the control circuit housing is detachably mountable to the base via an electromechanical connection, the electromechanical connection including a first set of connectors for connecting the fitting electrically to the control circuit for powering thereof and a second set of connectors for connecting outputs from the control circuit to input leads connected to the discharge tubes.

Typically, the control circuit housing includes an electromagnetic and radio frequency interference shield for protecting the control circuit.

In one form of the invention, the discharge tubes may be rectilinear.

The control circuit housing is conveniently wedge-shaped, with the housing tapering outwardly from the base.

An acute included angle of between 20° and 40°, and preferably 30°, may be defined between the discharge tubes.

The maximum width of the assembly is advantageously defined by the outermost ends of the discharge tubes, and corresponds to or is less than the maximum width of a conventional incandescent filament light bulb.

The overall length of the assembly is conveniently reduced by virtue both of the control circuit housing being positioned alongside and between the discharge tubes rather than between the fixed ends of the discharge tubes and the fitting and by the discharge tubes being splayed away from one another.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a side view of a first embodiment of a mercury vapour low pressure discharge lamp assembly of the invention;

Figure 2 shows a front view of the low pressure discharge lamp assembly of Figure 1;

Figure 3 shows a top plan view of the low pressure discharge lamp assembly of Figures 1 and 2;

Figure 4 shows a perspective view of the control circuit housing of the low pressure discharge lamp assembly of Figures 1 to 3;

Figure 5 shows a partly cut away side view of second embodiment of a mercury vapour low pressure discharge lamp assembly of the invention;

Figure 6 shows a top plan view of the embodiment of Figure 5;

Figure 7 shows a cross-section of a lower portion of the discharge lamp assembly on the line 7-7 of Figure 6;

Figure 8 shows a cross-section of a lower portion of the discharge lamp assembly on the line 8-8 of Figure 6;

Figure 9 shows a side view of a third embodiment of a low pressure discharge lamp assembly of the invention;

Figure 10 shows a perspective view of a control circuit housing forming part of the lamp assembly of Figure 9; and

Figure 11A and 11B show polar light distribution graphs of a respective conventional discharge lamp assembly and a discharge lamp assembly of the invention.

DESCRIPTION OF EMBODIMENTS

Referring first to Figures 1 to 3, a first embodiment of a low pressure mercury vapour discharge lamp assembly 10 comprises a base 12 terminating in a screw connector fitting 14. A pair of 7 Watt H-shaped biaxial mercury discharge tubes 16 and 18 of the type manufactured by General Electric extend upwardly from the base in a V-configuration, and are angled from one another at an included angle of approximately 24°, as shown at 20. The discharge tubes 16 and 18 flank a central housing 22 which is wedge-shaped in profile. The central housing 22 houses electronic starter circuitry as a well as a choke or ballast. The housing 22 has connection pins 24 which allow it to be plugged into a socket arrangement 26 which extends axially from the centre of the base 12.

The housing preferably has a reflective metallic coating, such as an aluminium coating, applied to its outer surface by vacuum deposition for enhancing its reflectivity. The metallic coating doubles as an electromagnetic and radio frequency interference shield for effectively shielding the control circuitry. Cathode sputtering, using alternating layers of steel with an intermediate copper layer sandwiched therebetween, may also be employed. The reflective outer surface may alternatively be constituted by a white plastics material having a gloss finish. A further option is to spray a conductive nickel coating onto the outer surface of the housing.

As can be seen in Figure 4, the housing has a pair of opposed reflective faces 28 and 30, which are arranged to reflect light emitted from the discharge tubes 16 and 18. Each face comprises a raised pair of triangular facets 32 and 34 flanked by a flat pair of triangular facets 36 and 38. Rectangular side faces 40 and 42 extend between the opposed faces 28 and 30. The facets 32 and 34 are angled at approximately 110° from one another in order to provide an even distribution of reflected light from the respective discharge tubes 16 and 18.

The overall length 44 of the discharge lamp assembly from the top of the screw connector 14 to the end of the discharge tubes 16 and 18 is approximately 102mm. The maximum width 46 of the discharge lamp assembly is approximately 55 mm. These dimensions allow the discharge lamp assembly to be housed within conventional light fittings which are designed to accommodate conventional 60 Watt or 100 Watt incandescent filament-type light bulbs. The compactness of the lamp assembly is achieved largely by the position of the control circuit housing 22, which houses both the starter circuit and the ballast alongside, rather than beneath the fluorescent tubes 16 and 18. As a result, the overall length of the incandescent lamp assembly is considerably reduced. In addition, the relatively spacious wedge-shaped configuration of the control circuit housing provides for automated assembly of the electronic components housed therein.

Once the discharge tubes have reached the end of their lifespan, the housing 22 is unplugged from the base and the discharge tubes 16 and 18 and the base 12 to which they are mounted are disposed of The housing 22 is then plugged into a replacement base 12, from which fresh discharge tubes 16 and 18 extend.

Referring now to Figure 6, a second embodiment of a fluorescent lamp assembly 48 is shown which is similar to the embodiment of Figures 1 to 4, with a pair of FW U-shaped tubes 16A and 18A being angled further apart from one another at an included angle of 30°, as is shown at 50. The central housing 22A is of substantially the same shape as the central housing 22, save that it has rectangular side faces 40A and 42A which are substantially narrower than the rectangular side faces 40 and 42. A printed circuit board, which is indicated in broken outline at 52, is populated with various circuit components 54, including starter circuitry and at last one ballast or choke.

As is best seen in Figures 7 and 8, a ten pin socket 56 is embedded within the base 12A. A first pair of leads 57 extends from the lower ends of the first two sockets 58. The leads 57 extend into a cathode terminal 60 of the fluorescent U-tube 16A. A similar pair of leads (not shown) extend from second and third sockets 62 into an anode terminal of the

U-tube 16A. A positive lead 64 extends from a base contact 66 of the fitting to the lower end of a fifth socket 68, and an earth or negative lead 70 extends from a sixth socket 72 to an outer earth or negative shell 74 of the screw fitting 14. The sixth to tenth sockets 76 are provided with corresponding lead which extend into the respective cathode and anode terminals of the U-tube 18A. One pair of cathode leads is shown at 78. The housing 22A terminates in a corresponding ten pin plug 80 which is arranged to plug into the socket 56.

Turning now to Figure 9, an alternative embodiment of a discharge lamp assembly is shown having a pair of U-tubes 82 and 84 withcorresponding base portions 86 and 88 which extend upwardly from the base 12A in a splayed vee-shaped configuration The base portions 86 and 88 terminate in respective upright portions 90 and 92 which are parallel both to one another and to a central axis of symmetry 94. A suitably shaped control circuit housing 96 extends between the U-tubes 82 and 84. The housing has an upper portion 98 which is square-cylindrical in form, thereby allowing increased space for the various circuitry components such as the starter circuitry and the ballast. A conventional incandescent bulb is superimposed in broken outline at 100 onto the embodiment illustrated in Figure 9. It is clear how the maximum widths of the incandescent bulb 100 and the fluorescent bulb assembly 84 correspond. It is also clear from this drawing how the base of the incadescent bulb 100 is approximately coterminous with the base 12A, thereby allowing the fluorescent light fitting 84 to be screwed into any socket which previously housed a conventional incandescent bulb of the type illustrated at 100.

Referring now to Figure 11A, a downlight sample test was performed in which a conventional CAS-PROLUX ® 11W-PLE-230V-S lamp assembly 102 was fitted within a cascade downlighter 104. At an average light intensity was measured over a luminous area of 300 cm^2 located beneath the downlighter 104. A accompanying polar graph 106 is shown in which average intensity in candelas per kilolumen was measured against degrees. Measurements were taken in the horizontal (0-180°) as well as the vertical (90-270°) planes. The same test was then performed with a fluorescent lamp assembly 48 of the type illustrated in Figure 5, so as to yield a polar graph 108. It is clear from the graph 108 how the solid line 110 plotting the average light intensity has a more even distribution and a greater maximum value that the solid line 112 of the polar graph 106. This is as a result both of the central reflective housing and the V-shaped configuration of the fluorescent bulbs.

The fluorescent lamp assembly of the invention enjoys a number of advantages over conventional lamp assemblies. Its compact dimensions allow it to be fitted to conventional incandescent light sockets without having to change any light housings. For the same or an even greater light output, it has a power consumption considerably less than that of a conventional incandescent bulb. The bulbs can be replaced without disposing of the starter circuitry, and vice versa. In addition, the discharge light assembly of the invention makes use of rectilinear fluorescent tubes, which are relatively easy to manufacture in comparison with tubes having more unconventional curved shapes.

Claims

1. A low pressure discharge lamp assembly (10) comprising a base (12) terminating in a fitting (14), an elongate control circuit housing (22) removably mounted to the base opposite fitting, and at least a pair of discharge TUBES (16, 18) flanking the control circuit housing, characterised in that the discharge tubes extend away from the base (12) and are splayed away from one another.

2. A low pressure discharge lamp assembly (10) according to Claim 1 characterised in that the control circuit housing (22) is provided with a reflective outer surface for reflecting light outwardly from the discharge tubes (16, 18).

3. A low pressure discharge lamp assembly according to either one of the preceding claims characterised in that the discharge tubes (16, 18) extend away from the base (12) in a vee-shaped configuration.

4. A low pressure discharge lamp assembly according to any one of the preceding claims characterised in that the control circuit housing houses both ballast and electronic starter circuitry (54).

5. A low pressure discharge lamp assembly (10) according to any one of the preceding claims characterised in that the control circuit housing (22) is detachably mountable to the base by means of an electromechanical connection (24, 26, 56), the electromechanical connection including a first set of connectors (62) for connecting the fitting (14) electrically to the control circuit for powering thereof and a second set of connectors (58, 62, 76) for connecting outputs from the control circuit (52, 54) to input leads (56, 78) connected to the discharge tubes (16A, 18A).

6. A low pressure discharge lamp assembly according to any one of the preceding claims characterised in that the control circuit housing (22) includes an electromagnetic and radio frequency interference shield for protecting the control circuit.

7. A low pressure discharge lamp assembly according to any one of the preceding claims characterised in that the discharge tubes (16, 18) are rectilinear.

8. A low pressure discharge lamp assembly according to any one of the preceding claims characterised in that the control circuit housing is wedge-shaped, with the housing (22) tapering outwardly from the base (12).

9. A low pressure discharge lamp assembly according to any one of the preceding claims characterised in that an acute included angle (20, 50) of between 20° and 40° is defined between the discharge tubes (12, 14).

10. A low pressure discharge lamp assembly according to any one of the preceding claims characterised in that the maximum width of the assembly (46) is defined by the outermost ends of the discharge tubes (16, 18), and in that the base (12) has lateral dimensions substantially smaller than the maximum width dimension of the discharge tube assembly (46) so that no contribution to the maximum width dimension of the discharge lamp assembly is made by the base (12).

11. A control circuit housing (22) for a low pressure discharge lamp assembly, the housing accommodating both a ballast and starter circuitry (54), and including electromechanical mounting means (24) for mounting the housing to a base (12), and a reflective outer surface for reflecting light outwardly from the discharge tubes, characterised in that the housing (22) is wedge-shaped in profile, with the electromechanical mounting means being located at a thin end of the wedge-shaped housing.

Patentansprüche

1. Niederdruckentladungslampen-Baugruppe (10), die folgende Komponenten aufweist: einen Sockel (12), der in einer Lampenarmatur (14) endet, ein längliches Steuerstromkreis-Gehäuse (22), das abnehmbar am Sockel gegenüber der Lampenarmatur angebracht ist, und wenigstens ein Paar Entladungsröhren (16, 18), die das Steuerstromkreis-Gehäuse flankieren, dadurch gekennzeichnet, daß die Entladungsröhren vom Sockel (12) weg führen und schräg zueinander verlaufen.

2. Niederdruckentladungslampen-Baugruppe (10) nach Anspruch 1, dadurch gekennzeichnet, daß das Steuerstromkreis-Gehäuse (22) mit einer reflektierenden Außenfläche versehen ist, um Licht von den Entladungsröhren (16, 18) nach außen zu reflektieren.

3. Niederdruckentladungslampen-Baugruppe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Entladungsröhren (16, 18) in einer V-förmigen Konfiguration vom Sockel (12) weg führen.

4. Niederdruckentladungslampen-Baugruppe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Steuerstromkreis-Gehäuse sowohl das Vorschaltgerät als auch den elektronischen Zündkreis (54) aufnimmt.

5. Niederdruckentladungslampen-Baugruppe (10) nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Steuerstromkreis-Gehäuse (22) am Sockel mit Hilfe einer elektromechanischen Verbindung (24, 26, 56) abnehmbar befestigt werden kann, wobei die elektromechanische Verbindung folgendes einschließt: einen ersten Satz von Verbindern (62) zur elektrischen Verbindung der Lampenarmatur (14) mit dem Steuerstromkreis, um diesen zu speisen, und einen zweiten Satz von Verbindern (58, 62, 76) zur Verbindung der Ausgänge von dem Steuerstromkreis (52, 54) mit den Eingangsleitungen (56, 78), die mit den Entladungsröhren (16A, 18A) verbunden sind.

6. Niederdruckentladungslampen-Baugruppe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Steuerstromkreis-Gehäuse (22) zum Schutz des Steuerstromkreises eine Abschirmung gegen elektromagnetische Beeinflussung und HF-Störung einschließt.

7. Niederdruckentladungslampen-Baugruppe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Entladungsröhren (16, 18) geradlinig sind.

8. Niederdruckentladungslampen-Baugruppe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Steuerstromkreis-Gehäuse keilförmig ist, wobei das Gehäuse (22) vom Sockel (12) konisch nach außen

verläuft.

9. Niederdruckentladungslampen-Baugruppe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß zwischen den Entladungsröhren (16, 18) ein spitzer eingeschlossener Winkel (20, 50) von 20 bis 40 gebildet wird.

10. Niederdruckentladungslampen-Baugruppe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die maximale Breite der Baugruppe (46) durch die äußersten Enden der Entladungsröhren (16, 18) definiert wird und daß der Sockel (12) seitliche Abmessungen hat, die wesentlich kleiner als die Dimension der maximalen Breite der Entladungslampen-Baugruppe (46) ist, so daß der Sockel (12) keinen Beitrag zur Dimension der maximalen Breite der Entladungslampen-Baugruppe erbringt.

11. Steuerstromkreis-Gehäuse (22) für eine Niederdruckentladungslampen-Baugruppe, wobei das Gehäuse sowohl das Vorschaltgerät als auch den Zündkreis (54) aufnimmt und elektromechanische Befestigungsmittel (24) zur Befestigung des Gehäuses an einem Sockel (12) und eine reflektierende Außenfläche zur Reflexion des Lichtes von den Entladungsröhren nach außen einschließt, dadurch gekennzeichnet, daß das Gehäuse (22) im Profil keilförmig ist, wobei sich die elektromechanischen Befestigungsmittel am schmalen Ende des keilförmigen Gehäuses befinden.

Revendications

1. Assemblage de lampe à décharge basse pression (10) comprenant une base (12) se terminant dans un raccord (14), un logement de circuit de commande allongé (22), monté de façon amovible sur la base en un point opposé au raccord, et au moins une paire de tubes de décharge (16, 18), adjacents au logement du circuit de commande, caractérisé en ce que les tubes de décharge s'étendent en s'éloignant de la base (12) et sont écartés l'un de l'autre.

2. Assemblage de lampe à décharge basse pression (10) selon la revendication 1, caractérisé en ce que le logement du circuit de commande (22) comporte une surface externe réfléchissante pour réfléchir la lumière vers l'extérieur des tubes de décharge (16, 18).

3. Assemblage de lampe à décharge basse pression selon l'une quelconque des revendications précédentes, caractérisé en ce que les tubes de décharge (16, 18) s'étendent en s'éloignant de la base (12) dans une configuration en V.

4. Assemblage de lampe à décharge basse pression selon l'une quelconque des revendications précédentes, caractérisé en ce que le logement du circuit de commande sert à loger à la fois un ballast et un circuit d'allumage électronique (54).

5. Assemblage de lampe à décharge basse pression (10) selon l'une quelconque des revendications précédentes, caractérisé en ce que le logement du circuit de commande (22) est monté de façon amovible à la base par l'intermédiaire d'une connexion électromécanique (24, 26, 56), la connexion électromécanique englobant un premier groupe de connecteurs (62), destinés à la connexion électrique du raccord (14) au circuit de commande en vue de son alimentation, et un deuxième groupe de connecteurs (58, 62, 76), destinés à la connexion des sorties du circuit de commande (52, 54) aux conducteurs d'entrée (56, 78) connectés aux tubes de décharge (16A, 18A).

6. Assemblage de lampe à décharge basse pression selon l'une quelconque des revendications précédentes, caractérisé en ce que le logement du circuit de commande (22) englobe un écran électromagnétique et un écran antiparasite pour protéger le circuit de commande.

7. Assemblage de lampe à décharge basse pression selon l'une quelconque des revendications précédentes, caractérisé en ce que les tubes de décharge (16, 18) sont rectilignes.

8. Assemblage de lampe à décharge basse pression selon l'une quelconque des revendications précédentes, caractérisé en ce que le logement du circuit de commande a une forme en coin, le logement (22) étant évasé vers l'extérieur à partir de la base (12).

9. Assemblage de lampe à décharge basse pression selon l'une quelconque des revendications précédentes, ca-

ractérisé en ce qu'un angle de dégagement aigu (20, 50) compris entre 20 et 40 est défini entre les tubes de décharge (16, 18).

10. Assemblage de lampe à décharge basse pression selon l'une quelconque des revendications précédentes, caractérisé en ce que la largeur maximale de l'assemblage (46) est définie par les extrémités les plus externes des tubes de décharge (16, 18) et en ce que la base (12) a des dimensions latérales sensiblement inférieures à la largeur maximale de l'assemblage de lampe à décharge (46), de sorte que la base (12) ne contribue pas à la largeur maximale de l'assemblage de lampe à décharge.

11. Logement de circuit de commande (22) pour une lampe à décharge basse pression, le logement servant à loger à la fois un ballast et un circuit d'allumage (54), et englobant un moyen de montage électromécanique (24) pour monter le logement sur une base (12), et une surface externe réfléchissante pour réfléchir la lumière vers l'extérieur des tubes de décharge, caractérisé en ce que le logement (22) a un profil en forme de coin, le moyen de montage électromécanique étant agencé au niveau d'une extrémité fine du logement en forme de coin.

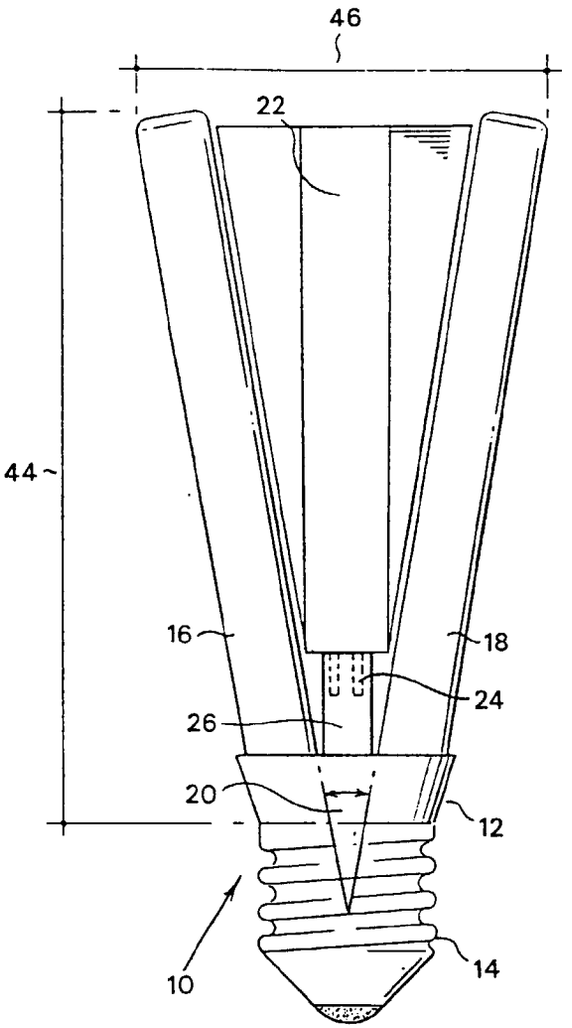


Fig 1

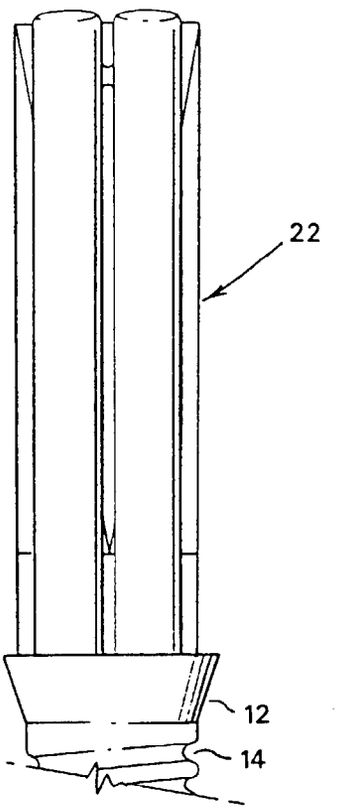


Fig 2

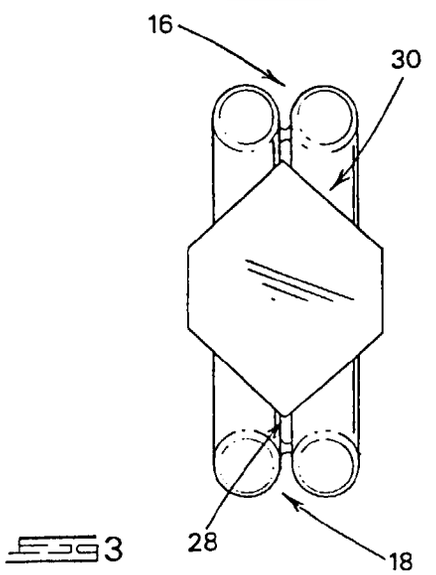


Fig 3

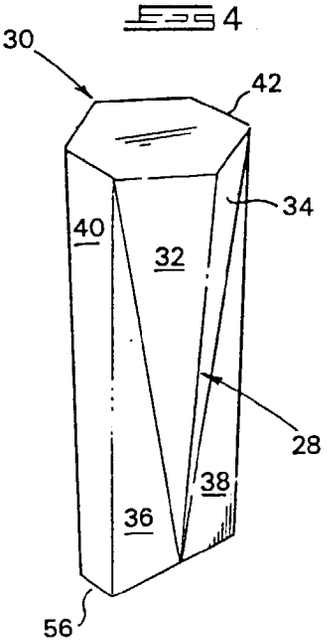
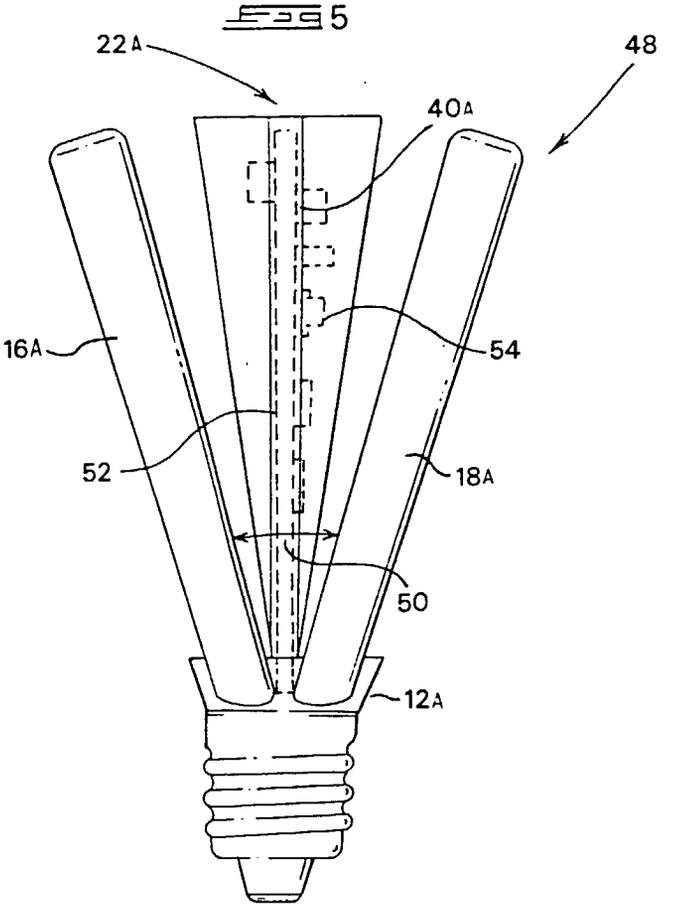


Fig 4

Fig 5



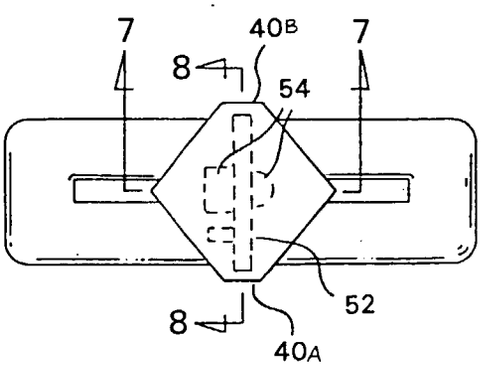


Fig 6

Fig 7

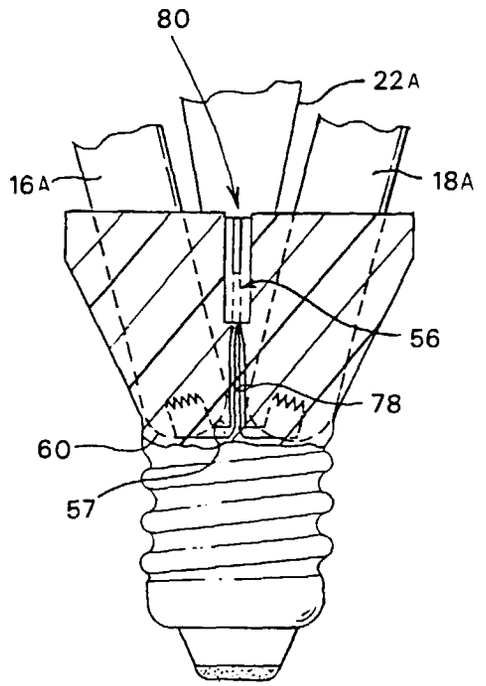
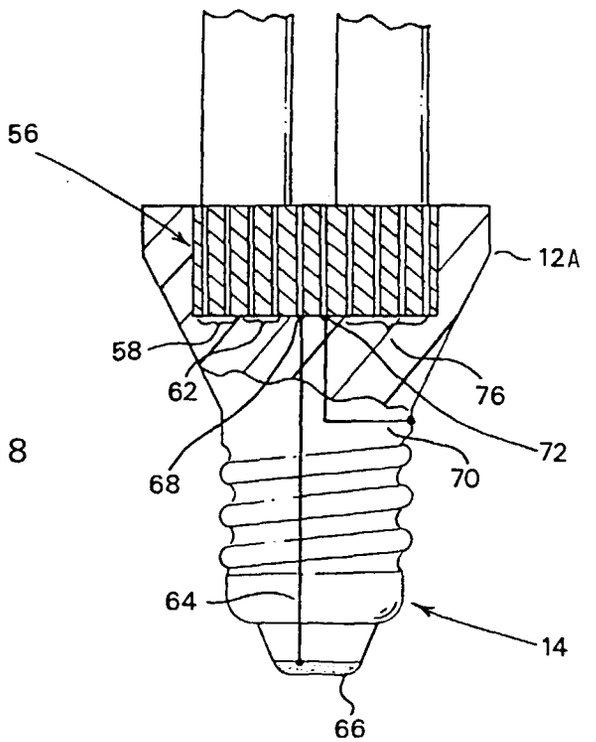


Fig 8



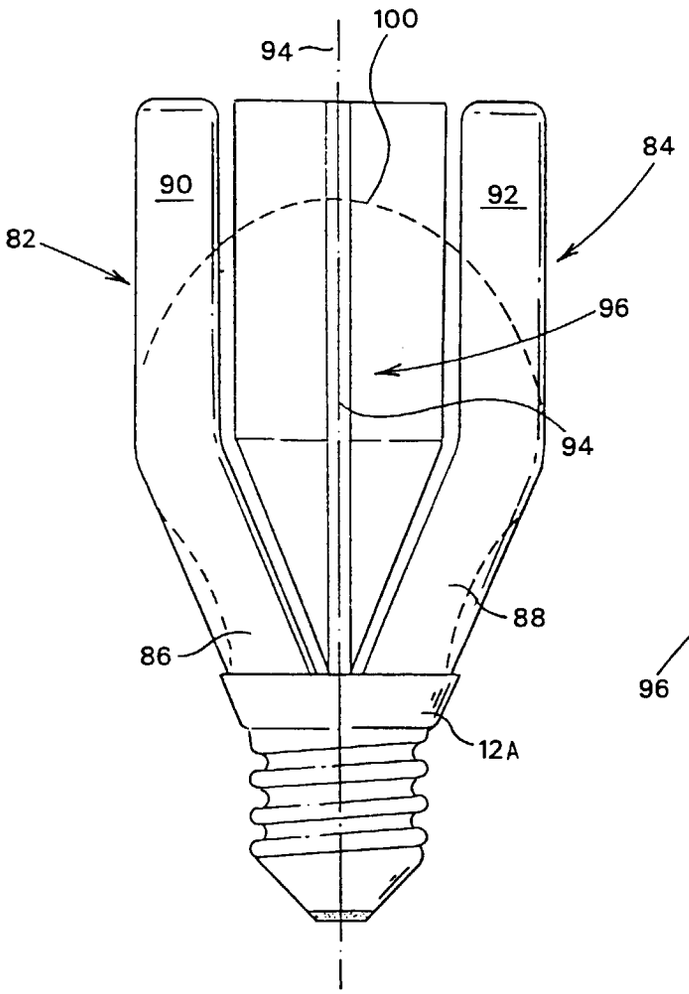


Fig 9

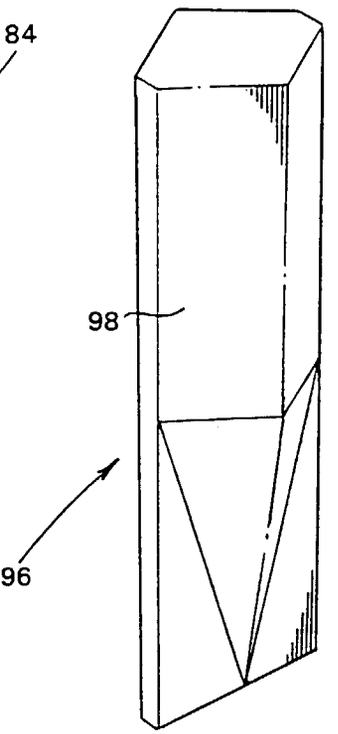


Fig 10

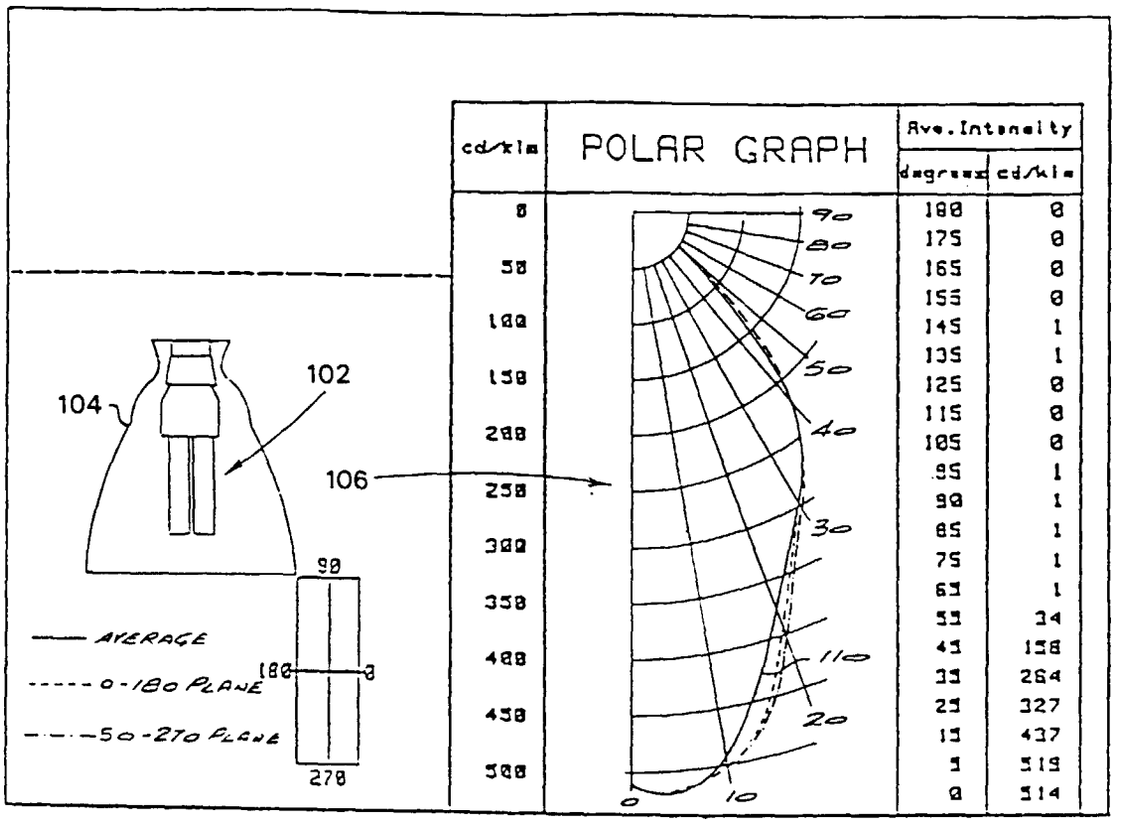


FIG 11A

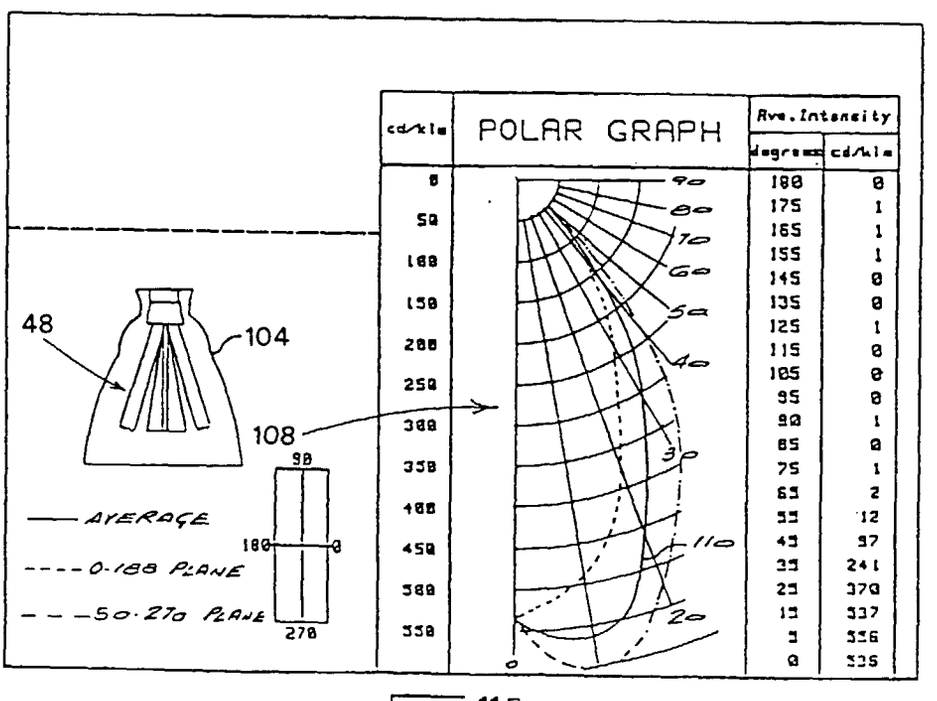


FIG 11B