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ELECTRICAL LAMP

FIELD OF THE INVENTION

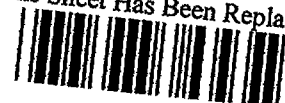
THIS INVENTION, in its various aspects, relates to the construction of a lamp providing a high light intensity in a required direction and, more specifically but not exclusively,
5 is concerned with a high-pressure discharge lamp or an incandescent lamp.

STATE OF THE ART

Ptchelin United States patent specification No. 5,051,755 describes a lamp having an elongated, convex, glass envelope which is non-circular in cross-section and is provided at one end with an electrical terminal connector. An illumination assembly
10 inside the lamp is provided with an intense light source of rod-like shape which extends lengthwise along a predetermined optical axis of the lamp. The lamp envelope has its inside surface partly-coated with a highly reflective layer or film. The envelope may be evacuated, or may be filled with an inert gas. When the lamp is in use, light produced by the light rod passes through a transparent window of the
15 envelope provided by its uncoated surface, part of this light coming directly from the light source and part being transmitted indirectly as a result of it being reflected by the reflecting film inside the envelope. The interior surface profile of the lamp is so shaped that the reflected light follows a path which largely misses the optical axis with which the light rod is aligned, so that the light rod is not subjected to excessive
20 heating. Its life time is therefore prolonged. Such a lamp will be referred to hereafter as being "of the type described".

The pattern of the radiation produced by a lamp of the type described with regard to the consistency of its quality and the shape of the radiated pattern, are determined by the accuracy of the positioning of the components of the illumination assembly inside the
25 lamp envelope. When the lamp is fitted into a luminaire positioned, for example, above a street to be illuminated, the consistency and quality of the light pattern falling on the street depends not only on the positioning of the light assembly within the lamp, but also on the angular positioning of a socket provided for the lamp inside the luminaire.

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OBJECT OF THE INVENTION

An object of this invention is to provide an improved lamp.

THE INVENTION

5 In accordance with a first aspect of this invention a high intensity directional lamp has a terminal connection attached to a glass envelope and which includes inner and outer concentrically-arranged and electrically interconnected sleeves which are relatively rotatable without axial displacement with respect to one another, stop means for limiting rotation of the outer sleeve in one direction with respect to the inner sleeve, and electrically-conductive means providing an electrical connection between a
10 light-generating source forming part of an illumination assembly within the lamp, and two mutually-insulated terminals provided on the terminal connection; in which lamp said stop means comprises a one-way ratcheting mechanism which permits unlimited relative rotation of the outer sleeve in one direction with respect to the inner sleeve, but which limits rotation of the outer sleeve when turned in the reverse direction with
15 respect to the inner sleeve.

The above construction of lamp has many advantages over prior art arrangements. For example, the one-way ratcheting mechanism allows the lamp to be screwed into its socket in a luminaire and then, by continued rotation of the lamp in the same direction, the pattern of illumination of the lamp can be turned to a required angular position.
20 This is achieved without risk of the terminal connection being slightly unscrewed from its operating position and which would otherwise cause the lamp to make intermittent electrical contact with the socket and to wobble in the socket. Removal of the lamp from the socket is not impaired by the ratcheting mechanism because it only allows indefinite rotation of the outer sleeve with respect to the inner sleeve, in one
25 direction. If the lamp is to be removed from the socket, it is turned in the reverse direction and the one-way ratcheting means then act as an abutment or stop means so that the two sleeves turn together in the reverse direction to unscrew the lamp.

The invention also includes, in accordance with a second aspect, a lamp of the type described and comprising a glass envelope having a reflective layer and containing a
30 light rod forming part of an illumination assembly which aligns the rod with a predetermined optical axis of the lamp, said rod being supported at one end by a terminal connection attached to one end of the envelope, and at the other end by a retainer which engages a formation provided at the end of the envelope opposite the



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terminal connector, the illumination assembly including electrical conductors connecting opposite ends of the light rod to two terminals on the terminal connection respectively, said conductors including a traverse wire located at a position between the light rod and the reflective layer on the envelope and which carries electrical current flowing between one of the terminals and the end of the light rod remote from the terminal connector; in which lamp the formation is of non-circular cross-section and the retainer has a cross-sectional shape which is complementary to that of the retainer and co-operates therewith to hold the traverse wire in a pre-determined angular position about the optical axis and at which the heat incident on the traverse wire is minimised, the construction of the retainer being such that it has a self-centring action to hold the adjacent end of light rod on the desired optical axis.

The advantage of the second aspect of the invention is that the traverse wire is automatically positioned in its correct angular position by the positive engagement of the retainer with the formation, and such engagement also ensures the adjacent end of the light rod is correctly positioned on the optical axis.

It has been found that if the two ends of the traverse are not each effectively anchored in position, the traverse orientation will change during and after assembly of the lamp and this will often cause distortion of the pattern of the light and a decrease in the light flux emanating from the lamp. This does not arise in a lamp constructed in accordance with the second aspect of the invention, as one end of the traverse is anchored to the terminal connection, and the other end of the traverse is positionally fixed by the positive location of the retainer with respect to the formation.

PREFERRED FEATURES OF THE INVENTION

The formation may take the form of a spigot or a socket of non-circular cross-section. However, preferably, the formation is constructed as a well of triangular cross-section in the end of the glass envelope opposite to the terminal connection. An advantage of such an arrangement is that the inside of the well correctly locates the retainer in the desired position. The outside surface of the well is usable to fix the position of the lamp inside a luminaire so that it is held against subsequent rotation or end-wise movement which can occur as a result of, for example, vibration or shock. The luminaire is conveniently provided with a cup-piece forming part of a catch and which enables the lamp to be held by the well in a particular axial and rotational position. The catch can be released during fitting of the lamp in the luminaire so that

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5 the lamp can be turned until its optimum position is found. The cup-piece can then be engaged with the external surface of the well so that the catch operates to retain the lamp against rotation and end-wise movement throughout its working life. The catch may be provided with a compression spring to assist retention of the lamp firmly in its operating position in the luminaire.

INTRODUCTION TO THE DRAWINGS

The invention will now be described in more detail, by way of example, with reference to the accompanying largely diagrammatic drawing, in which:-

IN THE DRAWINGS

- 10 FIGURE 1 Is a side view, partly in section, of a discharge lamp;
- FIGURE 2 Is a vertical section taken through figure 1 taken on the line and in the direction indicated by the arrows II - II in figure 1;
- 15 FIGURE 3 Is an enlarged view, in sectional side elevation, of a terminal connector end of the lamp of figure 1, with the longitudinal axis of the lamp arranged vertically;
- FIGURE 4 Is an enlarged perspective view of the part of the lamp within the ring "A" in the figure 1;
- FIGURE 5 Is a cross-section through figure 1 taken on the line and in the direction indicated by the arrows V - V in that figure;
- 20 FIGURE 6 Is a cross-section through figure 3 taken on the line and indicated by the arrows VI - VI in the figure 3 a cement filling and other minor details being omitted for the sake of clarity;
- FIGURE 7 Figure 7 is an exploded view showing how two concentrically arranged sleeves are attached to one another during a stage in the assembly of the
- 25 terminal connector;
- FIGURE 8 Is a diagrammatic representation of the lamp of figure 1 fitted into a luminaire; and,

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FIGURE 9 Is a diagrammatic cross-section through figure 8 taken on the line and in the direction indicated by the arrows ~~IX~~-~~IX~~ in figure 8, interior parts of the lamp being omitted for the sake of clarity.

DESCRIPTION OF PREFERRED EMBODIMENT

5 Figure 1 shows a gas discharge lamp 1 provided with a non-circular, bulbous glass envelope 2 which provides the lamp with a convex transparent underside 3. The upper part of the envelope 2 provides a convex, multi-vaulted roof 4 which is internally coated with a metallised reflecting film 5 as shown in figure 2. The film 5 has its lower edges 6 lying in a horizontal plane spaced beneath an optical longitudinal axis 7 of the lamp. The roof vaults intersect one another along lines lying in
10 respective planes which are radial with respect to the axis 7. The roof vaults are so shaped that heat and light produced by a light rod 8, positioned on the optical axis 7 of the lamp, is reflected downwards from the film 5 in a direction which misses the light rod 8 so that it is subjected to the minimum of reflected heat from the layer 5.

15 The lamp 1 has a terminal connection provided by an end-portion 9 which is provided with an Edison screw base 100. Such a base has a central end-terminal 11 and a frusto-conical insulator 13 which insulates the terminal 11 from an external screw terminal 12.

20 The construction of the terminal end-portion 9 is shown in more detail in figures 3, 6 and 7. The screw terminal 12 is formed by an outer metal sleeve 14 which provides external screw threads and which is contiguous with and rotates around a cylindrical inner sleeve 15 so that good electrical contact is maintained between the two sleeves at all angular positions of the outer sleeve 14 with respect to the inner sleeve 15. The glass envelope is provided with a neck 50 at its terminal end which is sealed onto a
25 glass stem 21, partially shown in figure 1 as well as figure 3, and through which extend parallel electrode wires 23 and 24. Only wire 23 is shown in figure 3. It is joined by a lead 56 to a central stud terminal 58 at the terminal end of the lamp. The other wire 24 (see Figure 1) is connected to the interior wall of the inner sleeve 15 at 59. A cement filling 51 attaches the inner sleeve 15 to the outside wall of the glass
30 neck 50. The frusto-conical insulator 13 is also cemented to the inside wall of the inner sleeve 15 as shown, and has a central bore 57 through which the lead 56 extends to the stud terminal 58 to which it is welded or soldered.

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A pendant strip 55 and an insulative bobbin 56 through which the wire 32 extends, forms part of the assembly 35 before it is joined to the wires 23, 24.

5 The adjacent marginal ends of the sleeves 14 and 15 remote from the neck 50, are turned inwardly to provide parallel radial flanges 17 and 52 (shown in Figure 7) which lie within the cavity of a collar 18 of outwardly channel-shaped cross-section. An annular metal gasket is also located in the collar 18 to increase the friction with which the two flanges 15 and 17 are pressed together to ensure good electrical and mechanical contact between them. The pressure between the flanges is insufficient to prevent the outer sleeve 14 rotating on the inner sleeve, but sufficient to ensure that
10 such rotation involves overcoming a stiff frictional resistance. Although Figure 3 shows a small gap between the flanges 17 and 52, such a gap does not occur in practice and the collar 18 acts to prevent axial movement between the sleeves 14, 15.

Figure 7 shows how the sleeves 14, 15 and the collar 18 are assembled together to form a sub-unit.

15 The collar 18 is initially in the form of a cylinder, as shown in the lower part of figure 7, having a radial flange 16 at its lower end. The outer sleeve 14 is located over the cylinder so that its inwardly turned flange 17 rests on the lower flange 16. The inner sleeve 15 is inserted into the sleeve 14 until its inwardly turned flange 52 rests on the flange 17. The metal gasket 19 is then fitted over the cylinder to rest on
20 the flange 52. The upper portion of the cylinder is then deformed outwardly and downwardly to form an upper flange 16 to the collar 18 so that the sleeve flanges 52 and 17, and the gasket 19, are firmly trapped between the two collar flanges 16. The frusto-conical insulator 13 is then lowered inside the inner sleeve 15 so that its lower end passes through the collar 18. The insulator 13 is then cemented to the
25 collar 18 and the inner sleeve 15 to complete the unit which is cemented at 51 to the neck 50.

As shown in figure 6, the inner sleeve 15 is formed towards its upper marginal end with a spring finger 20 which extends diagonally outwards from it. The upper marginal end of the outer sleeve 14 is likewise provided with an inwardly-extending
30 spring finger 10 at a position at which will abut against the spring figure 20 when the outer sleeve 14 is rotated in a clockwise direction in Figure 6. As the inner sleeve 15

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is cemented at 51 to the neck 50 of the lamp, the outer sleeve 14 cannot be rotated in the clockwise direction beyond the position at which such abutment occurs. On the other hand, if the outer sleeve 14 is rotated in the counter-clockwise direction in figure 6, the inclination of the two spring fingers 10 and 20 allow them to ratchet over one another so that the outer sleeve 14 can be rotated an indefinite number of times in the counter-clockwise direction. In this way, the two sleeves are locked together when the outer sleeve is rotated in one direction more than a certain amount, whereas the rotation in the other direction can continue indefinitely, while good electrical and mechanical contact is maintained between the two sleeves 14 and 15.

Returning to figure 1, a light-generating assembly 25 is located inside the envelope 2 and is supported at the terminal end of the lamp by the two wires 23, 24 which are fixed in the stem 21. The light-generating assembly 25 comprises a light source provided by the light rod 8 extending along the optical axis 7 of the lamp. The rod 8 is provided with two axially-extending metal electrode tubes 28 and 29 projecting from its opposite ends. Tube 28 is connected by a stiff support wire 32 and a stirrup 54 to the terminal wire 23. The tube 29 is connected by a stiff support wire 31 and an arched traverse wire 36, to the terminal wire 24.

The way in which the two metal tubes 28 and 29 are connected to their associated support wires 31 and 32, is apparent from figure 4 which shows only the connections associated with the tube 29. However it is to be understood that the connections associated with tube 28 are identical. figure 1 has been simplified, in that some of the components associated with the tube 29 and in the ring "A" have been omitted from the depiction of the tube 28 at the other end of the light rod 8.

The metal tube 29, as shown in Figure 4, contains an enlarged end 30 of the stiff support wire 31 which projects from the end of the tube. A stiff, resilient metal ribbon 33 is wound partially around the tube 29 and the associated wire 31, and is spot welded at its ends to them both. The ribbon 33 acts as a stiff spring which absorbs some of the compressive thrusts exerted on the assembly when inserted axially into the lamp envelope, while ensuring a good electrical and mechanical connection is made between the tube 29 and the wire 31 at all times. The axial movement of the enlarged end 30 inside the tube 39 is limited by this form of construction, so that assembly of the lamp is facilitated while axial movements of the various parts produced by thermal expansion and contraction, are accommodated.

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5 The support wire 31 is connected electrically to the terminal wire 24 by the arched traverse wire 36 which passes close to the line of intersection of two of the roof vaults. Although diagrammatic Figure 2 shows the traverse wire 36 close to the reflective layer 5, there is in practice always a space between them as clearly shown in Figure 1.

10 The support wire 31 extends from the metal tube 29 to a retainer shown at 35. The retainer comprises three springy metal U-shaped members 37, 38 and 39 lying in planes mutually displaced from one another by 120° as is clearly shown in figure 5. The adjacent limbs of the members are rigidly fixed to the end-portion of the wire 31 so that their outer limbs extend substantially parallel to, but slightly diverging from the axis of the wire. The junctions of the outer limbs and the intermediate limbs of the U-shaped wires are rounded, as shown in figure 1.

15 The end-portion of the glass envelope 2 remote from the terminal end 9, is provided with a well 22 of generally triangular-shaped cross-section as shown in figures 2 and 5. The well is integrally moulded with the glass envelope 2 during its fabrication. As is apparent from figure 5, the outer limbs of the members 37, 38 and 39 fit snugly in the corners of the well, when the lighting assembly 25 is located in its operating position as shown in figure 1. The upper corner of the well which accommodates the member 37 lies in the same radial plane to the optical axis 7 of the lamp as the traverse 36, so that the location of the retainer 35 in the well 22 automatically serves to correctly position the arched traverse wire 36. Simultaneously, the end of the light rod 8 adjacent to the well 22 is correctly positioned on the optical axis 7 as the three U-shaped members 37, 38 and 39 are identical and symmetrically arranged so that they have a self-centring action, during their insertion in the well, to hold the wire 31 on the optical axis 7.

30 Figure 8 shows how the lamp in figure 1 is fitted into a luminaire 42 which is provided with an internally threaded socket 43 for receiving the terminal end-portion 9 of the lamp. The luminaire 42 has a longitudinal axis 44 which extends axially through the socket 43 and through a tubular guide 48 at the opposite end of the luminaire. A rotatable and axially movable plunger rod 60 extends through the guide 48 and carries a triangular cup-piece 47 at its end inside the luminaire. A coiled compression spring 49 urges the cup-piece 47 away from the tube guide 48. The

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cup-piece 47 is sized to fit snugly over the outside wall of the triangular well 22 of the lamp 1. The arrangement of the rod 60, spring 49 and cup-piece 47 is so formed that it provides a catch 46 which will hold the well 22 in any desired angular position on the axis 44 to which it is moved, and will also prevent sagging of the lamp 1 in the socket 43 over a period of time. The resilience of the spring 49 also opposes outward movement of the lamp 1 from the socket 43 and which can be produced by vibration or impacts.

ASSEMBLY AND USE OF PREFERRED EMBODIMENT

The lamp of figure 1 is assembled and used as follows:

- 10 The assembly 25 comprising the combination of the light rod 8, the support wires 31, 32 together with the ribbons 33, the retainer 35 and the traverse 36 is constructed with the traverse 36 in the same plane as the axis of the light rod 8 and the member 37. This assembly 25 is electrically and mechanically joined to the ends of the stiff wires 23, 24 protruding from the stem 21, by means of the stirrup 54.
- 15 The glass envelope is preformed with the roof vaults and the well 22. It is internally coated with the reflective layer 5. The end of the envelope 2 opposite the well 22 is initially open to allow the fabricated assembly 25 which is now mounted on the stem 21, to be advanced axially into the envelope 2. During this movement, the three outer limbs of the members 37, 38 and 39 of the retainer 35 are aligned with the
- 20 respective corners of the well 22 in which they are to be located by axial thrusting movement of the stem 21. This inserts the outer limbs of the members 37, 38 and 39 firmly into their locating positions in the corners of the well in which they are thereafter held by the natural resilience of the members 37, 38 and 39. The ability of the mechanical connection between the stiff member 31 and 32, and the metal tubes 28
- 25 and 29 to yield resiliently, allows sufficient actual thrust to be exerted on the assembly 25 to spring the members 37, 38 and 39 into the positions shown in figures 1 and 5.

The location of the retainer 35 in the well serves two important functions in the assembly procedure, as a result of the precise angular positioning of the well with respect to the roof vaults of the envelope 2, during its manufacture, and the precise angular positioning of the members 37, 38 and 39 with respect to the wire 31 and the traverse 36 during the fabrication of the assembly 25. When the retainer 35 is

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5 thrust into its desired operating position in the well 22, it has an automatic self-centring effect on the support wire 31 so that it is aligned with the optical axis 7 of the envelope and simultaneously brings the traverse 36 to its desired operating position at which it is spaced from, but lies beneath, the line of intersection of the two central vaults of the envelope roof.

Once the retainer 35 is located inside the well 22, the position of the stem 21 is held and the open end of the envelope 2 is heat softened and compressed onto the stem 21 so that two are fused together in a gas-tight manner.

10 The glass envelope 2 is next either evacuated to a low pressure, or filled with an inert gas to a desired pressure, by way of the stem 21, in a conventional manner. The pre-assembled unit comprising the sleeves 14, 15, the collar 16, the metal washer 19, and the frusto-conical insulator 13. is then advanced towards the position shown in figure 3 and the electrical connections are made between the wire 24 and the interior metal surface of the sleeve 15 and the wire 23 and the stud terminal 11. The sleeve 15 is then sealed by the cement 51 to the neck portion 50 of the envelope 2.

15 in the assembled lamp, the two sleeves 14 and 15 cannot move axially with respect to one another, but the sleeve 14 can be rotated around the sleeve 15 against a degree of friction produced between their contiguous surfaces and which is sufficient to hold the envelope 2 in any position to which it is rotated with respect to the sleeve 14. As has previously been mentioned, the sleeve 14 is allowed only limited rotation in a clockwise direction (as seen in figure 6) with respect to the sleeve 15, as a result of the abutment of the fingers 10 and 20. However rotation in the reverse direction can continue indefinitely as the two fingers simply spring past one another each time they engage, to provide a one-way ratcheting mechanism.

25 The way in which the lamp is fitted into a luminaire will now be described with reference to figures 8 and 9. The lamp 1 is screw-fitted into the socket 43 of the luminaire 42 in the conventional way, that is to say by manually turning the lamp in a direction which screws the outer sleeve 14 into the internally-threaded socket of the luminaire. This corresponds to a counter-clockwise rotation of the sleeve 14 in Figure 6 but the frictional stiffness between the two sleeves 14 and 15 ensures that 30 the rotation of the envelope 2 produces a corresponding rotation of the outer sleeve 14.

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On completion of the lamp's rotation which occurs when the lamp is fully screwed into the socket, the lamp envelope 2 continues to be turned in the same direction to whatever position is considered to be appropriate to enable the lamp to provide the required pattern of light through the underside of the luminaire.

- 5 When the correct position of the lamp envelope is found, the cup-piece 47 is turned until it is aligned with the well 22 which is then trapped within its triangular cavity and held in place by the compression of the spring 49. The engagement of the catch 46 holds the cup-piece 47 in the desired position so that axial and rotational movement of the lamp envelope 2 within the luminaire 42 is thereafter prevented.
- 10 If it is desired to remove the lamp from the luminaire, this is achieved by first releasing the cup-piece 47 from engagement with the well 22 and then manually turning the envelope 2 in a direction which causes the inner sleeve 15 of figure 6 to rotate counter-clockwise. This brings its finger 20 into abutment with the finger 10 of the outer sleeve 14 so that, thereafter, the two sleeves rotate in unison in the
- 15 unscrewing direction to unscrew the lamp.

A lamp constructed in accordance with the example described above, has the following operating parameter and dimensions:

	Lamp input power	150 watt
	Lamp voltage	100 volts
20	Lamp current	1.8 amps
	Luminous flux	14 klm
	Luminous intensity at 68° =	700 cd/1000 lm
	Overall length of lamp	250 millimetres
	Max. diameter of lamp envelope	95 millimetres
25	Height of reflecting coating	50 millimetres

MODIFICATIONS TO PREFERRED EMBODIMENT

Various modifications of the above described lamp are possible.

For example, the well 22 may have another cross sectional shape than triangular. It may, for example, be square or polygonal so as to provide corners in which the

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springy limbs of an appropriately shaped retainer can locate to hold the light rod and traverse in the required positions.

5 Although it is preferred to provide the lamp envelope remote from the terminal end, with a well, the invention is equally usable with an inwardly-projecting spigot connector on the envelope which co-operates with a socket connector on the assembly. For instance, the lamp envelope may be provided with an inwardly-directed glass spigot of angular cross-section and the end of the lamp assembly may be provided with a complementary-shaped socket connector which engages the spigot during the assembly of the lamp.

10 Finally, although only two spring fingers 10 and 20 are provided in the lamp described, the one-way ratchet mechanism may comprise two or more arcuately distributed fingers on both sleeves 14 and 15, or an arrangement of one or more fingers on one sleeve co-operating with one or more suitably shaped slots on the other sleeve.

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CLAIMS

1. A high intensity directional lamp having a terminal connection attached to a glass envelope and which includes inner and outer concentrically-arranged and electrically interconnected sleeves which are relatively rotatable without axial displacement with respect to one another, stop means for limiting rotation of the outer sleeve in one direction with respect to the inner sleeve, and electrically-conductive means providing an electrical connection between a light-generating source forming part of an illumination assembly within the lamp, and two mutually-insulated terminals provided on the terminal connection; in which lamp said stop means comprises a one-way ratcheting mechanism which permits unlimited relative rotation of the outer sleeve in one direction with respect to the inner sleeve, but which limits rotation of the outer sleeve when turned in the reverse direction with respect to the inner sleeve.
2. A lamp as claimed in claim 1, in which said ratcheting mechanism includes a resilient finger sloping from one of the sleeves towards the other sleeve, and a stop on said other sleeve lying in the path of movement of the finger which is shaped and positioned to ratchet over the stop with each revolution of the outer sleeve with respect to the inner sleeve when turned in one direction, but which abuts against the stop when the outer sleeve is turned in the reverse direction.
3. A lamp as claimed in claim 1 or claim 2, in which the outer sleeve is externally screw-threaded; the inner sleeve is attached at one end to the glass envelope and at its other end is provided with a frusto-conical insulator carrying a stud providing a stud terminal at its narrow end; a circular collar of outwardly channel-shaped cross-section is fixed to the insulator and provides an annular rebate; metal gasket means and two radial flanges which respectively extend inwardly from the inner and outer sleeves are located in said rebate; and, said collar and gasket means maintain said flanges in good electrical and mechanical contact with one another so as to provide a stiff resistance to rotation of the outer sleeve with respect to the inner sleeve while preventing relative axial movement between the sleeves.

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4. A gas discharge lamp of the type described herein, comprising a glass envelope having a reflective layer and containing a light rod forming part of an illumination assembly which aligns the rod with a predetermined optical axis of the lamp, said rod being supported at one end by a terminal connection attached to one end of the envelope, and at the other end by a retainer which engages a formation provided at the end of the envelope opposite the terminal connector, the illumination assembly including electrical conductors connecting opposite ends of the light rod to two terminals on the terminal connection respectively, said conductors including a traverse wire located at a position between the light rod and the reflective layer on the envelope and which carries electrical current flowing between one of the terminals and the end of the light rod remote from the terminal connector; in which lamp the formation is of non-circular cross-section and the retainer has a cross-sectional shape which is complementary to that of the retainer and co-operates therewith to hold the traverse wire in a pre-determined angular position about the optical axis and at which the heat incident on the traverse wire is minimised, the construction of the retainer being such that it has a self-centring action to hold the adjacent end of the light rod on a desired optical axis.
5. A lamp as claimed in claim 4, in which the formation is shaped as a well of non-circular cross-section, and the retainer is provided with members which fit resiliently into corners of the well and one of which helps locate the traverse wire at the pre-determined angular position in the envelope.
6. A lamp as claimed in claim 5, in which the well is of triangular cross-sectional shape and the retainer is provided with three slightly divergent springy limbs which extend parallel to one another and are a push fit into respective corners of the well.
7. A lamp as claimed in claim 6, in which one end of the light rod is supported by an axially extended support wire which terminates in the well and has attached to it one of two substantially parallel side limbs of each of three U-shaped springy members, intermediate portions of the three members extending radially away from the support wire adjacent its free end and the outermost limbs of the three members extend substantially parallel to the support wire and are mutually displaced from one





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another by 120° in order to fit within three corners of a well having a cross-section of triangular isosceles shape.

- 5 8. A lamp as claimed in claim 4, wherein the portion of the envelope having the reflective layer is of vaulted shape with the lines of intersection of the vaults extending in planes containing the optical axis of the lamp, and the traverse wire is held at a position at which it is spaced from but extends along the line of intersection of the central two of the vaults.
- 10 9. A lamp as claimed in any one of the preceding claims, fitted into a luminaire having a lamp socket inside one end-portion and an axially-movable and rotatable cup-piece inside the other end-portion, the cup-piece being shaped to socket a triangular formation extending from the end of the lamp envelope opposite the terminal connector and forming part of a releasable catch operable to hold the lamp at a desired axial and angular operating position in the luminaire.
- 15 10. A lamp as claimed in claim 2, in which said stop is also provided by a resilient finger sloping circumferentially between the two sleeves and which is so arranged that its free end abuts the free end of the other resilient finger when the outer sleeve is turned in said reverse direction.

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