PATENT SPECIFICATION

Application Date: Sept. 27, 1937. No. 26138/37. **498,182**

Complete Specification Left: June 7, 1938.

Complete Specification Accepted: Jan. 4, 1939.

PROVISIONAL SPECIFICATION

Improvements in the Manufacture of Electric Lamps Capped at Each End

We, THE GENERAL ELECTRIC COMPANY LIMITED, of Magnet House, Kingsway, London, W.C.2, a British company, and CHRISTOPHER GABRIEL EDEN, of Research Laboratories of The General Electric Company Limited, Wembley, Middlesex, a British subject, do hereby declare the nature of this invention to be as follows:—

This invention relates to caps for electric lamps of the type providing a linear source of light and thereby adapted to cooperate with optical projection apparatus, such as a paraboloidal mirror, having a focal line which has to be occupied by the source.

The object of the invention is to provide convenient means for bringing the axis of the said linear source into coincidence with the said focal line.

If caps could be adjusted in manufacture so that in every lamp the cap occupied precisely the same position relative to the source of light, the problem to which the invention is directed would not arise. All that would be necessary would be to adjust a socket of any ordinary type, adapted to receive a cap of any ordinary type, in such a position that, when the cap is inserted in the socket, the lamp always assumes the correct position. But it is notoriously difficult to make the cap always occupy the same position. In order to attain the object of the invention, it is necessary to provide means for securing that the axis of the source will always occupy the same position, independently of the position of the cap.

According to the invention this object is secured by providing a cap at each end of the lamp and forming in the base of each cap (that is to say the part of the surface of the cap through which a line prolonging the axis of the source passes) a hole or depression, adapted to cooperate with a pin so as to prevent translation of the cap relative to the pin, through which hole or depression the said line passes. The depression may be no more than a punch mark in the approximately plane base of the cap.

If then the optical apparatus with which the lamp is adapted to cooperate is provided with two pins, whose points lie on the said focal line and are a suitable distance apart, one being preferably spring-controlled, the axis of the source can be brought into coincidence with the said focal line by merely inserting the two pins in the two depressions. The lamp may be supported wholly by the two pins, or subsidiary, preferably elastic, supporting means may be provided which allow the pins always to be in the depressions. Again the pins may serve as the supply terminals to the lamp, especially if the current taken by it does not greatly exceed 1A. If much heavier currents are to be taken, the connections are preferably independent of the pins; thus a flexible lead may be joined to the side of each cap and connected to a terminal on the projection apparatus. In this case the base of the lamp in which the depression is formed is preferably insulated from the side of the cap; it may be of insulating material.

The depression is to be formed by manufacture after the lamp has been capped. Methods of securing that the depressions are formed on the axis of the source will readily occur to those skilled in the art; the known methods of prefocussing the filaments of headlight lamps can be adapted to the problem.

If, as is likely, the lamp is a high-pressure metal-vapour discharge lamp and the linear source is the constricted column, doubt may arise as to the position of the axis; for the column bows upwards when the lamp is operated horizontally. In this case, the position of the axis is to be estimated when the lamp is operated with the column vertical, so that there is no bowing. Any allowance that has to be made for bowing is better made in the projection apparatus than in the cap.

Dated the 27th day of September, 1937.

For the Applicants,

NORMAN R. CAMPBELL.

[Printed for] PRICE 2/-

COMPLETE SPECIFICATION

Improvements in the Manufacture of Electric Lamps Capped at Each End

We, THE GENERAL ELECTRIC COMPANY LIMITED, of Magnet House, Kingsway, London, W.C.2, a British company, and CHRISTOPHER GABRIEL EDEN, of Research Laboratories of The General Electric Company Limited, Wembley, Middlesex, a British subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the manufacture of electric lamps of the type having a cap at each end and providing a substantially linear source of light, whereby they are adapted to cooperate with optical projection apparatus, such as a parabolic trough mirror, having a focal line which has to be occupied by the axis of the source. It also relates to optical projection apparatus adapted to cooperate with electric lamps of that type.

The object of the invention is to provide convenient means for bringing the axis of the source into coincidence with the focal line.

But here some explanation is necessary. Electric lamps of the type specified used in optical projection apparatus are now often high-pressure metal-vapour electric discharge (HPMV) lamps in which the linear source is a constricted discharge column. Unless the lamp is operated with the discharge column vertical or unless means (for example a magnetic field) are provided for counteracting the effects of convection, the column bows upwards and is not a straight line. The question then arises what is the axis of the source which should coincide with the focal line of the projection apparatus; it is not, of course, peculiar to any particular method of bringing the axis and the focal line into coincidence; it occurs whatever the method.

Experience with HPMV lamps has enabled those familiar with their use to judge what line fixed relative to the electrodes and the envelope should be made to coincide with the focal line of any particular projection apparatus in order that, in operation, the discharge column should approach most nearly to the focal line and the best conditions for projection secured. When the lamp is a HPMV lamp this line is to be taken as the axis of the source. Of course, when the lamp is one in which the position of the true source relative to the envelope is completely determinate, a line about which the source is symmetrical, or nearly symmetrical, is to be taken as the axis.

If caps could be adjusted in manufacture so that in every lamp the cap occupied precisely the same position relative to the axis of the source, the problem to which the invention is directed would not arise. All that would be necessary would be to adjust a socket of any ordinary type, adapted to receive a cap of any ordinary type, in such a position that, when the cap is inserted in the socket, the axis always assumes the correct position. But it is notoriously difficult to make the cap always occupy the same position. In order to attain the object of the invention, it is necessary to provide means for securing that the axis of the source will always occupy the same position relatively to the projection apparatus, whatever (within certain limits) is the position of the cap relative to the axis.

According to the invention this object is secured by forming in the base of each cap, after both caps have been attached to the lamp, a hole or depression, adapted to cooperate with the point of a pin so as to prevent translation of the cap relative to the pin, through or near both which holes or depressions the prolongation of the axis of the source passes. The depression may be no more than a punch mark in the approximately plane base of the cap.

The points of the pins adapted to cooperate with the holes or depressions may lie on the focal line of the projection apparatus or its prolongation. The axis of the source prolonged should then pass through the hole or depression. No reason for departing from this arrangement is known, so long as the position of the axis relative to the envelope, and therefore to the cap, is determinate. But if it is indeterminate, as aforesaid, it may be convenient to make some other line characteristic of the lamp near the axis of the source, for example the line passing through the parts of the electrodes on which the discharge terminates, pass through the holes or depressions and to displace the points slightly from the

focal line, so that the axis of the source coincides with the focal line. This, and no more, is implied by the statement that the prolongation of the axis passes near (not through) the hole or depression and that the point of the pin lies near (and not on) the focal line or its prolongation.

The pins are, of course, spaced apart so that their points can enter the holes or depressions in the caps. One at least of them is preferably spring-controlled, so that it can move relative to the other along the line joining them. The lamp may be supported wholly by the two pins, or subsidiary, preferably elastic, supporting means may be provided which allow the pins always to be in the depressions. Again the pins may serve as the supply terminals to the lamp, especially if the current taken by it does not exceed 4 amps. If much heavier currents are to be taken, the connections are preferably independent of the pins; thus a flexible lead may be joined to the side of each cap and connected to a terminal on the projection apparatus. In this case the base of the lamp, or at least that part of it in which the depression is formed, is insulated from the side of the cap; it may be of insulating material.

Methods of securing that the depressions are formed on (or at a predetermined distance from) the axis of the source will readily occur to those skilled in the art; the known methods of prefocussing the filaments of headlight lamps can be adapted to the problem. If the lamp is a HPMV lamp, it will usually be found preferable, as suggested above, to make the line passing through the holes or depressions coincide with the discharge column when the column is vertical and there is no bowing; allowance for the distance between this line and the axis of the source is then made by displacing the points of the pins from the focal line.

One embodiment of the invention will now be described, by way of example, with reference to the accompanying drawing, in which the skewness of the caps is greatly exaggerated.

Here 1 is the outer jacket of a HPMV lamp. 2 are the caps on either end. 3 are punch marks in their bases through which passes the line AA, which coincides with the position of the centre of the discharge column when the column is vertical. 4 is the discharge column when it is horizontal. 5 are the pins, forming part of the projection apparatus, and displaced from the focal line of the apparatus so that the discharge column coincides nearly with the focal line.

We are aware that it has been proposed to support an electric lamp of the type specified relative to the optical projection apparatus with which it is adapted to cooperate by means of a pair of members each fixed to the said apparatus and each entering a recess in a cap at the end of the lamp. (See, for example, Patent Specification No. 20834 of 1903). But in this, and in other proposals (for example those of Patent Specifications Nos. 25815 of 1907 and 4934 of 1914) for supporting a lamp by members entering recesses at its ends, it appears to be indicated that the recess should be formed before the body in which it is formed is attached to the lamp. The characteristic feature of the present invention, in virtue of which its object is attained, is the formation of the recesses after both bodies in which they are formed are attached to the lamp.

Further where it has been proposed to support a lamp as aforesaid, it has been proposed (for example in Specification No. 25815 of 1907 aforesaid) to lead the current to the terminals of the lamp by means other than the supporting means. No novelty is therefore claimed per se for the above proposal to make connections independent of the pins.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. The method of manufacturing an electric lamp of the type specified which comprises the step, subsequent to the attachment of both caps to the lamp, of forming in the base of each cap, a hole or depression, adapted to cooperate with the point of a pin, through or near both which holes or depressions the prolongation of the axis of the source passes.

2. The manufacture according to Claim 1 wherein a flexible lead is attached to the side of each cap and wherein the base of each cap, or that part of it in which the hole or depression is formed, is of insulating material or otherwise insulated from the side of the cap.

3. An electric lamp manufactured according to Claim 1 or 2.

4. An electric lamp according to Claim 3 which is a high-pressure metal-vapour electric discharge lamp.

5. Optical projection apparatus adapted to cooperate with an electric lamp according to Claim 3 or 4 comprising a pair of pins whose points lie on or near the focal line of the apparatus.

6. Apparatus according to Claim 5 comprising an elastic support for the said lamp other than the said pins.

focal line, so that the axis of the source coincides with the focal line. This, and no more, is implied by the statement that the prolongation of the axis passes near (not through) the hole or depression and that the point of the pin lies near (and not on) the focal line or its prolongation.

The pins are, of course, spaced apart so that their points can enter the holes or depressions in the caps. One at least of them is preferably spring-controlled, so that it can move relative to the other along the line joining them. The lamp may be supported wholly by the two pins, or subsidiary, preferably elastic, supporting means may be provided which allow the pins always to be in the depressions. Again the pins may serve as the supply terminals to the lamp, especially if the current taken by it does not exceed 4 amps. If much heavier currents are to be taken, the connections are preferably independent of the pins; thus a flexible lead may be joined to the side of each cap and connected to a terminal on the projection apparatus. In this case the base of the lamp, or at least that part of it in which the depression is formed, is insulated from the side of the cap; it may be of insulating material.

Methods of securing that the depressions are formed on (or at a predetermined distance from) the axis of the source will readily occur to those skilled in the art; the known methods of prefocussing the filaments of headlight lamps can be adapted to the problem. If the lamp is a HPMV lamp, it will usually be found preferable, as suggested above, to make the line passing through the holes or depressions coincide with the discharge column when the column is vertical and there is no bowing; allowance for the distance between this line and the axis of the source is then made by displacing the points of the pins from the focal line.

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Further where it has been proposed to support a lamp as aforesaid, it has been proposed (for example in Specification No. 25815 of 1907 aforesaid) to lead the current to the terminals of the lamp by means other than the supporting means. No novelty is therefore claimed per se for the above proposal to make connections independent of the pins.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. The method of manufacturing an electric lamp of the type specified which comprises the step, subsequent to the attachment of both caps to the lamp, of forming in the base of each cap, a hole or depression, adapted to cooperate with the point of a pin, through or near both which holes or depressions the prolongation of the axis of the source passes.

2. The manufacture according to Claim 1 wherein a flexible lead is attached to the side of each cap and wherein the base of each cap, or that part of it in which the hole or depression is formed, is of insulating material or otherwise insulated from the side of the cap.

3. An electric lamp manufactured according to Claim 1 or 2.

4. An electric lamp according to Claim 3 which is a high-pressure metal-vapour electric discharge lamp.

5. Optical projection apparatus adapted to cooperate with an electric lamp according to Claim 3 or 4 comprising a pair of pins whose points lie on or near the focal line of the apparatus.

6. Apparatus according to Claim 5 comprising an elastic support for the said lamp other than the said pins.

* C L M S *

7. A combination of optical projection apparatus according to Claim 5 with a lamp according to Claim 4 wherein the lamp, the caps, and the pins are constructed and arranged substantially as hereinbefore described with reference to the accompanying drawing.

Dated the 7th day of June, 1938.

For the Applicants,
NORMAN R. CAMPBELL.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1939.

