PATENT SPECIFICATION

593,760

Application Date: March 21, 1945. No. 7158/45.

Complete Specification Left: Jan. 7, 1946.

Complete Specification Accepted: Oct. 24, 1947.

PROVISIONAL SPECIFICATION

Improvements in and relating to Electric Discharge Lamps

We, THE GENERAL ELECTRIC COMPANY LIMITED, a British Company, of Magnet House, Kingsway, London, W.C.2, and ROBERT LEONARD BREADNER, HENRY GRAINGER JENKINS, and CHARLES HENRY SIMMS, all British Subjects, all of Research Laboratorties of The General Electric Co. Ltd., Wembley, Middlesex, do hereby declare the nature of this invention to be as follows:—

The present invention relates to electric discharge lamps of the kind in which the discharge paths between one or more pairs of electrodes are channels formed between two vitreous components sealed together, one or both of the components having one or more upstanding ridges which separate adjacent parts of the discharge path from one another.

One example of a discharge lamp of this kind has a discharge path formed between two moulded glass components each having a spiral depression or groove of approximately semi-circular cross-section extending from near the periphery to the centre. These two components are sealed together around their periphery with the upstanding ridges which separate the depressions in register with one another thus forming a spiral channel of approximately circular cross-section. Electrodes are arranged at the two ends of the channel.

It has been found sufficient, in lamps of the type described using moulded components where close contact can be established between the upstanding ridges by grinding for example, to seal the two components together only around the outer periphery to enable the spiral channel to be evacuated. The opposing faces of the upstanding ridges on the two components are arranged to abut or to lie close enough together to prevent leakage of the discharge between adjacent parts of the channel.

In constructing lamps of the design just described, difficulty has been met with owing to the fact that the two peripheral walls on the two components which have to be sealed together are not of uniform width owing to the upstanding spiral ridges merging in one region into these walls. This lack of uniformity renders it difficult to avoid cracks particularly when quantity production methods are employed. The same difficulty is encountered with many other shapes of discharge path.

It is the object of the present invention to provide a construction of discharge lamp of the kind set forth in which the difficulty referred to is overcome.

According to the present invention in an electric discharge lamp of the kind described in which one or both components has one or more upstanding ridges merging into an outer wall which forms the outer boundary of the discharge path, there is provided on each of the components a peripheral flange of substantially uniform width surrounding the said outer wall or walls, the said peripheral flanges being sealed together.

According to the present invention in another aspect, in an electric discharge lamp of the kind described in which a discharge path is bounded by upstanding ridges including a peripheral wall of non-uniform width, the sealing together of the two components is effected along flanges of substantially uniform width provided on the two components, which flanges are distinct from said upstanding ridges, the two components being arranged to abut along the said ridges sufficiently closely, without sealing, to prevent leakage of discharge.

In one embodiment of the present invention, applied to the form of discharge lamp already described, the two components are formed by pressing whereby each is provided with a spiral channel of semi-circular cross-section. An upstanding ridge of approximately spiral shape extends from near the centre to an outer circular wall into which it merges after approximately a quarter-circular turn. Thus starting from the outer end of the spiral and proceeding inwards, the channel is bounded throughout nearly one complete turn by the outer wall on the one side and by the upstanding spiral shaped ridge on the other side. The remainder of the channel is bounded on both sides by the spiral ridge. Outside

[Price 1/-]

PRICE 2/-

the outer wall, and separated therefrom by a semi-circular depression, is a sealing flange of uniform cross-section.

The upper surfaces of the upstanding ridges (including the outer wall) on the two components are arranged to abut closely when the two components are placed face to face. They are sealed together around the sealing flanges.

The invention is not limited to the particular form of discharge lamp described but may be applied to a variety of different forms of lamp in which the discharge path enclosed between two vitreous components is of multi-start spiral, zig-zag and many other shapes.

The upstanding ridges may be provided on only one of the two components, the other component then being free from ridges and usually having a uniform thickness and a flat or domed shape. In this case it is only necessary to provide a distinct sealing flange upon the ridged component, this being sealed to the outer zone of the other component.

Dated this 21st day of March, 1945.

A. F. CORNOCK,
Agent for the Applicants.

COMPLETE SPECIFICATION

Improvements in and relating to Electric Discharge Lamps

We, THE GENERAL ELECTRIC COMPANY LIMITED, of Magnet House, Kingsway, London, W.C.2, a British Company, ROBERT LEONARD BREADNER, HENRY GRAINGER JENKINS and CHARLES HENRY SIMMS, all of Research Laboratories of The General Electric Company Ltd., Wembley, Middlesex, and all British Subjects, 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:—

The present invention relates to electric discharge lamps of the kind in which the discharge passage between one or more pairs of electrodes is a channel formed between two vitreous components sealed together, one or both of the components having one or more upstanding ridges which separate adjacent parts of the discharge passage from one another.

One example of a discharge lamp of this kind has a discharge passage formed between two moulded glass components each having a spiral depression or groove of approximately semi-circular cross-section extending from near the periphery to the centre. These two components are sealed together around their periphery with the upstanding ridges which separate the depressions in register with one another thus forming a spiral channel of approximately circular cross-section. Electrodes are arranged at the two ends of the channel.

It has been found sufficient, in lamps of the type described using moulded components where close contact can be established between the upstanding ridges by grinding for example, to seal the two components together only around the outer periphery to enable the spiral channel to be evacuated. The opposing faces of the upstanding ridges on the two components are arranged to abut or to lie close enough together to prevent leakage of the discharge between adjacent parts of the channel.

In constructing lamps of the design just described, difficulty has been met with owing to the fact that the two peripheral walls on the two components which have to be sealed together are not of uniform width owing to the upstanding spiral ridges merging in one region into these walls. This lack of uniformity renders it difficult to avoid cracks particularly when quantity production methods are employed. The same difficulty is encountered with many other shapes of discharge passage.

It is the object of the present invention to provide a construction of discharge lamp of the kind set forth in which the difficulty referred to is overcome.

According to the present invention there is provided an electric discharge lamp of the kind specified in which the crests of the upstanding ridge or ridges on one component are arranged to abut or to lie close enough to the other component, without sealing, to prevent substantial leakage of the discharge, and in which said upstanding ridge or the outermost of said ridges merges into an outer wall forming a boundary of the discharge passage which wall is of non-uniform width and abuts or lies close to the said other component but is not sealed thereto, wherein there is provided on at least one of the components, outside of or beyond said outer wall, a flange of substantially uniform width which is sealed to the other component to form a vacuum-tight closure to the discharge passage.

When both components have upstanding ridges both are provided with flanges

which are sealed together to form the vacuum-tight closure.

If, however, only one of the components is ridged and the other is for example in the form of a flat disc, a cylinder, a conical frustrum or the like which is plain and unridged, no flange is required on this second component. The flange on the ridged component is then sealed to the surface or edge of the second component.

The invention will be described by way of example with reference to the accompanying drawings in which

Figs. 1 and 3 are views in underside plan and plan respectively of two components of one lamp according to the invention,

Fig. 2 is a view in sectional elevation and to an enlarged scale of the lamp of Figs. 1 and 3 with the components placed together, and

Figs. 4 and 5 are views in sectional elevation of two other forms of lamp according to the invention. It should be noted that in Figs. 1 and 3 the crests of the ridges are shown cross hatched for the sake of clearness.

Referring to Figs. 1—3, in this example both the upper component 10 and the lower component 11 are provided with upstanding ridges 12 and 13 respectively. These ridges bound channels 14 and 15 respectively of substantially semi-circular cross-section. The two components are conveniently formed in suitable moulds by pressing. The crests of the ridges 12 and 13 which are shown abutting in Fig. 2 are made flat and co-planar, either by adequate care in manufacture or by subsequent grinding for example, whereby when the components are placed as shown in Fig. 2 the boundaries between adjacent parts of the discharge passage constituted by the abutting ridges are effective in substantially preventing a leakage of discharge from one part of the passage to the adjacent part through the junction between the ridges.

It will be seen in Figs. 1 and 3 that the outer parts 16 and 17 of the upstanding ridges which form the outer walls or boundaries of the discharge passage are not of uniform width, since the spiral ridges merge into these outer parts at 18 and 19 respectively. If these outer ridges 16 and 17 were sealed together by fusion therefore, considerable care would be needed in the sealing operation in order to avoid the introduction of undesirable stresses and even fractures in the glass.

There are therefore provided outside of the outer walls 16 and 17 flanges 20 and 21 respectively which have abutting surfaces of uniform, and preferably the same, width. These flanges are sealed together by fusion in any convenient way in order to provide a vacuum-tight closure for the discharge passage.

Tubulations 22 and 23 are provided upon the component 10 and electrodes (not shown) are mounted on pins 24 and 25 within these tubulations. The inside of the walls of the spiral discharge passage may be coated with a fluorescent powder, and the passage may then be evacuated, filled with a suitable gas or vapour and sealed off at a pumping tube 26.

Referring to Fig. 4, the upper component 10 is of similar design to that of Figs. 1 to 3 and like parts are given the same references. The lower component 27 is in this example a flat disc of glass. In this case it is clearly not necessary to provide a flange upon the component 27 for sealing purposes in order to avoid the introduction of undesirable stresses. The flange 20 is therefore provided only upon the ridged component 10 and this flange is sealed to the outer part of the disc 27. The flange 20 could if desired extend over the edge 28 of the disc and be sealed to this edge. Only one of the tubulations 22 and one pair of electrode supporting pins 24 is shown in Fig. 4 but the second may be arranged as shown in Figs. 1 and 2.

In Fig. 5 the lamp is of a generally cylindrical shape and comprises a ridged inner component 29 and a plain (unridged) cylindrical outer component 30. The two components are arranged to be in close contact with one another along the upstanding helical ridge 31. In this case the discharge passage 32 is of helical shape and has a cross-section of approximately semi-circular shape. A tube 33 connecting with the lower end of the passage 32 may contain electrodes and a similar tube (not shown) also containing electrodes is arranged in connection with the upper end of the passage 32.

The two outer or boundary walls 34 and 35 are evidently not of uniform width and there are provided in accordance with the invention, flanges 36 and 37 of uniform width which are outside of or beyond the outer walls 34 and 35 respectively and which are sealed to the cylindrical outer component 30.

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. An electric discharge lamp of the kind specified, in which the crests of the upstanding ridge or ridges on one component are arranged to abut, or to lie close

which are sealed together to form the vacuum-tight closure.

If, however, only one of the components is ridged and the other is for example in the form of a flat disc, a cylinder, a conical frustrum or the like which is plain and unridged, no flange is required on this second component. The flange on the ridged component is then sealed to the surface or edge of the second component.

The invention will be described by way of example with reference to the accompanying drawings in which

Figs. 1 and 3 are views in underside plan and plan respectively of two components of one lamp according to the invention,

Fig. 2 is a view in sectional elevation and to an enlarged scale of the lamp of Figs. 1 and 3 with the components placed together, and

Figs. 4 and 5 are views in sectional elevation of two other forms of lamp according to the invention. It should be noted that in Figs. 1 and 3 the crests of the ridges are shown cross hatched for the sake of clearness.

Referring to Figs. 1—3, in this example both the upper component 10 and the lower component 11 are provided with upstanding ridges 12 and 13 respectively. These ridges bound channels 14 and 15 respectively of substantially semi-circular cross-section. The two components are conveniently formed in suitable moulds by pressing. The crests of the ridges 12 and 13 which are shown abutting in Fig. 2 are made flat and co-planar, either by adequate care in manufacture or by subsequent grinding for example, whereby when the components are placed as shown in Fig. 2 the boundaries between adjacent parts of the discharge passage constituted by the abutting ridges are effective in substantially preventing a leakage of discharge from one part of the passage to the adjacent part through the junction between the ridges.

It will be seen in Figs. 1 and 3 that the outer parts 16 and 17 of the upstanding ridges which form the outer walls or boundaries of the discharge passage are not of uniform width, since the spiral ridges merge into these outer parts at 18 and 19 respectively. If these outer ridges 16 and 17 were sealed together by fusion therefore, considerable care would be needed in the sealing operation in order to avoid the introduction of undesirable stresses and even fractures in the glass.

There are therefore provided outside of the outer walls 16 and 17 flanges 20 and 21 respectively which have abutting surfaces of uniform, and preferably the same, width. These flanges are sealed together by fusion in any convenient way in order to provide a vacuum-tight closure for the discharge passage.

Tubulations 22 and 23 are provided upon the component 10 and electrodes (not shown) are mounted on pins 24 and 25 within these tubulations. The inside of the walls of the spiral discharge passage may be coated with a fluorescent powder, and the passage may then be evacuated, filled with a suitable gas or vapour and sealed off at a pumping tube 26.

Referring to Fig. 4, the upper component 10 is of similar design to that of Figs. 1 to 3 and like parts are given the same references. The lower component 27 is in this example a flat disc of glass. In this case it is clearly not necessary to provide a flange upon the component 27 for sealing purposes in order to avoid the introduction of undesirable stresses. The flange 20 is therefore provided only upon the ridged component 10 and this flange is sealed to the outer part of the disc 27. The flange 20 could if desired extend over the edge 28 of the disc and be sealed to this edge. Only one of the tubulations 22 and one pair of electrode supporting pins 24 is shown in Fig. 4 but the second may be arranged as shown in Figs. 1 and 2.

In Fig. 5 the lamp is of a generally cylindrical shape and comprises a ridged inner component 29 and a plain (unridged) cylindrical outer component 30. The two components are arranged to be in close contact with one another along the upstanding helical ridge 31. In this case the discharge passage 32 is of helical shape and has a cross-section of approximately semi-circular shape. A tube 33 connecting with the lower end of the passage 32 may contain electrodes and a similar tube (not shown) also containing electrodes is arranged in connection with the upper end of the passage 32.

The two outer or boundary walls 34 and 35 are evidently not of uniform width and there are provided in accordance with the invention, flanges 36 and 37 of uniform width which are outside of or beyond the outer walls 34 and 35 respectively and which are sealed to the cylindrical outer component 30.

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. An electric discharge lamp of the kind specified, in which the crests of the upstanding ridge or ridges on one component are arranged to abut, or to lie close

enough to the other component, without sealing, to prevent substantial leakage of the discharge, and in which said upstanding ridge or the outermost of said ridges merges into an outer wall forming a boundary of the discharge passage which wall is of non-uniform width and abuts or lies close to the said other component but is not sealed thereto, wherein there is provided on at least one of the components, outside of or beyond said outer wall, a flange of substantially uniform width which is sealed to the other component to form a vacuum-tight closure to the discharge passage.

2. An electric discharge lamp according to Claim 1 in which both components have upstanding ridges and are arranged with the crests of the ridges abutting one another or close together, wherein flanges of substantially uniform width are provided on both components, these flanges being sealed together to form the vacuum-tight closure.

3. An electric discharge lamp according to Claim 2, wherein the surfaces of the flanges on the two components which are sealed together are of substantially the same width.

4. An electric discharge lamp according to Claim 1, in which only one of the two components has upstanding ridges and in which the crests of these ridges abut or lie close to an unridged surface on the other component, wherein a flange is provided only upon the ridged component this flange being sealed to a part of said unridged surface to form the vacuum-tight closure.

5. An electric discharge lamp according to Claim 4, wherein the unridged component is a flat disc, the flange on the ridged component being sealed to the disc near the edge thereof.

6. An electric discharge lamp according to Claim 4, wherein the unridged component is of cylindrical shape, flanges on the ridged component being sealed to the cylinder near the ends thereof.

7. An electric discharge lamp of the kind specified, substantially as described with reference to Figs. 1, 2 and 3 of the accompanying drawings.

8. An electric discharge lamp of the kind specified, substantially as described with reference to Fig. 4 of the accompanying drawings.

9. An electric discharge lamp of the kind specified, substantially as described with reference to Fig. 5 of the accompanying drawings.

Dated the 7th day of January, 1946.
For the Applicants.
A. F. CORNOCK.
Chartered Patent Agent.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1947.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies, price 1s. 0d. each (inland) 1s. 1d. (abroad) may be obtained.

