Feb. 9, 1965 H. R. KESTNER ET AL 3,169,205

FLUORESCENT LAMP MOUNT

Filed April 5, 1961

Fig. 1.

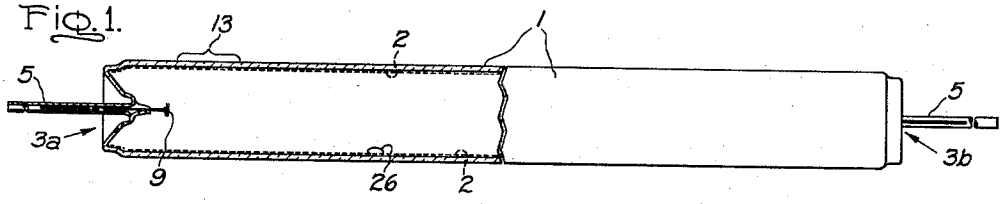


Fig. 2.

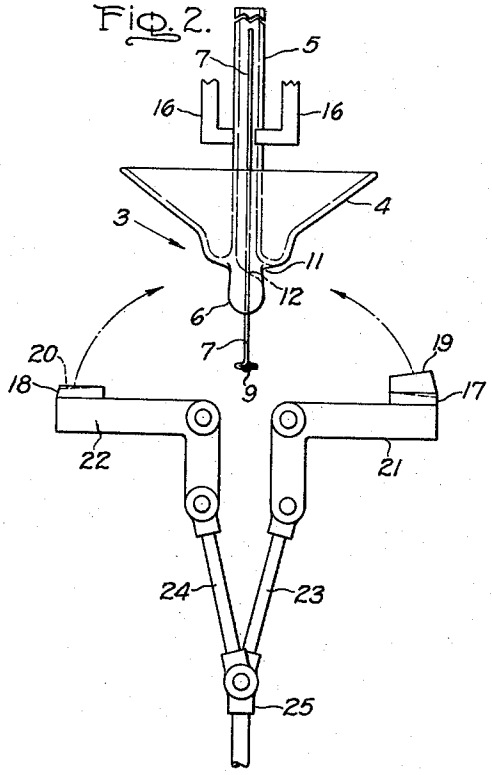


Fig. 3.

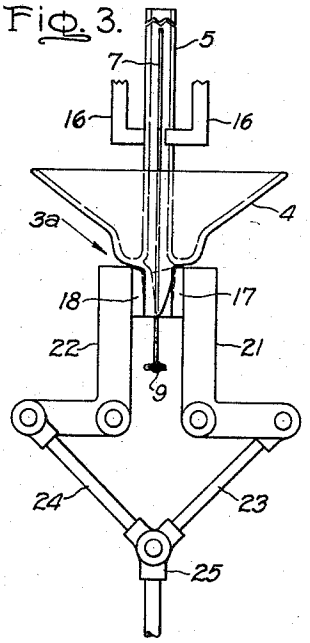


Fig. 4.

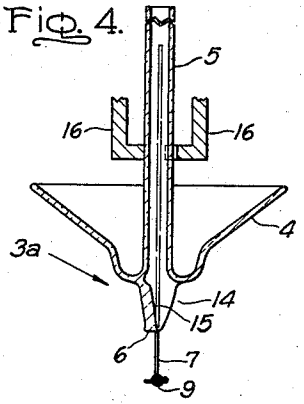
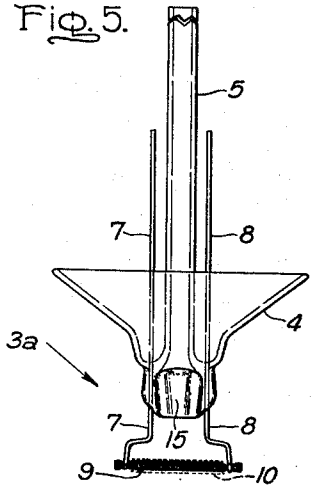


Fig. 5.



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FLUORESCENT LAMP MOUNT

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This invention relates to the manufacture of fluorescent lamps and in particular to the structure and manufacture of the mounts through which are sealed the lead-in wires that support the electrodes.

In the processing of fluorescent lamps at higher speeds an objectionable clear or thin spot in the internal phosphor coating may develop close to the end of the lamp having the exhaust tube through which the lamp is evacuated. This problem is particularly troublesome on long and large volume lamps such as the types commonly designated 96T12 slimline and high output. The problem is aggravated by the use of improved phosphors having a narrow particle size distribution, particularly when they are suspended in a water soluble binder for the purpose of applying the coating.

The object of the invention is to provide a solution to the clear spot problem as stated above.

Investigation of this problem has traced it to the gas filling of the lamp on the exhaust machine. In the processing of fluorescent lamps, the elongated tubes which form the envelopes of the lamps are first coated internally with a phosphor by causing the phosphor suspension to flow therethrough and afterwards drying it. The next step involves the sealing machine on which the lamp mounts through which extend the lead-in wires that support the electrodes, are sealed into the ends of the envelope. Following sealing, the lamp is processed on the exhaust machine where the electrodes are activated by passing current through the filaments in order to heat and decompose the alkaline earth carbonate coating thereon to alkaline earth oxide. At the same time the lamp is evacuated to remove the air and any gases and vapors including carbon dioxide resulting from the decomposition of the alkaline earth carbonates. The exhaust of the lamp is performed through the exhaust tube of one of the mounts which was previously blown open at the press for this purpose. Finally, at one of the last positions on the exhaust machine, an inert filling gas is added and a small measured quantity or dose of mercury is released into the lamp through the exhaust tube. The fill gas generally consists of one of the inert gases, more commonly argon at a pressure of a few millimeters of mercury, for instance at 2 to 3 millimeters.

Surprisingly enough, considering the low filling pressure and the relatively small mass of gas involved, we have determined that it is the addition of the fill gas which causes the clear spot in the phosphor coating next to the mount. The gas filling system commonly used is essentially a constant mass-flow type with a restriction controlling the rate of flow from a pressurized source such as a high pressure cylinder. The blow-out of the conventional mount design which has been commonly used in fluorescent lamp manufacture directs the gas jet at an angle of about 30° relative to the tube wall. The angle of the blow-out, together with the fact that there may be some slight constriction at the exit, results in a gas jet of sufficient force to blow the phosphor coating off the wall.

We have considered and discarded various possible solutions to this problem. For instance the use of a truly axial mount with a blow-out at the tip of the press along the axis of the exhaust tube is not desirable because it presents major manufacturing difficulties. The mercury dose is

released into the lamp through the exhaust tube and the cathode filament coated with emission mix extends across the axis of the mount. Since the lamp is vertically supported at this time, the mercury charge would strike the filament with the possibility of dislodging the emission mix coating. Offsetting the cathode to one side of the axis is not a satisfactory solution because it introduces further complications in mount manufacture, and moreover lamp appearance is adversely affected.

In accordance with the invention, we have satisfactorily resolved the problem by modifying the shape of the blow-out aperture at the press of the exhaust tube. We have flared the exit aperture and increased its width in a direction perpendicular to the axis of the exhaust tube, and we have changed the direction of the blow-out aperture by continuing it into a grooved channel formed in the side of the press and extending towards its end. Preferably the grooved channel makes but a shallow angle relative to the exhaust tube or lamp axis. These modifications have substantially eliminated clear or thin spot formation in the phosphor coating at gas fill.

For further objects and advantages and for a detailed explanation of the invention, attention is now directed to the following description of a preferred embodiment taken in conjunction with the accompanying drawing. The features of the invention believed to be novel will be more particularly pointed out in the appended claims.

In the drawing:

FIG. 1 is a side view, foreshortened and partly sectioned, of a fluorescent lamp embodying the invention.

FIG. 2 is a side view of a conventional mount operatively positioned relative to a mechanism for reforming the blow-out aperture.

FIG. 3 shows the same mount as in FIG. 2 with the reforming jaws actuated up into engagement with the mount press.

FIG. 4 is a side cross-sectional view of the mount reformed in accordance with the invention.

FIG. 5 is a side view of the reformed mount rotated on its axis 90° relative to FIG. 4 so as to place the wide curved surface of the blow-out aperture in the plane of the drawing.

The typical lamp illustrated in the drawing comprises a vitreous envelope 1 which is coated internally with a phosphor indicated by the dotted line at 2. To each end of the lamp a mount is sealed such as indicated at 3 in FIG. 2 for the case of the conventional mount heretofore used, and at 3*a* in FIGS. 4 and 5 for the improved quasi-axial blow-out mount in accordance with the invention.

Referring to FIG. 2, the conventional mount 3 comprises a stem tube which is formed into a flare 4 into which extends an exhaust tube 5. The junction of the stem and exhaust tube is formed into a press 6 consisting of a mass of glass through which extend the in-lead wires 7, 8. The inner ends of the in-lead wires are clamped about the ends of the filament 9 which is coated with alkaline earth carbonate emission mix as indicated at 10 in FIG. 5. In FIG. 2, the mount 3 has a blow-out aperture 11 with an exit surface 12 at a steep angle relative to the axis of the exhaust tube. This causes the gas jet which forms during the inert gas filling operation to strike with considerable force the envelope wall and to blow off the phosphor coating leaving a spot in the region indicated at 13 in FIG. 1 which is either clear or only very thinly coated with phosphor.

In accordance with the illustrated embodiment of the invention, the blow-out aperture of the mount is reformed to provide a flaring exit aperture 14 and a relatively wide grooved channel 15 in the side of the press and extending towards the end, as indicated in FIGS. 4 and 5. The reforming of the blow-out aperture may be done on a mount

or stem machine wherein the mount is supported in inverted position by means of jaws 16 which grip the exhaust tube, as conventionally indicated in FIGS. 2 and 3. The blow-out aperture 11 shown in FIG. 2 was formed in conventional fashion at an earlier station on the stem machine by blowing a puff of air through the exhaust tube while fires are played on the sides of the press to maintain the glass in a viscous state. The reforming of the press to give the desired blow-out contour is done by means of matrix jaws 17, 18, shown in FIGS. 2 and 3. Jaw 17 is provided with a rounded inclined ridge 19 while jaw 18 is provided with a relief V 20. The matrix jaws are mounted on pivoting levers 21, 22 which are actuated by means of links 23, 24 from a vertically reciprocating crosshead 25. In FIG. 2, the jaws and levers are shown in their outswung retracted position whereas in FIG. 3 they are shown in their upswung position engaging the press of the mount. The glass engaging surfaces of the matrix jaws diverge slightly in the direction of the filament so that excess glass not displaced laterally is forced down in the direction of the filament and may lengthen the press slightly.

In conventional mount making, the blow-out aperture may occur haphazardly on either side of the press, that is to the right as shown in FIG. 2, or to the left. For the present purpose, it is necessary that the blow-out always occur on the same side. This is achieved by offsetting the press-forming jaws to one side of the axis of the exhaust and stem tubes at the first pressing. This results in a press 6 as illustrated in FIG. 2 with slightly less glass on one (right as seen in the drawing) side of the axis than on the other. Then when the blow-out is formed, it forms preferentially on the side having the less glass. This preferential forming may be further assisted by making the fires slightly hotter on the side of the mount where the blow-out is desired to form.

The contour of the improved mount in accordance with the invention is shown in FIGS. 4 and 5. The exit aperture 14 flares outwardly and is continued into a grooved channel 15 extending between the lead-in wires towards the end of the press. The central portion of the wall of channel 15, which may be referred to as the exit surface, makes a shallow angle between 5° and 15°, preferably about 9°, to the axis of the exhaust tube which is also the longitudinal axis of the lamp envelope. Furthermore, as best seen in FIG. 5, the exit aperture 14 and the grooved channel 15 are widened transversely to the axis of the exhaust tube substantially in excess of the internal diameter of the passage through the exhaust tube. This combination of features insures that the filling gas jet emerges at a relatively shallow angle with respect to the envelope wall and with a lessened velocity. In other words, the gas jet is almost parallel to the lamp axis and has less force with the result that the phosphor is not blown off. At the same time, the shallow angle of the exit surface insures that when the mercury dose (shown as a drop 26 in FIG. 1) is released into the lamp through the exhaust tube, it is deflected off axis and does not strike the filament 9. Thus the possibility of dislodging emission coating from the filament is avoided.

The more common manufacturing procedure is to exhaust and gas fill the lamp from one end only, that is from the top end which would have mount 3*a*. In such case a so-called dummy mount 3*b* is used at the other end. The dummy mount may be similar to the conventional mount 3 shown in FIG. 2 except that the exhaust tube is not blown out at the press. An exhaust tube may nevertheless be provided to facilitate locating the end of the lamp in the clamp or holder therefor on the exhaust machine. However, if in order to further increase the machine speed it is desired to exhaust and gas fill from both ends of the lamp, then in such case both ends of the lamps would be provided with the improved mount 3*a* according to the invention.

The invention thus provides an unexpectedly convenient and fortuitous solution to the problem of clear spot formation in the phosphor coating at gas fill and without requiring any extensive modifications in lamp making machinery or processing techniques. Furthermore, the problem is solved without running afoul of the danger of emission coating dislodgement from the cathode which is encountered with an axial blow-out mount design.

The preferred embodiment of the invention which has been described in detail and illustrated in the drawing is intended as exemplary and not in order to limit the invention thereto. The scope of the invention is to be determined by the appended claims.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A fluorescent lamp mount comprising a flared stem tube and an exhaust tube extending axially thereinto and forming a juncture therewith constituting a vitreous press, lead-in wires projecting through said press, and a blow-out aperture formed in one side of said press and communicating with said exhaust tube, said blow-out aperture being flared outwardly and widened relative to the exhaust tube passage so that a gas jet issuing therefrom issues with reduced velocity and in a quasi-axial direction.

2. A fluorescent lamp mount comprising a flared stem tube and an exhaust tube extending axially thereinto and forming a juncture therewith constituting a vitreous press, lead-in wires projecting through said press, and a blow-out aperture formed in one side of said press and communicating with said exhaust tube, said blow-out aperture being continued into a groove formed in said one side of the press and extending towards the end thereof.

3. A fluorescent lamp mount comprising a flared stem tube and an exhaust tube extending axially thereinto and forming a juncture therewith constituting a vitreous press, lead-in wires projecting through said press and supporting an electrode, and a blow-out aperture formed in one side of said press and communicating with said exhaust tube, said blow-out aperture being flared outwardly and widened relative to the exhaust tube passage and being continued into a grooved channel formed in said one side of the press and extending towards the end thereof.

4. A fluorescent lamp mount comprising a flared stem tube and an exhaust tube extending axially thereinto and forming a juncture therewith constituting a vitreous press, lead-in wires projecting through said press and supporting a filament transversely to the axis of said exhaust tube, and a blow-out aperture formed in one side of said press and communicating with said exhaust tube, said blow-out aperture being flared outwardly and widened relative to the exhaust tube passage and being extended as a channel in said one side of the press between said lead wires substantially to the end of said press so that a gas jet issuing from said aperture issues with reduced velocity in a direction making a shallow angle with said axis but avoiding said filament.

5. A fluorescent lamp mount comprising a flared stem tube and an exhaust tube extending axially thereinto and forming a juncture therewith constituting a vitreous press, lead-in wires projecting through said press and supporting a filament across the projected axis of said exhaust tube, and a blow-out aperture formed in one side of said press and communicating with said exhaust tube, said blow-out aperture being widened relative to the exhaust tube passage and being continued into a grooved channel formed in said one side of the press and extending towards the end thereof, the central portion of the channel wall being inclined to said one side at an angle between 5° and 15° to the axis of said exhaust tube.

6. A fluorescent lamp mount as defined in claim 5 wherein said central portion of the channel wall is inclined to said one side at an angle of approximately 9° to the axis of said exhaust tube.

7. A fluorescent lamp comprising an elongated tubular envelope internally coated with phosphor and having

mounts sealed into the ends thereof, at least one of said mounts comprising a flared stem tube and an exhaust tube penetrating thereinto and forming a juncture therewith constituting a vitreous press, lead-in wires projecting through said press and supporting a filament within said lamp, and a blow-out aperture formed in one side of said press and communicating with said exhaust tube, said blowout aperture being flared outwardly and widened relative to the exhaust tube passage so that a gas jet issuing therefrom into said lamp at gas fill issues with reduced velocity and in a quai-axial direction relative to said envelope in order to avoid blowing phosphor off said envelope wall.

8. A fluorescent lamp comprising an elongated tubular envelope internally coated with phosphor and having mounts sealed into the ends therof, at least one of said mounts comprising a flared stem tube and an exhaust tube penetrating thereinto and forming a juncture therewith constituting a vitreous press, lead-in wires projecting through said press and supporting a filament within said lamp, and a blow-out aperture formed in one side of said press and communicating with said exhaust tube, said blow-out aperture being flared outwardly and widened relative to the exhaust tube passage and continued into a grooved channel formed in said one side of the press and extending to the end thereof, whereby a gas jet issuing from said aperture into said lamp at gas fill issues with reduced velocity and in a quasi-axial direction relative to said envelope in order to avoid blowing phosphor off said envelope wall.

9. A fluorescent lamp comprising an elongated tubular envelope internally coated with phosphor and having mounts sealed into the ends thereof, at least one of said mounts comprising a flared stem tube and an exhaust tube penetrating thereinto and forming a juncture therewith constituting a vitreous press, lead-in wires projecting through said press and supporting a filament within said lamp across its axis, and a blow-out aperture formed in one side of said press and communicating with said exhaust tube, said blow-out aperture being flared outwardly and widened relative to the exhaust tube passage and continued into a grooved channel formed in said one side of the press and extending to the end thereof at an angle between 5° and 15° to the axis of said lamp, whereby a gas jet issuing from said aperture into said lamp at gas fill issues with reduced velocity and in a quasi-axial direction relative to said envelope in order to avoid blowing phosphor off said envelope wall, and a mercury charge released into the lamp through said exhaust tube is deflected off axis sufficiently to avoid striking said filament.

10. A lamp as in claim 9 wherein said grooved channel is inclined at an angle of approximately 9° to said lamp axis.

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