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APPARATUS FOR COATING GLASS BULBS

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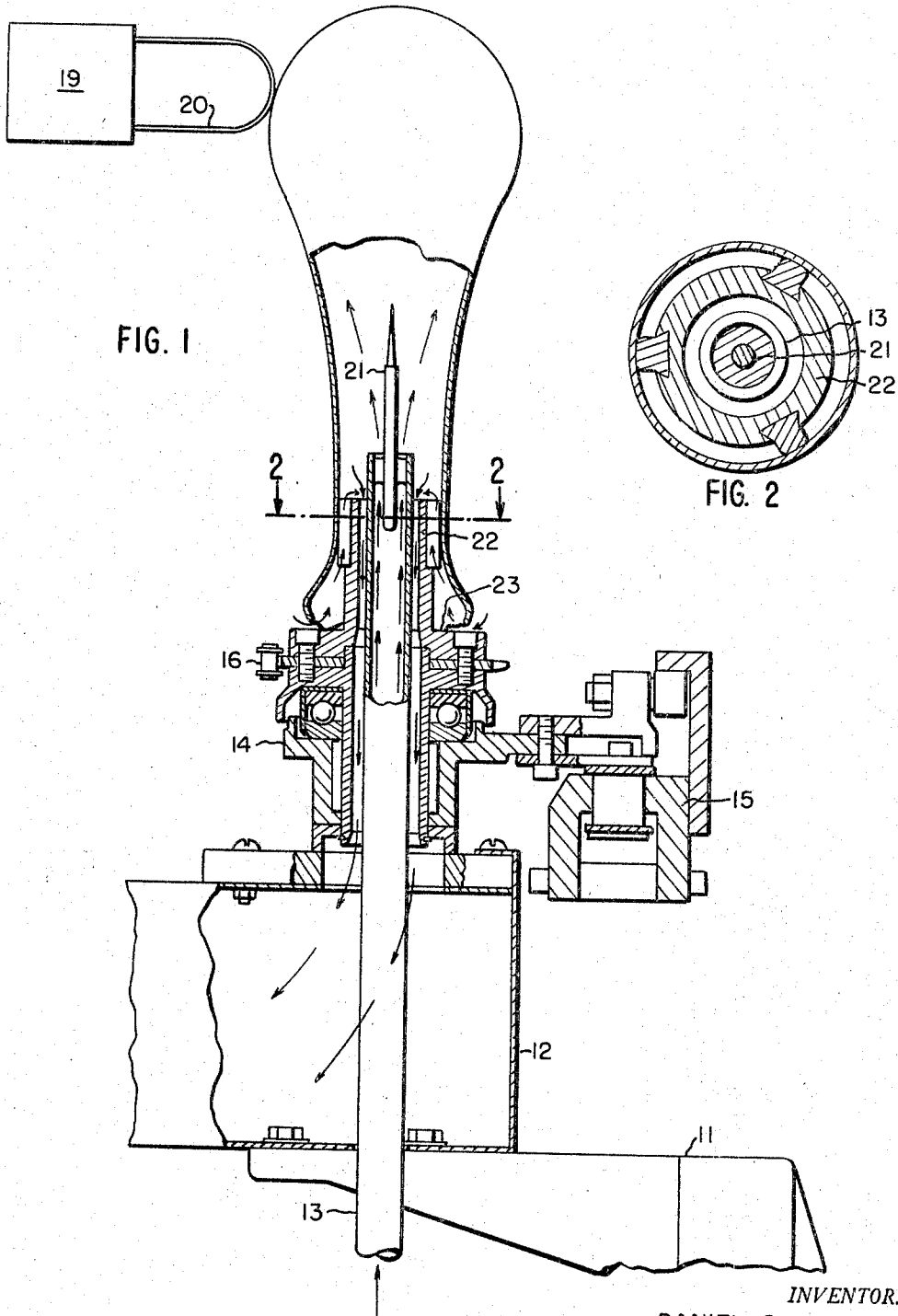


FIG. 2

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## APPARATUS FOR COATING GLASS BULBS

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Continuation of abandoned application Ser. No. 775,924, Nov. 24, 1958. This application Jan. 30, 1964, Ser. No. 341,384

3 Claims. (Cl. 118—49.1)

This application is a continuation of my copending and now abandoned application Ser. No. 775,924, filed Nov. 24, 1958.

This invention relates in general to the coating of vitreous materials such as glass and in particular to the coating of glass bulbs.

Incandescent lamp bulbs are usually provided with some form of light-diffusing coating for glare-reducing purposes. In conventional bulbs for general purposes sufficient diffusion is usually obtained by acid-etching the interior bulb surface. However, in some applications it is desirable to utilize a more efficient light-diffusing coating as, for example, in colored bulbs. In such instances, the interior lamp surface is coated with silica or similar material. A binder such as nitrocellulose may be used or finely divided silica may be applied as a smoke, deposited electrostatically or in the manner taught in U.S. Pat. No. 2,545,896 to Pipkin.

A similar situation exists in the manufacture of fluorescent lamps. The application of fluorescent powders to the interior bulb wall has been effected by a flush-coating method where a binder such as nitrocellulose is utilized. Also, the deposition of the fluorescent powders in the form of a smoke has met with some success.

The present invention is concerned with a superior apparatus for the deposition of any suitable coating of finely divided powder in either fluorescent or incandescent lamps. In the manufacture of either type lamp, after the interior surface has been coated, a mount structure is sealed into the open end or ends of the bulb. The mount structure usually includes a glass stem which is sealed to the bulb end to complete the enclosure and through which necessary electrical leads extend.

In making the seals, it is essential that no foreign matter contaminate the actual sealing surface. Such contaminations even though they may be of extremely small size are often the cause of leakage and ruptured seals.

The maintenance of clean sealing surfaces has proven particularly difficult when smoke coating methods are used. In some instances, it has been difficult to control precisely the areas of deposition of the coating material; and in other instances, the fixtures used to insert the coating have had a tendency to drag coating back to the sealing areas upon their removal.

It is, therefore, a general object of the present invention to provide an improved seal between bulb and stem elements in smoke coated lamps.

It is another object to the present invention to provide a clean cut-off of smoke coated areas in a bulb.

It is a further object of the present invention to improve and simplify smoke coating of bulbs.

In general, the present invention consists of a fixture for closely controlling the areas of deposition of coating within a bulb by smoking methods. The embodiment of the invention described herein is concerned primarily with incandescent light bulbs of conventional design, but the invention with minor modifications is applicable to bulbs of materials other than glass and of other designs.

The fixture includes a telescopic arrangement of tubes, one of which is utilized to introduce a finely divided powder in the form of a gas-borne smoke. The smoke-introducing tube is normally the central tube, and it is surrounded by a second tube through which gas is with-

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drawn as the powder is being deposited. Connected to the second tube is a vacuum chamber which expedites the removal of the gas introduced with the smoke and serves an even more important function outlined below.

The outer wall of the second tube is spaced from the interior surface of the bulb by means of equally spaced bumpers about its periphery. These bumpers may be in the form of simple protrusions or elongated strips parallel to the axis of the bulb and may be made removable or permanent on the wall of the outer tubing. They may also of course be made of a soft metal or other material coated with rubber or other resilient material. The bumper structure may also be made in the form of a sleeve fitted over the outer tube rather than being incorporated in the outer wall of the tubing.

The vacuum chamber connected to the second tube not only removes the gas introduced by the smoke, but is also efficient to cause an upward flow of atmospheric air around the periphery of the second tube. The clearance which is provided by the bumper between the inner wall of the bulb and the outer wall of the fixture results in a more uniform flow of air and provides a clean line of demarcation between the coated and uncoated bulb areas. Most important, none of the powder is deposited in the vicinity of the sealing areas of the bulb. For a better understanding of the present invention together with other and further objects, features, and advantages, the following detailed description of a specific embodiment of the invention should be read in connection with the accompanying drawings, in which:

FIG. 1 is a view partly in section and partly cut away of an electrostatic coating machine on which a bulb is shown in position for coating and

FIG. 2 is a section taken along the lines 2—2 of FIG. 1.

In FIG. 1 there is shown a frame 11 which supports a vacuum chamber 12. A smoke tube 13 passes through the vacuum chamber and is connected to a source of finely divided light-diffusing powder such as silica, metal silicates or mixtures thereof. The smoke tube 13 is arranged to reciprocate through a head 14, the upper portion of which is rotatable relative to the lower portion. A track 15 supports the head 14 and similar heads in their travel through a series of positions. A chain drive 16 is utilized to impart rotation to the upper position of the head. Much of the detail of the mechanism for indexing the bulb into the various positions and for actuating the reciprocating smoke nozzle is not shown in this drawing because it forms no part of the present invention.

A source of high voltage 19 is provided and a looped flexible electrode in the form of a spring 20 is connected to the high voltage 19. The flexible spring 20 is so disposed that each bulb is urged into contact with the spring when the bulb is indexed into the position shown. Attached to the top of the smoke 13 is a pointed electrode 21 which penetrates well within the bulb when the smoke tube 13 is at the uppermost limit of its travel.

The rotatable portion of the head 14 is provided with an extension 22 in the form of a sleeve through which the smoke tube 13 passes. A considerable amount of clearance is provided between the smoke tube 13 and the inner surface of the sleeve 22. As may be clearly seen in FIG. 2 of the drawing, the outer surface of the sleeve 22 is provided with three equally spaced projections 24 designed to contact the inner wall of the bulb. The bulb rests upon the upper flat surface 23 of the head 14 and normally the bulb edge is sufficiently irregular that air may flow freely between the bulb and the flat upper surface of the head. For the purposes of the present invention a free flow of air from the outside atmosphere into the area between the inner bulb surface and the

outer wall of the sleeve 22 is necessary. In the unlikely event that bulb ends be so flat as to prevent such passage of air, vents passing through the upper rotatable portion of the head 14 may be provided. Such vents, would, of course, permit communication between the outer atmosphere and the interior of the bulb.

In an actual operating machine, bulbs are loaded on a series of heads which are indexed along a track or carried by a rotatable turret sequentially through a number of work positions. The bulbs are first heated by flames or other means to render the glass conductive. After the heating operation, the bulbs are indexed into positions similar to that shown in FIG. 1.

The smoke tube 13 is advanced into the bulb through the sleeve 22 and finely divided light-diffusing powder is blown through the tube. Simultaneously, a vacuum is drawn by the chamber 12 through the annular opening between the smoke tube 13 and the sleeve 22. The vacuum thus provided draws off excess air from the smoke tube and also draws air into the bulb from the outside atmosphere. This latter flow is between the inner bulb wall and outer sleeve wall, air entering between the flat head surface and the lower bulb edge.

The air flowing into the bulb along its inner wall prevents the deposition of light-diffusing powder at any point near a sealing surface. Actually, a rather clear cut-off line is achieved adjacent the upper end of the sleeve 22. The high voltage applied between the electrode 20 and the grounded electrode 21 causes the light-diffusing powder to be deposited evenly over the inner bulb surface. The bulb is rotated continuously during the deposition process, of course, and the spring electrode 20 is maintained in contact with the heated bulb wall.

Clearly, the three rubber bumpers on the sleeve 22 may be inserted in the sleeve as shown or may be formed independently on an auxiliary sleeve to be fitted over the sleeve 22. Other alternatives suggested hereinabove such as using a soft metal or plastic in place of the rubber strips are quite feasible. Also, the bumpers need not be made in the form of strips, but might be made up as simple studs or protrusions.

What I claim is:

1. Apparatus for electrostatically coating the interior surface of an envelope having a bulbous portion, a narrower neck portion, and an open end, said apparatus comprising a rotatable head for supporting said bulb loosely at its open end to allow passage of air into said bulbous portion through the opening in said narrower neck portion, a spring electrode in position to contact said bulbous portion, a source of high voltage, a first electrode connected to one terminal of said source and electrically contacting said bulb, a sleeve projecting from said head into said bulb, a smoke tube reciprocable within said sleeve for introducing coating material in the form of smoke into said bulb, an electrode carried by said smoke tube and connected to the other terminal of said high voltage source, said smoke tube and electrode being disposed and reciprocable within said sleeve, a vacuum chamber in communication with the passage between said smoke pipe and the inner wall of said sleeve, and means spacing the inner wall of said bulb from the outer wall of said sleeve in the neck portion of said bulb and substantially above the open end of the bulb to permit the flow of air along said inner wall of said bulb to determine and limit the area of deposition of said coating material on said inner wall.

2. Apparatus as defined in claim 1 wherein said spacing means comprises a plurality of protruding members spaced about the periphery of said sleeve.

3. Apparatus as defined in claim 2 wherein said protruding members carried by said sleeve are in contact with the inner wall of said bulb.

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