

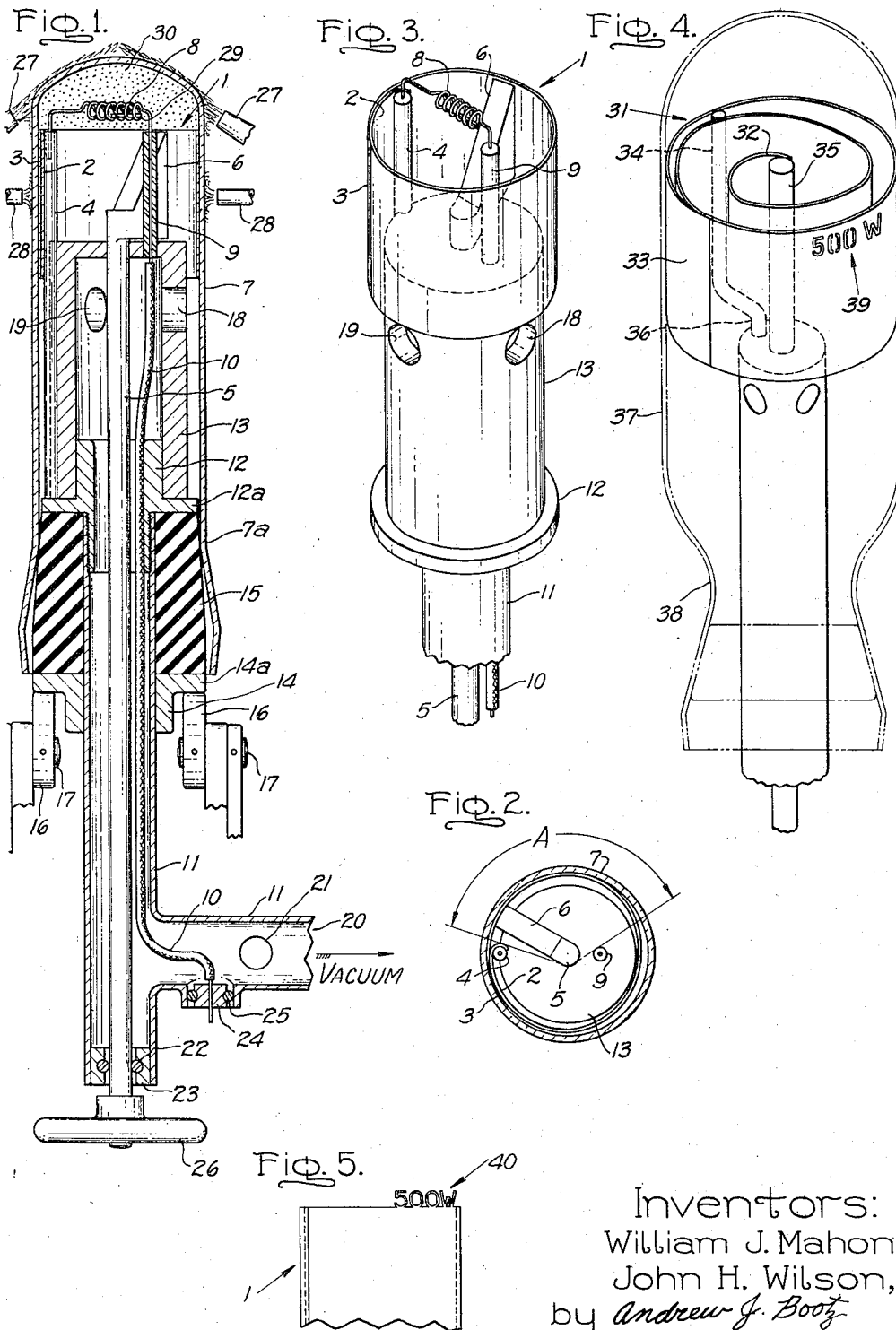
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APPARATUS FOR INTERNALLY COATING ARTICLES

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APPARATUS FOR INTERNALLY COATING ARTICLES

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11 Claims. (Cl. 118—49)

This invention relates to apparatus for manufacturing evacuated or gas-filled vessels and more particularly to apparatus for coating the interior of the bowl portion of a vitreous electric light bulb in which a mask is employed to shield part of the bulb.

In certain applications, for example, with incandescent projection lamps designed for use in projecting still or moving pictures, it is desirable to provide the lamp with an opaque coating at its bowl end to prevent the escape of stray light. A coating suitable for this application is that disclosed and claimed in copending application Serial No. 655,655, George W. Cressman, filed April 29, 1957 and assigned to the same assignee as the present application. In such a coating, particularly when it is applied by an evaporation or vaporization process, it is necessary that the portion of the bulb to be coated be heated to a high temperature while it may be desirable, but not necessary, to maintain the remainder of the bulb and the apparatus used at a lower temperature to minimize the deposit thereon of evaporated or vaporized coating material. Further, it is necessary that the area of the bulb which is not to be coated be well masked so as to prevent a deposit of coating material on these parts and to give smooth and well-defined edges to the coating. Provision must be made, in the event of vaporized coatings, for a vaporizing coil to be located inside or above the mask and possibly also for vacuum and gas lines to be accessible to the portion of the bulb which is being coated.

An object of our invention is to provide an improved apparatus for coating electric lamp bulbs in which a shielding mask is used to cover part of the bulb during the coating operation.

Another object of our invention is to provide an improved shielding mask arranged to permit coating the bowl end of a tubular electric lamp and which is adjustable to provide for manufacturing tolerances in the diameter of the tubular lamp.

Another object of our invention is to provide an improved expanding mask for an electric lamp which will permit the mask to be readily assembled and disassembled within the lamp bulb.

Another object of our invention is to provide an improved mask for forming indicia or design on the interior of a lamp wall.

Further objects and advantages of our invention will become apparent as the following description proceeds and the features of novelty which characterize our invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Briefly stated, in accordance with one aspect of our invention, we provide an expandable metallic mask adapted for insertion into an electric lamp bulb. The mask consists of a spiral-shaped strip of metal with means for expanding the metallic strip so that it fits tightly against the inside bulb surface when the bulb is loaded in place on the mask. Provision is also made for the vaporizing of a metallic coating and for the evacuation of the bulb during the vaporization process.

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The nature of the invention will best be understood when described in connection with the accompanying drawings, in which:

Fig. 1 is a cross-sectional view of a coating apparatus employing the invention;

Fig. 2 is a plan view of the shielding mask;

Fig. 3 is a perspective view of the shielding mask;

Fig. 4 illustrates an alternate modification of invention; and

Fig. 5 is a partial view of a shielding mask illustrating a method of forming indicia or design with the mask.

Referring to Figs. 1, 2 and 3, an expandable metal mask or shield is shown generally at 1. It is comprised of a spiral-shaped, thin-walled flexible split sleeve of a suitable metal, such as copper, nickel or chrome alloy for example, and having overlapping edges 2 and 3. The inner edge 2 of the mask is secured to a stationary post 4, while the outer edge 3 is free. Extending inwardly and permanently secured to a side wall of the mask 1 is an actuating wedge-shaped arm 6, the inner end of which is secured to a rotatable shaft 5. The arm 6 may be rotated through angle A, Fig. 2, which is shown less than 180°, but which may approach a complete turn by the proper location of post 9 with respect to post 4. As illustrated by Figs. 1 and 2, a glass bulb 7, to be coated, can be placed over the mask 1.

A heating or vaporizing filament 8 is provided for vaporizing the metallic coating material. One end of the filament 8 may be grounded directly into post 4 while the other end passes through an insulating supporting post 9 and is connected by means of an insulated lead 10 to a source of electrical heating or flashing current (not shown).

In order to support the mask 1 and associated structure thus far described within a lamp bulb, the apparatus includes an upstanding tube 11 which is threaded at one end to support a collar 12 having a flange 12a. A hollow member 13 is seated in position on collar 12a and, in turn, carries the aforementioned insulating supporting post 9. A second collar 14 having a flange 14a slides on the tube 11 in spaced relation with collar 12 and a compressible rubber gasket 15 is mounted on the tube between flanges 12a and 14a. Eccentric cams 16 engage the flange 14a of collar 14 and are carried by rotatable shafts 17. To secure an air seal between tube 11 and the lamp bulb, shafts 17 are rotated so that cams 16 move the collar 14 toward collar 12, thereby compressing the rubber gasket 15 causing it to expand diametrically to effect a seal between tube 11 and lamp bulb 7.

Tube 11, collar 12 and tubular member 13 have a common interior opening such that the air, during the vaporizing process, may be evacuated and the bulb filled with an inert gas such as nitrogen after coating. A number of openings, such as those illustrated at 18 and 19, are formed in member 13 and provide communicating passages between the interior of member 13 and the space around the mask 1. The outer end of tube 11 communicates with a vacuum line 20 and one or more lines 21 which supply nitrogen gas. The rotatable shaft 5 rotates within the interiors of member 13 and tube 11, the outer end of shafts 5 being sealed in respect to tube 13 by an O-ring 22 and bushing 23. The insulated lead 10 is likewise sealed by a bushing 24 of suitable insulating material and an O-ring 25 where it passes through the tube 13 or vacuum line 20. Means are provided at the outer end of shaft 5 for rotating both shaft 5 and the actuating arm 6, as, for example, a hand wheel 26.

Heating nozzles 27, shown diagrammatically in Fig. 1, heat the portion of the bulb 7 which is to be coated. Air nozzles 28, shown diagrammatically in Fig. 1, direct a stream of air against the bulb 7 so as to cool the bulb 7 after it has been coated.

In operation, shaft 5 is rotated so that the actuating arm 6 is at its position nearest or against post 4 and the mask 1 is at its minimum "diameter," as is best seen in Fig. 2. Burners 27 are moved from the position shown in Fig. 1 so that there is no heat being supplied to the apparatus; and the cooling air from nozzles 28 is shut off. A bulb 7 can now be placed over the mask, to the position illustrated in Fig. 1, so that the neck portion 7a seats against the rubber gasket 15. Rotation of the eccentric cams 16 through shafts 17 causes the movable collar 14 to move toward the stationary collar 12 thereby compressing the gasket 15 to expand it into sealing engagement with the bulb 7 at the neck 7a. The structure within the bulb above compression gasket 15 is now air-tight so that a vacuum may be pulled through the vacuum line 20. Rotation of the hand wheel 26 in a direction to move the actuating arm 6 away from post 4 will increase the diameter of the mask 1 so as to cause it to fit firmly against the bulb 7.

Burners 27 are adjusted into the position indicated in Fig. 1 so that the portion of the bulb to be coated is brought to a suitable temperature. A heating and vaporizing current is now passed through the lead 10 to the vaporizing filament 8. Coating material 29, which may have been placed within the filament 8 in the form of thin foil, will now vaporize, adhering to the heated portion of the lamp tube so as to form thereon a coating 30 of the desired material.

After the coating operation is complete, cooling air 28 is directed against the outer portion of the bulb and an inert gas such as nitrogen is passed to the inside of the bulb through line 21 to help cool the inner portion of the bulb 7. When the bulb is sufficiently cool for removal from the apparatus, cam 16 is rotated so as to permit movable collar 14 to move away from stationary collar 12 and remove the pressure from the compression gasket 15 thereby releasing the base of the bulb. At the same time rotation of the hand wheel 26, so as to move the actuating arm 6 toward the post 4, disengages the mask 1 from the side of the bulb and the bulb may now be removed.

Fig. 4 represents a modification of the invention adapted for insertion into narrow-necked bulbs. The expandable metal mask, shown generally at 31, consists of a spiral-shaped strip, one end 32 of which is secured to a rotatable shaft 35 with the other end 33 overlapping a portion of the side of the strip. The free end 33 of the mask 31 extends beyond a stationary supporting post 34 secured to the inner side wall of the mask. Post 34 has an off-set support 36, the purpose of which will be explained below.

In operating the device of Fig. 4, shaft 35 is rotated clockwise as viewed from above so as to tighten the spiral of the mask 31 and thereby reduce its effective diameter. A bulb 37 having a reduced diameter neck 38 may then be held at an angle and slipped over the mask so that the neck 38 clears the post 34 due to the off-set portion 36. By rotating shaft 35 in a counterclockwise direction after the bulb is in place, the mask 31 will partially unwind and expand the mask tightly against the inside bulb wall. The coating process can then proceed as described above. By rotating shaft 35 in a clockwise direction the spiral of mask 31 will be wound up and the bulb can be removed in the reverse manner from which it was assembled.

A further aspect of the present invention is that the mask disclosed herein may be in the form of a template and may be used for the purposes of placing a vaporizable coating in the form of indicia or a design on the interior bulb wall. For example, in Fig. 4, the mask is shown with perforations therein of the characters or design to be placed on the lamp wall as illustrated at 39; thereby forming a template of the design. When the coating is vaporized, the characters perforated in the

mask will appear as an opaque coating on the inside wall of the bulb.

Alternatively the design or indicia may be formed of clear characters against an opaque background by using a mask such as illustrated in Fig. 5, in which raised characters or designs 40 extend above the main body of the mask. When the bowl of the bulb is coated with the opaque metallic coating, the portion of the bulb shielded by the projecting characters will remain clear; the characters prohibit vaporized material from depositing on the shielded portion of the bulb.

While we have described only certain preferred embodiments of our invention by way of illustration, many modifications will occur to those skilled in the art. We, therefore, wish to have it understood that we intend in the appended claims to cover all such modifications as fall within the true spirit and scope of the invention.

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

1. In apparatus for masking the inside wall of a tubular vitreous light bulb, a spiral-shaped expandable mask having a fixed portion and a rotatable portion, support means securing said fixed portion against an inside wall of said bulb, and means for rotating said rotatable portion so as to expand said mask against the inside wall of said bulb.

2. Apparatus for masking the inside wall of a tubular vitreous light bulb having a bowl end and an open end opposite thereto, comprising a spiral-shaped expandable mask having a fixed portion and a rotatable portion, support means securing the fixed portion against an inside wall of said tubular bulb, a rotatable shaft concentric with said shield and rotatable through an angle of less than one turn, an actuating arm having one end secured to said shaft and the other end secured to said rotatable portion so as to move said rotatable portion along an arcuate path during rotation of said shaft to expand said mask against the inside portion of said bulb and means for rotating said shaft.

3. In apparatus for masking the inside wall of a tubular vitreous light bulb having a bowl end and a constricted open end opposite thereto, a spiral shaped expandable mask having a fixed portion and a rotatable portion, support means for securing said fixed portion against an inside wall of said tubular bulb, a rotatable shaft concentric with said mask and secured to said rotatable portion of said mask, and means for rotating said shaft so as to unwind said spiral-shaped mask and expand said mask against the inside tubular wall of said bulb.

4. Apparatus for coating the inside bowl portion of a tubular glass light bulb having a bowl end to be coated and open end opposite thereto, comprising in combination, means for securing said apparatus within said bulb in air-tight relation to the atmosphere, a spiral-shaped expandable mask having a fixed portion and a rotatable portion, support means securing said fixed portion against an inside wall of said bulb, means for rotating said rotatable portion so as to expand said mask against the inside wall of said tubular bulb, means for evacuating the air from within said bulb and around said mask, means for heating said bowl end of the bulb which is to be coated, and an electrical filament within said bowl for vaporizing coating material onto the wall of the bulb.

5. Apparatus for coating the inside bowl portion of a tubular vitreous light bulb having a bowl end to be coated and an open end opposite thereto, comprising in combination, means for securing said apparatus within said bulb in air-tight relation to the atmosphere, a spiral-shaped expandable mask having a fixed portion and a rotatable portion, support means securing said fixed portion against an inside wall of said bulb, a rotatable shaft concentric with said mask and rotatable through an angle of less than one turn, an actuating arm having one end secured to said shaft and the other end secured to said rotatable portion so as to move said rotatable portion along

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an arcuate path during rotation of said shaft to expand said mask against the inside portion of said bulb, means for evacuating the air from within the bulb and around the mask, means for heating the bowl end of the bulb which is to be coated, and an electrical filament within said bowl for vaporizing coated material onto the wall of the bulb.

6. Apparatus for coating the inside bowl portion of a tubular vitreous light bulb having a bowl end to be coated and an open end opposite thereto, comprising in combination, means for securing said apparatus within said bulb in air-tight relation to the atmosphere, a spiral-shaped expandable mask having a fixed portion and a rotatable portion, support means securing said fixed portion against an inside wall of said bulb, a rotatable shaft concentric with said mask and secured to said rotatable portion of said mask, means for rotating said shaft so as to unwind said spiral-shaped mask and expand said mask against the inside tubular wall of said bulb, means for evacuating the air from within said bulb and around said mask, means for heating said bowl end of the bulb to be coated, and an electrical filament within the bulb for vaporizing metallic coating onto the wall of the bulb.

7. In apparatus for forming design on the wall of a vitreous light bulb, a spiral-shaped expandable template having a fixed portion and a rotatable portion, support means securing said fixed portion against an inside wall of said bulb, means for rotating said rotatable portion so as to expand said template against the inside wall of the bulb.

8. Apparatus for forming design on the inside portion of a tubular glass light bulb having a bowl end and an open end opposite thereto, comprising in combination, means for securing said apparatus within said bulb in air-tight relation to the atmosphere, a spiral-shaped expandable template of the design to be formed, said template having a fixed portion and a rotatable portion, support means securing said fixed portion against an inside wall of said bulb, means for rotating said rotatable portion so as to expand said template against the inside wall of the bulb, means for evacuating the air from within the bulb and around the template, means for heating the portion

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of the bulb which is to be coated to form the design, and an electrical filament within said bulb for vaporizing metallic coating onto the wall of the bulb.

9. An apparatus for forming design on the inside wall of a glass bulb, comprising a template of the design to be formed, means for maintaining said template against the wall of said bulb, means for heating said bulb at least in the area on which said design is to be formed, means for evacuating the air from the bulb, and means for vaporizing a metallic coating material so as to form a metallic coating on the inside wall of the glass bulb which is not covered by the template.

10. An apparatus for forming design on the inside wall of a glass bulb, comprising, an expandable mask, means for expanding said mask against the inside wall of the bulb, said mask having the design to be formed cut through the wall of the mask so as to form a template, means for heating said bulb, means for evacuating air from said bulb, and means for vaporizing a metallic coating material so as to form a metallic coating on the inside surface of the bulb which is not covered by said mask.

11. An apparatus for forming design on the inside wall of a glass bulb, comprising an expandable mask adapted to be expanded against the inside wall of the bulb, means for expanding said mask against the inside wall of the bulb, a raised design formed on one edge of the mask, means for heating the bulb, means for evacuating air from the bulb, and means for vaporizing a metallic coating material within said bulb so as to form a metallic coating on the portions of the bulb which are not covered by said mask, whereby the raised design is formed on the inside wall of the bulb.

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