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APPARATUS FOR COATING FLUORESCENT LAMP TUBES

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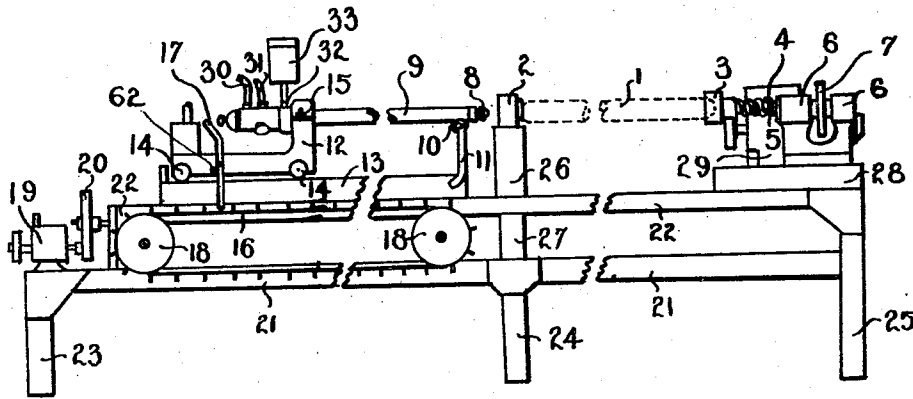


Fig. 1

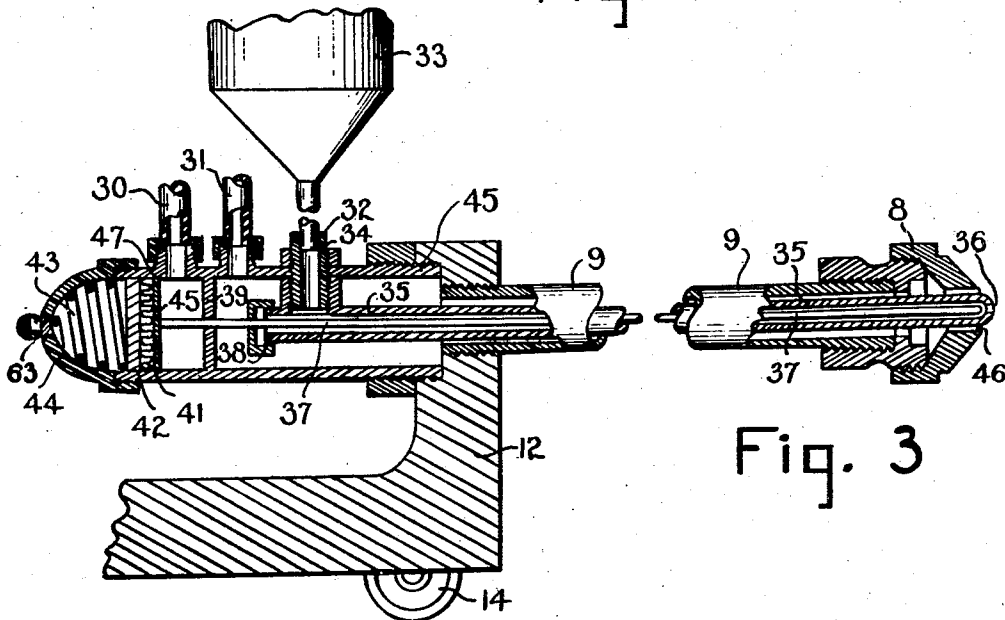
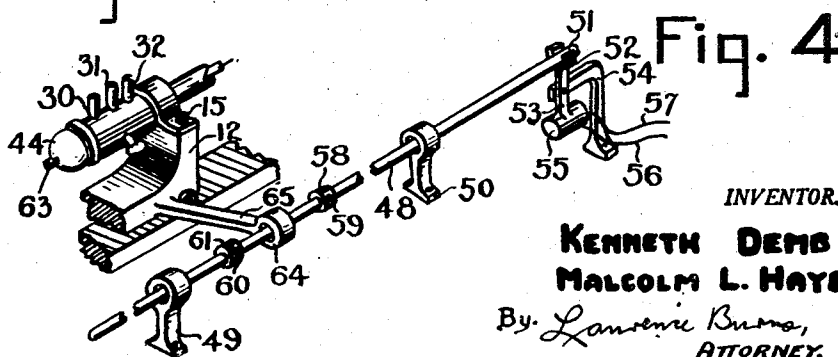


Fig. 2

Fig. 3



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APPARATUS FOR COATING FLUORESCENT
LAMP TUBES

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1 Claim. (Cl. 91—45)

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This invention relates to coating of elongated tubes on their interior surfaces, and particularly to coating the interior surfaces of glass lamp tubes with fluorescent materials.

An object of the invention is the provision of simple and effective means for coating the interior of elongated electric lamp tubes with fluorescent material.

A further feature of the invention is an apparatus for coating such a tube in which a spray nozzle moves through said bulb in an accurately aligned path to perform the spray.

Other features and advantages of the invention will be apparent from the following specification taken in connection with the accompanying drawings, in which:

Figure 1 represents a side view of the apparatus according to our invention;

Figure 2 is a view, chiefly in section, of the input end of the spraying nozzle;

Figure 3 is a view partly in section of the output end of the spraying nozzle;

Figure 4 is a view of the apparatus for starting and stopping the automatic retracting of the spraying nozzle from the tube being coated.

In Figure 1 the lamp bulb 1 is held rigidly in place by the supports 2 and 3 at each end of the bulb. Support 3 also serves to close off the corresponding end of the bulb. The spring 4 presses support 3 against the end of the tube 1. Inside the spring 4 is the rod 5 attached to the support and mounted in the bearings 6, in which it may rotate. The pulley 7 is fixed to rod or shaft 5 and may be rotated by a belt running from a motor. The rotation of the pulley 7 is transmitted to the bulb 1, through the rod 5 and support 3. A reduction gear may be used to reduce the speed.

The spray gun 9 is supported at its forward end by the roller 10 attached to support 11, while the rear or input end of said spray gun 9 is fixed by nut 15 to the carriage 12 movable along track 13 by means of wheels 14.

The carriage 12 is connected to chain 16 by means of clutch 17, (including its stop 62), so that the nozzle 8 can be inserted by hand through support 2 into tube 1 to a position near, but spaced slightly from the support 3, and will then be retracted automatically at constant speed by the chain 16 to the position shown in the figure. The path of retraction of the nozzle 8 must be accurately aligned with the position in which bulb 1 is held by supports 2 and 3, to give a uniform spray coating. Instead of moving the spray gun, the gun may be fixed and the bulb moved

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with respect to it to give the same relative motion.

The chain 16 is operated by the sprockets 18, one of which is driven from electric motor 19 through reduction gears 20. The heavy metal frame pieces 22 support the apparatus, assisted by legs 23, 24 and 25, uprights 26 and 27, and pieces 28 and 29.

Air under pressure flows into the spray gun 9 at inlets 30 and 31. The coating solution flows into inlet 32 from container 33 which would ordinarily be mounted higher than indicated in the drawing to secure proper flow.

Figures 2 and 3 show the nozzle 8 and its associated parts in more detail. The coating solution flows into inlet 32 and thence through pipe 34 into the internal liquid carrying tube 35, and out through opening 36 at the end thereof. The needle 37 normally closes said opening, and extends through bushing 38 and plate 39 to terminate in piston 41, backed by packing 41, plate 42, spring 43, and end piece 44 and its cap 63. Air flows into inlet 31 and around the internal liquid carrying tube 35 and out through opening 46 in nozzle 8 to mix with, and carry forward with it, the coating solution in the form of spray. Inlet 30 admits air to chamber to drive piston 47 back against the pressure of spring 43, to withdraw needle 37 to allow solution to flow out opening 36.

Figure 4 shows an attachment to carriage 12, which may be used to start and stop the driving motor 19. A ring 64 is supported from carriage 12 by piece 65. Rod 48 is set inside ring 64 and parallel to the direction of motion of carriage 12. The rod 48 moves through fixed ring supports 49 and 50 (which may be supported from the frame piece 22 of Figure 1). One end 51 of rod 48 is attached to an end 52 of lever 53, which is attached to support 54 as a fulcrum. The other end of lever 53 is attached to a conventional mercury switch 55, from which extend wires 56 and 57 to the control circuit of motor 19.

When the carriage 12 moves forward ring 64 pushes against ring 58, fixed to rod 48 by set screw 59. This raises mercury switch 55 and closes it, starting motor 19. When the carriage is retracted to the end of its journey, ring 64, bears against ring 60, fixed to rod 48 by set-screw 61, and pushes the switch 55 back to its open position, shutting off the motor 19. The rod must be balanced properly, or enough friction provided to keep it in either position to which it is pushed.

The same mercury switch control mechanism can be used also to open valves admitting air to

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inlets 30 and 31, and coating solution to inlet 32 when the motor 19 is started, and to close said valves when the motor is stopped, in a conventional manner.

We have used an atomizing air pressure of 70 lbs. per square inch, and a coating solution level of 72 inches above the nozzle 9. If desired, a form of spray not requiring atomizing air pressure can be used.

Although for clearness in Fig. 1, the chain 16 with its sprockets 18 is shown at the side of frame 22 and carriage 12, we prefer to place it directly below the carriage 12, so that there will be less tendency to sidewise motion of carriage 12 while being retracted. The carriage 12 and chain 16 should be quite heavy to further insure a smooth motion of the spray nozzle 9 through the tube 1. Any irregularity in this motion will produce unevenness in the coating.

The coated tubes 1 will not necessarily be dry immediately after spraying, and may be placed in a dryer for a few minutes, after which they may be baked in an oven at high enough temperatures under proper conditions to decompose and remove the nitrocellulose, leaving only the fluorescent powder in a coating on the interior of the lamp bulb. Such baking is described for example in U. S. Patent 2,267,727 issued December 30, 1941 to R. M. Gardner.

In some cases the holder 3 may have a small hole through which suction or air pressure lines can be connected to the end of the tube. In this way the spray near the end of the tube can be forced back from, or brought toward, the end of the tube 1 being coated to control the thickness of coating at the end of the bulb to a desired value.

What we claim is:

Apparatus for applying a suspension of luminescent material to the inner wall of an elongated glass envelope, said apparatus comprising:

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a base member, a pair of supporting members mounted on said base member for embracing the ends of said envelope, one of said supporting members being provided with an aperture therein, a track mounted on said base member, a carriage on said track, a spray gun mounted on said carriage, said spray gun comprising an elongated barrel and a nozzle mounted on one end of said barrel, said nozzle having an aperture therein, means for supplying air under pressure to said nozzle, means for supplying a suspension of luminescent material to the aperture in said nozzle, means for controlling the opening and closing of the aperture in said nozzle whereby the flow of luminescent material suspension therefrom may be regulated, and means for moving forward and retracting said carriage along said track and said nozzle through the aperture in one of said supporting members and toward the other of said supporting members, whereby a coating of luminescent material may be applied to the inner wall of an elongated glass envelope, the ends of which are held by said pair of supporting members.

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