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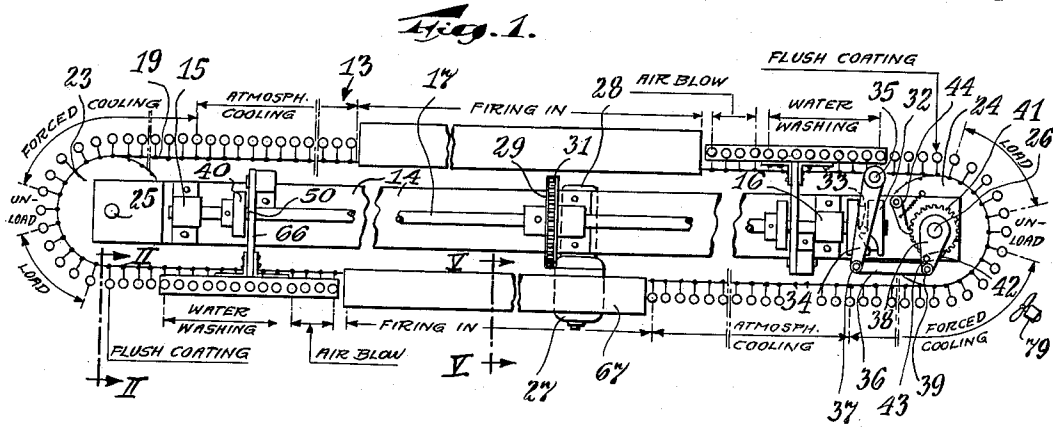
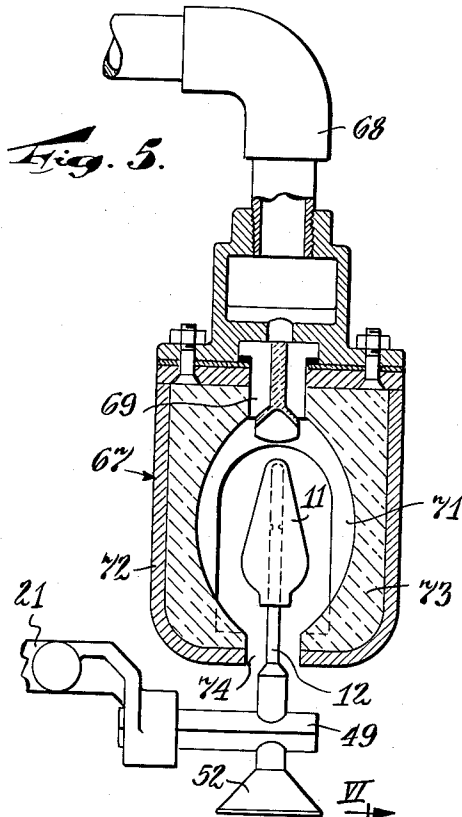
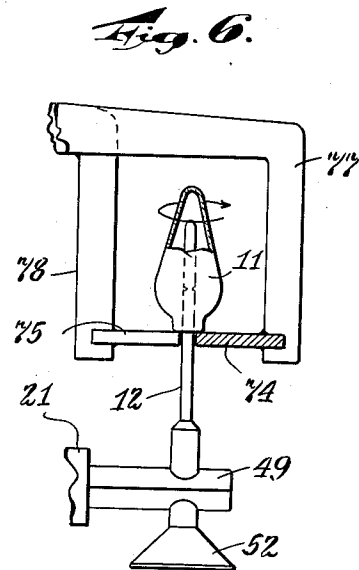
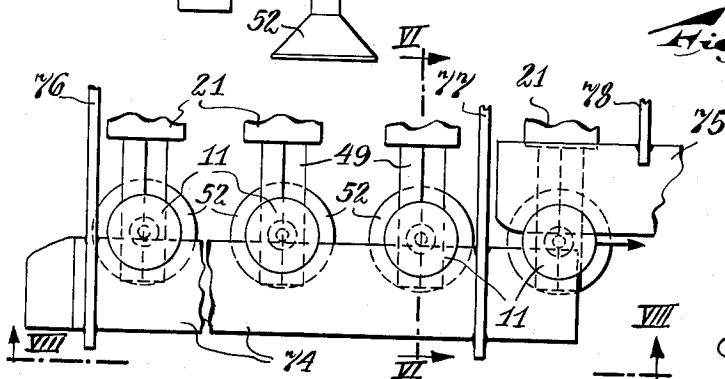
J. H. GREEN ET AL

2,716,620

MACHINE AND METHOD FOR COATING BULBS

Filed Jan. 26, 1952

2 Sheets-Sheet 1



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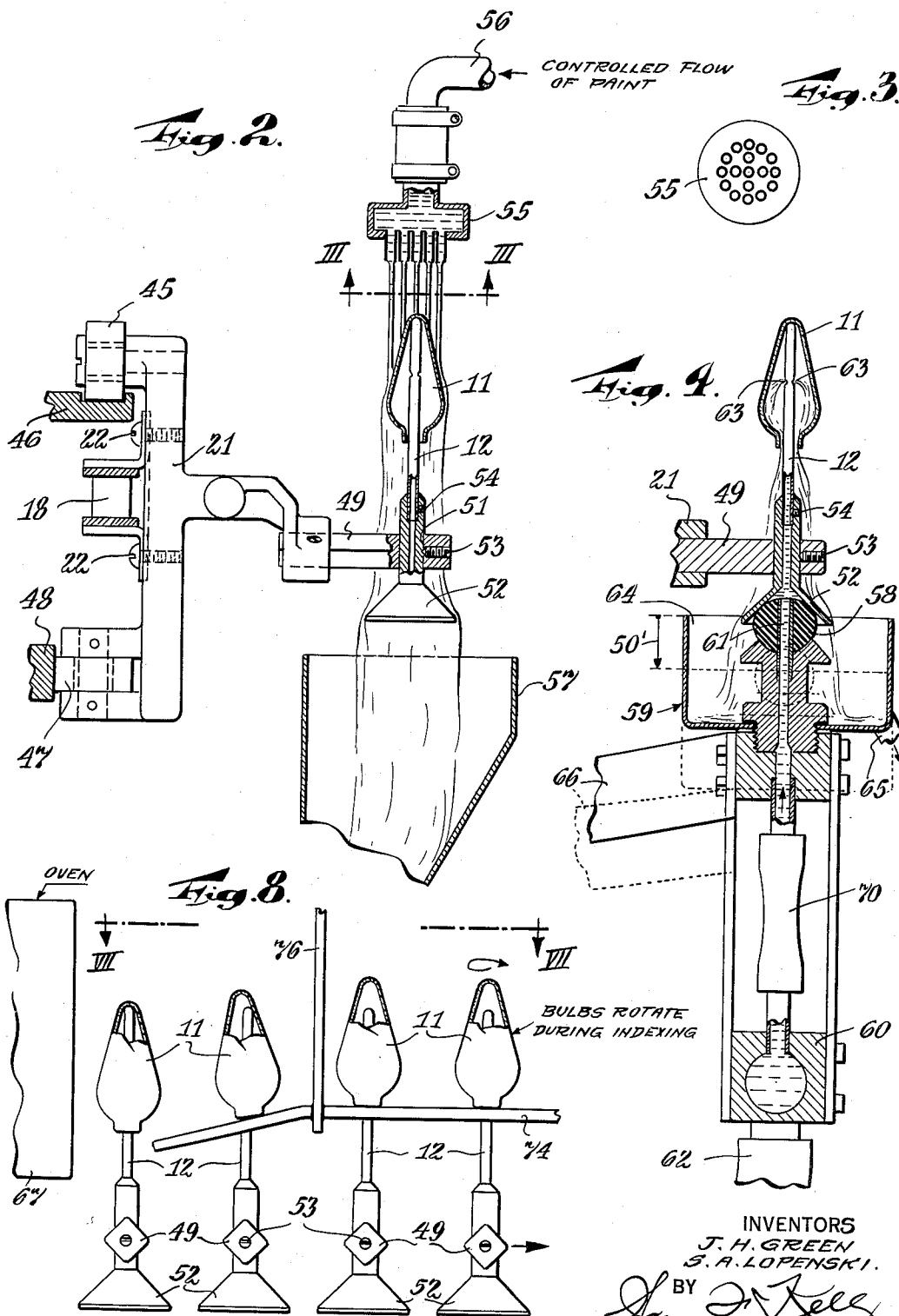
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MACHINE AND METHOD FOR COATING BULBS

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10 Claims. (Cl. 117-94)

This invention relates to the application of enamel to incandescent electric lamp bulbs and particularly those of the Christmas tree type.

The principal object of our invention, generally considered, is to efficiently coat bulbs with enamel, remove the surplus therefrom, bake the enamel thereon, and cool in an expeditious manner.

Another object of our invention is the provision of a machine for automatically coating lamp bulbs with enamel, and particularly such of the ceramic type, comprising a conveyor, means for driving the same and causing it to index from station to station, tubular means on said conveyor for holding a series of bulbs with their axes vertical, means disposed at one station along said conveyor for spraying or in other ways applying enamel on said bulbs, one by one, as they index thereat, means at a succeeding station for removing surplus enamel from the bottom edge portions of said bulbs, means at succeeding stations for drying the bulbs and baking the enamel thereon, means for then lifting said bulbs off said tubular supporting means and rotating them while cooling, and means at the final stations for speeding-up the cooling of said bulbs prior to removal from the machine.

A further object of our invention is the method of coating incandescent electric lamp bulbs with enamel, particularly such of the ceramic type, comprising moving said bulbs step by step while supported interiorly on hollow members, spraying enamel vertically downward on said bulbs while so supported, forcing cleansing fluid through said hollow members to remove surplus enamel from the bottom edge portions of said bulbs, blowing air through said hollow members to remove surplus cleansing fluid, heating said bulbs to dry and bake the enamel thereon and to dry the residual cleansing fluid in bulb interiors, thereafter raising said bulbs from engagement with the upper ends of said supporting tubular members while rotating the same, and finally blowing air on said bulbs to speed up the cooling thereof.

Other objects and advantages of the invention will become apparent as the description proceeds.

In the drawing:

Figure 1 is a plan of a machine embodying our invention.

Figure 2 is a vertical sectional view on the line II—II of Figure 1, in the direction of the arrows, illustrating the application of enamel to a bulb.

Figure 3 is a horizontal sectional view on the line III—III of Figure 2, in the direction of the arrows.

Figure 4 is a view corresponding to Figure 2, but showing a coated bulb at a subsequent position where surplus enamel or paint is being removed from the lower edge thereof by streams of cleansing fluid introduced through a hollow support.

Figure 5 is a sectional view of such a bulb in the Lehr on the line V—V of Figure 1, in the direction of the arrows.

Figure 6 is a sectional view of a bulb on the line VI—VI of Figure 7, after the coating has been baked thereon,

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during the process of cooling after raising it from a supporting tubular member while causing rotation thereof due to a supporting shelf contacting its lower edge.

Figure 7 is a plan as viewed on the line VII—VII of Figure 8, in the direction of the arrows.

Figure 8 is an elevational view, on the line VIII—VIII of Figure 7, in the direction of the arrows.

The purpose of the invention is to apply a smooth uniform, desirably ceramic, enamel or paint coating of predetermined color to bulbs for incandescent electric lamps, particularly those of the miniature or Christmas tree type. A machine has been produced of optimum simplicity, which can be constructed at low cost and will operate with low maintenance. One problem was to ascertain if a typical lime glass frit enamel could be used to coat lead-glass bulbs. It was feared that lime glass frit enamel would melt too close to the bulb softening temperature, thereby resulting in bulb deformation on enamel baking. It was found, however, that lead glass bulbs could be used with present lime frit enamels, as well as lead frit enamels, with a satisfactory baking and without bulb deformation.

The elements of the machine to be described in detail are an indexing-type horizontal conveyor driven by suitable means, a simple non-rotating bulb holder, a continuous down-flush recirculating coating system, an end cleaning method which employs an internal water spray for removing surplus paint from the lower edge portions of said bulbs to avoid interfering with butt-sealing thereof, a simple refractory burner designed so as to form a furnace or Lehr, and a pre-heat section which obtains its heat for drying by using electric strip heaters and the products of combustion from the burner.

Referring to the drawing in detail, like parts being designated by like reference characters, the apparatus of our invention, one embodiment only of which is illustrated, comprises a conveyor for supporting and transporting a series of bulbs, such as those used in the manufacture of incandescent lamps, such bulbs being designated by the reference character 11. These bulbs are supported during processing on a series of hollow or tubular members 12, in turn carried by a conveyor, generally designated 13, and indexed from station to station.

Lamp conveyor and frame

The frame of the present embodiment comprises a table 14 which extends the length of the machine and may be in the form of a channel member with the web at the top and the flanges projecting downwardly. This table may be supported from the floor by a plurality of legs (not shown). Upstanding from the table are a pair of bearings 15 and 16 which carry the drive shaft 17.

The conveyor for the lamps 11 comprises a series of links 18 forming a chain 19 and to which a series of lamp-support members 21 are connected, as by means of screws 22. The chain passes around sprocket wheels 23 and 24, only diagrammatically illustrated in Figure 1, on shafts 25 and 26, respectively.

Drive mechanism

The power drive mechanism for the conveyor comprises a motor or other prime mover 27 driving, through reduction gearing 28, a chain 29 passing over sprocket wheel 31. The latter is mounted on drive shaft 17 turning in the bearings 15 and 16 on the table 14. The shaft carries at one end a cam 32 in which rides a roller 33 on a lever 34 pivoted at 35 to the frame of the machine. The free end of the lever 34 is connected to link 36 by pin 37. The other end of the link is connected to a crank 38 by a pin 39. Crank 38 is mounted on the shaft 26 which carries the sprocket wheel 24.

The shaft 26 also carries a ratchet 41 engaged by a

pawl 42 connected to the crank 38 by pin 43, whereby reciprocation of the link 36, at each revolution of the shaft 17, turns the shaft 26 sufficiently to move, through the chain of mechanism described, the lamp-supporting members 12 from one station to the next. A pawl 44, 5 pivoted to the table and spring-biased toward the ratchet 41, is provided to hold said ratchet in a station position, while the crank 38 is being returned preparatory to making the next indexing movement.

In order to allow for properly-supported travel of the members 21, each carries adjacent its upper end a horizontally pivoted roller 45 traveling on a track 46 carried by the frame of the machine. The lower portion of each support member 21 also carries a vertically pivoted roller 47 engaging a track portion 48 supported on the frame of the machine. Each support member has an outstanding rod 49 provided with a normally vertical aperture 51 in which is received an inverted funnel member 52, secured in place by a set screw 53. In the stem of each funnel member is mounted one of the tubular bulb support members 12, held in adjusted position by set screw 54.

Loading, paint spraying and paint surplus removal

The bulbs are loaded on, and with the lower open ends receiving, the support members 12 at both ends of the machine at the positions in Fig. 1 marked "load." The conveyor is caused to rotate in a counterclockwise direction, carrying the bulbs one by one to the stationary position marked "flush coating," one of said positions being at each side of the machine adjacent opposite ends. The operations at one side only will be described, as those at the other side are duplicational. The flush coating operation is illustrated most clearly in Figures 2 and 3, paint being sprayed from a nozzle 55, to which it is introduced through pipe 56 from a pump or other suitable device for drawing it from a reservoir (not shown), said paint or enamel flowing down over the stationary bulb 11, at the one location only for each bulb, and over the flaring lower portion of the inverted funnel member 52, the surplus being caught in a receiving funnel 57 and returned to said reservoir for recirculation.

After passing to the subsequent positions designated "water washing" in Figure 1, the lower end of each inverted funnel member is engaged by one of the rubber ball members 58 on the upper ends of pipes 61 from a wash fluid or water supply mechanism 59. Water is fed thereto through flexible hose 62 from a water main or other water supply device (not shown), from whence it passes up through manifold 60, the several flexible hose connections 70, the funnel stems, sprays out of apertures 63 in the supporting members 12, from there out of the lower ends of the supported bulbs 11, carrying with it surplus paint from the lower edges of the bulbs, and is caught in the receiving tank portion 64, from which it is wasted through pipe 65. The device 64 is carried on a lever 66 which is pivoted to the frame of the machine and moved up and down automatically by cam 40 acting on roller 50 pivotally carried thereby, to and from the washing position illustrated in Figure 4. After such washing operation is completed, the device 64 is withdrawn or lowered, a distance shown by the arrow 50', to the dotted-line position, to allow the supported bulbs to pass on to the next positions.

At the positions designated "air blow," mechanism similar to that illustrated in Figure 4 is provided but, instead of water, drying gas or air is introduced in a similar manner into the bulbs through apertures 63 to remove surplus water or wash fluid therefrom preparatory to paint drying and firing.

Paint drying and baking lehr

The paint or enamel previously applied to the bulbs is dried and fired in a lehr generally designated 67 and illustrated in Figures 1 and 5. This lehr is supplied with heat

from a gas and air mixture main 68, said mixture passing through a manifold into burner orifices 69, where it burns in the chamber 71. The side walls 72 of the lehr are lined with ceramic 73. This chamber, as will be seen from Figure 5, is open in the bottom, providing a slot 74 through which pass the supporting members 12 carrying the lamps 11, traveling from the open access end to the open exit end of the lehr. The burners need only be near the center of the lehr, the products of combustion passing toward the ends thereof so that the bulbs are gradually heated, dried, and finally baked as they reach the central and hottest parts of the lehr, thereafter gradually cooling toward the exit end thereof. Electric strip heaters (not shown) may supplement the products of combustion in the preheating section of the lehr.

Cooling and unloading

After passing from the exit end of the lehr 67, as viewed in Figures 6, 7 and 8, the bulbs are partially removed from the tubular support members 12 by the lower edges thereof successively engaging a series of shelves 74, 75, etc., supported from the frame of machine by brackets 76, 77, 78, etc., said shelves 74 and 75 alternating from one side to the other, as viewed in Figure 7, so that the lower edges of the bulbs are first engaged at one side and rotated in one direction as they pass therealong, and then engaged at the other side and rotated in the opposite direction, thereby effecting an efficient but gradual cooling of the lamps while out of supporting contact with the hollow support members 12, thus avoiding the likelihood of cracking due to uneven cooling.

After cooling in this manner in relatively still air, they finally pass to positions near the end of the conveyor where forced cooling is effected, as by means of a fan 79. After this cooling to a moderate temperature, they are unloaded by hand.

From the foregoing it will be seen that we have provided a machine and method whereby bulbs are loaded at one end of the machine on hollow vertical supports, the lower ends of which flare, and removed at the other end, after being flush-coated with paint or enamel, with excess removed from the bottom edges thereof, by fluid-carrying means which resiliently registers inside of said flared lower portions, excess wash fluid removed, by similar gas carrying means, and thereafter dried, fired, and cooled in a gradual but expeditious manner, the cooling first being effected in still air while the bulbs are rotated, and then quickly cooled as by means of a fan prior to removal.

Although a preferred embodiment of our invention has been disclosed, it will be understood that modifications are contemplated.

We claim:

1. A machine for automatically coating bulbs comprising a conveyor, means for driving said conveyor and causing it to index from station to station, means on said conveyor for holding a series of bulbs with their axes vertical, means disposed at one station along said conveyor for spraying enamel on the exterior surfaces of said bulbs, one by one, as they are stationary and indexed thereat, and means at succeeding stations for drying and baking the enamel on said bulbs.

2. A machine for automatically coating bulbs comprising a conveyor, means for driving said conveyor and causing it to index from station to station, hollow means on said conveyor for holding a series of bulbs with their axes vertical, means disposed at one station along said conveyor for spraying enamel on the exterior surfaces of said bulbs, one by one, as they index thereat, means at a succeeding station for introducing washing fluid through said hollow means for removing surplus enamel from the bottom edge portions of said bulbs, one by one, as they index thereat, and means at succeeding stations for drying and baking the enamel on said bulbs.

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3. A machine for automatically coating bulbs with paint comprising a conveyor, means for driving said conveyor and causing it to index from station to station, hollow means on said conveyor for holding a series of bulbs with their axes vertical, means disposed at one station along said conveyor for spraying paint on the exterior surfaces of said bulbs, one by one, as they index thereat, means at a succeeding station for introducing washing fluid through said hollow holding means, for removing said surplus paint from the bottom edge portions of said bulbs, one by one, as they index thereat, means at a succeeding station for introducing drying gas through said hollow holding means for removing adhering washing fluid, and means at succeeding stations for drying and baking the paint on said bulbs.

4. A machine for automatically coating bulbs with paint comprising a conveyor, means for driving said conveyor and causing it to index from station to station, hollow means on said conveyor for holding a series of bulbs with their axes vertical, means disposed at one station along said conveyor for spraying paint on the exterior surfaces of said bulbs, one by one, as they index thereat, means at succeeding stations for drying and baking said paint on said bulbs, and means for lifting said bulbs off said hollow supporting means and rotating them while cooling.

5. A machine for automatically coating bulbs with paint comprising a conveyor, means for driving said conveyor and causing it to index from station to station, hollow means on said conveyor for holding a series of bulbs with their axes vertical, means disposed at one station along said conveyor for spraying paint on the exterior surfaces of said bulbs, one by one, as they index thereat, means at succeeding stations for drying and baking said paint on said bulbs, means for after baking lifting said bulbs off said hollow supporting means and rotating them while cooling, and means at the final stations for blowing air on said bulbs to shorten the necessary cooling time prior to removal from the machine.

6. A machine for automatically coating bulbs with paint, comprising a conveyor, means for driving said conveyor and causing it to index from station to station, hollow means with flared lower portions on said conveyor for holding a series of bulbs with their axes vertical, means disposed at one station along said conveyor for spraying paint on the exterior surfaces of said bulbs one by one as they index thereat, means at a succeeding station for resiliently registering inside of said flared lower portions for introducing washing fluid through said hollow holding means for removing surplus paint from the bottom edge portions of said bulbs, one by one, as they index thereat, means at a succeeding station for resiliently registering inside of said flared lower portions for introducing drying gas through said hollow holding means for removing adhering washing fluid, means at succeeding stations for drying and baking the paint on said bulbs, shelf means alternating at opposite sides for lifting said bulbs off said hollow supporting means and rotating them

in one direction and then in the other while cooling, and fan means at the final stations for blowing air on said lamps to shorten the necessary cooling time prior to removal from the machine.

7. The method of automatically coating bulbs with paint comprising inserting a series of said bulbs over a line of stationary hollow holding means, spraying paint on the exterior surface of said bulbs one by one while stationary, introducing water through said hollow holding means to wash off surplus paint adherent to the bottom edges thereof, blowing air through the same holding means to remove surplus water, drying and baking said bulbs while so held, rotating said bulbs while cooling after raising them from said hollow holding means, and finally blowing air thereon to effect quick cooling thereof.

8. The method of coating open-ended bulbs comprising holding the same stationary with their open ends at the bottom, spraying liquid coating material thereover from above while so held, and thereafter spraying the interior of said bulbs with washing liquid to remove the surplus coating material from the lower edges of the open end portions thereof.

9. A machine for coating bulbs comprising a conveyor, means for driving said conveyor and causing it to move step by step from one station to the next, hollow tubular means on said conveyor over which the open ends of bulbs are placed so that the tops of said bulbs are supported thereby, means disposed at one station along said conveyor for spraying coating material on the exterior surfaces of said bulbs, one by one while they are held stationary, and means at a succeeding station for introducing washing fluid through said tubular means for removing surplus coating material from the bottom edge portions of said bulbs, one by one, at said succeeding station.

10. A machine for coating bulbs comprising a conveyor, means for driving said conveyor and causing it to move step by step from one station to the next, hollow tubular means on said conveyor over which the open ends of bulbs are placed so that the tops of said bulbs are supported thereby, and means disposed at one station along said conveyor for spraying coating material on the exterior surfaces of said bulbs, one by one while they are held stationary.

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