Jan. 13, 1942. J. J. MALLOY ET AL 2,270,132

COATING APPARATUS

Filed Nov. 26, 1938 2 Sheets-Sheet 1

Fig. 1.

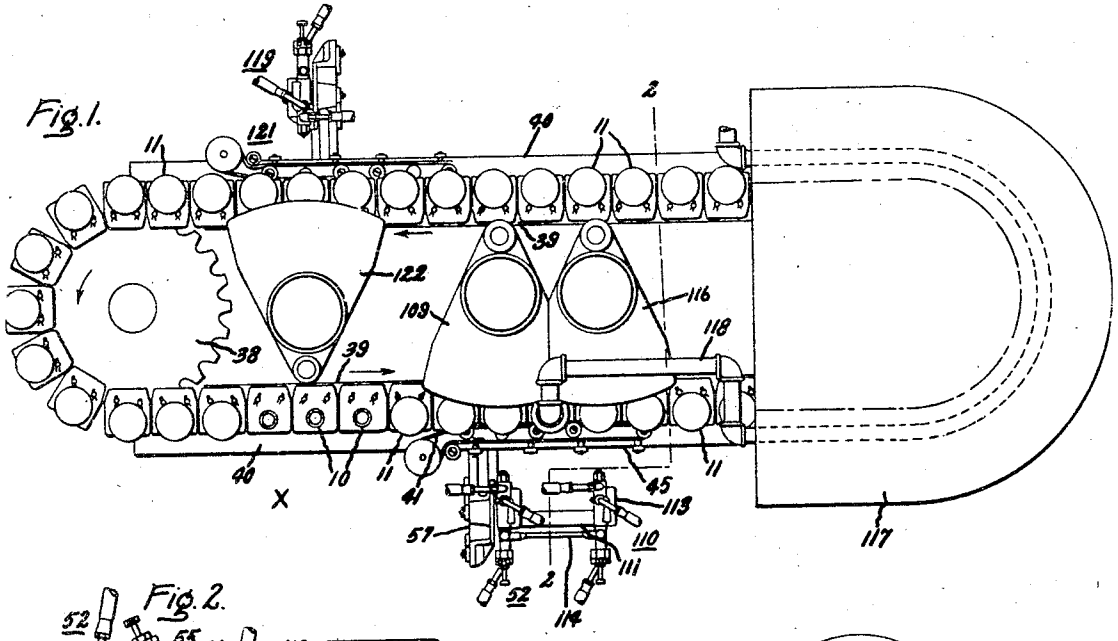


Fig. 2.

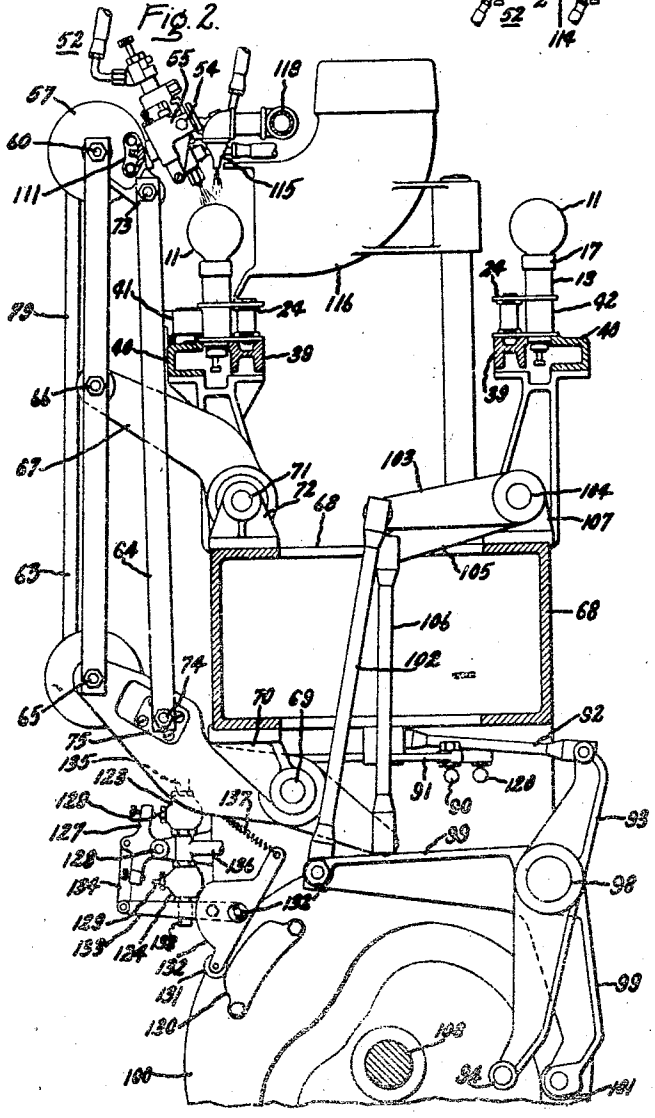
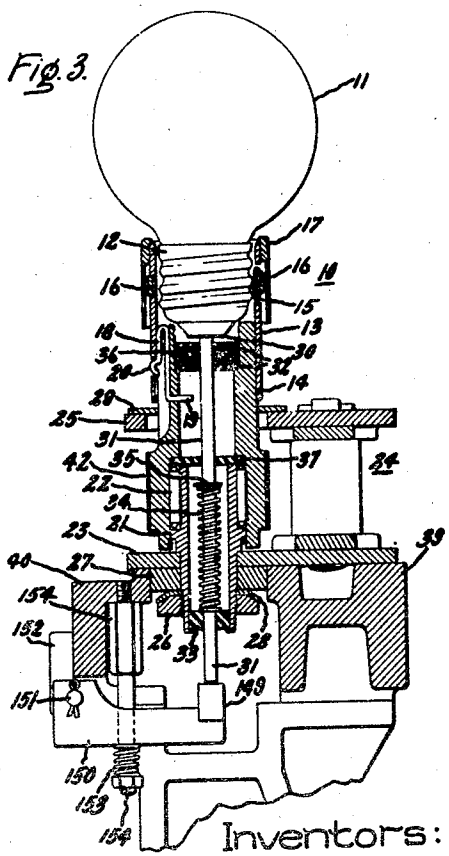


Fig. 3.



Inventors:
John J. Malloy,
Erich M. Hofmann,
by Harry E. Davidson
Their Attorney.

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Fig. 4.

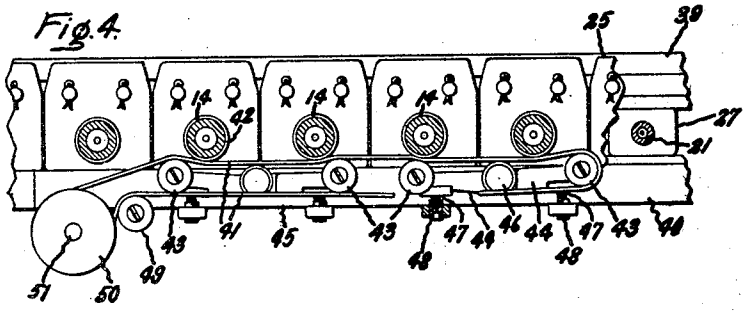

Fig. 5.

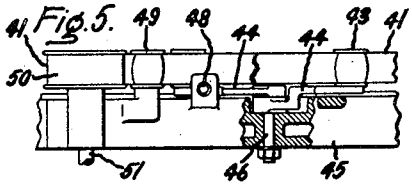

Fig. 6.

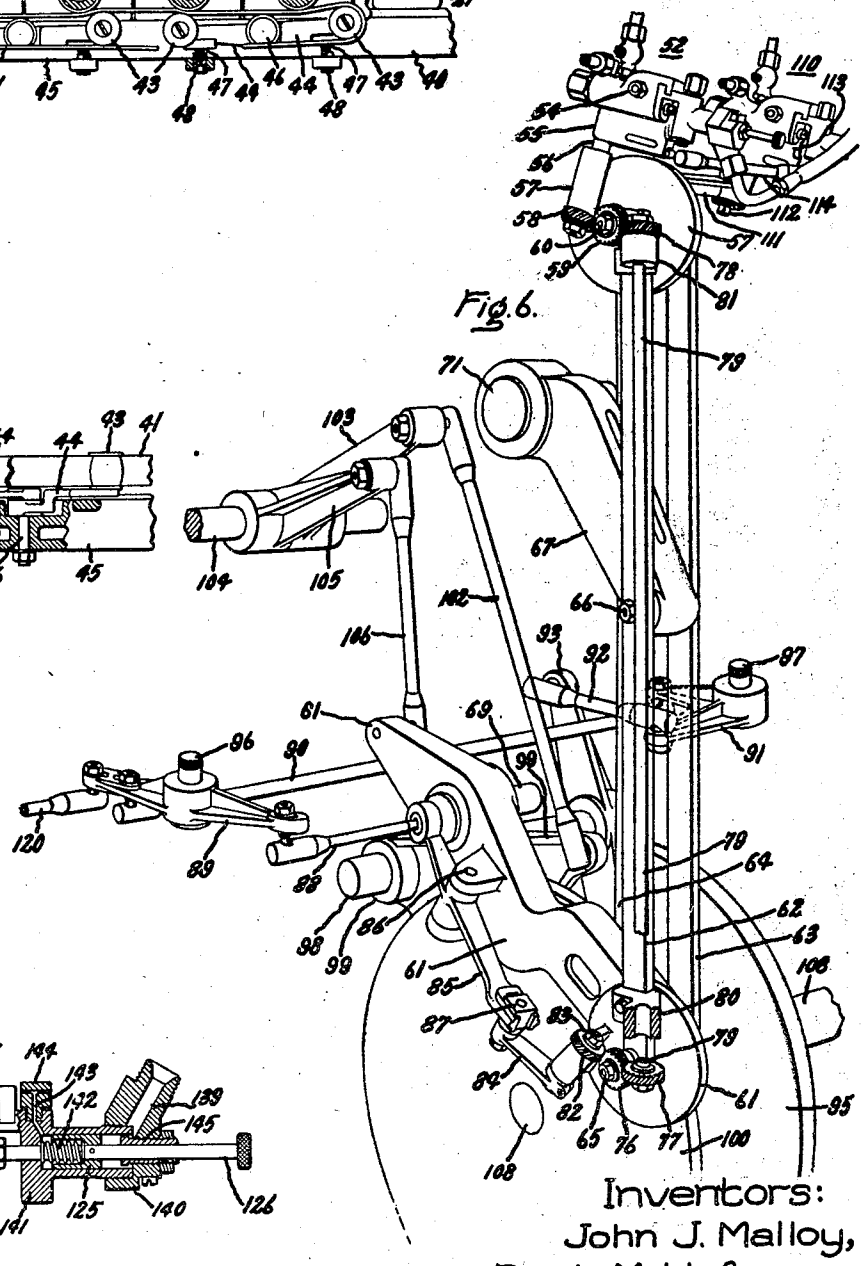

Fig. 7.

Inventors:
John J. Malloy,
Erich M. Hofmann,
by Harry E. Dunham
Their Attorney

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UNITED STATES PATENT OFFICE

2,270,132

COATING APPARATUS

John J. Malloy, Cleveland Heights, and Erich M. Hofmann, Euclid, Ohio, assignors to General Electric Company, a corporation of New York

Application November 26, 1938, Serial No. 242,582

3 Claims. (Cl. 91—45)

Our invention relates to coating apparatus, and more particularly to apparatus for automatically coating the exterior of an incandescent lamp bulb or the like with preferably a translucent colored or a diffusing coating.

Inasmuch as the light from the incandescent lamp passes through a coating applied thereto, all imperfections therein are readily apparent and the coating must therefore be applied very uniformly and must be of uniform thickness on all lamps to be satisfactory. Considerable difficulty is experienced in applying the coating in a satisfactory manner at a high rate of speed and the principal object of our invention is to provide a machine for applying the coating in an improved manner adaptable for high speed operation. Another object of our invention is to provide apparatus having a higher rate of production than heretofore. Still other objects and advantages of our invention will appear from the following description and the accompanying drawings of one species thereof.

In the drawings, Fig. 1 is a plan view of the machine of our invention; Fig. 2 is a vertical section through our machine along the line 2—2 of Fig. 1; Fig. 3 is a similar section on an enlarged scale of a head and a portion of the track for supporting said head; Fig. 4 is a plan view of one of the head spinning apparatus with the heads shown in connection therewith partially broken away; Fig. 5 is a side elevation of a portion of said apparatus; Fig. 6 is a perspective view of the connected spray guns and the apparatus for producing the movement thereof; and Fig. 7 is a side elevation of one spray gun with the portion controlling the operation thereof shown in section.

The machine comprises a plurality of heads 10 which in their regular order of movement pass before an operator located preferably at X who inserts a lamp 11 in each. The operator inserts the base 12 of the lamp 11 in the open end of the sleeve 13 as shown in Fig. 3 which in turn is mounted on the hollow spindle 14. In this position, the base 12 is frictionally engaged by the button 15 which lies in an aperture in the sleeve 13 and which is fastened to a split spring 16 extending nearly completely around the sleeve 13. The spring 16 presses the button 15 against the base 12 so that lamp 11 is held in place and is protected by a second sleeve 17 mounted on the end of sleeve 13 which keeps the lamp coating material and all other foreign matter from interfering with the operation thereof. Since it is often desirable to remove the sleeve 13 from the spindle 14 in order to clean the apparatus and substitute a similar sleeve adapted to hold another size or form of lamp base, said sleeve 13 is held in place by a spring 18 which allows said sleeve to be pulled from the hollow spindle 14. The spring 18 lies in a slot in the hollow spindle 14 and engages said hollow spindle 14 through the angular bent portion 19 which is located in a transverse opening therein and also engages said sleeve 13 through the loop 20 which extends into an opening therethrough. Support is provided for the hollow spindle 14 by the second hollow spindle 21 which is engaged by the rollers of the bearing 22 therebetween and which is fastened to the lower plate 23 of an endless chain 24. The lower plate 23 together with the upper plate 25 forms a link in the chain 24 which is made up of alternate links of the plates 23 and 25 of the other heads 10 in the same manner and which forms the carrier for and means of advancing the heads 10 through the machine. The second spindle 21 is fastened to the plate 23 by the nut 26 on the lower end thereof which also clamps the block 27 to the lower end thereof and is kept from loosening by the lock washer 28. A loose washer 29 covers the larger hole in the upper plate 25.

When the lamp 11 is properly positioned in the heads 10, the eyelet 30 on the end of the base 12 butts against the end of the contact pin 31 which provides for the making of an electric connection to the lamp 11. At this instant, no other electrical connection is made to the pin 31 and it is held upright by the insulating washers 32 and 33 which engage the hollow spindles 14 and 21 and pushed upward against the eyelet 30 by the expanding force of the spring 34 which butts against the washer 33 and the flange 35 on said pin 31. The felt washer 36 and insulating washer 37 prevent foreign matter from entering the interior of the head 10.

The movement of the heads 10 which is produced by the chain 24 is brought about by means (not shown) engaging said chain 24 through a sprocket (also not shown) at the right end of the machine and occurs in the direction indicated at a uniform rate. The chain 24 also extends about the idling sprocket 38 on the left end of the machine which, together with the driving sprocket (not shown), controls the general path of movement of the heads 10. The actual path of movement of the heads 10, however, is controlled by the inner and outer rails 39 and 40 of a track which is located along the straight portions of said path between the end

sprockets of the chain 24 and which engages the blocks 27 on the lower ends of said heads 10 and the lower plate 23 thereof. The plates 23 rest directly on the top surface of the rails 39 and 40 which carry the entire weight of the heads 10 and prevent sagging of the chain 24.

As the heads 10 are advanced out of the loading positions, they are carried into engagement with a rapidly moving belt 41 which causes them to rotate. The belt 41, as shown in detail in Figs. 4 and 5, engages a portion of the hollow spindle 14 having a band 42 of cotton tape thereabout which increases the friction therebetween and is pressed against said hollow spindle 14 by a series of rollers 43 located at intervals along its length. The rollers 43 are spaced at the proper intervals to keep the belt 41 against each of the hollow spindles 14 engaged and are each mounted on an arm 44 pivoted on a portion 45 of the outer rail 40 of the track. The arms 44 are mounted in pairs on a pin 46 extending from the rail 40 which is recessed to give clearance therefor and are swung so as to carry the rollers 43 toward the heads 10 by the springs 47 which butt against the screws 48 carried by raised parts of said rail portion 45. The belt 41 is endless and after passing about the roller 43 at the right end of the spinning apparatus passes along behind the three other rollers 43, into contact with the roller 49 and around the pulley 50 before again contacting the heads 10. The roller 49 is adjustably mounted on the rail portion 45 and can be shifted to take up slack in the belt 41 if desired, whereas the pulley 50 is a driven member and causes the necessary movement of the belt 41. The means for turning the pulley 50 is not shown and obviously may be an electric motor or other apparatus turning the shaft 51 which is attached to the pulley 50 and which is carried in a bearing in the rail portion 45.

Shortly after being caused to rotate, the heads 10 carry the lamps 11 into the field of a spray gun 52 which is then caused to operate and spray said lamp 11 with the desired coating. The spray gun 52 is of conventional design being preferably a type used previously for this purpose but is automatically moved so as to follow the lamp 11 for an interval and to move up and down so as to spray the entire surface of said lamp 11 uniformly. As shown in Figs. 2 and 6, the spray gun 52 is attached by means of bolt 54 to the bracket 55 which is supported by a pin 56 projecting therefrom and pivotally mounted in the bracket 57. The aiming of the gun 52 which causes it to follow the lamp 11 is produced by the rotation of the pin 56 in bracket 57 and is brought about through the gear 58 on the end thereof which meshes with the gear 59 on the end of the pin 60 extending from the bracket 57. The aiming of the gun 52 which causes it to reach all parts of the lamp 11 on the other hand depends on both the vertical movement of the bracket 57 and the rotation thereof about the axis of the pin 60. These movements of the bracket 57 are brought about by the lever 61 to which said bracket 57 is attached by the bars 62, 63 and 64 (see Figs. 2 and 6) and are substantially independent of the following movement of the gun 52. As shown bars 62 and 63 are pivotally attached by means of the pins 60 and 65 to the bracket 57 and lever 61 respectively and are also pivotally attached by means of pin 66 to the arm 67 which together with the lever 61 establishes the path of movement (vertically) of said bracket 57. Both the lever 61 and the arm 67 move about a pin supported by the frame 68 of the machine, the former about the pin 69 held by the bracket 70 and the latter about the pin 71 held by the bracket 72. The bar 64 causes the rotation of the bracket 57 about the pin 60 since it is attached to said bracket 57 by the stud 73 and to the lever 61 by the stud 74 and the block 75. The rotation of the gear 59 which causes the gun 52 to follow the head 10 results from a corresponding rotation of the gear 76 on the pin 65 carried by the lever 61 and is transferred thereto through the gears 77 and 78 on the opposite ends of the rod 79 which mesh with the gears 76 and 59 respectively. The rod 79 retains the gears 77 and 78 in the proper relation to the gears 76 and 59 at all times since it is supported by the arms 80 and 81 extending from the bar 62. The system which rotates the gear 76 includes the gear 82 which meshes therewith, the pin 83 which is attached to said gear 82 and the arm 84 and supported by an extending portion of the lever 61 and the lever 85 which pivots on a pin 86 carried by said lever 61 and engages the block 87 carried by a stud in the end of arm 84. The end of the lever 85 is located on the axis of the pin 69 so as not to be disturbed by the rotation of the lever 61 and is connected through the rod 88, lever 89, rod 90, lever 91 and rod 92 to a lever 93 which engages through a roller 94 on its lower end the ways of the cam 95. The levers 89, 91 and 93 are pivotally mounted on the pins 96 and 97 and the rod 98 respectively which are held in position by the various positions of the frame 68 of the machine. The motion of the lever 61 which causes the gun 52 to reach all parts of the lamp 11 is brought about by the lever 99 on the rod 98 which engages the ways of cam 100 through the roller 101 and is connected thereto through the rod 102, the arm 103, the shaft 104, the arm 105 and the rod 106. As shown in Fig. 2, shaft 104 is supported by a bracket 107 extending from the frame 68. Since both cams 95 and 100 are mounted on a common shaft 108 which is driven by the same means (not shown) moving the chain 24 and the heads 10, the various movements of the gun 52 occur in proper sequence and in proper timing with the movements of the heads 10. The ways of the cams 95 and 100 are shaped in this instance so that the spray gun 52 is always aligned with the axis of rotation of the lamp 11 and is directed and shifted so that it gradually sprays the lamp 11 from the bottom to the top and then from the top to the bottom. Other shapes and sizes of electric lamps 11 can be sprayed by the machine equally well, since provision is made for the adjustment of the up and down movement of the guns 52, 110 and 119. This adjustment is made by altering the position of the block 75 on the lever 61 which changes the vertical motion of the bar 64 although the movement of the lever 61 remains unchanged. All of the spray does not necessarily strike the lamp 11 but passes back into the mouth of the funnel 109 which is connected to the usual suction ventilating system so that all particles of coating deflected from the lamp 11 as well as all free spray and fumes therefrom are drawn off. With this ventilating system, there is less chance of free particles of the coating striking and spotting the adjacent lamps 11.

In some instances, a second spray gun such as shown at 110 is desired as a sufficiently thick coating cannot always be applied by the single spray gun 52 in the short period allowed. Such an arrangement can also be used for applying

two different colors as tints or two thinner coats of the same color where the coating material tends to run if applied all at once. The spray gun 110 is connected to the operating mechanism of the first gun 52 through the arm 111 which is fastened to the bracket 57 and which engages the pin 112 extending from the bracket 113 to which said gun 110 is attached. By this construction, the second spray gun 110 is caused to move vertically and aimed at the different parts of the lamp 11 in the same manner as the prior gun 52. A rod 114 extending between studs in the back end of the brackets 55 and 113 causes said brackets to be turned about the pins 56 and 112 in a like manner so that the guns 52 and 110 follow the movements of the respective lamps 11 being sprayed. In most instances, it is desirable to dry the first coating somewhat before the second is applied, and to hasten this action an air jet 115 disbursing heated air is mounted over the path of movement of the lamps 11 between the spray guns 52 and 110. As shown, the heads 10 continue to engage the belt 41 of the spinning means while in the drying and second spraying positions. A second funnel 116 functioning in the same manner as the first 109 is positioned behind the second spray gun 110.

Following the second coating operation, the lamps 11 are soon advanced into the oven 117 which is preferably of conventional design and as shown covers the entire right end of the machine. In the instance shown, the piping 118 conducting the air to the jet 115 also passes through the oven 117 so that the air is heated thereby. From the oven 117 the lamps 11 pass along a straight path paralleling the path of movement thereof along the front of the machine and again pass into position before a spray gun 119. This spray gun 119 is used only when a third coating is to be placed on the lamp 11 and can be used to advantage to apply a transparent lacquer surface to the lamp 11 for the protection of the coatings already thereon. The spray gun 119 is located some distance from the oven 117 for the dual purpose of allowing the lamps 11 to cool somewhat before they are again sprayed and reducing the fire hazard and is manipulated by means (not shown) duplicating that provided for the first spray gun 52. In this instance, however, the rod 120 (Fig. 6) which is attached to the lever 89 causes the spray gun 119 to follow the head 10 in the same manner as the rod 88 and the other movements of the spray gun 119 are brought about by the shaft 104 which extends forward and supports an arm (not shown) similar to the arm 105. As in the prior instances, the lamp 11 is rotated while it is sprayed although in this case by the apparatus 121 which is a duplication of the apparatus used for this same purpose on the opposite side of the machine. The fumes and excess free spray material are carried off through the funnel 122 which is connected to a ventilating system.

During the return movement of each of the guns 52, 110 and 119 which brings them into alignment with a succeeding lamp 11, said gun is automatically caused to be inoperative. The apparatus for this purpose appears in Figs. 2 and 7 and consists of a plurality of valves 123 and 124 which alternately admit and discharge compressed air from behind the piston 125 on the metering pin 126 of each gun. The valves 123 and 124, as shown in Fig. 2, are actuated through the lever 127 which is pivoted on the pin 128 carried by a portion of the frame 68 and are opened when the valve pin 129 is pressed in by the stud carried by the lever 127. At the instant shown, the cam segment 130 which is mounted on the face of cam 100 is below the roller 131 of the lever 132 which pivots on the pin 132' and the arm 133 which is attached to said lever 132 and to lever 127 through the link 134 is in such a position that the valve pin 129 of valve 123 is pushed in and said valve 123 is opened. In the open position, the valve 123 allows the compressed air carried thereto through pipe 135 to pass into the pipe 136 which is connected to each of the guns 52, 110, 119 by a flexible hose not shown. The spraying operation is performed during the greater portion of each single cycle of operation of the machine so that the roller 131 usually does not contact the cam segment 130 and lever 132 is pulled to another position by the contraction of spring 137. In moving to this latter position, the lever 132 tips the lever 127 so that valve 123 is allowed to close and valve 124 is opened thereby cutting off the supply of compressed air to the guns 52, 110 and 119 and allowing the discharge of the compressed air in the pipe line 136 connected thereto through the pipe 138. The compressed air actuating each gun, as shown in Fig. 7, enters the chamber behind the piston 125 on the metering pin 126 through the opening 139 in the cap 140 on the end of the bracket 141 and forces said piston 125 and metering pin 126 to the left so that the gun is closed. This movement of the piston compresses the spring 142 which expands and moves said piston 125 and metering pin 126 to the right opening the gun when the compressed air is discharged from the chamber. The space in the bracket 141 to the left of the piston 125 is vented through the opening 143 in the bracket 141 and the plug 144 so that said piston 125 moves as desired. The extent to which the piston 125 is allowed to move to the right and consequently the amount the gun is opened is controlled by the position of the bushing 145 in the bracket 141 which acts as stop to limit the movement of the piston 125. The bracket 141 is attached to the body 146 of the gun to which the fluid coating material is introduced through the valve 147 and the compressed air for spraying is introduced through the pipe fitting 148.

The coating operation must be very uniform in order to produce satisfactory results and it is one of the duties of the operator tending the machine to constantly check the spraying operation of the particular guns being operated. To check the operation properly, the lamps 11 must be lighted so that means are provided following each of the spraying positions and at the unloading position for making electrical connection to said lamps 11 as they continue to move along. The contact means in each instance consists, as shown in Fig. 3, of a bar 149 which engages the end of the pin 31 extending from the heads 10 and which parallels the path of movement of the head 10 for a short distance. The bar 149 is connected through a flexible wire (not shown) to the source of electricity and completes the circuit to the lamp 11 which is always connected to the grounded side of said source through the base shell 12 and the other portions of the machine. The bar 149 is mounted on the arm 150 of insulating material which is pivoted on a pin 151 extending from a bracket 152 and which is pushed upward by the expansion of the spring 153. The bracket 152 is fastened directly to the outer rail 40 of the track for the heads 10 where-

as the spring 153 rests on a nut on the end of a stud 154 extending from said rail and through an aperture in the arm 150. The lighting of the lamps 11 just prior to their removal from the machine allows the finished lamp 11 to be compared by the operator with standard lamps mounted adjacent thereto and gives a final check on the coating operation.

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

1. Apparatus for coating electric lamps or similar articles comprising a head adapted to support a lamp, a carrier for continuously moving said head along a predetermined path, a spray gun located adjacent a portion of said path for coating the lamp held by the head, means for causing said spray gun to be directed at, and travel with, said head during the movement thereof through said portion of the path to permit the lamp held thereby to be coated by said spray gun, means for moving said spray gun vertically to cause the coating material to be equally distributed over the length of the lamp, and means for rotating said head during said portion of said movement to cause the coating material to be applied equally on all sides of the lamp.

2. Apparatus for coating electric lamps or similar articles comprising a head adapted to support a lamp, a carrier for continuously moving said head along a predetermined path, a spray gun located adjacent a portion of said path for coating the lamp held by the head, means for causing said spray gun to be directed at, and travel with, said head during the movement thereof through said portion of the path to permit the lamp held thereby to be coated by said spray gun, means for moving said spray gun vertically and separate adjustable means for moving said spray gun through an arcuate path in a vertical plane during said movement to cause the coating material to be equally distributed over the length of the lamp, and means for rotating said head during said portion of said movement to cause the coating material to be applied equally on all sides of the lamp.

3. Apparatus for coating electric lamps or similar articles comprising a head adapted to support a lamp, a carrier for continuously moving said head along a predetermined path, a spray gun located adjacent a portion of said path for coating the lamp held by the head, means for causing said spray gun to be directed at, and travel with, said head during the movement thereof through said portion of the path to permit the lamp held thereby to be coated by said spray gun and for returning said spray gun into alignment with the head on its succeeding movement through said portion of the path, means for rotating said head during said portion of said movement to cause the coating material to be applied equally on all sides of the lamp, and means for causing the spray gun to be rendered inoperative except when in operative relation to a lamp.

JOHN J. MALLOY.
ERICH M. HOFMANN.