

Sept. 18, 1956

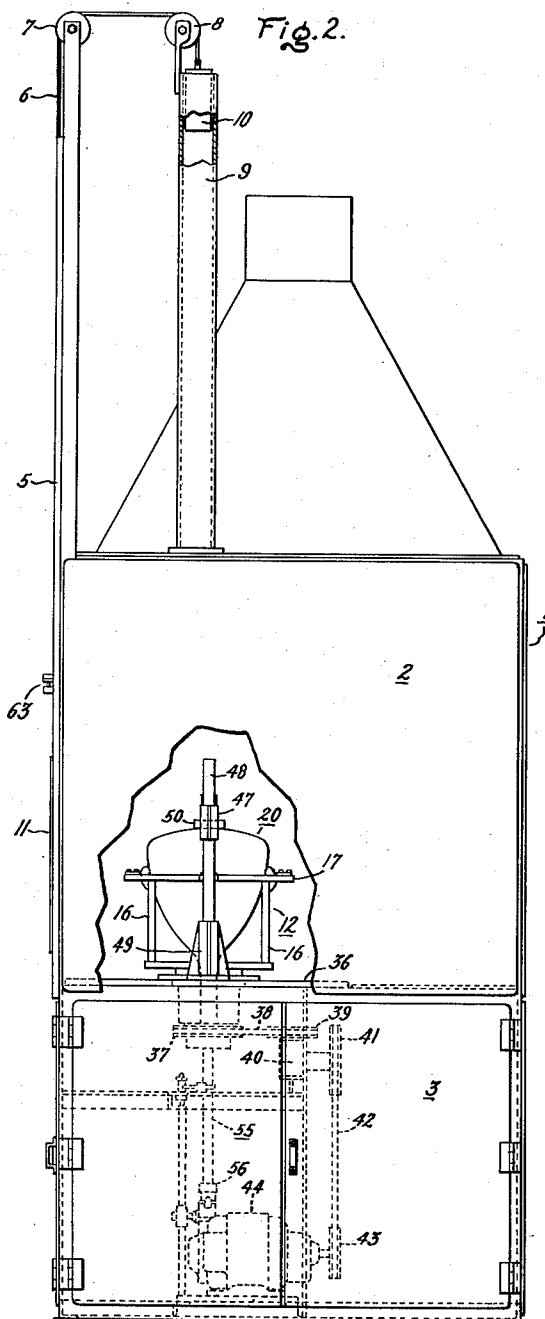
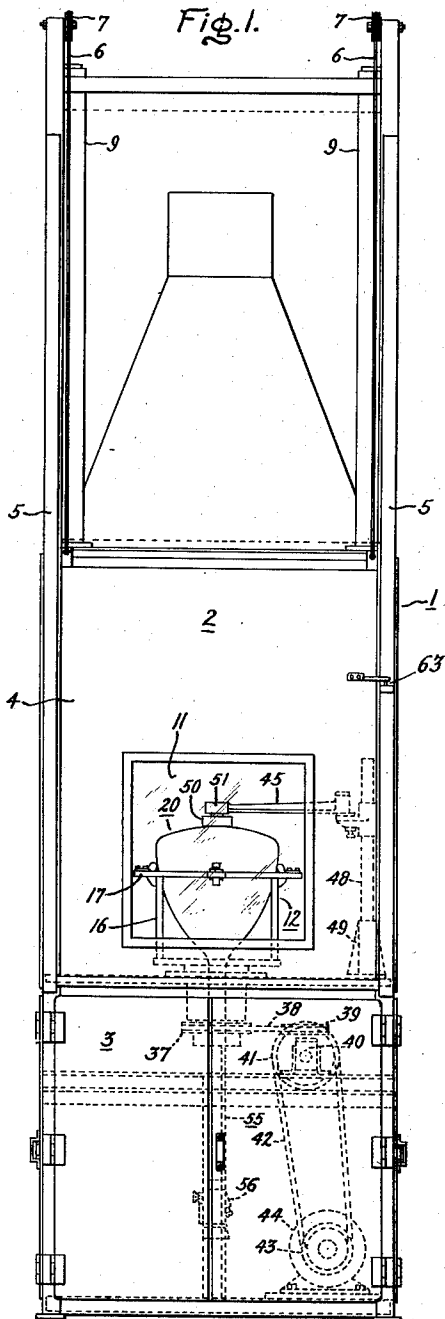
L. S. HARTLEY ET AL

2,763,233

AUTOMATIC MACHINE FOR COATING CATHODE RAY TUBE BULBS

Filed Nov. 25, 1953

3 Sheets-Sheet 1



Inventors:
Lloyd S. Hartley,
Raymond A. Newton,
by *Charles M. Hutchins*
Their Attorney.

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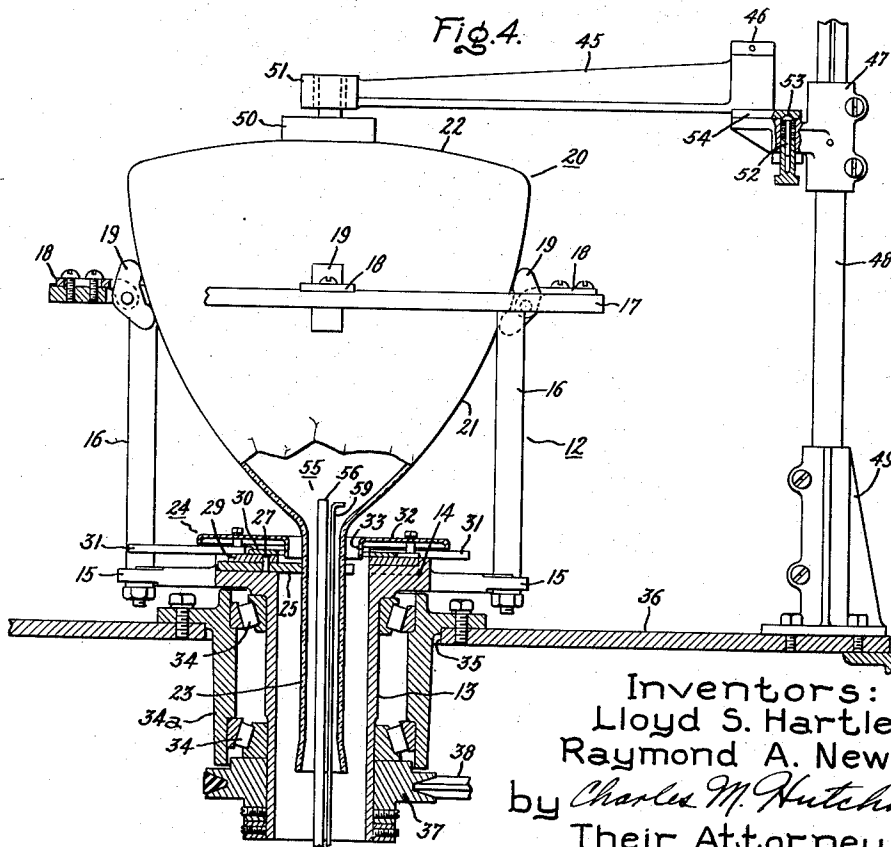
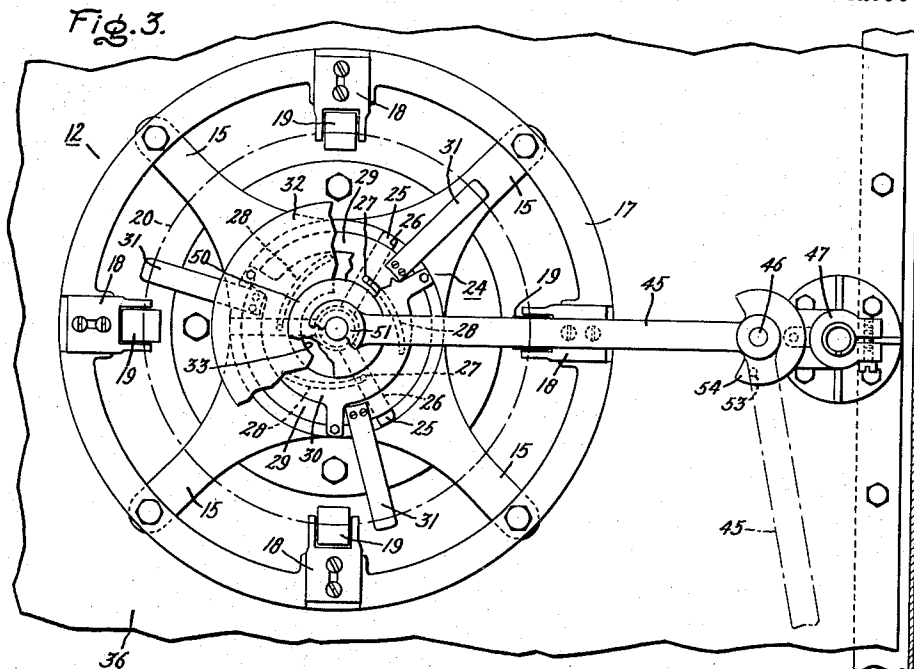
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3 Sheets-Sheet 3

Fig. 5.

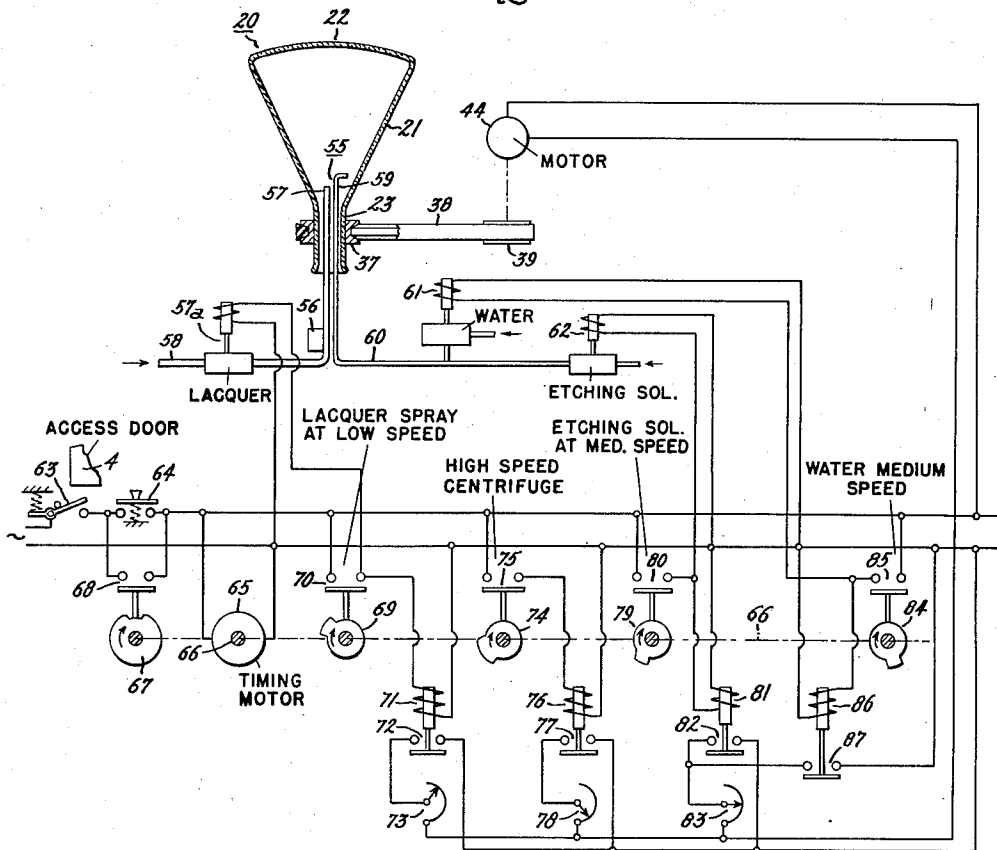


Fig. 6.

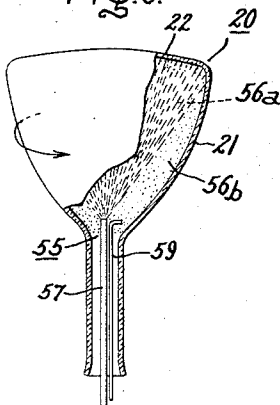
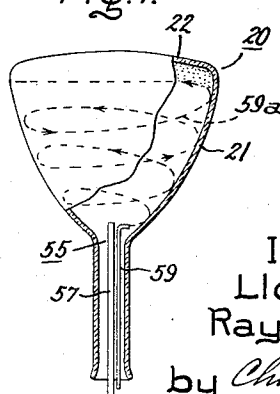


Fig. 7.



Inventors:
Lloyd S. Hartley,
Raymond A. Newton,
by *Charles M. Hitchins*
Their Attorney.

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AUTOMATIC MACHINE FOR COATING CATHODE RAY TUBE BULBS

Lloyd S. Hartley and Raymond A. Newton, Schenectady, N. Y., assignors to General Electric Company, a corporation of New York

Application November 25, 1953, Serial No. 394,276

12 Claims. (Cl. 118—11)

Our invention relates to cathode ray tube bulb processing machinery and pertains more particularly to new and improved automatic machinery for processing the interiors of such bulbs.

In the manufacture of cathode ray tube bulbs the inner surfaces of the face plates thereof are first coated with phosphorescent material to provide a screen portion. Thereafter a lacquer film is sprayed onto the phosphorescent screen and centrifugally spread over the screen to provide a suitable base for a subsequently applied aluminum coating. In spraying the lacquer on the screen some lacquer is deposited on the side walls of the bulbs. This lacquer must be removed completely since if even the smallest amount is left on the side walls it will effect during a subsequent baking operation a peeling of paint applied to the side walls. In the copending application Serial No. 394,372 of Von C. Campbell and Robert T. McKenzie filed November 25, 1953, and assigned to the same assignee as the present invention is disclosed means and methods for facilitating the spraying of a lacquer film on the screen portion and cleaning of excess lacquer from the side walls of cathode ray tube bulbs. The present invention contemplates the provision of automatic machinery for carrying out the methods disclosed in the above referred to copending application.

A primary object of our invention is to provide new and improved automatic machinery for processing the interiors of cathode ray tube bulbs.

Another object of our invention is to provide new and improved automatic machinery for spraying the screen portions of cathode ray tube bulbs with lacquer and cleaning the side walls thereof of excess lacquer.

Another object of our invention is to provide new and improved automatic machinery for spraying lacquer on the screens of cathode ray tube bulbs and cleaning the side walls thereof of excess lacquer whereby production can be markedly increased.

Another object of our invention is to provide new and improved automatic machinery for spraying lacquer on the screen of cathode ray tube bulbs and distributing the lacquer to a predetermined thickness.

Still another object of our invention is to provide new and improved automatic machinery for spraying lacquer on the screens of cathode ray tube bulbs and cleaning the side walls of the bulbs of excess lacquer which is safe and reliable in operation.

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 part of this specification.

In carrying out the objects of our invention we provide a cabinet housing a rotatable head. The head includes means for supporting a bulb with the screen portion upward and a chuck for firmly gripping the bulb neck. Variable speed means is provided for rotating the head. Spray means extend through the neck of the bulb for spraying lacquer onto the screen. A cleaning liquid line

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also extends through the neck of the bulb for introducing liquid into the bulb above the lower edge of the conical portion thereof. Automatically operated means are provided for controlling the rotating means and for determining the sequential operation of the spray means and introduction of liquid into the bulb.

For a better understanding of our invention reference may be had to the accompanying drawing in which:

Fig. 1 is a front elevational view of a preferred embodiment of our invention;

Fig. 2 is a side elevational view partially broken away to illustrate the bulb supporting head;

Fig. 3 is an enlarged fragmentary plan view illustrating the chuck arrangement;

Fig. 4 is an enlarged partially sectionalized view of the head illustrating the manner in which the spray gun and liquid line extend into the bulb through the neck thereof;

Fig. 5 is a schematic wiring diagram illustrating the automatic controlling means;

Fig. 6 is a diagrammatic illustration of spraying operation on the bulb; and

Fig. 7 is a similar illustration of the manner in which the liquid is centrifuged in the bulb.

Referring to the drawing we have shown in Figs. 1 and 2 a cabinet generally designated 1. The cabinet 1 includes an upper compartment 2 and a lower compartment 3. The front portion of the upper compartment 2 includes an access opening arranged for being closed by a door 4 provided for protecting an operator of the machine in the event of bulb breakage or cleaning liquid splash during operation. The door 4 is arranged for vertical sliding movement between a spaced apart pair of vertical channel members 5 which extend upwardly beyond the top side of the cabinet 1. A pair of cables 6 are each connected at one end to the door 4 and extend over a first pair of pulleys 7 suitably mounted at the upper ends of the members 5, and over a second pair of pulleys 8 suitably mounted on the upper ends of a second pair of vertical channel members 9 secured atop the cabinet and spaced apart from the members 5. To the other ends of the cables 6 are secured counterweights 10 adapted for riding in the channel members 9. In this arrangement the counterweights 10 facilitate the opening of the door 4. A window 11 is provided in the door in order to permit viewing of the processing of bulbs in the compartment 2.

The compartment 2 houses a bulb support head generally designated 12. The head 12 includes a vertical cylindrical portion 13 and a horizontal spider portion 14 including a plurality of radially extending leg portions 15. Secured on the ends of the leg portions 15 are vertically extending posts 16 to the upper ends of which is secured a ring 17. Carried on the ring 17 in spaced apart relationship between the positions of the posts 16 are brackets 18. The brackets 18 are adjustable relative to the vertical axis of the head and are bifurcated for receiving and having pivotally mounted therein rubber pads 19. When a cathode ray tube bulb 20 is placed in the head 12 in the manner shown in Figs. 1-4, the pads 19 engage the conical side wall portion 21 of the bulb for supporting the bulb with the face plate portion 22 upward and the neck portion 23 extending downward into the cylindrical portion 13 of the head.

Provided for assisting in centering the bulb in the head and gripping the neck portion 23 to secure the bulb in the head is a chuck generally designated 24. The chuck 24 includes a plurality of bars 25 arranged for sliding movement in radially extending slots 26 machined in the upper surface of the spider 14. In each bar 25 is fixed a vertically extending stud 27. The studs 27 are received in and cooperate with cam slots 28

formed in a cam plate 29. Secured on top of the cam plate 29 is a retaining plate 30 adapted for retaining the bars 25 in the slots 26 and the studs 27 and the cam plate 29 in cooperative relationship. Secured on the edge of the cam plate 29 is a plurality of spaced apart radially extending handles 31 provided for facilitating turning of the cam plate 29 by an operator. It will be seen that when through the agency of the handles 31 the cam plate 29 is rotated clockwise in Fig. 3 by an operator the cooperation between the cam slots 28 and the studs 27 will be such that the bars 25 will be actuated centripetally for engaging and firmly gripping the neck portion 23 of the tube thereby to secure the tube in the head. When the cam plate 29 is actuated counterclockwise in Fig. 3 the bars 25 will be actuated centrifugally for releasing the neck of the bulb. Suitably secured on the spider 14 of the head above the chuck 24 is a shield plate 32. The plate 32 includes a central aperture 33 through which extends the neck portion 23 of the bulb and is effective for shielding the moving parts of the chuck from broken glass or the like which could jam and adversely affect the operation of the chuck.

The head 12 is arranged for rotation about its vertical axis by means of a double set of roller bearings 34 fitted in spaced apart relation on the cylindrical portion 13 of the head. The bearings 34 are mounted in a sleeve 34a extending through and suitably secured to the edge of a circular aperture 35 formed in the bottom wall 36 of the compartment 2 of the cabinet. Secured on the extremity of the cylindrical portion 13 below the sleeve 34a is a pulley wheel 37. Fitted on the pulley wheel 37 is one end of a V-belt 38. As seen in Figs. 1 and 2 the other end of the V-belt 38 is fitted on a horizontally disposed pulley 39. The pulley 39 is part of an arrangement including a gear box 40 suitably fixedly mounted in the compartment 3 and another pulley wheel 41 whereby the direction of the pulley drive is changed 90° from the axis of rotation of the head 12. Fitted on the pulley 41 is one end of another V-belt 42. The other end of the V-belt 42 is fitted on a drive pulley 43 secured on the drive shaft of a variable speed motor 44 suitably mounted on the bottom of the compartment 3.

By means of the just described arrangement the head 12 and the bulb 20 supported therein is rotated when the motor 44 is energized. As pointed out above the motor 44 is of a variable speed type and by means to be described in detail hereinafter is controllable for providing various controlled speeds of rotation of the head.

Provided for assisting in maintaining the bulb 20 satisfactorily seated in the head 12 during rotation thereof is a bulb retaining arm 45 which is pivotally mounted at 46 on a bracket 47. The bracket 47 is slidably fitted on a vertical post 48 which is suitably mounted by another bracket 49 on the side portion of the bottom 36 of the compartment 2. The arm 45 carries at its extremity a pad 50 for engaging the face plate 22 of the bulb 20 as seen in Fig. 4. By means of a bearing 51 in the end of the arm 45 the pad 50 is arranged for rotating with the bulb 20. As seen in Fig. 3 the arm 45 is movable from the solid line position in which the pad 50 engages the bulb for assisting in retaining the bulb in the head, and a dot and dash line position substantially parallel to the side wall of the cabinet. In the dot and dash line position the arm 45 is in an unobstructive position which enables an operator to remove bulbs from and insert bulbs in the head 12. A resilient detent pin 52 is mounted in the bracket 47 for cooperating with a recess 53 provided in a skirt portion 54 formed on the arm 45 about the pivot point 46. This arrangement is provided for detenting the arm 45 in the dot and dash line position, to insure against its unintentional movement over the head 12 during removal or replacement of the bulb 20.

Provided for spraying lacquer into the bulb 20 and introducing liquid into the bulb at the lower edge of the conical portion 21 thereof is an assembly which extends

into the bulb through the neck portion 23 and is generally designated 55 in Figs. 1, 2, 4, and 5. The assembly 55 includes a spray gun 56 located in the compartment 3 and a gun barrel 57 which extends into bulb through the neck portion 23. By means not shown lacquer to be sprayed into the bulb and gas for atomizing the lacquer to effect the spray are supplied to the gun 56, the supply of these substances being controlled by a solenoid valve 57a in a line 58 connecting the gun with the sources of lacquer and gas. The assembly 55 further includes a vertical portion 59 of a liquid line 60. As seen in Fig. 5 the liquid line 60 is adapted for being supplied with water or an etching solution which may be hydrofluoric acid, ammonium bifluoride or the like. The flow of water into the line 60 is controlled by a solenoid valve 61 and the flow of etching solution into the line 60 is controlled by another solenoid valve 62. It will be seen that by controlling operation of the valve 61 and 62 water or etching solution can be supplied to the line 60 for being introduced selectively into the bulb 20 through the vertical portion 59. The upper end of the portion 59 is so disposed as to introduce the liquids into the bulb and direct them onto the side walls of the bulb above the lower edge of the conical portion 21 thereof.

The operation of our invention will now be described in detail with particular reference being made to Figs. 5-7. The bulb 20 when placed in the head already has the inner surface of the face plate 22 coated with phosphorescent material to provide a screen portion. Additionally the screen is saturated with water. As seen in Fig. 5 the bulb 20 is arranged for being rotated when the motor 44 is energized. Additionally, the controlling means for the arrangement includes a switch 63 which is normally biased to an open position. The access door 4 is adapted for cooperating with the switch 63 for closing it when the door is closed. Following closing of the switch 63 in this manner an operator may close a normally open control switch 64, thereby to complete a circuit through a timing motor 65. The timing motor includes a shaft 66 upon which is mounted a plurality of switch operating cams, one of which is a holding cam 67. Substantially immediately after the timing motor is first energized the holding cam is effective for closing a switch 68. The switch 68 is held closed for a complete cycle of operation of the machine, permitting the operator to release the switch 64. Thereafter a cam 69 on the shaft 66 is effective for closing a switch 70. When the switch 70 is closed a relay coil 71 is energized and is effective for closing a motor control switch 72. The motor control switch 72 when closed completes a circuit through the motor 44 for effecting rotation of the bulb 20. Included in this circuit is a potentiometer 73. The potentiometer 73 is preferably set for causing the variable speed motor 44 to rotate at such a speed as to cause the bulb 20 to rotate at a relatively slow speed of approximately 40 revolutions per minute. The switch 70 when closed also energizes the solenoid valve 57a for opening the valve to permit flow of lacquer to the spray gun 56 whereby the lacquer is sprayed into the bulb 20 and onto the screen portion thereof in the manner indicated at 56a in Fig. 6 during rotation of the bulb at 40 revolutions per minute.

Substantially immediately after cam 69 opens switch 70 thereby to deenergize the solenoid valve 57a for stopping the flow of lacquer to the spray gun 56 and for deenergizing the relay coil 71 to drop out the motor switch 72, another cam 74 on the shaft 66 is effective for closing a switch 75. The switch 75 when closed energizes a relay coil 76 for closing another motor control switch 77. The motor switch 77 when closed completes another circuit through the motor 44 and a potentiometer 78 included in this circuit is preset for causing the motor 44 to rotate the bulb 20 at a relatively

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high speed of approximately 400 to 600 revolutions per minute. At this speed of rotation of the bulb the lacquer previously sprayed on the screen portion of the bulb is centrifuged and caused to be distributed over the screen to a predetermined thinness after approximately 8 to 15 seconds of rotation. Thereafter, the cam 74 opens the switch 75 for deenergizing the relay coil 76 to drop out the motor 44. By means not shown the machine head and therefore the bulb therein are brought to a gradual but quicker stop than would be the case if the machine were permitted to come to a natural stop. The machine is preferably stopped for a period of 10 seconds to permit the excess lacquer to drain down the side walls and out of the neck portion 23 of the bulb into a suitable receptacle (not shown). During the spraying and the just described draining operations some of the excess lacquer is deposited on the side walls of the bulb 20 in the manner indicated at 56b in Fig. 6. It is this lacquer on the side walls which it is necessary to remove in advance of a side wall painting operation in order to prevent peeling of the paint during a subsequent baking operation.

Following drainage of the lacquer from the bulb a cam 79 on the shaft 66 effectively closes a switch 80. The switch 80 energizes a relay coil 81 for closing still another motor control switch 82. This control switch 82 completes a motor circuit including still another potentiometer 83 which is preset to effect a medium degree of rotation of bulb 20 of approximately 150 to 250 revolutions per minute. Additionally, during this rotation of the bulb the switch 80 energizes the solenoid valve 62 for admitting the flow of etching solution into the line 60 for being introduced by the vertical portion 59 of the line 60 into the bulb 20 above the lower edge of the conical side wall portion 21. By centrifugal force the etching solution is caused to ride up the side walls in the manner indicated by the arrow headed broken line 59a in Figure 7 and to a predetermined extent dependent upon the rotation of the bulb as effected by the motor 44. In the present embodiment the 150 to 250 revolution per minute rotation causes the etching solution to ride up the side walls and stop within approximately 1 to 2 inches of the face plate and before any splashing of the solution onto the screen portion is effected. The rotation of the bulb at relatively medium speed is continued for approximately 6 to 10 seconds during which time the etching solution works its way under the film on the side wall portions of the bulb for etching the glass. Thereafter the cam 79 opens the switch 80 whereby the solenoid valve 62 is closed and the etching solution flow into the bulb is shut off and the motor 44 is deenergized. Again the means for stopping the rotation (not shown) is effective for gradually slowing down and stopping the bulb to expedite the operation. The bulb is preferably stopped for a period of 6 to 10 seconds for allowing the etching solution and removed lacquer solution to drain out of the bulb through the neck 23. Thereafter it is desirable to flush out of the bulb with water, the etching and lacquer solutions which may still adhere to the side walls of the bulb. To accomplish this a cam 84 on the timing motor shaft 66 is effective for closing a switch 85. The switch 85 when closed effects energization of a relay coil 86 for closing a motor control switch 87. The switch 87 when closed completes the medium speed motor circuit including the potentiometer 83 for causing the motor 44 to rotate the bulb 20 at the medium speed of 150 to 250 revolutions per minute. Additionally, the switch 85 when closed energizes the solenoid valve 61 for opening it to permit water to flow through the tube 60 and the vertical portion 59 thereof for introducing water into the bulb above the lower edge of the conical side wall portion 21 of the bulb while the bulb is rotating. In this manner the water is caused to ride up the side walls of the bulb in the same manner as the etching solution

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and since the speed of rotation is the same as when the etching solution was introduced into the bulb the water rises to the predetermined extent of approximately 1 to 2 inches below the screen portion. Thereafter the cam 84 permits the switch 85 to open for shutting off the water and cutting out the motor 44 to permit the head to come to a stop, which stop is made gradual by the above referred to stopping means (not shown). When the bulb is stopped in this manner the water drains out of the bulb through the neck portion 23 for flushing therefrom any of the remaining etching solution or lacquer in the bulb. The just described water flushing operation may be repeated any desired number of times simply by providing a corresponding number of cams and switches for controlling the medium speed motor circuit and the water controlling solenoid valve 61. Following a complete machine cycle, the holding cam 67 opens the switch 68 for stopping the machine. At this time the door 4 is opened to remove the processed bulb and to replace it with a bulb to be processed. When the door 4 is open the switch 63 cuts off power to the machine to prevent premature starting if the switch 64 should be inadvertently closed. Following placement of another bulb in the head 12 the door is closed whereby the switch 63 is closed. Thereafter the operator may close the switch 64 to repeat the above described cycle of machine operation. It will be seen that if the door 4 is opened during operation of the machine the switch 63 will open and cut off power to the machine thereby to stop it. These several stopping features are provided to insure utmost safety in operation of the machine.

Thus it will be seen that we have provided a cathode ray tube bulb processing machine which is fully automatic in film spraying the screen portion of a bulb and spreading the film to a predetermined thickness in preparation for an aluminizing operation and for cleaning the side wall portions of the bulb of excess lacquer in contemplation of application of an aluminum coating and paint which would be deleteriously affected during a subsequent baking operation if all of the excess lacquer were not removed from the side walls of the bulb.

Additionally, it will be seen that while we have shown and described our invention as being sequentially operative for spraying lacquer on the screen portion of the bulb, centrifuging the bulb at high speed to thin out the lacquer to a predetermined thickness on the screen portion, causing an etching solution to ride up the side walls of the bulb to etch the side walls for removing excess lacquer, and subsequently causing one or more water flushing operations, our disclosed embodiment is modifiable for providing other sequences of operation. For instance, it is modifiable for carrying out the alternative method of cleaning the side walls of the bulbs disclosed in the above referred to copending application Serial No. 394,372. That is, the sequential operation can be so modified that the etching solution would be caused to ride up the side walls of the bulb for etching them before the spraying operation. The spraying operation would then follow at low speed and the film would be spread out on the screen by subsequent rotation of the bulb at high speed. Thereafter the water would be introduced into the bulb and caused to ride up the side walls through rotation of the bulb. The water would be effective for washing the lacquer from the etched side walls since there would be low adherence of the excess lacquer to the side walls due to the previous etching of the side walls. It will be seen further that while we have shown our machine in use for processing glass bulbs, it could be used in processing bulbs comprising metal cones and glass face plates which are generally referred to as cathode ray tube assemblies.

It will be seen still further that while we have shown and described our machine as sequentially operative in spraying the lacquer, centrifuging the lacquer and then centrifuging the cleaning liquid up the side walls of the bulb it is conceivable that by using a lacquer of satisfac-

tory consistency the spraying, centrifuging to spread the lacquer and centrifuging to run the cleaning liquid up the walls of the bulb could be carried out all at the same speed of rotation of the head.

While we have shown and described a specific embodiment of our invention we do not desire our invention to be limited to the particular form shown and described and we intend by the appended claims to cover all modifications within the spirit and scope of our invention.

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

1. In a machine for processing cathode ray tube bulbs, a rotatable head adapted for supporting a bulb with the screen portion upward, electrical drive means for rotating said head thereby to rotate said bulb, means for spraying a film material into said bulb and onto said screen, and a single electric control operative for concomitantly energizing said spraying means and said electrical drive means to effect a substantially even film on said screen portion of said bulb.

2. In a machine for processing cathode ray tube bulbs, a rotatable head adapted for supporting a bulb with the screen portion upward, a motor for rotating said head thereby to rotate said bulb, means associated with said head for spraying a film material into said bulb and onto said screen, and automatic control circuitry effective for sequentially energizing said spray means and energizing said motor to rotate said bulb at a predetermined speed for centrifuging and thereby distributing said film on said screen portion to a predetermined thickness.

3. In a machine for processing cathode ray tube bulbs having substantially conical side wall portions, means for supporting a bulb with the screen portion upward, variable-speed drive means for rotating said bulb, means for spraying a film material into said bulb and onto said screen, means for introducing a cleaning liquid into said bulb, and automatic control means operative first for concomitantly operating said spraying means and energizing said drive means at a predetermined speed for distributing said film material on said screen, and for subsequently energizing said means for introducing said cleaning liquid into said bulb and concomitantly energizing said drive means for rotating said bulb at a predetermined higher speed for causing said cleaning liquid to ride up said side wall portion of said bulb to a predetermined extent to clean said film material therefrom.

4. In a machine for processing cathode ray tube bulbs having conical side wall portions, means for supporting a bulb with the screen portion upward, means for rotating said bulb, means for spraying a film material into said bulb and onto said screen, means for introducing a cleaning liquid into said bulb, means for introducing a flushing liquid into said bulb, and automatic control means effective for sequentially energizing said spraying means, energizing said means for introducing said cleaning liquid into said bulb and said rotating means concomitantly to rotate said bulb at a predetermined speed to cause said cleaning liquid to ride up said conical side wall portion of said bulb to a predetermined extent to clean excess film material therefrom, and energizing said means for introducing said flushing liquid into said bulb and said rotating means concomitantly to rotate said bulb at a predetermined speed to cause said flushing liquid to ride up said conical side wall portions of said bulb to a predetermined extent for flushing remaining cleaning liquid and film material from said bulb.

5. In a machine for processing cathode ray tube bulbs having conical side wall portions, means for supporting a bulb with the screen portion upward, means for rotating said bulb, means for spraying a film material into said bulb and onto said screen, means for introducing a cleaning liquid into said bulb, means for introducing a flushing liquid into said bulb, and automatic control means effective for sequentially energizing said spraying means and said rotating means concomitantly to effect a substantial-

ly even film on said screen portion, energizing said rotating means to rotate said bulb at a predetermined speed for centrifuging and thereby distributing said film material on said screen portion to a predetermined thickness, energizing said means for introducing said cleaning liquid into said bulb and said rotating means concomitantly to rotate said bulb at a predetermined speed to cause said cleaning liquid to ride up said conical side wall portion of said bulb to a predetermined extent for cleaning excess film material therefrom, and energizing said means for introducing said flushing liquid into said bulb and said rotating means concomitantly to rotate said bulb at a predetermined speed to cause said flushing liquid to ride up said conical side wall portions of said bulb for flushing remaining cleaning liquid and film material from said bulb.

6. In a machine for processing cathode ray tube bulbs, a rotatable bulb support for supporting a bulb with the screen portion upward, a motor for rotating said support thereby to rotate said bulb, means including a solenoid valve adapted for spraying a film material into said bulb and onto said screen when said solenoid valve is energized, and automatic control circuitry operative for concomitantly energizing said solenoid valve and energizing said motor to rotate said bulb at a relatively low speed thereby to effect a substantially even film on said screen portion.

7. In a machine for processing cathode ray tube bulbs, a rotatable bulb support for supporting a bulb with the screen portion upward, electrical drive means for rotating said support thereby to rotate said bulb, means including a solenoid valve adapted for spraying a film material into said bulb and onto said screen when said solenoid valve is operated, and automatic control circuitry effective for sequentially energizing said solenoid valve and energizing said drive means to rotate said bulb at a predetermined relatively high speed for centrifuging and thereby distributing said film material on said screen portion to a predetermined thickness.

8. In a machine for processing cathode ray tube bulbs having conical side wall portions, means for supporting a bulb with the screen portion upward, variable speed means for rotating said bulb, means for spraying a film material into said bulb and onto said screen, means for introducing an etching solution into said bulb, means for introducing water into said bulb, and automatic control means effective for sequentially energizing said spraying means, energizing said means for introducing said etching solution into said bulb and said rotating means concomitantly to rotate said bulb at a predetermined speed to cause said etching solution to ride up said conical side wall portion of said bulb to a predetermined extent for etching said side wall portion thereby to remove excess film material therefrom, and energizing said means for introducing said water into said bulb and said rotating means concomitantly to rotate said bulb at a predetermined speed to cause said water to ride up said conical side wall portion of said bulb for flushing remaining etching solution and film material from said bulb.

9. In a machine for processing cathode ray tube bulbs having conical side wall portions, means for supporting a bulb with the screen portion upward, variable speed means for rotating said bulb, means for spraying a film material into said bulb and onto said screen, means for introducing an etching solution into said bulb, means for introducing water into said bulb, and automatic control means effective for sequentially energizing said spraying means and said rotating means concomitantly to rotate said bulb at a relatively low speed for effecting a substantially even film on said screen portion, energizing said rotating means to rotate said bulb at a predetermined high speed for centrifuging and thereby distributing said film material on said screen portion to a predetermined thickness, energizing said means for introducing said etching solution into said bulb and energizing said

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rotating means concomitantly to rotate said bulb at a predetermined medium speed to cause said etching solution to ride up said conical side wall portion of said bulb to a predetermined extent thereby to etch said side wall portion for cleaning excess film material therefrom, and energizing said means for introducing said water into said bulb and said rotating means concomitantly to rotate said bulb at a predetermined medium speed to cause said water to ride up said conical side wall portion of said bulb for flushing remaining etching solution and water from said bulb.

10. In a machine for processing cathode ray tube bulbs or the like having face plate portions and substantially conical side wall portions, means for supporting a bulb with the face plate portion upward, electrically actuated means for rotating said bulb, electrically controlled means for spraying a film material into said bulb and onto said face plate portion, electrically controlled means for introducing a cleaning liquid into said bulb and directing it onto said side wall portion at a point spaced from said face plate portion, and automatic control circuitry effective first for operating said first-mentioned electrically-controlled means to effect spraying of said film material onto said face plate portion, and then operating said second-mentioned electrically-controlled means, means for introducing said cleaning liquid into said bulb and concomitantly energizing said rotating means to rotate said bulb at a predetermined speed effective for causing said cleaning liquid to ride up said conical side wall portion of said bulb to a predetermined extent short of said face plate portion to clean said film material from said wall portion.

11. In a machine for processing cathode ray tube bulbs or the like having face plate portions and substantially conical side wall portions, means for supporting a bulb with the face plate portion upward, variable speed drive means for rotating said bulb, solenoid controlled means for spraying a film material into said bulb and onto said face plate portion, solenoid controlled means for introducing an etching solution into said bulb and directing it onto said side wall portion in the vicinity of the lower edge thereof, and automatic control circuitry effective first for operating said first-mentioned solenoid-controlled means to effect said spraying of said film material, and

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then operating said second-mentioned solenoid-controlled means for introducing said etching solution into said bulb and concomitantly operating said drive means to rotate said bulb at a predetermined speed effective for causing said etching solution to ride up the conical side wall portion of said bulb to a predetermined extent short of said face plate portion for etching said side wall portion of said bulb and thereby cleaning excess film material therefrom.

12. In a machine for processing cathode ray tube bulbs or the like having face plate portions and substantially conical side wall portions, means for supporting a bulb with the face plate portion upward, means for rotating said bulb, means for spraying a film material into said bulb and onto said face plate portion, means for introducing a cleaning liquid into said bulb and directing it onto said side wall portion at a point spaced from said face plate portion, means for introducing a flushing liquid into said bulb and directing it onto said side wall portion at a point spaced from said face plate portion, and automatic control means effective for sequentially energizing said spraying means, energizing said means for introducing said cleaning liquid into said bulb and said rotating means concomitantly to rotate said bulb at a predetermined speed effective for causing said cleaning liquid to ride up said conical side wall portion to a predetermined extent short of said face plate portion thereby to clean excess film material from said side wall portion, and energizing said means for introducing said flushing liquid into said bulb and said rotating means concomitantly to rotate said bulb at a predetermined speed effective for causing said flushing liquid to ride up said conical side wall portion to a predetermined extent short of said face plate portion for flushing remaining cleaning liquid and film material from said side wall portion.

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