

Sept. 18, 1956

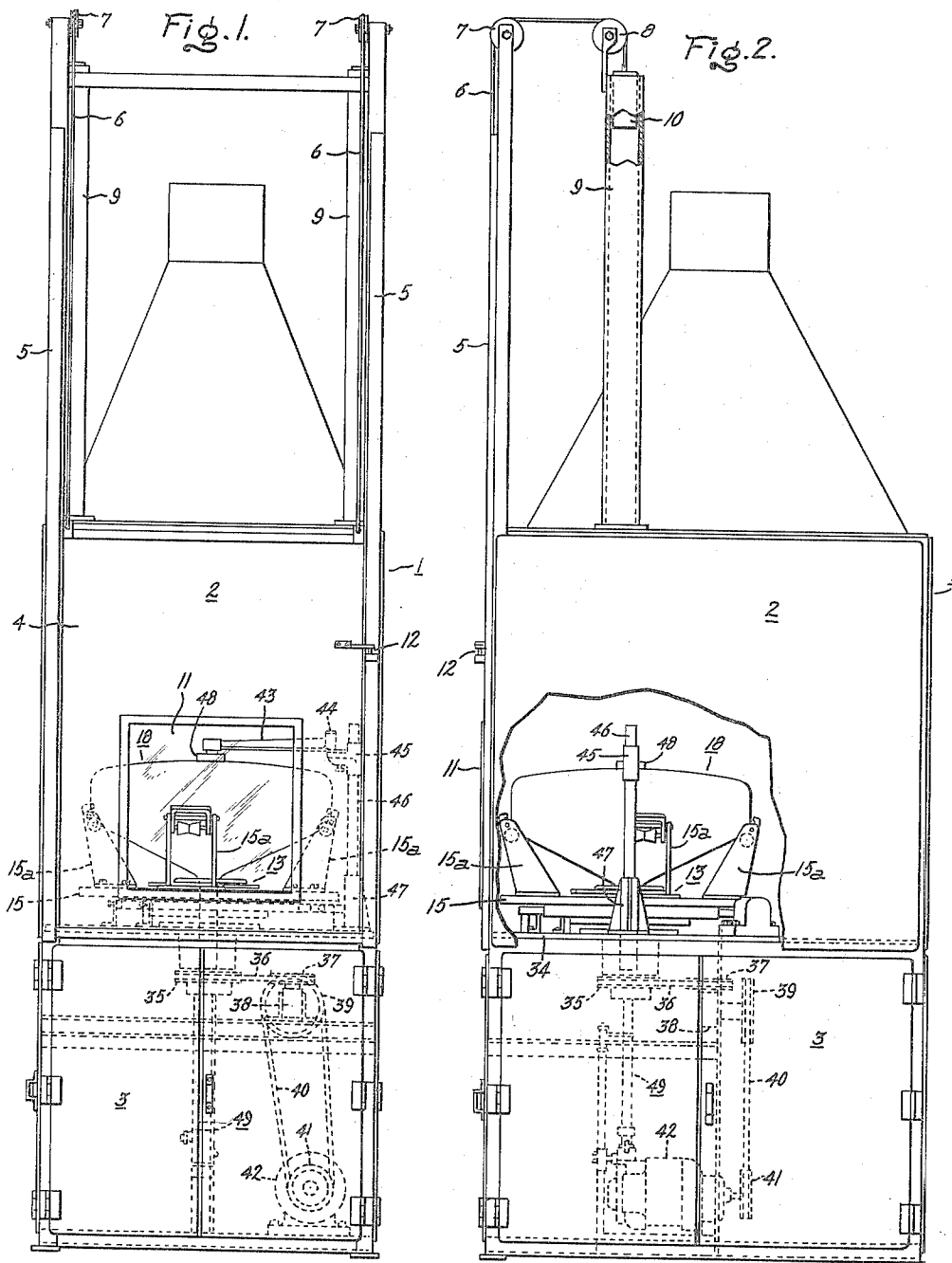
R. T. McKENZIE ET AL

2,763,565

MEANS AND METHODS FOR PROCESSING CATHODE RAY TUBE BULBS

Filed Nov. 25, 1953

3 Sheets-Sheet 1



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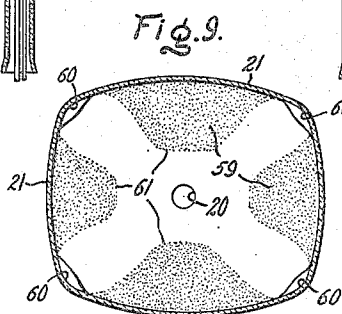
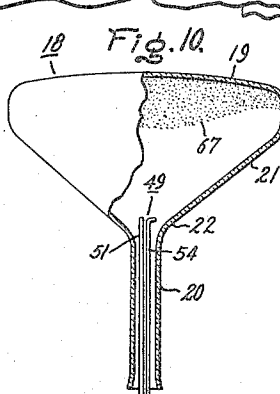
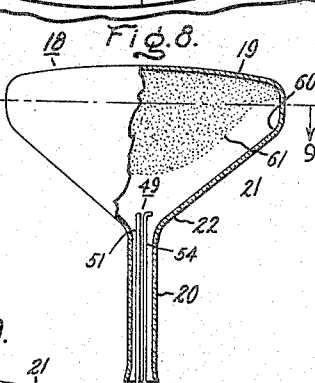
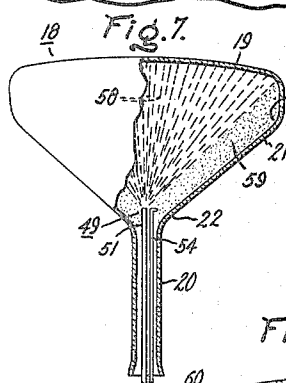
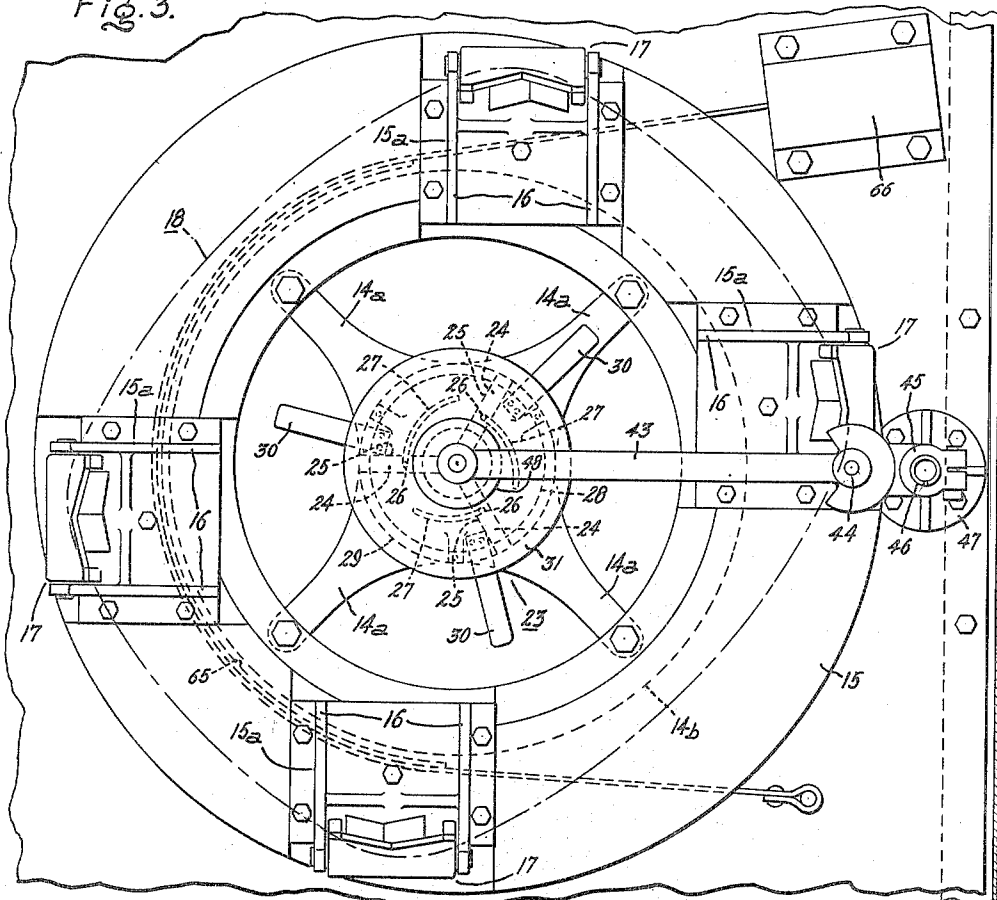
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MEANS AND METHODS FOR PROCESSING CATHODE RAY TUBE BULBS

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3 Sheets-Sheet 2

Fig. 3.



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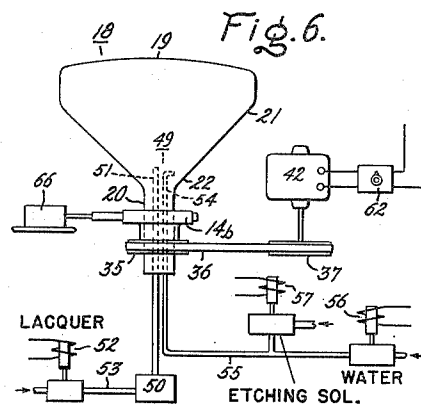
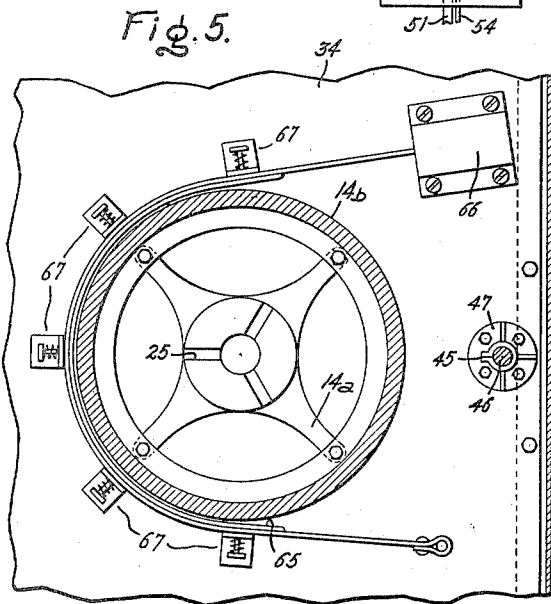
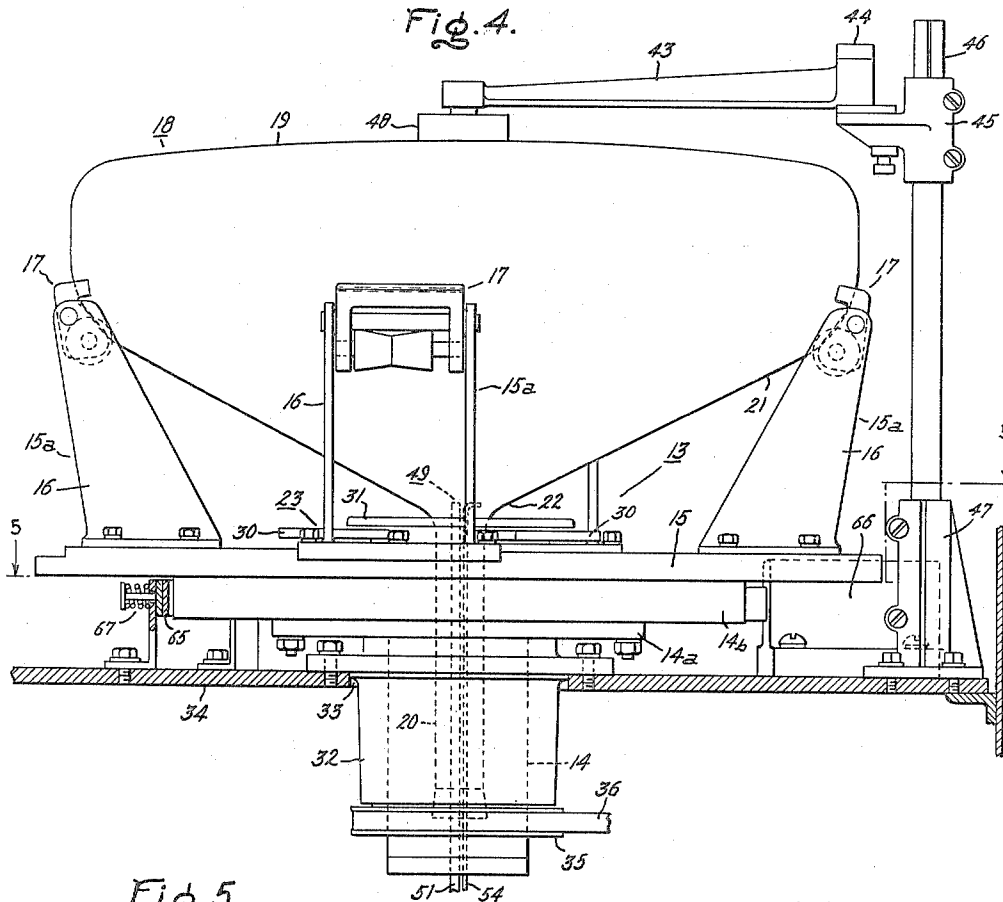
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MEANS AND METHODS FOR PROCESSING CATHODE RAY TUBE BULBS

Filed Nov. 25, 1953

3 Sheets-Sheet 3



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2,763,565

MEANS AND METHODS FOR PROCESSING CATHODE RAY TUBE BULBS

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Application November 25, 1953, Serial No. 394,322

20 Claims. (Cl. 117—8)

Our invention relates to the processing of cathode ray tube bulbs and pertains more particularly to new and improved means and methods for processing the interiors of the type of cathode ray tube bulbs having substantially rectangular screen portions.

In the manufacture of cathode ray tube bulbs, the inner surface of the face plates thereof are first coated with phosphorescent material to provide a screen portion and water rinsed. Thereafter a lacquer film is sprayed on the phosphorescent screen to provide a suitable base for a subsequently applied aluminum coating. In spraying the lacquer on the screen and draining excess lacquer from the bulbs some excess lacquer is deposited on the sides 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 an aluminum coating and paint applied to the walls. In a 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 and claimed means and methods for spraying the screen portions and cleaning excess lacquer from the side wall portions of cathode ray tube bulbs having substantially circular screen portions by introducing a cleaning liquid into the bulbs and rotating the bulbs to cause the cleaning liquid to ride up the side walls thereof. This method, however, is not applicable to the cleaning of rectangular bulbs. A bulb of this type includes a substantially rectangular face plate and is substantially rectangular in cross section from the face plate to a substantially conical side wall portion which provides a transition from the flat side walls to the cylindrical neck of the bulb. When it is attempted to clean the side walls of a rectangular bulb by the method employed for cleaning round bulbs, the cleaning liquid tends during rotation of the bulb to ride up the conical portion of the bulb and to ride up and concentrate or accumulate in the corners of the bulb formed by the flat side walls. As a result the substantially flat side walls of the bulb between the face plate and conical portions are not fully washed with cleaning liquid and, consequently, are not completely cleaned. Accordingly, a primary object of our invention is to provide new and improved means for processing the interiors of rectangular cathode ray tube bulbs.

Another object of our invention is to provide a new and improved means and methods for cleaning the side walls of rectangular cathode ray tube bulbs.

Another object of our invention is to provide new and improved means and methods for applying a film on the screen portion of the rectangular cathode ray tube bulb and cleaning excess film material from the side walls of such bulbs.

Another object of our invention is to provide new and improved means and methods for cleaning the side walls of rectangular cathode ray tube bulbs, which require no particular skill on the part of an operator.

Still another object of our invention is to provide new

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and improved means and methods for applying a film to the screen portion of a rectangular cathode ray tube bulb and cleaning the side walls of the bulb of excess film material which readily lend themselves to automation whereby production can be greatly increased.

Further object 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 means for spraying a film material into and on the screen portion of a rectangular cathode ray tube bulb and means for rotating the bulb with the screen portion upward. Additionally, we provide means for introducing a cleaning liquid into the bulb above the lower edge of the conical side wall portion thereof for being caused to ride up the conical portion and into the corner portions of the bulb during rotation thereof. Means is also provided for altering the movement of the bulb as by sudden acceleration or deceleration thereof, whereby inertial effects are introduced and operate on the liquid accumulation in the corner portions of the bulb, causing these accumulations to wash over the flat side wall portions of 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 bulb chuck and braking arrangements;

Fig. 4 is an enlarged detailed elevational view illustrating the manner in which the bulb is supported in the head;

Fig. 5 is a sectional view taken along the line 5—5 in Fig. 4;

Fig. 6 is a schematic illustration of our invention;

Fig. 7 is a diagrammatic illustration of the film spraying operation;

Fig. 8 is a similar illustration of the manner in which the liquid rides up into the corners of the bulb;

Fig. 9 is a sectional view taken along the line 9—9 in Fig. 8; and

Fig. 10 is a diagrammatic illustration of the manner in which the present invention is effective for cleaning the side walls of a rectangular bulb.

Referring to the drawing I 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 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 during operation. The door 4 is arranged for vertical sliding movement between a spaced pair of vertical channel members 5 which extend upward above 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 ends of the members 5 and over a second pair of pulleys 8 suitably mounted on the upper ends of a second pair of channel members 9 secured atop the cabinet and spaced from the members 5. To the other ends of the cables 6 are secured counterweights 10. 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. Additionally a door operated switch 12 is provided for cutting off power to the machine when the door is not fully closed.

The compartment 2 houses a bulb support head gen-

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erally designated 13. As perhaps best seen in Figs. 3 and 4, the head 13 includes a vertical cylindrical portion and a spider 14a. Suitably secured to the legs of the spider 14a is a brake drum 14b the purpose for which will be brought out in detail hereinafter. Suitably secured atop the brake drum 14b is a ring 15 and suitably mounted on the ring in spaced relationship on the edge portion thereof is a plurality of upright brackets 15a. The brackets 15a each include a pair of spaced arms 16 between which is suitably mounted bulb supporting members generally designated 17. The bulb supporting members 17 are each configured to receive a corner portion of a rectangular cathode ray tube bulb indicated by 18. When a rectangular cathode ray tube bulb 18 is placed in the head 13 in the manner shown in Figs. 1-4 the bulb rests on the support members 17 for supporting the bulb with the face plate portion 19 upward and the neck portion 20 extending downward into the cylindrical portion 14 of the head. It will be seen that in addition to the substantially rectangular face plate portion 19 and the cylindrical neck portion 20, the rectangular bulb 18 is substantially rectangular in cross section just beneath the face plate resulting in the bulb having substantially flat side wall portion 21. Additionally, in order to provide a transition from the flat side wall portions to the cylindrical neck 20 the bulb is formed to include a substantially conical side wall portion 22 just above the neck portion 20. While we have shown the bulb 18 as being formed wholly of glass the bulb could alternatively be formed to include metal side walls and a glass face plate and neck portion, all suitably sealed together to provide what is generally known as a cathode ray tube assembly.

Provided for assisting in centering the bulb in the head 13 and gripping the neck portion 20 to secure the bulb in the head is a chuck arrangement generally designated 23. The chuck 23 includes a plurality of bars arranged for sliding movement in radially extending slots 25 machined in the upper surface of the spider 14a in the manner shown in Fig. 5. In each bar 24 is provided a vertically extending stud 26. The studs 26 are received in and cooperated with cam slots 27 formed in a rotatable cam plate 28. Secured on the spider above the cam plate 28 is a retaining plate 29 adapted for retaining the bars 24 in the slots 25 and the studs 26 and the cam plate 28 in cooperative relationship. Secured on the edge of the cam plate 28 in spaced relationship is a plurality of handles 30 provided for facilitating the turning of the cam plate 28 by an operator. It will be seen that when through the agency of the handles 30 the cam plate 28 is rotated clockwise in Fig. 3 the cooperation between the cam slots 27 and the studs 26 will be such that the bars 24 will be actuated centripetally for engaging the neck portion 20 of the bulb firmly thereby to center the bulb neck in the chuck and secure the bulb in the head 13. When the cam plate 28 is actuated counterclockwise in Fig. 3 the bars 24 will be actuated centrifugally for releasing the neck of the bulb. Suitably secured on the ring 15 above the chuck 23 is a shield plate 31. The plate 31 includes a central aperture through which extends the neck portion 20 of the bulb and is effective for shielding the moving parts of the chuck from broken glass or the like which could jam the moving parts or the chuck and adversely affect the operation of the chuck.

The head 13 is suitably arranged for rotation by means of a sleeve 32 in which is journaled the cylindrical portion 14 of the head, the sleeve 32 being suitably secured to the edge of a circular aperture 33 formed in the bottom portion 34 of the compartment 2 of the cabinet. Secured on the extremity of the cylindrical portion of the head below the sleeve 32 and disposed on the compartment 3 is a pulley wheel 35. Fitted on the pulley wheel is one end of a V-belt 36. As seen in Figs. 1 and 2 the other end of the V-belt 36 is fitted on a horizontally disposed pulley 37. The pulley 37 is part of

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an arrangement including a gear box 38 suitably mounted in the compartment 3 and another pulley wheel 39 whereby the direction of the pulley drive is changed 90° from the axis of rotation of the head 13. Fitted on the pulley 39 is one end of another V-belt 40. The other end of the V-belt 40 is fitted on a drive pulley 41 secured on the drive shaft of a variable speed motor 42 suitably mounted on the bottom of the compartment 3. By means of the just-described arrangement the head 13 and the bulb 18 supported therein is rotated when the motor 42 is energized.

Provided for assisting in maintaining the bulb 18 satisfactorily seated in the head 13 during rotation thereof is a bulb retaining arm 43 which as seen in Fig. 3 is pivotally mounted at 44 on a bracket 45. The bracket 45 is slidably fitted on a vertical post 46 which is suitably mounted by another bracket 47 on the side portion of the bottom 34 of the compartment 2. The arm 43 carries at its extremity a pad 48 adapted for engaging the center of the face plate 19 of the bulb 20 and rotating freely therewith. The arm 43 is movable from the position in which the pad 48 engages the face plate of the bulb to a position substantially parallel to the side wall of the cabinet in which it is unobstructive relative to the bulb for permitting an operator to remove the bulb from the head and to insert another thereinto.

Provided for spraying film material such as lacquer into the bulb 18 and introducing liquid into the bulb in the vicinity of and preferably above or at the lower edge of the conical portion 22 is an assembly which extends into the bulb through the neck portion 23 and is generally designated 49. The assembly 49 includes a spray gun 50 having a barrel 51 which extends into the bulb through the neck portion 20. By means not shown material to be sprayed into the bulb and gas for atomizing the material to effect the spray are supplied to the gun 50, the supply of these substances being controlled by a solenoid valve or the like 52 in a line 53 connecting the gun with the sources of lacquer and gas. The assembly 49 further includes a vertical portion 54 of a liquid line 55. The liquid line 55 is adapted for being supplied with water or an etching solution such as hydrofluoric acid, ammonium bifluoride or the like. The flow of water into the line 55 is controlled by a solenoid valve or the like 56 and the flow of acid solution into the line 55 is controlled by another solenoid valve or the like 57. It will be seen that liquid other than an etching solution or water could be supplied to the line 55 under control of one of the solenoid valves. For instance, a solvent of the film material could be supplied to the line 55. It will be seen further that by controlling operation of the valves 56 and 57 water or etching solution can be supplied to the line 55 for being introduced selectively into the bulb 18 through the vertical portion 54. Additionally, the upper end of the portion 54 of the line is so disposed as to introduce the liquids and direct them onto the side walls of the bulb above the lower edge of the conical portion 22.

When a bulb 18 is placed in the head the inner surface of the face plate portion 19 is already coated with a phosphorescent material to provide a screen portion and water rinsed. It is this screen portion which it is desirable to coat with a film material such as lacquer to provide a suitable base for a subsequent aluminum coating. After the tube is suitably secured in the head by the chuck 23 and the arm 43 the head is preferably rotated slowly while the gun 50 is energized for spraying the lacquer into the bulb and onto the screen portion in the manner indicated at 58 in Fig. 7. As also seen in Fig. 7 the filming operation results in the deposit of excess film material on the side wall portions of the bulb. It is this excess film material on the side wall which it is necessary to clean from the side walls in advance of a painting operation in order to prevent peeling of the side wall aluminum coating and paint during a subsequent baking operation. In accord-

ance with one of our methods for cleaning the excess film material from the side walls of the bulb a cleaning liquid such as an etching solution is introduced into the bulb in the vicinity of the lower edge of the conical side wall portion 22 of the bulb. This may be effected by energizing the solenoid valve 57 for admitting an etching solution into the line 55 for being delivered by the vertical portion 54 thereof into the bulb. At the same time the motor 42 is energized for rotating the head 13 and the bulb 18 secured in the head. Rotation of the bulb in this manner causes the etching solution to ride up the conical side wall portion 22 of the bulb and into the corner portions of the bulb, indicated at 60 in Figs. 7-9 and formed by the meeting of the substantially flat side wall portions 21. This causes the etching solution to work under the film 59 on the side walls to etch the side walls and thereby clean the excess film therefrom in a pattern substantially the same as that indicated by 61 in Figs. 8 and 9. As clearly seen in Figs. 8 and 9 simply rotating the bulb is not satisfactory for cleaning the excess film material from the substantially flat side wall portions of the bulb. The extent to which the etching solution rides up into the corner portions 60 of the bulb is determined by the speed of rotation of the bulb. Provided for controlling the speed of rotation and thereby determining the extent to which the etching solution does ride up into the corner portions of the bulb is a motor controlling means designated 62 in Fig. 6.

In order to provide for cleaning of the excess film material 59 from the substantially flat side wall portions 21 of the bulb I have provided means for introducing inertial effects on the liquid and thereby causing the etching solution to wash from the corner portions 60 of the bulb over the substantially flat side wall portions. This means may be any form of means for altering the rotation of the bulb so as to cause the liquid in the corners of the bulb to move relative to the bulb under the influence of inertia for washing from the corners of the bulb over the flat side walls. For instance, the bulb could be initially rotated to a predetermined rate of speed until the liquid rode up into the corners and then the speed could be suddenly accelerated. Thus owing to inertia the liquid would tend to continue moving at the initial speed when the velocity of the bulb increased whereby the liquid would wash from the corners of the bulb back over the flat side walls. Also, the bulb could be rotated at a predetermined initial rate of speed until the liquid rode up into the corners of the bulb and then the rotation of the bulb could be suddenly decelerated whereby inertia would be effective for causing the liquid to tend to continue rotating at the initial velocity whereby the liquid would wash from the corners of the bulb forward over the flat side walls.

A preferred embodiment of our invention includes the above referred to brake drum 14b shown in Figs. 3-6 and is adapted for decelerating the bulb head with the bulb therein to a complete and sudden stop. It is to be understood that it is not necessary to the invention that the rotation be completely stopped. Provided for cooperating with the drum 14b is a brake band 65. The brake band 65 is secured at one end to the bottom 34 of the compartment 32. The opposite end of the brake band 65 is attached to actuating means generally designated 66 and which may comprise electrically or air-operated means or the like. As best seen in Figs. 4 and 6 the brake band 65 is biased out of engagement with the drum 14b by a plurality of biasing arrangements generally designated 67.

When during operation of the machine the etching solution has ridden up into the corner portions 60 of the bulb in the manner shown in Figs. 8 and 9 the brake is suddenly applied by energizing the actuating means 66 in order to bring the brake band 65 into braking engagement with the drum 14b for stopping the rotation of the bulb suddenly. As a result the etching solution in the

corner portions of the bulb is caused by inertia to wash over the substantially flat side wall portions 21 in a pattern indicated by 67 in Fig. 10 whereby the substantially flat side wall portions 21 are etched for cleaning the excess film material 59 therefrom.

Following stopping of the bulb in the just-described manner to effect cleaning of the flat side wall portions of the bulb the etching solution is drained out of the bulb through the neck portion 20 into a suitable receptacle (not shown). Thereafter in order to flush from the bulb any etching solution or lacquer solution remaining therein water is introduced into the bulb at the lower edge of the conical portion 22 by energizing the solenoid valve 56 and permitting water to flow into the line 55 and up through the vertical portion 54 thereof. Again the motor 42 is energized for causing the water to ride up the conical side wall portions 22 and into the corner portions of the bulb 60 for the same purpose as described above with regard to the etching solution. Again the controlling means 62 is effective for determining the extent to which the water rides up into the corner portions 60. Additionally, again the brake is suddenly applied for suddenly stopping the head 13 and the bulb 18 secured therein for causing the water in the corner portion 60 to wash over the substantially flat side wall portions 21 of the bulb. Thereafter the water is permitted to drain out of the bulb through the neck portion 20 for flushing from the bulb any remaining etching solution or film material. This water flushing operation may be carried out any desired number of times.

The above-described arrangement may also be employed for spraying the screen portion of a bulb and removing excess film material from the side walls of a bulb in another manner. In this other manner the bulb may first be rotated while the etching solution is introduced thereinto for causing the etching solution to ride up the conical side wall portion 22 of the bulb and into the corner portions 60 thereby to etch the side walls of the bulb in accordance with the pattern designated 61. In this method also the controlling means 62 would be utilized for controlling the rotation of the bulb to determine the extent to which the etching solution rides up into the corner portion 60. Thereafter the brake is suddenly applied for suddenly stopping the bulb rotation to cause the etching solution to wash over the substantially flat side wall portions 21 in the same manner as in the first described method for etching the side walls of the bulb in accordance with the pattern 67. Following etching of the side walls of the bulb in the just described manner, the spray gun 50 is energized for spraying the film material into the bulb and onto the screen in the manner indicated at 58 in Fig. 7. As a result of this spraying operation the side wall portions of the bulb will be coated with excess film as indicated at 59. Following spraying of the screen portion of the bulb in the just described manner, the bulb is rotated and the valve 56 is energized for causing water to be introduced into the bulb at the lower edge of the conical portion 22. Rotation of the bulb causes the water to ride up the side walls of the conical portion and up into the corner portions 60. Again rotation of the bulb is controlled by the controlling means 62 for determining the extent to which the water rides up into corner portions. Thereafter the brake is again suddenly applied for suddenly stopping the rotation of the bulb to cause the water to wash over the substantially flat side wall portions 21 in accordance with the pattern 67 in Fig. 10. In riding up the side walls and into the corner portions of the bulb and in being washed over the flat side wall portions of the bulb when rotation is suddenly stopped the water is effective for washing the film material from the side walls, this being possible since the previous etching operation thoroughly cleaned the side walls before the lacquer was deposited thereon and the lacquer is thereby prevented from strongly adhering to the side walls. Thereafter since the bulb

is stopped, the water and lacquer solution drain therefrom through the neck portion 20. This just described water flushing operation may be repeated any number of times desired.

In still another manner the above described arrangement may be employed for spraying film into the bulb and removing excess film material from the side walls thereof. The spray gun 50 may be first energized for spraying the film material into the bulb and onto the screen portion in a manner identical to that described above. Thereafter, however, instead of introducing an etching solution into the bulb for being caused to ride up into the corner portions of the bulb during rotation and further caused to wash over the substantially flat side wall portions when the bulb is suddenly stopped, a solvent for the film material may be introduced into the bulb through the vertical portion 54 of the line 55. During introduction of the solvent into the bulb, the bulb would be rotated whereby the solvent would be caused to ride up the conical side wall portions of the bulb and up into the corner portions 60 in the same manner as the etching solution and water referred to above. The extent to which the solvent rides up the sides of the bulb will be determined by the speed of rotation of the bulb which may be controlled by the controlling means 62. Thereafter the brake would be applied for suddenly stopping the rotation of the bulb to cause the solvent to wash over the substantially flat side wall portions 21 in accordance with pattern 67 of Fig. 10. In riding up the side wall and into the corner portions 60 and in being washed over the substantially flat side wall portions 21 the solvent would be effective for dissolving the excess film material 59 and when the bulb rotation is stopped the solvent and the dissolved film material would drain out of the bulb through the neck portion. This operation could be repeated any number of times desired and if desired a water flushing operation may be performed in the manner described above with regard to the first two methods of cleaning the side walls of the bulb.

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 having substantially rectangular screen portions, substantially flat side wall portions and transitional conical side wall portions, means for supporting a bulb with the screen portion upward, means for introducing a liquid into said bulb in the vicinity of the lower edge of said conical side wall portion, means for rotating said bulb to cause said liquid to ride up said conical side wall portion and into the corners of said bulb formed by said flat side wall portions and means to alter the rotation of said bulb thus to introduce inertial effects operable on said liquid, thereby to minimize accumulation of said liquid in said corners.

2. In a machine for processing cathode ray tube bulbs having substantially rectangular screen portions, substantially flat side wall portions and transitional conical side wall portions, means for supporting a bulb with the screen portion upward, means for introducing a liquid into said bulb in the vicinity of the lower edge of said conical side wall portion, means for rotating said bulb to cause said liquid to ride up said conical side wall portion and into the corners of said bulb formed by said flat side wall portions, means for controlling the speed of rotation of said bulb to determine the extent to which said liquid rides up into said corners, and means for suddenly altering the rotation of said bulb thereby to cause said liquid

in said corners of said bulb to wash over said flat side wall portions.

3. In a machine for providing a film on the screen portion and cleaning excess film material from the side wall portions of cathode ray tube bulbs having substantially rectangular screen portions, substantially flat side wall portions and transitional conical side wall portions, means for supporting a bulb with the screen portion upward, means for spraying a film material into said bulb and onto said screen portion, means for introducing a cleaning liquid into said bulb above the lower edge of said conical side wall portion, means for rotating said bulb to cause said liquid to ride up said conical side wall portion and into the corners of said bulb formed by said flat side wall portions, and means for suddenly stopping said bulb thereby to cause said cleaning liquid in said corners of said bulb to wash over said flat side wall portions whereby said side wall portions are cleaned of excess film material.

4. In a machine for providing a film on the screen portion and cleaning excess film material from the side wall portions of cathode ray tube bulbs having substantially rectangular screen portions, substantially flat side wall portions and transitional conical side wall portions, means for supporting a bulb with the screen portion upward means for spraying a film material into said bulb and onto said screen portion, means for introducing a cleaning liquid into said bulb above the lower edge of said conical side wall portion, means for rotating said bulb to cause said liquid to ride up said conical side wall portions and into the corners of said bulb formed by said flat side wall portions, means for controlling the speed of rotation of said bulb to determine the extent to which said cleaning liquid rides up into said corners, and means for suddenly stopping said bulb thereby to cause said liquid in said corners of said bulb to wash over said flat side wall portions whereby said side wall portions are cleaned of excess film material.

5. In the processing of cathode ray tube bulbs having outwardly inclined substantially flat side wall portions, the method consisting in the steps of supporting a bulb with the wide end upward, centrifuging a liquid in said bulb to cause said liquid to ride up into the corners of said bulb formed by said flat side wall portions and suddenly altering the rate of centrifuging of said bulb thus to introduce inertial effects operable on said liquid, thereby to minimize accumulation of said liquid in said corners.

6. In the processing of cathode ray tube bulbs having outwardly inclined substantially flat side wall portions, the method consisting in the steps of supporting a bulb with the wide end upward, centrifuging a liquid in said bulb to cause said liquid to ride up into the corners of said bulb formed by said flat side wall portions, controlling said centrifuging to determine the extent to which said liquid rides up into said corners, and suddenly altering the rate of centrifuging of said bulb thereby to cause said liquid in said corners to wash over said flat side wall portions.

7. In the processing of cathode ray tube bulbs having substantially rectangular screen portions, substantially flat side wall portions and transitional conical side wall portions, the method of cleaning the side wall portions of said bulbs consisting in the steps of supporting a bulb with the screen portion upward, introducing a cleaning liquid into said bulb in the vicinity of the lower edge of the conical side wall portion thereof, rotating said bulb to cause said liquid to ride up said conical side wall portion and into the corners of said bulb formed by said flat side wall portions, and suddenly altering the rotation of said bulb thereby to cause said liquid in said corners of said bulb to wash over said flat side wall portions.

8. In the processing of cathode ray tube bulbs having substantially rectangular screen portions, substantially flat side wall portions and transitional conical side wall

12. In the processing of cathode ray tube bulbs having substantially rectangular screen portions, substantially flat side wall portions and transitional conical side wall portions, the method of cleaning said side wall portions of said bulbs consisting in the steps of supporting a bulb with the screen portion upward, introducing an etching solution into said bulb above the lower edge of said conical side wall portion, rotating said bulb to cause said etching solution to ride up said conical side wall portion and into the corners of said bulb formed by said flat side wall portions, controlling the rotation of said

15. In the processing of cathode ray tube bulbs having substantially rectangular screen portions, substantially flat side wall portions and transitional conical side wall

portions, the method of providing a film on said screen portions and cleaning excess film material from said side wall portions of said bulbs consisting in the steps of supporting a bulb with the screen portion upward, introducing an etching solution into said bulb above the lower edge of said conical side wall portion, rotating said bulb to cause said etching solution to ride up said conical side wall portion and into the corners of said bulb formed by said flat side wall portions, suddenly stopping said bulb thereby to cause said etching solution in said corners of said bulb to wash over said flat side wall portions for etching and thereby cleaning said side walls, draining said etching solution from said bulb, spraying a film material into said bulb and onto said screen portion, introducing water into said bulb above said lower edge of said conical side wall portion, again rotating said bulb to cause said water to ride up into said corners of said bulb, again stopping said bulb thereby to cause said water to wash over said flat side wall portions, and draining said water from said bulb for flushing said excess film material from said bulb.

16. In the processing of cathode ray tube bulbs having substantially rectangular screen portions, substantially flat side wall portions and transitional conical side wall portions, the method of providing a film on said screen portions and cleaning excess film material from said side wall portions of said bulbs consisting in the steps of supporting a bulb with the screen portion upward, introducing an etching solution into said bulb above the lower edge of said conical side wall portion, rotating said bulb to cause said etching solution to ride up said conical side wall portion and into the corners of said bulb formed by said flat side wall portions, controlling the rotation of said bulb to determine the extent to which said etching solution rides up into said corners, suddenly stopping said bulb thereby to cause said etching solution in said corners of said bulb to wash over said flat side wall portions for etching and thereby cleaning said side walls, draining said etching solution from said bulb, spraying a film material into said bulb and onto said screen portion, introducing water into said bulb above said lower edge of said conical side wall portion, again rotating said bulb to cause said water to ride up into said corners of said bulb, controlling the rotation of said bulb to determine the extent to which said water rides up into said corners, again suddenly stopping said rotating means thereby to cause said water in said corners of said bulb to wash over said flat side wall portions, and draining said water from said bulb for flushing said excess film material from said bulb.

17. In the processing of cathode ray tube bulbs having substantially rectangular screen portions, substantially flat side wall portions and transitional conical side wall portions, the method of providing a film on said screen portions and cleaning excess film material from said side wall portions of said bulbs consisting in the steps of supporting a bulb with the screen portion upward, spraying

a film material into said bulb and onto said screen portion, introducing a solvent of said film material into said bulb above the lower edge of said conical side wall portion, rotating said bulb to cause said solvent to ride up said conical side wall portion and into the corners of said bulb formed by said flat side wall portion, suddenly stopping said bulb thereby to cause said solvent in said corners of said bulb to wash over said flat side wall portions for dissolving and thereby cleaning said excess film material from said side wall portions, and draining said solvent and dissolved film material from said bulb.

18. In the processing of cathode ray tube bulbs having substantially rectangular screen portions, substantially flat side wall portions and transitional conical side wall portions, the method of providing a film on said screen portions and cleaning excess film material from said side wall portions of said bulbs consisting in the steps of supporting a bulb with the screen portion upward, spraying a film material into said bulb and onto said screen portion, introducing a solvent of said film material into said bulb above the lower edge of said conical side wall portion, rotating said bulb to cause said solvent to ride up said conical side wall portion and into the corners of said bulb formed by said flat side wall portions, controlling the rotation of said bulb to determine the extent to which said solvent rides up into said corners, suddenly stopping said bulb thereby to cause said solvent in said corners of said bulb to wash over said flat side wall portions for dissolving and thereby cleaning said excess film material from said side wall portions, and draining said solvent and dissolved film material from said bulb.

19. The method of applying a fluid material to the inside surfaces of a hollow member having substantially flat side wall portions consisting in the steps of rotating said member about the longitudinal axis thereof, introducing the fluid material into the corners of said member formed by said side wall portions for being held therein by centrifugal force, and altering said rotation of said member thereby to introduce inertial effects operable on said fluid material for causing it to wash over said inside surfaces of said side wall portions.

20. The method of applying a fluid material to the inside surfaces of a hollow member having substantially flat side wall portions consisting in the steps of centrifuging the fluid material into the corners of said member formed by said side wall portions thereof, and suddenly altering the rate of centrifuging said material thereby to introduce inertial effects operable on said fluid material for causing it to wash over said inside surfaces of said side wall portions.

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