

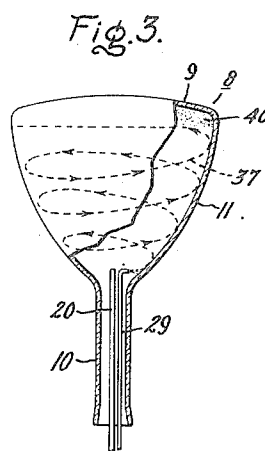
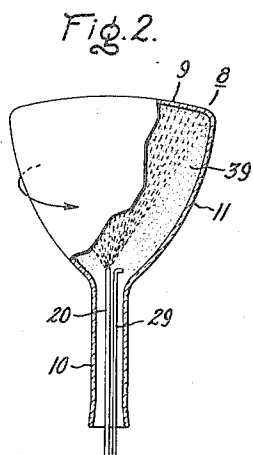
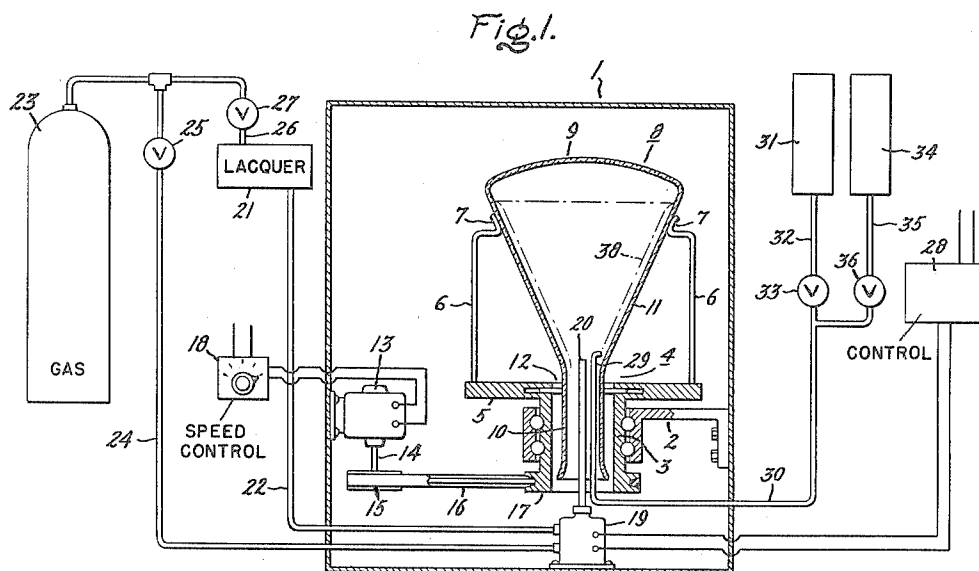
Sept. 18, 1956

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2,763,564

MEANS AND METHODS FOR PROCESSING CATHODE RAY TUBE BULBS

Filed Nov. 25, 1953



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2,763,564

MEANS AND METHODS FOR PROCESSING CATHODE RAY TUBE BULBS

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Application November 25, 1953, Serial No. 394,372

22 Claims. (Cl. 117—3)

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 such bulbs.

In the processing of cathode ray tube bulbs the inner surface of the face plates thereof are first coated with phosphorescent material to provide a screen portion. Thereafter the screen portion is water rinsed and a lacquer film is sprayed thereover 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 tubes. 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 side walls. Heretofore the lacquer has been first sprayed on the screen portion and then the excess lacquer has been cleaned off the side walls by an operator using a long handled liquid-fed brush. This method proved unsatisfactory since it was messy and required exceptional skill on the part of the operator to prevent splashing on the phosphorescent screen of the bulb. Additionally, it was slow and did not readily lend itself to automation whereby production could be increased. Accordingly, a primary object of our invention is to provide new and improved means and methods for processing the interiors of cathode ray tube bulbs.

Another object of our invention is to provide new and improved means and methods 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 means and methods for cleaning the side walls of cathode ray tube bulbs which afford a relatively clean operation and require no special skill on the part of an operator.

Still another object of our invention is to provide new and improved means and methods for spraying lacquer on the screen of cathode ray tube bulb and cleaning the side walls of the bulbs of excess lacquer which readily lend themselves to automation and whereby production can be markedly increased.

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 object of our invention we provide means for spraying lacquer on the interior surface of the screen portion of a 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 portion thereof for being caused to be centrifuged or ride up the side of the bulb during rotation thereof. Means for controlling the rotation of the bulb determines the extent, to which the liquid rides up the side walls of the bulb.

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For a better understanding of our invention reference may be had to the accompanying drawing in which: Fig. 1 is a somewhat schematic illustration of means for carrying out our invention.

Fig. 2 is a partially broken away view of a cathode ray tube bulb illustrating the manner in which the lacquer is sprayed into the bulb; and Fig. 3 is a similar view illustrating the manner in which the cleaning liquid rides up the side walls of the tube.

In Fig. 1 is shown a cabinet 1. Access to the interior of the cabinet is had through a door in the front wall of the cabinet which has been cut away to illustrate the components housed in the cabinet.

Suitably mounted on a side wall of the cabinet is a journal bracket 2. Journaled in the bracket 2 is a cylindrical portion 3 of a rotary head generally designated 4. The head 4 is also formed to include a plate portion 5 disposed above the bracket 2. Mounted on the plate 5 at the edge thereof and in spaced apart relationship is a plurality of upright brackets 6 formed to include pad portions 7 at their upper ends. The head 4 is adapted for receiving a cathode ray tube bulb 8 in the manner shown in Fig. 1. The bulb 8 may be of the completely glass type or the type including a metal cone and a glass face plate and generally referred to as a cathode ray tube bulb assembly. When the bulb 8 is positioned in the head the face plate portion 9 thereof extends upward, the neck portion 10 extends downward into the cylindrical portion 3 of the head, and the conical portion 11 of the bulb is engaged by the bracket pads 7 for supporting the bulb in the manner shown. Provided for assisting in centering and securing the bulb in the head 4 is a chuck generally designated 12. In a manner not fully shown, the chuck 12 firmly grips the neck portion 10 of the bulb just below the lower edge of the conical portion 11.

Also suitably secured on a wall of the cabinet 1 and provided for rotating the head 4 with the bulb secured therein is a variable speed motor 13. The motor 13 includes a shaft 14 to which is secured a pulley wheel 15. Fitted on the pulley wheel 15 is one end of a V-belt 16. The other end of the V-belt 16 is fitted on another pulley wheel 17 formed on the lower end of the cylindrical portion 3 of the head 4 below the bracket 2. Provided for controlling the speed of rotation of the motor 13 is controlling means generally designated 18. In the arrangement described to this point the motor 13 is effective for rotating the head 4 and the bulb 8 secured therein; and speed of rotation of the bulb is controllable by the motor controlling means 18.

Secured to the bottom of the cabinet 1 is a spray gun 19. As seen in Figs. 1-3 the spray gun 19 includes a vertically extending barrel 20 adapted for extending into the bulb 8 through the neck portion 10 thereof when the bulb is in place in the head. The gun 19 is supplied with lacquer from a reservoir 21 through a line 22. The gun 19 is also supplied with a gas from a tank 23 through a line 24 for atomizing the lacquer in the gun to effect spraying thereof into the bulb through the barrel 20 in the manner shown in Fig. 2. A valve 25 in the line 24 controls the flow of gas from the tank to the gun. A line 26 connects the gas tank 23 with the lacquer line 22 whereby the gas is utilized for assisting in delivering the lacquer to the gun. A valve 27 is provided in the line 26 for controlling the flow of gas into the line 22 and thereby controlling the amount of lacquer supplied to the gun. Controlling means generally designated 28 and suitably electrically connected to the gun 19 is provided whereby operation of the spray gun 19 can be controlled.

Also provided for extending into the bulb 8 through the neck portion 10 thereof is a vertical portion 29 of a liquid line 30. The line 30 is connected to a first liquid reservoir 31 by a tube 32 including a valve 33 for con-

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trolling flow of liquid from the reservoir 31 to the line 30. The line 30 is also connected to a second reservoir 34 by a tube 35 including a valve 36 for controlling flow of liquid from the second reservoir 34 to the line 30. In this arrangement liquid can be caused to flow into the line 30 selectively from either of the reservoirs.

The end of the vertical portion 29 of the line 30 is bent horizontal and is so disposed that when the liquid is caused to flow therethrough from either of the reservoirs 31 or 34 it will be introduced into the bulb 8 above the lower edge of the conical portion 11. Therefore, if the bulb 8 is rotated in the above described manner when the liquid is introduced into the bulb the liquid will be caused by centrifugal force to ride up the side walls of the bulb in the manner indicated by the broken arrow headed line 37 in Fig. 3 thereby to coat the side walls, of the bulb with liquid in the manner shown in dot and dash lines indicated by 38 in Fig. 1.

When the bulb 8 is secured in the head 4 for processing by the above described arrangement it is already provided with a phosphorescent coating (not shown), on the inner side of the face plate 9 to provide a picture screen. It is this phosphorescent screen which it is desirable to coat with a lacquer film to provide a suitable base for a subsequently applied aluminum coating. Additionally, before applying the lacquer the interior of the bulb is water rinsed. The application of the lacquer film is accomplished by means of the spray gun 19 in the manner shown in Fig. 2. Spraying of the film on the screen, however, also results in deposit of excess lacquer on the inner side walls or conical portions of the bulb as indicated by 39 in Fig. 2. This film if left on the side walls will result during a subsequent baking out operation in peeling of an aluminum coating and paint applied to the side walls just before baking. Therefore, it is desirable that the side walls of the bulb be thoroughly cleaned of lacquer before application of the aluminum coating and paint.

The above described arrangement can be utilized for spraying the lacquer on the screen portion of the bulb and in cleaning the excess lacquer from the side walls of the bulb in several manners. For instance, the spray gun 19 can be energized while the bulb is rotated at a low speed for spraying the lacquer on the screen portion of the bulb in the manner shown in Fig. 2. Thereafter the speed of rotation is increased for causing the film to spread out by centrifugal force and thereby assume a predetermined satisfactory thinness. Then the rotation is stopped and the excess lacquer is permitted to drain down the side walls and out the neck of the tube into a suitable receptacle (not shown). During the spraying and draining operation the side walls of the bulb become coated with film as indicated at 39, which for the reasons pointed out above, must be completely removed before application of an aluminum coating and paint to the side walls. To accomplish cleaning of the side walls the bulb is again rotated and the valve 33 is opened whereby an etching solution which may be a solution of hydrofluoric acid and water, ammonium bifluoride or the like is permitted to flow from the reservoir 31 through the tube 32 and the vertical portion 29 of the line 30 for being introduced into the bulb above the lower edge of the conical portion 11. By centrifugal force rotation of the bulb 8 causes the acid solution to ride up the side walls in the manner indicated by 37 in Fig. 3 for forming a liquid coating on the side walls as indicated at 38 in Fig. 1. By controlling the speed of rotation of the bulb 8 with the motor controlling means 18 the extent to which the solution rides up the side walls is determined. In riding up the side walls the etching solution works its way under the film thereon and etches the inner surface of the material comprising the side walls of the bulb. Thereafter the valve 33 is closed stopping the flow of etching solution and rotation of the bulb is stopped permitting the solu-

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tion and lacquer cleaned off the side walls to drain out of the bulb. Thus, the lacquer is cleaned off the side walls without affecting the film indicated by 40 which coats the screen portion of the bulb and extends a short distance down the side walls.

In order to flush out any etching solution and lacquer which might be still adhering to the walls of the bulb the bulb is again rotated and the valve 36 is opened permitting water to flow from the reservoir 34 into the tube 30 for being introduced into the bulb and caused to ride up the side walls of the bulb in the same manner as the etching solution. Again the rotations of the bulb are controlled for determining the extent to which the water rides up the side walls of the tube for preventing any splashing of liquid on the phosphorescent screen of the bulb. Subsequently the rotation of the bulb is stopped and the water is permitted to drain from the bulb for flushing out any etching and lacquer solution remaining in the bulb. This water flushing operation may be carried out any desired number of times.

The above described arrangement may also be employed for spraying and cleaning lacquer from the side walls of the bulb in another manner. In this other manner the bulb may first be rotated and the etching solution introduced thereto by opening the valve 33 for causing the etching solution to ride up the side walls of the bulb thereby to etch the side walls, the controlling means 18 being utilized for controlling the rotation of the bulb to determine the extent to which the side walls are etched. Then the rotation is stopped to permit drainage of the solution from the bulb. Thereafter the spray gun 19 is energized while the bulb is slowly turned for spraying a lacquer film onto the screen of the bulb, following which the bulb rotation is increased for thinning out the film on the screen. In this operation some of the lacquer is deposited on the side walls of the bulb and the bulb rotation is stopped for permitting the excess lacquer to drain out through the neck of the bulb. Thereafter the bulb is again rotated and water is introduced into the bulb by opening the valve 36. Rotation of the bulb causes the water to ride up the side walls. Rotation of the bulb is again controlled by the controlling means 18 for determining the extent to which the water rides up the side walls. In riding up the side walls the water is effective for washing the lacquer film 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 rotation of the bulb is stopped and the water and lacquer solution are permitted to drain from the bulb. This just described water flushing arrangement may be repeated any desired number of times.

In still another manner the arrangement shown in Fig. 1 may be employed for spraying film inside the bulb and removing excess film from the side walls thereof. The bulb may be slowly rotated while the spray gun 19 is energized and thereafter rotated faster for spreading the film on the screen portion of the bulb. Following this the rotation is stopped permitting excess lacquer to drain down the side walls of the bulb and out the neck thereof. Then in order to clean the side walls of the bulb a lacquer solvent may be introduced into the bulb through the tube 30 from either one of the reservoirs 31 or 34. During introduction of the solvent into the bulb the bulb is rotated whereby the solvent will be caused to ride up the side walls of the bulb by centrifugal force. The extent to which the solvent rides up the sides of the bulb is determined by the speed of rotation of the bulb which may be controlled by the controlling means 18. In riding up the side walls the solvent dissolves the lacquer from the side walls and when the bulb rotation is subsequently reduced the solvent and the dissolved lacquer drain out of the bulb through the neck portion. This operation may be repeated any number of times desired

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and if desired a water flushing operation may be performed in the manner described above with regard to the first two described methods of processing 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 cathode ray tube bulb processing machine, means for supporting a bulb with the face portion thereof upward, means for introducing a liquid into said bulb in the vicinity of the lower edge of the conical side wall portion of said bulb, and means for rotating said bulb to cause said liquid to ride up said side wall portion of said bulb.

2. In a cathode ray tube bulb processing machine, means for supporting a bulb with the face portion thereof upward, means for introducing a liquid into said bulb in the vicinity of the lower edge of the conical side wall portion of said bulb, means for rotating said bulb to cause said liquid to ride up said side wall portion of said bulb, and means for controlling the speed of said bulb rotating means to determine the extent to which said liquid rides up said conical side wall portion.

3. In a cathode ray tube bulb processing machine, for supporting a bulb with the screen portion thereof upward, means for spraying a film into said bulb and onto said screen portion, means for introducing a cleaning liquid into said bulb, and means for rotating said bulb to cause said cleaning liquid to ride up the side wall portion of said bulb for cleaning excess film material from the side walls of said bulb.

4. In a cathode ray tube bulb processing machine, means for supporting a bulb with the screen portion thereof upward, means for spraying a film into said bulb and onto said screen portion, means for introducing a cleaning liquid into said bulb, means for rotating said bulb to cause said cleaning liquid to ride up the side wall portion of said bulb for cleaning excess film material from the side walls of said bulb and means for controlling the speed of said bulb rotating means to determine the extent to which said liquid rides up said conical side wall portion.

5. In the processing of cathode ray tube bulbs, the method consisting in the steps of supporting a bulb with the face portion upward and centrifuging a liquid up the side wall portions of said bulb to provide a liquid coating on the side wall portions of said bulb.

6. In the processing of cathode ray tube bulbs, the method consisting in the steps of supporting a bulb with the face portion upward, centrifuging a liquid up the side wall portions of said bulb to provide a liquid coating on the side wall portions of said bulb, and controlling the said centrifuging to determine the extent of said coating.

7. In the processing of cathode ray tube bulbs, the method of cleaning the side wall portions of a bulb consisting in the steps of supporting a bulb with the face portion upward, introducing a cleaning liquid into said bulb in the vicinity of the lower edge of the conical side wall portion thereof, and rotating said bulb to cause said liquid to ride up said conical side wall portion of said bulb.

8. In the processing of cathode ray tube bulbs, the method of cleaning the side wall portions of a bulb consisting in the steps of supporting a bulb with the face 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 of said bulb, and controlling the rotation of said bulb to determine the extent to which said liquid rides up said conical side wall portion.

9. In the processing of cathode ray tube bulbs, the

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method of cleaning the side wall portions of a bulb consisting in the steps of supporting a bulb with the face portion upward, introducing an etching solution into said bulb, and rotating said bulb to cause said solution to ride up the side wall portion of said bulb for etching and thereby cleaning the side walls of said bulb.

10. In the processing of cathode ray tube bulbs, the method of cleaning the side wall portions of a bulb consisting in the steps of supporting a bulb with the face portion upward, introducing an etching solution into said bulb, rotating said bulb to cause said solution to ride up the side wall portion of said bulb for etching and thereby cleaning the side walls of said bulb, and controlling the rotation of said bulb to determine the extent to which said side walls are etched.

11. In the processing of cathode ray tube bulbs, the method of cleaning the side wall portions of a bulb consisting in the steps of supporting a bulb with the face portion upward, introducing an etching solution into said bulb, rotating said bulb to cause said solution to ride up the side wall portion of said bulb for etching and thereby cleaning the side walls of said bulb, reducing said rotation of said bulb to drain said etching solution and matter cleaned from said side walls from said bulb, introducing water into said bulb, again rotating said bulb to cause said water to ride up said side wall portion for washing any remaining acid solution and other matter from the side walls of said bulb and reducing said rotation of said bulb to drain said water from said bulb whereby said remaining etching solution and other matter are flushed from said bulb.

12. In the processing of cathode ray tube bulbs, the method of cleaning the side wall portions of a bulb consisting in the steps of supporting a bulb with the face portion upward, introducing an etching solution into said bulb, rotating said bulb to cause said solution to ride up the side wall portion of said bulb for etching and thereby cleaning the side walls of said bulb, controlling the rotation of said bulb to determine the extent to which said side walls are etched, reducing said rotation of said bulbs to drain said etching solution and matter cleaned from said side walls from said bulb, introducing water into said bulb, again rotating said bulb to cause said water to ride up said side wall portion for washing any remaining etching solution and other matter from said side walls, again controlling the rotation of said bulb to determine the extent to which said water rides up said side wall portion, and again reducing said rotation of said bulb to drain said water from said bulb whereby said remaining etching solution and other matter are flushed from said bulb.

13. In the processing of cathode ray tube bulbs, the method of coating the screen of a bulb with lacquer and cleaning the side wall portions of said bulb of excess lacquer deposited thereon consisting in the steps of supporting said bulb with the screen upward, spraying said lacquer into said bulb and onto said screen, introducing an etching solution into said bulb, and rotating said bulb to cause said solution to ride up said side wall portion of said bulb for etching the side walls of said bulb to remove lacquer therefrom.

14. In the processing of cathode ray tube bulbs, the method of coating the screen of a bulb with lacquer and cleaning the side wall portions of said bulb of excess lacquer deposited thereon consisting in the steps of supporting said bulb with the screen upward, spraying said lacquer into said bulb and onto said screen, introducing an etching solution into said bulb, rotating said bulb to cause said solution to ride up the side wall portion of said bulb for etching the side walls of said bulb to remove lacquer therefrom, and controlling the rotation of said bulb to determine the extent to which said solution rides up said side wall portion thereby to determine the extent to which said lacquer is removed from said side walls.

15. In the processing of cathode ray tube bulbs, the

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method of coating the screen of a bulb with lacquer and cleaning the side wall portions of said bulb of excess lacquer deposited thereon consisting in the steps of supporting said bulb with the screen upward, spraying a lacquer into said bulb and onto said screen, introducing an etching solution into said bulb, rotating said bulb to cause said solution to ride up the side wall portion of said bulb for etching the side walls of said bulb to remove lacquer therefrom, reducing rotation of said bulb to drain said etching solution and removed lacquer from said bulb, introducing water into said bulb, again rotating said bulb to cause said water to ride up said side wall portion for washing any remaining etching solution and lacquer from said side walls, and reducing said rotation of said bulb to drain said water from said bulb whereby said remaining etching solution and removed lacquer are flushed from said bulb.

16. In the processing of cathode ray tube bulbs, the method of coating the screen of a bulb with lacquer and cleaning the side wall portions of said bulb of excess lacquer deposited thereon consisting in the steps of supporting said bulb with the screen upward, spraying a lacquer into said bulb and onto said screen, introducing an etching solution into said bulb, rotating said bulb to cause said solution to ride up the side wall portion of said bulb for etching the side walls of said bulb to remove lacquer therefrom, controlling the rotation of said bulb to determine the extent to which said solution rides up said side walls thereby to determine the extent to which said lacquer is removed from said side walls, reducing rotation of said bulb to drain said etching solution and removed lacquer from said bulb, introducing water into said bulb, again rotating said bulb to cause said water to ride up said side walls for washing any remaining etching solution and removed lacquer from said side walls, again controlling said rotation of said bulb to determine the extent to which said water rides up said side wall portion, and again reducing said rotation of said bulb to drain said water from said bulb whereby said remaining etching solution and removed lacquer are flushed from said bulb.

17. In the processing of cathode ray tube bulbs, the method of coating the screen of a bulb with lacquer and cleaning the side wall portions of said bulb of excess lacquer deposited thereon consisting in the steps of supporting said bulb with the screen upward, introducing an etching solution into said bulb, rotating said bulb to cause said solution to ride up the side walls portion of said bulb for etching said side walls, reducing rotation of said bulb to drain said etching solution from said bulb, spraying a lacquer into said bulb and onto said screen, introducing water into said bulb, again rotating said bulb to cause said water to rise up said side wall portion for washing said lacquer from said etched side walls, and reducing said rotation of said bulb to drain said water from said bulb whereby said removed lacquer is flushed from said bulb.

18. In the processing of cathode ray tube bulbs, the method of coating the screen of a bulb with lacquer and cleaning the side wall portions of said bulb of excess lacquer deposited thereon consisting in the steps of supporting said bulb with the screen upward, introducing an etching solution into said bulb, rotating said bulb to cause said solution to ride up the side wall portion of said bulb for etching said side walls, controlling the rotation of said bulb to determine the extent to which said

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solution rides up said side wall portion thereby to determine the extent to which said side walls are etched, reducing rotation of said bulb to drain said etching solution from said bulb, spraying a lacquer into said bulb and onto said screen, introducing water into said bulb, again rotating said bulb to cause said water to ride up said side wall portion for washing said lacquer from said etched side walls, again controlling rotation of said bulb to determine the extent to which said water rides up said side wall portion, and again reducing said rotation of said bulb to drain said water from said bulb whereby said removed lacquer is flushed from said bulb.

19. In the processing of cathode ray tube bulbs, the method of removing soluble matter from the side wall portions of a bulb consisting in the steps of supporting said bulb with the face portion upward, introducing a solvent of the matter to be removed from said side walls into said bulb, rotating said bulb to cause said solvent to ride up said side wall portion of said bulb for dissolving said matter from the side walls of said bulb, and reducing rotation of said bulb to drain said solvent and said dissolved matter from said bulb.

20. In the processing of cathode ray tube bulbs, the method of removing soluble matter from the side wall portions of a bulb consisting in the steps of supporting a bulb with the face portion upward, introducing a solvent of the matter to be removed from said side walls into said bulb, rotating said bulb to cause said solvent to ride up said side walls portion of said bulb for dissolving said matter from the side walls of said bulbs, controlling the rotation of said bulb to determine the extent to which said solvent rides up said side walls for dissolving said matter from said side walls, and reducing rotation of said bulb to drain said solvent and said dissolved matter from said bulb.

21. In the processing of cathode ray tube bulbs, the method of coating the screen of a bulb with lacquer and cleaning the side wall portions of said bulb of excess lacquer deposited thereon consisting in the steps of supporting said bulb with the screen upward, spraying a lacquer into said bulb and onto said screen, introducing a lacquer solvent into said bulb, rotating said bulb to cause said solvent to ride up the side wall portion of said bulb for dissolving said lacquer from the side walls of said bulb, and reducing rotation of said bulb to drain said solvent and dissolve lacquer from said bulb.

22. In the processing of cathode ray tube bulbs, the method of coating the screen of a bulb with lacquer and cleaning the side wall portions of said bulb of excess lacquer deposited thereon consisting in the steps of supporting said bulb with the screen upward, spraying a lacquer into said bulb and onto said screen, introducing a lacquer solvent into said bulb, rotating said bulb to cause said solvent to ride up the side wall portion of said bulb for dissolving said lacquer from the side walls of said bulb, controlling the rotation of said bulb to determine the extent to which said solvent rides up said side wall portion thereby to determine the extent to which said lacquer is dissolved from said side walls, and reducing rotation of said bulb to drain said solvent and dissolved lacquer from said bulb.

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