

Aug. 11, 1959

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2,899,136

ELECTROSTATIC PAINTING APPARATUS

Filed Nov. 15, 1957

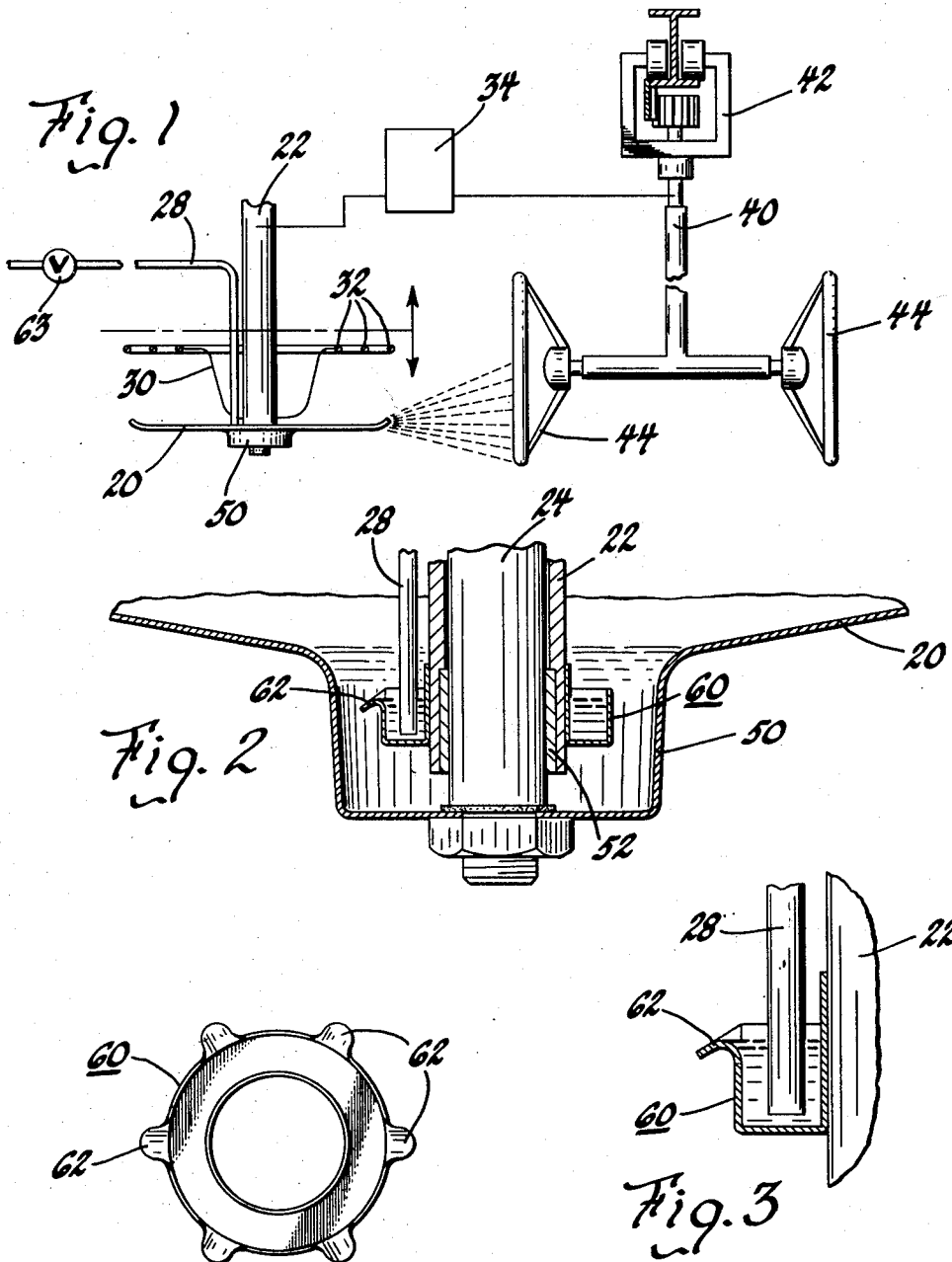


Fig. 4

Fig. 3

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ELECTROSTATIC PAINTING APPARATUS

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Application November 15, 1957, Serial No. 696,777

5 Claims. (Cl. 239—15)

This invention is directed to electrostatic painting apparatus and is particularly concerned with an improved apparatus for reducing maintenance costs on existing electrostatic equipment.

It is the main object of the invention to provide an electrostatic painting apparatus utilizing a centrifugal distributor for the paint wherein the paint supply comprises a tube leading to an annular cup, said cup and tube being stationary at all times whereby paint supplied to the cup from the tube seals the tube from the atmosphere and paint within the cup overflows therefrom onto the distributor.

In carrying out the above object, it is a further object to dispose the annular cup beneath the major surface of the distributor and preferably in a cup-shaped cavity in the distributor so that the edges of the cup are shielded by the distributor whereby electrostatic forces do not draw paint directly from the cup.

Another object of the invention is to provide an apparatus utilizing a centrifugal distributor where paint is supplied to the distributor from a depression centrally disposed and integral therewith which paint is supplied to the depression directly from the overflow of paint from a stationary cup located preferably within the depression.

In carrying out the above object, it is a further object of the invention to provide the annular stationary cup with a plurality of lips for distributing the paint to the distributor cup.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

Figure 1 is a diagrammatic view showing a centrifugal paint distributor and a conveyor support carrying a pair of steering wheels to be painted.

Figure 2 is an enlarged fragmentary sectional view of the central portion of the centrifugal paint distributor wherein the stationary distributing cup is clearly shown.

Figure 3 is an enlarged view of a portion of the paint distributing cup shown in Figure 2.

Figure 4 is a plan view of one form of the paint distributing cup.

In the electrostatic painting of articles, many problems arise which increase maintenance cost of the apparatus. One of these problems deals with change-over of paint colors and shut-down of the apparatus whereby in each case thorough cleaning operations must be used to prevent the paint from drying in the supply lines and fouling the lines and changing the shade of different colors subsequently used in the apparatus.

In application S.N. 687,107, assigned to the assignee of the present invention, I have disclosed an apparatus for electrostatic painting articles which uses a centrifugal non-circular distributor. The present invention may be used advantageously in connection with this distributor although it is understood that the present invention may

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also be used with circular distributors if desired since the same problems exist regardless of the shape of the distributor.

It is usual practice in these apparatuses to supply paint to the central portion of the distributor from a stationary paint supply tube which distributes the paint directly onto the surface of the distributor or into a central cup, for example, as shown in the aforementioned application. From this point, the paint is centrifugally and electrostatically distributed over the surface of the distributor and is thrown therefrom and further broken up centrifugally and electrostatically into a mist which is attracted to the article to be painted which carries an electrical charge of opposite polarity to the charge carried by the distributor.

In all of these assemblies, the paint supply tube is connected through a pump to a paint source from which it pumps paint to the distributor. When the device is to be shut down, for example, it is necessary to immediately immerse the supply tube in a solvent and pump solvent through the pump and paint supply tube to remove the paint therefrom. This is necessary since the paint is a solvent containing paint and if the supply tube is not cleaned immediately, the solvent in the paint therein begins to evaporate and the paint hardens within the tube thereby fouling the tube and, in some cases, requiring replacement thereof since the paint will harden for a substantial distance within the tube. For this reason, it is an expensive and troublesome operation to shut down the device for any substantial period of time.

Similarly, when it is desired to change colors to be electrostatically deposited, solvent is pumped through the device for cleaning out the tubes which generally leaves a small quantity of residual paint in the tube. If the device is shut down after this cleaning operation, as is usually the case, and again started the next day with a different color paint, the small quantities of hardened residual paint remaining in the tube are progressively redissolved in the paint solvents passing through the tube which causes contamination of the paint being used which modifies colors and shades over long periods of time.

The present invention eliminates all of these problems. It eliminates contamination of the paint over long periods of time and it likewise eliminates the necessity of cleaning the paint lines when the apparatus is shut down for a relatively short period, for example, over-night. These advantages are obtained by changing the paint supply to provide a seal therein.

Referring to the drawings, Figure 1 shows a centrifugal paint distributor 20 which is carried by a support 22 that encloses a rotating shaft 24 driven by a motor, not shown. The paint supply tube is noted at 28 and a three-spoke suppressor ring is mounted on the support 22 and is shown at 30. This suppressor ring may or may not be used, as desired, and may include one or more suppressor rings 32 supported on the spokes, three being shown. The centrifugal distributor is connected to one side of a power source 34 supplying high voltage current in the order of 120,000 volts wherein the other side of the source is connected to a carrier 40 which is diagrammatically shown as hanging from a conveyor system 42. The lower end of the carrier supports one or more steering wheels 44. The carrier is preferably a metal rod covered with polyethylene or other suitable material as clearly disclosed in my copending application, S.N. 677,722, now abandoned. The carrier may rotate or be stationary, as desired, and, in Figure 1, a rotating type of conveyor is shown wherein the upper end of the carrier 40 has a gear which runs along a rack on the conveyor track to cause the lower end of the carrier to rotate the wheels 44 as they move past the centrifugal distributor 20.

Referring to Figure 2, the distributor 20 is shown in

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more detail wherein a central depression is formed in the distributor 20 which forms a cup 50. The cup is centrally apertured and is carried by the lower end of the rotatable shaft 24. The shaft 24 is centered in the support 22 by a suitable bearing 52. The paint supply tube 28 which comes from a paint source through a pump terminates adjacent the bottom of an annular cup-shaped member 60 which is clamped or otherwise fastened to the outside of the tubular support 22 so that the upper edge thereof is below the major surface of the distributor 20. In fact, the upper edge of the cup 60 should be within the cup 50 substantially as shown. The cup 60 may have a continuous annular edge therearound or the edge may be depressed at a plurality of points as shown in Figure 4 to form a plurality of lips 62.

In operation, paint supplied to the device passes through the tube 28 and to the annular cup 60 whence it fills the cup as noted in Figure 3 and then overflows over either the top annular edge of the cup or over the lips 62 as the case may be. This paint overflows directly into the cup 50 whence it is distributed centrifugally and electrostatically over the surface of the distributor 20.

When it is desired to shut down the device for a short period of time, for example, over-night, it is merely necessary to close valve 63 adjacent the pump (not shown) and pour a relatively nonvolatile solvent, such as butyl carbitol, into the cup 60 to displace the paint therein whereby the paint tube is sealed from the atmosphere and paint therein does not harden since the solvents contained in the paint do not evaporate. When it is desired to restart the apparatus, it is merely necessary to open valve 63 and start the pump, and paint will flow to the cup 60 displacing the solvent whereupon the normal operation is reestablished.

The cup 60 is also useful when a change-over of colors is required. In this instance, solvent is pumped through the paint line and supply tube 28 which cleans the major portion of the paint therefrom and likewise cleans the cup 60, cup 50 and distributor surface 20 since the distributor is permitted to rotate during this cleaning operation. When the lines are substantially clean, the pump is shut down and valve 63 is closed whereby the supply line is maintained sealed from the atmosphere by solvent which remains in the cup 60. Thus, any residual paint in the supply lines, which is present in very small quantities, is maintained in a more or less fluid condition or at least in a condition where it will quickly dissolve when paint or solvent again reaches it, since the end of the tube 28 is sealed from the atmosphere by solvent maintained in the cup 60. Thus, when the device is restarted and a different color of paint is being used therein, any residual paint in the tube is quickly dispersed and the contamination of the color and shade of the paint is rapidly overcome whereby there is no build-up of paint within the tube and wherein a stabilization of color is quickly reached which is not possible when paint becomes dried in the tube.

Furthermore, the annular cup 60 distributes the paint from a plurality of points around its periphery into the cup 50 which tends to make the distribution of paint on the distributor 20 more uniform.

In general, the use of the annular cup 60 improves the operation of the device and reduces maintenance costs considerably whereby a more flexible device requiring less supervision in its operation is provided.

It is manifest that the annular cup 60 may also be used in connection with flat distributors or disc-shaped distributors similar in other respects to the central cup type distributor shown at 20.

The distributor may be reciprocated vertically in the direction of the double arrow on Figure 1, if desired, to increase the field of painting and may carry either a posi-

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tive or negative charge, as desired, with the articles to be painted carrying the opposite charge.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination with a centrifugal distributor for a solvent containing paint wherein paint is supplied to the distributor adjacent the center thereof and is distributed therefrom during rotation thereof; a distributor cup having a closed bottom positioned concentric with the geometric center of said distributor, a lip on said cup, a paint supply tube extending into the top edge of said cup and opening below the lip and fixed with respect to said cup, said paint supply tube being adapted to supply paint to said cup which then overflows from the cup and over said lip onto said distributor for centrifugal distribution over the surface of the distributor.

2. In combination with a centrifugal distributor for a solvent containing paint wherein paint is supplied to the distributor adjacent the geometric center thereof and is distributed therefrom during rotation thereof, a central depressed portion adjacent the center of the distributor, a distributor cup having a closed bottom disposed within said central depression, a lip on the top edge of said distributor cup and having its major plane below the main plane of the distributor surface, a paint supply tube extending into the cup held in fixed relationship thereto and opening below the lip thereof whereby paint supplied to said cup from said tube fills the cup and overflows over said lip into said depression and is then distributed therefrom over the surface of the distributor.

3. A centrifugal paint distributor, comprising in combination; a central shaft for rotating the distributor, a distributor plate fixedly attached to said shaft for rotation therewith, a housing support for said shaft and relatively rotatable with respect thereto, an annular distributor cup having a closed bottom and including a lip around the top edge thereof and carried by said support and fixed with respect thereto, a paint supply tube having its terminus within said cup and below said lip thereon and maintained in fixed relation with respect to said cup whereby, during rotation of said distributor, paint supplied from said tube to said cup overflows from the cup and falls directly from the lip thereof onto the distributor for centrifugal distribution thereover.

4. An electrostatic paint spray apparatus, comprising in combination; a distributor plate including a centrally depressed portion, a central shaft fixedly attached to the plate and coaxial with the depressed portion for rotating the plate, an annular distributor cup having a closed bottom surrounding the shaft and rotatable with respect thereto, a paint supply tube having its terminus within said annular cup and below the upper edge thereof and maintained in fixed relation with respect to said annular cup, a valve interposed in said tube and adapted to control the flow of paint through said tube, said tube being adapted to supply paint to said annular cup whereby paint supplied to the annular cup flows over the edge thereof and falls directly into said distributor cup for centrifugal distribution over said plate, and means for electrostatically charging said distributor plate.

5. The device as claimed in claim 4 wherein said annular cup has a plurality of depressed lips spaced around the upper edge thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

2,808,343 Simmons ----- Oct. 1, 1957

FOREIGN PATENTS

658,687 Great Britain ----- Oct. 10, 1951