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ELECTROSTATIC COATING OPERATIONS

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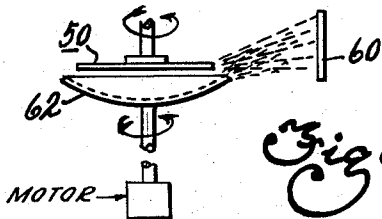
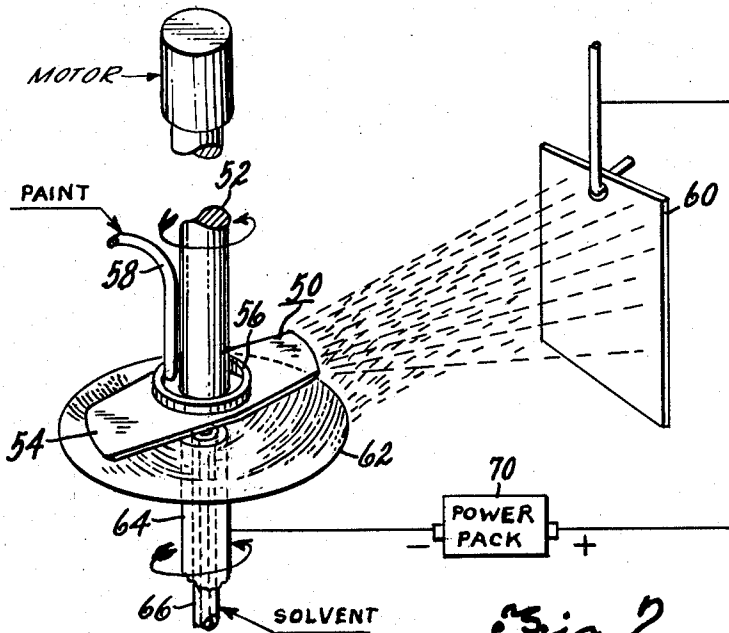
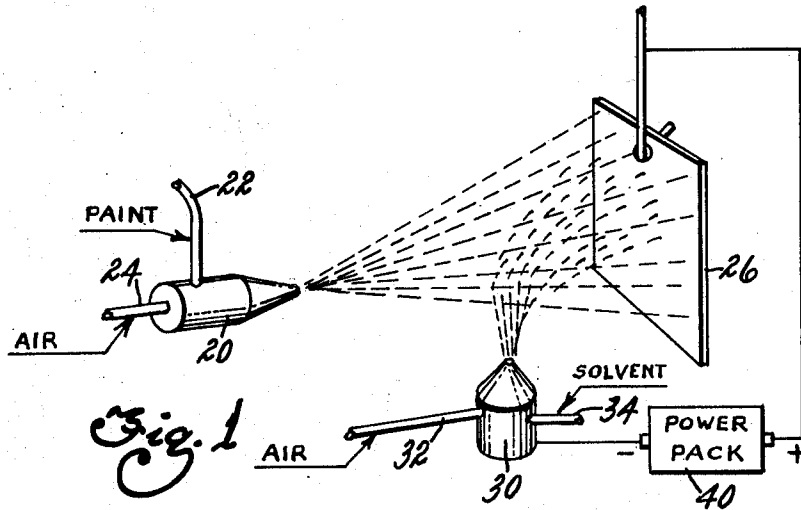


Fig. 2

Fig. 3

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ELECTROSTATIC COATING OPERATIONS

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This invention relates to electrostatic coating operations and to apparatus and method for carrying out said operations.

It is an object of the invention to provide a method and apparatus for electrostatically coating an article with a coating material such as paint wherein the paint is centrifugally atomized and distributed without a charge thereon and is intercepted by a spray of solvent which is charged whereby close control of the paint solvent ratio is obtained while simultaneously electrostatically charging the paint particles for improved deposition.

In carrying out the above object it is a further object to centrifugally distribute paint in a finely dispersed condition and in a pattern of expanding circular shape and to spray into this dispersion solvent in desired quantities wherein the solvent bears an electrostatic charge which is transferred to the paint particles during intermingling of the paint and solvent whereby the paint-solvent ratio is controlled and the resulting material is electrostatically charged and deposited.

A still further object of the invention is to utilize a centrifugal distributor for distributing uncharged paint particles in a finely divided condition and in an expanding pattern of circular shape. Simultaneously solvent is centrifugally distributed from a second distributor of greater diameter and positioned beneath the first mentioned distributor. The second distributor is connected to one pole of an electrostatic power pack whereby particles of solvent thrown centrifugally therefrom bear said charge. These particles are directed into the paint pattern and intermingle with the paint particles and transfer said electrostatic charges to the paint particles, an article spaced from the device is connected to the other pole of said power pack and bears the opposite charge to that carried by the solvent whereby the intermingled particles of paint and solvent are attracted to the article.

Further objects and advantages of the present invention will be apparent from the following description and drawings wherein FIG. 1 shows one form of the invention wherein paint and solvent are sprayed from separate atomizing guns.

FIG. 2 shows another embodiment of the device wherein the paint is centrifugally distributed and charged solvent is sprayed into the paint pattern from an air gun and FIG. 3 is a diagrammatic side view of the device shown in FIG. 2.

It is understood that in the descriptive matter contained herein that the words paint, pigment, and paint pigment all refer to a pigmented material either alone or carried by a resinous material such as alkyl resin wherein a very limited quantity of solvent may be added thereto to decrease the viscosity and act as a carrier. The remaining solvent which forms the major portion thereof is termed "solvent" for the purposes of description and claims.

It is highly desirable in electrostatic paint spraying operations to be able to control the paint-solvent ratio. This permits almost instantaneous changes in the quantity of solvent whereby "orange peel" and the like may be eliminated during the painting operation. This control also permits rapid adjustments to compensate for ambient changes in humidity conditions whereby greatly improved painting is obtained with a minimum of control. Application Serial No. 152,552, filed November 15, 1961, discloses one method and apparatus for obtaining this paint-solvent control. The present invention is an improvement

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over the disclosure of this copending application in that opposing electrostatic forces are eliminated so that the whole operation is facilitated. In the present invention, paint is distributed from an uncharged distributor, preferably of the centrifugal type. This paint is directed toward an article to be painted in a cloud of very small particles wherein none of the particles bear any imposed electrical charge. About mid-way in the flight of the particles from the distributor to the article, a solvent distributor is positioned wherein the effluent therefrom is directed into the mist or cloud of paint. This solvent distributor may be of any of the conventional types of distributors, either an air gun, a centrifugal distributor, etc., and carries an electrostatic charge opposite to the charge imposed on an article to be painted. Thus, the particles of the solvent, as they emit from the solvent distributor, intercept the paint particles and intermingle therewith, transferring electrical charges thereto. As the paint and solvent deposit on the article to be painted the entire spray bears an electrostatic charge opposite the charge on the article. In this manner, all of the advantages of electrostatic spraying are obtained together with all of the advantages of separate solvent distribution.

Referring specifically to the drawings, a painting set up is shown in FIG. 1 utilizing an air atomizing gun for the paint and a second air atomizing gun for the solvent. In this instance, 20 is the paint gun which is supplied paint through a tube 22 from a source thereof and compressed air through a tube 24 from a source thereof. The air atomizes the paint from the gun into a spray of particles of very small size which are directed at an article 26 to be painted. About half way between the gun 20 and the article 26 the second air atomizing gun 30 is positioned with its nozzle at substantially right angles to the nozzle of the gun 20. Air is supplied through tube 32 and the solvent for the paint through the tube 34. Thus, the solvent particles are directed into the stream of paint particles from the gun 20.

The gun 30 is connected to one side of an electrostatic power pack 40 while the other side of the power pack 40 is connected to the article 26. Thus, the solvent particles bear a charge opposite to the charge on the article and as they intermingle with the paint particles from the gun 20 they transfer their electrostatic charges thereto whereby the paint particles with the solvent are electrostatically deposited on the article.

Another embodiment of the invention is shown in FIG. 2. In this instance a centrifugal blade-like distributor 50 is utilized, which is rotatable upon a shaft 52 that is driven by a motor, not shown. At the end of the shaft, which is vertically disposed, there is positioned a centrifugal distributor 54 which includes a cup 56 therein which receives paint from a source of supply not shown, through a tube 58. As the paint flows into the cup 56 it overflows onto the surface of the distributor 54 and is thrown therefrom in the form of finely divided particles in an expanding pattern of circular extent. The distributor 50 may be grounded and carries no imposed electrical charge, or it may "float" and be isolated from any charge. In either case, it should be sufficiently remote from the parts carrying an electrostatic charge to prevent "breakdown" or arcing therebetween.

Articles 60 to be painted are carried around the distributor, preferably in a circular path, by a conveyor not shown. Directly beneath the distributor 50 and coaxial therewith is a second distributor 62 which is in the form of a cup-shaped central device supported on a vertical shaft 64 which is hollow and connects to a solvent supply tube 66 which, in turn, connects to a pressurized solvent source. Solvent pumped through the tube 66 flows into the bowl-shaped distributor 62 and upon rotation thereof, the solvent is centrifugally distributed in an expanding

pattern of circular extent and is simultaneously dispersed into fine particles. The distributor 62 is connected to one side of a power pack 70 so that the solvent particles, as they are thrown therefrom carry a charge, which in this instance is negative. The other side of the power pack 70 is connected to the article 60 so that the article 60 attracts the particles from the distributor 62 which bears an opposite charge. The distributor 62 is of larger diameter than the distributor 50 and, due to the more or less cup-shaped design thereof, causes the solvent particles to be thrown upwardly and outwardly whence they intermingle with the paint particles already distributed by the distributor 50. The particular relation of the several distributors is shown diagrammatically in FIG. 3. Thus, the paint particles pick up the charge from the solvent particles by transfer as they intermingle whereby the mixture is attracted electrostatically to the article 60 which bears the opposite charge. The distributors 50 and 62 may be driven at the same speed or different speeds. In some cases it is desirable to rotate the distributor 50 at about 3000 r.p.m. and the distributor 62 at about 4000 r.p.m. Electric or air motors, not shown, may be used to rotate the distributors.

It is understood that in place of a blade type distributor as shown at 50 the distributor may be a circular plate or any other suitably balanced design which will centrifugally distribute the paint. Similarly, the cup 56 may be a central depression as shown in Patent No. 2,899,136. The voltages used may vary widely and voltages between 20,000 and 120,000 volts have been found satisfactory although this range may be broadened as is well known in the art.

In all instances the addition of the charged solvent particles to the paint spray in no way slows down the paint spray but actually causes the rate of movement of the paint particles to increase as they pick up the electrostatic charge due to the electrostatic attraction of the article which carries the opposite charge. Also, difference in speeds of rotation may be used to control the deposition. Due to the fact that the paint and solvent are separately supplied it is an easy matter to control the quantity of the paint as it deposits on the article by visual inspection and the mere turning of a valve to increase or decrease the quantity of the solvent being used. This greatly facilitates painting operations, reduces scrap and lessens the cost of the operation since it is no longer necessary to mix the paint and solvent prior to its being supplied to the distributor. In the present instance it is merely necessary to control the flow of solvent to obtain controlled results.

The present invention is of particular value for use in connection with water base paints such as water emulsions, water solutions or suspensions such as porcelain frits and any other coating material that has a tendency to short out or be difficult to maintain the charged condition at optimum values. In all of these, electrostatic deposition has been extremely difficult and in some cases impossible due to the extreme conductivity of the solvent or carrier which shorts out the system. In the present instance the paint or frit, etc., is adequately atomized from the uncharged distributor. The electrostatic charge is then impressed from the solvent or thinner, which can be an alcohol or alcohol solution, that is sufficiently low in conductivity to prevent shorting out. The resulting mixture deposits electrostatically with great facility.

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. An electrostatic painting apparatus comprising; a first means for distributing paint in dispersed form toward an article to be painted, a second means for dis-

tributing solvent in dispersed form and positioned between said first means and said article whereby the dispersed solvent intercepts and intermingles with the dispersed paint, and an electrostatic power source connected at one pole to said article and at the other pole to said second means only.

2. The apparatus claimed in claim 1 wherein the second means is an air atomizing gun.

3. The apparatus claimed in claim 2 wherein the first means is an air atomizing gun.

4. The apparatus claimed in claim 3 wherein said guns are positioned at substantially right angles to one another.

5. The apparatus claimed in claim 1 wherein the first and second means are separately driven, coaxially positioned centrifugal distributors.

6. An electrostatic paint spray of the centrifugal distributor type for use in painting an article spaced therefrom comprising in combination; a first rotatable distributor, paint supply means for supplying paint to said distributor, a second and independent rotatable distributor positioned beneath and spaced from the first mentioned distributor and coaxial therewith, said second distributor having its greatest diameter in excess of the effective diameter of the first distributor, solvent supply means for supplying solvent to the second distributor, means for rotating said distributors and an electrostatic power source connected at one pole thereof to said second distributor only and at the other pole to said article.

7. An apparatus as claimed in claim 5 wherein said first distributor is substantially flat and the second distributor is cupped upwardly so as to distribute the solvent in an expanding plane which intersects the plane of the distributed paint from the first distributor in a circular path coaxial with said distributors and having a diameter greater than that of either distributor.

8. The apparatus claimed in claim 6 wherein the means for rotating the distributors are two separately controlled motors.

9. The apparatus claimed in claim 7 wherein the means for rotating the distributors are two separately controlled motors.

10. The method for electrostatically painting an object, the steps comprising distributing a dispersion of paint from a source, distributing a dispersion of solvent for the paint from another source, electrostatically charging the solvent only, causing the solvent dispersion to intercept and intermingle with the paint dispersion at a point remote from either source of dispersion to form a mixture, separately controlling the quantities of the paint and solvent dispersions to obtain an optimum mixture, and depositing said mixture on an object to be painted by charging said object opposite to the charge on the solvent.

11. An electrostatic painting apparatus comprising, a first means for distributing paint in dispersed form, a second means for distributing solvent in dispersed form, one of said means being directed so as to deposit its dispersion on an article to be coated and spaced therefrom and the other of said means being directed in a different direction so that its dispersion intercepts and intermingles with the first mentioned dispersion, and an electrostatic power source connected at one pole to the article to be coated and at the other pole to only one of said means.

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