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Legge et al.

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[54] **ELECTROSTATIC SPRAYING**

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[51] **Int. Cl.**..... **B05b 5/02**

[58] **Field of Search** ..... 239/3, 15; 222/199, 200; 117/93.4 R; 317/3

[56] **References Cited**

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[57] **ABSTRACT**

In an electrostatic powder spraying apparatus, powder is conveyed through a dielectric tube to a corona discharge device by vibratory motion of the tube. The powder is dispersed in a cloud downstream of the corona discharge device by a vibrating member at the end of the tube.

7 Claims, 3 Drawing Figures

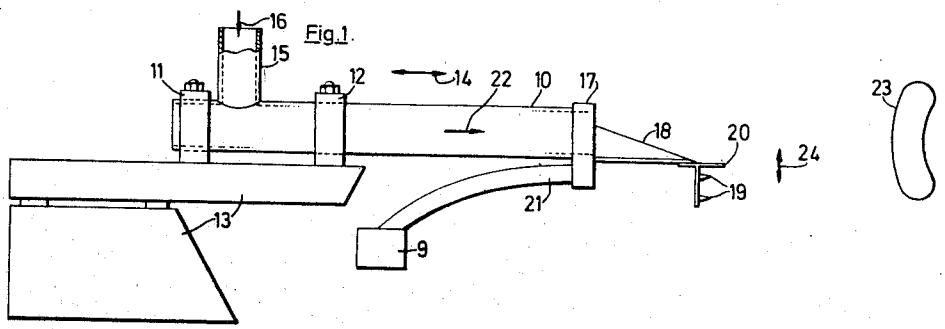

Fig.1.

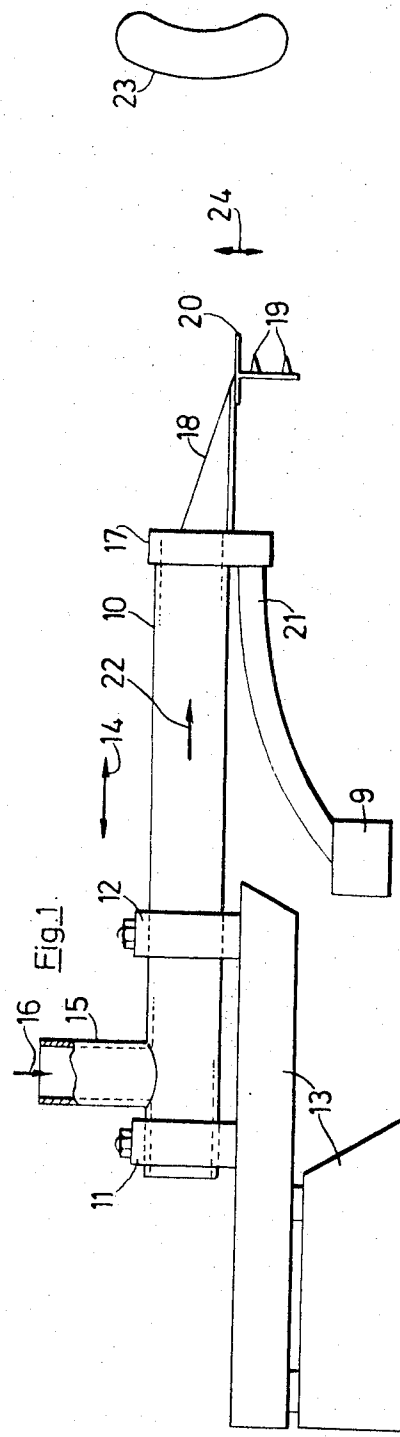

Fig.1.

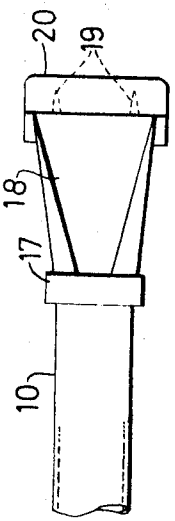

Fig.2.

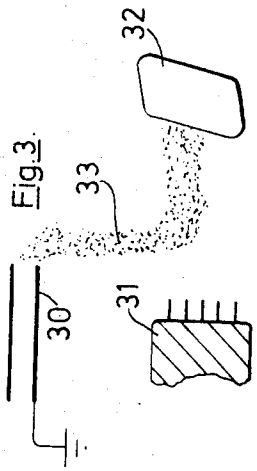

Fig.3.

ELECTROSTATIC SPRAYING

This invention relates to an apparatus for electrostatic powder spraying and to a method of electrostatic powder spraying.

According to one aspect of the present invention there is provided an apparatus for electrostatic powder spraying comprising a corona discharge device and a powder dispenser for conveying powder to the corona discharge device characterised in that the powder is conveyed along or through the dispenser solely by vibratory motion of the dispenser.

Preferably the dispenser comprises a dielectric tube having an open end for discharge and an inlet for receiving powder adjacent its opposite end, and means for vibrating the tube whereby powder fed to the tube is caused to flow along the tube to the corona discharge device.

Preferably there is further provided a vibratable member for dispensing the powder in a cloud in the vicinity of the corona discharge device.

The vibratable member preferably comprises a plate adjacent the open end of the tube and vibratable in a plane substantially at right angles to the longitudinal axis of the tube.

The vibratable member and the corona discharge device are preferably located on an extension member attached to the open end of the tube, the vibration of the vibratable member being provided by a component of the vibration of the tube.

Part of the corona discharge device may provide the vibratable member.

The tube may be vibrated at a frequency of between 5 and 200 Hz, preferably 50 Hz at an amplitude of approximately 1 mm.

The dispenser may be located above and separately from the corona discharge device so that powder falling from the dispenser past the discharge device becomes electrostatically charged.

According to another aspect of the invention there is provided a method of electrostatic powder spraying comprising supplying a stream of powder particles to a corona discharge device solely by vibrating them along a vibrating dielectric tube and dispersing them in a cloud downstream of the corona discharge device by means of a vibrating member.

The invention will now be described by way of example with reference to the diagrammatic accompanying drawings in which

FIG. 1 is a side elevation of an electrostatic powder spraying apparatus according to the invention,

FIG. 2 is a plan view of a discharge portion of the apparatus shown in FIG. 1,

FIG. 3 is a diagrammatic representation of an electrostatic powder spraying apparatus according to another aspect of the invention.

Referring to the drawings there is shown an electrostatic spraying apparatus, or spray gun, comprising a vibrator tube **10** of dielectric material, e.g., "Perspex" (Reg. Trade Mark), of about 1½ inches internal diameter, which is clamped by means of clamps **11, 12** to a vibrator machine **13.** The disposition of the clamps **11,** 12 and the vibrator machine **13** are such that the tube **10** vibrates along its longitudinal axis in the directions indicated by the arrow **14,** and because of inherent tolerances in the mechanism, also has a component of vibration at right angles to its longitudinal axis.

In the Perspex tube **10,** near one end, is an inlet tube **15** through which powder may be fed in the direction shown by arrow **16.**

Held to the other, open, end of the tube **10** by a clamp **17** is an extension member provided by a divergent guide plate **18** downstream **18** to the of which is attached a corona discharge element **19** and a vibratable member in the form of a thin brass flap **20** which extends in line with the tube **10.**

The corona discharge element is maintained at a high potential by means of a high tension voltage supply line **21** fed from a high voltage source **9.**

In a non-limiting example, epoxy resin powder of a particle size such that 50 percent is less than 50μ is gravity fed into the tube **10** by way of the supply tube **15.** The tube **10** is held in a horizontal position, and is vibrated by the vibrator **13** at a frequency of 50 Hz and at a longitudinal amplitude of about 1 mm. This vibration causes the powder in the tube to move in the direction of the arrow **22** onto the guide plate **18.**

The particles are charged partly by contact with the guide plate **18,** which is maintained at a potential of about 48 kV, and mainly by ion bombardment in the region in front of the discharge element **19.** They are then accelerated by the electric field created between the discharge element **19** and the earthed object **23** to be coated by the powder, and are propelled on to this object **23.**

The vertical component of vibration of the Perspex tube **10** causes the brass flap **20** to vibrate sympathetically in a plane perpendicular to the plane of vibration of the tube **10** as indicated by the arrows **24.** The effect of the vibrating flap **20** is to disperse the powder in a cloud and enable the powder particles more readily to take up their electrostatic charge.

In this example, typical rates of flow of the powder through the spray gun described above may vary between 27 and 123 grammes per minute.

In another embodiment of the invention, shown in FIG. **3,** the powder **33** is dispensed from a grounded metal vibratory dispenser **30,** which is maintained well clear of the charging electrode **31,** and is allowed to fall past the charging electrode where it is charged and deposited on the object **32** to be coated.

It is thus seen that the invention provides an apparatus for and a method of airless electrostatic spraying of powder, "airless" in the context of the present invention being understood to mean that a moving stream of air or other fluid is not used as the means for conveying electrostatically charged powder particles to an object to be sprayed.

An advantage of the present invention over known electrostatic powder spray guns in which the powder is carried to the article to be coated partly by an air or other fluid stream is that the need for an air supply is eliminated and the danger of particles being carried in the air stream beyond the article to be coated is minimized. Furthermore, a flow of air is a possible source of powder contamination (oil or water) and is an additional variable when consistency of coating thickness is the aim. Consequently, the airless spray gun of the present invention is more efficient in that it is capable of depositing a larger proportion of its through-put of powder on the object to be coated than other guns so far commercially available.

In an alternative embodiment the corona discharge element **19** may be omitted and the high tension volt-

age supply line **21** attached directly to the brass flap **20** which then generates the required electrostatic field.

The flap **20** may be made of a material other than brass provided it is able to vibrate sufficiently to disperse the powder stream in a cloud of particles.

The frequency at which the vibrator operates may suitably lie in the range 5 to 200 Hz.

The tube may be replaced by an open channel.

What we claim is:

1. An apparatus for airless electrostatic powder spraying comprising a corona discharge device, a vibratory dielectric hollow elongate means for conveying powder to the corona discharge device, the elongate means having an open end for delivering powder to the corona discharge device and an inlet for receiving powder adjacent its opposite end, means for vibrating the elongate means such that powder fed to the elongate means is caused to flow therealong to the corona discharge device, and a vibratable member for dispersing the powder in a cloud in the vicinity of the corona discharge device.

2. An apparatus as claimed in claim **1** wherein the elongate means comprises a tube.

3. An apparatus as claimed in claim **1** wherein the elongate means comprises an open channel.

4. An apparatus as claimed in claim **1** wherein the vibratable member comprises a plate adjacent the open end of the elongate means and vibratable in a plane substantially at right angles to the longitudinal axis of the elongate means.

5. An apparatus as claimed in claim **1** wherein the vibratable member and the corona discharge device are located on an extension member attached to the open end of the elongate means, the vibration of the vibratable member being provided by a component of the vibration of the elongate means.

6. An apparatus as claimed in claim **1** wherein part of the corona discharge device provides the vibratable member.

7. A method of electrostatic powder spraying comprising supplying a stream of powder particles to a corona discharge device solely by vibrating them along a vibrating dielectric tube and dispersing them in a cloud downstream of the corona discharge device by means of a vibrating member.

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