

Rokadia

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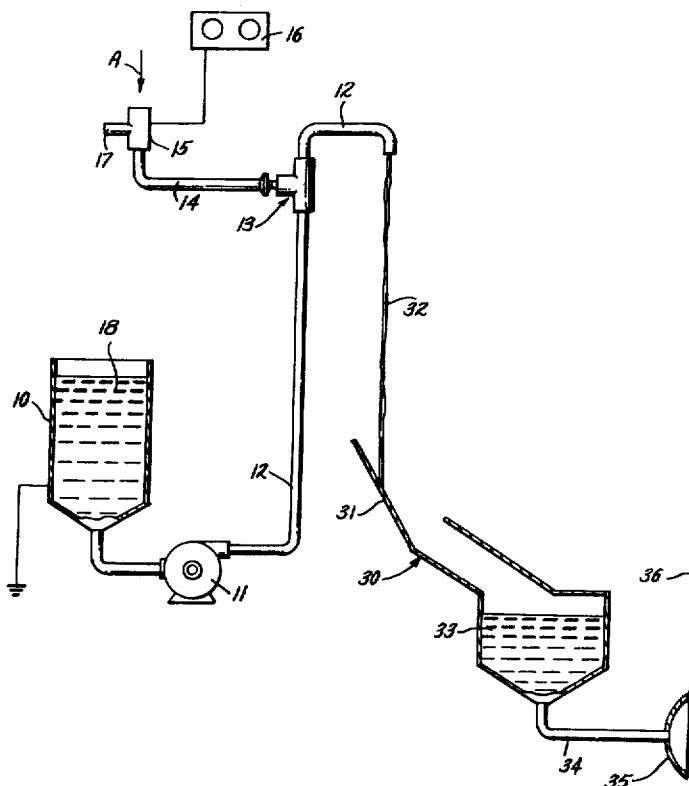
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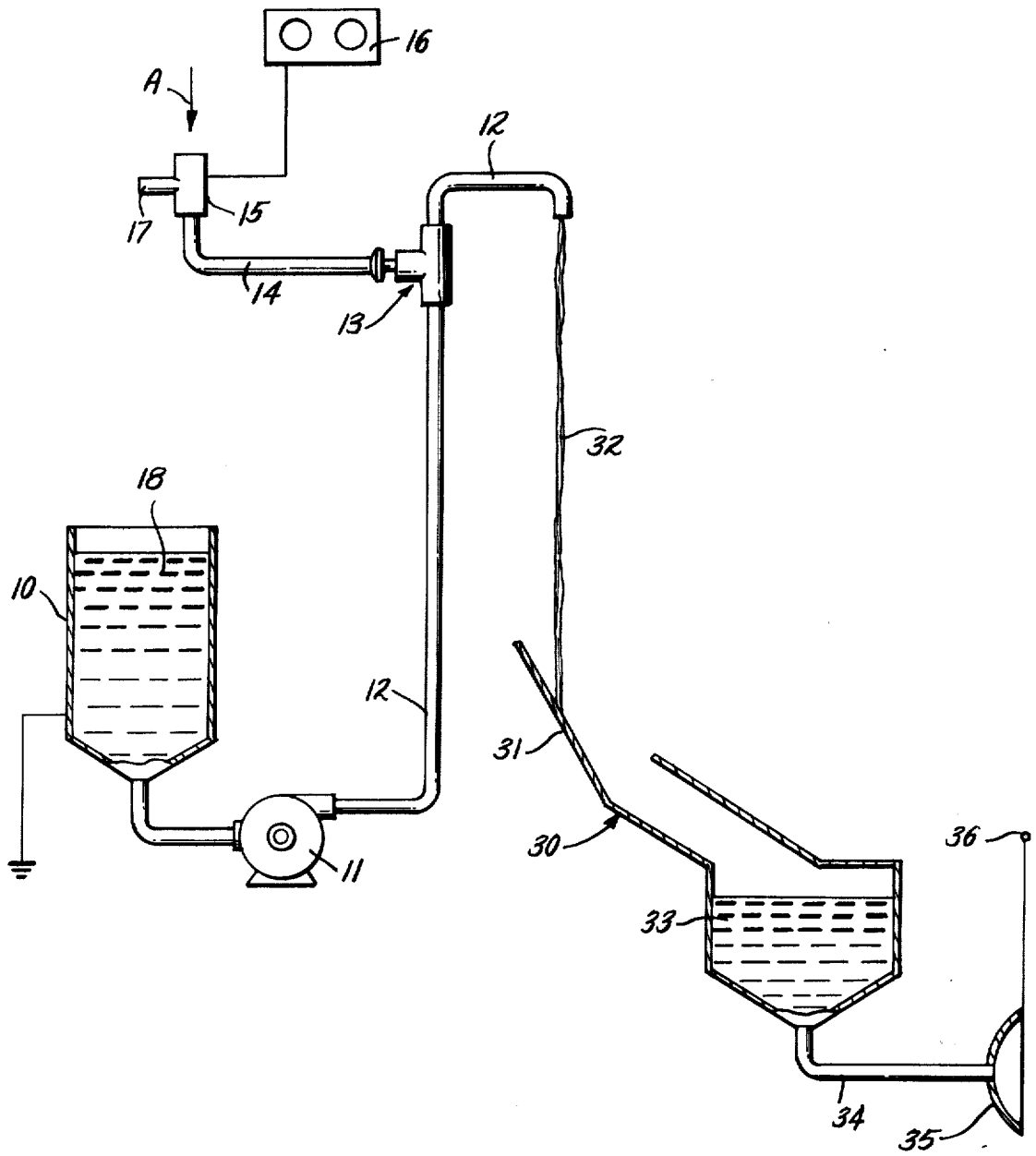
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Conductive paints are electrostatically sprayed by electrically isolating the electrostatic charge imposed on the atomizing head from the paint supply tank to prevent dissipation of the charge through the conductive paint which is supplied.

1 Claim, 1 Drawing Figure





ELECTROSTATIC ATOMIZATION OF CONDUCTIVE PAINTS

The present invention relates to the electrostatic spraying of conductive paints using equipment in which the electrostatic charge is employed to assist in the atomization of the paint. More particularly, this invention relates to the electrical isolation of the electrostatic charge from the paint supply tank in order that the charge not dissipate back through the paint supply to create a source of considerable hazard, and interfere with the electrostatic atomization by dissipating the charge on the atomizing head.

In the conventional electrostatic spray system, involving electrostatic atomization, the paint is pumped through a supply tube to a charged rotating disc, or other appropriate spray head, and the charge passes through the paint on the disc to assist its atomization. However, whenever the paint is unduly conductive, the charge shorts out through the conductive paint supply, hampering electrostatic atomization and creating an obvious hazard. The conventional practice, therefore, is to limit the conductivity of the paint which is used. Another alternative is to insulate the entire system, including the paint supply tank. This is not only expensive, but the system cannot be safely approached, and there is a risk of accidental electrical shock which could be serious and which cannot be eliminated. Of course, one can use electrostatic spray equipment which does not involve electrostatic atomization, but these are sometimes less satisfactory and this suggestion does not help one who already possesses equipment for electrostatic spray and simply wishes to apply a more conductive paint, e.g., an aluminum flake-pigmented paint, or an aqueous paint which may be in solution or in emulsion.

The present invention allows the electrostatic spraying of electrically conductive materials using electrostatic atomization by effectively isolating the electrostatic charge so that it is not conducted back to the paint supply tank.

In one aspect of this invention, isolation of the electrical charge from the paint supply tank is achieved by including in the paint supply system a section in which the column of paint which is supplied is unconfined, e.g., in a free fall.

Remarkably, it has been found that conductive paint which will easily carry the electrostatic charge when confined in a tube will not carry the same charge for any distance when it is unconfined. Thus, a 50,000 volt atomizing charge has been found to be conducted in a free falling column of conductive aqueous paint only about 2 feet. Since the system tested involved a free fall of 5 feet, no charge could be detected on the structure at the top of the column.

It will be appreciated that the distance which the charge can negotiate through the unconfined paint column will vary with such factors as the velocity of the paint column, the conductivity of the paint, and the level of charge. The remarkable point is that, regardless of the variation, the distance is limited, and normally does not exceed about 4 feet. As long as this distance is exceeded, the charge will not dissipate, and the paint supply will remain uncharged and safe to handle.

It should be kept in mind that the atomizing charge involves high voltage and minimal amperage, and this factor is probably important to the inability of the

charge to be conducted through the unconfined column of paint.

The unconfined column of paint is fed to an electrically isolated feed. This isolated feed is fed by the unconfined column of paint through an intervening air space to isolate the feed from the paint supply tank. Thus, in the practice of the method of this invention, paint is supplied to the electrostatically charged atomizing head from an electrically isolated paint reservoir which is supplied with an unconfined column of paint through an intervening air space.

To further increase the security of operation, the paint being supplied can be supplied in spurts providing separate discrete paint portions which move to the isolated paint reservoir through the intervening air space. Thus, in one form of the invention, the electrically insulating character of the unconfined paint is assisted by having the unconfined paint in the form of physically separated discrete portions or slugs.

Thus, the conductive paint is supplied through a tube and means are provided to interrupt the flow on and off to divide the paint at the free end of the tube into spaced apart drops or spurts which pass through the intervening air space in the form of separated slugs to maintain the desired pool of paint in the feed reservoir.

While the use of separated portions of paint increases the security of the system, it adds considerably to the cost of the system. The use of a continuous column of unconfined paint is particularly valuable since construction costs are minimized and convenience of operation is enhanced.

The number and size of the separated slugs which are employed to provide the desired supplementary obstruction to the flow of electricity from the atomizing head back through the paint supply column will depend upon the conductivity of the paint as well as the level of charge to be maintained.

This invention is particularly applicable to highly conductive paints, such as aqueous paints based on acidic resins which are dispersed or stabilized with ammonia or an amine.

The conductivity of the aqueous paints to which this invention is particularly applicable can vary considerably and is dependent on many factors. Thus, the amine concentration and the pH are important factors which will vary the conductivity and, correspondingly, the extent to which the features of this invention must be used to provide effective electrical isolation.

The spaced apart slugs of paint which may be supplied in accordance with this invention may be produced in any desired manner, and this, therefore, is not a primary feature of the invention. An illustrative method of producing them would involve the use of a timer which opens and closes a valve to intermittently open and close the paint supply line. A diaphragm pump will provide the same interrupted flow, but this is less preferred because of difficulty at the check valves.

The present invention is applicable to any electrostatic atomizing system which the conductivity of the paint may cause the charge applied to the atomizing head to be conducted back through the paint supply line to the paint supply tank. Illustrative of the kind of atomizing head which is employed in this invention is electrostatic discs or bells, these being, per se, well known in the art. However, the paint can be flowed to any charged surface or needle point so that the charge will pass through the body of the paint on its way to a

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grounded target and, as an incident to such passage, the paint will become atomized. Similarly, the spray function can be only partly electrostatic. In any event, the paint is directly charged so that the charge has the opportunity to short out through the paint supply, and this raises the problem of the invention.

To particularly illustrate the use of this invention, a waterbased latex paint may be sprayed electrostatically using an atomizing bell spinning at 1800 RPM and having a 100,000 volt charge thereon to maintain a voltage gradient of about 10,000 volts per inch with respect to a grounded target placed 10 inches from the atomizing bell. This paint is supplied to an isolated reservoir through an air space 6 feet high. The paint is supplied through a steel tube one-fourth inch inside diameter at about 1250 grams per minute. Using a voltmeter reading up to 30,000 volts, the voltage in the reservoir was over 30,000 volts. No voltage could be detected at the supply tube above the reservoir even though the atmosphere was damp so that the charged area or field around the reservoir extended out 3 to 4 feet from the reservoir. The area of charge will vary with the charge used, and the humidity and the column length needed will vary with the paint conductivity and the paint velocity.

The invention will be described more fully in connection with the accompanying drawing in which the single figure is a diagrammatic view showing the use of an isolated feed to an electrostatic atomizing disc with unconfined paint being supplied to insulate the grounded feed supply structure.

Referring more particularly to the drawing, paint supply tank 10 supplies paint through pump 11 to a supply tube 12 which may be conductive or non-conductive as desired.

Located along the length of supply tube 12 is an air operated on-off valve 13 which is conveniently positioned near the free end of the tube as shown. Valve 13 is supplied with operating air through line 14.

Timer 16 operates a three-way solenoid valve 15. In the energized position with the timer on the "on" cycle, air under pressure shown by Arrow A passes through line 14 to operate valve 13 to open the line 12. When the timer is in its "off" position, solenoid valve 15 is de-

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energized and air in line 14 bleeds out through opening 17, and this causes valve 13 to close, shutting off flow in line 12.

The paint 18 in the reservoir 10 flows through pump 11 and forms a continuous confined column in line 12. This column of paint is released and falls freely and unconfined into paint receiver 30. If the valve 13 is operated, then the unconfined column of paint shown at 32 is broken into separated slugs or droplets.

Tube 12 terminates above an electrically isolated paint receiver 30 having an inclined receiving surface 31 for the purpose of minimizing spattering as the unconfined column of paint 32 delivered from tube 12 falls through the intervening air space to strike upon and then flow down the inclined receiving surface 31 to merge into and become part of pool 33.

From the pool 33 the paint flows by force of gravity through tube 34 the atomizing disc or bell 35 which is charged through terminal 36.

A gravity feed to the disc 35 is shown and is preferred, but an air operated pump can be interposed in the line 34 to add flexibility in the process, or to increase the flow rate.

Normally, the paint will simply fall vertically through the intervening air space, as shown, but it may be propelled horizontally if desired.

The invention is defined in the claims which follow. I claim:

1. A method for electrostatically spraying an electrically conductive aqueous paint comprising supplying an unconfined continuous column of said paint through an intervening air space to an electrically isolated paint reservoir, and then conveying said aqueous paint from said electrically isolated reservoir as a confined column in a paint supply line to an electrostatically charged atomizing device so that said electrostatic charge is conducted back through said paint to the electrically isolated paint reservoir to create a charged field around said reservoir, the paint providing said unconfined continuous column supplied to said reservoir being released to provide said unconfined column from a point at least about 2 feet above said reservoir.

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