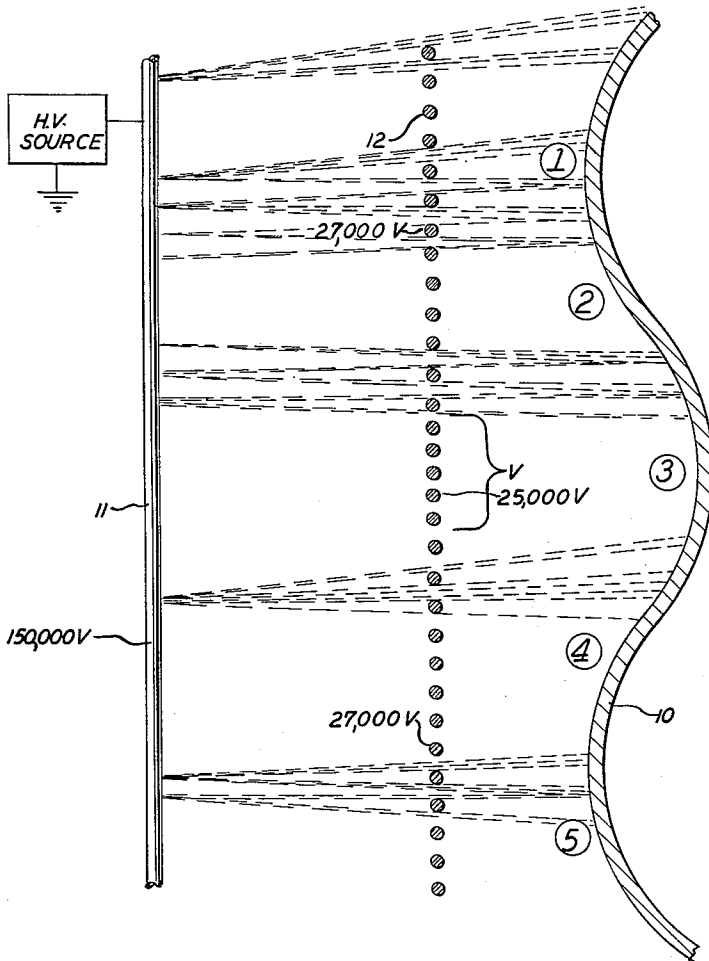


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M. J. IRLAND ET AL
ELECTROSTATIC PAINTING
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ATTORNEYS

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ELECTROSTATIC PAINTING

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1 Claim. (Cl. 117-93)

This invention relates to a process and apparatus for electrostatically coating workpieces with a liquid. This invention is more particularly concerned with a process and apparatus which will enable a uniform coating of liquid to be laid down upon a nonuniform surface of a workpiece by means of an electrostatic field.

The use of an electrostatic field to cause a precipitation of liquids and more particularly paint upon a workpiece has been common practice for many years and the art thereon is very voluminous. A factor common to all of these processes is the creation of an electrically charged aerosol of the liquid and propulsion and deposition of this aerosol upon the working piece by means of an electrostatic field.

The particular object of this invention is to permit a uniform electrostatic coating to be applied to workpieces which present an uneven or irregular surface to the electrostatic field. The electrostatic coating of such irregular surfaces has in the past been unsatisfactory due to the tendency of the electrostatic field to shun declivities and preferentially to deposit paint on those portions of the workpieces which are electrostatically closest to the source of the aerosol.

The sole FIGURE of drawing is a schematic cross section of an apparatus usable in the practice of this invention.

This invention can be most readily comprehended by a study of the figure of drawing which has been presented herewith. In this figure the numeral 10 has been assigned to the workpiece. It is to be noted that workpiece 10 presents an undulating surface to the electrostatic field. Liquid charging and atomizing means 11 may be any of the conventional apparatus well-known to the art for producing a charged aerosol. Wires 12 have been interposed between workpiece 10 and liquid charging and atomizing means 11. The sole purpose of wires 12 is to cause the aerosol to deposit in a layer of approximately uniform thickness upon undulating workpiece 10.

In the specific apparatus depicted in the figure of drawing, 11 is a perforated tube which serves to atomize and charge paint contained therein. A space of thirty inches was maintained between the liquid charging and atomizing means 11 (perforated tube) and the crests of the undulating workpiece 10. Wires 12 are arranged in the form of a grid and consist of a central section indicated by the letter "V" consisting of five wires and two outer sections of thirteen wires each, these wires being spaced apart two inches and preferably parallel to the workpiece and to each other. Liquid charging and atomizing means 11 (perforated tube) is maintained by any conventional means at a voltage of 150,000 volts negative with respect to the grounded workpiece 10. That portion of the wires 12 designated by the letter "V" is charged to a negative potential of 25,000 volts and the remaining 26 wires are

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charged to a negative potential of 27,000 volts. A spacing of four inches exists between the peak of the undulations of workpiece 10 and twenty-six inches between wires 12 and liquid charging and atomizing means 11. The undulations in workpiece 10 are four inches from crest to trough and twenty inches from crest to crest. In the following table the positions enumerated in the left hand column correspond to the positions encircled in the drawing.

TABLE I

Weight of Paint Deposited on Test Patches

Position	Original Weight, grams	Final Weight	Gain in Weight
(1)-----	1.0278	1.4831	0.4553
(2)-----	1.0234	1.4202	0.3968
(3)-----	1.0378	1.4685	0.4307
(4)-----	1.0554	1.5090	0.4534
(5)-----	1.0418	1.6014	0.5596

It has been found desirable to keep the potential on the grid wires 12 relatively great in order to reduce the tendency for paint to accumulate on them. If large deposits of paint are permitted to accumulate on the grid wires, the electric field existing between the wires and the sprayer will result in the formation on the wires of positively charged drops which will be carried back toward the sprayer ultimately to be deposited thereon, or to discharge a corresponding quantity of negatively charged droplets in flight. These will result in wastage of paint and interference with the operation of the system.

The charge applied to wires 12 is preferably of the same polarity as liquid charging and atomizing means 11. However, this is not necessary. Under some circumstances wires 12 may be charged to the opposite polarity with respect to charging and atomizing means 11. Alternatively, certain of the wires may have a potential negative to the workpiece and other wires a positive potential. Each individual painting setup must ordinarily be experimentally evaluated for the proper values of such parameters as voltages, wire diameter and wire spacing.

We claim:

The process of applying an approximately uniform coating of a liquid to a workpiece presenting a nonuniform surface comprising establishing a high potential between a liquid charging and atomizing means and the workpiece, positioning between the charging and atomizing means and the workpiece a plurality of wires and charging these wires to substantial potentials which are numerically less than the potential of the charging and atomizing means and of the same polarity, the potentials of these wires being adjusted to nonuniform values to establish a relatively uniform field intensity over the nonuniform surface of the workpiece, the wires closer to the workpiece being charged to a potential higher than the wires more remote from the workpiece.

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