

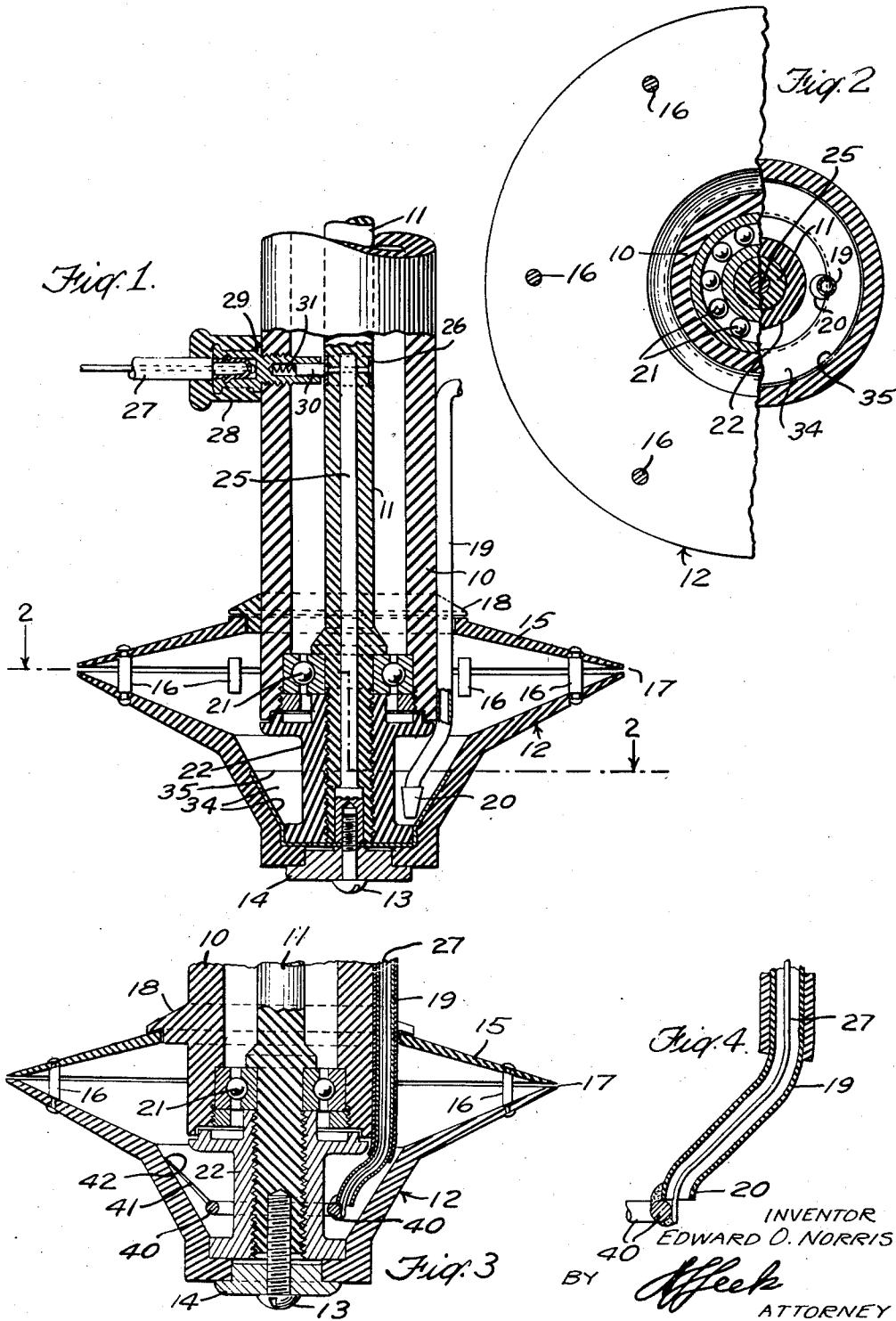
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SPRAYING APPARATUS

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2,901,177

SPRAYING APPARATUS

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5 Claims. (Cl. 239—15)

This invention relates to apparatus for spray coating articles and has for an object to provide a coating device having novel and improved characteristics.

Another object of this invention is to provide improved means to project ionized spray particles into a spray zone without using exposed high potential electrodes.

A further object is to minimize the possibility of flash-over between the atomizing head and the parts being coated.

A further object is to provide an electrostatic spraying device utilizing high ionizing potentials, where the atomizing head may be safely operated in close association with the surfaces being sprayed.

Another object is to provide means for imparting a high, uniform degree of ionization to the spray particles.

Other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

The nature of the invention will be better understood by referring to the following description, taken in connection with the accompanying drawing wherein specific embodiments have been set forth for purposes of illustration.

In the drawings:

Fig. 1 is a longitudinal section of an atomizing head embodying the present invention;

Fig. 2 is a section taken on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view of an atomizing head similar to Fig. 1 illustrating an embodiment using a wire electrode; and

Fig. 4 is an enlarged detail view of the feed tube and electrode support of Fig. 3.

Referring to the drawing more in detail, the atomizer head is shown as mounted on the lower end of an insulating tube 10 which provides a bearing and support for the lower end of a shaft 11 which is driven by a motor, not shown. The shaft 11 and tube 10 are of insulating material.

A lower frusto conical atomizer member 12 of electrical insulating material is attached to the lower end of the shaft 11 by a plastic screw 13 and collar 14. An upper conical member 15 is disposed above the lower head 12 and is held by plastic spacers 16 in spaced relationship with respect to the lower member 12 to provide a peripheral slot 17 therebetween. The inner rim of the member 15 is disposed beneath an annular ring 18 on the tube 10. A feed pipe 19 extends down along the outside of the tube 10 and through the ring 18 with its lower end terminating in a discharge nozzle 20 adjacent the lower inner surface of the member 12 and is so arranged that liquid discharged from the nozzle 20 is fed upwardly along the frusto conical inner surface of the member 12 by centrifugal force and outwardly as an atomized spray through the peripheral slot 17. Bearing 21 is shielded by a sleeve 22 which is secured to and rotates with the member 12.

A metal shaft 25 is disposed in the insulating drive shaft 11 and is electrically connected to a slip ring 26 on shaft 11.

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A high tension electric cable 27 is connected through an insulating bushing 28 to a metal sleeve 29 containing a brush 30 held in pressure contact with the slip ring 26 by a spring 31.

A frusto conical metal electrode 34 is clamped over the lower end of the shaft 11 between the collar 14 and sleeve 21 by the screw 13. The metal cone 34 conforms to the inner surface of the member 12 and preferably has a sharp peripheral edge 35 to promote corona discharge.

In the operation of this device the uncharged liquid flows from the nozzle 20 over the inner surface of the frusto conical electrode 34 and through the corona zone around the peripheral edge 35 where it becomes highly charged and ionized and is discharged centrifugally from the slot 17 as an atomized spray.

Referring to Figs. 3 and 4 the construction of the atomizing head is generally similar to that of Fig. 1 and corresponding parts have been identified by the same reference characters.

In Fig. 3 the high tension cable 27 is disposed within the feed pipe 19 and the nozzle 20 carries a semi-circular rod 40 which in turn carries a spring wire 41 having a tip 42 which rests lightly upon the inner surface of the member 12. The high tension cable 27 is connected to the rod 40 to supply a charging voltage to the wire 41. Several such wires 41 may be attached to the rod 40 and spaced around the periphery of the member 12 if desired.

The operation of this form is similar to that of Fig. 1. The uncharged liquid flows from the nozzle 20 and forms a film on the inner surface of the member 12 which flows upwardly as it rotates by the tips 42 of the wires 41 where it receives the electrostatic charge.

The charged liquid is atomized from the slot 17 as an ionized spray.

In both of these embodiments the liquid or liquid-like material to be sprayed flows between and over non-conducting surfaces, except for the charging electrodes (the cone 34 of Fig. 1 or the wires 41 of Fig. 3) so that the electrostatic charge is maintained until the non-conducting atomization cycles are reached. Since the charge is imparted just prior to atomization the loss of charge is further minimized.

The highly charged liquid is readily atomized at the peripheral slot 17 to produce an ionized spray which can be attracted to any suitable charged or grounded surface such as a grounded can shell as set forth in my copending application Serial No. 607,105, filed August 30, 1956, now abandoned.

The rotor surfaces such as the member 12 are made of an electrical insulating material such as hard rubber, nylon, or other synthetic plastic and the feed pipe 19 is preferably made of a similar material.

What is claimed is:

1. A spraying apparatus for ionizing and atomizing a sprayable material comprising an elongated tubular holder, a shaft rotatably mounted in said holder, a rotary spray head of electrical insulating material having an outwardly flaring film supporting surface terminating in a peripheral discharge edge, a feed conduit secured to said holder in position to feed sprayable material onto the central portion of said surface, said spray head being secured to said shaft for rotation thereby at a rate to cause said material to flow outwardly in a thin film over said surface by centrifugal force and be discharged outwardly from said peripheral discharge edge, a film contacting electrode disposed in fixed position in the flow path of said film with the entire film contacting portion of said electrode being disposed a substantial distance inwardly from said peripheral discharge edge, to thereby provide an annular ring shaped insulating area of said surface between said electrode and said peripheral discharge edge over

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which said film flows after ionization, and electrical connecting means by which an ionizing potential is applied to said electrode.

2. A spraying apparatus for ionizing and atomizing a sprayable material, comprising a cup shaped rotary spray head of electrical insulating material having a frusto conical upwardly and outwardly flaring inner surface terminating in a peripheral discharge edge, an electrode having an upwardly extending outwardly flaring annular wall mounted in said spray head adjacent the lower end thereof for rotation therewith with the upper edge of said annular wall disposed a fixed distance downwardly from said peripheral discharge edge, a feed conduit by which sprayable material is fed into the lower end of said spray head, means by which said spray head and said electrode are rotated at a rate to cause said material to flow upwardly in a thin film by centrifugal force over the inner surface of said electrode and the said inner surface of said spray head and to be discharged outwardly from said peripheral discharge edge, and electrical connecting means by which an ionizing potential is applied to said electrode.

3. A spraying apparatus for ionizing and atomizing a sprayable material, comprising a cup shaped rotary spray head of electrical insulating material having a frusto conical upwardly and outwardly flaring inner surface terminating in a peripheral discharge edge, a complementary cup shaped frusto conical electrode disposed in bottom of said cup shaped spray head for rotation therewith with the upper edge thereof disposed a fixed distance down-

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wardly from said peripheral discharge edge, a feed conduit by which sprayable material is fed into said cup shaped electrode, means by which said spray head and said electrode are rotated at a rate to cause said sprayable material to flow upwardly in a thin film by centrifugal force from said cup shaped electrode and over the said frusto conical inner surface of said spray head and to be discharged outwardly from said peripheral discharge edge, and electrical connecting means by which an ionizing potential is applied to said electrode.

4. A spraying apparatus as defined by claim 1, in which said electrode comprises a spring wire secured in fixed position within said spray head with the free end thereof in contact with said film a fixed distance inwardly from said peripheral discharge edge.

5. A spraying apparatus as defined by claim 4, in which said electrode is carried by a metal ring which is secured to said feed conduit adjacent the lower end thereof.

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