Jan. 13, 1953 D. J. PEEPS 2,625,590

MEANS FOR ELECTROSTATICALLY CHARGING SPRAY MATERIAL

Original Filed July 31, 1948 2 SHEETS—SHEET 1

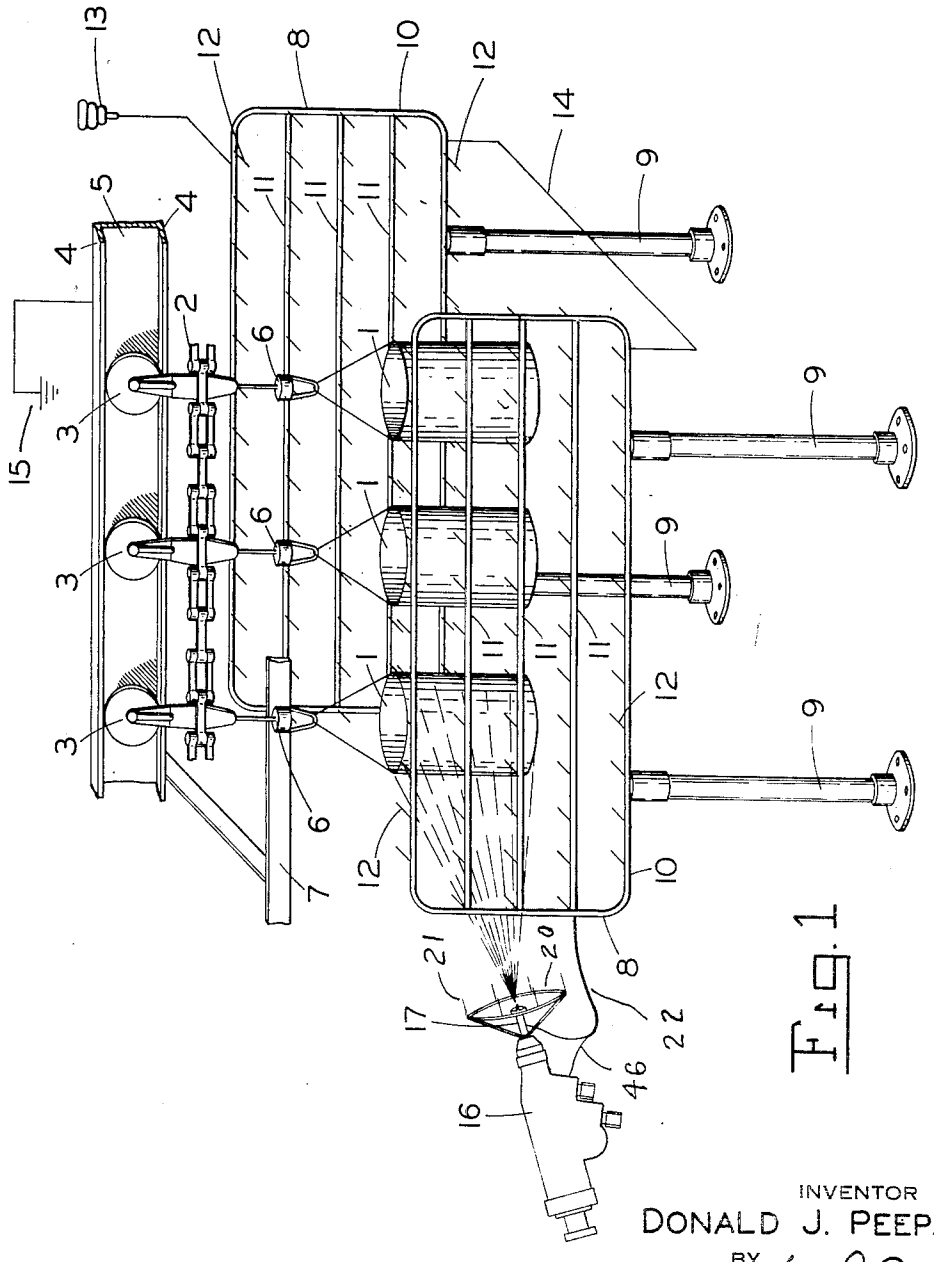


Fig. 1

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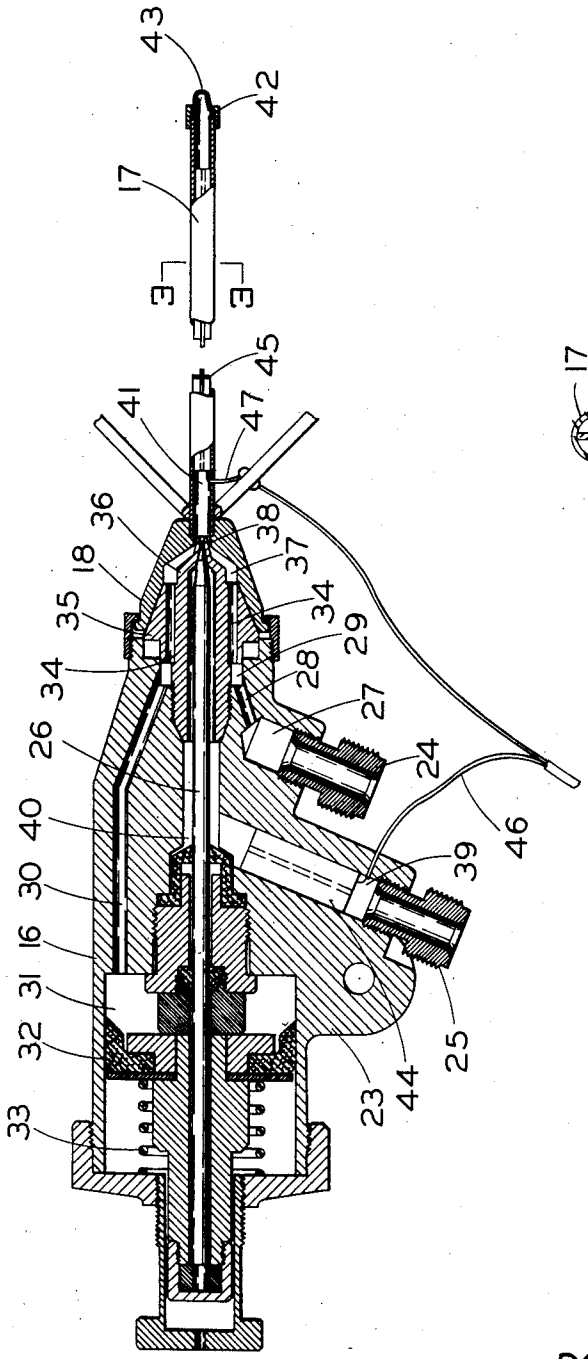


Fig. 2



Fig. 3

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Patented Jan. 13, 1953

2,625,590

UNITED STATES PATENT OFFICE

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MEANS FOR ELECTROSTATICALLY CHARGING SPRAY MATERIAL

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Original application July 31, 1948, Serial No. 41,800. Divided and this application May 2, 1951, Serial No. 225,012

4 Claims. (Cl. 175—265)

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This invention relates to the use of electrostatic charges with spray apparatus for improving the deposition of sprayed coating materials, and more particularly to the arrangement of discharge electrodes interiorly as well as exteriorly of the spray emitting nozzle.

This application is a division of abandoned application Serial No. 41,800 filed July 31, 1948, for Spray Apparatus.

In electrostatic spray processes, it has been the general practice to create an electrostatic field in the vinicity of the articles to be coated through the placing of discharge electrode grids parallel with the path of the articles, and receiving electrodes behind the articles if the articles are not themselves the receiving electrodes. With this standard design of installation, the uncharged particles of coating substance receive a charge upon entering the zone between the grids and the articles being treated.

Because of the somewhat dielectric nature of the ingredients of many coating compounds, the absorption of electrostatic charges by atomized particles of such substances when limited to a brief exposure to charging may not be great and consequently their attraction to the surface to be coated is slight. The fact that the particles are quite widely separated and are inclined to be insulated by the surrounding air, makes them less receptive to the electrostatic charges travelling from the grids toward the articles to be coated.

This invention has the primary object of providing means for fixing a more definite and effective charge upon the coating material.

A further object is to have equipment which supplements the discharge grids in the vicinity of the surfaces being coated.

As one means of attaining such objects, my invention provides a structure which charges the finishing substance prior to its emission from the spray nozzle. This charging is accomplished by having extended charging surfaces within the passage or passages for the spray material leading to the discharge nozzle of the spraying device. Since the material may have less electrical receptivity as a solid stream, my invention includes a spray device with means for dividing or breaking up the material stream flowing therethrough. One such means is an internal atomizing nozzle and a passage thereafter in which an electrical charging surface is located and through which the atomizing material flows before being emitted from the spray nozzle.

Another is a partitioning insert in a liquid passage of the spray device which acts as a source of electrostatic charge for the separate streams

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of the spray liquid into which the insert has divided the liquid flowing therethrough.

By breaking up the liquid, physical forms with greater surface area are obtained. This is considered advantageous on the theory that electric forces gather on the surface of conductors. Then, too, with greater surface area, contact with the charging electrodes is increased.

A further means of achieving the objects of this invention is the provision of electrostatic discharge structure adjacent to the spray emission nozzle.

The above and other objects of this invention and the means provided for attaining them may be more clearly understood by referring to the following description and the accompanying drawing, in which:

Figure 1 is a perspective view of an apparatus embodying my invention;

Figure 2 is a lengthwise vertical section of the spray device forming a part of the apparatus; and

Figure 3 is a vertical cross section of the nozzle of the spray device and the charging grid within it.

In Figure 1 of the drawing an apparatus embodying my invention is illustrated in a rather diagrammatic manner. The articles being coated are pail-like products 1 rotatably suspended from a chain conveyor 2 which is attached to and moves along below rollers 3 riding between the lateral legs 4 of guide rail 5. Besides moving with the conveyor the articles to be coated are rotated through the contact of friction rollers 6 against stationary driving strip 7.

Positioned on both sides of the conveyor are electrostatic grids 8. These are supported on tubular pedestals 9. From the frame 10 and horizontal bars 11 of the grids extend discharge pins 12 directed toward the conveyor. A source of high electrostatic power, preferably delivering about 80,000 volts, is figuratively shown at 13 connected to one of the grids. A connecting wire 14 carries the electricity to the other grid. The guide rail 5 is grounded at 15. As all parts of the conveyor are conductive material, this ground has communication with the pails or other metallic articles supported by the conveyor.

The spray device 16 is positioned to direct the atomized coating material into the space between a grid 8 and the conveyor and at a slight angle to the path of the conveyor. Attached to the nozzle 17 of the spray device is a ring 20 carrying electrostatic discharge pins 21. The ring 20 is connected through conduit 22 to one of the

grids whereby it receives an equal electrostatic charge.

The spray device 16 details of which are disclosed in Figures 2 and 3, has a non-conductive body 23 with inlet connections 24 and 25 for air and liquid coating material respectively. The air entering connection 24 serves both to atomize the coating material and to actuate the coating material flow controlling needle valve 26. The air entering connection 24 passes through passages 27 and 28 into annular chamber 29. From chamber 29 part of the air travels rearwardly through bore 30 to the cylinder 31. Here it acts upon the forward face of piston 32 to move it and the needle valve 26 carried by it rearwardly against spring 33. The major part of the air proceeds forwardly from chamber 29 through the ports 34 in the flange 35 of material tip 36. From the space 37 between the tip 36 and adapter 18 this air issues through the constricted annular port 38 around the forward end of tip 36 and mingles with and atomizes the liquid material coming from the tip. The material reaches the tip from connection 25 and passages 39 and 40.

From the point of atomization there extends within nozzle 17 a long tubular chamber 41 terminating with the spray emission cap 42 having a restricted discharge orifice 43.

There are two electrostatically charged grids in the spray device to deliver electricity to the spray liquid passing therethrough. In liquid passage 39 is insert 44 having a cross section of X shape. This divides the flow of liquid into four channels of quarter cylindrical form. The contacting surface of the liquid is thus increased.

Then in the tubular chamber 41 there is a similar elongated insert 45 from which the atomized particles of the spray liquid pick up an electrostatic charge. These particles naturally have a combined larger surface area than did the liquid stream before it was atomized.

The coating material thus absorbs a more thorough charge within the spray device than is possible for the discharged particles dispersed within the insulating atmosphere outside of the device while travelling to the surface to be finished.

Electrical energy is carried to the inserts 44 and 45 through branch conduits 46 and 47 connected to conduit 22 leading from the exterior grid 8 to the ring 20.

With the heavy charge absorbed within the spray device, little additional charging is ordinarily necessary exteriorly of the spray device. However, to insure a more thorough charge the emission of electrostatic energy from the ring 20 affords any uncharged particles issuing from the spray nozzle an opportunity to pick up electricity, and the standard design of grids in parallel relation to the path of the articles creates a final supplementing charging area. The combination of the ring electrode 20 on the nozzle and the grids 8 produce a continuous two-stage electrostatic field from the spraying device to the surface being coated.

It may be seen therefore that I have provided equipment that results in a much more thorough imposition of a charge upon the spray material whereby a stronger attraction between the material and the surface to be coated results and better coverage and use of the material is obtained.

What I claim is:

1. An air atomizing spray device of the type having means for electrically charging particles of coating material discharged thereby to improve the deposition of the material upon the electro-conductive surface being coated, said spray device characterized by having means composed of an electrical non-conducting material providing an elongated passage for the coating material, an elongated electrical discharge element of passage-partitioning form extending longitudinally within the passage and terminating therein, and conduit means connected to the element and delivering electricity of single polarity thereto.

2. An air atomizing spray device of the type having means for electrically charging particles of coating material discharged thereby to improve the deposition of the material upon the electro-conductive surface being coated, said spray device characterized by having means composed of an electrical non-conducting material providing an elongated passage for coating material and atomizing air mixed therewith, means for delivering material and air in mixed relation to the passage, an elongated electrical discharge element extending longitudinally within the passage and terminating therein, conduit means connected to the element and delivering electricity of single polarity thereto, and a spray discharge nozzle with which the chamber communicates.

3. An air atomizing spray device as set forth in claim 2 in which the electrical discharge element has radially extending fins with longitudinal edges contacting the sides of the passage to divide the passage into longitudinally extending sections.

4. An air atomizing spray device as set forth in claim 2 in which the electrical discharge element has an X-shaped cross section fitting closely within the passage.

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