

March 21, 1950

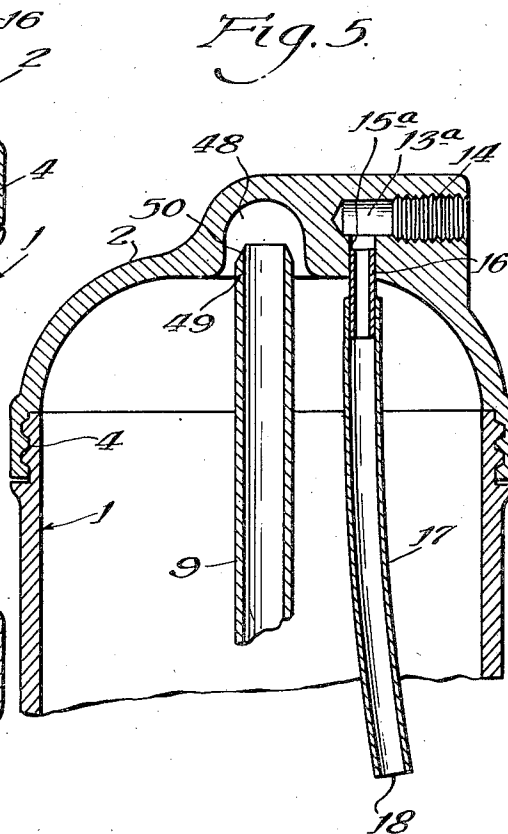
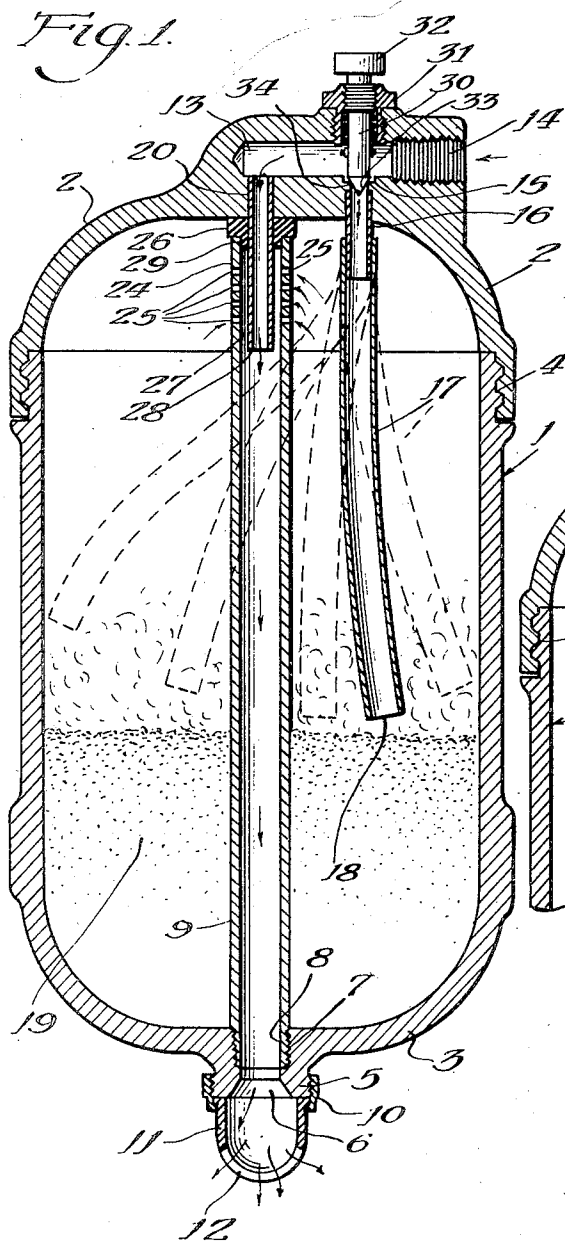
E. GUSTAFSSON ET AL

2,501,047

DRY POWDER SPRAYER

Filed Oct. 20, 1945

2 Sheets-Sheet 1



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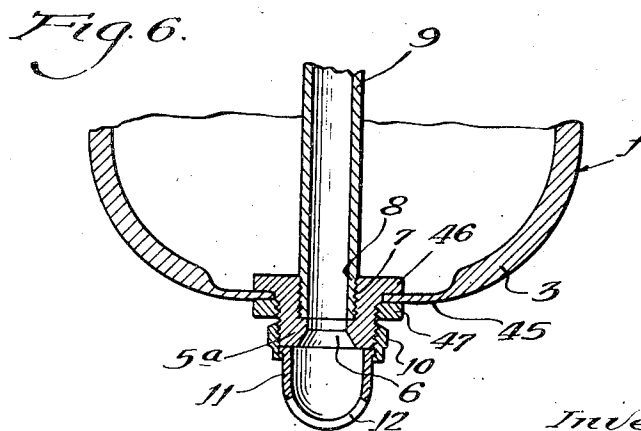
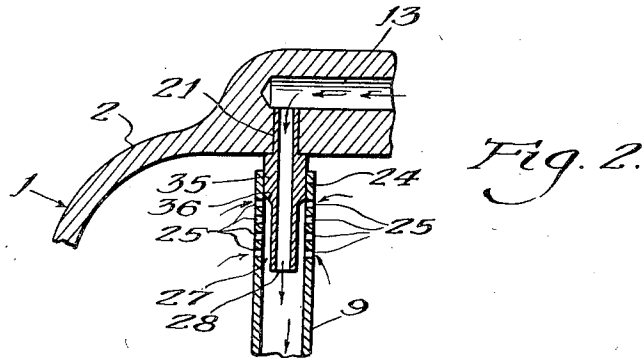
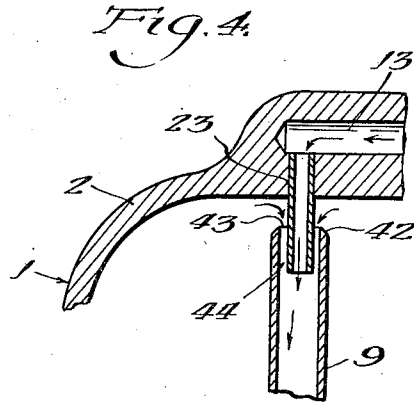
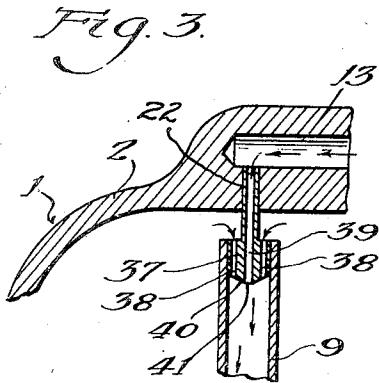
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DRY POWDER SPRAYER

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,501,047

DRY POWDER SPRAYER

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11 Claims. (Cl. 91-45)

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The present invention relates to spraying devices and more particularly to means for spraying powder or powder-like material or substance.

Among the objects of the present invention is to provide a novel device or means for distributing a dry powder or powdery substance in the form of a cloud or clouds, particularly for use upon printed sheets in printing as they are moved toward stacking position to prevent offset of ink, comprising a receptacle or container, preferably made of transparent material, for holding the substance, means for projecting a fluid, such as air, against or into such substance to nebulate or form a homogeneous fluidal and aerated mass of fine particles and air or the like, and means for conducting such mass with or without more air or the like to a locus of use. The means for nebulating and aerating the substance may have and preferably has a mobile or flexible part for automatically moving in various positions under the influence of the flow of the air through it to direct the air at various points or loci of the contained mass of the powdery substance in the container or receptacle, and means for regulating the action of the mobile or flexible part may be used for regulating or controlling the intensity of the cloud or puff of the nebulous and aerated mass at the locus of application, as on or over the printed sheet moving in the press to and toward its stacking position. Means also may be used to maintain the homogeneity of the nebulous and aerated mass and to prevent any accumulation of the particles of the substance which would form blobs or the like in the applied fluidal mass at the printed sheet. Also, means may be and preferably is provided for self-centering of the means for delivering or projecting the nebulous mass upon or over the printed sheet.

Other objects, advantages, capabilities, features and the like are comprehended by the invention as will later appear or as are inherently possessed by the invention.

Referring briefly to the drawings:

Fig. 1 is a vertical sectional view of an embodiment of the invention;

Figs. 2, 3, 4 and 5 are fragmentary vertical sectional views of alternate forms of the invention; and

Fig. 6 is a fragmentary vertical sectional view of a further form of the invention.

Referring more in detail to the drawings, the embodiments chosen to illustrate the invention comprise a container or receptacle 1, which may be made of transparent synthetic material, having a cap or top closure 2, and a bottom 3, the

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top 2 and the body of the container 1 having a suitable connecting or joining means 4, such as screw threads or the like. The bottom 4 has formed therewith or fixed thereto a boss 5 or 5a having an orifice 6, and a socket 7, which may be screw threaded, for the connection of the lower end portion 8 of a delivery tube or duct 9 extending upwardly in the container 1. The bosses 5 and 5a may be threaded to receive a coupling ring or the like 10 for holding a spray nozzle 11 clamped to the open end of the boss 5 or 5a, this nozzle 11 having a spray orifice 12 which is preferably in the form of a slot or slit of arcuate shape or form so that the materials sprayed there-through and therefrom may be of fan shape or the like.

The cap 2 is provided with an air inlet chamber or duct 13 (Figs. 1, 2, 3 and 4) or 13a (Fig. 5) having a threaded inlet end portion 14 for the suitable connection of an air supply duct (not shown) from a suitable pressure air source. At an intermediate point of the chamber or duct 13 or 13a, the cap 2 is provided with a socket or passage 15 and 15a, as the case may be, in which is fixed the upper end of a tube 16 the lower end of which extends downward in the upper portion of the chamber 1, and to this lower end of the tube 16 is suitably connected the upper end of a flexible tube 17 or the like which under the influence and force of the air passing down through the tube 17 will cause this tube 17 to flap around in the chamber 1, in various directions and positions, shown by way of example by the dotted line positions thereof in Fig. 1, so that the air projected from the delivery end or mouth 18 of the tube 17 will stir up a cloud or the like of particles from the powder mass 19 in the lower portion of the chamber 1, and the air so projected will mix thoroughly with such stirred-up cloud of particles so that the resultant mixture will be more or less homogeneous, and thoroughly aerated.

At or near an end portion of the duct 13 (see Figs. 1-4) the cap 2 has a passage in which is fitted the upper tubular end portion of an air nozzle 20, 21, 22 or 23 (see Figs. 1, 2, 3 and 4, respectively) for delivering air under pressure into the delivery duct 9.

Referring to Figs. 1 and 2 the delivery duct 9 has an upper portion 24 which is provided with a plurality of orifices or apertures 25 and the upper end of the duct portion 24 is sealed (see Fig. 1) by a suitable sealing disc or the like 26 which serves to prevent entry of the particles of substance 19 into the upper end of the duct portion 24. The air nozzle 20 extends in seal-

ing condition down through this sealing member 26 and is spaced from the apertured portion of the delivery duct portion 24 of the tube 9 so as to provide an annular space 27 therearound, and the lower end 28 of the air nozzle 20 extends to a point below the lowermost apertures 25 in the duct part 24. The sealing member 26 may have a boss 29 at its underside to fit into the upper end of the part 24 to serve as a centering means for the duct 9 so that the annular space 27 will be maintained substantially uniform, the duct 9 flexing sufficiently for such purpose.

The cap 2 also is provided with a valve 30 adjustably maintained in a thimble 31 secured, as screwed, into the upper part of the cap 12, the valve 30 having a knurled finger piece 32 by which the valve 30 may be adjusted. The lower end of the valve 30 has a valve seat or tip 33 adapted to seat on a valve seat 34 provided in the passage 15 and above the upper end of the tube 16. The air passage from the air chamber 13 to the tube 16 and the flexible duct 17 may be controlled and regulated by means of this valve 30—33.

In Fig. 2 the device is similar to that shown in Fig. 1 but the air nozzle 21 has an enlargement 35 for fitting into the upper end portion 24 of the duct 9 to center and maintain centered the latter, this part 35 having a tapered portion 36 for aiding the entry of the part 35 when assembling the parts.

In the form shown in Fig. 3 the upper portion of the supply duct 9 omits the side apertures, and the air nozzle 22 has a head 37 which fits into the upper end portion of the duct 9 to center it and to maintain it centered, similarly to the parts 35 and 36 of the form shown in Fig. 2. The head 37 is provided with a plurality of orifice 38 for the passage of the nebula of powder particles and air from the chamber 1 to the duct 9. The air nozzle 22 and the head 37 have a central duct or air passage 39 for the passage of air from the chamber 13 to the duct 9. The lower end of the head 37 preferably has a tapered portion 40 to afford facile entry of the head 37 into the upper end of the duct 9 when assembling the parts, and also to provide for a lower end 41 of the passage 39 being at a lower point than the orifices 38.

In the form shown in Fig. 4, the upper end of the duct 9 is open and has a tapered end 42 to prevent the accumulation of the particles of the powder 19 as the nebulated powder and air pass into the opening 43 of the duct 9 and into the annular space 44 around the lower portion of the air nozzle 23 and in the upper portion of the duct 9.

In the form shown in Fig. 6, the lower part 3 of the chamber or container 1, is provided with a reduced thickness portion 45 to which the lower boss 5a is clamped by way of the flange 46 of the boss 5a and a clamping nut 47. This thin wall portion 45 serves as a flexing means when the duct 9 is being centered by the part 29 (Fig. 1) or 35 (Fig. 2) or 37 (Fig. 3).

In Fig. 5 the top has an upper recess or chamber 48 into which the upper end portion 49 of the delivery duct 9 extends, so that the nebula of powder particles and air will pass into the recess or chamber 48 to pass into the upper open end 49 of the duct 9. The upper end of the duct 9 has a tapered portion 50 to prevent accumulation of powder thereon.

In use and operation air under pressure is supplied by way of chamber 13 to the air nozzle 20,

or 21, or 22, or 23, as the case may be, to project a stream of air into and along the duct 9 and to the spray nozzle 11. At the same time air under pressure is also supplied by way of the valve 30, duct or tube 16, and flexible tube 17, whereby the tube 17 will flop around in the chamber 1 to direct air at different loci of the powder 19 and stir up and cause the cloud or nebula of the particles and air, which is then carried to the duct 9 by way of the orifices 25 (Figs. 1 and 2) or 38 (Fig. 3) or opening 43 (Fig. 4), to unite with the air passing through the air nozzle 20—23, as the case may be, and to then be sprayed from the nozzle 11 in a fine cloud or mist or the like. In Fig. 5 there is no air nozzle extending into the duct 9, so the air supplied to the flexible duct 17 stirs up the powder the same way as in the other forms of the invention, and moves with particles of powder to the upper end of the duct 9 and thence to the nozzle 11, without addition of further air, as by way of air nozzles 20—23 as in the other cases.

Usually, the air supplied to the device, by way of the passage or chamber 13, 13a will be by impulses controlled by suitable means (not shown) so that the nebulous cloud projected or sprayed from the nozzle 11 will be in the nature of puffs or the like, as a puff for each printed sheet moving in the press to and toward the locus of stacking the sheets. By varying the valve 30 the density or rarity of the powder particles in each puff may be varied or regulated at will.

While we have herein described and upon the drawings shown a few embodiments illustrative of our invention, it is to be understood that the invention is not limited thereto but comprehends other constructions, details, arrangements of parts, features and the like without departing from the spirit of the invention.

Having thus disclosed the invention, we claim:

1. A sprayer of the character disclosed comprising a container having enclosing wall portions forming a normally closed chamber adapted to receive therein a dry material in powdered condition which normally is disposed in the lower portion of said chamber when said material is at rest therein, and a nozzle means carried by and extending outwardly from a wall portion and having an entry means at the inner side of said wall portion, a delivery duct located wholly within said chamber and having an outlet end part communicating with said nozzle means at said entry means, said duct extending upwardly from said entry means and within said chamber and terminating in an inlet end part in the upper portion of said chamber and above the at rest level of the material in the lower portion of the chamber, an air inlet tube connected with a source of air pressure and extending a substantial distance into said container with the outlet part of said tube located above and directed toward the material normally in the lower portion of the chamber to project air under pressure against said material to produce a cloud of particles of said material in suspension in said air to be delivered by way of said duct to said nozzle means and to be sprayed through said nozzle means as a fine nebula of particles of said material.

2. A sprayer of the character disclosed comprising a container having enclosing wall portions forming a normally closed chamber adapted to receive therein a dry material in powdered condition which normally is disposed in the lower portion of said chamber when said material

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is at rest therein, and a nozzle means carried by and extending outwardly from a wall portion and having an entry means at the inner side of said wall portion, a delivery duct located wholly within said chamber and having an outlet end part communicating with said nozzle means at said entry means, said duct extending upwardly from said entry means and within said chamber and terminating in an inlet end part in the upper portion of said chamber and above the at rest level of the material in the lower portion of the chamber, an air inlet tube connected with a source of air pressure and extending a substantial distance into said container with the outlet part of said tube located above and directed toward the material normally in the lower portion of the chamber to project air under pressure against said material to produce a cloud of particles of said material in suspension in said air to be delivered by way of said duct to said nozzle means and to be sprayed through said nozzle means as a fine nebula of particles of said material; said outlet portion of said air inlet tube comprising a mobile part, movable in said chamber over the material normally in the lower portion thereof under the influence of the air passing through said mobile part to direct air at various loci of said material.

3. A sprayer of the character disclosed comprising a container having enclosing wall portions forming a normally closed chamber adapted to receive therein a dry material in powdered condition which normally is disposed in the lower portion of said chamber when said material is at rest therein, and a nozzle means carried by and extending outwardly from a wall portion and having an entry means at the inner side of said wall portion, a delivery duct located wholly within said chamber and having an outlet end part communicating with said nozzle means at said entry means, said duct extending upwardly from said entry means and within said chamber and terminating in an inlet end part in the upper portion of said chamber and above the at rest level of the material in the lower portion of the chamber, an air inlet tube connected with a source of air pressure and extending a substantial distance into said container with the outlet part of said tube located above and directed toward the material normally in the lower portion of the chamber to project air under pressure against said material to produce a cloud of particles of said material in suspension in said air to be delivered by way of said duct to said nozzle means and to be sprayed through said nozzle means as a fine nebula of particles of said material, said air inlet tube having means associated therewith for regulating the pressure of air passing through said tube and into said container from said source of air pressure.

4. A sprayer of the character disclosed comprising a container having enclosing wall portions forming a normally closed chamber adapted to receive therein a dry material in powdered condition which normally is disposed in the lower portion of said chamber when said material is at rest therein, and a nozzle means carried by and extending outwardly from a wall portion and having an entry means at the inner side of said wall portion, a delivery duct located wholly within said chamber and having an outlet end part communicating with said nozzle means at said entry means, said duct extending upwardly from said entry means and within said chamber

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and terminating in an inlet end part in the upper portion of said chamber and above the at rest level of the material in the lower portion of the chamber, an air inlet tube connected with a source of air pressure and extending a substantial distance into said container with the outlet part of said tube located above and directed toward the material normally in the lower portion of the chamber to project air under pressure against said material to produce a cloud of particles of said material in suspension in said air to be delivered by way of said duct to said nozzle means and to be sprayed through said nozzle means as a fine nebula of particles of said material, said outlet portion of said air inlet tube comprising a mobile part movable in said chamber over the material normally in the lower portion thereof under the influence of the air passing through said mobile part to direct air at various loci of said material, said air inlet tube having means associated therewith for regulating the pressure of air passing through said passage and through said tube and into said chamber from said source of air pressure.

5. A sprayer of the character disclosed comprising a container having enclosing wall portions forming a normally closed chamber adapted to receive therein a dry material in powdered condition which normally is disposed in the lower portion of said chamber when said material is at rest therein, and a nozzle means carried by and extending outwardly from a wall portion and having an entry means at the inner side of said wall portion, a delivery duct located wholly within said chamber and having an outlet end part communicating with said nozzle means at said entry means, said duct extending upwardly from said entry means and within said chamber and terminating in an inlet end part in the upper portion of said chamber and above the at rest level of the material in the lower portion of the chamber, an air inlet tube connected with a source of air pressure and extending a substantial distance into said container with the outlet part of said tube located above and directed toward the material normally in the lower portion of the chamber to project air under pressure against said material to produce a cloud of particles of said material in suspension in said air to be delivered by way of said duct to said nozzle means and to be sprayed through said nozzle means as a fine nebula of particles of said material, and a second air inlet tube connected with a source of air pressure and extending downwardly into the inlet end part of said delivery duct to deliver air thereto and to aerate the mixture of particles of material and air passing from said chamber into and through said delivery duct.

6. A sprayer of the character disclosed comprising a container having enclosing wall portions forming a normally closed chamber adapted to receive therein a dry material in powdered condition which normally is disposed in the lower portion of said chamber when said material is at rest therein, and a nozzle means carried by and extending outwardly from a wall portion and having an entry means at the inner side of said wall portion, a delivery duct located wholly within said chamber and having an outlet end part communicating with said nozzle means at said entry means, said duct extending upwardly from said entry means and within said chamber and terminating in an inlet end part in the upper portion of said chamber and above the at rest

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level of the material in the lower portion of the chamber, an air inlet tube connected with a source of air pressure and extending a substantial distance into said container with the outlet part of said tube located above and directed toward the material normally in the lower portion of the chamber to project air under pressure against said material to produce a cloud of particles of said material in suspension in said air to be delivered by way of said duct to said nozzle means and to be sprayed through said nozzle means as a fine nebula of particles of said material, and a second air inlet tube connected with a source of air pressure and extending downwardly into the inlet end part of said delivery duct to deliver air thereto and to aerate the mixture of particles of material and air passing from said chamber into and through said delivery duct, said second air inlet tube having means thereon engaging said inlet end part of said delivery duct for centering said delivery duct co-axially with respect to said second air inlet tube.

7. A sprayer of the character disclosed comprising a container having enclosing wall portions forming a normally closed chamber adapted to receive therein a dry material in powdered condition which normally is disposed in the lower portion of said chamber when said material is at rest therein, and a nozzle means carried by and extending outwardly from a wall portion and having an entry means at the inner side of said wall portion, a delivery duct located wholly within said chamber and having an outlet end part communicating with said nozzle means at said entry means, said duct extending upwardly from said entry means and within said chamber and terminating in an inlet end part in the upper portion of said chamber and above the at rest level of the material in the lower portion of the chamber, an air inlet tube connected with a source of air pressure and extending a substantial distance into said container with the outlet part of said tube located above and directed toward the material normally in the lower portion of the chamber to project air under pressure against said material to produce a cloud of particles of said material in suspension in said air to be delivered by way of said duct to said nozzle means and to be sprayed through said nozzle means as a fine nebula of particles of said material, and a second air inlet tube connected with a source of air pressure and extending downwardly into the inlet end part of said delivery duct to deliver air thereto and to aerate the mixture of particles of material and air passing from said chamber into and through said delivery duct, said inlet end part of said delivery duct having orifices for the entry of said particles of material and air from said chamber into said duct, said second air inlet tube having its outer wall spaced from the inner wall of said delivery duct to provide a chamber around said second air inlet tube.

8. A sprayer of the character disclosed comprising a container having enclosing wall portions forming a normally closed chamber adapted to receive therein a dry material in powdered condition which normally is disposed in the lower portion of said chamber when said material is at rest therein, and a nozzle means carried by and extending outwardly from a wall portion and having an entry means at the inner side of said wall portion, a delivery duct located wholly within said chamber and having an outlet end part communicating with said nozzle means at said

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entry means, said duct extending upwardly from said entry means within said chamber and terminating in an inlet end part in the upper portion of said chamber and above the at rest level of the material in the lower portion of the chamber, an air inlet tube connected with a source of air pressure and extending a substantial distance into said container with the outlet part of said tube located above and directed toward the material normally in the lower portion of the chamber to project air under pressure against said material to produce a cloud of particles of said material in suspension in said air to be delivered by way of said duct to said nozzle means and to be sprayed through said nozzle means as a fine nebula of particles of said material, and a second air inlet tube connected with a source of air pressure and extending downwardly into the inlet end part of said delivery duct to deliver air thereto and to aerate the mixture of particles of material and air passing from said chamber into and through said delivery duct, said inlet end part of said delivery duct having orifices for the entry of said particles of material and air from said chamber into said duct, said second air inlet tube having its outer wall spaced from the inner wall of said delivery duct to provide a chamber around said second air inlet tube, and the outlet end of said second air inlet tube being at a lower point in said delivery duct than the lowermost of said orifices.

9. A sprayer of the character disclosed comprising a container having enclosing wall portions forming a normally closed chamber adapted to receive therein a dry material in powdered condition which normally is disposed in the lower portion of said chamber when said material is at rest therein, and a nozzle means carried by and extending outwardly from a wall portion and having an entry means at the inner side of said wall portion, a delivery duct located wholly within said chamber and having an outlet end part communicating with said nozzle means at said entry means, said duct extending upwardly from said entry means and within said chamber and terminating in an inlet end part in the upper portion of said chamber and above the at rest level of the material in the lower portion of the chamber, an air inlet tube connected with a source of air pressure and extending a substantial distance into said container with the outlet part of said tube located above and directed toward the material normally in the lower portion of the chamber to project air under pressure against said material to produce a cloud of particles of said material in suspension in said air to be delivered by way of said duct to said nozzle means and to be sprayed through said nozzle means as a fine nebula of particles of said material, and a second air inlet tube connected with a source of air pressure and extending downwardly into the inlet end part of said delivery duct to deliver air thereto and to aerate the mixture of particles of material and air passing from said chamber into and through said delivery duct, said second air inlet tube having means thereon engaging said inlet end part of said delivery duct for centering said delivery duct co-axially with respect to said second air inlet tube and said container having a reduced thickness portion surrounding said entry means where said delivery duct extends upwardly from said entry means to permit said centering action of said delivery duct.

10. A sprayer of the character disclosed com-

prising a container having enclosing wall portions forming a normally closed chamber adapted to receive therein a dry material in powdered condition which normally is disposed in the lower portion of said chamber when said material is at rest therein, and a nozzle means carried by and extending outwardly from a wall portion and having an entry means at the inner side of said wall portion, a delivery duct located wholly within said chamber and having an outlet end part communicating with said nozzle means at said entry means, said duct extending upwardly from said entry means and within said chamber and terminating in an inlet end part in the upper portion of said chamber and above the at rest level of the material in the lower portion of the chamber, an air inlet tube connected with a source of air pressure and extending a substantial distance into said container with the outlet part of said tube located above and directed toward the material normally in the lower portion of the chamber to project air under pressure against said material to produce a cloud of particles of said material in suspension in said air to be delivered by way of said duct to said nozzle means and to be sprayed through said nozzle means as a fine nebula of particles of said material, and a second air inlet tube connected with a source of air pressure and extending downwardly into the inlet end part of said delivery duct to deliver air thereto and to aerate the mixture of particles of material and air passing from said chamber into and through said delivery duct, said inlet end part of said delivery duct having orifices for the entry of said particles of material and air from said chamber into said duct, said second air inlet tube having its outer wall spaced from the inner wall of said delivery duct to provide a chamber around said second air inlet tube, and means for closing the upper end of said delivery duct around said second air inlet tube to prevent entry of the particles of material and air into said upper end and to compel the entry thereof through said orifices into the chamber provided between the outer wall of said second air inlet tube and the inner wall of said delivery duct.

11. A sprayer of the character disclosed com-

prising a container having enclosing wall portions forming a normally closed chamber adapted to receive therein a dry material in powdered condition which normally is disposed in the lower portion of said chamber when said material is at rest therein, and a nozzle means carried by and extending outwardly from a wall portion and having an entry means at the inner side of said wall portion, a delivery duct located wholly within said chamber and having an outlet end part communicating with said nozzle means at said entry means, said duct extending upwardly from said entry means and within said chamber and terminating in an inlet end part in the upper portion of said chamber and above the at rest level of the material in the lower portion of the chamber, an air inlet tube connected with a source of air pressure and extending a substantial distance into said container with the outlet part of said tube located above and directed toward the material normally in the lower portion of the chamber to project air under pressure against said material to produce a cloud of particles of said material in suspension in said air to be delivered by way of said duct to said nozzle means and to be sprayed through said nozzle means as a fine nebula of particles of said material, the inlet end part of said delivery duct being beveled to prevent the accumulation thereon of particles of said material.

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