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DRY POWDER CONDITIONING AND DISPENSING MEANS

Filed March 18, 1949

2 Sheets-Sheet 1

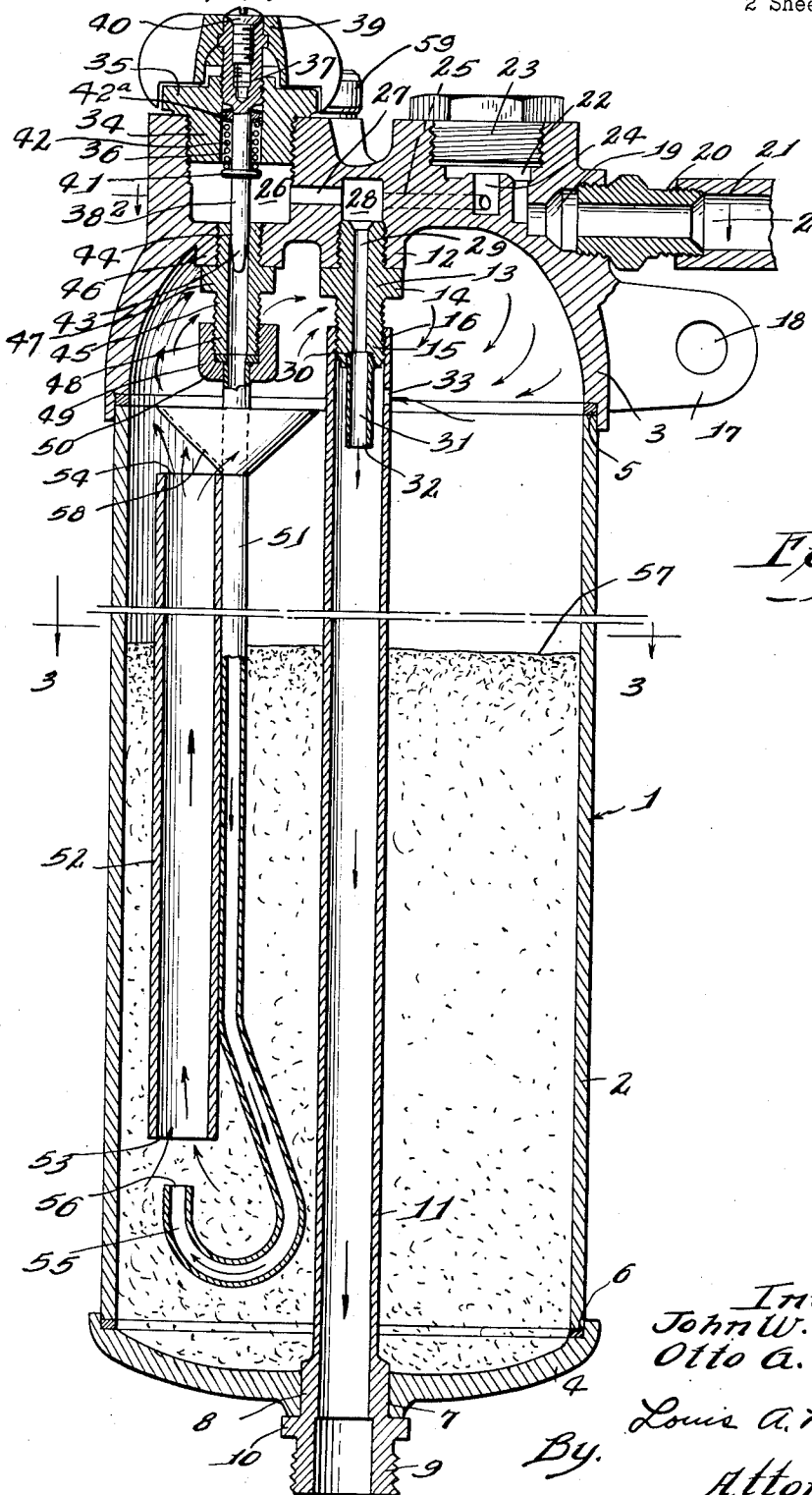


Fig. 1.

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2 Sheets-Sheet 2

Fig. 2.

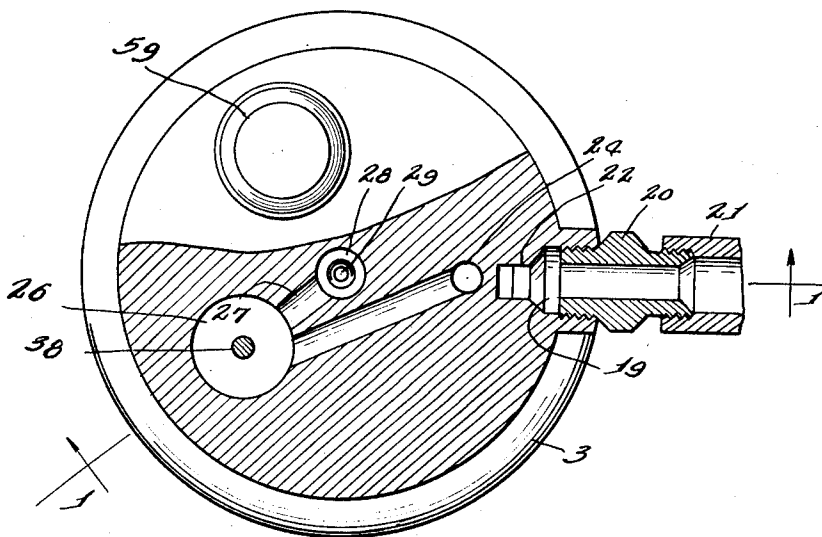
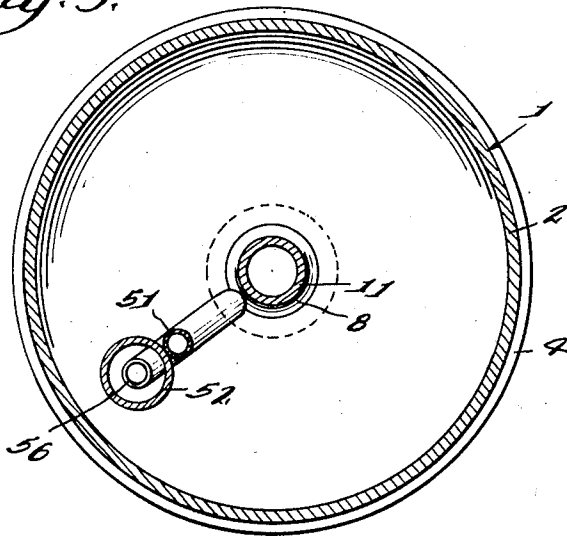


Fig. 3.



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DRY POWDER CONDITIONING AND DISPENSING MEANS

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15 Claims. (Cl. 222—193)

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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, and is considered an improvement of the invention disclosed and claimed in applications for Dry Powder Sprayer filed by Eric Gustafsson et al., Ser. No. 623,516, filed October 20, 1945, now Patent No. 2,501,047, issued March 21, 1950, and Ser. No. 748,092, filed May 14, 1948, now Patent No. 2,577,519, issued December 4, 1951.

Among the objects of the invention is to provide a novel device or means for conditioning and dispensing or distributing a dry powder or powdery substance in the form of a cloud or clouds, particularly for use upon printed sheets in printing as the sheets move toward stacking or like position for preventing offset of ink, colors, and the like; comprising a chamber, container or holder made of any suitable material, but preferably of transparent or like material, for holding the substance, with 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 in desired proportions or the like and maintaining the desired proportion or the like regularly, and with means for conducting of such mass with or without more air or the like to a locus of use or application or the like.

Another object of the invention is to provide such means with a novel means of distribution of the nebulated and aerated mass or particles to effect a wide range of application over the printed sheets of different sizes and shapes and to supply such mass in even density at all points of application and to maintain such evenness of density during the time of application.

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;

Fig. 2 is a horizontal transverse sectional view, with a part shown in plan, of the device taken in a plane represented by line 2—2 in Fig. 1 of the drawings; and,

Fig. 3 is a transverse sectional view taken in a plane represented by line 3—3 in Fig. 1 of the drawings.

Referring more in detail to the drawings, the embodiment selected to illustrate the invention is shown as comprising an upright chamber 1 which may be of any suitable form, as cylindrical as

shown, and which may have a chamber wall 2 closed at its upper end by a cap or head 3 and a lower cap or head 4 both suitably sealed to the upper and lower ends of the chamber 1 by suitable sealing means 5 and 6.

The lower cap 4 has a hub or neck part 7 in which fits a hub portion 8 of a connector or coupling member having a threaded or like part 9 adapted for connection to a spray nozzle (not shown) or to suitable duct or like means leading to one or more spray nozzles (not shown). The connector has a nut or like portion 10 by which the connector 8—9 may be turned. To the hub part 7 is connected or fixed the lower end part of a delivery duct 11 which extends upwardly in the chamber 1 and to the upper cap 3.

The cap 3 has a hub portion 12 which is threaded to receive an upper end portion of a tubular coupling member 13, the latter having a collar or flange 14 for abutting with the hub 12 and having a threaded portion 15 engaged with the threaded upper end portion 16 of the member 11.

In this way and by such means the caps 4 and 3 are held to the chamber 1, the lower end of the duct 11 being connected to the part 7 of the cap 4 and the upper end portion 16 connected to the hub portion 12 by way of the coupling member 13. To the cap 3 may be connected an ear or the like 17 provided with a hole 18 to afford means for holding or supporting the device in operative position.

The cap 3 has an air entry chamber 19 in which is connected, as by way of screw threads, a coupling or like member 20 to which may be connected a suitable air supply duct or tube 21. The chamber 19 communicates with a chamber 22 the upper portion of which has an opening in which is a closure plug 23, and beneath this plug is provided a well or the like 24 which is in communication with the chamber 22. From the well 24 runs a duct or passage 25 which is provided in the cap 3 and this duct or passage extends to and communicates with a chamber or well 26 provided in the head or cap 3. From this well 26 is provided duct 27 which establishes communication with the well 26 and a chamber 28 provided in the cap or head 3 at the upper end of the coupling or like member 13. The member 13 is provided with a passage or duct 29 leading to the lower end of the member 13, and in the lower end of the member 13, or rather the portion 15 of the member 13, is provided a socket or the like 30 in which is connected a tube or nozzle 31 which preferably is short but of sufficient length

so that its discharge orifice 32 will be beyond or below an orifice 33 provided in a side of the duct 11 near its upper end portion thereof.

The chamber 26 has an upper opening in which is secured a plug or the like 34, this member having a head 35 by which the member 34 may be connected or disconnected as and when desired.

The member 34 has a valve passage or chamber 36 the upper end of which is threaded or the like for the securing therein of the head portion 37 of a valve member 38. To the upper end portion of the head portion 37 is suitably connected a winged part 39 by which the valve head 37 and the valve stem part 38 may be adjusted, the wing part 39 having a holding member, as a screw 40 threaded into the head part 37 to hold the winged part 39 rigid with the valve part 37-38. The stem portion of the valve 38 has a collar 41 on which is a coiled spring 42 pressing up against a packing means or the like 42a on the valve stem and pressed against the head part 37 of the valve 38. The lower portion of the valve 38 has a tapered valve seating part 43 adapted to seat in or vary the size of an air entry orifice 44 provided at the upper end of a coupling member or the like 45 connected to and communicating with the lower part or portion 46 of the chamber 26. The coupling 45 has a nut part or the like 47 for effecting connection to the part 46.

The lower portion of the coupling 45 has a threaded stem portion 48 to which is connected a coupling cap or ring 49 for clamping the upper flanged end 50 of an air delivery tube or the like 51 which extends to a lower point or locus in the chamber 1. In the chamber 1 is provided and located an upright mixing chamber 52 having openings 53 and 54 at both ends, that is the opening 53 at the lower end of the chamber 52 and opening 54 at the upper end of the chamber 52. This member 52 may be supported in any suitable way in the chamber 1, and as shown, is connected in any suitable way to a side of the air delivery tube 51. The connection may be adjustable in any suitable way.

The tube or duct 51 has at its lower portion a nozzle portion 55 having a discharge orifice 56, this orifice being in axial alignment with the opening 53 at the lower end of the chamber 52. This orifice 56 is located a suitable distance from, as below, the opening 53, as shown in Fig. 1. The size or cross-sectional area of the chamber 52 is larger than that of the duct part 55.

In the chamber 1 is contained a mass 57 of powder or the like to be sprayed by the device. The nozzle part 55-56 of the air tube 51 and the lower end portion of the chamber 52 are preferably at a low level so that there may always be an aspiration or injection of the powder between the orifices 56 and 53 to produce a proper proportion of powder to air in the chamber 52. Since the powder is light in weight there can be no "head" at the orifices 56 and 53 as would be in the case of using liquids and, hence, the depth of the powder in the chamber 1 has no influence on the injecting effect of the air at the orifices 56 and 53.

As the mixture of powder and air flows upwardly from the opening 54 of the chamber 52, the mixture spreads in the space under the cap or head 3 and becomes nebulated. It eventually flows to and is drawn in by way of the orifice 33 in the chamber, by the aspirating effect of the jet or stream of air being projected from the nozzle 31 whence more air is mixed and nebulated with

the fluid mass entering the chamber 11 by way of the orifice 33.

In order to enhance the mixing and nebulating effect of the fluids in the upper portion of the chamber 1, a deflecting means 58 or the like may be provided at or near the outlet of the chamber 52. This means may be of conical or like form and having an apical opening to fit around the tube 51 and to be connected or fixed thereto in any suitable way. This provides for an ample curved and conic portion at and near the outlet 54 of the chamber 52 so that the mixture issuing from the opening 54 of the chamber 52 will be deflected in various ways and directions so as to enhance the mixing and nebulizing thereof by the time the fluidal mass reaches the inlet orifice 33 of the chamber 11.

The cap or head 3 may have a suitable filler opening having a cap 59 by which to charge more powder into the chamber 1 when desired and necessary.

In operation, air under pressure flows, preferably intermittently or by impulses, in by way of the parts 21, 19, 22, 24 and 25 to the chamber 26. Some of the air passes by way of the passage 27 to chamber 28 and thence by way of the duct 29 and nozzle 31 to the chamber 11, connector 8-9, and thence to the spray means, as nozzles or the like (not shown). The injection effect at the nozzle 31-32 is to draw in a portion of the mixture in chamber 1 by way of the opening 33 in the chamber 11. The orifice 33 is farthest away from the opening 54 of the chamber 52 to afford a long path of travel and hence a greater chance for the powder and air to be best mixed and nebulated by the time the mass enters the orifice 33.

The air also is likewise or similarly fed by way of the valve means 43-44 to and into the duct 51 and thence to the nozzle 56 of the duct 51. The puffs or the like of the air projected from the nozzle 56 will engage a quantity of the powder or floc in the gap between the nozzle 56 and the mouth 53 at the lower end of the chamber 52, whereby the two are mixed and carried or projected up in the chamber 52 to and through its outlet 54, against the cone or deflector 58 to be dispersed in the chamber of the cap 3 and to flow by way of the orifice 33 to the duct 11. When the puff of air passes down through the nozzle 31-32 in the upper part of the duct 11, it mixes with the mixture that has entered through the orifice 33, and to be propagated down along the duct 11 and thence forth to the spraying means.

The air pressure may be varied but the proportion of air and powder will not vary by a change in air pressure, because the relation of the orifices 56 and 53 remain the same (when once set). The injection or injector effect may vary but the proportion of the powder to the air remains the same.

While we have herein described and upon the drawings shown a preferred embodiment of the invention, it is to be understood that the invention is not limited hereto 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 powder conditioning and dispensing device comprising a container having a lower chamber portion for containing a dry material in powdered form therein and an upper chamber portion normally above said material contained in said lower chamber portion, a delivery duct in

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said container and having a receiving end portion located in said upper chamber portion and above said material and a delivery end portion extending to the exterior of said container, said delivery end portion having means for connection thereto of a suitable means for spraying said powdered material, an air supply chamber member at the upper part of said container and an air supply duct extending from said supply chamber to the receiving end portion of said delivery duct for conducting air under pressure into said delivery duct at said receiving end portion thereof, a second air supply duct extending from said air supply chamber to a low point in said lower chamber portion and into said material therein and having an air nozzle at its lower end portion for delivering air in the form of a concentrated jet in said material at said point, a mixing chamber member having a lower open end portion located in said material at said point and spaced from said air nozzle for receiving powdered material and air into the chamber of said mixing chamber member, said mixing chamber member having an outlet portion located in said upper chamber portion and above said material in said lower chamber portion, said delivery duct having an orifice provided in said receiving end portion thereof for passage of said mixture of air and powdered material from said upper chamber portion to be mixed with the air passing from said air supply duct extending from said air chamber to said receiving end portion of said delivery duct to move along said delivery duct to be sprayed.

2. A device as set forth in claim 1, and wherein is provided an adjustable regulating means in said second air supply duct extending from said air supply chamber for controlling the pressure and flow of air to said air nozzle.

3. A device as set forth in claim 2, and wherein is provided a deflecting means located at the outlet of said mixing chamber member for enhancing the mixing of the air and powdered material flowing from said mixing chamber member to said upper chamber portion.

4. A device as set forth in claim 3, and wherein said deflecting means has an inclined surface located above the outlet end portion of said mixing chamber member for deflecting the mixture of said powdered material and air issuing from said mixing chamber member in different directions into said upper chamber portion.

5. A device as set forth in claim 4, and wherein said air duct from said air chamber to said delivery duct has an air nozzle extending into the receiving end portion of said delivery duct for effecting an aspirating effect on the mixture of powdered material and air entering through said orifice into said delivery duct.

6. A device as set forth in claim 5, and wherein said deflecting means comprises a conical member having its apical portion connected to said second air supply duct and having its flaring skirt portion extending upwardly with a part thereof located above the upper and delivery end portion of said mixing chamber member.

7. A device as set forth in claim 6, and wherein said air nozzle at the lower end portion of said second air supply duct has a return bent portion for presenting its air delivering end portion upwardly, and said inlet end portion of said mixing chamber member being located spacedly above said air delivery end portion of said air nozzle as also in alignment therewith.

8. A device as set forth in claim 1, and wherein is provided a deflecting means located at the out-

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let portion of said mixing chamber member for enhancing the mixing of the air and the powdered material flowing from said mixing chamber member to said upper chamber portion.

9. A device as set forth in claim 8, and wherein said deflecting means has an inclined surface located above the outlet end portion of said mixing chamber member for deflecting the mixture of powdered material and air issuing from said mixing chamber member in different directions into said upper chamber portion of said container.

10. A device as set forth in claim 1, and wherein said air duct from said air chamber to said delivery duct having an air nozzle extending into the receiving end portion of said delivery duct for effecting an aspiration effect on the mixture of powdered material and air entering through said orifice into said delivery duct.

11. A device as set forth in claim 10, and wherein said air nozzle is spaced from the wall of said delivery duct to afford room for the mixture of material and air entering therein through said orifice.

12. A device as set forth in claim 11, and wherein said air nozzle has a delivery end extending into said delivery duct to a point beyond where said orifice in said side wall of said delivery duct is located.

13. A device as set forth in claim 1, and wherein is provided a deflecting means located at the outlet portion of said mixing chamber member for enhancing the mixing of the air and the powdered material flowing from said mixing chamber to said upper chamber portion of said container, and said deflecting means comprising a conical member having its apical portion connected to said second air duct and having its flaring skirt portion extending upwardly with a part thereof located above the upper and delivery end portion of said mixing chamber member.

14. A device as set forth in claim 1, and wherein said air nozzle at the lower end portion of said second air duct has a return bent portion for presenting its air delivery end portion to said mixing chamber member being located spacedly above said air delivery end portion of said air nozzle as also in alignment therewith.

15. A powder conditioning and dispensing device comprising a container having a lower chamber portion for containing a dry material in discrete form and an upper chamber portion for containing a mass of said dry material suspended in air, means for introducing air under pressure into said container, a delivery duct positioned in said container and extending through the upper and lower chamber portions of said container and projecting exteriorly of said container at the bottom thereof, a mixing compartment in said container having an upper end opening into the upper chamber portion and a lower end opening into the mass of dry material in the lower chamber portion, means for introducing a portion of said air under pressure into the mass of dry material in the lower chamber portion of the container, a discharge nozzle carried by said means for directing a concentrated jet of said air under pressure in company with dry material into the lower end of said mixing chamber to pass a mass of said dry material suspended in air out of the upper end of the mixing chamber to the upper chamber portion of the container, means for introducing the remaining portion of said air under pressure into the upper portion of said delivery duct, said delivery duct being provided with an opening in

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that portion thereof positioned in the upper chamber portion of the container through which suspended dry material from said upper chamber portion passes to be mixed with the air under pressure in said delivery duct.

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