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POWDER DISTRIBUTING APPARATUS

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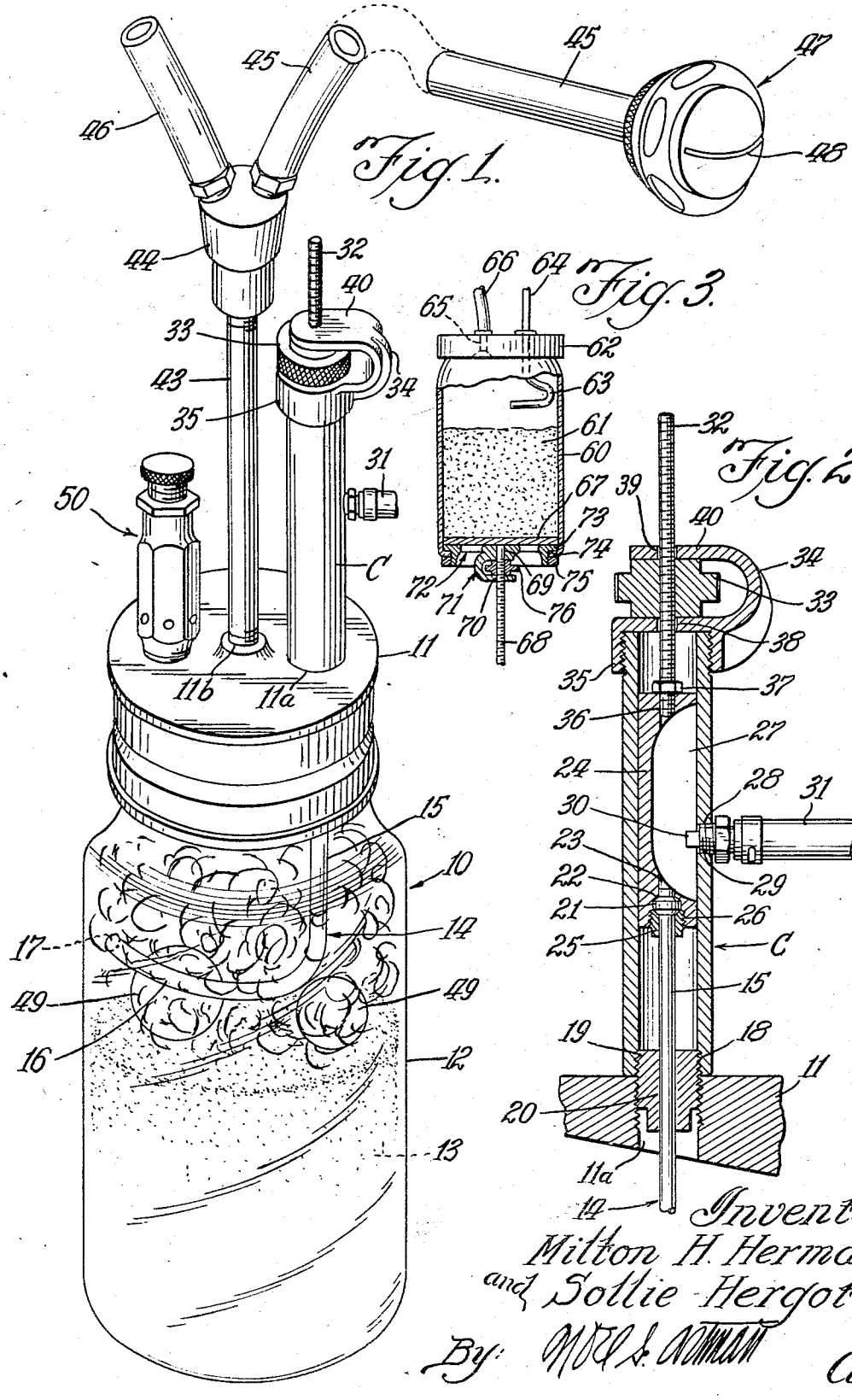


Fig. 1.

Fig. 3.

Fig. 2.

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POWDER DISTRIBUTING APPARATUS

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This invention has to do with apparatus employing an air stream for turbulating and thus taking powder particles into suspension for conveying such particles to a distributing area, and relates more particularly to an air inlet tube in association with a powder container and means for adjusting the relative position of the powder body from which the particles are taken and the tube whereby the concentration of suspended particles may be accurately regulated.

Apparatus of the present character is used extensively in the printing and lithographing fields where the powder is sprayed onto the freshly inked faces of sheets as they leave the presses, prior to stacking. The effect of this powder is to prevent "offset" of ink from any sheet onto the back of the sheet stacked thereagainst. While it is necessary that sufficient powder shall be deposited upon the sheets to prevent "offset," it is also highly desirable that there shall be no deposits in excess of this amount. First because too much powder which is easily detected by the fingers has for some persons an unpleasant feel or touch, and secondly because a portion of the excess drifts away in the atmosphere where it is inhaled by the pressman.

One object of the present invention is the provision of a powder distributing apparatus capable of wide and accurate variation in the amount of powder suspended in an air or gas stream passing therethrough.

Another object of the present invention is the provision of an apparatus as the above in which the powder concentration can be modified independently of the stream's velocity. This is accomplished by adjusting the distance between the mouth of an air inlet tube and the surface of a loose powder body whereby the intensity with which the air stream encounters said surface and the consequent amount of powder particles picked up thereby may be selectively regulated.

The invention has for another of its objects the provision in a powder spraying apparatus, wherein powder particles are picked up from a loose powder body by an air stream, of one or more light-weight pellets or balls agitatable by such air stream to break down surface irregularities in the powder body and thus prevent the formation of any substantial crater by erosion. Greater uniformity in the quantity of powder carried by the air stream is thereby assured.

A further object of the invention is the provision of an improved air inlet tube having its discharge end disposed for directing an air stream circumferentially about the side walls of a powder container above the surface of a powder body therein.

These and other desirable objects inherent in and encompassed by the invention will later appear.

In the drawing:

Fig. 1 is a perspective view of a powder distributing apparatus constructed according to the principles of the present invention;

Fig. 2 is a fragmentary sectional view taken upon a plane coinciding with the principal axis of an adjustable support for an air inlet tube of the apparatus; and

Fig. 3 is an elevational view, partly in section, of a modified form of the invention.

The first embodiment of the invention will now be described with reference to Figs. 1 and 2 of the drawing. In Fig. 1 the apparatus will be seen to include a powder container 10 having an open top which is closed by a screwed-on cap 11. Preferably the container side wall 12 is made of transparent material such as glass so the height of a powder body 13 therein can be conveniently ascertained by observation. During operation of the apparatus, later described, an air stream directed over the surface of this powder body 13 picks up particles therefrom and conducts them away to a desired place for deposit. The air, which term is herein used to include any gas, is introduced through a tube 14 which has a vertical section 15 and a substantially horizontal section 16 disposed adjacently to the wall 12 and curved to conform with the curvature thereof. A discharge opening 17 is at the end of said curved section.

In Fig. 2 the vertical part 15 of the tube 14 will be seen to extend upwardly through an opening 11a in the cap 11 into a cylindrical casing C. This casing C is connected by means of screw threads 18 with a threaded plug 19 which in turn is in threaded engagement with the opening 11a. Said plug 19 is provided with an axial opening 20 through which the vertical portion 15 of the tube 14 projects.

The upper end of the tube section 15 has an enlarged circumferential section 21 which is bevelled about its upper side for seating against a shoulder 22 circumscribing an axial bore 23 within a piston or plunger 24 which is reciprocal vertically within the cylindrical casing C. A sleeve-like nut 25 surrounds the tube section 15 and is in threaded relation with an enlarged threaded section 26 of the bore 23 for pressing the enlarged portion 21 of the tube snugly against

the shoulder 22 and thus holding the tube 14 in rigid assembly with the plunger 24.

One side of the plunger 24 has a slot 27 extending lengthwise thereof and forming complementally with the cylindrical casing 17 an air intake chamber. Said slot 27 registers with a threaded side wall opening 28 of the casing 17 wherein there is turned a nipple 29 having an end section 30 which projects into the slot 27 to prevent rotation of the plunger 24 while permitting of axial adjustment thereof. One end of an air intake conduit 31 is connected with the nipple 29, the opposite end of said conduit being communicable with a source of air under pressure.

Vertical adjustment of the plunger 24 and hence of the tube 14 connected therewith is had by means of a threaded stem 32 in combination with a knurled nut 33 which is held against axial displacement by a bracket 34 of which a base portion 35 is in threaded relation with the upper end of the casing C. The lower end of the stem 32 is threaded into a bore 36 in the upper end of the plunger 24 where it is held non-rotatively by a lock nut 37. Apertures 38 and 39 in the base section 35 and in the opposed leg 40 of the bracket 34 are sufficiently large to permit endwise movement of the stem 32. The nut 33 which engages the threaded stem 32 causes endwise movement of said stem in either direction depending upon the direction of rotation of said nut.

In the operation of the apparatus, a valve (not shown) between the conduit 31 and a source of air under pressure will be opened to cause the flow of such air through the conduit 31 and the nipple 29 into the intake chamber formed by the slot 27. There is a sufficiently close fit between the plunger 24 and the casing C to prevent the escape of air past either end of the plunger so that the air flows downwardly through the bore 23 and the tube 14 into the container 10 from the discharge end 17 of said tube. Due to the position of the tube 14 the discharged air will be caused to whirl about the container wall 12, and to expedite the air movement the wall 12 is preferably cylindrical, or nearly so. While passing over the exposed surface of the powder body 13 the air stream will pick up powder particles so that a dust cloud will be formed above the powder body and discharged from the container through an opening 11b in the cap 11, a conduit 43 of which an end is in threaded relation with said opening 11b, a multi-duct coupling member 44 and one or more conduits as 45 and 46 to spray heads 47 or the like. The spray head 47 shown in Fig. 1 has a transverse slot 48 through which the powder laden air is discharged.

The amount of powder suspended in a unit quantity of air can be accurately regulated by changing the elevation of the tube 14 and thus varying the proximity of the swifter part of the air current leaving the tube 14 and the powder surface. When it is desired to increase the quantity of powder particles per unit quantity of air, the tube 14 will be lowered by rotating the knurled nut 13 counterclockwise as viewed from above and when it is desired to decrease the amount of powder per unit quantity of air the nut 33 will be rotated in the opposite direction until said tube is raised to the required position. Sometimes it will be desirable to change the velocity of the air stream so the particles will be shot a different selected distance from the spray heads but without changing the amount of powder per unit volume of air. This adjustment can be made by changing the degree of opening of the valve (not shown) between the air source and the conduit 31 until the air issuing from the spray heads is at the desired velocity and then placing the tube 14 at the elevation necessary to obtain the required pick-up of powder particles.

The absence of surface irregularities and of crater-like formations within the upper surface of the powder body is assured by one or more light balls or pellets 49, two being shown in Fig. 1, which are turbulated and carried about by the air stream. Hollow thin-shelled spherical balls when used for this purpose have been found to keep the surface of the powdered body comparatively smooth and uniform in contour so that the amount of powder picked up by the air stream, will not fluctuate once the aforesaid valve (not shown) has been selectively set. There will be a gradual diminution in the powder content of the air stream as the surface of the powder body recedes pursuant to erosion by the air stream, but since the erosion process is very slow the desired amount of powder discharged can be regulated sufficiently close for practical use and purposes by periodically rotating the nut 33 to cause re-adjustment of the stem 14.

A safety valve 50 of any standard structure attached to the cap 11 prevents excessive air pressure in the container.

In a modified form of the invention shown in Fig. 3 a container 60 holding a body 61 of powder is provided with a cap 62 from which there depends an air inlet tube 63 of which the lower end is shaped similarly to the tube 14. Air is introduced into the device through a conduit 64 which communicates with the upper end of said tube 63. Discharge of the dust cloud formed by the air stream and powder picked up from the body 61 is discharged through an opening 65 in the cap 62 and a conduit 66 which corresponds to the conduit 43.

Relative vertical adjustment between the tube 63 and the upper surface of the powder body 61 is taken care of by means of a piston or axially movable bottom member 67 in the lower part of the container. This bottom member 67 has a threaded stem 68 projecting downwardly therefrom through openings 69 and 70 in a bracket 71 which is integral with a spider 72. A flange 73 upon the spider 72 abuts against the upper side of an inwardly projecting flange 74 upon the bottom of the container side wall, and a threaded ring 75 turned upon a threaded exterior section of the spider 72 cooperates with the flanges 73 and 74 for holding this spider in position upon the container. A knurled nut 76 disposed between the legs of the bracket 71 is in threaded relation with the stem 68 and can be rotated for effecting vertical adjustment of said stem and the bottom member 67 to raise or lower the powder body and thus regulate the spacing of said body and the tube 63 for the purpose explained with respect to the tube 14.

While we have herein shown and described but two specific embodiments, it should be understood that the invention extends to other arrangements, details and structures falling within the spirit thereof.

We claim:

1. Powder distributing apparatus comprising a closed container adapted to hold a body of such powder, tube support means, an air inlet tube upon said support means and projecting into the container, said tube including discharge opening means for normal operation only above the sur-

face of said powder body and in the form of a discharge opening disposed adjacently to and facing horizontally in general parallelism with the adjacent portion of a side wall of the container to direct the discharge of air carried into the container thereby horizontally along said wall at a section above the powder body whereby the discharged air creates in said container a circular current laden with powder picked up solely from the surface of said body, and said container having an opening above the powder body for the discharge of the powder laden air.

2. Powder distributing apparatus comprising a closed container adapted to hold a body of such powder, a channelled air inlet member disposed in said container, the channel in said member having an air outlet portion normally above the powder body and disposed for directing the discharge of air therefrom into the container horizontally along a wall section of said container, means for effecting relative movement between said powder body and said member to selectively change the relative position of the powder body and the air stream, and said container also having a discharge opening normally above such powder body.

3. Powder distributing apparatus comprising a closed container adapted to hold a body of such powder, a channelled air inlet member in the container with the outlet portion of the channel therein normally disposed above said powder body, and said outlet portion of the channel being constructed and arranged to direct the discharge of air carried thereby into the container horizontally along a wall section of the container, means for adjusting said channelled member vertically to selectively vary the distance between said member and the surface of said powder body, and said container also having a discharge opening above such powder body.

4. Powder distributing apparatus comprising a closed container adapted to hold a body of such powder, an air inlet tube having a discharge section in said container, said container having an outlet opening above the normal level of such a powder body, and means for adjusting the elevation of said tube comprising a generally upright cylinder upon said container, a plunger reciprocally mounted in said cylinder, said tube being connected with said plunger for movement therewith, said plunger setting off above at least a part thereof an interior portion of said cylinder as an air receiving chamber, said cylinder having an air inlet opening communicating with said chamber, and said plunger having a passage communicating between said chamber and said tube.

5. Powder distributing apparatus comprising a closed container adapted to hold a body of such powder, an air inlet tube having a discharge section in said container, said container having an outlet opening above the normal level of such a powder body, and means for adjusting the elevation of said tube comprising guide means, a coupling head adjustable generally vertically in said guide means and having an air inlet passage therein and manually operable means for adjusting said head in said guide member, and said tube being connected with said coupling head for movement therewith and also being connected communicatively with said air inlet passage therein.

6. Powder distributing apparatus comprising a closed container having a generally cylindrical upright side wall and adapted to hold a body of such powder, said container also having an outlet opening above the normal level of such a powder body, an air inlet tube including a substantially horizontal discharge end portion disposed adjacently to and generally in parallelism with a section of said side wall and an upwardly extending portion, and means for adjusting the elevation of said tube comprising upright guide means, a member adjustable generally vertically in said guide means, and manually operable means for adjusting said head in said guide means, and said upwardly extending portion of the tube being connected with said head for movement therewith.

7. Powder distributing apparatus comprising a closed container having a generally vertical side wall closed upon itself for circumscribing a body of such powder and for deflecting an air stream circularly about the inner periphery of such wall, said container also having an outlet opening for such air above the section of the container for occupation by a powder body, an air inlet conduit including a discharge section in the container entirely above the normal level of a body of such powder and in the form of an opening disposed adjacently to a portion of said wall and facing horizontally in general parallelism with said wall portion, powder body supporting means adjustable vertically in said container, and manually operable means for adjusting said supporting means.

8. Powder distributing apparatus comprising a closed container adapted to hold a body of powder, air injection means disposed for directing a stream of air over the surface of said powder body for picking up powder particles, means for conducting the particle laden air stream from said container, and at least one pellet member in said container in the path of such air stream and sufficiently light in weight to be propelled thereby over the surface of said body during operation of the apparatus.

9. Powder distributing apparatus comprising a closed container adapted to hold a body of such powder, tube support means, an air inlet tube in said container and held by said support means, said tube having a discharge opening facing generally horizontally in one direction along a wall section of the container at a position normally above the level of a powder body therein, means for adjusting said tube vertically to vary the distance between said opening and the surface of said powder body, and said container also having a discharge opening above the space therein for said powder body.

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