United States Patent [19]

Grun

[11] **3,733,012**

[45] **May 15, 1973**

[54] **DISPENSING DEVICE FOR A BULK MATERIAL RECEPTACLE**

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[22] Filed: **June 5, 1972**

[21] Appl. No.: **259,758**

[52] **U.S. Cl.** **222/193,** 222/504, 222/509

[51] **Int. Cl.**.....**B65g 65/62**

[58] **Field of Search**.....222/193, 460, 462, 222/504, 509, 522, 523, 524, 525

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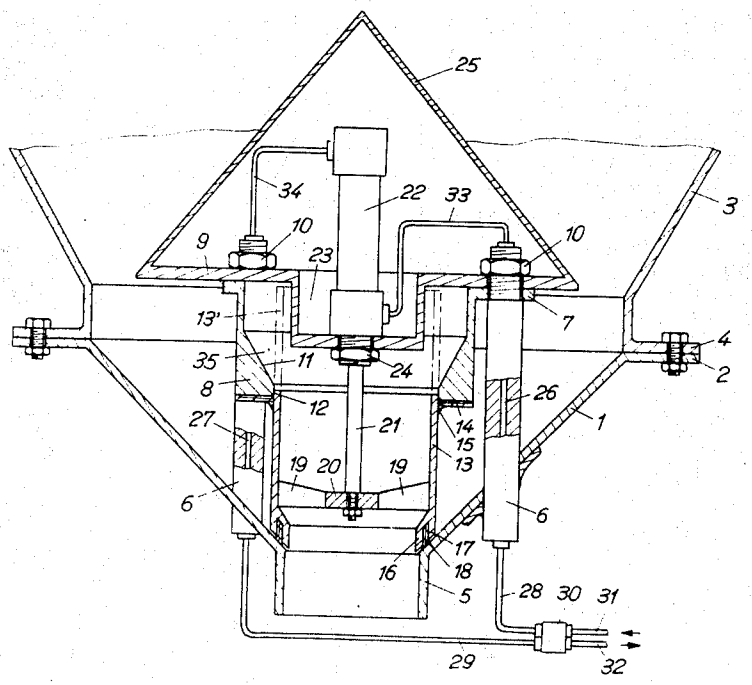
Assistant Examiner—John P. Shannon
Attorney—Eric H. Waters et al.

[57] **ABSTRACT**

A dispensing device for the metered discharge of bulk material from a receptacle including a vertically movable cylindrical or tubular slide located in a funnel-shaped dispenser. Actuating means, such as a hydraulic cylinder arrangement, or a winding cable are adapted to raise or lower the slide so as to provide a variable material outlet orifice in the lower end of funnel-shaped dispenser. Pressurized air may be introduced into the device for enhancing pneumatic conveyance of the material and prevent adherence thereof to the interior walls of the device.

7 Claims, 3 Drawing Figures



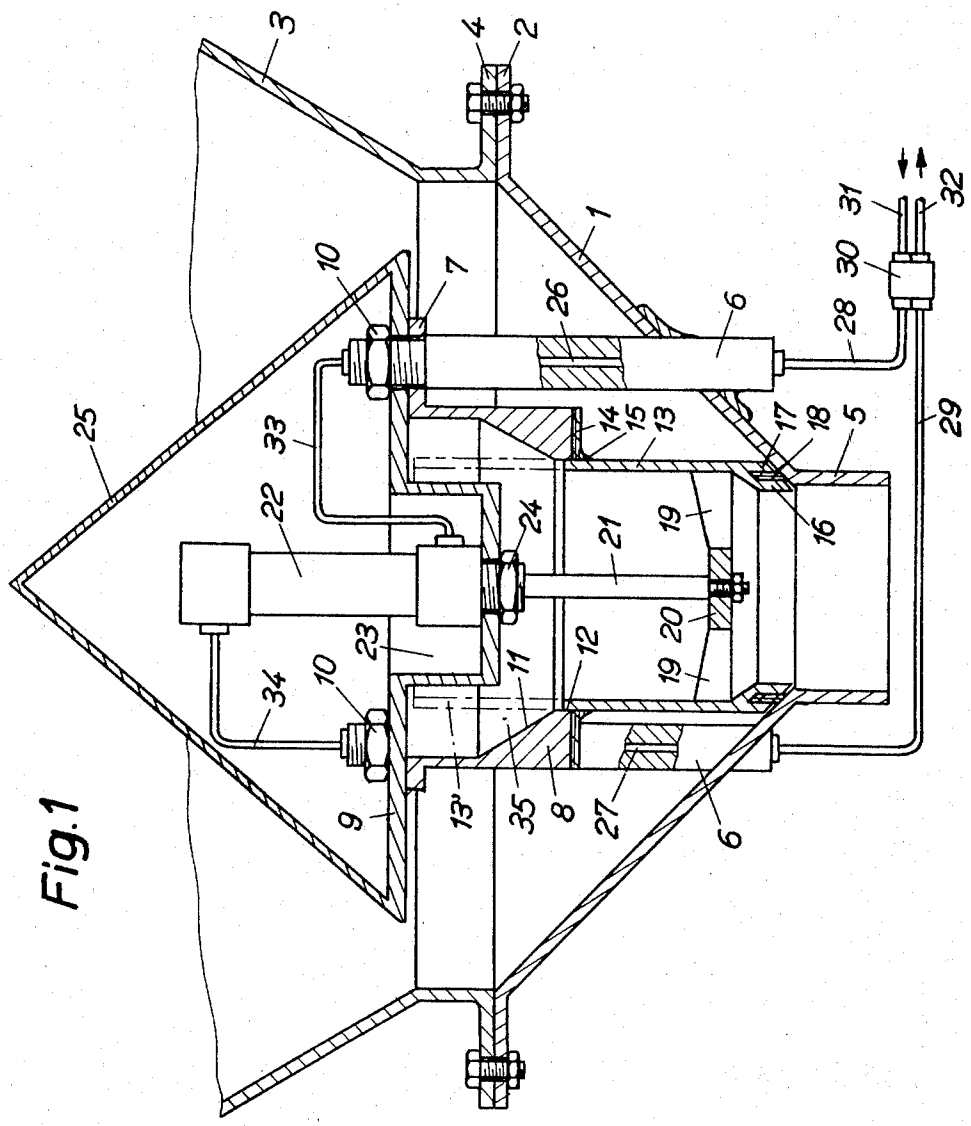

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Fig.1

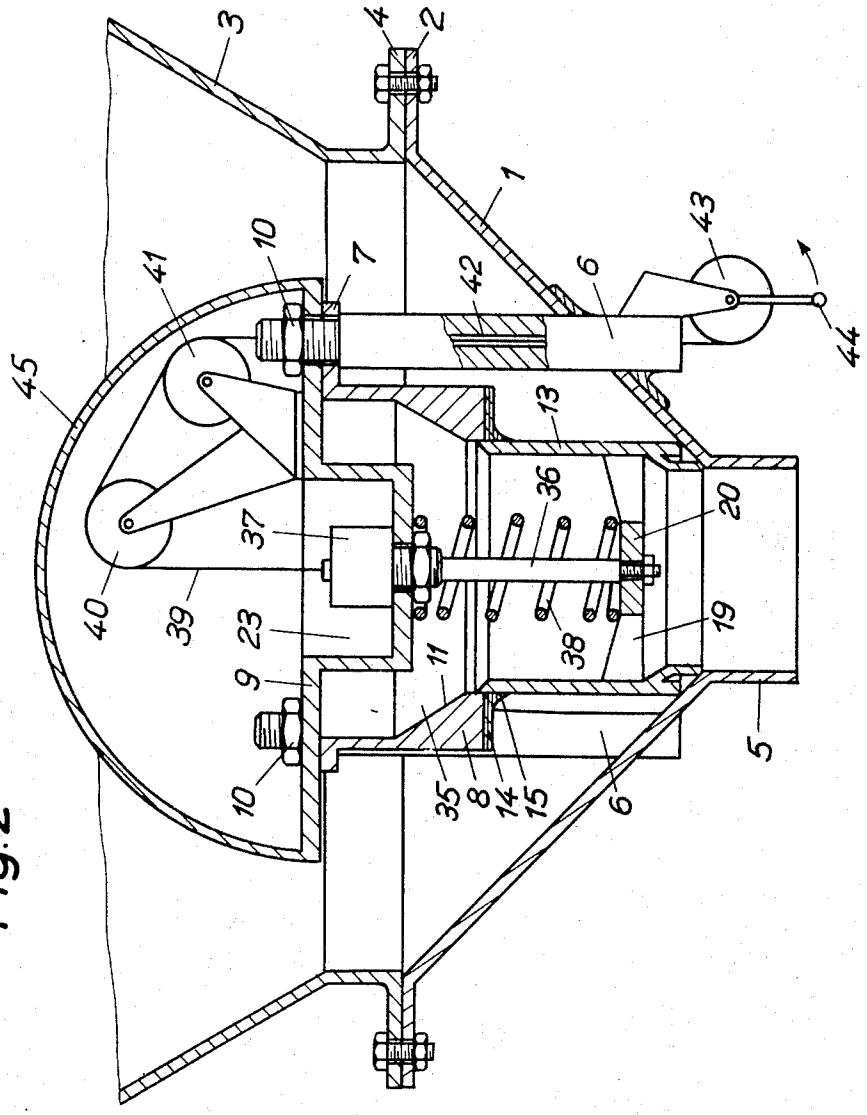
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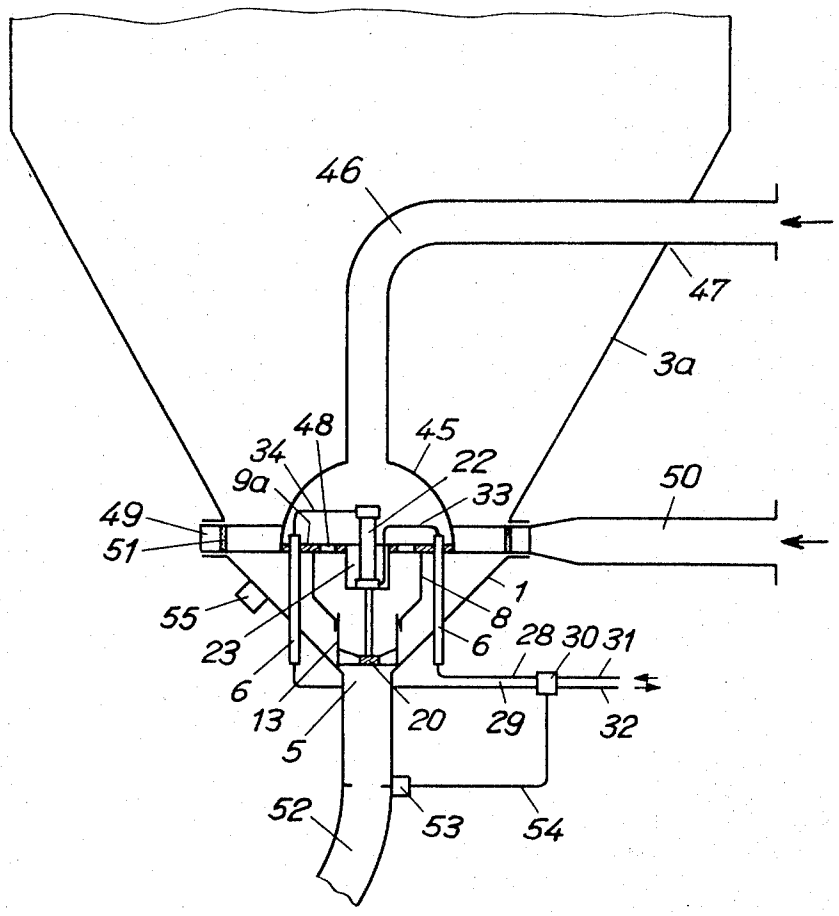
Fig. 2

Fig.3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DISPENSING DEVICE FOR A BULK MATERIAL RECEPTACLE

FIELD OF THE INVENTION

The present invention relates to a dispensing device for a bulk material receptacle and, more particularly, to a funnel-shaped dispenser having a variable orifice for the metered discharge of the material.

DESCRIPTION OF THE PRIOR ART

Heretofore, dispensing devices known in the art generally included a flat slider adapted to, in its closing position, bar the discharge orifice or conduit of the material-containing receptacle. Upon opening of the flat slider, either manually or by means of a suitable servo installation, quantities of the material were introduced into the operative components of the slider so as to greatly increase the wear thereof. Furthermore, dust and material particles frequently leaked through the slider actuating or operative components exteriorly of the receptacle, thereby frequently causing undesirable hygienic and environmental problems.

SUMMARY OF THE INVENTION

Accordingly, in order to obviate the drawbacks and disadvantages encountered in the prior art constructions, the present invention contemplates the provision of a dispensing device of extremely compact construction incorporating a precisely adjustable slider arrangement and which, if required, may be readily adapted to facilitate the pneumatic conveyance of loose or bulk materials being dispensed from the receptacle. In connection with the foregoing, the novel bulk material dispensing device, in accordance with the present invention, provides for a unique vertically movable cylindrical slide which is fastened, through the intermediary of a plurality of suitable columns or supports, onto a dispensing funnel for the material-containing receptacle. The dispensing device further includes an actuating or drive installation for imparting vertical movement to the slide, with the installation including a first portion formed by a supporting base plate covered by a hood, and wherein the base plate supports a depending rod member which is rigidly fastened to the slide, and additionally, a sleeve member fastened to the base plate. The slide is adapted to move within the sleeve so as to be sealingly encompassed by the latter, and is also formed to sealingly engage at its lowermost end the inner wall surface of the dispensing funnel. The above-mentioned first portion of the actuating arrangement has at least one of its support columns provided with a passageway which forms an operative connection between the first portion of the actuating installation and with a second portion in response to externally supplied motive power for the operation of the installation.

Preferably, the slide is moved from its closed position by upward displacement or movement thereof, however, the invention also contemplates within its scope the downward movement of the slide in order to effect the opening of the material discharge orifice in the funnel.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to obtain a more complete understanding of the invention, reference is now had to the detailed description of exemplary embodiments thereof, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a sectional view of a dispensing device according to the invention for bulk material, incorporating hydraulic actuating means;

FIG. 2 is a sectional view of another embodiment of a dispensing device according to the invention, including manually operable actuating means; and

FIG. 3 is a sectional view of a third embodiment of a dispensing device according to the invention, adapted to provide a metering element through use of a pneumatic conveyor arrangement, and applicable as a dispensing device for bulk material having relatively low flow characteristics.

DETAILED DESCRIPTION

Referring now in detail to the drawings, and particularly FIG. 1, the illustrated dispensing device includes a bulk material discharge funnel 1 having at its upper end a radially outwardly projecting annular flange 2, which has fastened thereto a complementary flange 4 formed at the lower outlet end of a bulk material receptacle 3.

The funnel 1 extends downwardly into a centrally located discharge duct 5. Three vertically extending columns or supports 6 extend through the wall of funnel 1 at peripherally spaced locations of 120° relative to each other, and preferably are welded to the wall of the funnel 1. The upper ends of each of the columns 6 are threaded and extend through suitable aligned apertures formed in flange 7 of a sleeve 8 and a supporting bias plate 9, to which they are fastened by means of threaded nuts 10.

The inner wall of sleeve 8 includes, for at least a portion of its height, a downwardly and radially inwardly extending annular conical surface 11, the latter of which extends into a short cylindrical guide surface portion 12 for a vertically movable hollow cylindrical or tubular slide 13. A ring-shaped lip seal 14 is fastened to the lower horizontal surface of sleeve 8, with the seal 14 having a radially inwardly projecting annular lip 15 adapted to sealingly engage the outer peripheral wall surface of cylindrical slide 13.

The cylindrical slide 13 is provided, at its lower end and interiorly thereof, with a cylindrical downwardly depending extension 16, the latter of which is generally conical toward its upper end and cylindrical toward its lower end, with the extension 16 having formed therein an annular groove 17 in which a preferably highly elastic sealing ring 18 is positioned. The sealing ring 18 is adapted to, as shown in solid lines in the drawings, in the closed position of the slide 13 to firmly press against the inner wall surface at the lower end 18 of the discharge funnel 1. The slide 13 is rigidly connected to a central hub 20 by a plurality of radially extending arms 19. The lower end of a piston rod 21 is fastened to the hub 20, and is vertically reciprocable in response to actuation of a piston (not shown) within a double-acting hydraulic cylinder 22.

The base plate 9 includes a central recessed portion 23 having a suitable threaded aperture in which the bottom of the cylinder 22 is threadingly received and

fastened by means of a nut **24**. The base plate **9** is provided with a conical hood **25** which covers the cylinder **22** as well as the upper ends of columns **6**.

Two of the support columns **6** are provided with longitudinally extending axial passageways **26** and **27** whose lower ends are connected, through the intermediary of inlet and outlet conduits **28** and **29** and a control valve installation **30**, with a pressure conduit **31** and an exhaust conduit **32**. The upper ends of passageways **26** and **27** are connected, respectively, by means of conduits **33** and **34** with respectively the upper and lower working chambers of cylinder **22**. Thus, upon actuation of control valve installation **30**, the cylindrical slide **13** may be raised or lowered to a precisely adjustable extent. The position in which the slide **13** provides the largest material discharge opening is illustrated in chain-dot at **13'**.

When the slide **13** is in its open position, dust and material particles lodge in the space **35** between slide **13** and sleeve **8**. Because of the conical surface **11**, these particles slide downwardly through the interior of slide **13** and duct **5** without in any possible manner being able to escape out of the installation, and without causing damage during operation of the slide.

Referring now to the embodiment illustrated in FIG. **2** of the drawings, this embodiment is primarily distinguished from the construction shown in FIG. **1** in that, in lieu of the hydraulic actuation of the slide, there is provided a manually operated system. In this construction, the hub **20** of the cylindrical slide **13** is fastened to a rod **36** at the lower end of the latter, the rod being carried by a guide or support member **37** which is threaded into the bottom of recessed portion **23** of the base plate **9**. A compression spring **38** is provided so as to normally bias slide **13** into its lower or closed position. The upper end of rod **36** or member **37** is connected to a cable **39**, the latter of which is entrained about two rollers **40** and **41**, and with the cable leading through a passageway **42** formed in one of the columns **6** toward a winding drum **43**. The drum **43** is provided with a suitable hand crank **44** which facilitates the winding of the cable **39** onto the drum in opposition to the force of spring **38**, thereby permitting the slide **13** to be manually raised and opened to a predetermined discharge orifice-opening extent.

A locking arrangement of usual construction (not shown) is adapted to position the drum **43** in the predetermined stationary or locked position whereby, in order to effect the closing of the slide, a small force must be exerted against crank **44** in the unwinding direction thereof. In the construction shown in FIG. **2**, the base plate **9**, the guide member **37**, rollers **40** and **41**, and the cable **39** are covered by a hemi-spherical hood **45**. The particular shape of hood **25** or **45** which, in accordance with the embodiments of FIGS. **1** and **2**, primarily serves to protect the slide actuating elements mounted on base plate **9** from contact with the bulk material, may be determined in accordance with the type of material being processed, in effect, to provide the desired material sliding or flow slope and angle.

Referring now to the embodiment illustrated in FIG. **3** of the drawings, the hood **45** disclosed therein has the additional purpose of introducing an air stream into the stream or flow of the bulk material being dispensed, so as to further convey the material further in a pneumatic environment. In order to attain this purpose, the hood **45** is connected with a pressurized air-flow conduit **46** which extends into receptacle **3*a*** through an aperture **47**. The base plate **9*a*** is provided with apertures **48** which permit the pressurized air introduced into the space below hood **45** to flow into sleeve **8**. With the possible exception of a few relatively minor constructional modifications, the installation according to the embodiment of FIG. **3** essentially corresponds with that of FIG. **1**, as may be ascertained by referring to the generally schematic illustration of the former.

The upper end of discharge funnel **1** is provided with an external annular ring-shaped channel **49** which is connected to a pressurized-air conduit **50**. The inner peripheral wall **51** of the channel **49** is constituted of an essentially porous metal having, for example, a thickness of approximately 5 mm. Upon opening of a suitable valve (not shown), pressurized air is conveyed through conduit **50** into the annular ring-shaped channel **49**, in which it is distributed and from which it then flows through the porous inner wall of the channel **49** into the funnel **1**, and also into receptacle **3*a***, the latter of which has an inherent internal excess pressure of approximately two atmospheres without appreciable leakage losses. In accordance with the foregoing, the bulk material is fluidized by the thus introduced pressurized air and, in particular, when applied to bulk materials tending to coagulate, such as cement, adherence to the wall surface of the receptacle is prevented.

An extension conduit or duct **52** is connected to discharge duct **5**, and may be provided with a flow measuring installation **53** of known construction. By manipulation of the control valve **30** the quantity of bulk material being discharged into conduit **52** may be precisely metered.

When the receptacle **3*a*** is emptied of bulk material, the compressed air contained in the conveying components of the installation is suddenly expanded when conveyed through conduit **52**, which may be detrimental components with installation containing, for example, a filter device.

In order to rapidly reduce the flow of air, the measuring device **53** may be connected to control valve **30** through a control conduit **54**, thereby permitting the cylindrical slide **13** to be lowered in response to an excessive air stream. In its closed position, slide **13** throttles the air stream emanating from receptacle **3*a***, thereby preventing overloading of the components connected downstream thereof, such as filters or the like.

Annular ring-shaped channels **49** having porous inner walls may be positioned not only on the dispensing device, but also on the receptacle **3*a*** at predetermined elevations. In order to enhance the flow of the bulk material, other suitable means may be utilized, such as applying a vibrator **55** to the outer wall of the discharge funnel **1**.

The cylindrical slide **13** need only be externally formed as a cylindrical member. The inner surface thereof may include a suitable restriction which may readily take the form of a Venturi-tube, and is particularly advantageous in the embodiment of FIG. **3**, since this provides for the pneumatic conveyance of the bulk material being discharged.

While there has been shown what is considered to be the preferred embodiment of the invention, it will be obvious that modifications may be made which come within the scope of the disclosure of the specification.

What is claimed is:

1. Dispensing device for a bulk material receptacle having a material discharge funnel converging upon a cylindrical material outlet duct member; comprising a variable-orifice closure means in said discharge funnel for the metered dispensing of materials therethrough, a vertically movable cylindrical slide in said discharge funnel, a stationary base plate in said funnel, a plurality of spaced column means fastening said base plate to said funnel, slide actuating means having a first portion mounted on said base plate, a second portion of said actuating means including a vertically reciprocable depending rod member rigidly connected to said slide, a sleeve fastened to and depending from said base plate, said slide in the lower closed position thereof being adapted to sealingly engage said sleeve and the lower end of said discharge funnel, said base plate including a hood portion covering at least portions of said slide actuating means, and passageway means extending through at least one of the base plate fastening column means providing access of an operative medium to said slide actuating means.

2. Dispensing device as claimed in claim 1, comprising sealing means mounted at the lower end of said slide, said sealing means sealingly engaging said discharge funnel in the lower closed position of said slide, said sleeve having a downwardly and inwardly projecting annular conical flange portion, and annular sealing means fastened to the lower surface of said sleeve and encompassing said slide so as to provide sealing contact therewith.

3. Dispensing device as claimed in claim 1, said first portion of the actuating means comprising a double-acting cylinder, said rod member comprising a piston rod extending at its upper end into said cylinder so as to form a pair of working chambers therein, two of said base plate-fastening column means having passageways therein comprising actuating medium conduits connected to respectively each of said working chambers, and control valve means being connected to the opposite ends of each of said conduits for conveying operative pressure media toward and from the working chambers of said cylinder.

4. Dispensing device as claimed in claim 1, said first portion of the actuating means comprising roller means mounted on said base plate, a cable entrained about said roller means, said cable having one end thereof fastened to the upper end of said rod member and a length thereof extending through the passageway means in at least one of said base plate-fastening column means, resilient spring means encompassing said rod member and engaging said slide so as to normally bias the latter downwardly into discharge orifice-closing relationship, and winding means connected to the free end of the cable extending from said base plate-fastening column means for imparting opening movement to said slide in response to winding of said cable about said winding means.

5. Dispensing device as claimed in claim 1, comprising conduit means connected to said hood for supplying pressurized air thereinto, said base plate having apertures extending therethrough for egress of said pressurized air through said sleeve and said slide toward said material outlet duct member, said pressurized air, upon opening of said slide, enhancing flow of said bulk material from said discharge funnel into said outlet duct member.

6. Dispensing device as claimed in claim 5, said slide having an internal reduced diameter portion comprising a Venturi-tube configuration.

7. Dispensing device as claimed in claim 1, comprising an annular conduit encompassing the upper end of said discharge funnel, said conduit having a porous inner wall communicating with the interior of said funnel, said conduit means being adapted to receive pressurized air and convey said air through said porous wall into said funnel to thereby admix with and fluidize said bulk material.

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