

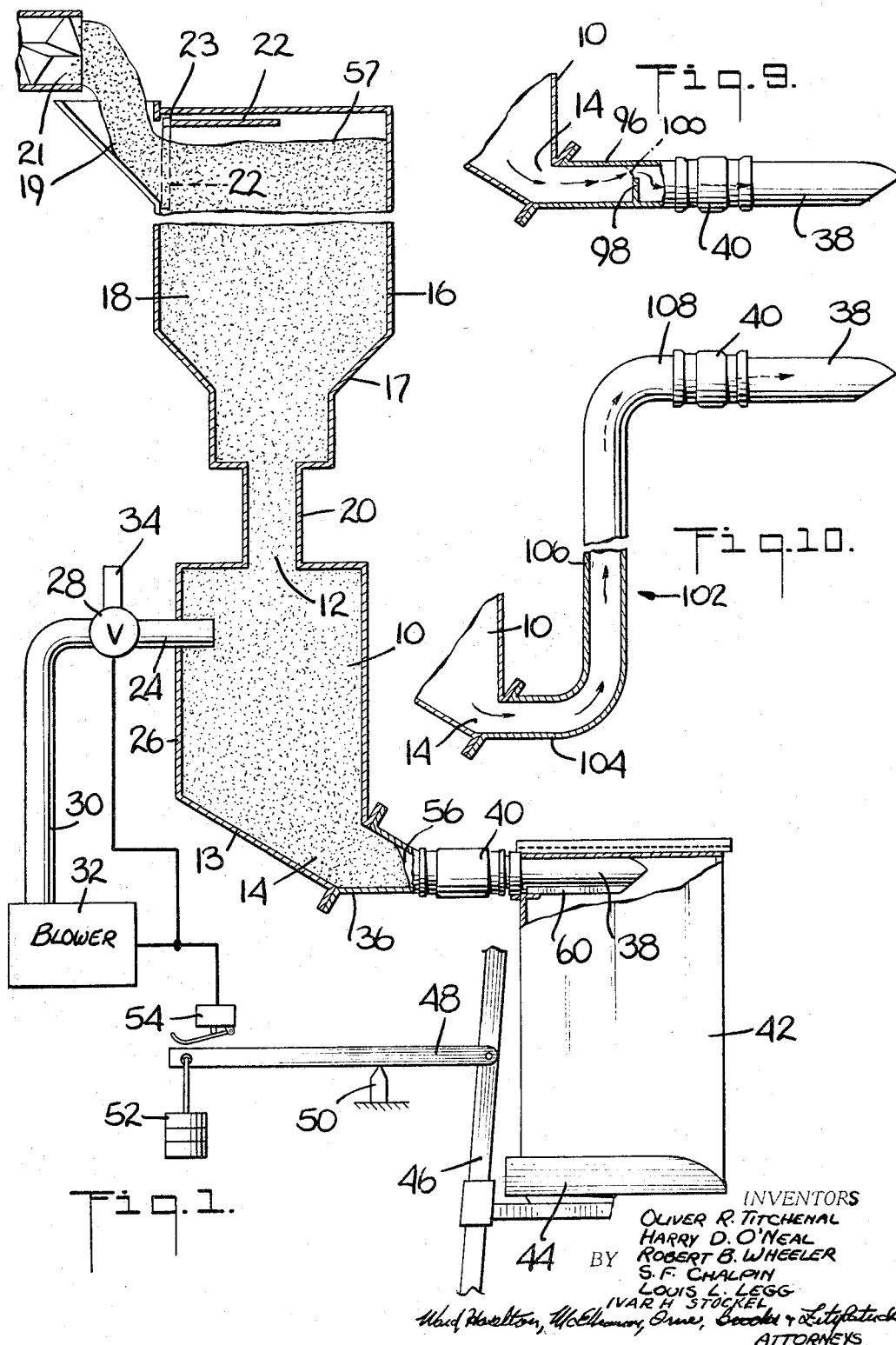
Nov. 15, 1966

O. R. TITCHENAL ET AL
METHOD AND APPARATUS FOR FILLING CONTAINERS WITH
POWDERED OR GRANULAR MATERIALS

3,285,295

Filed June 14, 1965

3 Sheets-Sheet 1



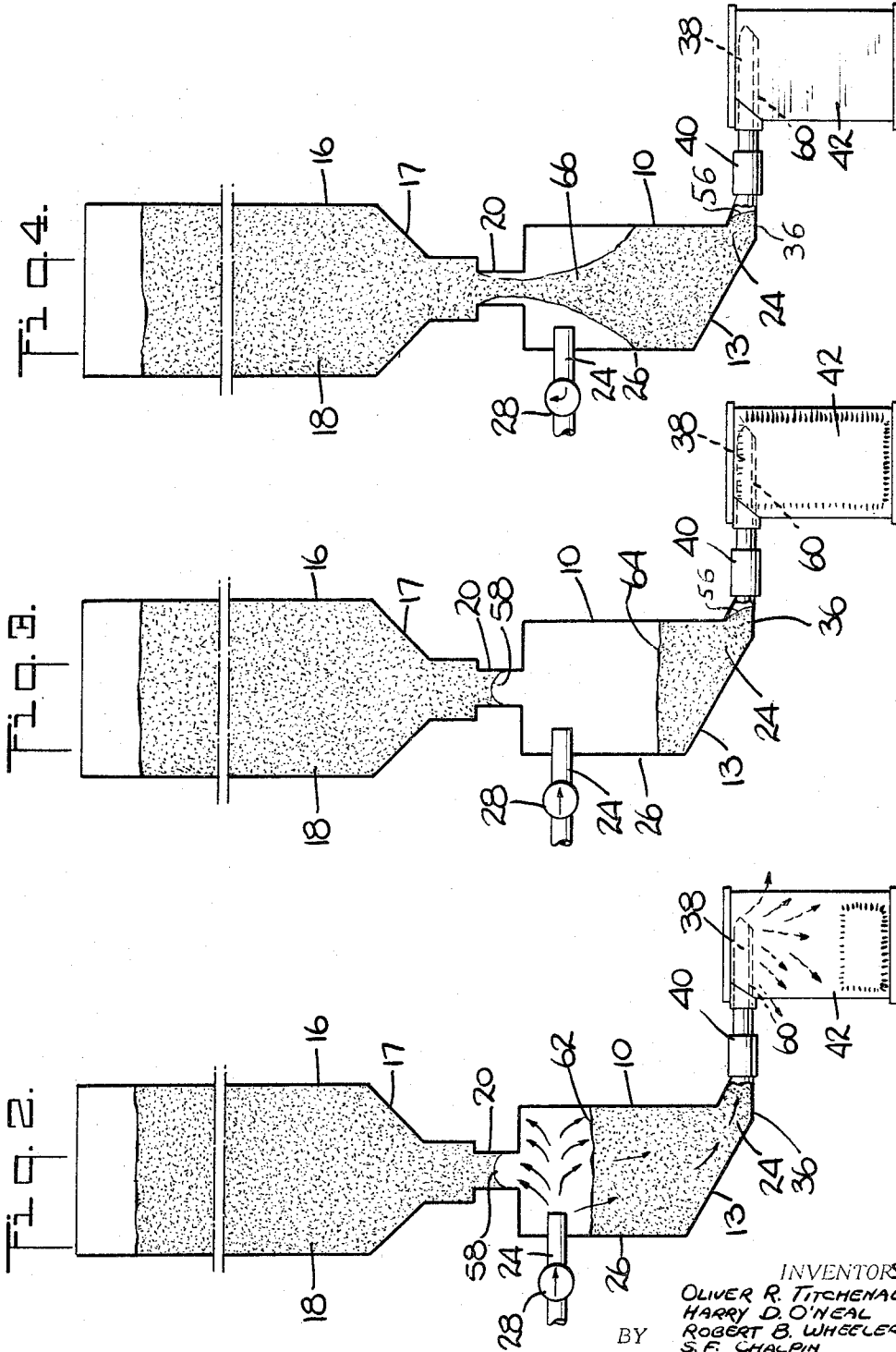
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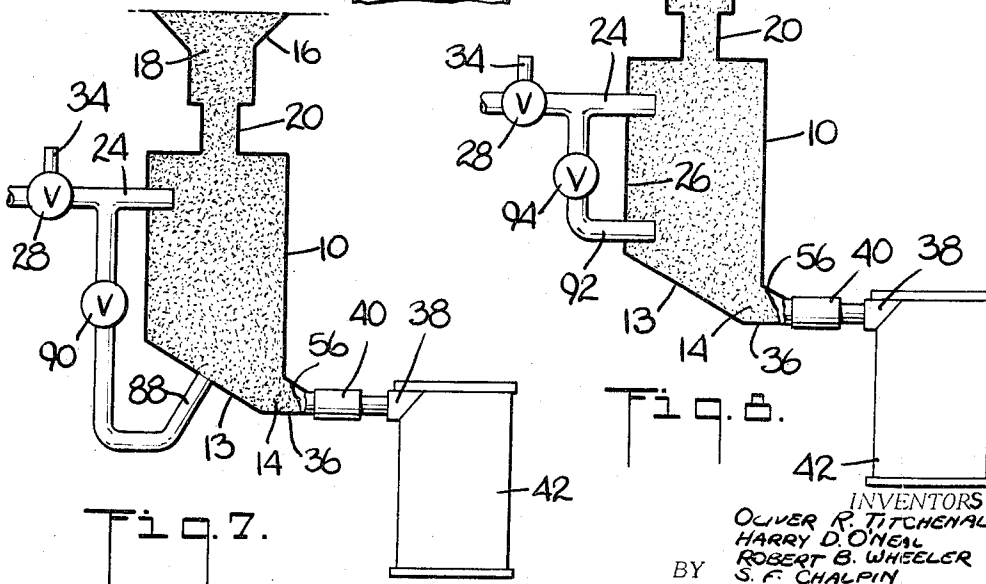
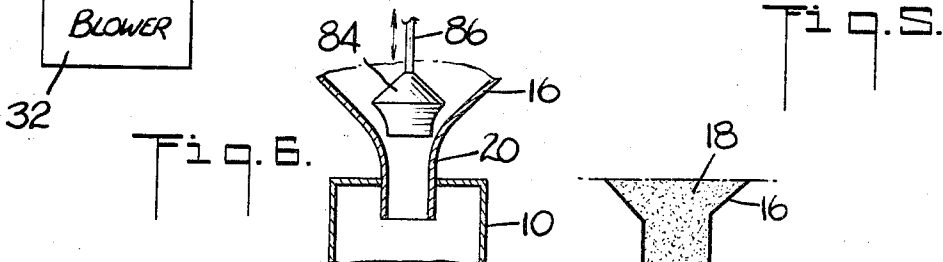
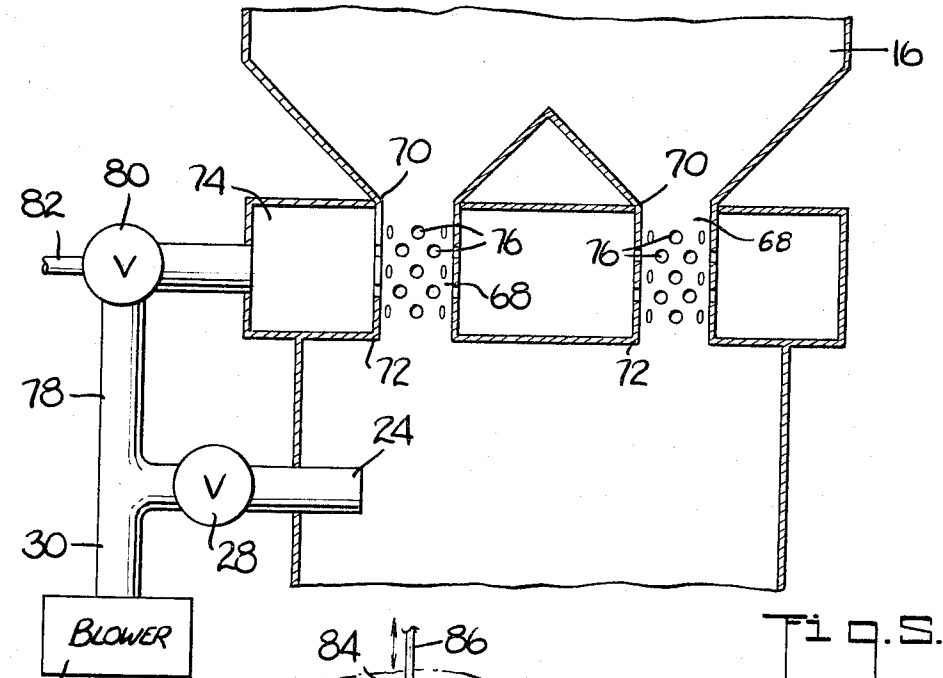
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METHOD AND APPARATUS FOR FILLING CONTAINERS WITH POWDERED OR GRANULAR MATERIALS

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12 Claims. (Cl. 141-10)

This is a continuation-in-part application of copending application Serial No. 287,834 filed June 14, 1963 now Patent No. 3,189,061 which, in turn, is a continuation-in-part application of copending application Serial No. 810,465, filed May 1, 1959 now Patent No. 3,261,397. This is also a continuation-in-part application of copending application Serial No. 253,556 filed January 24, 1963.

This invention relates to methods and apparatus for dispensing and packaging dry divided solid material, and more particularly, to a method and apparatus for fluidizing such material and delivering it into packaging containers, such as paper bags, for example. Packers embodying the invention are particularly adapted, among other possible uses, for the packaging of medium, fine granular material, however, powdered as well as granular or pelletized material may also be used.

Packers of the low head force flow type constructed in accordance with the present invention dispense dry divided solid material from a dispensing bin through a dispensing duct, through a discharge spout and into a packaging container, such as a paper bag, by the injection of gas, such as air, under pressure into the bin. The material is fed to the dispensing bin from an upper supply bin through interconnecting piping means. The bin, except for the spout outlet, is sealed against the atmosphere during the discharge process so that the material is forcefully discharged through the spout means by the pressurized air flow.

A feature of the invention resides in the provision of new and improved apparatus and methods which are substantially simpler than apparatus and methods heretofore deemed necessary for dispensing and packaging dry divided solid material, whereby apparatus components and manipulative operations are eliminated as compared to practices of the prior art.

Another feature of the invention is the provision of apparatus having greatly increased operating life without repairs, and reduced down time for repairs and replacement of parts as compared to prior such devices.

Still another feature of the invention resides in the provision of new and improved method and apparatus for packaging dry divided solid material which requires no moving parts except a single valve to control the air inlet, and which is far superior to existing devices for the packaging of material of a particle size such as tends to jam and block mechanical closure members of existing packaging mechanism.

This apparatus in one embodiment, comprises a vertical dispensing or packer bin, usually cylindrical, having a discharge spout connected through a dispensing duct to the base, a pipe line having one end thereof connected through a valve to a compressed air source and having the other end thereof penetrating the bin sidewall near the top and

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terminating preferably in a generally horizontal attitude towards the center of the bin. In one form of the invention, a second pipe line leading from the same compressed air source penetrates the bin in the lower portion thereof.

The bin is closed off at the top except for an infeed duct which interconnects with a supply bin disposed above the packer bin to provide an infeed passage for periodically charging the dry divided solid material from the former into the latter by gravity feed. Means are also provided for venting the packer bin to atmospheric exhaust.

According to one mode of operation, with the packer bin vented to atmosphere and the compressed air supply shut off, a supply of divided solid material flows through the infeed pipe to charge the packer from the supply bin. Thereafter a predetermined quantity of material has entered the packer or dispensing bin, air is injected into the dispensing bin causing the material to stop flowing from the supply bin into the dispensing bin, but causing the material to flow out through the dispensing outlet, through the dispensing duct to the discharge spout, and thence, into a packaging container, such as a bag. When the bag is filled to a preselected weight, the air supply is shut off and the packer bin again vented to exhaust, and the bin recharged as aforesaid. According to the invention, we have found that the need for mechanical closure of the infeed passage between the storage and packer bins and the mechanical closure in the dispensing duct between the packer bin and the spout may be eliminated, if the respective passages are made of sufficiently small apertures and of sufficient length, and if a sufficient quantity of material is disposed above and restricted aperture to form a static head, on the order of about 100 to 300 pounds over the cross-sectional area of the restricted apertures, respectively, depending upon the material being packaged. That is, the divided material itself automatically forms a plug or wedge of material in the respective duct or spout which so compacts the material within same as to form substantially gas tight closures. Thus, according to our discovery the combination of factors apparently conducive to the formation of the material bridge across the infeed duct and across the discharge spout and consequent air seals produced thereby include; the packing effect of the static head of divided material in the supply bin and in the dispensing bin respectively, the restricted aperture of the infeed duct and the discharge spout, and the length of the infeed duct and the length of the discharge spout. Exemplification of these apparent controlling factors will be given below.

There has thus been outlined rather broadly the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the concept upon which this disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of the invention. It is important, therefore, that the claims be regarded as including such equivalent constructions as do not depart from the spirit and scope of the invention.

Several specific embodiments of the invention have been chosen for purposes of illustration and description,

and are shown in the accompanying drawings, forming a part of the specification, wherein:

FIG. 1 is an elevational view, partly in longitudinal section of a low head force flow packer constructed in accordance with the invention;

FIGS. 2-4, inc., are similar views illustrative of successive stages of the bag filling operations;

FIG. 5 is a fragmentary view in elevation showing a modified form of infeed duct interconnecting the supply and dispensing bins;

FIG. 6 is a fragmentary detail in elevation illustrative of still another form of infeed duct;

FIG. 7 is an elevational view, partly in longitudinal section, on a reduced scale of a packer showing a modified form of air injection means;

FIG. 8 is similar to FIG. 7, but shows still another form of air injection means;

FIG. 9 is a fragmentary view in elevation illustrative of a modified form of dispensing duct interconnecting the dispensing bin and the spout; and

FIG. 10 is similar to FIG. 9, but shows still another form of dispensing duct.

In the embodiment of the invention illustrated in FIGS. 1-4, the low head force flow packer comprises a dispensing bin or packer 10 having an upper infeed inlet 12, an angularly disposed base 13 and a lower dispensing outlet 14. Positioned above the bin 10 is a supply bin 16 which contains a supply of dry divided solid materials 18 to be packed, and interposed in sealed relation between a tapered base 17 of the supply bin 16 and the dispensing bin 10 is an inlet or infeed duct 20.

The infeed duct 20 is of reduced cross-sectional area, and preferably round as shown in FIG. 1, having a ratio of length to diameter of about $2\frac{1}{2}$ to 1. It is desirable to have a ratio of the length to cross-sectional area of at least about 2 to 1. It has also been found desirable to have a length of from about 4 to about 12 inches and a cross-sectional area of from about 2 to about 120 square inches.

A supply of dry divided solid material 18 is charged by a screw conveyor 21 into the supply bin 16 through an offset hopper 19. In order to clean out the packer and to pack below the level that will plug the inlet duct 20, it is necessary to provide some artificial means for creating sufficient pressure within the supply bin 16. For this purpose a clean-out gate 22 is pivotally connected to the sidewall as at 23, FIG. 1. This gate is adapted to move from its normal open position as shown in solid lines in FIG. 1 to a closed position as shown in broken lines in FIG. 1, thereby sealing the supply bin 16.

A pipe section 24 extends through the sidewall 26 of the bin 10, preferably in the upper half region thereof, and preferably extending inwardly in a generally horizontal attitude for injecting air under pressure into the bin 10. The pipe section 24 terminates exteriorly of the bin 10 in a valve 28 which is positionable for connecting the pipe section 24 to a source of compressed air or blower 32 via pipe line 30. While it is normally not necessary, valve 28 may be positionable for connecting the pipe section 24 to an atmospheric exhaust outlet 34 as shown in FIG. 1.

Still referring to FIG. 1, the dispensing outlet 14 leads to a dispensing or outlet duct 36 which is connected to a discharge spout 38 by a flexible coupling 40. A bag or other container 42 is mounted on the spout 38 in any suitable manner during the bag filling operation. A bag seat 44 for supporting the bag during the filling operation is mounted on frame 46 which is pivotally connected to one end of a beam 48. This beam pivots on fulcrum 50, and the other end thereof supports a weight basket 52. During operation of the packer, after a predetermined weight of material has entered the bag 42 the weighing means actuates a micro switch 54 which in turn controls the blower 32 and the valve 28 for purposes of initiating or terminating the flow of air into the bin 10.

It has been found desirable to terminate the flow of air into the dispensing container slightly before the actual final desired weight of material has entered the bag 42 and allow the material to gradually stop flowing from the outlet duct 36, thereby providing a dribble-feed of material into the container until the precise weight is attained.

Still referring to FIG. 1, assuming the apparatus initially is in the completely empty condition, a supply of the dry divided solid material 18 is charged from the worm conveyor 21 through the off-set hopper 19, through the supply bin 16 through the inlet duct 20 and upper inlet opening 12. The material will continue to fall through the dispensing or packing bin 10, through the outlet 14 and into the dispensing duct 36 forming a plug 56 therein. Continued loading will then progressively fill the supply bin 16 with material until the supply bin is filled to a level 57, FIG. 1, such that the static head of the material over the area of the infeed duct is on the order of about 100-300 pounds, depending on the material. With the apparatus exemplified above, this would be on the order of about 3-10 p.s.i. over the inlet duct area.

The continued flow of material through the infeed duct 20 will gradually fill the dispensing bin 10 because the outlet thereof is closed by the material gate 56, in the dispensing duct 36, FIG. 1. Preferably, the dispensing duct 36 is disposed in a horizontal attitude in order to assist the formation of the plug or material gate 56. Further, it will be appreciated that the cross-sectional area of the dispensing duct 36 is reduced in order to further assist the formation of the plug. At the time when the material plug is formed in the duct 36, the material is not fluid, and hence, does not readily flow. Therefore, the angle of repose of the material in "dead storage" and the length of the duct 36 must be such that the material will not flow by the force of gravity. A ratio of length to diameter of about four to one has been found satisfactory. After sufficient material has flowed into the dispensing bin 10, the valve 28 is opened, thereby allowing air under pressure to flow through the pipe 24 into the dispensing bin 10 as viewed in FIG. 2. Preferably the pipe 24 is disposed in a horizontal attitude in order for a portion of the air to flow upwardly to form the inlet plug and a portion thereof to flow downwardly to fluidize pressurize the material. Air flows into the dispensing bin 10 at high volumes and pressures which preferably range from about 1 to about 10 p.s.i.g. Under the influence of this air pressure, the air and material flows in the dispensing bin 10 in all directions. The material that flows upwardly is resisted by gravity, the material in the supply bin 16 thereabove and the friction on the side of the pipe. This causes the material to compact and bridge across or plug the inlet duct 20 as at 58, FIGS. 2 and 3, which further increases the resistance to the flow of air, and effectively creates a seal. Simultaneously, the air and the material flowing downwardly is not restricted to the same degree, and, as a result, releases the plug 56 in the dispensing duct 36 so that the material flows out of the dispensing duct 36, through the coupling 40, through the spout 38 and into the bag 42. The air is continuously being vented out of the bag 42 through venting means 60, FIGS. 1-4, in the spout 38 in a known manner. Also, a portion of the air may be vented through the bag itself.

As the material 18 in the packer bin 10 continues to discharge through the spout 38 into the bag 42, the level of the material in the packer bin will continue to fall, as at 62, FIG. 2, thence as at 64 of FIG. 3 at which level the bag 42 is filled to the preselected or desired weight. As long as the air is forced into the pressure or packing chamber 10 at the volume-pressure needed, the plug 58 will remain in the inlet duct 20 and the material will flow into the bag. As soon as the correct weight is reached in the bag, it will depress the bag seat 44 (FIG. 1) which pivots the beam 48 actuating the micro switch 54, thereby terminating the blower operation 32 and changing the

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position of the valve 28 so that the flow of air through pipe 24 is terminated. At this stage of the operation, the apparatus is in the condition as shown in FIG. 3. A short time after terminating the flow of air through the pipe 24, the dispensing bin or pressure chamber 10 vents very quickly as there is no resistance in the dispensing duct 36. Further, if desired, valve 28, FIG. 1, can be provided with a vent line 34 so that the valve may be positioned to vent the bin back through line 24 to the atmospheric exhaust 34.

As soon as the pressure in the dispensing bin 10 is low enough, the plug or material bridge 58 in the inlet duct 20, FIGS. 2 and 3, collapses or releases, causing the material 18 in the supply bin 16 to flow under the influence of gravity through the infeed duct 20 into the packer 10 as at 66, thus refilling the packer bin, as shown in FIG. 4. The material stops flowing into the bag 42 when the aforementioned weight signal is reached without a cut-off valve because when the air flow is terminated the air vents through the material and the flow of material through the dispensing duct 36 dies out, becoming fluidized, and thence, stops flowing, forming a material gate 56 as shown in FIG. 4. At this stage in the operation the filled bag is removed from the spout 38 and replaced by a new empty bag, and the cycle of operation is repeated for each successive bag to be filled.

Referring to FIG. 5, the infeed means interposed between the supply bin 16 and the dispensing bin 10, in one embodiment of the invention, may take the form of one or more infeed ducts 68 which interconnect the supply bin 16 with the dispensing bin 10 in an air tight manner. That is, the upper portion of the inlet ducts 68 are connected to the supply bin 16 in sealed relationship as at 70, and the lower portion of the ducts 68 are connected to the top of the dispensing bin 10 in sealed relationship as at 72. A closed air chamber 74 surrounds the inlet ducts 68, each of which is provided with a plurality of horizontally extending openings or apertures 76 which are preferably about $\frac{1}{16}$ inch in diameter, depending upon the material being packaged, in order to provide air flow communication between the duct 68 and the chamber 74. Pipe 30 which normally leads from the blower 32 to the valve 28 is provided with an upwardly directed extension 78 leading to a valve 80 for purposes of pressurizing chamber 74 with air. Valve 78 may be provided with a atmospheric vent relief connection 82 in order to more quickly vent the chamber 74.

In operation when it is desired to form material gates or plugs in the inlet ducts 68, FIG. 5, air is supplied from the blower through the pipe 78, valve 80 and into the chamber 74. The air in the chamber 74 flows inwardly into the inlet duct 68 through the opening 76, thereby forming a plug or material gate of material in the inlet ducts 68. Release of the air pressure in chamber 74 and termination of the air flow through pipe line 24, releases the material gates in the inlet duct 68. Accordingly, this plug or material gate serves the same function as the material gate 58 shown and described in connection with FIGS. 2 and 3.

Referring to FIG. 6, the infeed duct 20, may be provided with a plug 84 of conforming contour and secured to an adjusting rod 86, for vertical up or down adjustment as indicated by the arrow, the adjustment being such that for any given loose aggregate material being packaged, as to establish the optimum infeed aperture for assuring the material bridging action in the duct during discharge of the packer bin.

When packing certain material the packer bin 10 may be provided with an additional lower air supply in the angular base 13 as shown by the pipe 88 in FIG. 7. Pipe 88 is connected to pipe 24 and is provided with a valve 90 so that the flow of air under pressure therethrough either may be individually controlled, or it may be simultaneously controlled with the flow through pipe 24 by means of valve 28. Alternately there may be a slight

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time interval between the closing of valve 90 and valve 28.

Referring to FIG. 8, a lower air ejection pipe 92 projects through the sidewall 26 of the bin 10. Pipe 92 is connected to pipe 24 through a valve 94 for controlling purposes. It will be appreciated that both lower pipes 88 and 92 are preferably disposed a distance from the lower dispensing outlet 14 of the bin 10 so that they will not act in an aspirator-like manner when the material is being discharged from the bin.

We have discovered that an open dispensing duct, such as 36, FIG. 1, is satisfactory when packing medium, fine granular material. However, when packing finely divided, powdered material it is preferable to employ a partition 98, as best seen in FIG. 9, in the dispensing duct 96 for purposes of stopping the loose flow of material through the duct after the air flow in the dispensing bin 10 has been terminated and the bag 42 is being replaced. Therefore, when air under pressure is injected into the bin 10, the material flows along the path as shown by the arrows in FIG. 9, however, upon termination of the air flow in the bin 10 a material gate or plug forms adjacent the partition 98, as shown by the dotted line 100, FIG. 9, thereby terminating the flow of material through the dispensing duct 96.

Referring next to FIG. 10, there is illustrated another modified form of dispensing duct indicated generally at 102, wherein the dispensing duct has a horizontal portion 104, an upward portion 106 and a second horizontal portion 108 for purposes of preventing the material, if finely divided powdered material is being packaged, from flowing through the dispensing duct when the air supply to the dispensing bin 10 is shutoff and the bag is being replaced. During the bag filling stage the material flows through the dispensing duct 102 as indicated by the arrows.

Although certain particular embodiments of the invention are herein disclosed for purposes of explanation, various modifications thereof, after study of this specification will be apparent to those skilled in the art to which this invention pertains. Reference should accordingly be had to the appended claims in determining the scope of the invention.

What is claimed is:

1. A method of packaging dry, divided solid material, comprising: introducing said material from a supply bin into an infeed duct having reduced passage area, passing said material from said infeed duct into a closed dispensing bin having increased passage area, passing said material from said dispensing bin into a dispensing duct of reduced passage area and forming a releasable material barrier in said dispensing duct, thence simultaneously injecting air under pressure into at least an upper portion of said dispensing bin, forming a releasable material barrier in said inlet duct, and releasing said material barrier in said dispensing duct, passing said material from said dispensing bin through said dispensing duct into a packaging container to a preselected weight, and prior to attainment of said weight, terminating the injected air flow to dribble-feed said material into said packaging container until said preselected weight is attained, and repeating said method for the filling of additional containers.

2. A method of packaging dry, divided solid material, comprising: introducing said material from a supply bin into a plurality of infeed ducts having reduced passage area, passing said material from said infeed ducts into a closed dispensing bin having increased passage area, passing said material from said dispensing bin into a dispensing duct of reduced passage area and forming a releasable material barrier in said dispensing duct, thence simultaneously injecting air under pressure into at least an upper portion of said dispensing bin, injecting air into said inlet ducts through a plurality of radially disposed openings forming a releasable material barrier in said

inlet ducts, and releasing said material barrier in said dispensing duct, whereby said material passes from said dispensing bin through said dispensing duct into a packaging container.

3. A method of packaging dry, divided solid material, comprising: introducing said material from a supply bin into an infeed duct having reduced passage area, passing said material from said infeed duct into a closed dispensing bin having increased passage area, passing said material from said dispensing bin into a horizontal dispensing duct having a vertically disposed partition therein and forming a releasable material barrier in said dispensing duct adjacent said partition, thence simultaneously injecting air under pressure into at least an upper portion of said dispensing bin forming a releasable material barrier in said inlet duct and releasing said material barrier in said dispensing duct, and passing said material from said dispensing bin through said dispensing duct into a packaging container.

4. Apparatus for dispensing and packaging dry, divided solid material, comprising: a closed dispensing bin having a lower dispensing outlet to which a packaging container is connectable, a supply bin disposed above said dispensing bin and opening at its base into an inlet duct which extends downward and opens into a top portion of said dispensing bin, an outlet duct in material flow communication with said lower dispensing outlet, means for injecting air under pressure into at least an upper portion of said dispensing bin for dispensing said material therefrom through said outlet and outlet duct, said inlet duct being of dimensions such that during pressurization of said dispensing bin by said injected air, and with said supply bin filled with said material to the extent of forming a static head of material for maintaining a substantial pressure over said inlet duct area, the said material in said supply bin plugs said inlet duct and prevents flow of said material into said dispensing bin, a plug fixedly disposed adjacent said inlet duct providing a restricted infeed aperture for assuring material bridging action in the inlet duct during discharge of the dispensing bin, and said outlet duct being of dimensions such that upon termination of pressurization of said dispensing bin by said injected air and while material is flowing from said supply bin to said dispensing bin through said inlet duct forming a static head of material for maintaining a substantial pressure over said outlet duct area, the said material in said dispensing bin plugs said outlet duct and prevents flow of said material from said dispensing bin through said outlet duct.

5. Apparatus for dispensing and packaging dry, divided solid material, comprising: a closed dispensing bin having a lower dispensing outlet to which a packaging container is connectable, a supply bin disposed above said dispensing bin and opening at its base into an inlet duct which extends downward and opens into a top portion of said dispensing bin, an outlet duct in material flow communication with said lower dispensing outlet, means for injecting air under pressure into at least an upper portion of said dispensing bin for dispensing said material therefrom through said outlet and outlet duct, means for directing air under pressure directly into said inlet duct and said inlet duct being of dimensions such that during pressurization of said dispensing bin by said injected air, and with said supply bin filled with said material to the extent of forming a static head of material for maintaining a pressure over said inlet duct area, the said material in said supply bin bridges across said inlet duct and prevents flow of said material into said dispensing bin, and said outlet duct being of dimensions such that upon termination of pressurization of said dispensing bin by said injected air, and upon termination of air flow into the inlet duct, and while material is flowing from said supply bin to said dispensing bin through said inlet duct forming a static head of material for maintaining a pressure over said outlet duct area, the said material in said dispensing bin

bridges across said outlet duct and prevents flow of said material from said dispensing bin through said outlet duct.

6. Apparatus for dispensing and packaging dry, divided solid material, comprising: a closed dispensing bin having a lower dispensing outlet, a supply bin disposed above said dispensing bin and opening at its base into a plurality of substantially parallelly disposed inlet ducts which extend downward and open into a top portion of said dispensing bin, a horizontally disposed outlet duct in material flow communication with said lower dispensing outlet, means for injecting air under pressure into at least an upper portion of said dispensing bin for dispensing said material therefrom through said outlet and outlet duct, said inlet ducts being provided with a plurality of radially disposed apertures for receiving inwardly directed air under pressure and said inlet ducts being of dimensions such that during pressurization of said dispensing bin by said injected air, and with said supply bin filled with said material to the extent of forming a static head of material for maintaining a pressure over said inlet duct area, the said material in said supply bin bridges across each of said inlet ducts and prevents flow of said material into said dispensing bin, and said outlet duct being of dimensions such that upon termination of pressurization of said dispensing bin by said injected air and while material is flowing from said supply bin to said dispensing bin through said inlet ducts forming a static head of material for maintaining a pressure over said outlet duct area, the said material in said dispensing bin bridging across said outlet duct and preventing flow of said material from said dispensing bin through the outlet ducts.

7. Apparatus for dispensing and packaging dry, divided solid material, comprising: a closed dispensing bin having a lower dispensing outlet, a supply bin disposed above said dispensing bin and opening at its base into a plurality of substantially parallelly disposed inlet ducts which extend downward and open into a top portion of said dispensing bin, a horizontally disposed air chamber encircling said inlet ducts, each of said inlet ducts being provided with a plurality of radially disposed apertures for receiving air under pressure from said chamber, an outlet duct in material flow communication with said lower dispensing outlet, means for injecting air under pressure into at least an upper portion of said dispensing bin and into said air chamber for dispensing said material from said dispensing bin through said outlet and outlet duct, said inlet ducts being of dimensions such that during pressurization of said dispensing bin by said injected air and when air is flowing through said radial apertures, and with the said supply bin filled with said material to the extent of forming a static head of material for maintaining a pressure over said inlet duct area, the said material in said supply bin plugs said inlet ducts and prevents flow of said material into the dispensing bin, and said outlet duct being of dimensions such that upon termination of pressurization of said dispensing bin by said injected air and pressurization of said air chamber and while material is flowing from said supply bin to said dispensing bin through said inlet ducts forming a static head of material for maintaining a pressure over said outlet duct area, the said material in said dispensing bin plugs said outlet duct and prevents flow of said material from the dispensing bin through the outlet duct.

8. Apparatus for dispensing and packaging dry, divided solid material, comprising: a closed dispensing bin having a lower dispensing outlet, a supply bin disposed above said dispensing bin and opening at its bottom into a plurality of substantially parallelly disposed inlet ducts which extend downward and open into a top portion of said dispensing bin, a closed air chamber surrounding and encompassing said inlet ducts, and said inlet ducts being provided with a plurality of radially disposed perforations for providing communication between the interior of said ducts and said air pressure chamber respectively, a horizontally disposed outlet duct in material flow communica-

tion with said lower dispensing outlet, means for injecting air under pressure into said air chamber and into at least an upper portion of said dispensing bin for dispensing said material therefrom through said outlet and outlet ducts, valve means for controlling the air flow into said air chamber and into said dispensing bin, said inlet ducts being of dimensions such that during pressurization of said dispensing bin and air flow into said inlet ducts, and with said supply bin filled with said material to the extent of forming a static head of material for maintaining a pressure over said inlet duct area, the said material in said supply bin bridges across said inlet ducts and prevents flow of said material into the dispensing bin, and said outlet duct being of dimensions such that upon termination of air flow into said inlet ducts and of pressurization of said dispensing bin by said injected air and while material is flowing from said supply bin to said dispensing bin through said inlet duct forming a static head of material for maintaining a substantial pressure over said outlet duct area, the said material in said dispensing bin plugs said outlet duct and prevents flow of said material from said dispensing bin through said outlet duct.

9. Apparatus for dispensing dry, divided solid material, comprising: a closed dispensing bin having a lower dispensing outlet, a supply bin disposed above said dispensing bin and opening at its base into an inlet duct which extends downward and opens into a top portion of said dispensing bin, a horizontally disposed outlet duct in material flow communication with said lower dispensing outlet, a horizontally disposed pipe located in the upper portion of said dispensing bin for injecting air under pressure into at least an upper portion of said dispensing bin for dispensing said material therefrom through said outlet and outlet duct, said inlet duct being of dimensions such that during pressurization of said dispensing bin by said injected air, and with said supply bin filled with said material to the extent of forming a static head of material of the order of at least 100 pounds over said inlet duct area, the said material in said supply bin plugs said inlet duct and prevents flow of said material into said dispensing bin, a vertically disposed partition extending partially across the passage of said outlet duct and said outlet duct being of dimensions such that upon termination of pressurization of said dispensing bin by said injected air and while material is flowing from said supply bin to said dispensing bin through said inlet duct forming a static head of material for maintaining a substantial pressure over said outlet duct area, the said material in said dispensing bin bridging across and plugs said outlet duct preventing flow of the material from the dispensing bin through the outlet duct.

10. Apparatus for dispensing dry, divided solid material, comprising: a closed dispensing bin having a lower dispensing outlet, a supply bin disposed above said dispensing bin and opening at its base into a plurality of substantially parallelly disposed inlet ducts which extend downward and open into a top portion of the dispensing bin, an outlet duct in material flow communication with said lower dispensing outlet, an air chamber surrounding and encompassing said inlet ducts and a plurality of radially disposed openings in each of said inlet ducts providing air flow communication between the inside of said inlet ducts and said air chamber, means for supplying air under pressure to said air chamber and for injecting air under pressure into at least an upper portion of said dispensing bin for dispensing said material therefrom through said outlet and outlet duct, said inlet ducts being of dimensions such that when subjected to air pressure and during pressurization of said dispensing bin by said injected air, and with said supply bin filled with said material to the extent of forming a static head of material for maintaining a pressure over said inlet duct area, the said material in said supply bin plugs said inlet ducts and prevents flow of the material into the dispensing bin, partition means extending partially across said

outlet duct and said outlet duct being of dimensions such that upon termination of pressurization of the dispensing bin and the injection of air in the inlet duct and while material is flowing from said supply bin to said dispensing bin through the inlet ducts forming a static head of material for maintaining a pressure over the outlet duct area, the material in said dispensing bin bridges across the outlet duct adjacent said partition and prevents flow of the material from the dispensing bin through the outlet duct.

11. Apparatus for dispensing and packaging dry, divided solid material, comprising: a closed dispensing bin having a lower dispensing outlet and a lower angularly disposed base directed towards said lower dispensing outlet, a supply bin disposed above said dispensing bin and opening at its base into an inlet duct which extends downward and opens into a top portion of said dispensing bin, a horizontally disposed outlet duct in material flow communication with said lower dispensing outlet, a pipe disposed in the upper portion of said dispensing bin and a pipe projecting through the base of said dispensing bin, means for supplying said pipes with air under pressure for fluidizing and dispensing said material from said dispensing bin through said outlet and outlet duct, said inlet duct being of dimensions such that during pressurization of said dispensing bin by said injected air, and with said supply bin filled with said material to the extent of forming a static head of material for maintaining a substantial pressure over said inlet duct area, the said material in said supply bin plugs the inlet duct and prevents flow of material into said dispensing bin, vertically disposed partition means extending across a portion of the outlet duct and said outlet duct being of dimensions such that upon termination of pressurization of the dispensing bins by said injected air through said pipes and while material is flowing from the supply bin to the dispensing bin through the inlet duct forming a static head of material for maintaining a pressure over the outlet duct area, the said material in the dispensing bin forming a bridge across said outlet duct adjacent said partition and preventing flow of the material from the dispensing bin through the outlet duct.

12. Apparatus for dispensing and packaging dry, divided solid material, comprising: a closed dispensing bin having a lower dispensing outlet, a supply bin disposed above said dispensing bin and opening at its base into a plurality of substantially parallelly disposed inlet ducts which extend downward and open into a top portion of the dispensing bin, an air chamber surrounding said inlet ducts and each of said ducts being provided with a plurality of radially extending openings communicating with said chamber, an outlet duct in material flow communication with said lower dispensing outlet, a pipe extending into the upper portion of said dispensing bin and a second pipe extending into the lower portion of said dispensing bin, both of said pipes injecting air under pressure for fluidizing and dispensing said material from said dispensing bin through the outlet and outlet duct, said inlet duct being of dimensions such that during pressurization of said dispensing bin by said injected air and by air flowing from said chamber into said inlet ducts, and with supply bin filled with said material to the extent of forming a static head of material for maintaining a pressure over the inlet duct area, the material in the supply bin bridges across the inlet ducts and prevents flow of the material into the dispensing bin, said outlet duct having a horizontally extending portion and a vertically extending portion and a second horizontally extending portion to which a package filling spout is connected, and being of dimensions such that upon termination of pressurization of said dispensing bin by said injected air and while the material is flowing from said supply bin to said dispensing bin through the inlet duct forming a static head of material for maintaining a substantial pressure over the outlet duct area, the said material in the dispensing

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bin plugs the outlet duct and prevents flow of material from the dispensing bin through the outlet duct.

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