MECHANICAL DEVICE FOR FILLING A CONTAINER

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This invention relates to the packing of nursery products and it relates particularly to means for filling a container having a nursery product previously placed therein with a dry (including slightly moist) pulverulent air-entrainable material, such as peat moss, wood shavings or the like.

In my application Serial No. 185,915, now Patent No. 3,195,283, I have set forth a method and apparatus for introducing packing material into a container with particular reference to a container having an opening in the bottom thereof. The method and apparatus therein set forth is extremely effective for providing a container of practically any commercially desirable degree of hardness in packing and is therefore quite satisfactory for the purposes therein set forth. However, there are other types of packing carried out in the nursery business where it is not as essential that the pack be hard but it is preferred that there be no openings in the package other than at the top thereof.

Accordingly, the objects of the present invention are:

1. To provide apparatus for directing the air and an entrained quantity of packing material into a container which container may have only one opening therein.

2. To provide apparatus, as aforesaid, which will be simple to operate and whose operation will be obvious to a workman acquainted with the operation of the method and apparatus set forth in my application Serial No. 185,915.

3. To provide apparatus, as aforesaid, which will utilize a substantial part of the equipment set forth in my application Serial No. 185,915, now Patent No. 3,195,283.

4. To provide apparatus, as aforesaid, which will be sufficiently simple and inexpensive to make that it can readily be modified or rebuilt as needed to fit particular filling situations including the accommodating of both plants and containers of varying sizes as required.

5. To provide apparatus, as aforesaid, which will have at least a limited amount of adjustability within itself.

6. To provide apparatus, as aforesaid, which may be of semiautomatic nature where desired to obtain both the flexibility of hand operation and at least some of the speed of automatic operation and which further, if desired, may be easily adapted to fully automatic operation.

Other objects and purposes of the invention will be apparent to persons acquainted with devices of this general type upon reading the following specification and inspection of the accompanying drawings.

In the drawings:

FIGURE 1 is an oblique view of the apparatus of my invention.

FIGURE 2 is another oblique view of said apparatus taken from a different direction.

FIGURE 3 is a side elevation of a portion of the apparatus showing the mounting thereof to the apparatus of said previous application.

FIGURE 4 is a top view of a part of the apparatus.

FIGURE 5 is a section taken on the line V—V of FIGURE 3.

FIGURE 6 is an oblique view of a modified apparatus embodying my invention.

FIGURE 7 is a sectional view taken along the line VII—VII of FIGURE 6.

FIGURE 8 is a sectional view taken along the line VIII—VIII of FIGURE 7.

FIGURE 9 is a sectional view taken along the line IX—IX of FIGURE 7.

FIGURE 10 is a sectional view taken along the line X—X of FIGURE 8.

FIGURE 11 is a sectional view taken along the line XI—XI of FIGURE 8.

FIGURE 12 is a schematic diagram of a control system for the apparatus embodying the invention.

Description

Referring now to the drawings, attention will first be directed for reference purposes to the basic machine as set forth in more detail in U.S. application Serial No. 185,915, now Patent No. 3,195,283. As shown in FIGURE 3, this apparatus includes a frame structure 1, pure 1 and suitably fabricated parts, and appropriately arranged in any convenient manner for holding the parts of the apparatus as hereinafter described, both in operative relationship to each other and in operative position with respect to a supporting surface, such as a floor. A hopper 2 is provided for receiving the fluted packing material and is arranged to discharge same into a suspension chamber 3 which is conveniently here shown as being of generally cylindrical shape. The packing material in the suspension chamber 3 is held therein in the absence of an air blast from the blast nozzle N by its own viscosity.

Any suitable valve structure 4, here indicated as a sliding-gate type of valve, is provided for controlling the flow of material from said hopper 2 into the suspension chamber 3. The valve structure 4 is here shown as operative by a pressure fluid cylinder 39 controlled by a valve 38 and supplied from a source S. A suitable agitator (not shown) may if desired be provided of any conventional type at the discharge end of the hopper 2 for the purpose of keeping same agitated sufficiently to prevent bridging of the fluted material across the discharge opening of said hopper.

A pressure cylinder 7 is mounted on the frame structure 1 and suitably connected to base means 8 supporting the conduit 9. Energizing of the cylinder 7 from any convenient source such as the source S through a valve 41 and a conduit 7a will lift the entire structure comprising the suspension chamber 3, the conduit 9, and other parts associated therewith and further described in said application Serial No. 185,915, now Patent No. 3,195,283, to effect a sealing of the upper end of the suspension chamber 3 against the valve 4 and further sealing of the valve 4 against the bottom of the hopper 2 to prevent escape of pressure fluid and solid material from the top of the suspension chamber 3 past said valve when said chamber is placed under pressure. As further shown in FIGURES 3 and 5, said suspension chamber 3 is mounted in vertical sliding relationship with a supporting and guiding tubular member 5 having a plurality, such as two, suitably machined contact bushings 5a and 5b fixed rigidly to the inner surface of the tubular support member 5 and for engagement with a guidance of the suspension chamber 3. Said tubular member 5 is mounted in any convenient manner, such as by radially arranged support members, three of which appear at 5c, 5d and 5e (FIGURE 3 and 5) to the frame structure 1. A block 10 is affixed to the suspension chamber 3 and extends between a pair of such support members for the tubular member 5 such as between the members 5f and 5g (FIGURE 5), for permitting vertical movement of said suspension chamber with respect to said tubular member but limiting rotatable movement with respect thereto. The adjustable devices 10a and 10b are provided to effect suit-
able adjustment of block 10 with respect to the clearance between members 5d and 5e. Leading from the bottom of the suspension chamber 3 is a member 9 which preferably monolithically blends by a radius at 11 with the bottom of the suspension chamber 3. Said conduit 9 terminates in a mounting plate 13 to which may be attached whatever nozzle structure or other means may be desired. A supply of gas, usually air, under pressure is introduced in any convenient manner from a source, such as the source S, through a suitable conduit into the suspension chamber 3. A conventional pressure regulator valve is provided to regulate the pressure and a suitable on-off valve 37 is provided to control the flow.

Turning now more specifically to the subject matter of the present invention, there extends downwardly from the mounting plate 13 an attaching portion 14 (FIGURE 3) for receiving a brace mounting plate 20. Said brace mounting plate has suitable slots 15 and 16 (FIGURE 2) therein for adjustable fastening by any convenient means, such as screws 17 and 18, to said attaching portion 14, whereby the brace mounting plate 20 may be adjusted vertically to assure proper positioning of containers of differing diameters. A nozzle plate 19 is rigidly fixed in any convenient manner, such as by screws, to the mounting plate 13 and supports a conduit 21 rigidly fastened thereto. Suitable openings (FIGURE 3) are provided in registry with each other through the plates 13 and 19 to effect communication between the conduit 9 and the conduit 21.

While said conduits 21 may continue from the nozzle plate 19 to the hereinafter mentioned nozzle without any bend therein, it is more convenient to provide some bend, such as a bend of approximately 45 degrees indicated at 23 (FIGURE 1), for the purpose of enabling the top of the plant being packaged to be maintained away from and out of contact with the machine. Said bend also allows the operator to work closer to the controls of the machine without interference from the frame of the machine.

The conduit 21 then extends beyond the bend 23 downwardly and divides into a pair of nozzles 24 and 26 (FIGURE 4) which are essentially parallel at their outlets for reasons appearing hereinafter. These nozzles are of such length and are spaced sufficiently apart at the tips thereof that they can span substantially all of the root system of the type of plant with which they are to be used. Thus, where, as shown in the drawings, the apparatus is to be used for packing roses, the distance "a" between the tips of the nozzles will be sufficient to receive the root system of an average rose plant with reasonable ease there between. Likewise, the distance "b" will be sufficient that the plant can be received comfortably between said nozzles with the ends thereof discharging at a distance greater than one quarter of the container depth from the bottom of the container but from the top a distance not appreciably less than a container diameter.

A platform 27 is provided substantially parallel with the direction of alignment of the nozzles 24 and 26 and is mounted rigidly onto the brace mounting plate 20 in any convenient manner, such as by the bracket structures 28 and 29, both of which may be welded or otherwise rigidly fastened in place. Said platform 27 is provided with an adjustable rest 31, the same being located at a point spaced from the discharge point of said nozzles, mounted upon a bracket 32 and slidably affixed to the platform 27 by any convenient means which in this particular embodiment includes the bolt and nut assemblies 33 and 34 extending through the slot 35.

**Operation**

To provide the apparatus for operation, a plant such as a rose bush is placed in a suitable container, such as the generally cylindrical-shaped sack C shown in the drawings, and the sack C is slipped over nozzles 24 and 26 so that said nozzles extend into the sack C to a point spaced from the bottom thereof and preferably approximately one-fourth of the length of the sack C from the bottom thereof and so that the roots of the plant lie between said nozzles preferably with a substantial portion of said roots extending below said nozzles. So arranged, the sack C is placed on the platform 27 with the bottom of said sack spaced from the rest 31. The foregoing statement of the positioning of the nozzles is based upon a container size in which the roots of the plant lie near, but not within, the boundary of the container. If the nozzles are spaced too far from the bottom of the sack, voids are likely to form in the packing material adjacent the bottom. If the nozzles are too close to the bottom of the container, the plant roots may rise in the sack with the rising packing material and therefore be only partially packed.

While the above described relative positioning of the sack C, the nozzles 24 and 26, the plant, and the rest 31 is illustrative of a successful mode of operation, it will be understood that other positionings may be used as desired and that the above steps are not to be taken as limiting.

Assuming the suspension chamber 3 to contain a supply of packing material, the valve 39 is actuated, by means of the foot pedal F, to move the valve mechanism 4 between the hopper 2 and the suspension chamber 3. The valve 40 (FIGURES 22 and 23) is then actuated as by means of the foot pedal F to move the suspension chamber 3 upwardly into contact with the valve mechanism 4, thus sealing the top of said chamber.

When the bag is to be filled, a valve 37 is actuated and a blast of compressed gas, usually air from the source S, is caused to enter into the suspension chamber 3 wherein the agitation and entrains the packing material therein and carries it on through the conduit 9 thence through the conduit 21 and out the nozzles 24 and 26. The material thus discharged is carried by its own inertia to the bottom of the sack C and, being discharged substantially equally from the two nozzles 24 and 26, is caused to build up substantially equally on either side of the plant roots thereby seizing and holding the plant centered in the sack C. The inertia of material being discharged forces the sack and plant down the nozzles 24 and 26 until the bottom of the bag strikes the rest 31 and comes to an abrupt stop whereby the packing material in the sack C becomes more tightly packed. Continuation of filling allows the deposited packing material to build up to the ends of said nozzles thereby causing a sudden local intensification of pressure which tends to pack the packing material more tightly in the sack C. Filling is preferably stopped at this point, cessation being accomplished by releasing the valve 37.

The agitation of the material within the sack C as the result of the air blast will be sufficient that the air will be distributed throughout the sack C and among the roots of the plant in a highly uniform manner. Inasmuch as the carrying gas must turn through an arc of approximately 180 degrees in order to exit from the sack C, this will further tend to separate the packing material from the carrying gas exiting from the sack C and such exiting gas will carry with it very little, if any, of the packing material.

After the sack C is filled to the desired level, and removed from the platform 27, the valve 41 is de-activated to allow the chamber 3 to move downwardly and free the valve mechanism 4. The valve 38 is then adjusted to allow the valve mechanism 4 to be withdrawn from between the hopper 2 and the chamber 3 thus allowing said chamber to be recharged with packing material.

Inasmuch as the average sack in which ordinary nursery products are packaged will be filled in only a few seconds, it will be advantageous, to insure accuracy of filling, a valve 42 (FIGURE 3) in operative connection with the valve 37 for the purpose of closing same after the elapsing of a predetermined period.
of time, such as one second. The timer may, in addition, be advantageously used to control the action of the valves 38 and 41, and be itself initiated by the foot pedal F as shown in FIGURE 3.

When a plant of a different size is to be packaged, resulting in the use of a container C of a different length, the rest 31 will be moved as desired merely by loosening the nut and bolt assemblies 33 and 34 and moving the rest 31 as desired. Similarly, if a container C of a different diameter is to be used, the screws 17 and 18 are loosened and the brace mounting plate 20 is relocated as desired, after which said screws are retightened. It should be noted, however, that the rest 31 should always be spaced far enough away from the nozzles 24 and 26 that the container C and plants held therein can be moved into filling position and out therefrom by a turning movement effected by sliding the base of the sack C toward the operator and off the platform 27. It will also be apparent that containers of different sizes and shapes may be accommodated within the scope of the present invention by providing fittings wherein the nozzles are of different lengths and/or diameters provided only that there is sufficient space between said nozzles to receive the upper root portion of the plant and provided only that the needles are small enough to enter conveniently into the container being used. The length of the nozzles is less important inasmuch as this can be accommodated by the setting of the rest 31 providing only that the nozzles extend sufficiently from their point of junction with the conduit 21 to permit a sufficient length of the plant to lie between the nozzles 24 and 26 to effect easy handling thereof. Under certain circumstances, as where it may be desired to have the nozzles extend down more deeply into the container, the nut and bolt assemblies 33 and 34 may be replaced by any kind of quick clamping and unclamping device (not shown) whereby the rest 31 may be quickly and conveniently moved as desired to carry the bottom of the container close to the nozzles 24 and 26 and to release it therefrom.

Inasmuch as the embodiment of the invention discussed herein does not effect as hard a pack as the apparatus of my application Serial No. 185,915, the strength of the container, even though same is a paper sack, is sufficient to withstand the pressure of the material being injected thereinto. Hence, the combination of the twin nozzles above described with the inherent agitation produced by directing the injected material against the bottom of the sack, which bottom is supported against breakage by the rest 31, will be sufficient to provide a desirable uniform distribution of packing material through the roots of the plant and a satisfactory pack is obtained. It should be noted that the multiplicity and mutual placement of the nozzles 24 and 26 bears directly on the effectiveness of the device herein described. A single nozzle, for example, would, in forcing packing material into the sack C, or any other container, tend to force the roots of the plant to one side of a center location and even against the side of the container which in many cases would be unacceptable. The use of two nozzles properly placed as hereinabove described tends, contrastingly, to maintain the plant centered in the sack C as is usually desired. Further placement of the nozzles 24 and 26 in coparallel relationship and parallel to the axis of the sack C directs the blast at the supported bottom of the sack C as hereinabove described whereas if the nozzles 24 and 26 were angled outwardly from each other and toward the unsupported sides of the sack C, the blast might rupture said sides. Directing the nozzles toward each other would have a lesser tendency to rupture said sack but would destabilize the central location of the plant in the sack C.

The basic machine as described hereinabove and as set forth in more detail in the application Serial No. 185,915, now Patent No. 3,195,283, is also adapted to be a device directed specifically at filling relatively rigid, large mouthed containers such as pots rather than relatively narrow mouthed containers such as sacks as is the embodiment of the invention described hereinabove. Because the modified embodiment of the invention described hereinbelow is adapted to work with the same basic machine as the device described hereinabove, said machine and common parts thereof will be delineated by the same numbers used hereinabove but with the suffix "a."
cover 81 in its downward or closed position is preferably coplanar with the rim of the pot P. The pot cover 81 may be biased toward its open position by means such as the spring 94.

**Operation of modification**

Assuming several pots of the same size are to be filled, one such pot P is placed on the table 71 and said table is adjusted vertically until the plane defined by the rim of the pot P is level with or slightly below the bottom of the nozzles 56 and 57. The cover 81 is then adjusted vertically by means of the bolt 83 so that the bottom of said cover is coplanar with the rim of the pot P and rests thereon. If the table 71 has been correctly positioned, the cover 81 is now pivotable upwardly about the hinge 82 to its open position indicated by the dotted lines in FIGURE 7 without interference from the nozzles 56 and 57. With the pot P centered under the nozzles 56 and 57 the locator stops 76 and 77 may be adjusted until they contact the sides of said pot whereat they are secured to the table 71 by means of the screws 78 and 79. With the completion of the above steps, the hereinafore described apparatus is ready to receive a succession of similar pots for filling. Should it be desired to fill a pot of a different size, the table 71 must be again properly positioned as described above.

To begin the pot packing operation, and assuming the table 71 and pot cover 81 are properly positioned, a plant is placed in the center of the pot P, the pot cover 81 is pivoted upwardly on the hinge 82 to its open position, and the pot P is placed on the table 71 in contact with the locator stops 76 and 77 as the stem of the plant simultaneously enters the slot 88 in the cover 81. The cover 81 is then pivoted downwardly to its closed position wherein its rests on the rim of the pot P. Packing material fed into the conduit 9a in the manner described hereinafter in connection with the primary embodiment of the invention enters the conduit 54 and the nozzles 56 and 57 connected thereto. Said packing material is conducted from the nozzles 56 and 57 through the holes 91 and 92 in the cover 81 by the air blast above described downwardly past each side of the plant to the bottom of the pot P. Further packing material entering the pot P surrounds and holds the roots of the plant centered in said pot. Sufficient packing material is preferably admitted into said pot to fill the pot to its brim. The plate 87 molds a depression in the packing material surrounding it to provide a basin so that the plant, after being so packed, may be conveniently watered.

Excess gas pressure escapes from the pot into the air through the slot 88, through the edges of the holes 91 and 92, and sometimes between the rim of the pot P and the bottom side of the cover 81. During the initial stage of filling and if the pot P is of conventional construction whereby a hole is provided through the bottom thereof, carrying gas may also escape from said hole in the manner set forth in my pending application Serial No. 185,915. The carrying gas so escaping carries with it little or no packing material due to the tendency of said material to bridge said opening. As filling progresses, said hole is covered by previously deposited material and thus the carrying gas, such as air, is forced to travel through a 180° degree turn in order to leave the pot P. For this reason and since the exits from the pot P are relatively restricted, very little packing material if any will be carried out of the pot P by the exiting carrying gas. Filling of the pot P preferably continues until the nozzles are blocked off which causes a sudden intensification of pressure on the packing material in the pot thereby compressing said material and driving air held therein out said hole. Thus, a firm pack is assured with no damage to the roots of the plant. It will be noted that a hole through the table 71 and adjacent to the hole of the pot will aid the function of the hole in the pot but that the hole in the pot will function with an unpierced table wherein escaping air flows between the pot bottom and the table. In cases where the container used does not have a hole in the bottom thereof, the intensification of pressure mentioned above will still compress the packing material but the air escaping therefrom will exit from the top of the container. The amount of packing material admitted to pot P may be controlled in any convenient manner such as the way suggested hereinabove in connection with the primary embodiment of the invention.

Upon being filled the pot P, with the plant located therein by the packing material, may be removed from the table 71 by pivoting the pot cover 81 upwardly on the hinge 82 to its open position and then removing the pot P from the table 71. The slot 88 is then passed out of the slot 88 in the cover 81. Should it be wished to pack plants in additional similar pots, the next pot with a plant lying therein may now be placed on the table 71 and packing continues as hereinafore described.

**Modified control system**

FIGURE 12 discloses a control system for the apparatus embodying the invention herein disclosed wherein a source of pressure fluid 5N, which is preferably pressurized, feeds packers 39 and 7 and a blast nozzle N used to agitate the packing material in the suspension chamber 3, shown in FIGURE 3. The source S also feeds a pack pressure fluid system which controls the operation of said cylinders and blast nozzle. Air conduits for the pack system are indicated in FIGURE 12 as dotted lines and air conduits for the main air system which operates said pressure cylinders and blast nozzle are indicated by solid lines.

The source S feeds filtered air through a pressure regulator R1 to a valve V1 which is biased to remain in the closed position shown by the spring S1 whereby the pilot line 101 is sealed. The valve V2 is actuated by the foot pedal F1, which may be the foot pedal F of FIGURE 3, so as to connect the pilot line 101 to the pilot line 102 which, at a junction point 103, connects to pilot lines 104 and 105 and 106. The line 104 connects through a timing device T1, here shown as comprising a ball check valve 110 and a constrictive orifice 109, to an air cylinder AC1. The ball check valve 110 is arranged to check the entrance of air from the line 104 to the cylinder AC1. The air cylinder AC1 is operable to open the valve V3 which is normally biased by the spring S3 in the closed state shown. Opening the valve V3 connects the line 105 to a pilot line 111. Line 111 is connectible by means of a two-way valve RV, through the lines 112 and 113 to the air cylinder AC. Line 112 is also connected by a line 114 to a timing device T2. Line 106 connects the line 101 to a valve V4 operated by a foot pedal F2. Said valve V4 is biased in the closed position shown by the spring S4. Line 106 is connectible by said valve to a line 116 which is connectible to the line 112 by means of the two-way valve RV. The line 106 connects to a timing device T3 to an air cylinder AC2 which operates a valve V6. The timing device T3 has a ball check valve which is oriented so as to allow a free flow of air from the line 106 to the air cylinder AC2.

The line 106 also connects through an air line 117 to a timing device T4 and thence to an air cylinder AC3, which controls a valve V9 biased in the position shown in FIGURE 12 by the spring S5. The ball check valve of the timing device T5 is so oriented as to impede the flow of air from the line 117 to the air cylinder AC3.

The air pressure source S is also connected to a main air line 119 containing a lubrication device L, which connects to the valve V4 and through a main air line 121 to the valve V5. The lubrication device L is provided to insure proper lubrication and long life of the air cylinders 39 and 7. The valve V4 in its normal position shown in FIGURE 12 passes air from the main air line 119 through a flow control T6, the ball check valve of which
is arranged to allow free movement of the air into the right side of the air cylinder 39, whereby the piston of said air cylinder is moved leftwardly as shown in FIGURE 12 and whereby the valve mechanism 4 in FIGURE 3 is removed from between the hopper 2 and the suspension chamber 3. The left side of the air cylinder 39 exhausts through the valve V2 and a restrictor orifice 124 into the open air. Actuation of the air cylinder AC2 to move the valve structure V1 rightwardly against the spring S1 allows air from the main air line 119 to pass into the leftward end of the air cylinder 39 thereby moving the piston thereon rightwardly and moving the valve structure 4 of FIGURE 3 into the hopper 2 and suspension chamber 3. The rightward side of the air cylinder 39 exhausts through the flow control T4 which is so oriented as to restrict said exhaust and thence through the valve V4 into the open air.

The valve V5 when in its position shown in FIGURE 12 allows air from the main air line 121 to flow through a flow control T5 which is oriented to allow free flow into the upper end of the air cylinder 7 producing downward movement of the piston thereof and lowering of the suspension chamber 3 of FIGURE 1. The lower end of the air cylinder 7 exhausts through a flow control T5 which is oriented to impede the flow of air therethrough, through the valve V5 into the open air. Actuation of the air cylinder AC2 to move the valve V5 rightwardly against said spring S5 allows air from the main air line 121 to flow through the flow control T5 which is oriented to allow free flow into the lower end of the air cylinder 7 and producing an upward movement of the piston thereof and an upward movement of the suspension chamber 3 of FIGURE 3.

The upper end of the air cylinder 7 exhausts through the flow control T5 which is so arranged as to restrict the flow of air therethrough, and thence through the valve V5 into the open air.

Air from the source S is also fed through a main air line 126 containing a regulator R3 wherein to the valve V6. The valve V6 is biased in the position shown in FIGURE 12 by the spring S6 in which position it seals the end of the air line 126. Air pressure in the line 113 acts through air cylinder AC5 to move the valve V5 rightwardly against the spring S5 whereby the line 126 is connected through said valve to the blast nozzle N which admits air under pressure to the interior of the suspension chamber 3 thereby producing agitation of the packing material contained in said suspension chamber. Air pressure in the line 114 is retarded by the timing device T5. After a suitable predetermined length of time, the timing device T5 allows sufficient air to flow into the air cylinder AC5 to move the valve V5 leftwardly to its position shown in FIGURE 12 and thereby cutting off the supply of air from the main air line 126 to the blast nozzle N. The pressures in the air cylinders AC1 and AC2 of equal magnitude cooperate with the spring S6 to allow the valve V5 to assume the closed position shown in FIGURE 12.

Although the operation of the control system of FIGURE 12 has been partially imparted in the description above, the operation of said control system will now be specifically described for purposes of clear understanding. The control device of FIGURE 12 may be operated in either of two ways. In its first mode, the suspension chamber 3 of FIGURE 3 is charged from the hopper 2 to fill a single container, said filling operation requiring only operation of the foot pedal F2. The control device in FIGURE 12 may be so set as to allow a single filling of the suspension chamber 3 to fill several containers and in this mode of operation, actuation of a second foot pedal F2 is required in addition to the operation of the foot pedal F1.

In considering the first mode of operation it will be assumed that the suspension chamber 3 has been charged with packing material and that a container C with a plant contained therein is placed on a machine for filling. The two-way valve RV is rotated to its position shown in FIGURE 12 so that the line 112 is connected to the line 111 rather than to the line 116. Actuation of the foot pedal F2 opens the valve V1 so that air from the line 101 may flow into the line 102 and through the line 103 and to the timing device T1 which is so oriented as to restrict or time the flow of air therethrough to the air cylinder AC1. The air in the line 102 also flows to the timing devices T2 and T3. The timing device T2 is oriented to allow free flow of air therethrough into the air cylinder AC2 which moves the valve V4 rightwardly and air from the main air line 119 into the leftward end of the air cylinder 39 for moving the valve structure 4 of FIGURE 3 into its position between the hopper 2 and the suspension chamber 3. The timing device T3 is oriented to restrict the flow of air into the air cylinder AC3. Therefore, the valve V3 has already been moved to its rightward position when the air cylinder AC3 moves the valve V4 to its rightward position thereby allowing air from the main air line 121 into the lower end of the air cylinder 7 which raises the suspension chamber 3 of FIGURE 3 in contact with the valve mechanism 4 and the hopper 2 thereby sealing the top end of said suspension chamber 3. After the suspension chamber 3 has thus been closed the timing device T2 transmits air to the air cylinder AC2 and the valve V3 leftwardly.

Air flows from the main air line 126 through the valve V5 and out the blast nozzle N thereby agitating and expelling the packing material from the suspension chamber 3 into the plant container. Expulsion of the preselected amount of packing material from the suspension chamber is determined by the timing out of the timing device T2 which after sufficient packing material has been expelled actuates the air cylinder AC3 to move the valve V4 leftwardly to its position shown in FIGURE 12 thus sealing off the main air line 126 from the blast nozzle N. The machine operator is apprised of the cessation of the blast through the blast nozzle N by any convenient means, such as the sound associated therewith, and releases the foot pedal F1. Such release causes the spring S2 to move the valve V2 leftwardly and into its normally closed position shown in FIGURE 12. In said position the valve V2 seals the pilot air line 101 but allows the pilot air line 102 to dump into the open air. The timing device T1 allows free flow of air from the air pressure cylinder AC3 through the line 102 to the open air thereby allowing the spring S2 to move the air cylinder AC5 leftwardly to its closed position. Therefore, the air cylinder AC5 may exhaust through the pilot lines 113 and 112 and the air cylinder AC3 may exhaust through the timing device T1 which is oriented to allow free flow therethrough, and through the lines 113 and 112. The line 112 exhausts through the line 111 and the valve V4 and into the atmosphere. Simultaneously the air cylinder AC3 exhausts through the timing device T3 which is oriented for free flow through the lines 117, 106 and 102 and the valve V1 into the open air thereby allowing the spring S3 to move the valve V4 leftwardly to its normal position shown in FIGURE 12 and the valve V5 then allows air from the main line 121 to pass through the free flow oriented flow control device T4 into the upper end of the air cylinder 7 which drives the piston thereof downwardly and allows the suspension chamber 3 of FIGURE 1 to move downwardly. The lower end of the air cylinder 7 exhausts through the flow control T5 and oriented so as to oppose or restrict the flow of air therethrough and through the valve V5 into the open air. Restriction of exhaust flow from the cylinder 7 by the flow control T5 insures that the suspension chamber 3 will move downwardly slowly and gently. The timing device T3 is so oriented as to restrict the flow of air from the air cylinder AC3 to the lines 106 and 102 and then to the open air. Thereby the air cylinder AC3 exhausts after the suspension chamber 3 has moved downwardly. Exhausting the
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air cylinder AC₂ allows the valve V₄ to move leftwardly under the influence of the spring thus to assume its normal position as shown in FIGURE 12. In this position the valve V₄ admits air from the main air line 119 through the flow control line 118 which is oriented for free flow, into the rightward side of the air cylinder 39. This produces a leftward movement of the piston therein and withdraws the valve structure 4 from between the hopper 2 and suspension chamber 3 as shown in FIGURE 3. The leftward end of the air cylinder 39 exhausts through the valve V₃, and through the cushioning restriction 124 into the open air. Provision of the restriction 124 insures that the valve structure 4 will be moved in a smooth and gentle manner. Such movement of the valve structure 4 allows packing material from the hopper 2 to fall into the suspension chamber 3 and said suspension chamber is made ready for another packing operation. Another packing operation may now take place as in the manner above described.

As mentioned hereinabove the control device of FIGURE 12 may also be operated to allow one charging of the suspension chamber 3 to fill several packing containers. To begin such a mode of operation the two-way valve RV is manipulated to disconnect the line 111 from the line 112 thus sealing the line 111 and to connect the line 116 to the line 112. The foot pedal F₁ is then operated to move the valve V₁ rightwardly and allow air from the main line 101 to flow into the pilot air line 102 and thence to the timing devices T₁ and T₂ which operate in the manner above described in connection with the single foot pedal mode of operation. In this case, however, the timing device T₁, the air cylinder AC₁ and the valve V₂ are locked out of the pneumatic circuit by the above-mentioned manipulation of the two-way valve RV. After the operation of the timing devices T₁ and T₂ to allow the valve structure 4 (FIGURE 3) to be moved between the hopper 2 and the suspension chamber 3 and the suspension chamber 3 to be moved upwardly to contact said valve structure and said hopper in the manner above described, the foot pedal F₂ may be operated to open the valve V₃ and allow air from the line 108 to pass into the lines 116, 112, 113 and 114. Actuation and de-actuation of the blast nozzle N takes place in the manner hereinabove described in connection with the single foot pedal mode of operation. Upon cessation of the blast, the operator releases the foot pedal F₂ to allow the spring S₇ to return the valve V₃ to its normal closed position shown in FIGURE 12 thus exhausting the lines 116, 112, 113 and 114 to the open air and thereby exhausting the air cylinders AC₁ and AC₂. The operator may now remove the filled container with the plant packed therein from the apparatus and place an unpacked container with a plant therein on the apparatus for packing. The foot pedal F₁ is then depressed pushing the valve V₄ to the right to its open position and allowing actuation and de-actuation of the air cylinders AC₄ and AC₅ in the above-disclosed manner to actuate and de-actuate the blast nozzle N. The above practice is carried on until a pre-selected number of bags have been filled or until the suspension chamber 3 is empty whereupon when the last bag is filled, the foot pedal F₂ is released for the last time to exhaust the air cylinders AC₄ and AC₅. The last-filled container is removed from the apparatus and the foot pedal F₁ is released to allow the suspension chamber 3 to move downwardly and to allow the valve structure 4 to be removed from between the hopper 2 and the suspension chamber 3 whereby the suspension chamber 3 is charged with packing material from the hopper 2. Should it be desired to fill another quantity of containers the above set of procedures is repeated. It will be noted that the above procedures require that the foot pedal F₁ remain depressed continuously from the time that the filled suspension chamber 3 is sealed at its upper end to the time when the suspension chamber is to be refilled. It may therefore be desired to supply a lock mechanism such as that shown schematically at 129 (FIGURE 12) which will maintain the foot pedal F₁ in its actuated position without attention from the operator until the operator releases the foot pedal F₁ at which time the foot pedal F₁ becomes de-activated.

While certain particular embodiments have herein been utilized to illustrate the invention, it will be recognized that the basic concept of the invention may be embodied in a wide variety of other specific embodiments and accordingly should not be understood as including such variations except as expressly implied otherwise in the hereinafter appended claims. What is claimed is:

1. A device for conveying packaging material into an open end container containing a plant, the roots of said plant being in said container and the stem thereof extending out of said container, comprising:
   - a frame structure and a hopper supported on said frame structure;
   - an entrapment chamber selectively communicable by a first valve with said hopper;
   - an injection means for introducing a carrying gas under pressure into said entrapment chamber;
   - a nozzle means in constant open communication with said entrapment chamber and means for supporting a container in a position such that said container suspension plate nozzle means and the roots of said plant are locatable between said nozzle means and the bottom of said container;
   - first control means for opening and closing said first valve for introducing packing material from said hopper into said entrapment chamber and second control means for introducing a carrying gas under pressure into said entrapment chamber and carrying at least a portion of said packing material out from said entrapment chamber and depositing it into said container and around the roots of a plant therein;

2. A device for conveying packing material into an open end container containing a plant, the roots thereof being within said container and the stem thereof extending out therefrom, comprising:
   - a means defining a suspension chamber having a discharge opening;
   - means for supplying said material to said suspension chamber;
   - means for introducing air under pressure into said suspension chamber so that the material becomes entraped in the air;
   - a mounting plate affixed to said wall means adjacent said discharge opening;
   - an attaching plate fastened to said mounting plate; a conduit supported at one end by said attaching plate in registry with said opening;
   - at least two nozzles communicating with the other end of said conduit; and
   - means for supporting a container having a plant therein with the plant positioned between said nozzles and said container encircling said nozzles.

3. The device defined in claim 2 wherein said pair of nozzles are supported on and by said conduit.

4. The device defined in claim 2 wherein the means for supporting said container includes a platform arranged substantially parallel with that portion of said conduit adjacent its said other end and said nozzles being positioned parallel with said platform.

5. The device defined in claim 4 including also an abutment supported on said platform and spaced a selectable distance from the discharge point of said nozzles.

6. The device defined in claim 2 including also a cover arranged to span the open end of said container, said cover having a slot therein leading from the edge thereof to a point substantially between said nozzles for the introduction of a plant therein, and said above-ground
portion of said plant extending above said cover and the below-ground portion of said plant lying substantially between said nozzles.

7. The device for conveying packing material into an open end container containing a plant, the roots thereof being within said container and the stem thereof extending out of said container, comprising:

- means for introducing air under pressure into said suspension chamber so that the material becomes entrained in the air;
- a conduit arranged at one end for communication with said discharge opening, said conduit being closed except at its ends and defining an enclosed passageway through which the material flows;
- at least two spaced nozzles arranged substantially parallel with respect to each other and for discharging in the same direction; and
- support means for supporting a container having a plant therein with the root portion of said plant positioned between said nozzles and container encircling said nozzles.

8. The device defined in claim 7 wherein said last-named means is a platform positioned substantially perpendicularly to the axis of discharge of said nozzles.

9. The device defined in claim 7 including a cover arranged to span the open end of said container, said cover having a slot therein leading from the edge thereof to a point substantially between said nozzles for the introduction of a plant therein into the above-ground portion of said plant extending above said cover and the below-ground portion of said plant lying substantially between said nozzles, said cover being provided with openings for the projection of said nozzles therethrough and means for pivoting said cover to a point fixed with respect to said support means whereby said cover may be quickly and conveniently moved into and out of registry with the open end of a container positioned on said platform in position for filling.

10. The device defined in claim 9 wherein said nozzles are curved on a radius centered at the point of pivoting of said cover whereby said cover in moving away from its container-closing position will follow along said nozzles.

11. The device defined in claim 9 wherein said cover has a plate fixed on its underside and of a shape slightly smaller than the mouth of a container with which a given cover is to be used whereby a depression will be provided in the filling material in a zone surrounding the stem of said plant.

12. A device for conveying packing material into an open-end container containing a plant, the roots thereof being in said container and the stem thereof extending out therefrom, comprising in combination:

- a frame structure and a hopper supported on said frame structure;
- an entrainment chamber selectively communicable by a first valve with said hopper; and
- injection means introducing a carrying gas under pressure into said entrainment chamber;

a pair of spaced nozzles in constant and open communication with said entrainment chamber and means for supporting said container in a position such that the roots of said plant are locatable between said nozzle and said container surrounds said nozzles;

first manually responsive control means opening and closing said first valve for introducing packing material from said hopper into the entrainment chamber and second manually responsive control means for introducing a carrying gas under pressure into said entrainment chamber and carrying at least a portion of said packing material out from said entrainment chamber and depositing it into said container and around the roots of a plant therein.

13. The device defined in claim 12 wherein said entrainment chamber is of a size several times the size of the container with which the apparatus is to be used whereby several containers may be filled between each pair of successive actuations of said first valve means.

14. The device defined in claim 12 wherein said second control means includes a timer for automatically terminating the flow of said carrying gas at a predetermined time interval following the initiation of flow thereof.

15. An apparatus for packing a particulate material around an object inside of a container, comprising:

- a frame;
- wall means mounted on said frame and defining a suspension chamber having a discharge opening;
- means for introducing air under superatmospheric pressure into said suspension chamber so that the material therein becomes entrained in the air;
- a conduit communicating at one end thereof with said discharge opening, said conduit being closed except at its ends and defining an enclosed passageway through which the material flows;
- nozzle means communicating with the other end of said conduit; and
- container-supporting means mounted on said frame and arranged in association with said nozzle means so that a container can be supported on said container-supporting means in surrounding relation to said nozzle means.

A device for conveying packing material into an open-end container containing a plant, the roots thereof being in said container and the stem thereof extending out therefrom, comprising in combination:

- a frame structure and a hopper supported on said frame structure;
- an entrainment chamber selectively communicable by a first valve with said hopper; and
- injection means introducing a carrying gas under pressure into said entrainment chamber;

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