Aug. 2, 1966 R. J. BROERSMA 3,263,395

MECHANICAL DEVICE FOR FILLING A CONTAINER

Filed Oct. 17, 1962

4 Sheets-Sheet 1

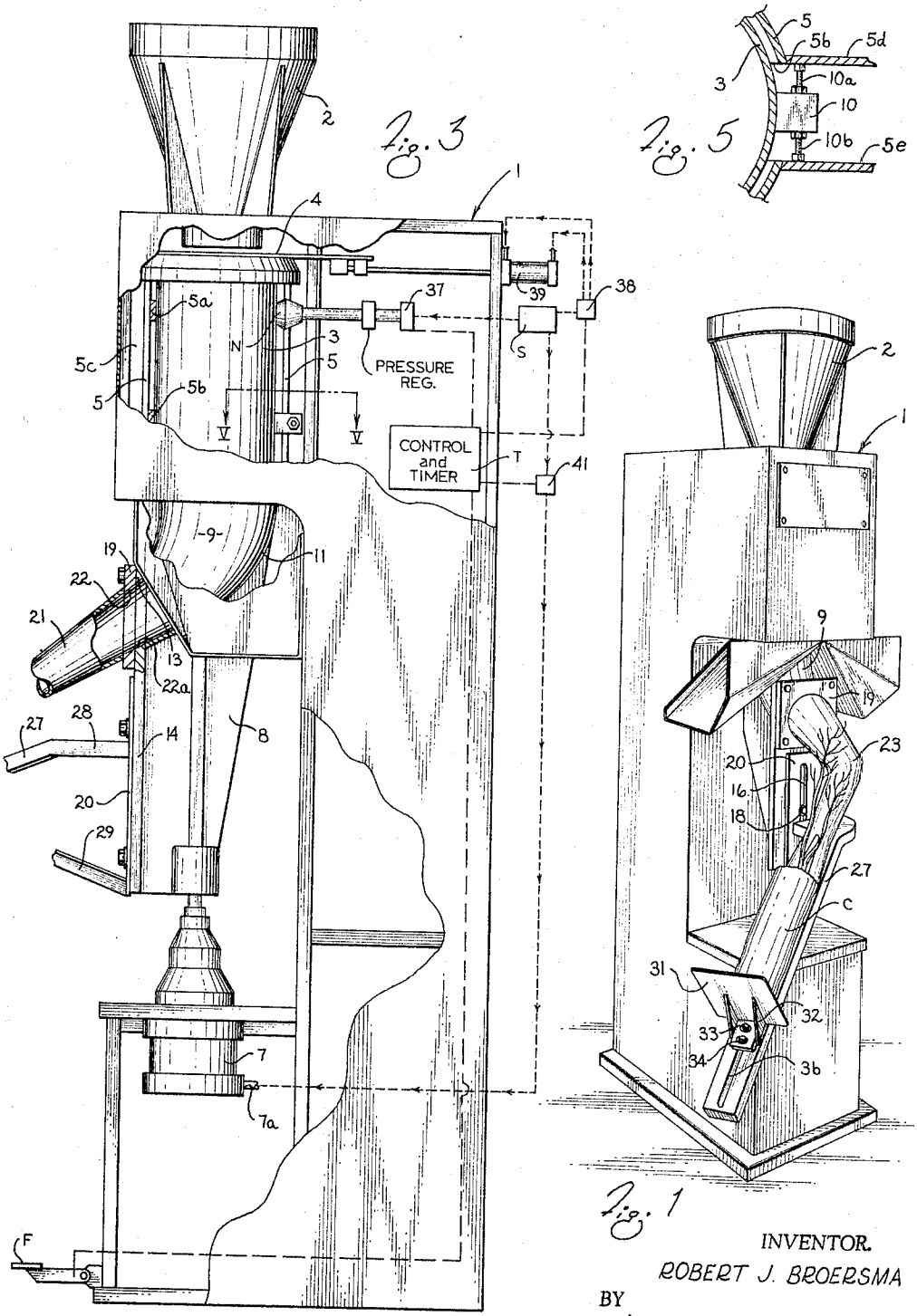


Fig. 3

Fig. 5

Fig. 1

INVENTOR.
ROBERT J. BROERSMA
BY
Woodhams, Blanchard & Flynn
ATTORNEYS

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4 Sheets-Sheet 2

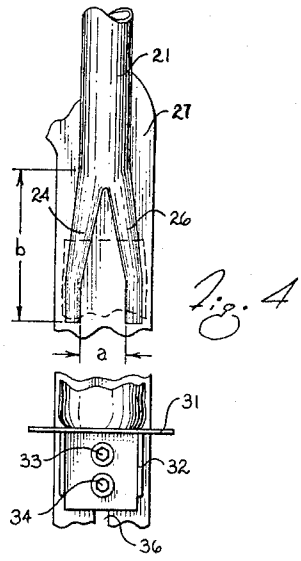


Fig. 4

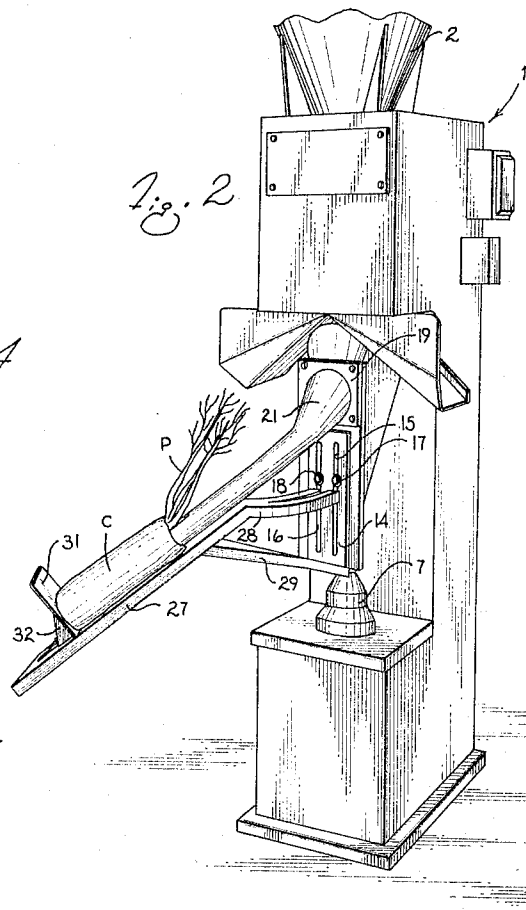


Fig. 2

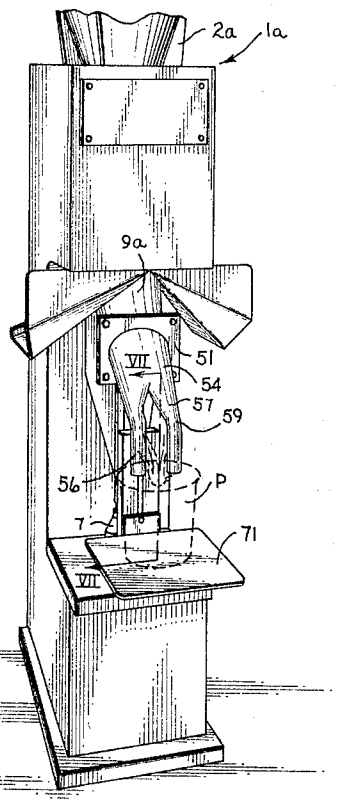


Fig. 6

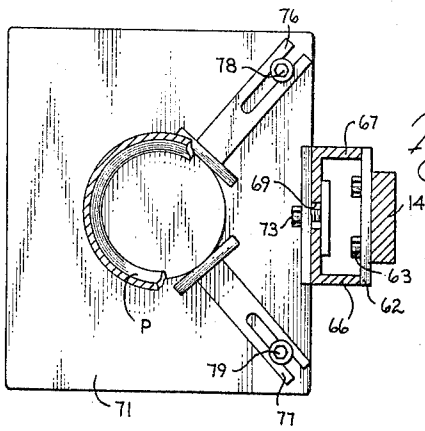


Fig. 9

INVENTOR.
ROBERT J. BROERSMA
BY
Woodhams, Blanchard & Flynn
ATTORNEYS

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MECHANICAL DEVICE FOR FILLING A CONTAINER

Filed Oct. 17, 1962 4 Sheets-Sheet 3

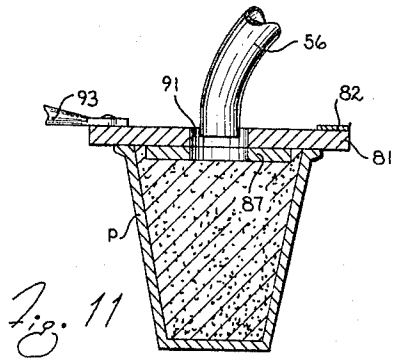


Fig. 11

Fig. 1

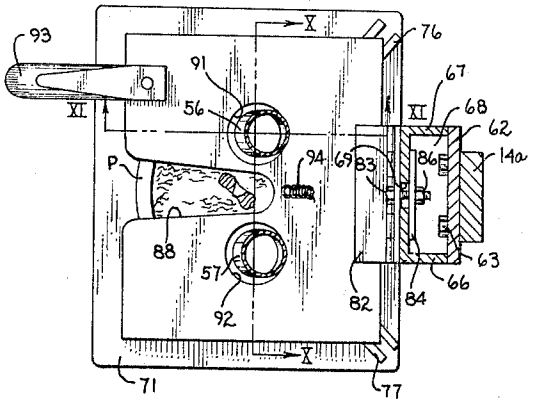


Fig. 8

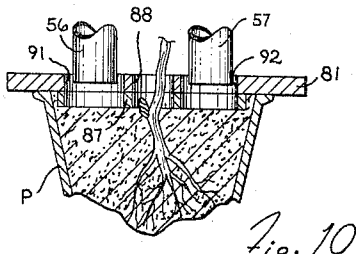


Fig. 10

INVENTOR.
ROBERT J. BROERSMA
BY
Woodhams, Blanchard & Flynn
ATTORNEYS

Aug. 2, 1966 R. J. BROERSMA 3,263,395

MECHANICAL DEVICE FOR FILLING A CONTAINER

Filed Oct. 17, 1962 4 Sheets-Sheet 4

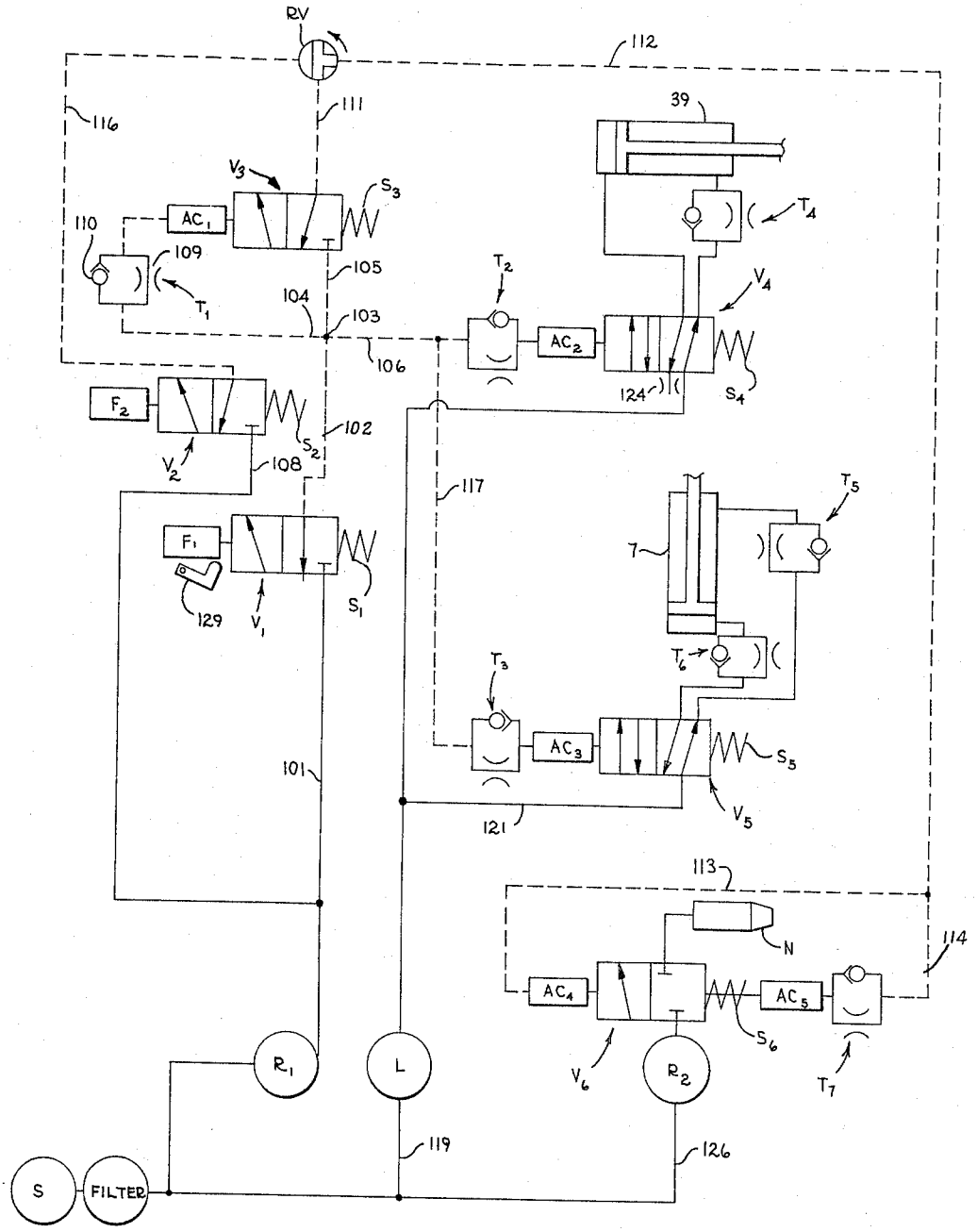


Fig. 12

INVENTOR.
ROBERT J. BROERSMA
BY
Woodhams, Blanchard & Flynn
ATTORNEYS

United States Patent Office 3,263,395 Patented August 2, 1966

3,263,395

MECHANICAL DEVICE FOR FILLING A CONTAINER

Robert J. Broersma, Spring Lake Township, Ottawa County, Mich., assignor to B & B Engineering Company, Grand Haven, Mich., a partnership of Michigan

Filed Oct. 17, 1962, Ser. No. 231,117
16 Claims. (Cl. 53—124)

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**, preferably of 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 fluent 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 fluent 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 **7***a* 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 **5***a* and **5***b* 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 **5***c*, **5***d* and **5***e* (FIGURES 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 **5***d* and **5***e* (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 **10***a* and **10***b* are provided to effect suit-

able adjustment of block **10** with respect to the clearance between members **5***d* and **5***e*.

Leading from the bottom of the suspension chamber **3** is the conduit **9** which is preferably smoothly blended 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 **22** and **22***a* (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 therebetween. 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 **36**.

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 against, the bottom 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 activated, by means of the foot pedal F, to move the valve mechanism **4** between the hopper **2** and the suspension chamber **3**. The valve **41** (FIGURE 3) is then activated 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 it agitates and entrains the packing material contained therein and carries it on through the conduit **9** thence through the conduit **21** and out the nozzles **24** and **26**. The material thus discharge 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, to place an automatic timer T (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 T 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 nozzles 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. However, 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 desirably 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.

While the foregoing has referred to sacks as the containers into which the nursery products are being packed, it will be recognized that the apparatus will be equally useful with boxes, pots, cans and other types of containers as desired.

Modification

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 work with 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*."

A nozzle plate **51** (FIGURES 6 and 7) is affixed to the mounting plate **13***a* of the basic machine frame **1***a* by any convenient means such as screws. The nozzle plate **51** has an opening therethrough which allows communication between the conduit **9***a* and a conduit **54** which is fixed to the nozzle plate **51** by any convenient means such as welding. The conduit **54** communicates with and is preferably integral with a pair of spaced, parallel nozzles **56** and **57**. Said nozzles are bent smoothly downwardly as indicated at **59** through a portion of their length so that their outlet ends point downwardly.

A pair of vertically spaced spacer bars **61** and **62** are fixed to the attaching portion **14***a* of the basic machine frame **1***a* by any convenient means such as by screws, one of which is indicated at **63**. A pair of spaced vertical support members **66** and **67** (FIGURE 8) of generally L-shaped cross section are fixed to the spacer bars **61** and **62** by any convenient means such as welding. The front walls of said support members are essentially coplanar and are spaced from the attaching portion **14***a* to form a chamber **68**. The adjacent edges of said front walls are spaced to form a slot **69** which has essentially parallel sides. Said vertical support members preferably extend upwardly to a point above the outlet ends of the nozzles **56** and **57**. A horizontal, braced table **71** (FIGURE 7) is adjustably fixed to the vertical supports **66** and **67** by means such as the screws **72** and **73** which project through the slot **69** and are threaded into a slider plate **74** which bears on the inner surface of the front walls of the vertical support members **66** and **67**. A pair of locator stops **76** and **77** (FIGURE 9) may be conveniently and adjustably secured to the table **71** by means such as the screws **78** and **79** for purposes appearing hereinafter. The table **71** is preferably used to support a container such as the pot P.

A pot cover **81** is fixed by any convenient means not shown to a hinge **82** which is secured for vertical adjustment to the vertical supports **66** and **67** by any convenient means such as a bolt **83** which extends through the slot **69** and is secured to a spacer plate **84** by a nut **86**. A flat, preferably circular plate **87** which is smaller in diameter than the rim of the pot P is fixed to the middle of the underside of the pot cover **81** for purposes appearing hereinafter. A wedge-shaped slot **88** through the cover **81** and plate **87** extends from the front edge of the cover **81** to a point behind the center of said cover. The central axis of said slot is preferably centered on the pot cover **81** and said slot is of sufficient width to closely accommodate the stem of a plant to be placed in the pot P. The pot cover **81** and the plate **87** are pierced with holes **91** and **92** into which extend the outlet ends of the nozzles **56** and **57**, respectively. The cross sections of the nozzles **56** and **57** are essentially constant near the ends thereof and the curvature of said nozzles near the ends thereof conform to a radius centered on the pivot axis of the hinge **82**. Thus, the cover **81** may be pivoted upwardly on the hinge **82** without restriction by the nozzles **56** and **57** so that the pot P may be easily placed on or removed from the table **71**. A handle, such as that shown at **93**, may be fixed to the cover **81** near the front edge thereof to aid in pivoting the cover **81**. The bottom surface of pot

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 hereinabove 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 plant 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 rest on the rim of the pot P. Packing material fed into the conduit 9a in the manner described hereinabove 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 copending 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 fitting progrresses, 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 locked 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 plant simultaneously passing 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 hereinabove described.

Modified control system

FIGURE 12 discloses a control system for the apparatus embodying the invention herein disclosed wherein a source of pressure fluid S, which fluid is preferably air, feeds means hereinbelow described for operating the pressure cylinders 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 pilot pressure fluid system which controls the operation of said cylinders and blast nozzle. Air conduits for the pilot 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 R_1 to a valve V_1 which is biased to remain in the closed position shown by the spring S_1 whereby the pilot line 101 is sealed. The valve V_1 is actuatable by the foot pedal F_1, 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 T_1, here shown as comprising a ball check valve 110 and a constrictive orifice 109, to an air cylinder AC_1. The ball check valve 110 is arranged to check the entrance of air from the line 104 to the cylinder AC_1. The air cylinder AC_1 is operable to open the valve V_3 which is normally biased by the spring S_3 in the closed state shown. Opening the valve V_3 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_4. The line 112 is also connected by a line 114 to the timing device T_7.

A line 108 connects the line 101 to a valve V_2 operated by a foot pedal F_2. Said valve V_2 is biased in the closed position shown by the spring S_2. The line 108 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 T_2 to an air cylinder AC_2 which operates a valve V_4. The timing device T_2 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 AC_2.

The line 106 also connects through an air line 117 to a timing device T_3 and thence to an air cylinder AC_3 which controls a valve V_5 biased in the position shown in FIGURE 12 by the spring S_5. The ball check valve of the timing device T_3 is so oriented as to impede the flow of air from the line 117 to the air cylinder AC_3.

The air pressure source S is also connected to a main air line 119 containing a lubrication device L and which connects to the valve V_4 and through a main air line 121 to the valve V_5. The lubrication device L is provided to insure proper lubrication and long life of the air cylinders 39 and 7. The valve V_4 in its normal position shown in FIGURE 12 passes air from the main air line 119 through a flow control T_4, 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 V_4 and a restrictive orifice **124** into the open air. Actuation of the air cylinder AC_2 to move the valve structure V_4 rightwardly against the spring S_4 allows air from the main air line **119** to pass into the leftward end of the air cylinder **39** thereby moving the piston thereof rightwardly and moving the valve structure **4** of FIGURE 3 to a position between the hopper **2** and suspension chamber **3**. The rightward side of the air cylinder **39** exhausts through the flow control T_4 which is so oriented as to restrict said exhausting and thence through the valve V_4 into the open air.

The valve V_5 when in its position shown in FIGURE 12 allows air from the main air line **121** to flow through a flow control T_5, 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 T_6, which is oriented to impede the flow of air therethrough, through the valve V_5 into the open air. Actuation of the air cylinder AC_3 to move the valve V_5 rightwardly against said spring S_5 allows air from the main air line **121** to flow through the flow control T_6, which is oriented to allow free flow into the lower end of the air cylinder **7** 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 T_5, which is so arranged as to restrict the flow of air therethrough, and thence through the valve V_5 into the open air.

Air from the source S is also fed through a main air line **126** containing a pressure regulator R_2 therein to the valve V_6. The valve V_6 is biased in the position shown in FIGURE 12 by the spring S_6 in which position it seals the end of the air line **126**. Air pressure in the line **113** acts through air cylinder AC_4 to move the valve V_6 rightwardly against the spring S_6 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 T_7. After a suitable predetermined length of time, the timing device T_7 allows sufficient air to flow into the air cylinder AC_5, to move the valve V_6 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 AC_4 and AC_5 if of equal magnitude cooperate with the spring S_6 to allow the valve V_6 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 the operation of the foot pedal F_1. 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 F_2 is required in addition to the operation of the foot pedal F_1.

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 F_1 opens the valve V_1 so that air from the line **101** may flow into the line **102** and through the line **104** and to the timing device T_1 which is so oriented as to restrict or time the flow of air therethrough to the air cylinder AC_1. The air in the line **102** also flows to the timing devices T_2 and T_3. The timing device T_2 is oriented to allow free flow of air therethrough into the air cylinder AC_2 which moves the valve V_4 rightwardly to allow 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 T_3 is oriented to restrict the flow of air into the air cylinder AC_3. Therefore, the valve V_4 has already been moved to its rightward position when the air cylinder AC_3 moves the valve V_5 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 into 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 T_1 times out allowing air to flow into the air cylinder AC_1 and moving the valve V_3 rightwardly to its open position. Air is then allowed to move from the pilot line **105** through the pilot lines **111**, **112** and **113** to the air cylinder AC_4 which moves the valve V_6 rightwardly to its open position. Air thus flows from the main air line **126** through the valve V_6 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 T_7 which after sufficient packing material has been expelled actuates the air cylinder AC_5 to move the valve V_6 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 apprized 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 F_1. Such release causes the spring S_1 to move the valve V_1 leftwardly into its normally closed position shown in FIGURE 12. In said position the valve V_1 seals the pilot air line **101** but allows the pilot air line **102** to dump into the open air. The timing device T_1 allows free flow of air from the air pressure cylinder AC_1 through the line **102** to the open air thus allowing the spring S_3 to move the valve V_3 leftwardly to its closed position. Therefore, the air cylinder AC_4 may exhaust through the pilot lines **113** and **112** and the air cylinder AC_5 may exhaust through the timing device T_7, which is oriented to allow free flow therethrough, and through the lines **114** and **112**. The line **112** exhausts through the line **111** and the valve V_3 and into the atmosphere. Simultaneously the air cylinder AC_3 exhausts through the timing device T_3 which is oriented for free flow through the lines **117**, **106** and **102** and the valve V_1 into the open air thereby allowing the spring S_5 to move the valve V_5 leftwardly to its normal position shown in FIGURE 12 and the valve V_5 then allows air from the main air line **121** to pass through the free flow oriented flow control device T_5 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 T_6 oriented so as to oppose or restrict the flow of air therethrough and through the valve V_5 into the open air. Restriction of exhaust flow from the cylinder **7** by the flow control T_6 insures that the suspension chamber **3** will move downwardly slowly and gently. The timing device T_2 is so oriented as to restrict the flow of air from the air cylinder AC_2 to the lines **106** and **102** and then to the open air. Thereby the air cylinder AC_2 exhausts after the suspension chamber **3** has moved downwardly. Exhausting the

air cylinder AC_2 allows the valve V_4 to move leftwardly under the influence of the spring thus to assume is normal position as shown in FIGURE 12. In this position the valve V_4 admits air from the main air line **119** through the flow control T_4, 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 V_4 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 F_1 is then operated to move the valve V_1 rightwardly and allow air from the air line **101** to flow into the pilot air line **102** and thence to the timing devices T_2 and T_3 which operate in the manner above described in connection with the single foot pedal mode of operation. In this case, however, the timing device T_1, the air cylinder AC_1 and the valve V_3 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 T_2 and T_3 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 F_2 may be operated to open the valve V_2 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. Upon cessation of the blast, the operator releases the foot pedal F_2 to allow the spring S_2 to return the valve V_2 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 AC_4 and AC_5. 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 F_2 is then depressed pushing the valve V_2 to the right to its open position and allowing actuation and de-actuation of the air cylinders AC_4 and AC_5 in the above-disclosed manner to actuate and de-actuate the blast nozzle N. The above practice is carried on until a preselected number of bags have been filled or until the suspension chamber **3** is empty whereupon when the last bag is filled, the foot pedal F_2 is released for the last time to exhaust the air cylinders AC_4 and AC_5, the last-filled container is removed from the apparatus and the foot pedal F_1 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** will be recharged 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 F_1 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 F_1 in its actuated position without attention from the operator until the operator releases said lock mechanism at which time the foot pedal F_1 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 the invention shall be understood as including such variations excepting 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 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;

injection means for introducing a carrying gas under pressure into said entrainment chamber;

nozzle means in constant open communication with said entrainment chamber and means for supporting a container in a position such that said container surrounds said 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 entrainment chamber and second 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 therewithin.

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:

wall 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 entrained 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 of 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 thereinto with the 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:

wall 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 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 thereinto with 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 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;

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 therewith.

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.

16. An apparatus according to claim 15, in which said container-supporting means includes a platform which extends generally parallel with the lengthwise extent of said nozzle means and which extends past the discharge end of said nozzle means, and a container rest mounted on said platform and projecting laterally therefrom across and spaced a selectable distance from the discharge end of said nozzle means.

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TRAVIS S. McGEHEE, *Primary Examiner.*

A. E. FOURNIER, *Assistant Examiner.*