May 17, 1960 E. M. LAU 2,936,994

BAG FILLING MACHINE

Filed Sept. 10, 1956 6 Sheets-Sheet 1

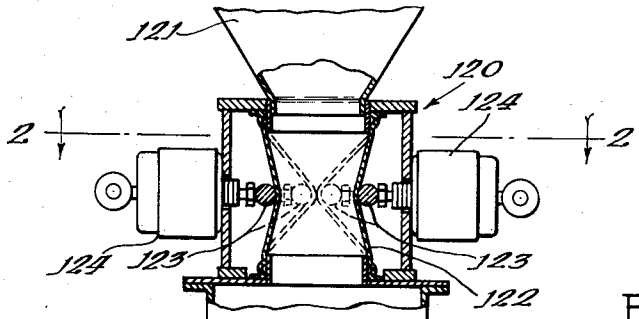


FIG. 2

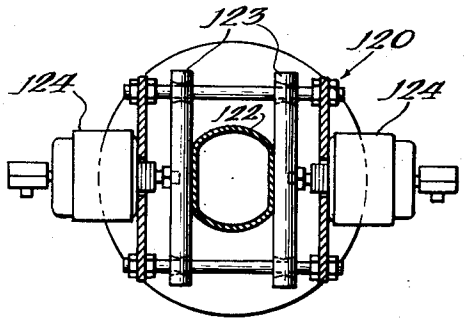
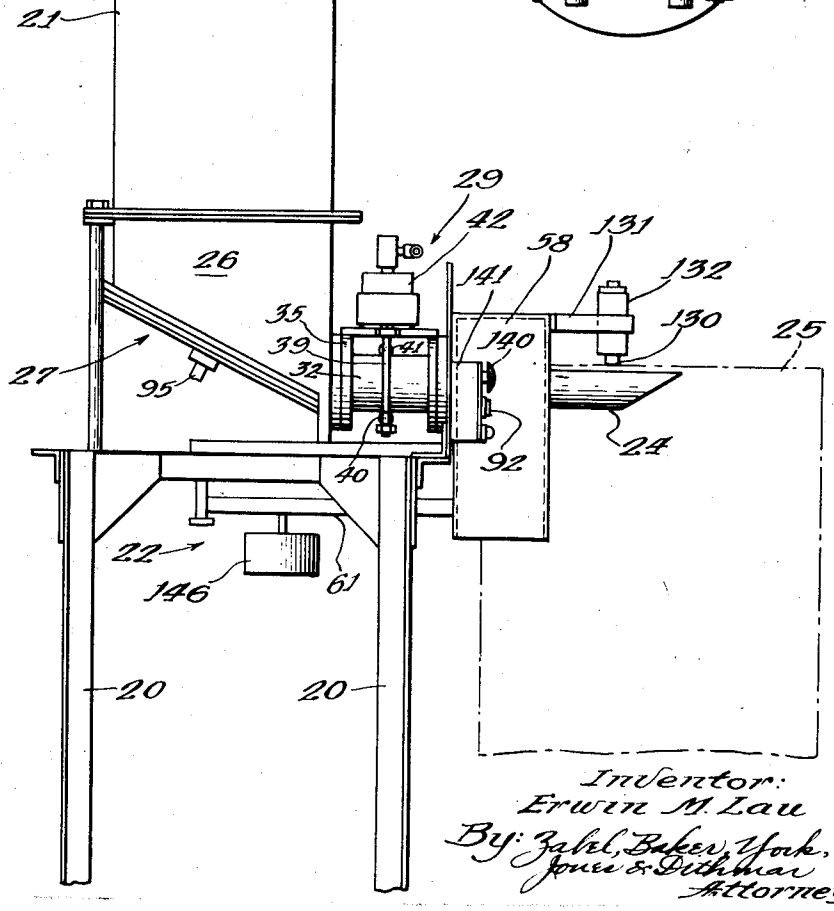


FIG. 1



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BAG FILLING MACHINE

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FIG. 3

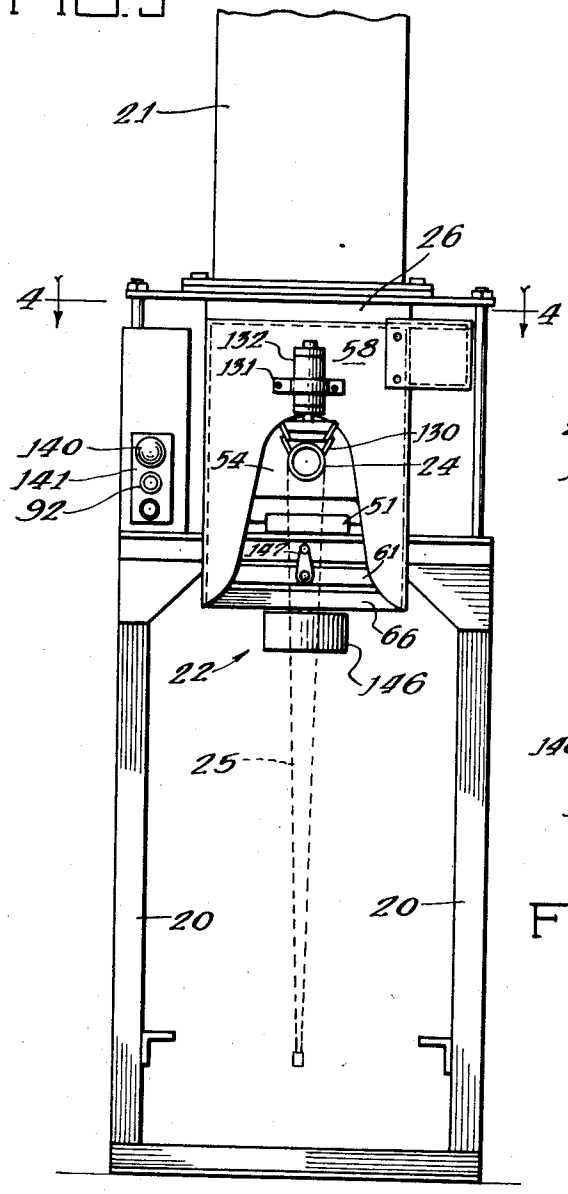


FIG. 4

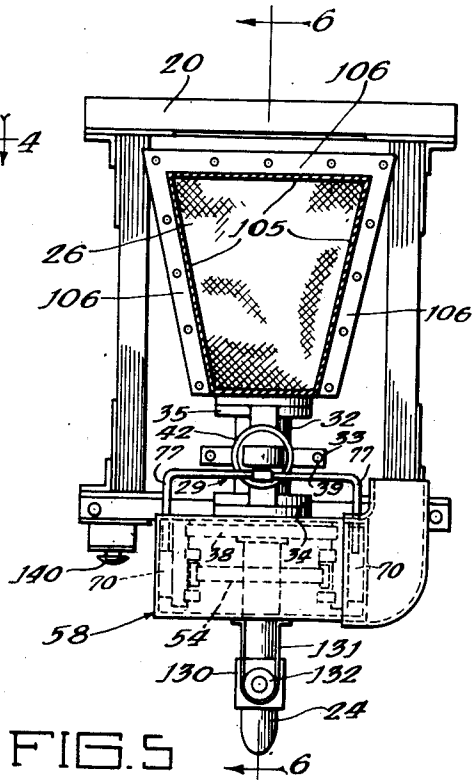
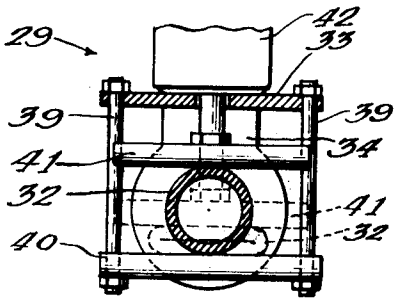


FIG. 5



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BAG FILLING MACHINE

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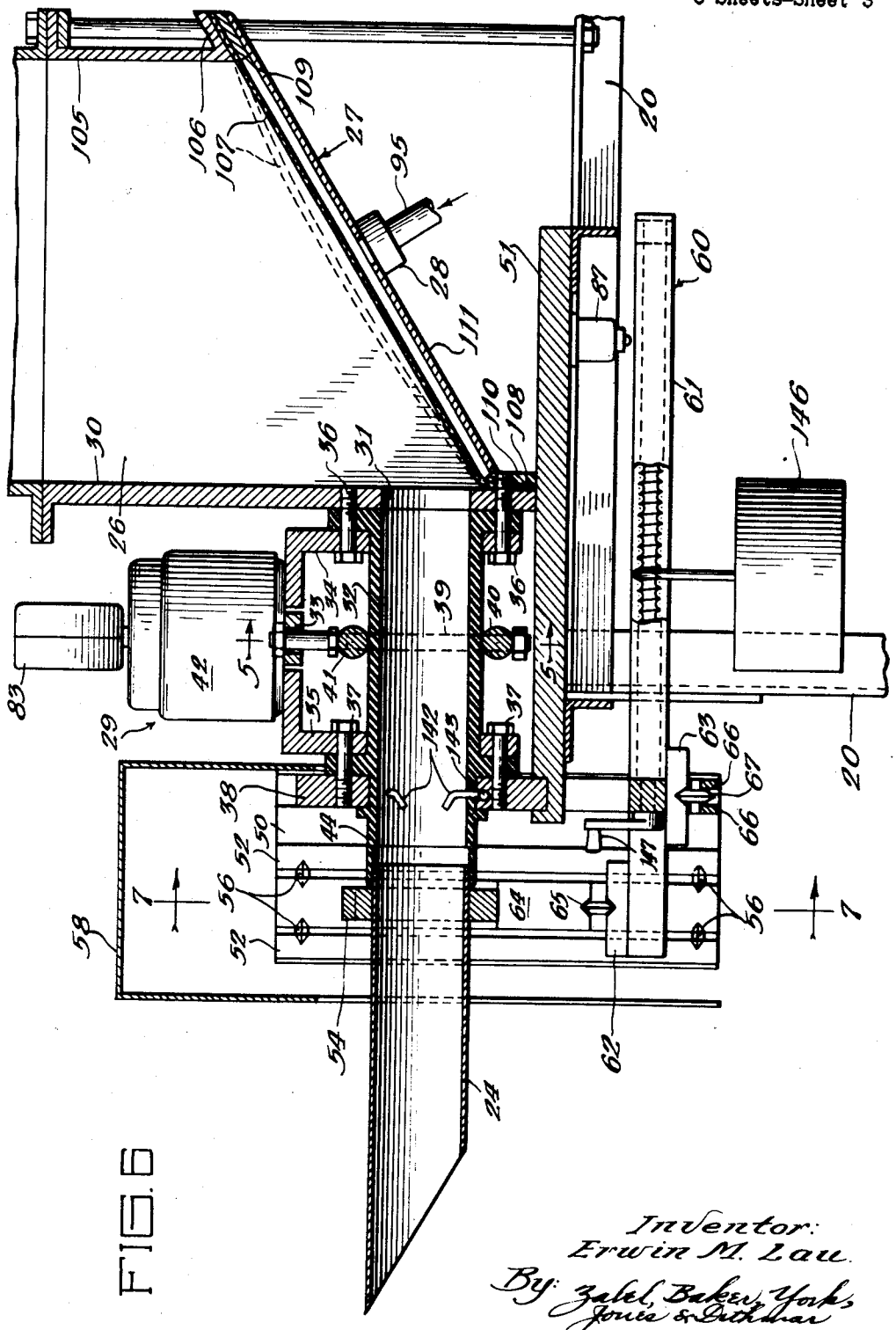


FIG. 6

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BAG FILLING MACHINE

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FIG. 7

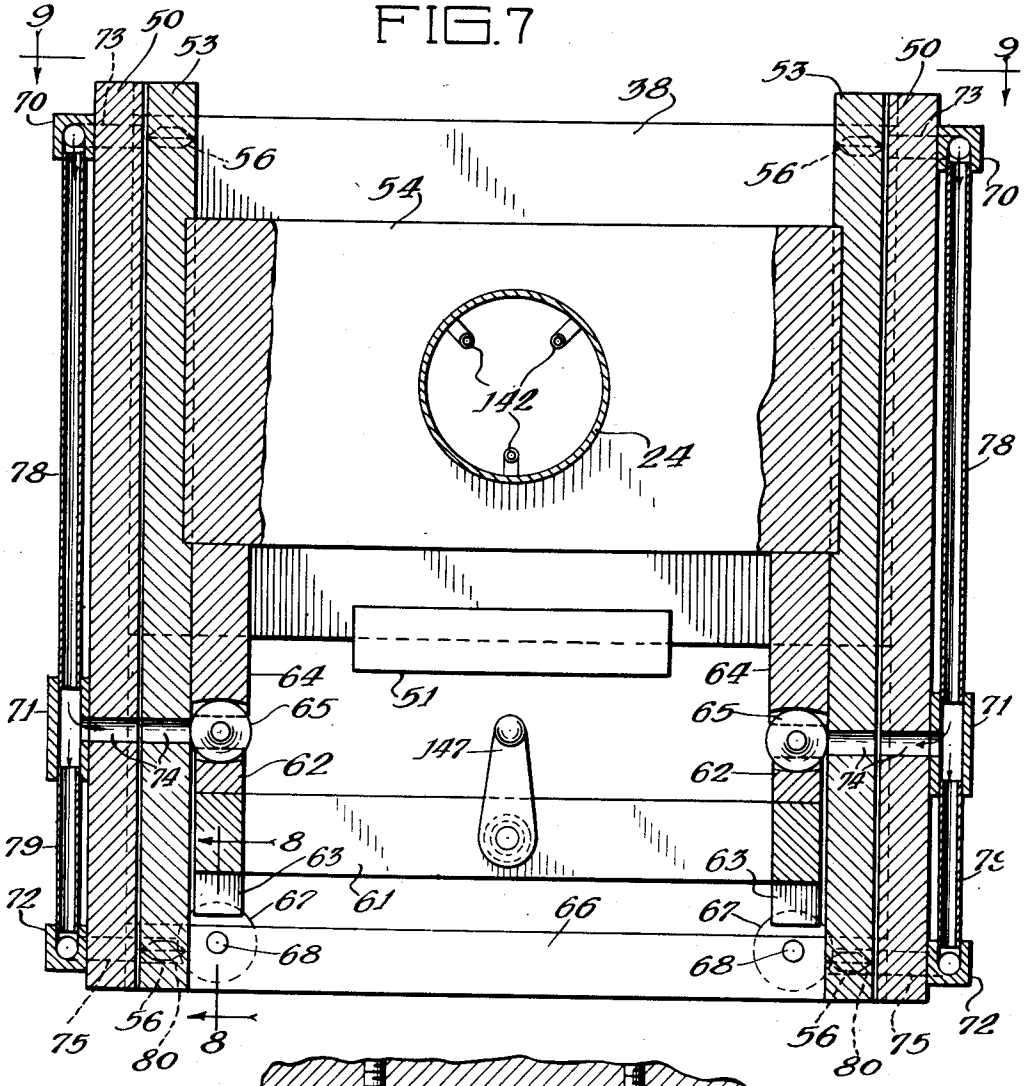
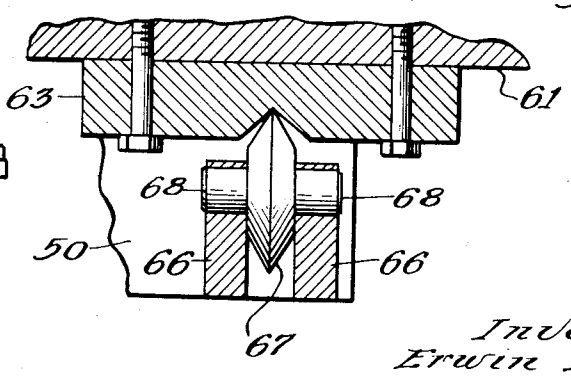


FIG. 8



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BAG FILLING MACHINE

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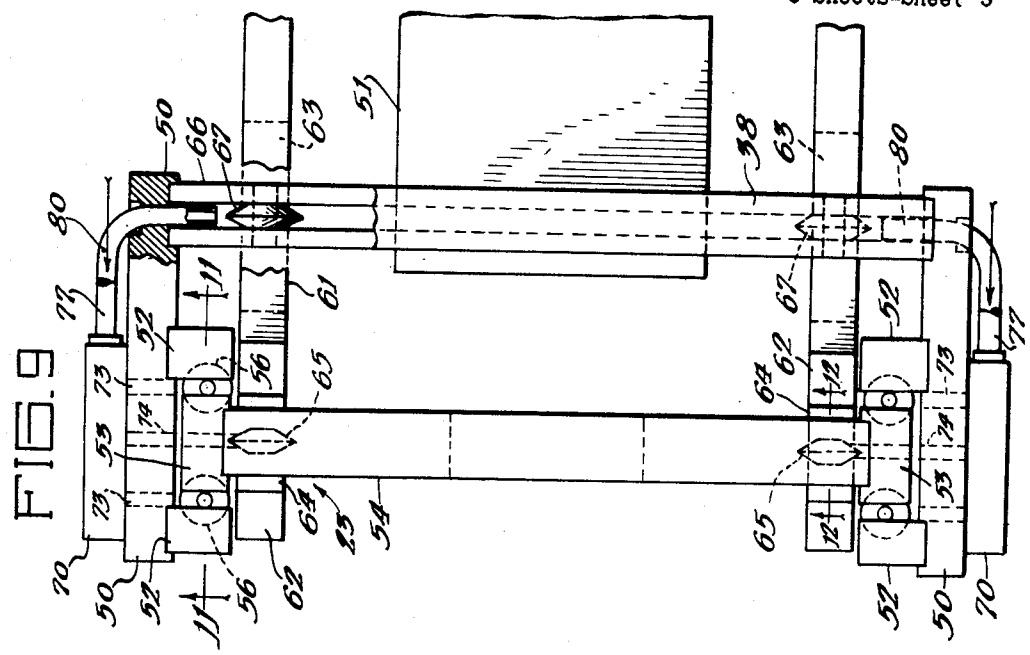


FIG. 9

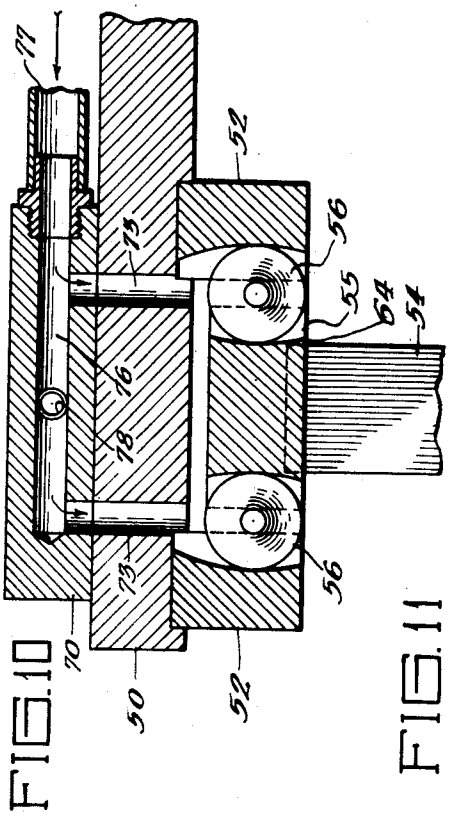


FIG. 10

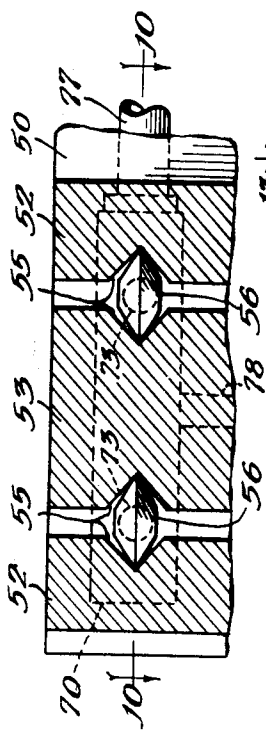


FIG. 11

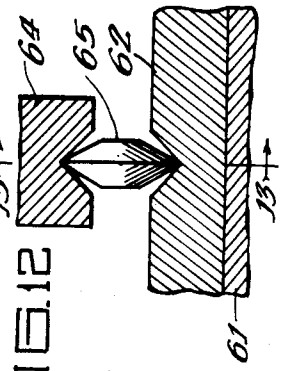


FIG. 12

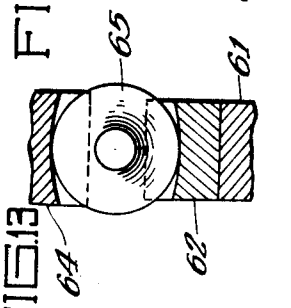


FIG. 13

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FIG. 14

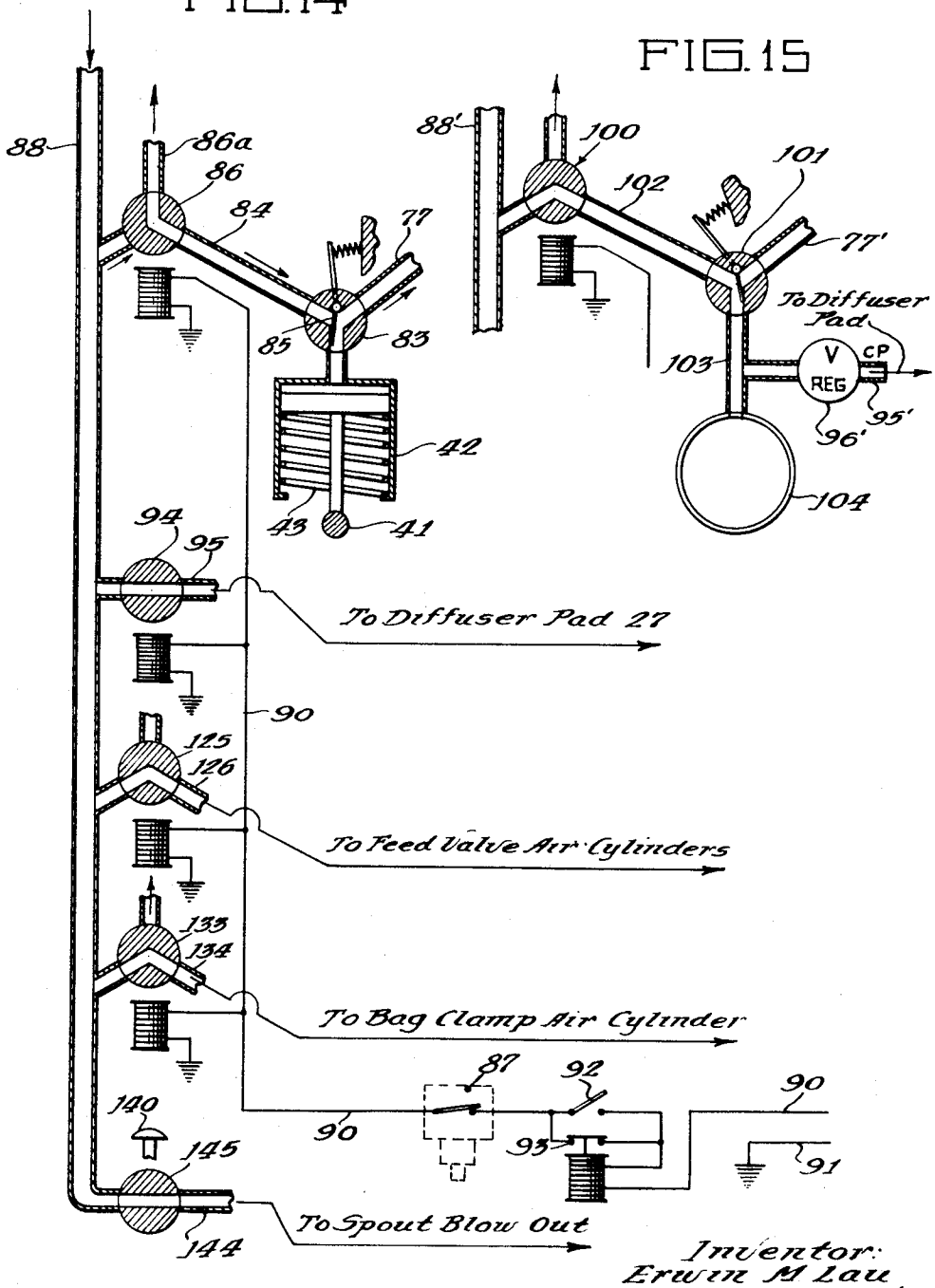


FIG. 15

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United States Patent Office 2,936,994
Patented May 17, 1960

2,936,994

BAG FILLING MACHINE

Erwin M. Lau, Dolton, Ill., assignor to Black Products Co., Chicago, Ill., a corporation of Illinois

Application September 10, 1956, Serial No. 608,760

17 Claims. (Cl. 249—60)

This invention relates to bag filling machines of fluidizing type.

According to this type of machine, the powdered or granular material to be packed is contained in a chamber and a filling spout leads from the chamber, through suitable valve or cut off means. A bag is suspended from the spout, so that the powdered or granular material may flow directly from the chamber through the filling spout and into the bag.

Air is introduced through a porous diffusing pad, located at the bottom of the chamber, into the powdered or granular material, and this air serves to fluidize the material so that it will flow by gravity through the spout and into the bag, this principle being disclosed in Schemm Patent No. 2,316,814, dated April 20, 1943.

The feeding operation is discontinued by shutting off the air supply and by simultaneously closing the valve or cut off means. Such means are automatically actuated by scale mechanism which may be of the same general type as shown in my prior Patent No. 2,733,040, dated January 26, 1956, in which the weight of the bag contents is transmitted to a scale beam by a floating frame. When the beam is tripped the feeding operation is automatically discontinued.

It has been found, especially when packing powdered material, that the material, due to fluidization, tends to seep between the bag and the spout and interferes with the accuracy of the scale mechanism. For instance, the powder or dust will settle on or clog the bearing surfaces, such as the fulcrum of the scale beam and the spacer points of the floating frame.

It is an object of this invention to provide an improved bag filling machine which incorporates means for maintaining the fulcrum and other bearing surfaces free of dust and powdered material.

It is another object of this invention to provide in a machine of the fluidizer type improved means for directing a blast of air at said bearing surfaces at periodic intervals and, in particular, to provide means which utilizes the control means for certain other machine components or functions as a means for controlling said air blast.

Another disadvantage incident to the operation of a fluidizer type of bag filling machine is that the pneumatic pressure incident to fluidization tends to push the bag from the spout. In this connection, it is a still further object of this invention to provide an improved bag clamp to hold the bag in its proper position on the spout, and to provide improved means for actuating the same in synchronism with the other operating elements of the machine.

Other objects are to provide a conditioning chamber of improved construction, to provide means for feeding granular and flaky material, to provide means for cleaning out the spout, and to provide bearing surfaces, such as spacer points, of increased sensitivity.

Other objects features and advantages will become apparent as the description proceeds.

With reference now to the drawings in which like reference numerals designate like parts:

Fig. 1 is a side elevation of a preferred embodiment of this invention;

Fig. 2 is a horizontal section along line 2—2 of Fig. 1 showing the hopper feed valve;

Fig. 3 is a front elevation of Fig. 1; Fig. 4 is a plan section taken along line 4—4 of Fig. 3;

Fig. 5 is a vertical transverse section taken along line 5—5 of Fig. 6;

Fig. 6 is a vertical longitudinal section taken along line 6—6 of Fig. 4;

Fig. 7 is a vertical transverse section taken along line 7—7 of Fig. 6;

Fig. 8 is a detailed vertical longitudinal section taken along line 8—8 of Fig. 7;

Fig. 9 is a plan view taken along line 9—9 of Fig. 7;

Fig. 10 is a horizontal section taken along line 10—10 of Fig. 11;

Fig. 11 is a vertical longitudinal section taken along line 11—11 of Fig. 9;

Fig. 12 is a detailed vertical longitudinal section taken along line 12—12 of Fig. 9;

Fig. 13 is a vertical transverse section taken along line 13—13 of Fig. 12;

Fig. 14 is a diagrammatical representation of the air and electrical system; and

Fig. 15 is a representation similar to Fig. 14, but showing a modification.

With reference now to Figs. 1 and 3, the general organization of the bag filling machine comprises the framework **20** which supports a conditioning chamber **21** and scale mechanism generally indicated by the reference numeral **22**. The latter includes a floating frame **23**, shown in Figs. 6, 7 and 9. The spout **24** is mounted on the floating frame **23**, and a bag **25** may be suspended from the spout **24**.

The lower portion **26** of the conditioning chamber is of generally trapezoidal section as shown in Fig. 4 and the bottom wall of this portion **26**, constitutes a diffuser pad **27** having suitable coupling means **28** for connection to an air conduit **95**.

In operation, the material to be packed is disposed in the conditioning chamber **21**. When air is caused to flow through the conduit **95** and the diffuser pad **27**, the material within the conditioning chamber is fluidized, in the sense that it tends to flow in the manner of a liquid, tending to seek its own level. Thus, the material will flow in the horizontal direction through the spout **24** and into the bag **25**. When the weight of the bag and contents reaches a predetermined amount the scale mechanism **22** is tripped, and the flow of air to the diffuser pad **27** is automatically cut off by means to be hereinafter described, thus tending to cause discontinuance of the flow of material.

In order to provide accuracy of operation, additional means in the form of a standard pinch valve **29** is provided to cut off the flow of material through the spout **24**.

As shown in Fig. 6, the front wall **30** of the lower portion **26** of the conditioning chamber is provided with an outlet aperture **31** with which is aligned a flanged tube **32** formed of rubber or like material. The tube **32** extends through suitable apertures in the legs **34** and **35** of a bracket **33**. Bolts **36** clamp one flange between the front wall **30** and the bracket leg **34**. Bolts **37** clamp the other flange of the flanged rubber tube between the other bracket leg **35** and front plate **38**. As shown in Figs. 6 and 7, two vertical guide rods **39** extend downwardly from the bracket **33** and are connected and reinforced at the bottom by a stationary horizontal rod **40**. A pinch rod **41**, having cylindrically concave end surfaces for engagement with the guide

rods 39, is slidably mounted between the guide rods for movement toward and away from the stationary rod 40, thus pinching off the flanged rubber tube 32 to stop the flow of material therethrough. The pinch rod is actuated by and connected to the piston of an air cylinder 42 which is mounted in the bracket 33, the piston being biased upwardly by a suitable spring 43. The air cylinder 42 is preferably of the diaphragm type.

The flanged tube 32 is formed with an integral extension 44 which, as shown in Fig. 6, engages the rear end of the spout 24, and thus serves to provide a flexible conduit bridging the gap between the front plate 38 and the spout. Thus, the flexible extension 44 permits vertical movement of the spout, and preferably, it is of thin wall construction so as to have as little effect as possible on the scale mechanism 22. If preferred, the extension 44 may be made separately from the flanged rubber tube 32.

The floating frame 23, on which the spout 24 is mounted, is supported by a structure comprising two sets of bracket plates 50 and supporting rails 52 which are connected by the front plate 38 which, in turn, rests on a horizontal supporting plate 51 forming a part of the supporting framework 20.

The floating frame 23 is an H-shaped structure and comprises a pair of vertically disposed rails 53 together with a transverse apertured web 54, the spout 24 being mounted on the web 54. The elements 50 and 52 are vertically disposed and as shown in Fig. 9 each rail 53 is disposed between a pair of supporting rails 52. Each of the rails 52 and 53 is provided with oppositely disposed V-shaped notches 55 as shown in Figs. 10 and 11. The spaced relationship of the parts is maintained by spacer points 56, the arrangement being substantially the same as that shown in my aforesaid prior patent, except that the spacer points may be disk shaped, as shown herein, rather than the parallelepiped shown in that patent. The disk shape, or double truncated coned configuration, is found to provide even greater sensitivity than the prior arrangement. The notches 55 are of an arcuate type, which is to say that they are cut on a radius (Fig. 10), in order to eliminate any tendency of the spacer points 56 to become displaced. Thus, the disk shaped spacer points provide a point contact, as contrasted with the line contact provided by the spacer points of aforesaid patent.

The entire floating frame and supporting structure may be partially surrounded by a hood 58, as shown in Fig. 6, which may be connected to an exhaust line (not shown).

The floating frame 23 reacts on a beam assembly 60 which comprises a rectangular frame 61 having notched pads 62 on its upper surface, and notched fulcrum pads 63 secured to its lower surface. The floating frame 23 is provided with notched blocks 64 secured to the inner surfaces of the rails 53. Spacer points 65 are disposed between the notched blocks 64 and the pads 62 to provide a substantially frictionless bearing means for transmitting the vertical force from the vertical frame 23 to the beam assembly 60.

Extending between the bracket plates 50 are spaced cross members 66 between which, as shown in Fig. 8, are supported two disk type fulcrum members 67, one for cooperation with each of the fulcrum pads 63 of the beam assembly. Each of the fulcrum members 67 are provided with axles 68 which are received within the cross members 66. The axes of the fulcrum members 67 are parallel to each other, and the notches of the blocks 64 and the fulcrum edges of the members 67 are otherwise aligned as closely as possible to provide a very sensitive fulcrum bearing for the beam assembly 60.

As previously indicated, the flow of fluidized material into a bag is accompanied by the escape of excess air from the bag opening. This excess air moves between the bag wall and the spout 24 backwardly toward the

floating frame, and inevitably will carry with it some of the material to be packed. For this reason, the hood 58 is exhausted, but in spite of this, a considerable amount of powdered material will tend to collect on the exposed surfaces of the bearing points 56, 65 and 67, and their associated notches, and this will detract substantially from the sensitivity of the bearing point constructions unless rectified. To this end, means are provided to direct a jet of air at periodic intervals against each of the bearing points in order to remove the accumulated dust or powder, and preferably this is done at the end of each filling operation.

This clean-off means is illustrated in Figs. 7, 9 and 10. As shown in Fig. 7, there is secured to the outer surface of each bracket plate 50 an upper manifold block 70, a middle manifold block 71, and a lower manifold block 72. Bores 73 extend laterally through the bracket plate 50 to provide communication between the upper manifold block and each one of the upper pair of spacer points 56 as shown in Figs. 7 and 10. Thus, air supplied to the upper manifold block will be directed against each one of these two spacer points and serve to keep the same free from dust.

Similarly, bores 74 extend from the middle manifold block 71 to the spacer points 65, these bores also extending through the rails 53 of the floating frame. Also, bores 75 extend between the lower manifold block 72 and the lower pair of spacer points 56.

The manifold blocks have suitable passageways 76 formed therein, as shown in Fig. 10 in the case of the upper manifold block 70. An air conduit 77 is connected to the upper manifold block 70 to supply air to all the manifold blocks on that side of the machine, suitable connections being made by the conduits 78 and 79. A further conduit 80 extends from the lower manifold block 72 to the fulcrum member 67, and, as shown in Fig. 9, its inner end may pass upwardly between the spaced cross members 66. In the alternative, the lower manifold block 72 may be extended rearwardly, and a suitable bore provided through the bracket plate 50, which can communicate with a small nozzle extending from the inner end thereof into the proximity of the fulcrum member 67.

The clean-off system has been described with respect to only one side of the machine, but as shown in the drawings it is duplicated at the other side.

Air may be periodically supplied to the conduit 77 by any suitable means. However, since the pinch valve 29, as well as certain other components of the machine, is operated by pneumatic means, I have found that it is possible to use the exhaust air from one of these air cylinders as a source of supply for the bearing surface clean-off means.

For instance, the operation of the air cylinder 42 may be controlled by a 2-way solenoid valve 86, shown in Fig. 14, of which the inlet port is connected to a shop air line 88, the outlet port to the clean-off conduit 77 (not shown), and the third port to a conduit 84 which leads to the air cylinder 42.

The 2-way solenoid valve 86 is spring biased to open position in which the air cylinder 42 is energized and the pinch valve 29 is closed. When the solenoid of the solenoid valve 86 is energized, the valve 86 closes causing the pinch valve 29 to open and the exhaust air from air cylinder 42 is used for the bearing surface clean-off. I have found, however, that improved operation is obtained by interposing a quick exhaust valve 83 between the solenoid valve 86 and the air cylinder 42. A quick exhaust valve is a standard commercial product and comprises essentially a pressure operated 2-way valve, of which, as shown in Fig. 14, the inlet is connected to the conduit 84, the outlet to the clean-off conduit 77, and the third port to the air cylinder 42.

The operation of the quick exhaust valve is best explained by reference to the vane 85 which is spring biased to provide communication between the third port

and the outlet, as represented by the air cylinder **42** and the clean-off conduit **77**. However, pressure on the inlet side, that is, in the conduit **84** causes the vane **85** to close the outlet, and thus communication is provided between the conduit **84** and the air cylinder **42**. The advantage of using a quick exhaust valve is that it is quicker acting than the usual solenoid valve and hence will provide a jet of higher velocity.

The diffuser pad **27** is energized by a solenoid valve **94** which is interposed between the shop air line **88** and conduit **95** which leads to the diffuser pad **27**. The solenoid valve **94** is biased to closed position which means that the diffuser pad **27** is deenergized when the pinch valve **29** is closed.

A common electrical control means, shown in Fig. 14, is provided for both the solenoid valves **86** and **94**. The electrical control means comprises a normally open circuit which includes the solenoids of the solenoid valves **86** and **94**, and which circuit when established and maintained causes the bag filling operation to take place. The electric circuit comprises power leads **90** and **91**, one of which is shown as a conductor **90** and the other of which for the purpose of convenience, is shown as a ground connection **91**. Interposed in the power lead **90** and in series with the above mentioned solenoids is a normally closed micro switch **87** and a normally open starting switch **92**. A holding relay **93** is connected in parallel with the normally open starting switch **92**. Thus, the circuit is established by closing the starting switch **92**; it is maintained by the holding relay **93**; and it is broken by operation of the micro switch **87**.

The normally closed micro switch **87**, as shown in Fig. 6, may be suitably mounted on the framework **20** to be engaged by the beam assembly **60** when the same is tripped.

Fig. 14 shows the position of the parts when the circuit is being maintained by the holding relay **93**, so that the material is flowing from the conditioning chamber **21** through the spout **24** and into the bag **25**. In other words, during this circuit condition, the pinch valve **29** is open, the diffuser pad **27** is energized. More specifically, the solenoids of the solenoid valves **86** and **94** are both energized, with the result that the solenoid valve **86** is closed, and the solenoid valve **94** is open. Since the solenoid valve **86** is closed the air cylinder **42** is deenergized and this corresponds to open position of the pinch valve **29**.

When the tripping of the scale mechanism operates the micro switch **87** to open the circuit, then the 2-way solenoid valve **86** is opened to energize the air cylinder **42** and close the pinch valve **29**. At the same time, the solenoid valve **94** is closed to deenergize the diffuser pad **27**.

When the circuit is again closed, by depression of the starting switch **92**, the consequent deenergization of the air cylinder **42** is accompanied by the exhausting of the air contained therein through the outlet of the quick exhaust valve **83** and into the bearing surface clean-off means.

Suitable pressure regulating valves, not shown, may be inserted between the shop air line **88** and the solenoid valves **86** and **94**, respectively. For instance, the amount of air required for fluidization will vary according to the material, and in most instances the pressure required to deliver the air at the required rate may be considerably less than the pressure required for operation of the air cylinder **42** and any other air cylinders provided in the bag filling machine. Preferably, therefore, the pressure regulators in the line which supplies the diffuser pad should be of the adjustable type so as to permit regulation of the rate of air supply.

As a modification, the air supply for the bearing surface clean-off means may be obtained from the means for supplying air to the diffuser pad **27**. This modified arrangement is shown in Fig. 15 in which the solenoid valve **100**, which is interposed between the shop air line **88'** and the diffuser pad **27**, is a 2-way solenoid valve, of which the inlet port is connected to the shop air line **88'**, the outlet port exhausts to atmosphere, and the third port communicates with a quick exhaust valve **101** through a suitable conduit **102**. The quick exhaust valve **101** is like that described above; the inlet port communicates with the conduit **102**, the outlet port communicates with the clean-off conduit **77'**, and the third port communicates with a T fitting **103**. One leg of the T fitting communicates with the conduit **95'** through a suitable pressure regulating valve **96**, to the end that the rate of air supply can be controlled as outlined above. Another leg of the T fitting communicates with a reservoir **104**. The 2-way solenoid valve **100** is spring biased into closed position, the same as in the case of the valve **94**. When the solenoid is energized, the valve is opened and the air pressure goes up in the reservoir **104** as air is supplied to the diffuser pad **27**. When the circuit is opened by the tripping of the beam, since the conduit **102** communicates with the outlet of the 2-way valve **100**, the pressure within the conduit **102** will drop to atmospheric pressure and cause actuation of the vane of the quick exhaust valve **101**, with the result that the air from the reservoir **104** will exhaust through the outlet of the quick exhaust valve **101** and into the clean-off means. In this instance the clean-off occurs at the end of each filling cycle, whereas in the case of the arrangement shown in Fig. 14, the clean-off occurs at the beginning of each filling cycle. In the embodiment of Fig. 14, the air cylinder itself acts as a reservoir, whereas in the modification of Fig. 15, unless the conduit **95'** in itself is of sufficient length and diameter, it is desirable to provide a separate reservoir **104**.

I have found that improved filling operation is obtained by providing a diffuser pad **27** the area of which is coextensive with the full cross sectional area of the conditioning chamber, as shown in Figs. 4 and 6, and which is so located with respect to the outlet **31** that a maximum degree of fluidization is provided for the material in the immediate vicinity of said outlet **31** to the end that there will be no dead spots in the direct path of material flow.

As shown in Figs. 4 and 6, the three vertical walls **105** of the lower portion **26** of the conditioning chamber **21** are provided with outwardly extending flanges **106**. The diffusing member **107**, preferably in the form of a three-ply canvas belting, directly underlies the flanges **106**, and its lower edge **108** is extended downwardly into contact with the lower edge of the front wall **30**. A clamping frame **109** underlies the diffusing member **107**, the fourth side of the frame comprising a vertically disposed clamping strip **110**. Thus, three side edges of the diffusing member **107** are clamped between the flanges **106** and three sides of the frame **109** and the fourth edge is clamped between the front wall **30** and the fourth side **110** of the frame **109**.

Underlying the three sides of the frame **109** is a plate **111** which is suitably bolted to the flanges **106** on three of the sides and which may be welded along its fourth side to the upper edge of the clamping strip **110**. The clamping strip **110** may be urged into clamping engagement with the lower edge **108** of the diffusing member by suitable bolts, one of which may be the bolt **36**, as shown.

The plate **111** is provided with a suitable coupling **28** for connection with the conduit **95**.

The angular disposition of the diffusing pad **27** assists in converting the vertical gravitational force, or "head" which acts on the fluidized material immediately adjacent the diffuser pad **27**, into the horizontal force which causes the movement of the material through the spout **24**. Furthermore, it is believed that improved results are also due to the fact that the fluidizing air tends to move in a direction perpendicular to the plane of the diffusing pad **27**, with the result that there is a greater proportion

of air to solids in the immediate vicinity of the outlet **31** than there is along the rear edge of the diffuser pad, due to its angular disposition which tends to form a pocket at this point, which is the outlet of the conditioning chamber.

I have found that whereas this improved diffuser pad construction performs very satisfactorily with powdered materials, that the rate of flow is somewhat less when the material to be packed is a granular material, such as seed corn or certain types of flaky material such as stearic acid. This is believed to be due to the fact that in the case of granular material, the larger particles offer less resistance to the flow of air with result that a greater proportion of the fluidizing air escapes upwardly between the interstices of the particles, and a lesser proportion is available for imparting such kinetic energy to the separate particles as will result in the flow which is characteristic of fluidization. In the case of flaky materials, the shape of the particles themselves tend to prevent that random orientation which promotes fluidization; also, there may be some tendency towards adhesion in the case of stearic acid flakes.

I have overcome these difficulties by providing a feed valve **120** at the top of the conditioning chamber **21**, which controls the flow of material from the hopper **121** into the conditioning chamber. This feed valve is automatically closed during the fluidizing and filling operation with result that the proportion of effective air, which is that which imparts the desired kinetic energy, to escaping air is substantially increased. However, irrespective of the explanation, it has been found that granular and flaky materials will flow at a satisfactory rate of speed, due to the provision of the feed valve **120**.

The feed valve **120** is of the double pinch type, as shown in Figs. 1 and 2, and comprises a suitable flexible tube **122** and a pair of pinch rods **123** which are operated by two air cylinders **124**. The air cylinders **124** are actuated by a normally closed 2-way solenoid valve **125** which is interposed in a conduit **126** extending from the shop air line **88** to the air cylinders **124**, as shown in Fig. 14. In operation, when the electrical circuit **90—91** is energized, solenoid valve **125** is opened, causing the feed valve **120** to be closed during the filling operation, as pointed out above. Immediately at the conclusion of the filling operation the feed valve **120** opens and permits entry into the conditioning chamber of an amount of material which is equivalent to that previously withdrawn.

Also powered from the shop air line **88** is a bag clamp **130** and a spout clean-out means including nozzles **142**.

In order to maintain the bag **25** in its proper position on the spout **24**, a bag clamp **130** is provided, as shown in Figs. 1 and 3. The bag clamp is mounted on a suitable bracket **131** which in turn is mounted on the hood **53**, and is operated by an air cylinder **132**. The air cylinder **132** is actuated by a normally closed 2-way solenoid valve **133** which is interposed in a conduit **134** extending from the shop air line **88** to the air cylinder **132**, as shown in Fig. 14. In operation, when the electrical circuit **90—91** is energized, the solenoid valve **133** is opened, and the clamp is actuated to clamp the bag **25** during the filling operation.

In certain types of filling operations, it is desirable to clean out the spout after each filling cycle in order to avoid dribble on the floor while changing bags. If this is done consistently, it will not materially affect uniformity of bag weight. In order to facilitate this clean-out operation, the air jets are actuated by a push button type of valve control represented by the push button **140** mounted on the control panel **141**, as shown in Figs. 1 and 3. Thus, the manual valve control is located adjacent to the button of the starting switch **92** where it is easily accessible to the operator. In the alternative the spout clean-out may be automatically powered by the exhaust air from one of the air cylinders **124** or **132** in the same manner as the bearing surface clean-off means.

As shown in Fig. 6, one or more nozzles **142** extend through the tube extension **44** and are connected with suitable passageways **143** formed in the front plate **38**. These passageways **143** are connected to a suitable conduit **144** which extends from the manually actuated valve **145**, as shown in Fig. 14. Thus, a simple and effective spout clean-out is provided which makes for cleaner operation, and which does not affect the bag weight, since almost all of the material removed from the spout **24** is included in the material supported by the floating frame **23**.

To summarize the operation of my invention which has been described in detail in connection with the description of the various parts and sub-assemblies, the machine is set up by first filling the hopper **121** with the material to be packed, and the material flows down through the feed valve **120** and fills the conditioning chamber **21**.

The various valves are connected to the shop air line **88**, through pressure regulators if desired, and the electrical circuit **90—91** is plugged into a suitable power outlet. The scale mechanism is set to the desired bag weight by adjusting the position of the balance weights **146**, by suitable crank means **147**, as more fully described in my aforesaid earlier patent.

Then the bag **25** is slipped over the spout **24**, and the starting button **92** is depressed. This causes the bearing points to be blown off just before the pinch valve **29** is opened, and the diffuser pad **27** is energized thereby causing flow of material into the bag **25**. In the case of powdered materials, it may be desired to disconnect the solenoid valve **125** which controls the feed valve **120**; in the case of granular and flaky materials, the connection is maintained to improve the fluidizing operation, as previously outlined.

During the filling operation, the bag is clamped on the spout by the bag clamp **130**. When the bag reaches the predetermined weight, say 100 pounds, the beam is tripped, opening the microswitch and deenergizing all air cylinders, with the exception of the air cylinder **42** which is energized to close the pinch valve **29**. A glancing blow by the operator's hand on the push button **140** cleans out the spout **24**. Then the bag is removed and an empty bag put in its place.

The use of the disc shaped spacer points **56** and **65**, and the disc type fulcrum **67** provides an extremely sensitive scale mechanism, having an accuracy of as great as plus or minus one or two ounces in a 100 pound bag. Of course, the bearing surface blow-off means assists materially in maintaining this degree of accuracy.

As an example of the quantities involved in fluidization, the area of the diffusing member **107** when formed of 3-ply canvas belting may be 126 square inches. For powdered materials, air is supplied to the diffuser pad at a rate of from 4 to 6 cubic feet per minute, and a suitable pressure regulating valve such as the valve **96**, may be adjusted accordingly. In the case of granular materials, such as seed corn, sugar, etc., when the feed valve **120** is used, the rate of air supply will be substantially increased, for example, up to as much as 18 cubic feet per minute.

If it is desired to actuate the pinch valves **29** and **120**, and the bag clamp **130** by electrical means, rather than by air cylinders, then the modification of Fig. 15 may be employed in which the air supply for the diffuser pad is utilized for the bearing surface clean-off means.

Although only preferred embodiments of this invention have been shown and described herein, it will be understood that various modifications and changes may be made in the construction shown without departing from the spirit of this invention as pointed out in the appended claims.

I claim:

1. A bag filling machine comprising a conditioning

chamber for the reception of material to be packed and having an outlet at the lower portion thereof, a spout for supporting a bag to be filled, a flexible conduit communicating with said conditioning chamber and said spout, a diffuser pad located in said conditioning chamber in proximity to said outlet, means for supplying air to said diffuser pad to cause material adjacent said outlet to flow in a substantially horizontal direction through said outlet, said flexible conduit, and said spout into said bag, scale mechanism responsive to the weight of the contents of said bag and including a fulcrum means and means for supporting said spout, a pinch valve for said flexible conduit, control means responsive to the tripping of said scale mechanism for operating said pinch valve into closed position and for cutting off said air supplying means for said diffuser pad, and means for directing a jet of air at said fulcrum means to clean off the same at periodic intervals.

2. A bag filling machine as claimed in claim 1, in which said control means includes an air cylinder for actuating said pinch valve, the combination of means for conducting the exhaust air from said air cylinder to said air jet directing means, whereby the exhaust air from said air cylinder is utilized for cleaning off said fulcrum means.

3. In a bag-filling machine which includes a conditioning chamber for the reception of material to be packed and having an outlet at the lower portion thereof, a spout for supporting a bag to be filled, a flexible conduit communicating with said conditioning chamber and said spout, a diffuser pad located in said conditioning chamber in proximity to said outlet, means for supplying air to said diffuser pad to cause material adjacent said outlet to flow in a substantially horizontal direction through said outlet, said flexible conduit, and said spout into said bag, scale mechanism responsive to the weight of the contents of said bag and including a fulcrum means and means for supporting said spout, a pinch valve for said flexible conduit, the combination of control means responsive to the tripping of said scale mechanism for operating said pinch valve into closed position and for cutting off said air supplying means, and means for directing a jet of air at said fulcrum means to clean off the same at periodic intervals, said control means including a valve for controlling said air supplying means for said diffuser pad, a conduit leading from said valve to said diffuser pad, an air reservoir communicating with said conduit, and means for conducting the air which has been stored in said reservoir during the energization of said diffuser pad to said air jet directing means upon actuation of said valve into closed position.

4. A bag filling machine as claimed in claim 3, which includes a pressure reducing valve between said reservoir and said diffuser pad, and a quick exhaust valve located between said reservoir and said first mentioned valve, and in which means for conducting the air from said reservoir includes a conduit leading from the outlet port of said quick exhaust valve to said air jet directing means.

5. A bag filling machine as claimed in claim 1, in which said spout supporting means includes a floating frame, bearing means for supporting said floating frame for limited vertical movement, said bearing means comprising spacer points, and means for directing a jet of air at said spacer points to clean off the same at periodic intervals.

6. A bag filling machine comprising a conditioning chamber for the reception of material to be packed and having an outlet at the lower portion thereof, a spout for supporting a bag to be filled and connected to said outlet, a diffuser pad located in said conditioning chamber in proximity to said outlet, means for supplying air to said diffuser pad to cause material adjacent said outlet to flow in a substantially horizontal direction through said outlet and said spout into said bag, a bag clamp mounted above said spout for cooperation therewith, means for actuating said bag clamp during such periods as air is supplied to said diffuser pad by said air supplying means, scale mechanism responsive to the weight of the contents of said bag, and control means responsive to the tripping of said scale mechanism for cutting off said air supplying means and for releasing said bag clamp.

7. A bag filling machine as claimed in claim 6, in which said scale mechanism includes a floating frame, said spout being supported by said floating frame, spacer points for supporting said floating frame for limited vertical movement, and means for directing a jet of air at said spacer points to clean off the surfaces of the same at periodic intervals.

8. A bag filling machine comprising a conditioning chamber for the reception of material to be packed and having an outlet at the lower portion thereof, a spout for supporting a bag to be filled, a flexible conduit communicating with said conditioning chamber and said spout, a diffuser pad located in said conditioning chamber in proximity to said outlet, means for supplying air to said diffuser pad to cause material adjacent said outlet to flow in a substantially horizontal direction through said outlet, said flexible conduit, and said spout into said bag, scale mechanism responsive to the weight of the contents of said bag and including fulcrum means and a floating frame for supporting said spout, means, including spacer points, for supporting said floating frame for limited vertical movement, a pinch valve for said flexible conduit, control means responsive to the tripping of said scale mechanism for operating said pinch valve into closed position and for cutting off said air supplying means, and means for directing a jet of air at said fulcrum means and said spacer points to clean off the same at periodic intervals.

9. A bag filling machine as claimed in claim 8, including an air line, and in which said control means includes a first solenoid valve disposed between said air line and said diffuser pad, an air cylinder for actuating said pinch valve, a second solenoid valve disposed between said air cylinder and said air line, a quick exhaust valve interposed between said second solenoid valve and said air cylinder, and means connecting the outlet port of said quick exhaust valve to said air jet directing means.

10. A bag filling machine as claimed in claim 8, including an air line, and in which said control means includes a first solenoid valve disposed between said air line and said diffuser pad, an air cylinder for actuating said pinch valve, a second solenoid valve disposed between said air cylinder and said air supply, a normally closed switch mounted for engagement by said scale mechanism when tripped, and an electric circuit including the solenoids of said two solenoid valves and said switch whereby the breaking of said electric circuit will close said first solenoid valve to deenergize said diffuser pad, and open said second solenoid valve to close said pinch valve.

11. A bag filling machine as claimed in claim 10 in which said control means also includes a quick exhaust valve interposed between said second solenoid valve and said air cylinder, and means connecting the outlet port of said quick exhaust valve to said air jet directing means, whereby the exhaust air of said air cylinder is utilized to operate said air jet directing means at the beginning of each operating cycle as said pinch valve opens.

12. A bag filling machine comprising a conditioning chamber having an outlet in the lower portion thereof, a diffuser pad in said chamber, means for causing air to flow through said diffuser pad at periodic intervals to fluidize the material contained within said conditioning chamber to cause the same to flow through said outlet in a generally horizontal direction, a hopper disposed above said conditioning chamber and communicating therewith, a feed valve located between said hopper and said conditioning chamber, means for closing said feed valve during those intervals when air is caused to flow through said diffuser pad in order to increase the ratio between air, which is effective in imparting kinetic energy to material particles located adjacent said diffuser pad,

and air which escapes upwardly through interstices between adjacent particles, a spout communicating with said outlet, and valve means located between said outlet and said spout, and being operative into open position during the intervals at which air is caused to flow through said diffuser pad, and being closed at other times.

13. A bag filling machine comprising a conditioning chamber having a substantially vertical front wall and a bottom wall, an outlet in the lower portion of said front wall at a point adjacent said bottom wall, said bottom wall comprising a porous member, and means for causing air to flow through said porous bottom wall to fluidize the material contained within said conditioning chamber to cause the same to flow through said outlet in a generally horizontal direction, said porous bottom wall being inclined at an acute angle to said front wall so as to provide adjacent said outlet an increased ratio between air which is effective in imparting kinetic energy to adjacent material particles and air which escapes upwardly through interstices between adjacent particles, and, said conditioning chamber being of trapezoidal cross section with two of the side walls tapering toward said outlet.

14. A bag filling machine comprising a conditioning chamber having a substantially vertical front wall and a bottom wall which is inclined at an acute angle to said front wall, an outlet in the lower portion of said front wall at a point adjacent said inclined bottom wall, said bottom wall comprising a porous member, means for causing air to flow through said porous bottom wall at periodic intervals to fluidize the material contained within said conditioning chamber to cause the same to flow through said outlet in a generally horizontal direction, a hopper disposed above said conditioning chamber and communicating therewith, a feed valve located between said hopper and said conditioning chamber, means for closing said feed valve during those intervals when air is caused to flow through said porous bottom wall in order to increase the ratio between air, which is effective in imparting kinetic energy to material particles located adjacent porous bottom wall, and air which escapes upwardly through interstices between adjacent particles, a spout communicating with said outlet, and valve means located between said outlet and said spout, and being operative into open position during the intervals at which air is caused to flow through said porous bottom wall, and being closed at other times.

15. In a bag filling machine of the automatic cut-off type having scale mechanism including a beam assembly and a filling spout, the combination of a floating frame for supporting said spout and having two side rails, a pair of supporting rails disposed on each side of each side rail for supporting said floating frame, said beam assembly engaging said floating frame and said spout being mounted on said floating frame so that the force exerted by a bag suspended from said spout will be transmitted to said beam assembly through said floating frame, said side rails and said supporting rails having oppositely disposed notches, and disc shaped spacer points disposed in said notches to provide low friction bearing means permitting limited up and down movement of said floating frame with respect to said supporting rails, said notches being cut on a radius in order to prevent edgewise displacement of said spacer points out of said notches.

16. Scale mechanism as claimed in claim 15 including air jet directing means for blowing off the surfaces of said spacer points and said notches at periodic intervals.

17. A bag filling machine comprising a conditioning chamber for the reception of material to be packed and having an outlet at the lower portion thereof, a spout for supporting a bag to be filled and connected to said outlet, a diffuser pad located in said conditioning chamber in proximity to said outlet, means for supplying air to said diffuser pad to cause material adjacent said outlet to flow in a substantially horizontal direction through said outlet and said spout into said bag, a bag clamp mounted above said spout for cooperation therewith, means for actuating said bag clamp during such periods as air is supplied to said diffuser pad by said air supplying means, scale mechanism responsive to the weight of the contents of said bag, and control means responsive to the tripping of said scale mechanism for cutting off said air supplying means and for releasing said bag clamp, said air supplying means including a source of air, and said control means including a first solenoid valve disposed between said air source and said diffuser pad, an air cylinder for actuating said bag clamp, a second solenoid valve disposed between said air cylinder and said air source, a normally closed switch mounted for engagement by said scale mechanism when tripped, and an electric circuit including the solenoids of said two solenoid valves and said switch, whereby the breaking of said electric circuit will cause movement of both of said solenoid valves to closed position.

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