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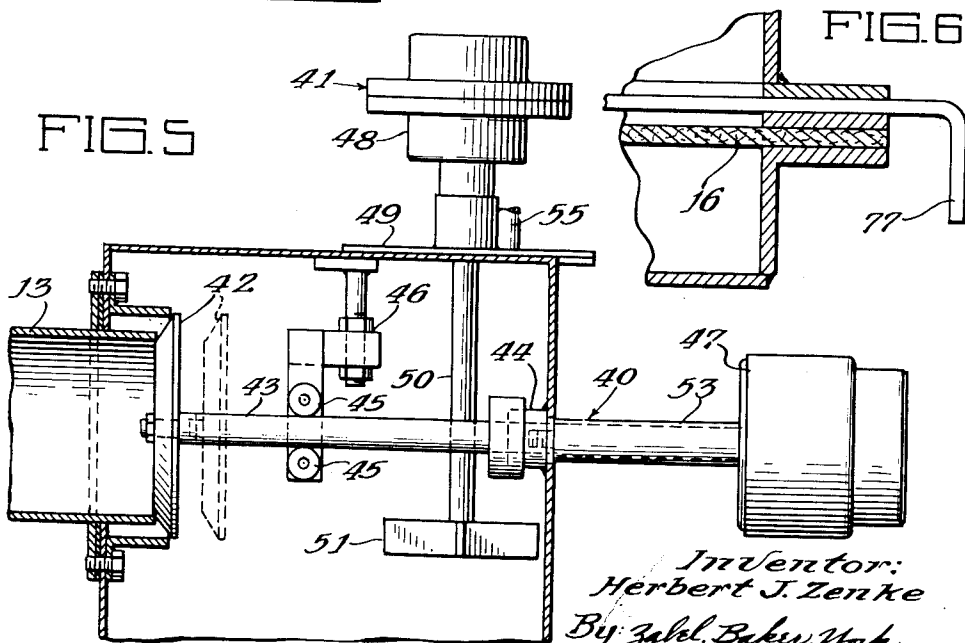
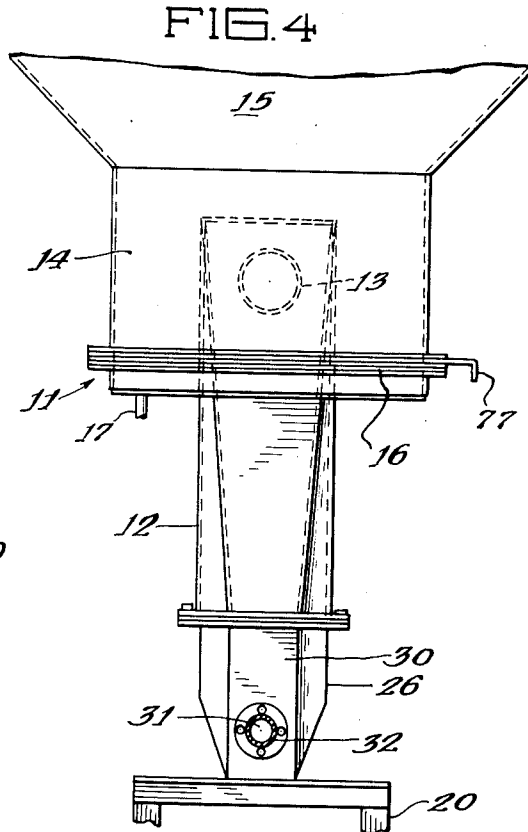
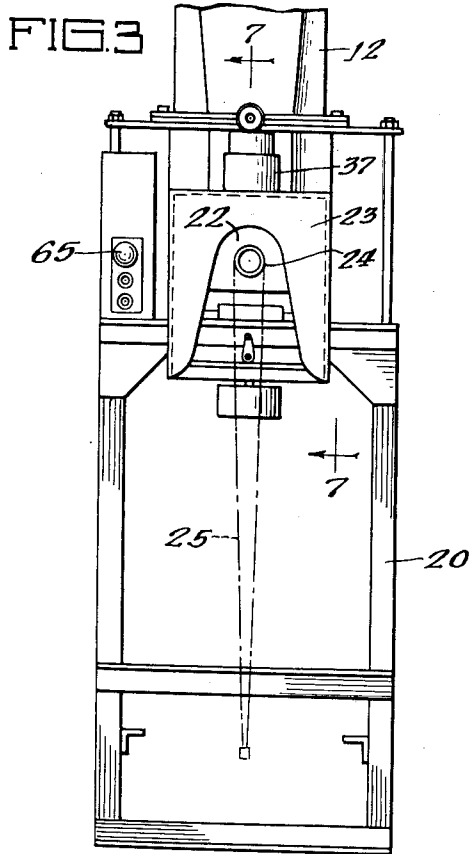
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3,073,401

METHOD AND APPARATUS FOR FILLING BAGS

Filed May 22, 1958

3 Sheets-Sheet 2



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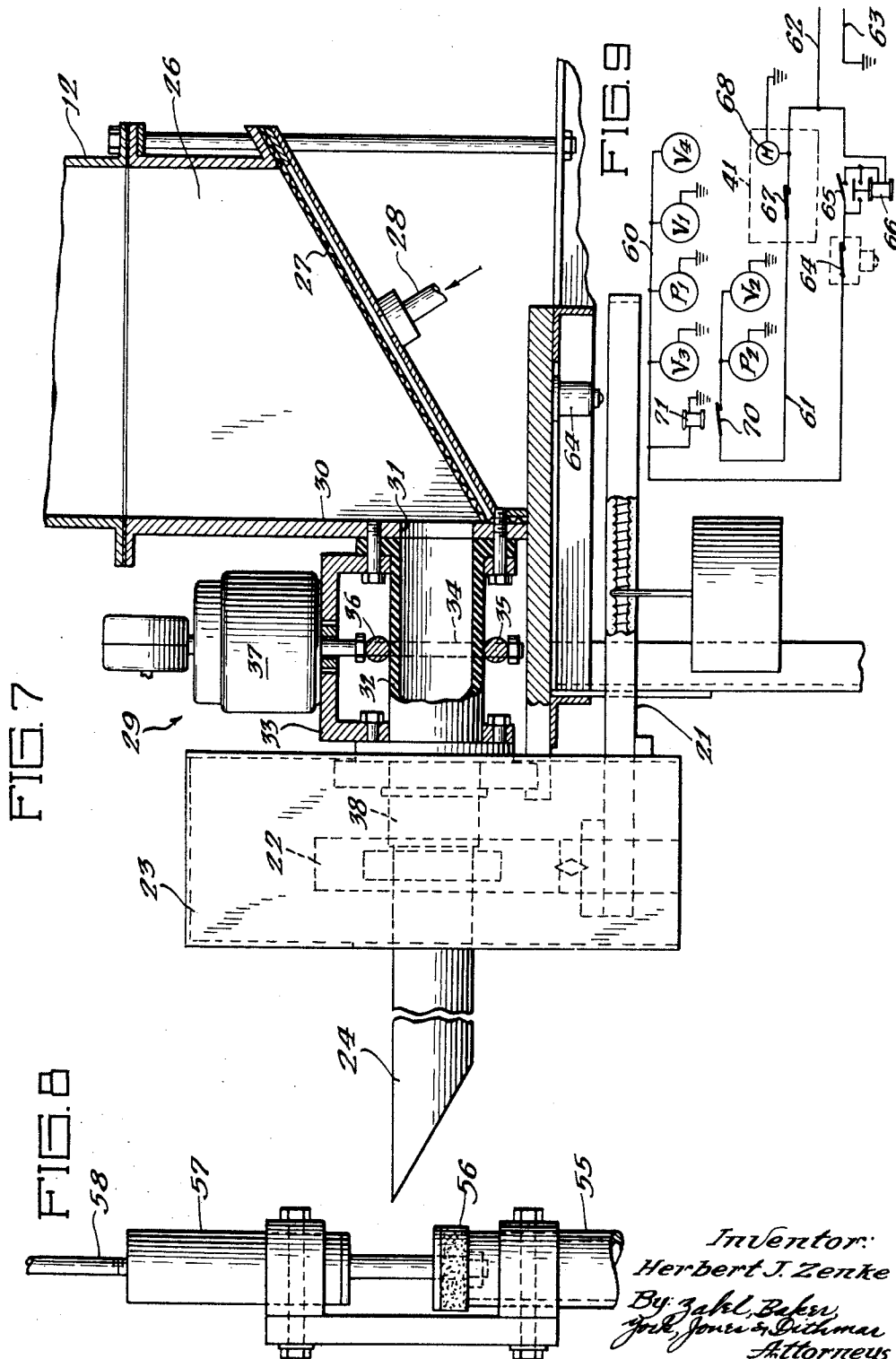
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3 Sheets-Sheet 3



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METHOD AND APPARATUS FOR FILLING BAGS
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This invention relates to an improved method and apparatus for filling bags from a hopper according to the fluidization process.

It is well known in the bag filling art that the packing and fluidization characteristics of powder or granular material differ so widely from one material to the other that it is very difficult to prophesy with certainty whether a given material can be packed by the fluidization process. As a matter of fact, these characteristics differ so widely that with respect to some materials it has been impossible to pack them by this process.

A further problem that has been encountered is that of obtaining a uniform rate of material flow through the spout. In machines of this type, the packing operation is discontinued by the provision of bag weight responsive means, and there is a certain time lag between the tripping of the weight responsive means and the discontinuance of the flow of material. If the rate of flow is not uniform, this time lag will further affect the accuracy of the filling operation.

Furthermore, the flow characteristics of a given material will vary from instant to instant within the filling cycle due to variations in external conditions, such as head, pressure, and momentum, and also due to inherent conditions, such as the presence of agglomerations. In the latter event, of course, the variations are unpredictable. More specifically, I have found that the variations in external conditions are a function of time or, in the case of pressure, can be caused to vary with time; therefore, by regulating the external conditions uniformly from cycle to cycle, one is enabled to achieve a remarkably constant duration of filling cycle and hence accurate filling.

According to the present invention, I have found that extremely accurate operation can be obtained by splitting the bag filling operation into two separate consecutive steps; the first step being a preliminary metering step which is independent of the time factor, and the second step being the final metering step in which uniformity of material flow is essential to accuracy. Since the preliminary metering step is independent of the time factor, variation in the external and inherent conditions will not affect the accuracy of the second step. Accuracy is obtained in the second step by providing uniformity of both external and internal conditions at the beginning of the filling cycle as well as during the course of the same.

I have further found that by so splitting the filling operation, I am enabled to pack many materials, of which ball-milled autoclaved mason's hydrated lime is an example, which could not previously be packed by any fluidizing process known to me. This is believed to be due, in part, to the fact that the preliminary metering step breaks up the agglomerations or otherwise modifies the inherent conditions or properties of the material in such a manner that the conditioning incident to the second will render the same fluidizable and packable.

It is an object of the present invention to provide a bag filling method and apparatus which is much more versatile in its application to different types of material than are the methods and apparatuses now commercially available.

It is a further object of this invention to provide a bag filling method and apparatus which is characterized by a uniform rate of material flow through the spout, thereby promoting greater accuracy in the filling operation.

A still further object is to provide improved condition-

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ing means, including a pressurized conditioning chamber, to the end that certain materials can be satisfactorily packed by the fluidization process.

Although the present invention contemplates a single method comprising two metering steps, or two metering steps and an intermediate conditioning step, and a single apparatus for performing this method which comprises two fluidizing and metering devices, it is possible to consider the preliminary metering device as the combination of a standard storage hopper plus a hopper discharge unit, and it is possible to consider the second metering device as a standard fluidizing type of bag filling machine plus a conditioning chamber, an example of such machine being that shown in co-pending application of Erwin M. Lau, Serial No. 608,760, filed September 10, 1956 now Patent No. 2,936,994, granted May 17, 1960.

Still another object is to provide bag filling apparatus which includes a bag filling machine of the fluidizing type and which is operative to withdraw the material to be packed from a standard type of hopper, to the end that the apparatus as a whole may be applied to whatever standard type of hopper is used in the particular art to which the material to be packed pertains.

A still further object is to provide a bag filling apparatus characterized by a rapid and uniform operating cycle.

Other objects, features and advantages of my invention 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 complete bag filling installation embodying the principle of my invention;

FIG. 2 is a plan section taken along line 2-2 of FIG. 1;

FIG. 3 is a front elevational view of the lower portion of the bag filling machine as shown in FIG. 1;

FIG. 4 is a front sectional view taken substantially along line 4-4 of FIG. 1 and showing the upper portion of the bag filling machine;

FIG. 5 is a vertical sectional elevation showing the upper interior portion of the conditioning chamber;

FIG. 6 is an enlarged detailed vertical section taken substantially along line 6-6 of FIG. 1;

FIG. 7 is a vertical section taken along line 7-7 of FIG. 3 and showing the lower portion of the conditioning chamber and the spout feeding mechanism;

FIG. 8 is an enlarged elevational view showing the vent valve; and

FIG. 9 is a wiring diagram illustrating the operation of the installation.

With reference now to FIG. 1, the apparatus comprises a bag filling machine 10 of the fluidizing type and a hopper discharge unit 11. The bag filling machine is provided with a closed conditioning chamber 12. An inlet pipe 13 extends horizontally from the hopper discharge unit 11 into the conditioning chamber so that material contained in a hopper 15 may be metered into the conditioning chamber 12.

The hopper discharge unit 11 also includes a hopper chute 14 which is suitably secured to the lower portion of the hopper 15, which may be the standard hopper used in this particular art for storing material incident to packing. The hopper discharge unit also includes a diffusing pad 16 to which is connected an air conduit 17 for actuating the same. When air is caused to flow through the conduit 17 and the diffusing pad 16, the material in the vicinity of the diffusing pad and the inlet pipe 13 will be 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 a horizontal direction through inlet pipe 13 and into the conditioning chamber 12.

With reference now to FIGS. 2, 3 and 7, the bag filling machine comprises a framework 20 which supports the conditioning chamber 12 and scale mechanism generally indicated by the reference numeral 21. The latter includes a floating frame 22, disposed within a hood 23. A 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. 2 and the bottom wall of this portion 26 constitutes a diffuser pad 27 having a suitable connection to an air conduit 28.

In operation, the material to be packed is disposed in the conditioning chamber 12. When air is caused to flow through the conduit 28 and the diffuser pad 27, the material within the conditioning chamber is fluidized. Thus, the material will flow in a 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 21 is tripped and the flow of air to the diffuser pad 27 is automatically cut off, 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 type of pinch valve 29 is provided to cut off the flow of material through the spout 24.

As shown in FIG. 7, 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 of a bracket 33. As shown in FIGS. 2 and 7, two vertical guide rods 34 extend downwardly from the bracket 33 and are connected and reinforced at the bottom by a stationary horizontal rod 35. A pinch rod 36, having cylindrically concave end surfaces for engagement with the guide rods 34, is slidably mounted between the guide rods for movement toward and away from the stationary rod 35, 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 37 which is mounted in the bracket 33, the piston being biased upwardly by a suitable spring, not shown. The air cylinder 37 is preferably of the diaphragm type.

The flange tube 32 is formed with an integral extension 38 which, as shown in FIG. 7, engages the rear end of the spout 24, and thus serves to provide a flexible conduit bridging the gap between the bracket 33 and the spout 24. Thus, the flexible extension 38 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.

The foregoing parts of the bag filling machine are described in greater detail in the aforesaid Lau application to which reference is hereby made.

As shown in FIGS. 1 and 5, mechanism, located in the upper portion of the conditioning chamber 12, is provided for effecting the preliminary metering operation by means of which a volume measured amount of material may be fed from the hopper 15 into the conditioning chamber 12. This means includes a valve 40 for the inlet pipe 13 and a level responsive device 41 which actuates the valve 40, and also a suitable air valve, not shown, for cutting off the flow of air to the diffuser pad 16.

The valve 40 comprises a valve disk 42 which cooperates with the open end of the inlet pipe 13 and is mounted on a stem 43. The stem extends through the wall of the conditioning chamber and is guided for reciprocating motion by means of a bushing 44 and a pair of guide rolls 45, the latter being mounted on a suitable bracket 46, as shown in FIG. 5. An actuating means 47 is suitably mounted on a tube 53 which surrounds the projecting portion of the stem 43. Thus, the valve disk 42 may be moved between the closed position shown in solid lines and an open position shown in dotted lines. The actuating means 47 may be in the form of a solenoid or

an air cylinder. As presently described, it is in the form of an air cylinder which, when energized, causes the valve to move into its closed position against the bias of a suitable spring. Electromagnetic means, described hereinafter, control the air supply to the actuating means 47.

The level responsive device 41 may constitute any one of several commercial devices now on the market. As shown herein, it is a rotating paddle-type of bulk material level indicator sold under the trademark Roto-Bin-Dicator of the high level normally closed type. This device constitutes a housing 48 which is mounted on a supporting plate 49, which in turn is mounted on the top wall of the conditioning chamber 12. Projecting downwardly through the supporting plate and chamber wall is a tube 50 within which is disposed a shaft. A paddle 51 is mounted on the shaft. Disposed within the housing 48 is a synchronous motor which drives the paddle. When the level of the material within the conditioning chamber rises into contact with the rotating paddle 51, it will interfere with the rotation of the paddle and stall the synchronous motor. A flexible coupling is disposed between the paddle and the armature shaft and the differential movement between the same when the motor is stalled is utilized to actuate a microswitch 67 (FIG. 9), the microswitch being biased closed so that the stalling of the paddle opens the circuit.

This particular type of level responsive device is described only by way of example, as it is clear that other types would be equally suitable for this purpose.

Means are provided to vent the conditioning chamber 12 during the preliminary metering operation so as to accommodate the air that is displaced, thus avoiding interference with the flow of material through the conduit 13. This venting means includes a vent pipe 55 which communicates with the interior of the conditioning chamber 12 and extends upwardly therefrom and terminates in a valve 56, shown in FIG. 8. Actuating means 57 are provided for the valve and may be in the form either of a solenoid or of an air cylinder. As shown, the actuating means comprises an air cylinder which in its operated position closes the valve 56, the piston being biased into valve open position. An air conduit 58 supplies air to the actuating means 57. Means, to be hereinafter described, are provided for controlling the supply of air to the actuating mechanism 57. Thus, the vent may be opened during the preliminary metering step, and closed during the second metering step during which time it is desired to control the pressure within the conditioning chamber 12.

Electrical control means, shown in FIG. 9, is provided for controlling the air supply to the diffusing pads 27 and 16, and to the various valves. As shown in FIG. 9, a solenoid valve V-1 is provided which is connected to the air cylinder 37 for actuating the pinch valve 29. A solenoid valve P-1 is connected to the air conduit 28 for energizing the diffusing pad 27. A solenoid valve V-3 is connected to the air conduit 58 which supplies air to the actuating mechanism 57 for the vent valve 56. These solenoid valves V-1, P-1, and V-3 are connected in parallel across a line 60 and ground.

When the electrical circuit 60 is energized, the valve P-1 is caused to open and the valve V-1, which is biased to open position, is caused to close. Thus, as air is supplied to the diffuser pad 27, the pinch valve 29 is open, and when the air to the diffuser pad is cut off, the pinch valve automatically closes. When the solenoid valve V-3 is energized, it opens and establishes the air supply to the actuating mechanism 57, thus closing the vent during the period that the diffuser pad 27 is energized. In other words, these three solenoid valves control the operation of the bag filling machine 10, which constitutes the second metering step.

Solenoid valve V-2, which is connected to the actuating means 47 for inlet pipe valve 40, and solenoid valve P-2, which is connected to the air conduit 17 of the dif-

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fuser pad 16, are connected in parallel across a conductor 61 and ground. When the solenoid valve V-2 is energized, it is closed, which causes the inlet pipe valve 40 to move into its open position. When the solenoid valve V-2 is de-energized, the inlet pipe valve 40 closes. When the solenoid valve P-2 is energized, the diffuser pad 16 is energized to cause the preliminary metering step to take place. In other words, energization of the conductor 61 causes the material to flow from the hopper 15 through the inlet pipe 13 and past the open valve 40 into the conditioning chamber 12. When the conductor is de-energized, the flow is discontinued.

Conductors 60 and 61 constitute the two branches of the control circuit, these two conductors being connected to one of the power lines 62, 63 and the other power line 63 being shown as grounded for the purpose of convenience.

Interposed in the branch circuit 60 and in series with the solenoid valves V-1, P-1, and V-3 is a normally closed microswitch 64 and a normally opened starting switch 65. A holding relay 66 is connected in parallel with the normally opened starting switch 65. Thus, the circuit is established by closing the starting switch 65; it is maintained by the holding relay 66; and it is broken by operation of the microswitch 64. As shown in FIG. 7, the microswitch 64 is opened by the tripping of the scale mechanism 21, and thus causes discontinuance of the second metering operation.

Interposed in the conductor 61 and in series with the solenoid valves V-2 and P-2 is the level responsive device 41, which includes a normally closed switch 67 and the aforementioned synchronous motor 68. Thus, when the synchronous motor 68 is stalled, the branch circuit 61 is de-energized to discontinue the preliminary metering step.

Relay means are provided to render the branch circuit 61 inoperative during energization of the branch circuit 60. This relay means comprises a biased closed relay switch 70 in series circuit with the solenoid valves P-2 and V-2 and a relay coil 71 connected across the branch circuit 60 and ground. Thus, immediately after the discontinuance of the bag filling operation, the solenoid valves P-2 and V-2 are energized to initiate the flow of material into the conditioning chamber.

To summarize the operation which has been heretofore described in detail in connection with the various parts and sub-assemblies, the operating cycle is initiated by depressing the start button 65 at a time when the conditioning chamber is filled up to a predetermined level and the inlet valve 40 is closed. The start button energizes the branch circuit 60 which closes the vent 55, supplies air to the pad 27, and opens the pinch valve 29. The material adjacent opening will be fluidized, and due to the head on the material, it will start to flow through the spout into the bag. Since the conditioning chamber is now sealed, the air pressure in the chamber will build up to create an artificial head which compensates for the decrease in actual head as the material level drops. The presence of pressure also increases the ratio of fluidizing air to escaping air, as pointed out in the aforesaid Lau application. However, in those cases where it is desired not to increase the fluidizing air beyond a predetermined optimum measured in cubic feet per minute, it is possible according to my invention to regulate the pressure independently by means of an auxiliary air supply 75 which may lead into the conditioning chamber directly, or through a diffuser pad 76, as shown in FIG. 1. This can be controlled by a solenoid valve V-4 connected into the branch circuit 60 to bring the pressure up very rapidly to increase the total head in the case of materials which require, in order to establish flow, a head which is greater than that provided by the material level.

The actual head may be regulated within limits by changing the dimensions of the conditioning chamber and by shifting the elevation of the paddle 51. Thus, accord-

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ing to my invention, the actual head, the pressure, and the fluidizing air may all be regulated independently of each other in setting up the apparatus for a particular type of material. Thus the optimum combination of external conditions may be secured for that material.

By providing a free space at the top of the conditioning chamber, it is possible to provide for the initial expansion of the material when the diffuser pad 27 is first energized. The diffusing air not only fluidizes the material immediately adjacent to the pad 27, but also conditions the upper layers in a manner which renders the actual head fully effective. In other words, the combination of free space and escaping air eliminates the tendency to pack, with the result that spout flow is instituted immediately and continues with uniformity.

As a result of the uniformity of both external and internal conditions, as outlined above, the duration of the filling cycle is remarkably uniform and a high degree of accuracy in the second metering step is obtained.

Upon the tripping of the scale mechanism 21, the branch circuit 60 is de-energized, thereby closing the pinch valve 29 and discontinuing the bag filling operation. This also energizes the branch circuit 61 to initiate the preliminary metering step.

The purpose of the preliminary metering step, as previously explained, is to feed into the conditioning chamber an amount of material which is roughly accurate, in order that a predetermined material level may be provided for the second metering step. Upon energization of the branch circuit 61 which controls the preliminary metering operation, the diffuser pad 16 is energized, and the inlet air valve 40 is opened. Since the bin 15 may be the standard storage bin provided, and in which the material may have been standing for some time, it is clear that the external conditions, such as head, are not uniform, and furthermore the internal conditions of the material may not be uniform. However, these variations are not critical since a uniform rate of flow is not essential to the preliminary metering operation. Furthermore, by providing a fluidizing type of metering operation, a preliminary conditioning of the material is obtained which will tend to break up agglomerations at least to the extent that it will flow through the inlet pipe 13, which is of fairly large diameter. In other words, it is easier to establish flow of material through a large diameter pipe than it is through a small diameter, and for this reason, the diameter of the inlet pipe 13 is considerably greater than the diameter of the spout 24.

The provision of a large diameter inlet pipe also speeds up considerably the preliminary metering step, with the result that the complete cycle of operation is considerably reduced.

The provision of vent 55 also accelerates the preliminary metering operation for the reason that the displaced air does not have to move through the inlet pipe against the direction of material flow.

As soon as the material level in the conditioning chamber 12 rises to the height of the paddle 51, the preliminary feeding step is discontinued by the closing of the inlet valve 40 and the cutting off of the air to the diffuser pad 16. At this time, both of the branch circuits 60 and 61 are de-energized, and the mechanism is ready for the subsequent operating cycle.

As an example of the quantities involved in the application of this method and apparatus to the packing of ball-milled autoclaved mason's hydrated lime, the area of the diffusing pad 27, which is formed of three-ply canvas belting or of fabric of comparable permeability such as Fuller fabric, may be 126 square inches, and the area of the diffusing pad 16 may be 636 square inches. Assuming that the material is to be packed in 50 pound bags, the conditioning chamber 12 may be dimensioned so that it will accommodate about 100 pounds of material, providing an average initial head of about 36 inches, and a free space of about 12 inches.

Air is supplied to the diffuser pad 27 during operation at a pressure of 3 pounds per square inch and at a rate of 12 cubic feet per minute. The air pressure at the diffuser pad 16, during operation is 3 pounds per square inch. The diameter of the inlet pipe 13 is 6 inches, and the inner diameter of the spout 24 is 1½ inches.

Under these conditions, the bag filling or weight metering step takes 10 seconds, which period has been found to be uniform within less than plus or minus 10%. The weight accuracy is uniform within plus or minus 4 ounces. The preliminary or volume metering step occupies about 3 seconds.

In the foregoing example, it is preferred not to use any auxiliary air supplied by the diffusing pad 76. However, in the packing of zinc stearate, auxiliary air would preferably be supplied at the rate of 10 cubic feet per minute.

The slide 77 shown in FIG. 6 is provided to shut off the hopper 15 when it is desired to replace the diffusing pad 16 or to perform other service operations.

As previously indicated, the various valves may be actuated electrically, if desired. Furthermore, a suitable timing device may be applied in conjunction with the solenoid valve V-4 to cut off the auxiliary air at an intermediate portion of the cycle, although substantially the same effect may be obtained by regulating the line pressure in air conduit 75.

Although only a preferred embodiment of this invention has 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. Apparatus for filling bags from a hopper comprising a bag filling machine which includes a conditioning chamber, said conditioning chamber being laterally spaced from the lower portion of said hopper, a conduit extending from said hopper into said conditioning chamber, a first diffuser pad located in said hopper adjacent to the inlet of said conduit, a second diffuser pad located at the bottom of said conditioning chamber for fluidizing the material in said conditioning chamber, first valve means for sealing the outlet of said conduit to prevent reverse flow of air from said conditioning chamber into said hopper, level responsive means disposed in said conditioning chamber and being operative to cut off the flow of air to said first diffuser pad and to close said first valve when the material being fed into said conditioning chamber reaches a predetermined level, a filling spout disposed at the lower end of said conditioning chamber for filling a bag suspended therefrom, second valve means disposed between the outlet of said filling spout and said conditioning chamber, bag weight responsive means operative for cutting off the air supply to said second diffuser pad and for closing said second valve when a predetermined amount of material has been fed into said bag, and means controlled by the operation of said weight responsive means for establishing the flow of material from said hopper through said conduit and into said conditioning chamber at the time that the flow of material through said spout is discontinued.

2. Apparatus as claimed in claim 1 including vent means for said conditioning chamber, and means for rendering said vent means inoperative during the time that material is flowing through said spout.

3. Apparatus for filling bags from a hopper comprising a bag filling machine which includes a conditioning chamber, inlet means for said conditioning chamber, a diffuser pad located at the bottom of said conditioning chamber for fluidizing the material in said conditioning chamber, first valve means for closing said inlet means to prevent reverse flow of air from said conditioning chamber into said hopper, level responsive means disposed in said conditioning chamber and being operative to close said first valve means when the material being fed into said con-

ditioning chamber reaches a predetermined level, a filling spout disposed at the lower end of said conditioning chamber for filling a bag, second valve means disposed between the outlet of said filling spout and said conditioning chamber, bag weight responsive means operative for cutting off the air supply to said diffuser pad and for closing said second valve means when a predetermined amount of material has been fed into said bag, and means controlled by the operation of said weight responsive means for opening said first valve means to establish the flow of material from said hopper through said inlet means and into said conditioning chamber at the time that the flow of material through said spout is discontinued.

4. Apparatus for filling bags from a hopper comprising a bag filling machine which includes a closed conditioning chamber, inlet means for said conditioning chamber for permitting material to flow from said hopper into said conditioning chamber, a diffuser pad located at the bottom of said conditioning chamber for fluidizing the material in said conditioning chamber, first valve means for closing said inlet means for cutting off the flow of material there-through and to prevent the escape of air from said conditioning chamber during a bag filling operation, level responsive control means disposed in said conditioning chamber and being operative to close said first valve means when the material being fed into said conditioning chamber reaches a predetermined level, a filling spout disposed at the lower end of said conditioning chamber for filling a bag, second valve means disposed between the outlet of said filling spout and said conditioning chamber for cutting off the flow of material through said spout, bag weight responsive control means for closing said second valve means when a predetermined amount of material has been fed into said bag, and means controlled by the operation of one of said control means for opening the valve means associated with the other of said control means to establish the flow of material through the valve means associated with said other control means at the time that the flow of material through the valve means associated with said first mentioned control means is discontinued.

5. A bag filling apparatus as claimed in claim 4 in which said level responsive means is located below the top of said conditioning chamber by a distance which provides a free space above said predetermined level such that the volume of said free space is less than the volume represented by the said predetermined amount of material to be fed into said bag.

6. Bag filling apparatus as claimed in claim 4 in which the total volume of said conditioning chamber is between two and three times the volume occupied by said volume measured amount of material.

7. Bag filling apparatus as claimed in claim 4 including an air inlet located in said conditioning chamber at a point above said level responsive means, and air supply means for said inlet for supplying air to said free space to create an artificial head to increase the rate of flow of fluidized material through said spout and into said bag.

8. Apparatus for filling bags from a hopper comprising a bag filling machine which includes a conditioning chamber, said conditioning chamber being spaced from the lower portion of said hopper, a conduit extending from said hopper into the upper end of said conditioning chamber, a first diffuser pad located in said hopper adjacent to the inlet of said conduit, a second diffuser pad located at the bottom of said conditioning chamber for fluidizing the material in said conditioning chamber, first valve means for closing said conduit to prevent reverse flow of air from said conditioning chamber into said hopper, level responsive means disposed in said conditioning chamber and being operative to cut off the flow of air to said first diffuser pad and to close said first valve when the material being fed into said conditioning chamber reaches a predetermined level, a filling spout disposed

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at the lower end of said conditioning chamber for filling a bag suspended therefrom, second valve means disposed between the outlet of said filling spout and said conditioning chamber, bag weight responsive means operative for cutting off the air supply to said second diffuser pad and for closing said second valve when a predetermined amount of material has been fed into said bag, and means controlled by the operation of said weight responsive means for opening said first valve means to establish the flow of material from said hopper through said conduit and into said conditioning chamber at the time that the flow of material through said spout is discontinued.

9. Apparatus for filling bags from a hopper comprising a bag filling machine which includes a conditioning chamber, inlet means for said conditioning chamber, a diffuser pad located at the bottom of said conditioning chamber for fluidizing the material in said conditioning chamber, first valve means for closing said inlet means to prevent reverse flow of air from said conditioning chamber into said hopper, vent means for said conditioning chamber, level responsive means disposed in said conditioning chamber and being operative to close said first valve means when the material being fed into said conditioning chamber reaches a predetermined level, a filling spout disposed at the lower end of said conditioning chamber for filling a bag, second valve means disposed between the outlet of said filling spout and said conditioning chamber, bag weight responsive means operative for opening said vent means and for closing said second valve means when a predetermined amount of material has been fed into said bag, and means controlled by the operation of said weight responsive means for opening said first valve means to establish the flow of material from said hopper through said inlet means and into said conditioning chamber at the time that the flow of material through said spout is discontinued, said vent means being inoperative during the time that material is flowing through said spout.

10. Apparatus for filling bags from a hopper comprising

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a bag filling machine which includes

a closed conditioning chamber,

inlet means for said conditioning chamber,

a diffuser pad located at the bottom of said conditioning chamber

for fluidizing the material in said conditioning chamber,

first valve means for closing said inlet means

to prevent the escape of air from said conditioning chamber during a bag filling operation,

level responsive means disposed in said conditioning chamber and being operative to close said first valve means when the material being fed into said conditioning chamber reaches a predetermined level,

a filling spout disposed at the lower end of said conditioning chamber for filling a bag,

second valve means disposed between the outlet of said filling spout and said conditioning chamber for cutting off the flow of material through said spout,

bag weight responsive means for closing said second valve means when a predetermined amount of material has been fed into said bag, and

means controlled by the operation of said weight responsive means for opening said first valve means to establish the flow of material from said hopper through said inlet means and into said conditioning chamber at the time that the flow of material through said spout is discontinued.

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