

[54] **AUTOMATIC APPARATUS FOR PACKAGING POWDERED MATERIAL WITH UNIFORM BAG WEIGHT AND WITH DUST-FREE OPERATION**

[72] Inventor: **Kaisuji Obara**, No. 2233-42, Minami Tsunashima-cho, Kohoku-ku, Yokohama, Japan

[22] Filed: **Jan. 25, 1971**

[21] Appl. No.: **109,299**

[52] U.S. Cl.**141/59, 141/68, 141/83, 141/93, 141/128, 141/317, 141/118, 177/160**

[51] Int. Cl.**B65b 31/02**

[58] Field of Search....**141/67, 68, 83, 128, 317, 359, 141/59, 10, 93; 177/117, 118, 160, 123**

[56] **References Cited**

UNITED STATES PATENTS

1,880,562	10/1932	Weckerux	177/123
3,133,609	5/1964	Lau	177/160
3,366,190	1/1968	Lau	177/160

FOREIGN PATENTS OR APPLICATIONS

1,445,308	5/1966	France	141/359
-----------	--------	--------------	---------

Primary Examiner—Houston S. Bell, Jr.
Attorney—Oberlin, Maky, Donnelly & Renner

[57] **ABSTRACT**

An automatic packaging apparatus for powdered material comprising a hopper for containing such material, a chamber disposed beneath said hopper and a housing arranged beneath the bottom of said chamber. Air inlet means are provided for admitting air into the chamber and the housing for fluidizing the material delivered thereto. The housing is provided with clog inhibiting means for urging the fluidized material through and out of said housing. Flow control means is connected to feed pipe means for controlling the rate of flow of the material through said feed pipe means, said filling means is associated with the flow control means for discharging the material into a bag, the filling means being provided with a flexible sleeve for assisting smooth flow of the material. Automatic weighing means is operatively connected to the flow control means to selectively regulate material flow according to bag weight whereby a plurality of bags may be filled to a uniform weight, and a bag seat means is arranged independent of the weighing means for urging the delivery of the bag from the apparatus. The dust in said chamber and at said filling means is recirculated back into the hopper.

14 Claims, 13 Drawing Figures

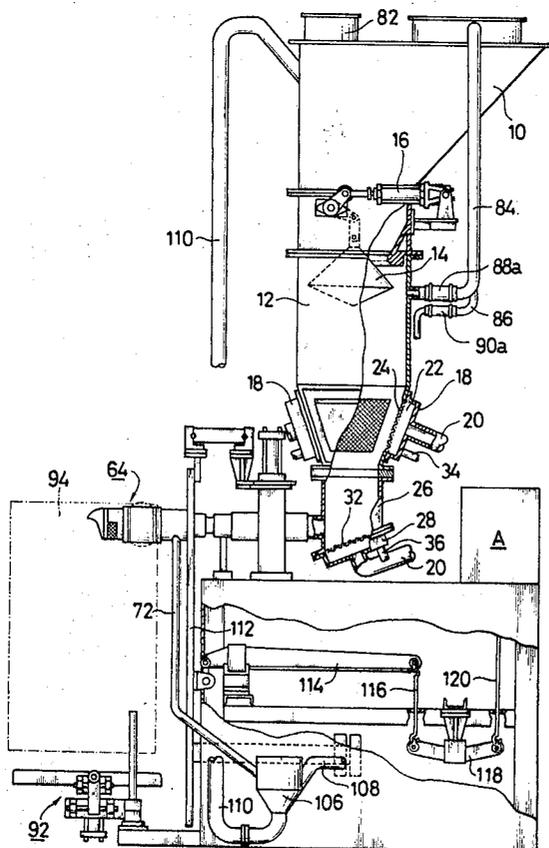


FIG.2

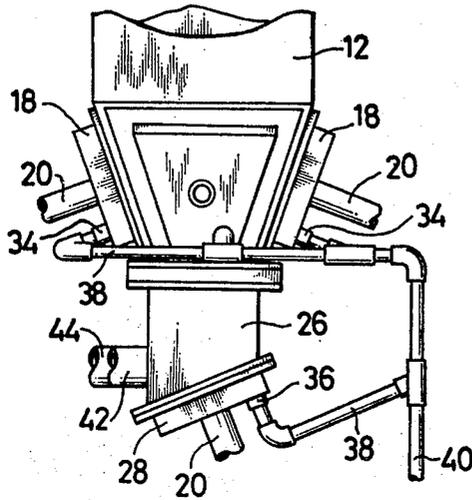


FIG.3

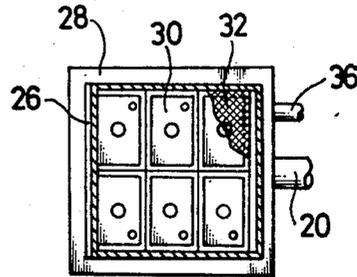


FIG.4

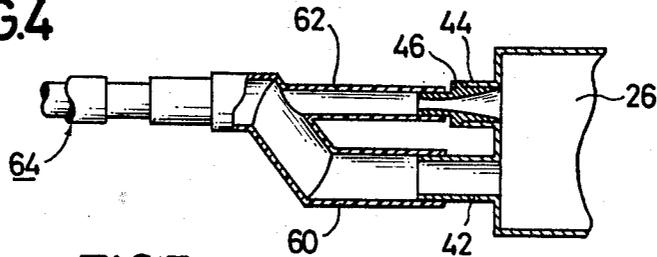


FIG.5

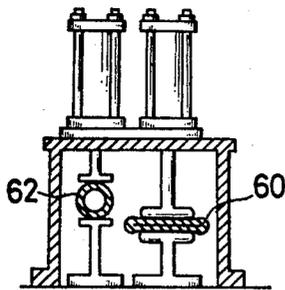
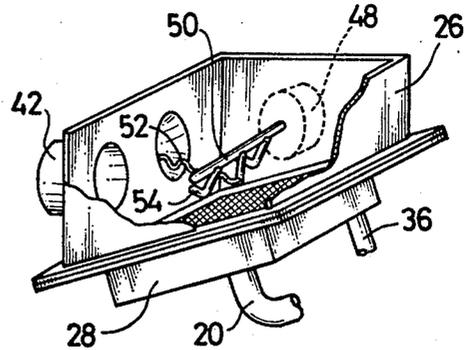


FIG.6



INVENTOR

KATSUJI OBARA

FIG.7a

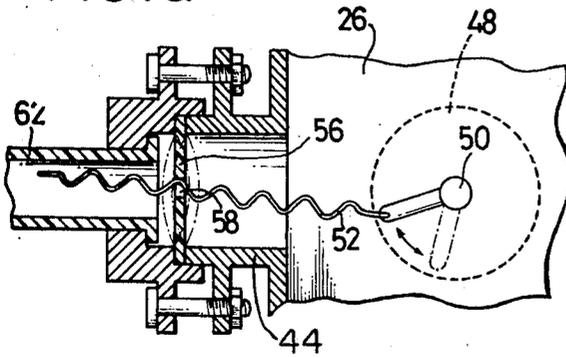


FIG.7b

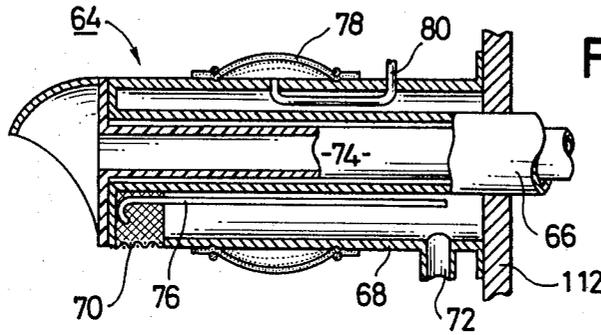
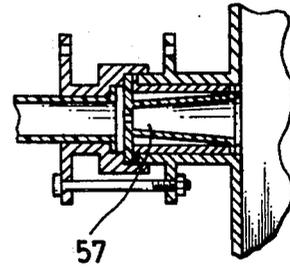


FIG.8

FIG.10

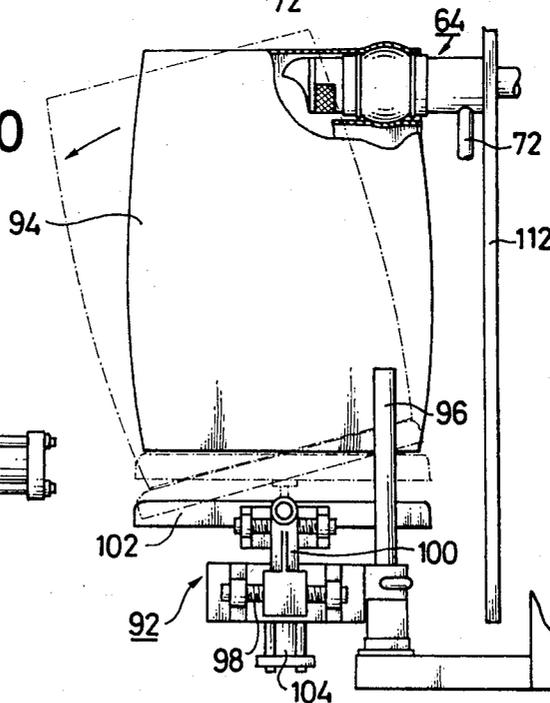
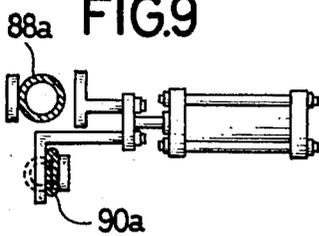


FIG.9



INVENTOR

KATSUJI OBARA

FIG.11

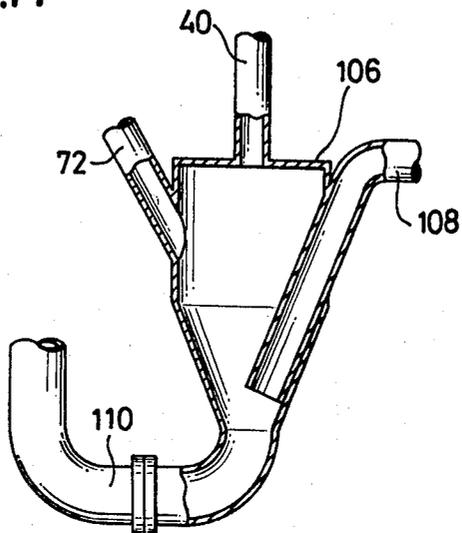
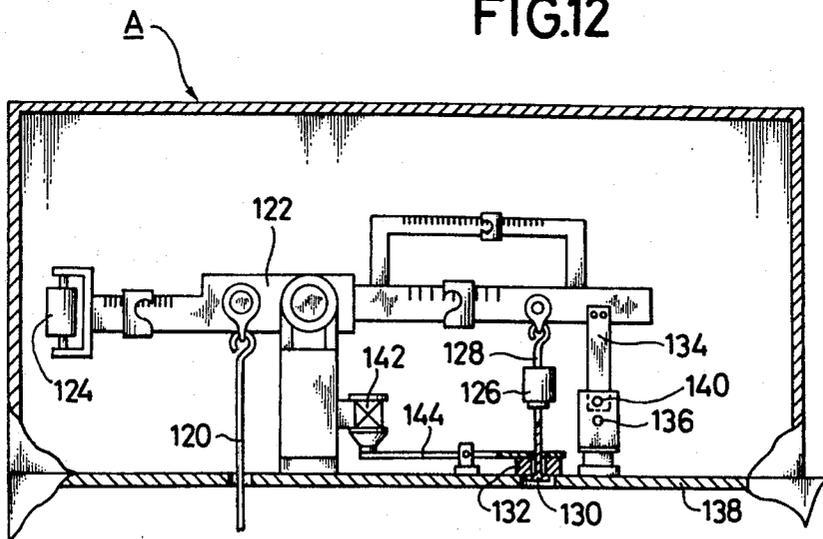


FIG.12



INVENTOR

KATSUJI OBARA

AUTOMATIC APPARATUS FOR PACKAGING POWDERED MATERIAL WITH UNIFORM BAG WEIGHT AND WITH DUST-FREE OPERATION

This invention relates to an automatic apparatus for packaging powdered or granular materials such as carbon black, starch, wheat flour, fly ash, powdered synthetic resin, diatomaceous earth, fertilizer and other fine chemical by-products, with uniform bag weight and with dust-free operation, while in a fluidized state of the materials.

According to the packer heretofore used, uniformity of the bag weight is not obtained due to the difficulties in the fine bag discharge of the material to be packaged.

Further, the air impervious bags such as polyethylene, polyvinyl, vinyl bags or laminated paper bags, for example, are used to prevent the packaged material from being moistened. According to the conventional apparatus of this class, however, the quick filling of the material into such air impervious bag cannot be accomplished since the material escapes outside through the clearance formed between the discharge spout and the inlet of the bag.

Moreover, adhesive material is likely to adhere to an inner circumferential wall of a discharge spout or conduit thereby causing an undesirable clogging of the discharge spout during the packaging operation.

According to the conventional single air inlet system, the powdered or granular material to be packaged is not uniformly fluidized and is rather bound or bridged under the extensive air pressure, increasing the air pressure more with increase of the coagulation of the material. As a result, the performance of the packer is remarkably reduced.

It is, therefore, a principal object of the invention to eliminate the above difficulties and disadvantages and to provide a new automatic apparatus for dispensing and packaging powdered or granular material with accurate and uniform bag weight and with dust-free operation, which enables the accomplishment of such packaging even for the air impervious bag with a high filling speed.

Another object of the invention is to provide an automatic apparatus for packaging powdered material with uniform bag weight in which means for filling the material is provided with a flow control system which comprises a control pipe of large diameter for full flow of the material to be packaged and a control pipe of small diameter for dribble flow of the material, both of said control pipes being connected to a flexible manifold of different diameters which can be pinched alternately by a flow cut-off control arrangement so that the flow rate of the material at the final step of the packaging operation is finely controlled.

Still another object of the invention is to provide an automatic apparatus for packaging powdered material with uniform bag weight in which the filling means accommodates an inner retractable sleeve for preventing an inner circumferential wall of the filling means from being adhered with the adhesive material to be packaged.

Another object of the invention is to provide an automatic apparatus for packaging the powdered or granular material in which an air inlet means is divided into a plurality of small air inlets which are communicated with an air manifold so that the material is fluidized uniformly.

Yet another object of the invention is to provide an automatic apparatus for packaging the powdered or granular material in which a clog inhibiting means is arranged in the housing for assisting the smooth flow of material to be packaged through the control pipe of small diameter for dribble flow of the material.

Another object of the invention is to provide an automatic apparatus for packaging powdered material with uniform bag weight in which filling means at its open end is provided with a filtering mesh means so that the air discharged into the bag together with powdered material may be exhausted through an exhaust pipe connected to the said filling means of the material.

A further object of the invention is to provide an automatic apparatus for packaging powdered material with uniform bag weight in which an outer periphery of the filling means at its base portion is provided with a retractable valve means into which an air supply pipe is connected so that the clearance formed between the filling means and the inlet of the bag may be sealed airtight when the said valve means is expanded by the air supply.

Still a further object of the invention is to provide an automatic apparatus for packaging powdered material with uniform bag weight in which a weighing system comprises a main balance weight means somewhat lighter than a predetermined desired filled bag weight and an auxiliary weight for balancing the predetermined bag weight, detecting means operative just before the predetermined bag weight is attained, and means for temporarily stopping the auxiliary weight at a certain level.

Yet a further object of the invention is to provide an automatic apparatus for packaging the powdered or granular material in which a bag seat means is arranged independent of the weighing means for urging the separation of the filled bag from the filling means.

And a further important object of the invention is to provide an automatic apparatus for packaging powdered material with dust-free operation and a high filling speed in which air exhaust means are connected to the air inlet units arranged at the lower convergent portion of the air chamber and at the bottom of the housing, and to the filling means and are assembled into the dust collecting means which communicates with a feed back conduit leading to a hopper so that all the leaked dusts are perfectly fed back by the circulation system.

According to one aspect of the present invention there is provided an automatic packaging apparatus for powdered material, said apparatus comprising hopper for containing powdered material to be packaged, a chamber disposed beneath said hopper, said chamber being provided at its upper portion with an air exhaust outlet for discharging air therefrom after packaging has been finished and at its lower downwardly convergent portion with at least two first air inlets for blowing air into said chamber, a housing arranged beneath the downwardly convergent portion of said chamber and provided at its bottom portion with a second air inlet for admitting air into said housing to support the material, flow control means connected to said housing for controlling the rate of flow of the material along a feed pipe from the housing, clog inhibiting means arranged in said housing for assisting the smooth flow of material to be packaged through the control pipe of

small diameter of said flow control means, filling means connected with said flow control means for discharging the material into a bag, a retractable sleeve accommodated in said filling means for preventing an inner circumferential wall of filling means from being adhered with the material to be packaged, automatic weighing means which is cooperative with said flow control means, a bag seat means arranged independent of said weighing means for urging the separation of the filled bag from the filling means, and means for feeding dust in said chamber back into said hopper.

These and other objects and advantages of this invention will become readily apparent and be understood from the following description of an embodiment by way of example, reference being made to the accompanying drawings in which the same reference numerals designate the same or similar parts throughout the drawings, in which:

FIG. 1 is a schematic view of automatic apparatus for packaging powdered material;

FIG. 2 is a fragmentarily enlarged front view of the air inlets;

FIG. 3 is a fragmentarily enlarged plan view of one of the air inlets;

FIG. 4 is a fragmentarily enlarged sectional view of the flow control system comprising two feed pipes with pinch couplings of different diameters;

FIG. 5 is a pictorial view illustrative of the operation of the flow control system of FIG. 4, showing the larger coupling squeezed shut and the smaller coupling open;

FIG. 6 is a fragmentarily enlarged perspective view of the housing a portion of which is broken away to show one form of the clog inhibiting means;

FIGS. 7a and 7b are fragmentarily enlarged sectional views of alternative forms of the clog inhibiting means;

FIG. 8 is a fragmentarily enlarged cross-sectional view of the filling means;

FIG. 9 is a pictorial view illustrative of the operation of the air exhaust outlet;

FIG. 10 is a lateral view of the bag seat means illustrative of the operation of the bag in separating from the discharge spout;

FIG. 11 is a fragmentarily enlarged sectional view of the dust collecting means; and

FIG. 12 is a pictorial view of the weighing means.

Referring to FIGS. 1 and 2, powdered material is charged into a hopper 10 and subsequently the material is dropped, in a suitable quantity, into a chamber 12 by opening a cone valve 14 operable by an action of an air cylinder 16 arranged at the constriction of the hopper 10.

On the convergent portion of the chamber 12 are provided four air inlet units 18 for fluidizing the powdered material in the chamber 12. The four air inlet units 18 may be replaced by two or three units in order to achieve fluidization of the material to be packaged.

Compressed air supplied through an air pipe 20 is introduced into an intermediate chamber 22 and then blown into the chamber 12 through an air-pervious pad 24 to fluidize the material in the chamber 12. When this happens the powdered material is directed downwardly by the air flow into a housing 26 connected to the lower end of the chamber 12.

A further air inlet unit 28 is provided at the bottom of the housing 26 to bear the powdered material which has left the chamber 12 in a fluidized state.

As best shown in FIG. 3, the air inlet unit 28 is further divided into a plurality of air inlets 30 so that the material is fluidized uniformly by the compressed air supplied through an air pipe 20.

If air inflow through the pads 24 and 32 is continued even after the air charge exceeds a certain limit in the chamber 12, as well as the housing 26, the powdered material is bound or bridged under the extensive air pressure, increasing the air pressure more with increase of the coagulation of the material. As a result, the performance of the packer is remarkably reduced.

To avoid the above nuisance, the exhaust pipes 34 and 36 are connected to the air inlet units 18 and 28 to relieve the pressure in the chamber 12 and the housing 26. The other ends of the exhaust pipes 34 and 36 are connected to an intermediate pipe 38 encompassing the air inlets 18, which is further connected to a main conduit 40 communicating with dust collecting means hereinafter illustrated.

By this construction high pressure air permeates through the inclined air-pervious pads 24 and 32 stretched between the air chamber, the housing and the air inlet units, and is directed together with the dust, to the exhaust pipes 34 and 36, and then collected in a dust chamber as hereinafter will be described. Accordingly, the air-pervious pads may be prevented from becoming blocked by the dust.

In FIGS. 4 and 5, the flow control system illustrated comprises a feed pipe 42 of large diameter for the full flow of the material and a feed pipe 44 of smaller diameter for the dribble flow of the material, which latter is provided with a detachable fitting 46 having a conical constriction. The inner diameter of the fitting 46 may be determined in accordance with the particle size of the material to be packaged.

The entrance of the fitting 46 is likely to suffer from the clogging of the material to be packaged. To avoid this nuisance, the clog inhibiting means 48 is provided in the entrance of the feed pipe 44 of a smaller diameter for disintegrating the material bounded or bridged in the constriction of the fitting 46.

As best shown in FIG. 6, the clog inhibiting means 48 comprises a main shaft 50 having a center spiral bar 52 extending into the feed pipe 44 and opposite agitating rods 54 for stirring the material. The shaft 50 is given a swing motion of about 45° by a rotary solenoid arranged at one outer side of the housing 26 as best shown in FIG. 6.

In another form of the clog inhibiting means as best shown in FIG. 7a, a flexible diaphragm 56 having a center hole 58 is provided in the entrance of the feed pipe 44. The spiral bar 52 reciprocates through the center hole 56 entailing oscillation of the diaphragm 54 so that the material adhered to the diaphragm is peeled off and subsequently urged into the feed pipe 44 through the center hole 58 of the diaphragm 56.

Alternatively, a bracket orifice 57 possessing two symmetrically inclined members and one vertical member with a center aperture of expansible material may be provided in the entrance of the feed pipe 44 as best shown in FIG. 7b so that the material adhered to the inner surface of the said bracket orifice may be peeled off by an expansion of the bracket orifice under the air pressure.

Now back to FIG. 4 again, the feed pipes 42 and 44 of different sizes are connected to breeches pinch

couplings 60 and 62, which at its convergent portion is connected to a discharge spout 64.

The flow control system cooperates with the weighing system, and immediately before the powdered material packaged in the bag comes to the predetermined desired bag weight, the pinch coupling 60 of larger diameter is squeezed shut by a cut-off device of known construction, to close the feed pipe 42 for the full flow, while the pinch coupling 44 of smaller diameter is opened to permit dribble flow of the material, as is shown in FIG. 5. When the material in the bag comes to the predetermined weight, the pinch coupling 62 of smaller diameter is squeezed shut to close the feed pipe 44 for dribble flow. The packaging operation is thus carried out under uniform and accurate bag weight control.

As best shown in FIG. 8, the filling means, designated by reference numeral 64, comprises a discharge spout 66 and an outer sleeve 68. An open end of the outer sleeve 68 is provided with a mesh filter 70 such as a wire screen or cloth of mesh size corresponding to the particle size of the powdered material to be packaged. To the lower periphery of the outer sleeve 68 is connected an air exhaust conduit 72.

The adhesive material such as pigment is likely to adhere to the inner circumferential wall of the filling spout thereby to cause the clogging of the discharge spout. To avoid this nuisance, a flexible sleeve 74 is inserted into the discharge spout 66. The material adhered to the inner circumferential wall of the filling spout 66 is peeled off by the retractive motion of the flexible sleeve 74 on the filling operation.

The powdered material discharged together with the air flow is precipitated in the bag, while the air is exhausted through the mesh filter 70 and the outer sleeve 68 to the exhaust conduit 72. In this case, some dust is exhausted together with the air flow, and the dust is subsequently directed through the exhaust conduit 72 and collected in the dust chamber which hereinafter will be described, so that any leakage of dust from the apparatus may be prevented.

With this construction, automatic packaging of the powdered material in the air impervious bag may be effected at a higher speed than with a conventional packer. In the outer sleeve 68 is arranged an air cleanout pipe 76 for cleaning the mesh filter 70 to prevent any clogging thereof.

The outer sleeve 68 is provided around its outer periphery with an expansible membrane 78 to which an air supply pipe 80 is connected. After the insertion of the filling means 64 into the inlet of a bag, air is supplied to the interior of the membrane 78 to expand the membrane radially, as is shown in FIG. 8, so that the clearance formed between the inlet of the bag and the filling spout 64 is sealed airtightly to inhibit any leakage of the material. The air supply pipe 80 may also act as an exhaust pipe, so that when the packaging operation is finished the air enclosed by the membrane 78 is exhausted through the air supply pipe 80, to allow the membrane 78 to return to its original flat state.

The air pressurized in the hopper 10 is discharged to the atmosphere through an air vent 82 provided with a filter, and after the packaging operation the air in the chamber 12 is exhausted through the exhaust pipe 84 and fed to the hopper 10. As shown in FIGS. 1 and 9,

the exhaust pipe 84 is provided with an auxiliary cleanout pipe 86 connectable to a source of compressed air, so that when a flexible coupling 88a is squeezed shut by a cut-off device of known construction a pinch coupling 90a is opened to supply air through the cleanout pipe 86 to clean the inside of the exhaust pipe 84. On the other hand, when the coupling 88a is opened to exhaust the air in the chamber 12, the pinch coupling 90a is squeezed shut by means of the cut-off device, which may conveniently be an air-cylinder.

A bag seat means 92 supports a bag 94 to be filled with powdered material, and when the powdered material in the bag comes to the predetermined bag weight, the weighing means cooperates with the flow control system to cut off the flow of material.

As best shown in FIGS. 1 and 10, the bag seat means 92 is arranged independent of the weighing means so that no influence is exerted on the weighing means even by the separation of the bag 94 from the discharge spout.

The bag seat means 92 comprises two symmetrical supports 96 to which a fixed mounting 98 possessing opposite arms 100 is affixed. The level of the fixed mounting 98 in relation to the supports 96 may be selectively adjusted in accordance with the size of the bag 94.

The arms 100 carries a seat plate 102 which is elevated upwardly by an action of an air cylinder 104 to support the bag 94 after the packaging has been finished. The seat plate 102 subsequently tilts outwardly with increase of weight of the bag 94 thereby to deliver the bag 94 outside the apparatus as shown in FIG. 10.

As best shown in FIG. 11, the dust feeding means comprises the chamber 106 having a conical lower portion, with which the main conduit 40 leading from the air inlet units 18 and 28 and the exhaust conduit 72 from the filling means 64 are connected.

An air supply pipe 108 enters the chamber 106 to urge the dust fed by the main conduit 40 and the exhaust conduit 72.

The dust chamber 106 at its lower portion is connected to a feed back conduit 110, the other end of which is connected to the hopper 10. Accordingly, the dust collected in the chamber 106 is fed back to the hopper 10 without leakage, and charged again into the chamber 12.

The weighing means comprises a balance weighing mechanism and detecting means (FIGS. 1 and 12). The discharge spout 66 is shifted downwardly in proportion to an increase of the amount of powdered material in the bag 94.

The downward movement of the discharge spout 66 is transferred through a frame 112, a main lever 114, a draft rod 116, an extension lever 118 and a draft rod 120 to a scale beam 122 of the balance weighing system (A) to raise the righthand end of the said scale beam 122. The lefthand end of the scale beam is provided with a center weight 124.

The scale beam 122 at its righthand side is provided with an exchangeable main weight 126, which is somewhat insufficient to balance the predetermined bag weight, supported on a suspension rod 128 which is provided at its lower end with a collar support 130 for

bearing an auxiliary weight 132 which satisfies the final bag weight.

During the packaging operation, the righthand arm of the scale beam 122 rises, so that a slit plate 134 fitted to the scale beam 122 actuates a primary photo-electric detector 136 which cooperates with the flow control system to pinch the coupling 60 of the feed pipe 42 for full flow of the material. During the operation of the primary photoelectric detector 136, the collar support 130 is raised to a level such as to contact the bottom of the auxiliary weight 132 lying on the floor of frame 138, so that an additional weight acts on the scale beam 122. After this, the powdered material is fed only through the small feed pipe 44 for dribble flow, and when the weight of powdered material in the bag reaches the predetermined weight the scale beam 122 is tilted to enable the slit plate 134 to actuate a secondary photo-electric detector 140, which cooperates with the flow control system to shut the small feed pipe 44 and then to terminate the packaging operation.

In the weighing mechanism mentioned above, the operation of the primary photo-electric detector 136 induces the starting of a timer or a delay open relay circuit to energize a solenoid 142 which makes magnetic contact with one end of an auxiliary beam 144 to fix the auxiliary weight 132 on the floor of frame 138 so that any unnecessary suspension of the auxiliary weight 132 by the suspension rod 128 is avoided.

In the packaging apparatus described above the powdered material in the chamber 12 is fluidized without suffering any overpressure problem, and the flow rate of the material to be packaged is finely and uniformly controlled by the combination of the flow control system comprising the larger feed pipe for full flow and the smaller feed pipe for dribble flow with the weighing system comprising the main weight and the auxiliary weight. This ensures that the packaging operation is capable of providing a highly uniform bag weight, with a maximum weighing error of 1/5000.

Furthermore, dust-free operation may be achieved, since the dust is completely collected by the circulation system.

It will be appreciated that in lieu of the air inlet units arranged at the conical lower portion of the chamber, a vertical screw conveyor may be disposed along the central axis of the chamber to convey powdered materials such as salt, sugar and the like into the housing, while satisfactorily stirring such powdered material. Wet powdered materials may in this case be used.

What is claimed is:

1. An automatic packaging apparatus for powdered material, said apparatus comprising a hopper for containing such material, a chamber disposed beneath said hopper, said chamber being provided in its upper portion with an air exhaust outlet for discharging air therefrom after packaging has been finished and at its lower portion with air inlet means for blowing air into said chamber to fluidize said material moving therethrough, a housing arranged beneath the bottom of said chamber, said housing being provided with a second air inlet means for admitting air into said housing for fluidizing the material delivered thereto, said housing being provided with clog inhibiting means for urging the fluidized material through and out of said housing, feed pipe means connected to and commu-

nicating with said housing for receiving material moved by said air supply pipe, flow control means connected to said feed pipe means for controlling the rate of flow of the material through said feed pipe means, filling means associated with said flow control means for discharging the material into a bag, said filling means being provided with a flexible sleeve for assisting smooth flow of the material, automatic weighing means operatively connected to said flow control means to selectively regulate material flow according to bag weight whereby a plurality of bags may be filled to a uniform weight, a bag seat means arranged independent of said weighing means for urging the delivery of the bag from the apparatus, and means for feeding dust in said chamber and at said filling means back into said hopper for recirculation of said dust.

2. Apparatus according to claim 1 wherein each of said air inlets comprises a casing which is provided at one side with an air pervious pad and at the other side with an air supply pipe of large diameter and an air exhaust pipe of small diameter for relieving air pressure both in the chamber and in the housing.

3. Apparatus according to claim 2 wherein air inlet unit is further divided into a plurality of air inlet unit for supplying air uniformly.

4. Apparatus according to claim 1 wherein said air exhaust outlet comprises an air exhaust pipe of large diameter and a cleanout pipe of small diameter, which are connected to two flexible coupling pipes of different diameters which can be pinched alternately by a flow cut-off arrangement.

5. Apparatus according to claim 1 wherein the clog inhibiting means comprises a main shaft possessing a center spiral bar extending into a control pipe of small diameter and opposite stirring rods and a solenoid arranged at one outer side of the housing to rotate said main shaft in about 40°.

6. Apparatus according to claim 5 wherein the clog inhibiting means comprises a flexible diaphragm having a center hole and arranged in an entrance of the control pipe of small diameter, the spiral bar being reciprocated through said center hole for urging the fluidized material through and out of the housing.

7. Apparatus according to claim 1 wherein the clog inhibiting means comprises a flexible bracket orifice possessing two symmetrically inclined members and one vertical member with a center aperture of expansible material and arranged in an entrance of the control pipe of small diameter.

8. Apparatus according to claim 1 wherein said flow control means comprises a control pipe of large diameter for full flow of the material to be packaged and a control pipe of small diameter for dribble flow of the material, both of said control pipes being connected to flexible coupling control pipes of different diameters which can be pinched alternately by a flow cut-off control arrangement.

9. Apparatus according to claim 5 wherein said control pipe of small diameter is provided with a detachable inner fitting having a conical flow construction.

10. Apparatus according to claim 1 wherein said filling means comprises a discharge spout connected to said flow control means for discharging the material into a bag, an outer sleeve surrounding said discharge spout for providing an air exhaust path, the end of said

outer sleeve being provided with a filtering mesh for releasing air from the bag while preventing escape of the material therefrom, and an air cleanout pipe in the outer sleeve for cleaning said filtering mesh.

11. Apparatus according to claim 10 wherein said outer sleeve is provided around a portion of its outer periphery with an expansible membrane whose interior communicates with an air supply pipe for sealing the inlet of the bag airtightly during filling of the bag.

12. Apparatus according to claim 1 wherein said bag seat means comprises two symmetrical supports, a fixed mounting having two opposite arms and slidably affixed to said supports and a bag seat to be elevated upwardly to support the bag after the packaging has been finished, said bag seat being tilted outwardly with increase of the weight of the bag thereby to deliver the bag out of the apparatus.

13. Apparatus according to claim 1 wherein said au-

tomatic weighing means comprises, a weighing mechanism including a main balancing weight somewhat lighter than a predetermined desired filled bag weight and an auxiliary weight for balancing the predetermined bag weight, detecting means operative just before the predetermined bag weight is attained, and means for temporarily stopping the auxiliary weight at a certain level.

14. Apparatus according to claim 1 wherein said dust feeding means has an upper cylindrical portion, to which dust conduit means from each air inlet and from the filling means are connected and a conical lower portion to which an air supply pipe is connected, an opening in the lower end of said lower portion being connected to a feed back conduit leading to said hopper.

* * * * *

20

25

30

35

40

45

50

55

60

65