June 28, 1966 E. M. LAU 3,258,041

METHOD AND APPARATUS FOR FILLING BAGS

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FIG. 1

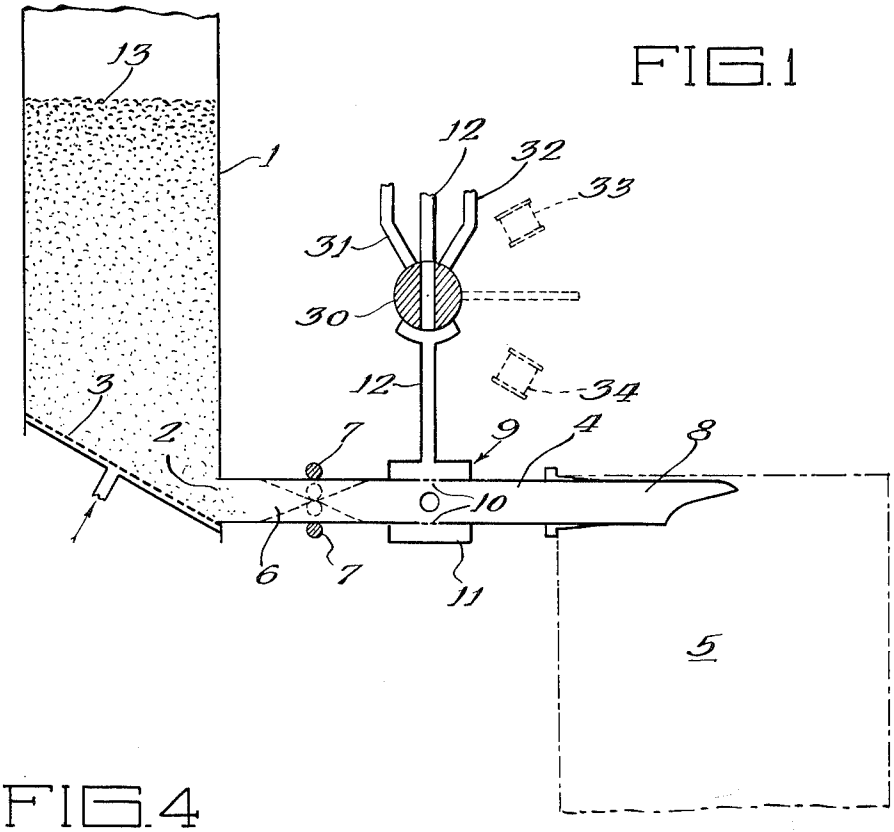


FIG. 4

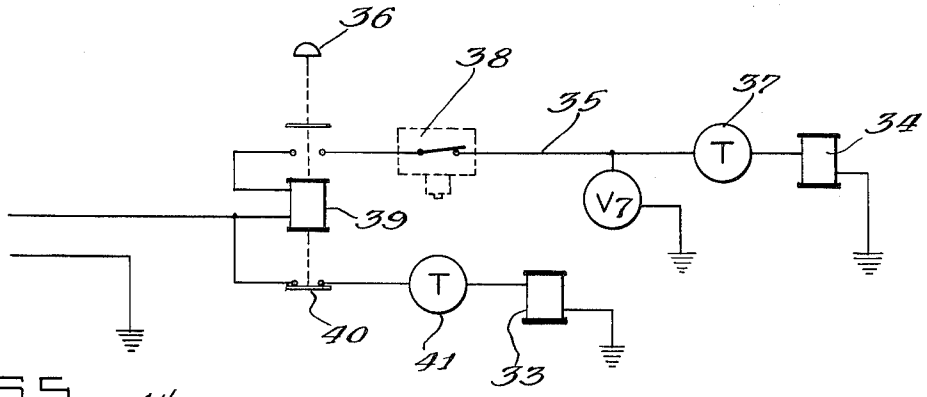
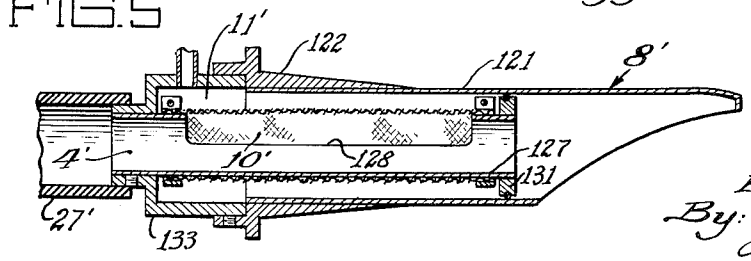


FIG. 5



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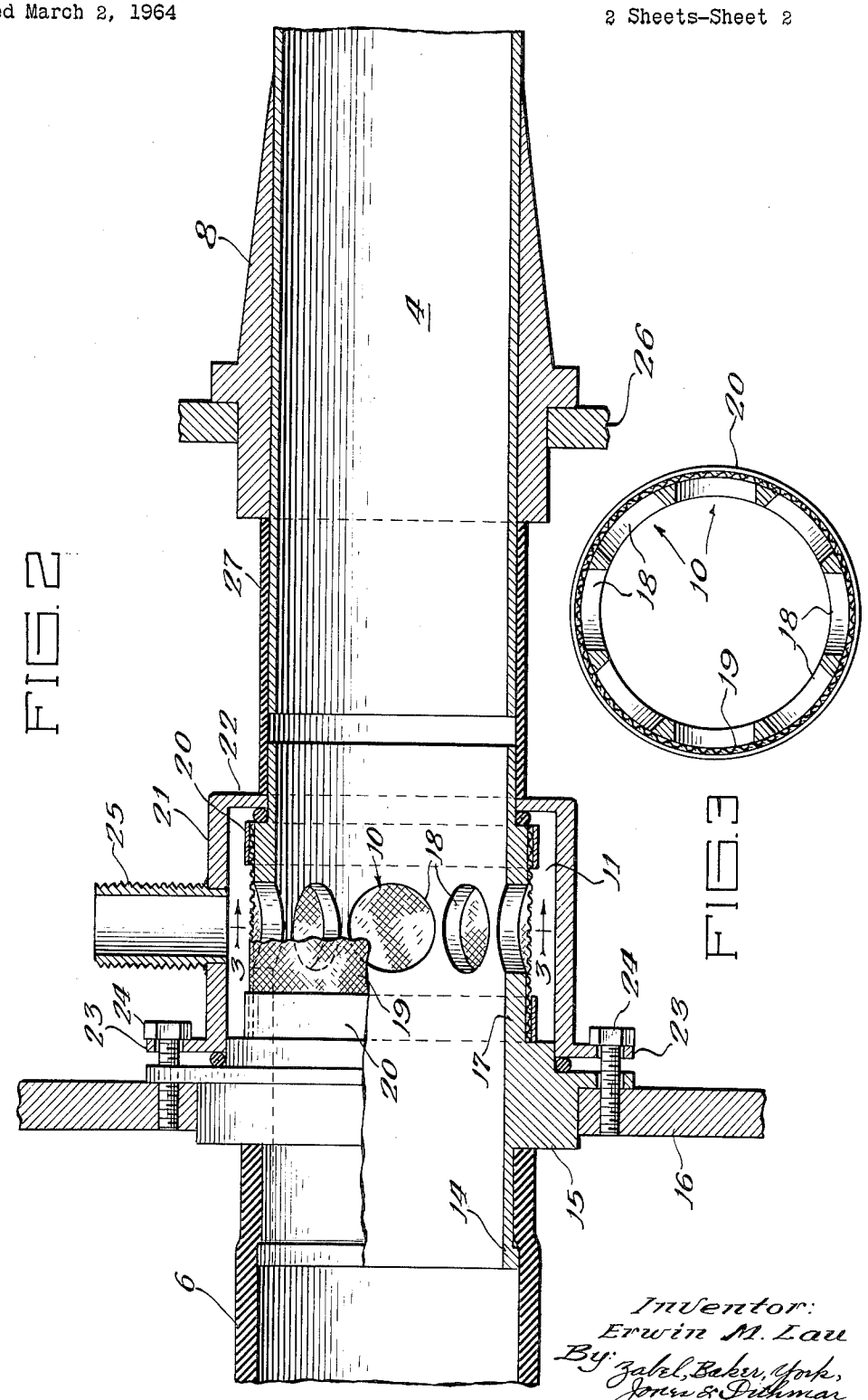


FIG. 2

FIG. 3

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METHOD AND APPARATUS FOR FILLING BAGS

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Filed Mar. 2, 1964, Ser. No. 348,547
18 Claims. (Cl. 141—10)

The present invention relates to an improved method and apparatus for filling bags.

It is an object of my invention to provide a bag filling method and apparatus which is more rapid than the usual fluidizing arrangement.

According to my invention, I have found that where horizontal movement of the material is required, the bag may be filled very rapidly if the material is first fluidized in a fluidizing chamber, then set into motion and caused to flow through the horizontally disposed material flow passageway by the gravitational head of the material within the chamber, and then the fluidizing air, or a major portion thereof, is alleviated or allowed to escape from the fluidized material while it is in motion so that the inertia of the particles causes the material to continue its movement in a horizontal direction and to drop into the bag. According to this method, the fluidizing air is not carried into the bag where it sets up a back pressure which opposes the material flow and materially slows up the bag filling operation.

The present invention is an improvement of the arrangement of my Patent No. 3,102,561 granted September 3, 1963, which recognizes the problem of back pressure in fluidizing type machines, but which solves it in a different manner. The nature of the improvement, briefly, is this:

When it is the bag itself which is vented, there is a selective or winnowing action which causes the filter in the vent passageway to become blocked by the fines. This requires frequent filter blow out which slows up the venting process.

I have found that where the air is alleviated from the material when in transit, the mixture of coarser particles and fines of which the material fed is comprised, does not block the filter as rapidly, with the result that filter blow out is required only once per filling cycle, or even less in some arrangements.

Other objects are to provide an arrangement which avoids constriction of the material flow passageway by material which adheres to the porous wall portion or filter, to provide an arrangement which permits the location of the air alleviating means rearwardly of the spout proper so that the sensitivity of the scaling mechanism is not affected by the connection of any vent or air line to the air alleviating means, to provide an arrangement providing for terminal bag evacuation and subsequent filter blow out, and to provide an arrangement which effects an initial cleaning out of the material flow passageway.

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 diagram showing a preferred embodiment of my invention;

FIG. 2 is an enlarged section showing the air alleviation means;

FIG. 3 is a section taken along line 3—3 of FIG. 2;

FIG. 4 is a circuit diagram illustrating the operation; and

FIG. 5 is a section showing a modification.

With reference now to FIG. 1, the bag filling machine is of the fluidizing type illustrated in my Patent No. 2,936,994, granted May 17, 1960. It comprises a fluidizing chamber 1 having an outlet 2 at the lower end thereof

and a fluidizing pad 3 disposed near the outlet 2. Conduit means provides a material flow passageway 4 which extends from the outlet 2 to the bag 5, to be filled. A portion of the conduit means is in the form of flexible pinch-off tube 6 forming a part of pinch valve 7 to shut off the flow of material through the passageway 4. The outer end of the conduit means is in the form of a spout 8 which extends into the bag 5, and also serves as a bag supporting means.

In operation, when air is supplied to the porous fluidizing pad 3, the material adjacent the outlet 2 becomes fluidized, and will flow in a horizontal direction due to the gravitational head 13 of the material disposed within the fluidizing chamber 1. The material flows through the passageway 4 and into the bag 5, and when the weight of the material within the bag reaches a predetermined amount, such as 100 pounds, the flow of material is cut off by the pinch valve 7, as described in the aforesaid patent.

Disposed between the pinch valve 7 and the spout 8 is an air alleviating means 9. This comprises one or more porous wall portions 10 formed in the wall of the material flow passageway 4. The porous wall portions 10 are surrounded by a vent chamber 11 which vents to the atmosphere through a vent pipe 12.

Due to its fluidized condition and the gravitational or other head represented by the level 13 of the material within the chamber 1, the material passing the air alleviation means 9 has a substantial velocity. The material, as it passes through the air alleviating means 9, gives up its fluidizing air, but the inertia of the particles permits the flow to continue through the remainder of the passageway 4, including the spout 8, so that it passes into the bag 5, as previously described.

The air alleviating means as shown in FIGS. 2 and 3 comprises a section of conduit 14 which is mounted by means of a flange 15 on a suitable part of the machine structure, such as the bridge 16 of the pinch valve 7. The central part of the conduit 14 constitutes a wall portion 17 of substantial thickness, such as 3/16 of an inch. This wall portion 17 is provided with a plurality of openings 18 which are in the form of eight circular holes having a diameter of 3/4 of an inch. The wall portion 17 and the holes 18 are surrounded by a short sleeve 19 of filter cloth or other porous material, held in place by clamp rings 20.

A collar 21 fits over the filter sleeve 19 to provide the vent chamber 11, the collar having a front flange 22 and a rear flange 23. These flanges face or abut correspondingly located shoulders on the conduit section 14, and suitable O-ring gaskets can be provided to seal the joints. The parts may be drawn up by screws 24, making a compact and easily assembled structure.

A nipple 25 takes into the collar 21 to provide the connection between the vent chamber 11 and the vent pipe 12.

The front end of the pinch off tube 6 is fitted over the rearwardly projecting end of the conduit 14.

The spout 8 is mounted on and movable with the scale mechanism 26, such as the floating frame shown in the aforesaid Patents 2,936,994 and 3,102,561. A short length of thin wall rubber tubing 27 connects the front of the conduit section 14 and the rear of the spout 8, permitting substantially free movement of the scale mechanism 26.

Preferably, suction is applied at the end of the filling cycle to evacuate from the bag any entrained air which may not have been alleviated. This evacuation step results in the previously mentioned selective or winnowing action which clogs the filter. Therefore the evacuation step must be followed by a filter blow out, and preferably this occurs at the beginning of the next filling cycle.

This is for the reason that the material flowing through the spout 8 during blow out is fluidized material, and fluidized material will displace any dead material in the spout left over from the previous cycle, whereas unfluidized material will not.

The means for applying first a partial vacuum, and then a blow out pressure, to the alleviating means 9 is diagrammatically shown in FIG. 1 and comprises a three-way valve 30 interposed within the vent pipe 12. A vacuum line 31 and a pressure line 32 connect with the three-way valve 30. The valve 30 is shifted in either direction from atmospheric venting 12 by the solenoids 33 and 34, respectively.

As shown in FIG. 4, the pressure line solenoid 34 is connected in the operating circuit 35 so that the depression of the start button 36 will close the circuit to the pressure line solenoid 34 through a timer 37 which deenergizes same after two seconds, for example. When the scale mechanism 26 trips and opens the microswitch 38 to close the air actuated pinch valve 7 (through deenergization of the solenoid valve V7 and the relay coil 39), a relay switch 40 closes the circuit to the vacuum line solenoid 33 through a timer 41 which timer again opens the circuit and deenergizes the vacuum line solenoid 33 after two seconds, for example.

Where a porous wall portion is disposed in the lower half of the material flow passageway, it should be radially offset below the surface of the passageway so that the two or three layers of particles which tend to adhere to the porous wall portion are disposed beneath the flow surface. This avoids a certain friction between the adherent layers and the material in transit, which friction would slow up the movement and possibly serve as a back up point, resulting in passageway constriction or clogging.

In the FIG. 2 embodiment, the distance of radial offsetting is substantially one-quarter of the axial dimension of the opening. Where a larger filter area is desired, the porous wall portion 10′ can be located in the upper half of the material flow passageway as shown in FIG. 5 and described in my copending application, Serial No. 261,898, filed February 28, 1963.

Also, if desired, the alleviating means may be located in the spout itself, as shown in FIG. 5 and also in that application.

Also, the aspirator of that application can be arranged to provide atomspheric venting during the major portion of the bag filling operation, and thus substituted for the three-way valve 30 of FIG. 1.

As shown in FIG. 5, the spout 8′ includes an outer shell 121 having a support collar 122 by means of which it may be suitably mounted on the scale mechanism 26. Disposed within the shell 121 is an inner tubular member 127 having an opening 128 formed in its upper half and extending for substantially its full length. The porous wall portion 10′ comprises a fabric sleeve which surrounds the tube 127 and is secured thereto by suitable clamps. A front ring 131 and a suitable O-ring gasket mountel on the front end of the tube 127 seal off the front end of the vent chamber 11′. The tube 127 is mounted within the shell by a collar 133 which engages the rear end of the support collar 122. The collar 133 has an opening therein and a fitting 25′ is secured thereto for connection with the vent pipe 12.

In the FIG. 5 embodiment shown, the opening 128 is seven inches long, and the tube 27 is two inches in diameter. This provides a filter area of about twenty-two square inches.

The present state of my development indicates that for most materials, the arrangement disclosed herein is as satisfactory as that of the aforesaid copending application, even though the filter area is about 4 square inches, as compared with 22 square inches of the earlier arrangement. The present arrangement has the advantage of being less costly to manufacture, and also, it permits the three-way valve 30, or the aspirator, to be located on the machine frame itself, instead of on the scale mechanism, with the result that the sensitivity of the scale mechanism is not affected by flexible air line and vent line connections between the scale mechanism and the machine frame.

Furthermore, where the material is very fine, the continuous application of vacuum generally calls either for a more frequent blow out, or for a larger filter area, whereas the terminal evacuation of FIGS. 1 and 4 requires neither.

In other words, I have found that it is not necessary that alleviation occur immediately adjacent to the open end of the spout, nor that efficiency calls for a large area filter. As a result, the alleviation means can be located not only remotely from the spout end but, being of small axial dimension, can be located at a point where there would ordinarily be insufficient room to accommodate a large area filter. Therefore it is possible to obtain the advantages of greater sensitivity and less costly construction, as above outlined.

The subject matter of my aforesaid copending application, Serial No. 261,898 is hereby incorporated by reference into this application, insofar as consistent with the present disclosure.

Although only a preferred embodiment of my 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 my invention as pointed out in the appended claims.

I claim:

1. The method of filling a bag with powdered, granular, or flaky material which comprises the steps of fluidizing at least the lower part of a body of material to establish a gravitational head, causing the fluidized material to flow through a horizontal passageway under the influence of said gravitational head, alleviating the fluidizing air from the fluidized material while it is in motion, and permitting the inertia of said unfluidized material to carry it through the remaining portion of said passageway and through the open end thereof and into said bag.

2. The method of claim 1 which includes the steps of evacuating the bag at the end of the bag filling operation, and of commencing the alleviating step shortly after the beginning of the next bag filling operation so that the initial movement of material through said outlet will be a movement of fluidized material.

3. Bag filling apparatus comprising a fluidizing chamber, an outlet at the lower end thereof, a fluidizing pad disposed in said chamber adjacent to said outlet, bag supporting means, horizontally disposed conduit means providing a material flow passageway extending from said outlet to a bag supported by said bag supporting means, and air alleviating means for said material flow passageway comprising a porous wall portion of said conduit means.

4. Bag filling apparatus as claimed in claim 3 which includes cut-off means for cutting off the flow of material through said conduit means, said air alleviating means being located between said cut-off means and the outer end of said conduit means.

5. Bag filling apparatus as claimed in claim 3 in which said conduit means includes a spout, said spout forming a part of said bag supporting means.

6. Bag filling apparatus as claimed in claim 5 in which said air alleviating means is located rearwardly of said spout.

7. Bag filling apparatus as claimed in claim 3 in which said air alleviating means includes chamber means overlying said porous wall portion, and a vent pipe communicating with said chamber means.

8. Bag filling apparatus as claimed in claim 7 which includes suction means and air supply means, means con-

necting said suction means to said chamber means at the conclusion of a bag filling operation, and means connecting said air supply means to said chamber means for a short interval at the beginning of a bag filling operation.

9. Bag filling apparatus as claimed in claim **3** in which said air alleviating means comprises a plurality of porous wall portions circumferentially spaced from each other, those porous wall portions located in the lower half of said conduit means being offset beneath the inner surface of said material flow passageway.

10. Bag filling apparatus as claimed in claim **3** in which said conduit means includes a conduit wall section having a plurality of circumferentially spaced openings formed therein, said porous wall portion comprising filter means overlying said openings.

11. Bag filling apparatus as claimed in claim **10** in which said wall section has a thickness of substantially three-sixteenths of an inch, and in which said openings are circular holes having a diameter of substantially three-quarters of an inch.

12. Bag filling apparatus as claimed in claim **10** in which the thickness of said wall section is substantially one-fourth of the dimension of said openings measured in a direction parallel to the axis of said passageway.

13. Bag filling apparatus as claimed in claim **3** in which said porous wall portion comprises an opening in the wall of said conduit means, and filter means overlying said opening.

14. Bag filling apparatus as claimed in claim **13** in which said filter means is a fabric sleeve surrounding said conduit means.

15. A self venting spout for a bag filling machine comprising a horizontally disposed outer shell adapted for cooperation with a bag to be filled, an inner tube disposed within the spout dividing the interior thereof longitudinally into a material flow passageway and an annular vent chamber surrounding same, the upper portion of said inner tube having a longitudinally extending opening

formed therein, and a filter element overlying said opening, said opening extending in one direction throughout the major portion of the length of said inner tube and in the other direction for substantially 180° of the wall of said tube, the lower portion of said inner tube being imperforate.

16. A self venting spout as claimed in claim **15** in which said filter element is a fabric sleeve surrounding said inner tube and secured thereto.

17. A self venting spout for a bag filling machine having a fluidizing chamber comprising a horizontally disposed outer shell adapted for cooperation with a bag to be filled, means dividing the interior of said shell longitudinally into two portions, one of said portions communicating with the fluidizing chamber of said bag filling machine, and the other portion comprising a vent chamber to permit the escape of fluidizing air from material passing through said first mentioned portion during the bag filling operation, said dividing means including a porous separating wall disposed longitudinally of said spout and extending for a substantial portion of the length of said shell and serving as a filter element, a vent outlet communicating with said vent chamber, and means to supply air under pressure to said vent chamber at intervals to reverse the direction of air flow through said filter element to clean the same.

18. A self venting spout as claimed in claim **17** including suction means communicating with said vent outlet.

References Cited by the Examiner

UNITED STATES PATENTS

2,142,990	1/1939	Belcher	141—286 X
2,981,298	4/1961	Vogt	141—73 X
3,073,401	1/1963	Zenke.	

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