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METHOD AND APPARATUS FOR DE-AERATING BAGS DURING FILLING

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Fig. 2.

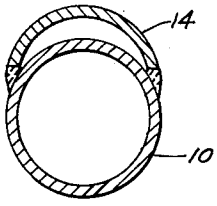

Fig. 1.

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METHOD AND APPARATUS FOR DE-AERATING BAGS DURING FILLING

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This invention relates to a method and apparatus for de-aerating or removing excess air from bags as they are being filled with granular or powdery substance.

In our co-pending application entitled "Container Venting Apparatus and Method," Serial No. 596,683, filed July 9, 1956, now abandoned, we described the filling and concurrent venting or de-aerating of a bag through the valve of a conventional paper valve bag. Briefly the valve opening of a bag is placed over a filling spout and an adjacent vacuum nozzle. As cement, flour, powdered chemicals or other such materials are forced through the spout together with extraneous air, distention of the bag which tends to rupture it and interfere with filling is obviated by drawing air through the vacuum nozzle. This has many beneficial results. For example, small perforations previously used to vent surplus air through various parts of the bag may be omitted preventing loss of materials and resulting in cleaner exteriors of the bags when they are handled and stored.

Furthermore, the bags may be filled more quickly, more accurately as to weight and more nearly full so that bags of somewhat smaller size may be used for a given quantity of a particular commodity.

One difficulty that has been encountered in the use of a vacuum nozzle for de-aerating bags as they are being filled results from the withdrawal of an excessive amount of the powdered commodity just prior to complete filling of the bag. Since the filling spout and vacuum nozzle are disposed in the upper portion of the bag, the final part of the filling operation results in a turbulent condition in that portion and much of the commodity is withdrawn by the vacuum nozzle. While this material is subsequently reclaimed, the condition nevertheless results in inefficiency and slightly slower filling.

It is the object of the present invention to provide a method and apparatus for de-aerating bags in which the amount of the commodity withdrawn during filling is greatly minimized.

More specifically it is an object of the invention to provide a method and apparatus in which the suction or vacuum employed for de-aerating is discontinued just prior to complete filling of the bag so that none of the commodity is withdrawn when the most turbulent condition prevails in the vicinity of the vacuum nozzle.

Further and more specific objects and advantages of the invention and the manner in which it is carried into practice are made apparent in the following specification wherein reference is made to the accompanying drawing.

In the drawing:

Fig. 1 is a schematic view illustrating a bag filling spout with a suction nozzle combined therewith and illustrating diagrammatically the electric circuit by means of which the suction through the spout is discontinued at a predetermined time; and

Fig. 2 is a sectional view taken on the line II—II of the combined filling spout and suction nozzle.

Conventional apparatus for filling bags includes a scale having a beam which supports a filling spout, the open valve of a bag to be filled is placed over the spout so that the weight of the bag is imposed on the scale. The commodity with which the bag is to be filled is introduced under pressure, and usually with a considerable quantity of extraneous air, through the spout until a pre-determined weight is attained to lower the beam of the scale and automatically interrupt the flow of material through the spout by closing a valve. According to the present invention, the suction which de-aerates the bag during filling is interrupted just prior to the complete filling of the bag when the powdered commodity is most turbulent and most likely to flow out through the vacuum nozzle.

Referring to Fig. 1 of the drawing, a filling spout is illustrated at **10** as supported on a vertical bar **11** which is a part of the beam of the automatic scale mechanism, not shown, which serves to close the filling spout automatically as previously described when a predetermined weight of material has been deposited in a bag which is supported on the spout. The position of the bag is illustrated in broken lines at **12** wherein one upper corner of the bag having a valve opening **13** is illustrated. Material with which the bag is filled may be directed through the spout by any suitable means one form of which is here illustrated as an impellor **28** rotated by a motor, not shown. The impellor rotates in a clockwise direction, as viewed in the drawing, and receives material from a hopper **29**. Combined with the filling spout **10** is a vacuum nozzle provided by welding or otherwise securing a segment of a tubular member **14** to its upper surface. The welding or securing means is terminated short of the outer end of the member **14** leaving a narrow opening in the area indicated at **15** for the admission of air when suction is applied to the nozzle portion **14**. Suction from any convenient low pressure source is communicated thereto through a conduit **16** which enters a fitting **17** on the spout, the interior of which communicates with the member **14**.

A solenoid valve **18** of conventional construction is disposed in the suction conduit **16** and is energized by a circuit indicated at **19** which includes a timer **20** controlled by a micro-switch **21**. The micro-switch is adapted to be closed by upward movement of a lever **22**. It should be closed at the time that filling of the bag starts. In this case the lever **22** is engaged by a cam **23** projecting from a small plate secured as by screws **24** extending through a slot **25** to a frame portion **11** of the scale which supports the nozzle **10**. The slot **25** permits adjustment of the cam **23** vertically of the frame member **11**.

In the position of the parts illustrated in Fig. 1, the bag is being filled and the solenoid valve is open so that extraneous air is being withdrawn from the upper portion of the bag at approximately the same rate that it enters through the nozzle **10**. Assuming that filling of the bag with a particular commodity, such for example as cement, requires about six to seven seconds, the timing switch will be set to close a circuit to the solenoid valve about one or one and one-half seconds before the bag is filled, thus closing the solenoid valve shortly before the bag is completely filled and preventing withdrawal of large quantities of the cement or other powdered material during the final portion of filling when turbulence in the upper end of the bag is high. When the bag is filled its weight lowers the beam of the scale, and the frame member **11** attached thereto by the cam **23** has no effect on the micro-switch as it depresses the arm **22** during this lowering movement. In practice the beam of the scale is latched in its lowered position by conventional mechanism not shown, and when an opera-

tor places an unfilled bag over the spout **10** he also trips the latch which permits raising of the beam and actuates the micro-switch again to set the timer in operation for that period of time slightly shorter than is required for filling the bag. It is to be understood that the timer is of the type which resets itself for a new cycle after each cycle of its operation.

In the co-pending application referred to above, the suction for de-aerating the container being filled is illustrated as provided by the medium of compressed air passing through a venturi type ejection device. In such a construction the solenoid valve disclosed in the present application may be applied to the pressure line at a point in advance of its connection with the venturi device and thus providing the same effect of discontinuing the suction at a predetermined time just in advance of the complete filling of the bag.

We claim:

1. In combination with a filling spout for filling containers, a suction tube adjacent the spout for de-aerating a container being filled, means to fill and de-aerate the container simultaneously and means for discontinuing suction through said tube prior in time to and during the completion of the filling operation.

2. In combination with a container filling apparatus in which a container is supported by a scale to weigh the contents for determining when it is full, suction means for withdrawing excess air from the container as it is being filled, timing means to discontinue suction at a predetermined time period and while the container is still being filled, and means actuated by movement of the scale for setting said timing means in operation.

3. In combination with a container filling apparatus in which a container is supported by a scale to weigh the contents for determining when it is full, suction means for withdrawing excess air from the container as it is being filled, an electrically actuated valve for interrupting said suction, timing means in the circuit to the valve, and means to initiate operation of the timing means when filling of the container commences.

4. In combination with a container filling apparatus of the kind in which the container is supported on a scale and weight of material in the container moves a scale part downwardly to discontinue filling when the container is full and in which the scale part is moved upwardly to initiate filling of another container, a filling means, a suction conduit associated with the filling means to deaerate the container being filled, valve means to discontinue suction, a timer for controlling the operation of said valve means to discontinue suction prior to complete filling of the container, and means actuated by upward movement of said scale part, to initiate operation of the timer.

5. The method of filling and de-aerating a container which is being filled by material that is accompanied by extraneous air which comprises first introducing said material and withdrawing air by suction from the container simultaneously, then discontinuing the suction prior to the time that the filling of the container is completed, and then completing the filling of the container.

6. The method of filling and de-aerating a container which is being filled by material that is accompanied by extraneous air which comprises first introducing said material and withdrawing air by suction applied within the upper portion of the container simultaneously, and then, when the container is nearly full and a turbulent condition prevails in its upper portion, discontinuing said suction and continuing the introduction of material until the container is full.

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