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[54] **PRESSURE TYPE BAG FILLING MACHINE**

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[52] **U.S. Cl.** **141/68,** 141/83, 141/286, 222/193, 222/195, 302/51, 141/83, 141/286, 222/195, 302/51

[51] **Int. Cl.**.....**B65b 1/16,** B65b 1/16

[58] **Field of Search**....141/68, 67, 83, 314, 315, 317; 222/193, 195; 302/52–54; 141/68, 67, 83, 314, 315, 317, 286; 222/193, 195; 302/52–54

[56] **References Cited**

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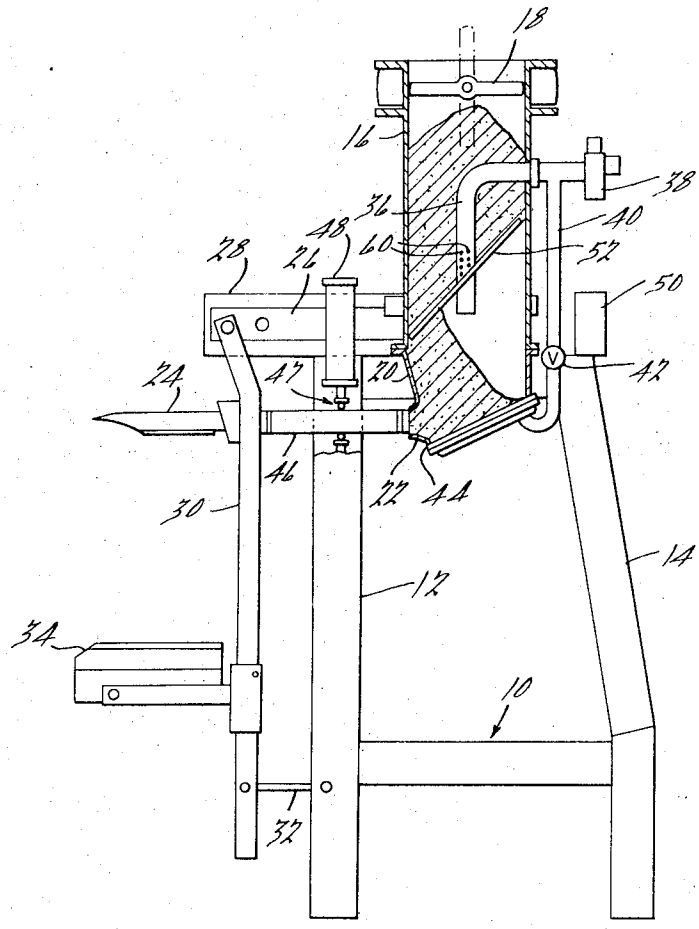
[57] **ABSTRACT**

A pressure type bag filling machine in which a pressure hopper has a downwardly directed air tube supplied with air under pressure to effect the flow of granular material from the hopper through a discharge nozzle and into a valve bag until the bag is filled with a predetermined weight of product. The air tube extends through an inclined orifice plate which extends across the hopper and allows the product to accumulate in a small pile below the orifice plate over the discharge nozzle so that the pressure air can more easily initiate motion of the product and maintain substantially uniform flow of product through the nozzle, resulting in more rapid operation and more accurate weighing.

1 Claim, 2 Drawing Figures



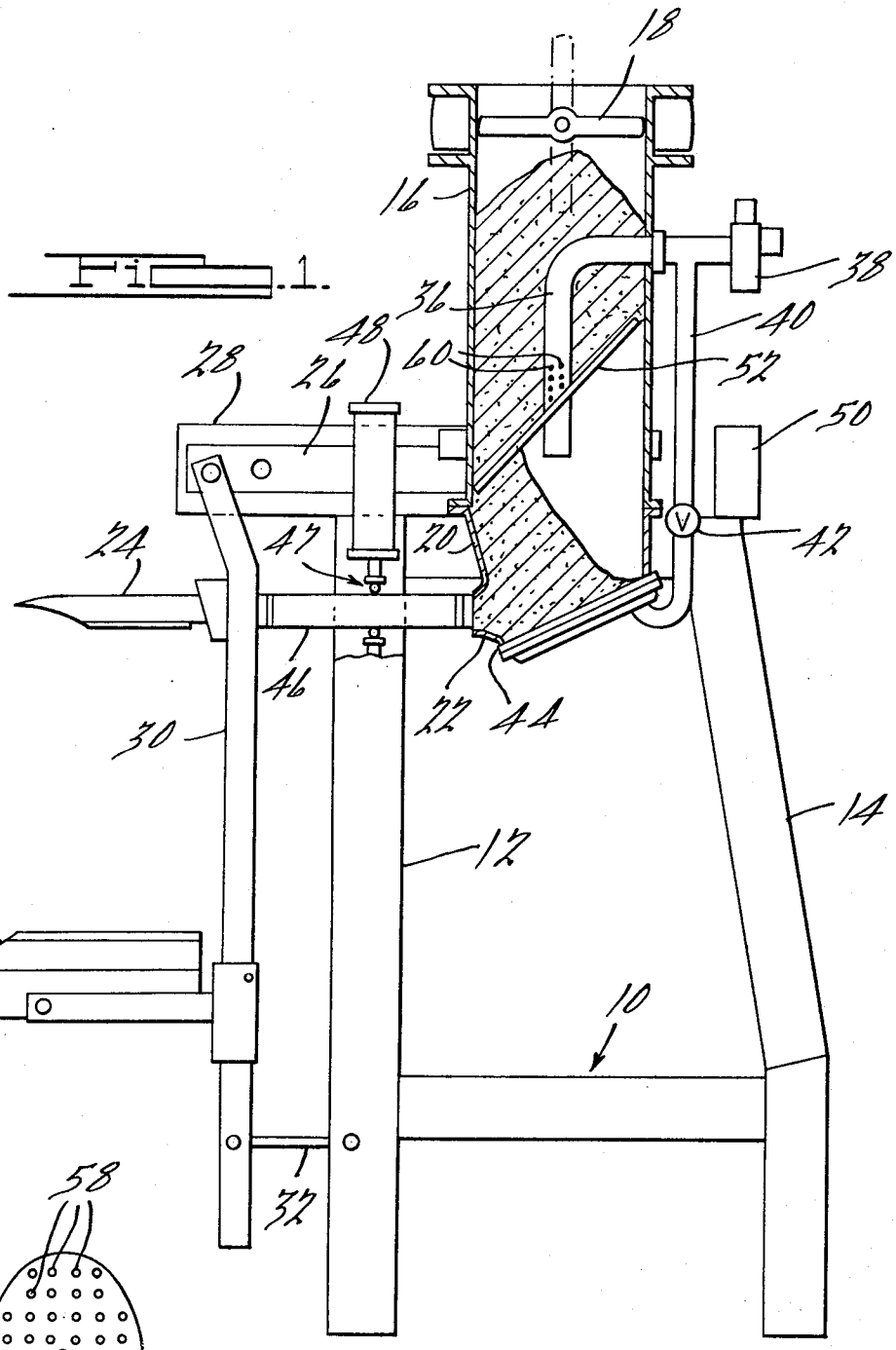


Fig. 1.

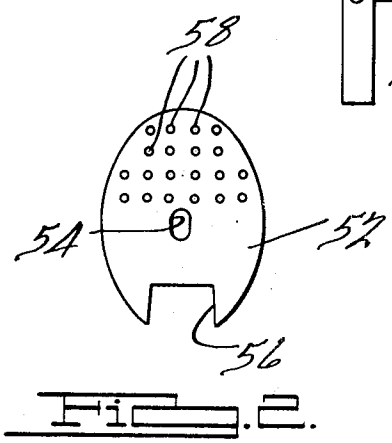


Fig. 2.

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PRESSURE TYPE BAG FILLING MACHINE

Valve bag filling machines of the pressure type generally comprise a pressurized hopper containing a supply of granular product and a tube supplying air under pressure to promote the flow of product from the hopper into a valve bag supported on a scale beam until a predetermined weight of product is reached. It is necessary to employ a hopper of a size which will contain sufficient product for any size bag that is conventionally used, such bags generally ranging from 25-pound to 100-pound sizes. When the hopper is completely filled with certain types of material, generally material consisting of larger size particles or particles of irregular shape with rough surfaces, the pressure air from the air tube frequently cannot initiate movement of the particles from the bottom of the column of product in the hopper, and the flow rate from the hopper into the bag is usually quite irregular, which results in inaccurate weighing of the material in the bag.

The present invention provides a bag filling machine of the type described capable of handling granular products of any particle size or shape with greatly increased speed of operation and greatly improved weighing accuracy even when the height of the product in the hopper is at its maximum. The invention contemplates the provision of an inclined orifice plate extending across the hopper and through which the air tube extends, the orifice plate being designed to allow the product to accumulate in a small pile at one side of the bottom of the hopper over the discharge nozzle so that the pressure air can easily initiate motion of the product through the discharge nozzle from this smaller pile of material regardless of the total height of material in the hopper. A further advantage of the provision of the orifice plate is that the pile of product under the orifice plate is continually replenished by a stream of material falling past the plate, and the falling stream of material is easily driven through the discharge nozzle by the air. Since the air reacts against a relatively small pile of product of limited height, the total height of material in the hopper will not affect performance of the machine, and the machine can accommodate the full range of bag weights desired while maintaining substantially uniform flow rates which results in weighing accuracy.

In the drawings:

FIG. 1 is an elevational view, partly in section, of a bag filling machine embodying the present invention; and

FIG. 2 is an elevational view of the orifice plate used in the machine.

The machine comprises a support frame **10** having legs **12** and **14** and a hopper **16** supported on the frame **10**. The hopper **16** is adapted to contain a supply of granular material, and the size of the hopper is such as to contain an amount of material at least sufficient to fill the largest size bag that is conventionally filled by machines of this type. The hopper **16** is open at its upper end and is adapted to be supplied with material from a supply bin (not shown). A charging valve **18** is disposed at the upper end of the hopper **16** and is movable by an air cylinder (not shown) or by other means between the closed position shown in FIG. **1** and the open position shown in dotted lines.

The hopper **16** includes a lower portion **20** having a discharge nozzle **22** through which the product is conveyed to a filling tube **24** which is adapted to extend into a valve bag (not shown) to fill the bag with the material contained in the hopper.

A scale beam **26** is movably mounted on a frame member **28** and carries a hanger **30** which at its lower end is pivotally connected to one of the legs **12** of the frame **10** by a link **32**. The hanger **30** carries a bag support or plateform **34** on which a bag to be filled is supported with the filling tube **24** extending through the valve opening in the bag.

An air tube **36** enters the side wall of the hopper and extends downwardly along the axis of the hopper. The air tube **36** is supplied with air under pressure by a blower (not shown) through a valve **38**. Air may also be supplied through a branch line **40** containing a valve **42** through the bottom wall of the hopper **16** which is closed by a porous pad **44**.

A section **46** of the filling tube **24** may consist of a flexible tube which is adapted to be pinched or closed off by a valve **47** operated by an air cylinder **48** or in any other suitable manner. The movable scale beam **26** is adapted to operate a control **50** which controls the cycle of operation of the machine.

When the machine is off, the charging valve **18** is open, the filling tube valve **47** is closed, and the air control valve **38** is closed. The granular product fills the hopper **16** to the required level. The bag is then placed on the bag support **34** and the controls **50** are energized to initiate a cycle of operation, at which time the charging valve **18** closes and valves **38** and **47** are opened. Air under pressure, for example at 10 pounds per square inch, flows through the air tube **36** and effects the flow of the material from the hopper through the filling tube and into the bag.

An orifice plate **52** is disposed within the hopper **16** and may be supported by the air tube **36** or in any other suitable manner. The orifice plate **52** is inclined, as shown in FIG. **1**, and the air tube **36** extends downwardly through a central opening **54** in the plate **52**. At its lower end the plate **52** is provided with a cut-out portion **56** which allows the material in the hopper above the plate **52** to fall to the bottom of the hopper along one side thereof and to accumulate in a pile over the discharge nozzle **22**. The pressurized air from the tube **36** thus reacts against the relatively small pile of material below the plate **52** and can easily initiate flow of the material through the discharge nozzle **22** and through the filling tube **24** into the bag. As the material flows through the discharge nozzle **22**, the pile of material below the orifice plate **52** is continually replenished by a falling stream of material which is easily deflected by the air from tube **36** to the nozzle **22** and through the filling tube **24**. It will be seen that the provision of the orifice plate **52** prevents the pressure air from having to move the particles against the resistance offered by the head height of the material in the hopper **16** as in conventional machines. The present machine therefore can be used for filling of the largest size bags even though the product may consist of relatively large particles of rough or irregular shape while maintaining very uniform flow rates, which leads to greatly increased weighing accuracy.

As soon as the bag is filled with the proper weight of material, the scale beam **26** tips, thus tripping the main control **50** to stop the cycle of operation, whereupon the air control valve **38** is closed, the filling tube section **46** is closed off, and the charging valve **18** is opened to permit refilling of the hopper **16**.

The orifice plate **52** may be provided with a series of small openings **58** on the side thereof opposite the cut-out portion **56**. The air tube **36** may also be provided with a number of small openings **60** above the orifice plate **52**. Either the plate **52** or the air tube **36**, or both, may be provided with openings **58** or **60**, respectively, to balance the air pressure on opposite sides of the plate **52** so that the flow of material past the plate **52** is unaffected by air pressure and falls by gravity alone. It is contemplated that the orifice plate **52** may be adjustably mounted on the air tube **36** or within the hopper **16** so that the height of the orifice plate may be adjusted to provide the optimum results according to the type of material being handled.

What I claim as my invention is:

1. A pressure type bag filling machine for filling a valve type bag with a required weight of granular product, comprising a pressure hopper having a discharge nozzle at its lower end, a filling tube extending from said nozzle, means for supporting and weighing a bag with said filling tube extending into said bag, an air tube in said hopper, means for supplying air under pressure through said tube to promote the flow of product from said hopper through said nozzle and filling tube into said bag, and an orifice plate in said hopper above said discharge nozzle and adapted to support a column of product in said hopper, said orifice plate having an opening therein substantially directly above said discharge nozzle to allow the product to fall freely through said opening to accumulate in a pile over said discharge nozzle, said air tube discharging air under pressure into said hopper below said plate to cause the flow of product from said pile through said nozzle and filling tube, said orifice plate being provided with a series of apertures therein to equalize the air pressure in said hopper on opposite sides of said plate.

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