

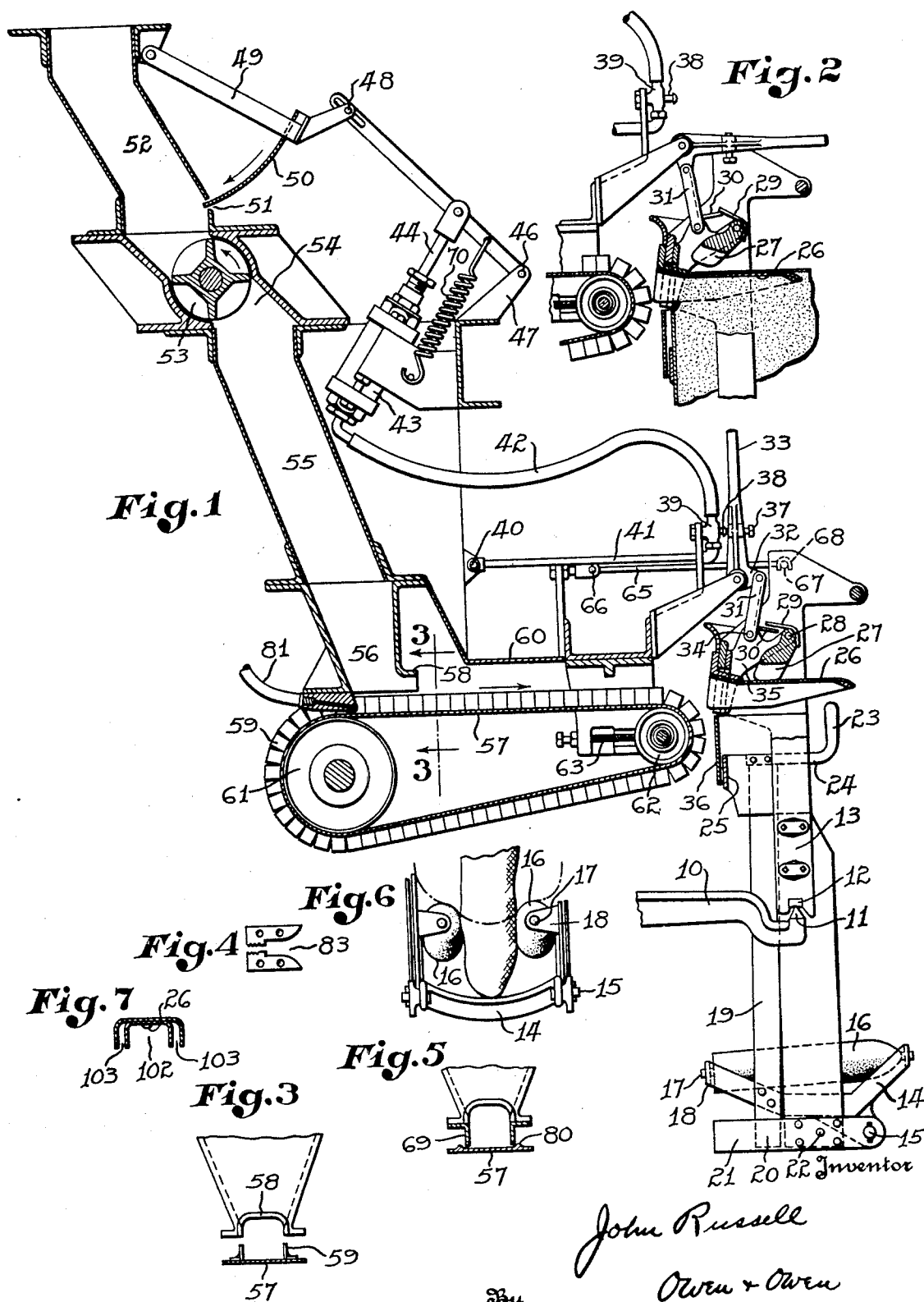
Nov. 6, 1934.

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1,979,492

METHOD OF AND APPARATUS FOR FILLING BAGS WITH POWDERED OR GRANULAR PRODUCTS

Filed Feb. 7, 1931



Attorneys

UNITED STATES PATENT OFFICE

1,979,492

METHOD OF AND APPARATUS FOR FILLING
BAGS WITH POWDERED OR GRANULAR
PRODUCTS

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Application February 7, 1931, Serial No. 514,095
In Australia March 17, 1930

8 Claims. (Cl. 226—48)

This invention relates to filling valve bags, and it has been devised to provide a method and means for ensuring unobstructed flow of granular or powder materials, particularly those having a sticky or cloggy nature, through the feeder devices into a filler spout and a valve bag. In the specific embodiment herein disclosed, the means comprise essentially a fast running continuous belt which forms the floorway of a hopper boot into which the feed material is dropped from a hopper above. This belt carries the material forwardly out of the hopper boot and projects it in a stream into the filler spout, through which it passes into the bag. The belt delivery is assisted by an air blast directed along the belt in the direction of its movement.

The filler spout is carried on a movable balance frame in which the bag cradle is supported, and the filler spout is moved out of register with the stream of feed projected by a belt when the bag is full by operation of a scale beam which supports the balance frame, thus to cut off the stream of material from the bag and to shunt the stream to a return circuit during the time the filled bag is being removed from the cradle and another valve bag is being set on the cradle.

In the accompanying drawing:—

Fig. 1 is a sectional elevational view of the complete machine;

Fig. 2 is a fragmentary view showing the position of certain of the parts at the moment when a valved bag has received its full charge and is about to be removed from the cradle;

Fig. 3 is a fragmentary transverse section on the plane 3—3, Fig. 1;

Fig. 4 is a plan view of the air blast nipple which is associated with the feed belt;

Fig. 5 is a fragmentary transverse section illustrating an alternative detail with reference to Fig. 3;

Fig. 6 is a fragmentary elevational view of the cradle showing its rocking pillows and its mounting in the scale beam balance frame; and

Fig. 7 is a transverse section through the filler spout, showing lateral air channels thereon for the evacuation of displaced air from the bag.

10 is the scale beam, 11 knife edges on the forked end of same, 12 seating for these knife edges in the balance frame 13, 14 is a cradle pivotally mounted at 15 in the bottom ends of the side members of the balance frame 13, 16 rolling pillows pivotally mounted at 17 in brackets 18 at either side of the cradle frame 14, 19 vertical members riveted to the cradle frame 14 and extended below it to form guides at 20 work-

ing within the side members 21 which are fixed at 22 to the foot of the balance frame side members 13. 23 is a hand grip on a yoke 24 which connects the top ends of the members 19. The top ends of the members 19 are connected by the collar piece 25 which sets back against the baffle shield 36 of the balance frame 13 when the cradle is erect. The bag to be filled is set on the cradle with the bottom end of it between the rolling pillows 16 and the valve top end of it is slid over the filler spout 26. As the point of support of the cradle is at the pivots 15 the weight of the bag and its contents on the cradle and also the frictional grip of the top of the bag on the spout 26 holds the bag securely whilst filling proceeds. As the bag fills it distends, and the pillows 16 rock to accommodate it; the bottom of the bag flattens out laterally on the pillows, the bottom end of it rising off the cradle bottom, and the distended bag is finally supported by the pillows. The top end of the bag is gripped on the filler spout 26 by a straddling pawl clamp 27; this clamp is pivoted at 28 and is provided with a trip finger 29; with this trip finger there coacts a release finger 30 on a link 31; this link connects the bell crank arm 32 of a lever 33 with the balance frame 13 through pivots 34. The filler spout 26 is carried by the upper structure of the balance frame and around the butt of it a baffle shield 36 is fitted, this shield being disposed rearward of the collar member 25. The lever 33 is fitted with an adjustable tappet stud 37. The point of this stud is engageable with the stem-piece 38 of a three-way valve 39; this valve controls an air service from the air main 40 and pipe 41 to a flexible pipe 42 which connects the valve to the bottom end of a cylinder 43, the third port opening to atmosphere. The piston rod 44 of this cylinder is connected to a lever 45 fulcrumed at 46 on a fixture 47, and the outer end of it is connected by the pin and slot arrangement 48 with a radius arm 49 which carries a gate valve 50; this valve works through a slot 51 in a chute 52 above which the feed hopper (not shown) is mounted. 53 is a rotary valve having its spindle extended through the side of the valve casing 54 and fitted with a belt pulley or gear wheel which is driven at a constant rate to determine the rate of flow of the material from the hopper above and the chute 52 into the spout 55, through which it passes to a boot 56 disposed above a continuous belt 57. The forward end of the boot 56 is formed as an open front hood 58 which spans over the belt 57 as seen in Fig. 3. For-

wardly of the open front of the boot hood 58 a casing 60 covers the top side of the belt 57. The continuous belt 57 is constructed of leather or rubberized cloth and it has attached along either 5 selvage of it a series of short fence flanges 59 of very light metal which are riveted to it. In the straight flight of the belt the vertical edges of these fence flanges contact as seen clearly in Fig. 1, and as the belt passes over its pulleys 10 61 and 62 the upstanding flanges spread apart, also as seen in that figure. In the straight flight of the belt the flanges 59 make, in effect, continuous fences along the sides of the belt so that the belt has thus a channel formation as seen 15 in Fig. 3; loss of feed material over the sides of the belt is thus prevented. The back end of the belt runs over a driving pulley 61, the direction of rotation being indicated by an arrow on that pulley. The forward end of it approaching the open butt end of the feeder spout 26 is 20 carried on an idle pulley 62, 63 being a tensioning gear associated with this pulley. The pulley 61 is driven at a fast peripheral speed with the object that the belt 57 will run at a 25 fast speed, taking up the feed material which falls onto it through the boot 56, imparting velocity to that material, and projecting it as a continuous stream off the end of the straight flight of the belt into the butt of the feeder 30 spout 26.

So long as the feed spout is in the normal upper position which it occupies whilst the scale beam 10 is up, the feed which is then projected off the belt passes through the feeder spout 26 35 into the bag. As soon as the bag has taken its appointed weight the scale beam 10 descends, carrying the balance frame 13 down with it and thus bringing the spout 26 out of alignment from the current of material shooting off the end of 40 the belt 57. This current of material then strikes against the baffle 36 and is deflected downwards into a receptacle below (not shown) whence it is re-elevated to the feed hopper. When the balance frame 13 descends, the lever 45 33 is thrown outward to the position shown in Fig. 2 by reason of the pull exerted on its cranked arm through the link 31. In the Fig. 2 position, the link 31 forms a toggle with the crank arm 33 so that the balance frame when 50 descended is locked by the straight toggle in the low position as seen in Fig. 2. In the descending movement the finger 30 strikes up the finger 29 on the butt of the pawl clamp 27 and releases the top of the bag from the filler spout 26. The 55 filled bag may then be tipped out of the machine by pulling on the handpiece 23 thus to tilt the cradle 14 forwardly, whereupon the bag slides off.

When the lever 33 leaves the vertical position 60 shown in Fig. 1, it releases the valve stem 38, operating and closing the valve 39, then cuts off air pressure from the air main 40 and at the same time permits exhaust from the cylinder 43. When the air supply to the cylinder is 65 broken the spring 70 pulls down the lever 45 and closes the valve 50, shutting off the downflow of material from the hopper to the valve 53. When the lever 33 is restored to the vertical position, the tappet 37 striking on the valve stem 38 re-opens the valve 39, admitting air to the cylinder 70 43 and thus re-opening the gate valve 50, whereupon flow of material downward from the hopper is again permitted.

The channelway of the belt 57 between the 75 flange fences 59 is relatively narrow and the

boot 56 is contracted as seen in Figs. 3 and 5 to direct the falling feed into the channelway of the belt. The fences 59 protect the material from 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150

spilling over the side of the belt in its run from the boot to the feeder spout 26. The butt end of the feeder spout is splayed to give it sufficient width to pick up the ribbon of feed which is projected to it from the belt. The feeder spout is open for its full length along the bottom of it, and in section it is therefore an inverted channelway. If from any cause a blockage should occur in that part of the feeder spout which is within the bag (see Fig. 2) the feed which is delivered by the belt into the butt of the feeder spout deflects downwardly over the baffle 36 and falls into a receptacle below, whence it is re-elevated.

When the bag is constructed of paper or of a fabric which does not allow escape of displaced air, or when the bag seams are too close to allow displaced air to vent through them, provision is desirable for eduction of displaced air through the valve. Such provision has been made in certain known packers in which a feeder spout tubular in section for the full length of it or for part of the length of it is used; in the known arrangement tubular air passages have been provided extending backward over and under the spout from its forward end to vents in the feeder boot. Owing to its relatively small section relatively to its length venting of air through this air tube was unreliable. Venting of displaced air is effected in the packer of the present invention through two open bottom passages which flank the channel of the filler spout. These passages are formed by fitting a channel shaped cap 101 (see Fig. 7) over the filler spout 26. The feed passes forwardly into the bag through the channelway 102 in the spout, and the displaced air passes backwardly through the flank passages 103, and exits to atmosphere through their open bottoms outside the bag.

Similarly, when a bag has been filled, and, by reason of its weight, has tipped down the scale beam 10, the balance frame 13 descends, bringing down the feeder spout 26 so that the feed coming off the belt strikes the upper part of the baffle 36 which is then across its course.

In these circumstances the feed delivered by the belt when the balance frame is in the low position falls into the receptacle below.

There is thus a cut-off of the downflow of feed from the hopper to the rotary valve 53 as each bag is filled and the scale beam tipped down, and a restoration of the downflow of feed as soon as a new bag has been set on the cradle with the filler spout 26 set into the valve in the top end of the bag. The hand lever 33 must, however, be swung back to the Fig. 1 position in order to allow the balance frame 13 to rise, thus to bring the filler spout 26 into alignment with the course of the feed thrown by the belt. The cut-off and opening movements of the arcuate valve 50 correspond with the rising and falling movements of the balance frame 13.

The peripheral speed of the belt must be such that the trajectory of the projected feed will be nearly straight. For most granular or powder material the desirable speed is about 2000 feet per minute.

The particular method of fencing the belt sides is secondary to the main feature of the invention; whilst the sectional flanges 59 have been found quite effective devices, it would

nevertheless be practicable to construct belts with ribbings 80 forming fences on the top face of it as seen in Fig. 5. The rapid movement around the pulleys, however, does not favour the use of belts of this construction. It is preferred to use belts with the fastened-on sectional fences as shown in Figs. 1 and 3.

The movement of the feed from the boot 56 along the belt 57 is promoted by an air blast from a pipe 81 projected through a flat splayed orifice 83 (see Fig. 4). The flat jet high pressure air striking slightly downwards along the belt face and entering at the rear of the boot operates to assist in the movement of the feed on the belt, and to diminish lag in the pick-up when the feed meets the belt.

The balance frame is held in erect position by a radius arm 65 pivoted at 66 to a bracket on the machine frame, and connected to the top end of the balance frame 13 by a claw 68 engaging a stud 67.

In Fig. 5 the fence is a fixed fence and it consists of angle plates 69 supported on the fixed structure and extending down to near contact with the top surface of the belt.

In Fig. 6 the position occupied by the bag on the cradle when the bag is empty is indicated in full lines. The position to which the bag comes as it distends during filling is indicated in the dotted lines, the pillows 16, it will be noted, tilting as the bag bottom swells and lifts. The lifting of the bag bottom which thus takes place relieves downward tension on the bag sides and so minimizes risk of tearing the head of the bag where it hangs on the filler spout 26 and offers sufficient freedom for the release of the bag from the filler spout when it is quite full and it is required to tip it off the cradle.

By the above described means, material is fed in regulated amounts to the hopper or chute and guided thereby onto the horizontal run of the belt, and the air blast accelerates the material and tends to turn it towards a horizontal direction of movement as it approaches the horizontal run of the belt. As will be seen, the opening between the belt and the discharging side of the hopper is materially longer than the valve of the bag. The contact of the surface of the belt with the underside of the stream as it leaves the hopper accelerates the movement of the material and so attenuates the stream that it is discharged from the belt with a cross section enough smaller than that of the valve so that it can pass through the guide spout and valve into the bag, leaving room around it for the escape of air from the bag.

In this way, the bag is quickly and compactly filled by a stream of material originally larger in cross section than the valve of the bag, but accelerated and attenuated until its cross section is smaller than the valve of the bag, and this acceleration is by means of surface engagement with the periphery of the stream and with no retarding friction on the surface of the stream after it has been accelerated, and with no stirring, frictional-impelling contact with the interior of the stream. Thereby the material can be discharged through the valve of the bag without compacting, stirring or heating friction. Accordingly this method and means are particularly suitable for quickly and compactly filling valve bags with material of a sticky or cloggy nature.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A bag filler comprising a downcast chute for the feed, a valve in said chute adapted for regulating the rate of feed flow therethrough, an open bottom boot at the foot of the chute, a continuous belt disposed horizontally or approximately so with its upper flight passing under the boot and extending forwardly therefrom, a filler spout on a bag carrier said spout disposed in alignment with the line of flight of material projected off the belt, a baffle shield surrounding the butt of the filler spout and a clearance between the delivery end of the belt and said baffle adapted for permitting the discharge downwardly of feed projected from the belt and not accepted by the filler spout.

2. A bag filler having a boot, a chute leading downwardly from a hopper to the boot, a valve in said chute adapted for controlling flow of feed therethrough, a bag supporter carried on a scale beam, a self locking toggle linkage connecting said bag supporter with the machine frame, a valve with pressure air service thereto adapted to be operated by the toggle movement and connected with pneumatic device which controls said chute valve, said air valve adapted to cause closing of the chute valve, when the bag supporter descends, and adapted also to cause opening of the chute valve when the bag supporter is at its high position.

3. In combination with a bag filler having a fast running continuous belt receiving feed at one end of its upper flight and discharging said feed at high velocity from the other end of its upper flight into a filler spout which is adapted to direct it into a bag,—a vertically movable bag carrying frame supported on a scale beam and having the filler spout fixed in it, a toggle linkage between said vertically movable frame and the fixed main frame of the machine, said toggle linkage arranged to come to the locking position when the frame descends and thereafter to hold the frame down until it is re-set, a valve controlling supply of feed to the belt, a pneumatic device operating said feed valve, and a valve in an air service to said pneumatic device controlling its operation, said air service valve interlocked with said toggle so as to effect the closing of the feed valve through the pneumatic device when the bag frame descends and to effect opening of the feed valve when the bag frame is re-set at its high position.

4. In a bag filler having a bag carrier frame supported on a scale beam and adapted for vertical movement and having a filler spout fixed on said frame and adapted to enter the top of the bag set in said frame; means for relieving tension on the bag sides as filling proceeds, said means comprising oppositely disposed tilting pillows in the lower part of the frame, said pillows adapted to be tilted by the pressure of the bag sides as the bag distends and in their movement to raise the bottom of the bag upwardly in said frame.

5. A self-acting bag bottom elevating arrangement for relieving distension tension on the sides of a bag undergoing filling, consisting of a pair of tilting pillows in the lower part of a support frame in which the bag is accommodated, said pillows adapted to be tilted as the bag descends and in their tilting movement to raise the bag bottom.

6. A valve bag filling machine comprising a belt having a horizontally disposed portion, means for delivering a stream of granular material to the horizontally disposed portion of the

belt, and a filling tube smaller in cross section than is said stream at the point it starts on said belt and adapted to enter the valve of a valve bag and disposed substantially in alignment with the movement of material on said belt, and means for driving the belt fast enough to attenuate said stream to a cross section not greater than that of said tube.

7. A valve bag filling machine comprising a chute, a continuous belt having a horizontally disposed portion arranged directly below such chute the side of the chute away from which the belt moves being cut away to deliver a stream of granular material on the belt, means for driving said belt at sufficient speed to project material substantially horizontally therefrom, and to attenuate said stream, and a filling tube adapted to enter the valve of a valve bag and disposed substantially in alignment with the movement of material on said belt, and of a

size to receive and guide material drawn from said belt into a valve bag.

8. The method of filling a valve bag which consists in forming a stream of material larger in cross sectional area than the valve of the bag to be filled, positioning the bag with its valve at a distance from the source of the stream, accelerating the stream by contacting only a peripheral surface thereof by a surface moving at high speed towards said valve, attenuating the stream by said acceleration to a cross sectional area slightly less than that of said valve, supporting and directing the stream into alignment with the valve by means of said moving surface, continuing said support of the stream until it is closely adjacent the valve, and then abruptly removing said moving surface from the path of the stream and projecting the stream through the valve into the bag.

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