Nov. 6, 1934. E. A. MARSH 1,979,483

BAG FILLING APPARATUS

Filed Jan. 16, 1932 2 Sheets-Sheet 1

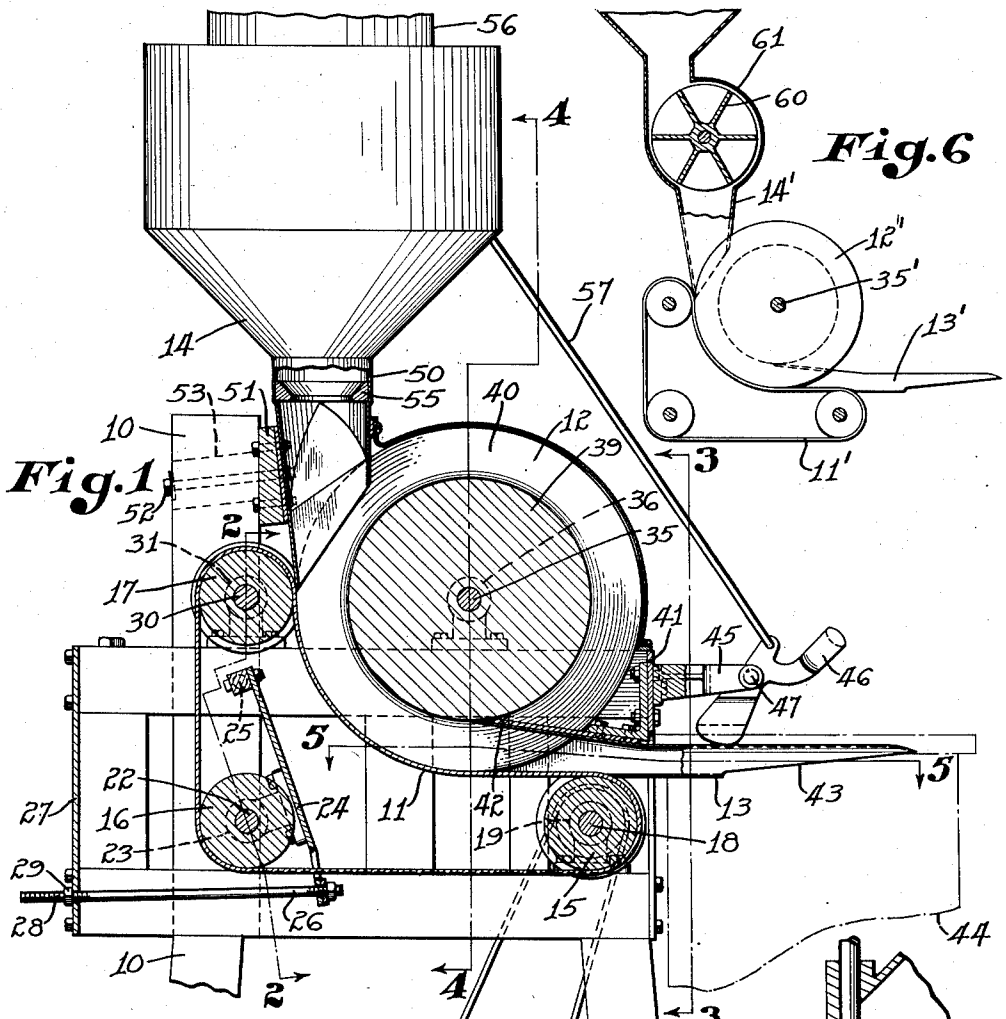


Fig. 1

Fig. 6

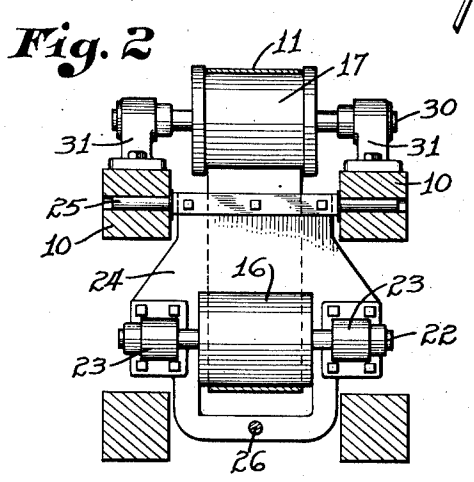


Fig. 2

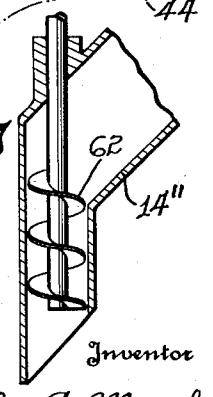


Fig. 7

Inventor

Esli A. Marsh

By Owen & Owen

Attorneys

Nov. 6, 1934. E. A. MARSH 1,979,483

BAG FILLING APPARATUS

Filed Jan. 16, 1932 2 Sheets-Sheet 2

Fig. 3

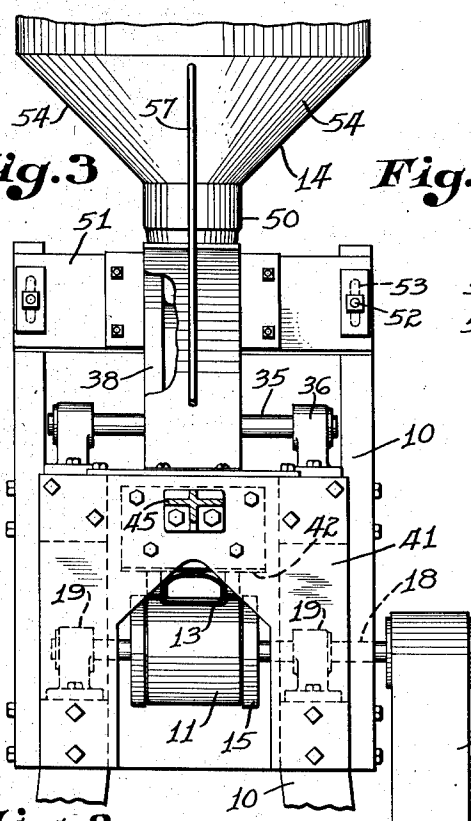


Fig. 4

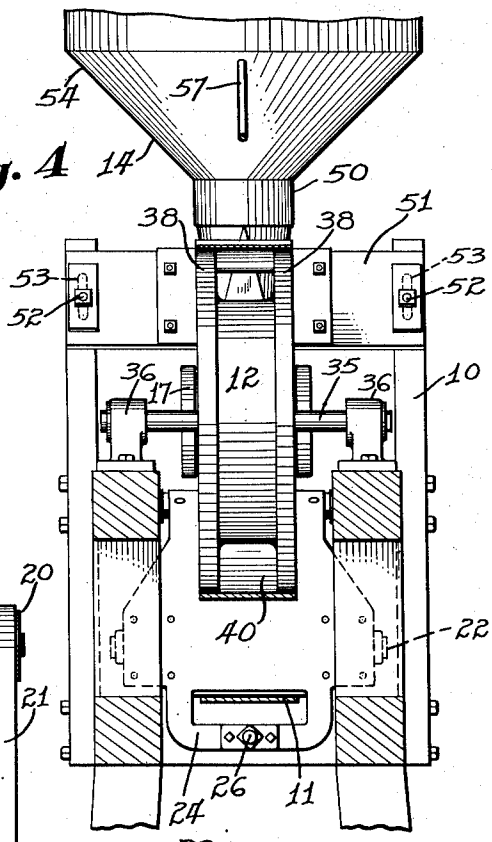


Fig. 8

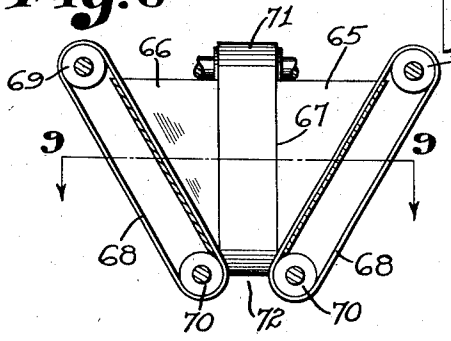


Fig. 5

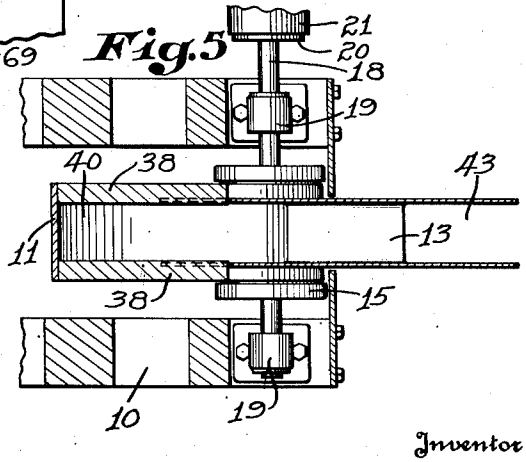
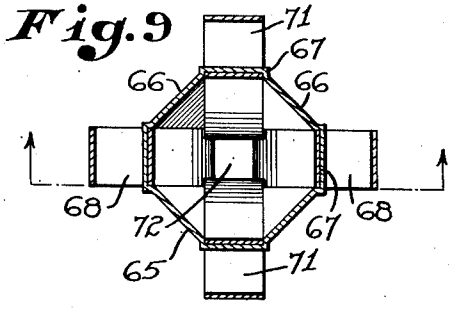


Fig. 9



Inventor

Esli A. Marsh

By Owen & Owen

Attorneys

Patented Nov. 6, 1934

1,979,483

UNITED STATES PATENT OFFICE

1,979,483

BAG FILLING APPARATUS

Esli A. Marsh, Oswego, N. Y., assignor to St. Regis Paper Company, New York, N. Y., a corporation of New York

Application January 16, 1932, Serial No. 586,992

5 Claims. (Cl. 226—48)

This invention relates to a bag filling apparatus and has for its object to provide means for filling material into a bag at high speed without applying such friction or agitation to the material as to be injurious thereto.

Another object of the invention is to propel material into a bag with a minimum of friction. A further object of the invention is to receive a stream of material falling vertically and deflect it into a horizontal direction without decreasing its momentum and preferably with an increase of speed. More specifically the object of the invention is to deliver charges of material to a valve bag by producing a high speed stream of material adapted to enter the bag, and projecting that stream in a substantially horizontal direction with a minimum of friction upon or turbulence within the material.

The apparatus specifically devised for accomplishing the objects of this invention comprises members adapted to enclose an arcuate channel and move all the walls of the channel at substantially equal angular speeds throughout the arc, means to deliver a stream of material to the receiving end of the arcuate channel and to guide the stream from the discharge end of the arcuate channel into a bag through the valve thereof.

Details and other objects of the invention will appear as the description proceeds.

Figure 1 is a vertical section showing apparatus embodying one form of the invention;

Figure 2 is a section substantially on the line 2—2 of Figure 1, showing details of the belt operating rollers;

Figure 3 is a view substantially on the line 3—3 of Figure 1, showing the delivery spout in section and a front elevation of other portions of the apparatus;

Figure 4 is a vertical section through the delivery mechanism, substantially on the line 4—4 of Figure 1;

Figure 5 is a horizontal section through the delivery spout, substantially on the line 5—5 of Figure 1;

Figure 6 is a somewhat diagrammatic view, similar to Figure 1, but showing a different form of feeding apparatus;

Figure 7 is a section of another form of feeding apparatus;

Figure 8 is a vertical section of still another form of feeding apparatus; and

Figure 9 is a cross section substantially on the lin 9—9 of Figure 8 of the feeding apparatus shown in that view.

The apparatus disclosed herein is mounted upon a framework 10, and the essential parts are a feeding belt 11 running against a flanged pulley 12 and delivering material to a delivery spout 13, and means 14 for feeding material to the belt and wheel.

In the construction shown in Figure 1, the belt is mounted upon three rollers 15, 16 and 17. Roller 15 is mounted on a shaft 18 which is journaled in bearings 19 on the frame 10, and is extended at one end to carry a pulley 20 driven by a belt 21 from any suitable source of power.

Roller 16 is mounted on a shaft 22 journaled in bearings 23 upon a bracket 24 pivoted at 25 upon framework 10. The lower end of bracket 24 receives a rod 26 the other end of which passes through a plate 27 mounted upon the frame. The end of rod 26 is screw-threaded at 28, and may be adjusted by a nut 29 so as to swing bracket 24 upon its pivot and thereby tighten the belt, when desired.

Roller 17 is mounted upon a shaft 30 journaled in bearings 31 mounted upon frame 10. Wheel 12 is mounted upon a shaft 35 journaled in bearings 36 mounted upon frame 10 and spaced horizontally from roller 17 so as to bring the periphery of flanges 38 of the wheel in close contact with belt 11 between the wheel and roller 17. The wheel has a central portion 39 which leaves a groove or space 40 between the flanges. Where the flanges run against belt 11 as the belt turns from a vertical direction between the flanges and rollers 17 to a practically horizontal direction as it leaves the flanges to run over roller 15, the space 40 encloses material between walls which are moving on all sides thereof. This portion of space 40 forms an arcuate channel receiving material vertically and delivering it horizontally.

In front of the pulley there is a bracket 41 on which there is mounted a deflecting plate 42 which enters space 40 and extends substantially to body 39 so as to strip material from space 40 and compel it to follow belt 11 as the belt leaves the wheel. Spout 13 is mounted in front of the delivery end of belt 11 and receives the material from the belt and discharges it, through its cut-off lower side 43 at its discharge end, into a bag 44, the valve of which filling tube 13 is adapted to enter.

A supporting bracket 45 extends forward from bracket 41. A bag clamp 46 may be pivoted at 47 on bracket 45, and operates to clamp a bag upon the filling spout during the filling operation.

In the construction shown in Figures 1, 3 and 4, the material is guided to the belt and wheel by a discharge tube 50 mounted upon a cross-piece 51 which, in turn, is mounted for vertical adjustment upon frame 10 by means of a bolt and slot connection 52, 53. The lower end of the spout is substantially rectangular in cross section, and is adapted to deliver a stream within space 40. The upper end of spout 50 carries a hopper 54 which directs material to a gage ing 55, which has therein an opening of the desired size to deliver a stream of material to the belt and wheel. It is preferred to adjust the size of the opening in

ring 55 to the nature of the material delivered, the speed of the belt and wheel, and the distance of the ring above the belt and wheel, so that the material will be carried off by the belt and wheel as fast as it reaches them, and will not pile up so as to stop the momentum of the material at any time. In other words, the material, as it drops from ring 55, is accelerated by gravity until it reaches the belt and wheel, and thereafter is carried forward at a speed at least equaling that which it has acquired before contacting with the belt and wheel. Preferably the belt and wheel further accelerate the motion of the material so that it is delivered through the spout at high velocity.

In the construction shown in Figure 1, there is indicated a weighing can 56 of any desired automatic weighing device, which may be tripped if desired by a rod 57 leading from clamp 46.

The operation of the apparatus thus far described is as follows. The belt 11 is run constantly by power applied from any suitable source through pulley 20. Wheel 12 also rotates constantly, either because of the contact of its flanges with belt 11 or from separately applied power, if desired. Since drive roller 15 pulls the belt against the flanges of wheel 12, the belt makes tight contact with those flanges because of the pull exerted thereon, even if the belt is slightly loose; but this tight contact can be further insured by adjustment of bracket 24 and tightening-roller 16, if desired. With these parts in movement, a bag is placed upon filling tube 13 and clamp 46 operated to hold the bag in position. Either independently or by this same motion, the weighing device is tripped to discharge a suitable load for the bag into hopper 54. From there, it runs by gravity through the opening in ring 55 and is accelerated by gravity, the stream being somewhat reduced in cross section, until it reaches the belt 11 and groove 40, in a stream not greater than the cross section of the groove. It will be noted that guide 50 is normally out of contact with the stream of material. It will be further noted that while the opening in ring 55 is somewhat larger than the cross section of channel 40, it is spaced above the point where belt 11 covers groove 40, a sufficient distance so that gravity will reduce the cross section of the stream sufficiently to make it as small as that of groove 40 when it reaches the belt. Thereafter it travels with the traveling walls of space 40 and is somewhat accelerated until it is stripped from the space by tongue 42 and thrown from belt 11 through filling tube 13 into the bag, into which it is thus discharged at high velocity. After the charge has been completely driven into the bag, clamp 46 is released and the bag removed, after which another bag may be placed in receiving position and the operation may be repeated.

The mechanism indicated diagrammatically in Figure 6, is similar to that shown in Figure 1, except that it is intended to operate upon material which may require feeding by such means as spider 60 within enlargement 61 in the feeding tube. This will break up the material, if desired, and regulate its flow in a well known manner, and may be used where the nature of the material being handled renders it advisable to use such means rather than, or in addition to, the means shown in Figure 1 for feeding the material to the discharging impeller.

In Figure 7 there is shown another form of feeding device 14'', which may be employed to feed material to the discharging belt and wheel. In this construction there is shown a screw 62 which may be operated by any suitable means, and which serves to control the flow of the material and insure a continual and even discharge to the belt.

Figures 8 and 9 show still another form of feeding device. In these figures there is shown a hopper 65 which tapers downwardly and has triangular sides 66 between grooves 67, there being shown four of these grooves. In two of these grooves there run belts 68 which pass over upper rollers 69 and lower rollers 70, the lower rollers 70 being driven in any suitable manner. There are shown also two belts 71 running in a plane perpendicular to the plane in which belts 68 run. The rollers around which belts 71 pass at their lower ends are somewhat higher than rollers 70, and for that reason, the lower ends of belts 71 may approach each other somewhat closer than the width of belts 68, and thus with belts 68 form a substantially square discharge opening 72, as best shown in Fig. 9. It will be readily seen that material dropped into hopper 65 will be urged downward by the belts, and will leave the hopper through opening 72 in a substantially rectangular stream at approximately the speed of movement of the belts. It will be readily understood that this stream is directed into the channel formed by belt 11 and wheel 12.

While, in the broader aspect of the invention, it is immaterial how the channel 40 is charged, a preferred method is to supply it by means of a stream which is accelerated and reduced in cross section as it approaches the channel, so that the material reaches the channel at considerable velocity, and in a stream which will readily enter the channel and travel with the walls thereof. In other words, the belt and wheel preferably take all moving material and continue to move this material in a changing direction, and at as great or higher speed than that at which it is received.

It will be seen that belt 11 and wheel 12 together form an arcuate channel 40. The walls of this channel move at equal angular speeds about the axis of shaft 35, so far as belt 11 is in contact with flanges 38, which is for substantially 90°. This may be called the propelling channel. It will be seen that this channel is in the shape of a 90° arc, and receives material substantially vertically and tangentially of the receiving end of the arc, while it delivers material substantially horizontally and tangentially of the delivery end of the arc. For the purpose of filling valve bags, it is preferable to discharge the material through a substantially horizontal filling tube, in the manner shown, and that is the primary purpose of this apparatus. It will be readily understood that, by the means shown, high velocity can be imparted to the material with a minimum of friction, and with a minimum of agitation or rubbing of the material. It is important in filling valve bags to have the material enter at high velocity, because the comparatively small opening, desirable for the purpose of proper valve closing, requires a column to be fed at high velocity in order to fill the bag without a delay which would be objectionable in many plants. The avoidance of friction is always desirable, as it eliminates waste of power, excessive wear, etc. However, it is important because of another reason and that is, that many materials which might otherwise have been filled

into valve bags have not been packaged in that manner to any great extent in the past, because of injury the material would suffer in being discharged by feeding mechanisms previously in use, or because it could not be successively handled by such mechanism. It will be readily seen that, by the present mechanism, any material which can be successfully introduced into the entrance end of the impeller channel will be discharged at high velocity through the filling tube into the bag without friction or disturbance of the material which could injure any kind of material.

As indicated, the avoidance of friction upon, or internal disturbance within, the delivered material is an important feature. As indicated, the parts are so proportioned that the feeding groove is not filled completely at its entrance end, and the speeding up of the material as it travels with the belt is such that it is reduced at delivery point to a small stream readily projected through the spout and bag-valve into the bag.

While plate 42 is referred to as a "stripper", it will be readily understood that the material reaches the discharge point from the groove in a stream somewhat smaller than the internal diameter of spout 13, and this thin stream is held against the belt by centrifugal force and normally leaves the groove without contacting plate 42. Likewise the sides of tube 13 are slightly farther apart than flanges 38, as shown in Fig. 5, and therefore the stream does not normally contact the walls of tube 13, but is projected as a free stream from the end of the belt, the tube serving to confine any dust that might otherwise escape, but having as its principal function the holding of the bag valve open and in proper alignment.

It being desirable to feed as large a stream as practicable through the tube into the bag, the discharged stream is intended to be nearly the depth of the tube, the same as it is nearly the width thereof. The tube cannot be enlarged without enlarging the valve of the bag, but the channel in the wheel may be made as deep as desired. In order that there may be no possibility of clogging at the entrance of the channel between the flanges, the groove therebetween is made materially deeper than is the discharge tube. This relation is always desirable, and is essential if there is acceleration of the material by the belt.

Having set forth the nature of my invention and details of one specific embodiment thereof, with some obvious variations of the devices for feeding material to the discharging impeller, it will be readily understod that various changes may be made, and mechanical equivalents may be substituted within the spirit of the invention and in accordance with the following claims.

What I claim is:

1. In filling apparatus, an endless belt, means for driving the upper run of the belt through a path curving from a downward direction to a more horizontal direction, means to deliver a stream of material to the upper end of said curve, means to support a valve bag with its valve in position to receive material delivered tangentially from the lower end of said curve through said valve, and means forming a channel about said stream from the time it strikes the belt until it is within the bag, the cross section of said channel being least where it passes through the valve and being at all points larger than the stream passing therethrough.

2. In bag filling apparatus, members forming together complete walls for an arcuate channel, means for driving the members and moving all walls of said channel about a common axis, means to feed material to one end of said arcuate channel in a stream never exceeding the cross section of the channel, and a filling spout in substantially tangential alinement with the delivery end of said arcuate channel, said spout being adapted to enter the valve of a valve bag and being of slightly greater width and materially less depth than said channel.

3. In bag filling apparatus, members forming together complete walls for an arcuate channel, means for driving the members and moving all walls of said channel about a common axis, and means to propel material towards the channel in a stream that decreases in cross section and increases in speed as it approaches the channel and reaches said channel in a cross section never exceeding that of said channel, and a delivery spout in alignment with the delivery end of said channel and having a cross sectional area materially less than that of said channel but greater than that of the delivered stream.

4. In bag filling apparatus, a peripherally grooved wheel mounted upon a substantially horizontal axis, a belt, means for driving the belt through a closed path including a path coming into contact with one side of said wheel and running downward around the wheel to the bottom thereof and then onward tangentially of the wheel in a substantially horizontal direction until it has moved from the periphery of the wheel a distance equal to the depth of said groove and thereafter departing abruptly downward from said tangential line, means for feeding material downward into said groove at the point where it is covered by said belt and in a stream never greater in cross section than said groove, and a tube adapted to enter the valve of a bag and in position to receive material thrown from the horizontal run of said belt, said tube being slightly wider but of materially less depth than said groove.

5. In bag filling apparatus, a peripherally grooved wheel mounted upon a substantially horizontal axis, a belt, means for driving the belt through a closed path including a path coming into contact with one side of said wheel and running downward around the wheel to the bottom thereof and then onward tangentially of the wheel in a substantially horizontal direction until it has moved from the periphery of the wheel a distance equal to the depth of said groove and thereafter departing abruptly downward from said tangential line, feeding means providing an opening above said groove at the point where it is covered by said belt, said opening being larger in cross section than said groove and spaced above the groove a distance so that gravity will reduce the cross section of a stream dropping from the opening so that it is never larger than said groove when it reaches the same, and a filling tube adapted to enter the valve of a bag and in position to receive material from said horizontal run of the belt, said tube being slightly wider but of materially less depth than said groove.

ESLI A. MARSH.