

[54] MACHINE FOR FILLING CONTAINERS
WITH GRANULAR PRODUCTS[75] Inventor: **Bernard C. Eisenberg**, Rockaway,
N.J.[73] Assignee: **Solbern Corporation**, Fairfield, N.J.[22] Filed: **Jan. 25, 1974**[21] Appl. No.: **436,661**[52] U.S. Cl. **141/51; 141/129; 222/167**[51] Int. Cl.² **B65B 31/00**[58] Field of Search 141/1, 51, 59, 65, 69,
141/73, 74, 78-80, 93, 115, 116, 118, 124,
125, 129, 131, 132, 256, 283, 324; 222/167,
170, 358, 363, 364[56] **References Cited****UNITED STATES PATENTS**

2,433,478	12/1947	Nelson	141/129 X
3,696,581	10/1972	Eisenberg	141/78 X

Primary Examiner—Richard E. Aegerter
 Assistant Examiner—Frederick R. Schmidt
 Attorney, Agent, or Firm—Kenyon & Kenyon Reilly
 Carr & Chapin

[57] **ABSTRACT**

A rotary drum type of container filling machine particularly adapted for handling granular products has semicylindrical pivoted troughs spaced around the inner circumference of the drum in place of the conventional stationary shelf or bucket. The machine features completely sealed construction, including a unique sealing arrangement for the removable drum cover. Negative pressure inside the drum is maintained by an exhaust blower to prevent escape of product during the filling operation, and frusto-conical drum ends return any spilled product to the center portion of the drum for recycling.

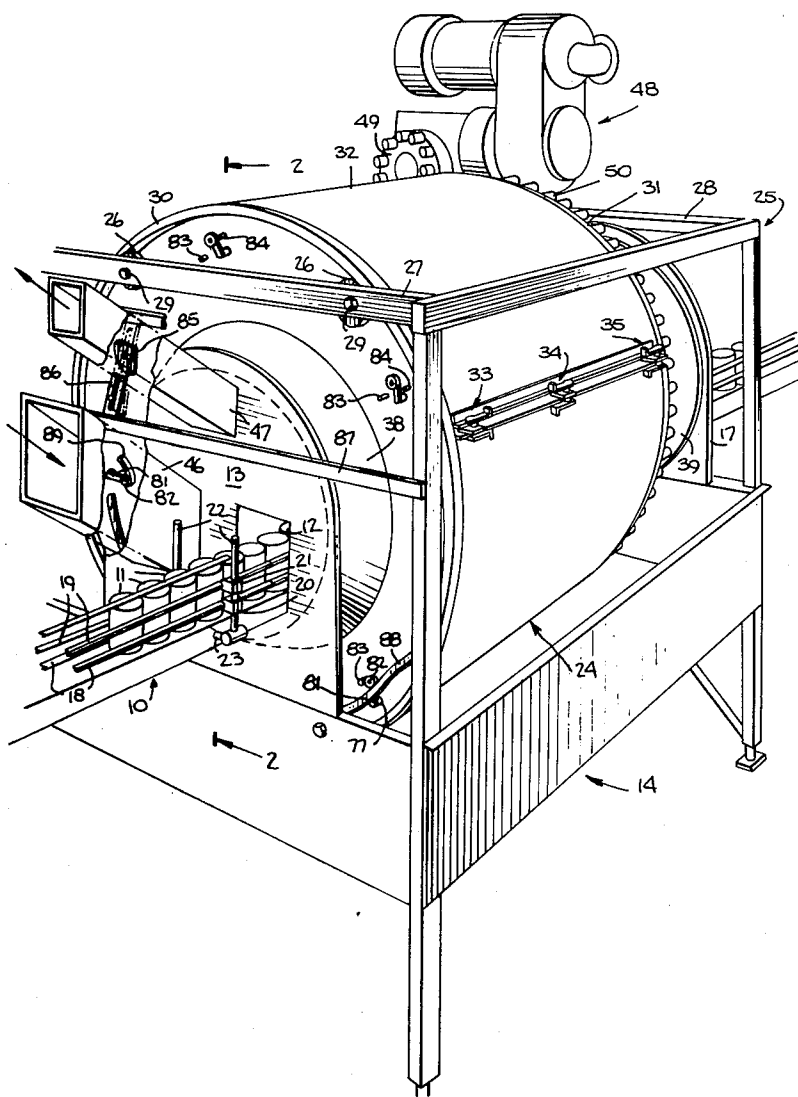
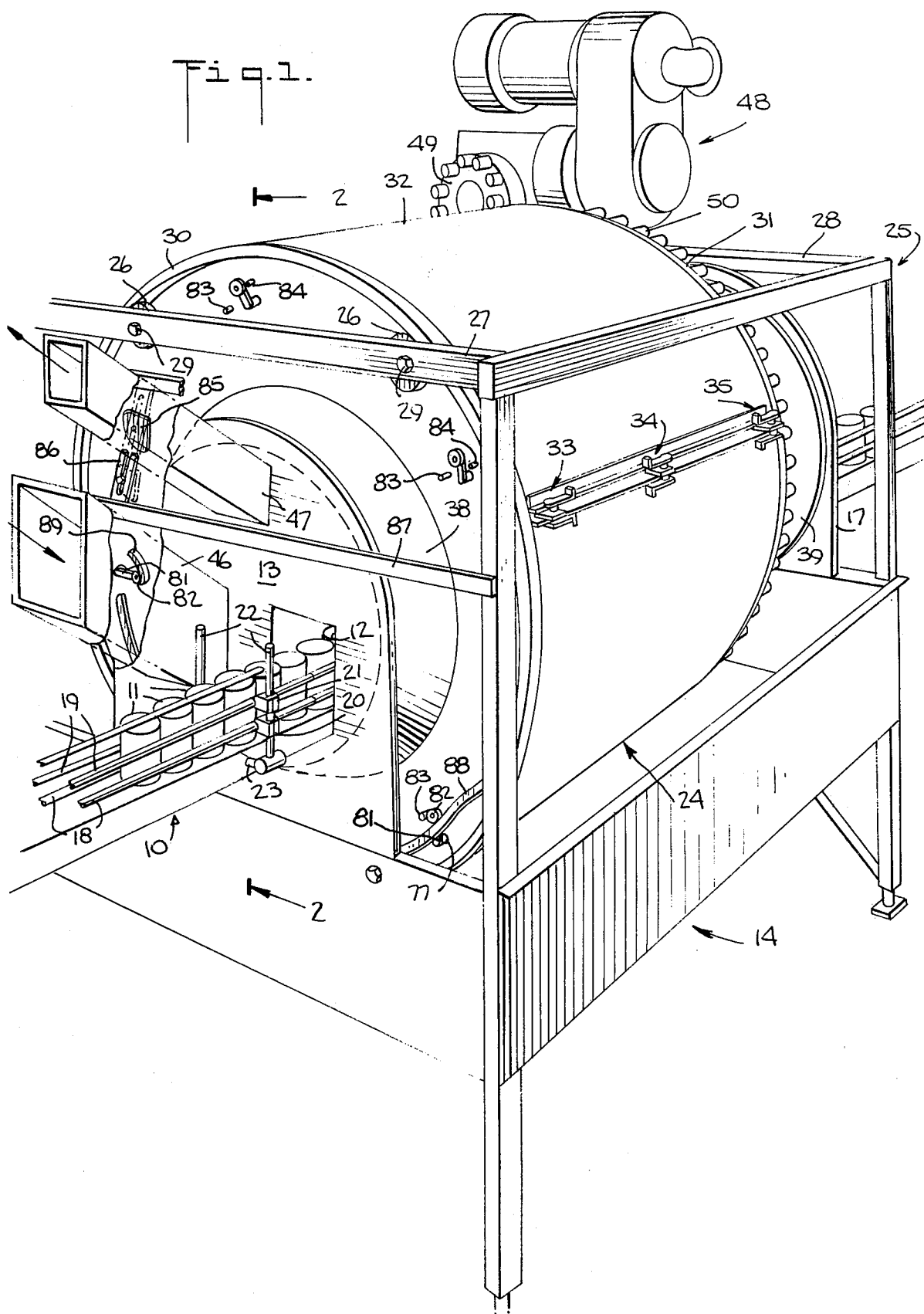
11 Claims, 7 Drawing Figures

Fig. 1.



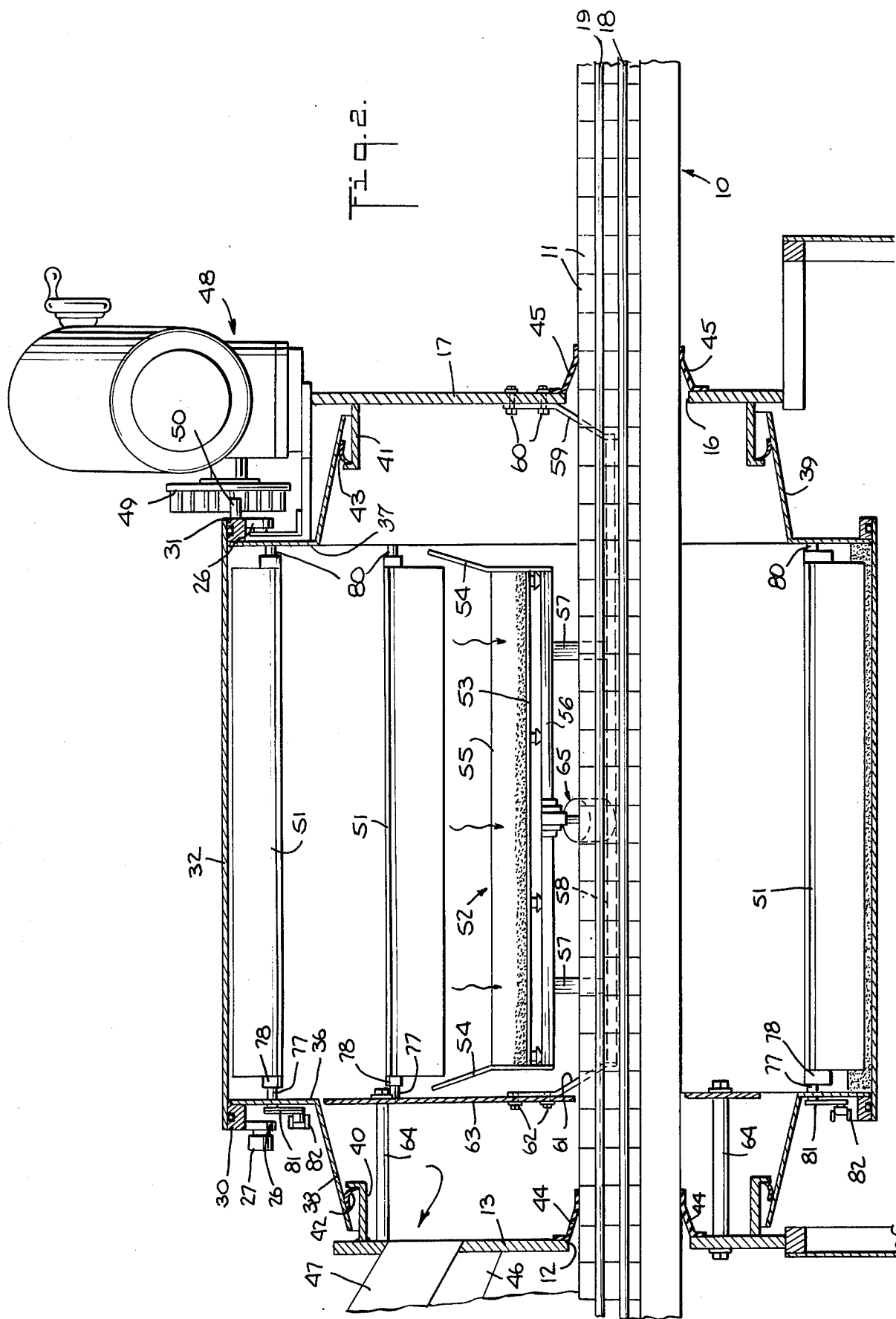


Fig. 3.

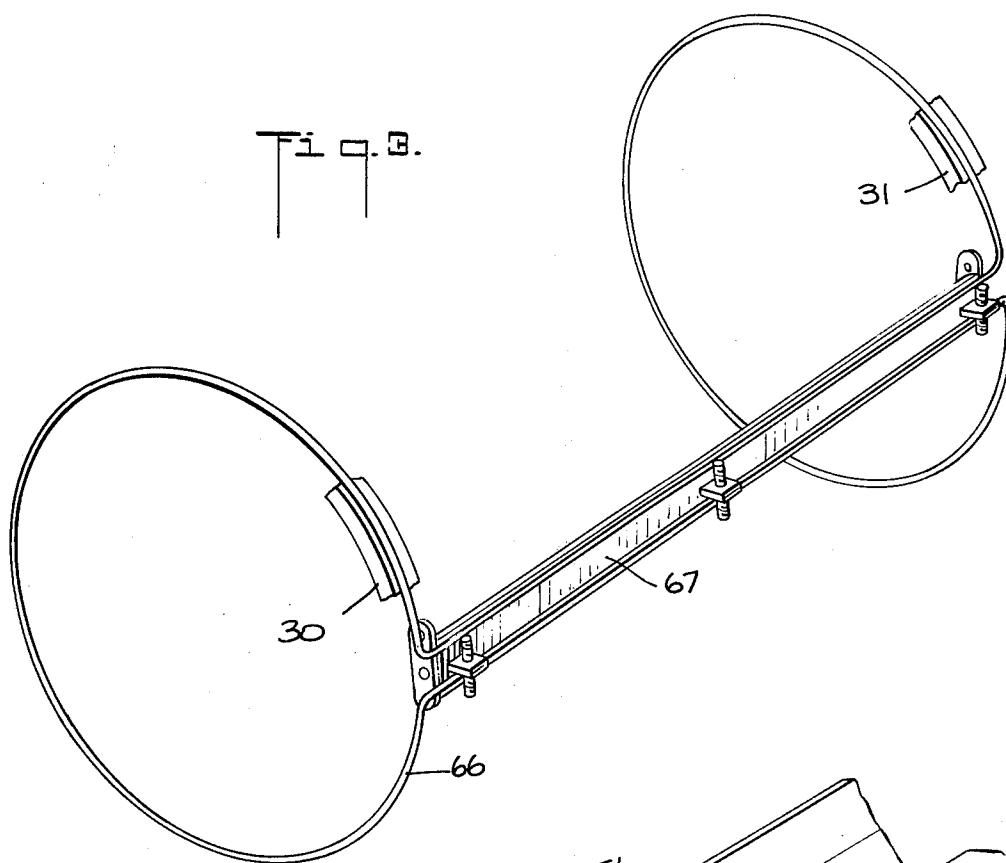
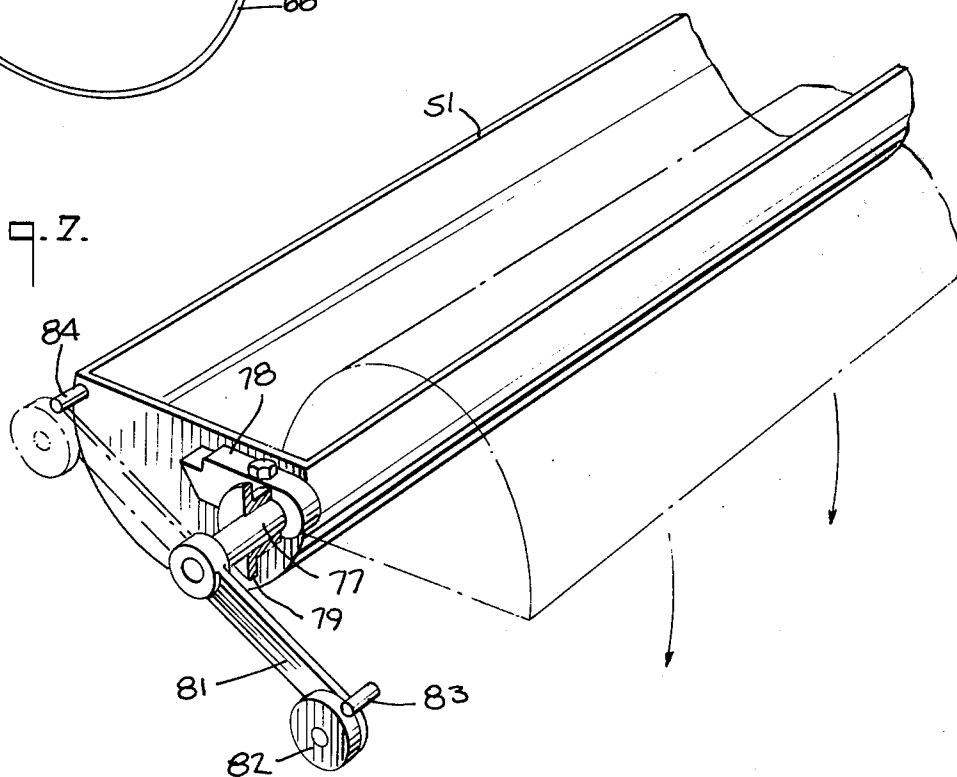


Fig. 7.



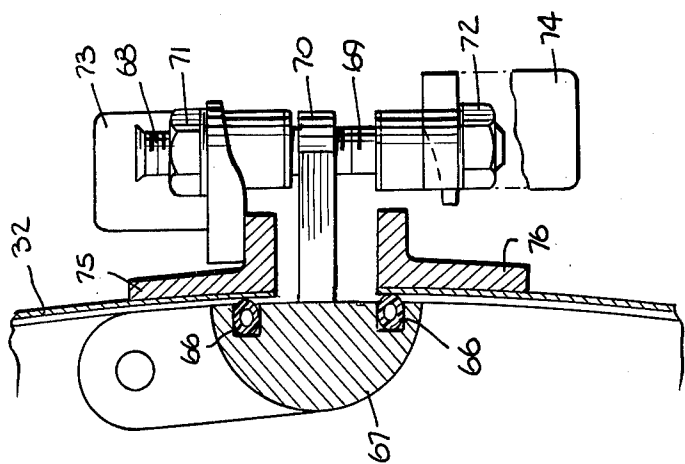
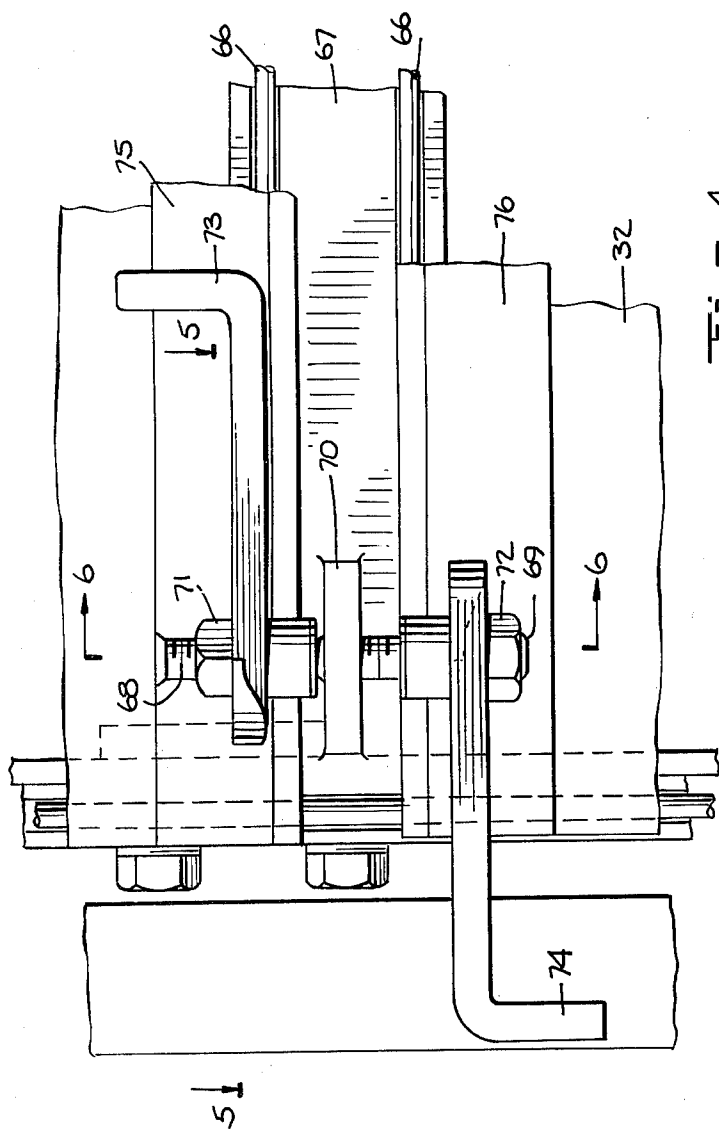


Fig. 4.

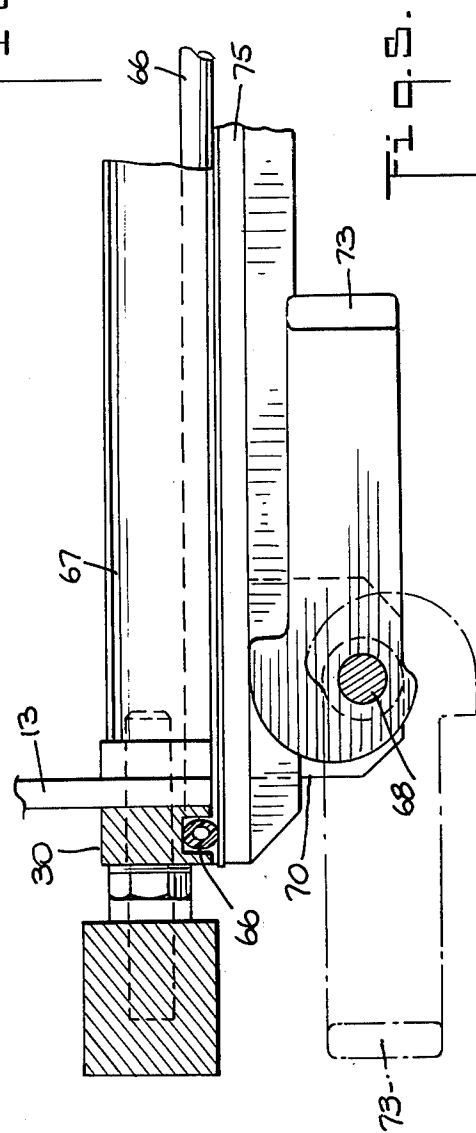


Fig. 5.

Fig. 6.

MACHINE FOR FILLING CONTAINERS WITH GRANULAR PRODUCTS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to machines for filling containers and more particularly to rotary-drum type machines for filling containers with granular products.

2. Description of the Prior Art

My previous U.S. Pat. No. 2,937,670, issued May 24, 1960; No. 3,217,760, issued Nov. 16, 1965; and No. 3,298,404, issued Jan. 17, 1967, disclose container filling machines of the type of which the present invention is an improvement, and their disclosures are incorporated expressly in this application by reference.

In these prior machines, empty containers such as cans or jars are placed on an elongated conveyor for transport past a material delivery location. The materials usually handled are small food items such as fruit, cut or sliced vegetables, and so forth. These materials are delivered by a chute to the interior of an open-ended drum surrounding the conveyor, with the drum axis extending generally in the direction of the path of travel of the containers on the conveyor. The drum is supported for rotation about its axis and is rotated by a suitable drive means.

Elongated rake-like members or fixed shelves with pivoted gates are spaced circumferentially around the inside of the drum and pick up portions of the material in the bottom of the drum as it rotates. The rakes or shelves carry the portions to a predetermined location above the level of the containers where the material is released onto a chute or shaker tray for delivery into the containers. The rake-like members are suitable for picking up elongated, tangly products such as french-cut string beans or shredded products like spinach, while the fixed shelves with pivoted gates are better for food in the form of relatively small pieces such as peas, mushrooms, and various other like food products. Alternatively, a fixed shelf with a lip may be used for products like olives, as shown in my U.S. Pat. No. 2,719,661, issued Oct. 4, 1955.

The drums of these prior filling machines have cylindrical covers of either perforated sheet metal or wire screening to allow syrup or other liquid to pass through and maintain its level in a reservoir tank surrounding the drum instead of churning and splashing inside the drum. At the same time the liquid provides a liquid cushion at the bottom of the drum to prevent injury to the food products.

This construction, although completely suitable for the products described, has been found to be unsatisfactory when filling containers with granular products like salt, wheat germ, other grains, and the like. These products tend to sift through the perforated covers, and the required clearance between the fixed shelves and pivoted gates permits more product spillage with attendant loss and tendency to produce excessive dust with corresponding housekeeping problems. On the other hand, the fixed-lip, bucket type of shelves allow granular products to cascade over the edge of the lip of each bucket as it follows an arcuate path upward as a result of drum rotation; so that only a small amount is left for release at the predetermined location near the top of the drum.

These and other problems have been solved by the machine of the present invention as will become more

apparent from the detailed description of the preferred embodiment in connection with the drawings.

SUMMARY OF THE INVENTION

5 It is an object of the present invention to provide an improved machine for filling containers on a conveyor line with granular products.

It is another object of the invention to provide a drum-type filling machine having an interior sealed from the surroundings to prevent loss of product or contamination of the surrounding area with dust or chaff.

Another object of the invention is to provide a pivoted trough arrangement in a rotary drum filling machine for controlled discharge of product with minimum spillage.

Still another object of the invention is to provide a simple yet effective means for tightly sealing the edges of a cylindrical cover for a rotary drum filling machine.

20 These and other objects are achieved in a rotary drumtype filling machine in which the drum includes a pair of annular members or support rings positioned coaxially and spaced apart to serve as the ends of the cylindrical portion of the drum. A flexible rectangular cover of imperforate sheet material is wrapped around the perimeter of each ring to form the shell of the drum, and releasable latching means are provided for drawing the cover tightly into frictional sealing engagement with the circumference of each annular member.

30 The circular line of contact between the cover and each support ring and the longitudinal line of contact between the adjacent edges of the cover are sealed by a means that preferably includes a resilient elongated gasket positioned in circumferential grooves formed in the perimeters of both rings and in at least one longitudinal groove in an elongated backing member fastened at one end to one of the support rings and at the other end to the other of the support rings. The gasket can be formed as a continuous unit, preferably circular in cross section, or it may be made in separate pieces that include two circular O-rings positioned in the circumferential grooves of the two annular members and at least one piece placed in the at least one longitudinal groove of the backing member.

45 Each end of the drum preferably includes a frusto-conical section having its large end sealed to an annular plate that, in turn, is sealingly attached to the inward-facing side of the corresponding support ring. The annular plates serve as mounting supports for pivoted troughs to be described below and also provide clearance for trunnion rollers to contact the inner surfaces of the support rings. The frusto-conical sections at each end funnel any materials spilled from the troughs or from the containers being filled back to the bottom of the cylindrical portion of the drum.

55 Stationary circular plates located at the outer ends of the frusto-conical sections are equipped with rotary seals bearing against the surfaces of the conical sections and with resilient seals around inlet and outlet openings for a line of containers being conveyed through the drum. The interior of the drum is thus fully sealed from the surroundings and preferably is maintained at a negative pressure by a fan in an exhaust duct connected to the interior through one of the stationary end plates.

65 A plurality of elongated troughs are spaced around the inner circumference of the drum, the troughs being

preferably of semi-circular cross section with their longitudinal axes extending parallel to the drum axis of rotation. Each trough is mounted at its ends by means that permit it to pivot about an axis parallel to the drum axis between a first position in which the trough opening faces forward in relation to the direction of drum rotation and a second position in which the trough opening faces backward in relation to the direction of drum rotation. Means are provided for rotating each trough from the first to the second position at a discharge point located in the upper quadrant of the upward-moving side of the drum.

The pivot axis for each trough preferably is laterally displaced from the plane of symmetry of the trough, the direction of displacement being such that at least a major portion of the trough, and desirably all of it, lies outboard of the pivot axis when the trough is in the first position and lies inboard of the pivot axis when the trough is in the second position.

The advantage of this offset pivot axis arrangement is that in its first position the trough can be located contiguous to the inner wall of the drum so as to pick up a full load with a minimum level of material in the bottom of the drum. In this location and position of the trough there is also maximum radial clearance for placement of the outboard edge of a shaker tray at the level of the discharge point. When the trough is rotated about the offset pivot axis to its second position upon passing the discharge point, it overlies the outer edge of the tray so that substantially all of its contents fall onto the tray.

Another advantage of the offset pivot arrangement is that movement of the troughs from the first to the second position at the discharge point is positive after the center of gravity of the trough crosses a vertical plane through the pivot axis. First and second stop means are provided for limiting rotation of each trough between the two positions, and a lever and stationary cam plate serve to flip the trough from one position to the other at the discharge point. An arcuate cam track extending for at least a portion of the lower quadrant on the downward-moving side of the drum then guides the lever to return the trough to the first position and maintains it in that position until the drum rotates to an angle where gravitational force alone will hold the trough against the first stop means.

It has been found that granular materials tend to pile up ahead of each trough against the inner surface of the drum as the trough emerges from the store of materials in the bottom of the drum. As the drum rotates, these materials cascade continuously over the inner lip of the trough until it reaches the discharge point. This continuous sifting tends to break up granular materials into powder and materially increases dust problems in the vicinity of the machine as well as degrading the size uniformity of the product.

A short third camming member located above the level of materials in the drum on the upward-moving side eliminates the material buildup problem by engaging the lever attached to each trough to tilt the trough as it emerges from the store of materials at the bottom of the drum. The amount of tilt is just enough to dump the excess materials; then the camming member terminates, and the trough drops back against the first stop member.

The advantages of these and other components of the improved drum-type filling machine of the present in-

vention will be readily apparent from the following description of the preferred embodiment in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front perspective view of the improved rotary-drum machine for filling containers with granular materials.

FIG. 2 is a section view of the machine in elevation along lines 2—2 of FIG. 1.

FIG. 3 is a phantom perspective view of the drum cover sealing means for the machine of FIG. 1.

FIG. 4 is an enlarged detail side view of a releasable latching means for the drum cover of the machine of FIG. 1.

FIG. 5 is a top view in section of the releasable latching means taken along lines 5—5 of FIG. 4.

FIG. 6 is an end view of the releasable latching means taken along lines 6-6 of FIG. 4.

FIG. 7 is a partial view of a pivoted trough of the machine of FIG. 1 showing the range of movement between a first loaded position and a second discharging position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, FIG. 1 shows a perspective view looking at the entrance end of the preferred embodiment of a filling machine for granular materials according to the invention. The machine is particularly adapted for filling open-top containers with granular food items such as salt, sugar, rice or other grains, and so forth, but it can be used for filling containers with any granular or similar type of product with minimum waste, minimum contamination of the surrounding area, and minimum damage to the product.

An elongated conveyor 10 carries a line of empty opentop containers such as cylindrical cartons 11 in a linear path through an inlet opening 12 in a stationary end plate 13 of a rotary-drum filling machine 14. The containers are filled with granular material 15 or the like inside the drum (see FIG. 2) and exit through an outlet opening 16 in a second stationary end plate 17.

The containers are guided through the filling machine by two pairs of guide rails 18 and 19, one rail of each pair extending along each side of the line of containers. Guide rails 18, 19 are adjustable in height by means of clamps 20 and 21 mounted on an upright bar 22. A horizontal bar 23 permits lateral adjustment of the spacing between the pairs of guide rails for different size containers.

Rotary-drum filling machine 14 includes a cylindrical drum 24 supported at each end within a frame 25 by trunnions 26 mounted to cross bars 27 and 28 by bolts 29. Trunnions 26 bear against the inner surfaces of a pair of annular members such as parallel, spaced apart support rings 30 and 31 whose centers define the drum axis. A flexible rectangular drum cover 32 of imperforate sheet material, such as a stainless steel sheet, is wrapped around the circumference of each annular member to form a cylindrical shell for the drum. Releasable latching means 33, 34 and 35 draw the cover tightly into frictional engagement with each annular member to form a relatively light yet rigid structure.

Referring to FIGS. 1 and 2, the ends of the drum are formed by a pair of annular plates 36 and 37 sealingly attached, as by welding, at their outer circumferences

to the inner faces of support rings 30 and 31, respectively. To the inner diameter of each of the annular end plates 36, 37 is attached the large diameter end of corresponding frusto-conical sections 38, 39. The small diameter ends of these frusto-conical sections extend outwardly to surround in spaced relation short tubular sections 40, 41 welded to the inner surfaces of end plates 13 and 17, respectively.

Resilient sealing means, such as flexible sheet rings 42 and 43 may be used to seal against atmospheric pressure outside the drum between tubular sections 40, 41 and frustoconical sections 38, 39, respectively. Inlet opening 12 and outlet opening 16 likewise may be sealed by flexible flaps 44 and 45, respectively, if the material being handled is particularly dusty; otherwise these seals are not needed.

Granular material to be filled into the containers is supplied to the bottom of drum 24 by means of a chute 46 through end plate 13. The interior of the drum is maintained at a negative pressure by means of a fan or blower (not shown) operating in an exhaust duct 47 also connected through end plate 13.

The drum is rotated about its axis upon trunnions 26 by a conventional variable speed motor drive 48 acting through a pin gear 49 and mating studs 50 spaced around the outer face of support ring 31. As shown in FIG. 2, a plurality of elongated troughs 51 are spaced circumferentially around the inside of the drum (to avoid confusion, only a few of the troughs are shown). As the drum rotates, each trough in turn scoops up material from the bottom of the drum and carries it to a discharge point above a shaker tray 52 where the material is dumped onto the tray by means to be described more fully below.

The design of shaker tray 52 is not part of the present invention, such trays being known in the art. In the embodiment shown, tray 52 has a bottom 53, sides 54 and back 55 of sheet metal that are rigidly tied to an underframe 56. Two pairs of parallel hinged legs 57 support the tray for oscillating movement transverse to the conveyor line on parallel support bars 58 that are attached at one end to end plate 17 through bracket 59 and bolts 60 and are attached at the other end to end plate 13 through bracket 61, bolts 62, vertical plate 63, and standoff studs 64. A reciprocating actuator such as pneumatic piston and cylinder 65 is connected between support bars 58 and underframe 56 to oscillate the latter relative to the former and thereby move the granular material uniformly across the bottom of the tray to cascade over a lip extending parallel to and above the line of containers as they pass through the drum.

Although a shaker tray such as that described above is a preferred means for moving granular materials uniformly from the discharge point from the troughs to the delivery point about the containers, an inclined chute—either vibratory or stationary—as disclosed in the above-mentioned prior patents may be substituted if desired. The important requirement is to provide a means for gently moving the materials in a uniform flow transversely to the conveyor line from the trough discharge point to the container delivery point.

In addition, although guide rails 18 are shown as continuous through the drum in FIG. 2, it will be appreciated that any of the means for shaking or swinging the containers shown in the above-mentioned prior patents, or similar devices, may be used to agitate the containers as they pass under the shaker tray or similar

material delivering means to settle the contents as the containers are being filled and to shake off any excess material after the containers continue past the end of the filling means.

Referring next to FIG. 3, there is shown by phantom view a continuous gasket 66 arranged for sealing the circular line of contact between the drum cover and each of the annular members 30, 31 and also for sealing the drum along the opposed longitudinal edges of the cover. The continuous gasket is made of natural or synthetic rubber or a similar resilient material and has, preferably, a circular cross section. Gasket 66 is fitted in a continuous groove that substantially completely encircles the outer circumference of annular member 30, then turns and proceeds in parallel grooves along the outer surface of an elongated backing member 67 that joins the two annular members 30, 31, and then encircles the outer circumference of annular member 31. It will be apparent that when the drum cover is drawn tightly around the annular members by latching means connected to backing member 67, a continuous line of sealing contact will be formed between the inner surface of the drum cover and gasket 66.

Alternatively, if desired, gasket 66 can be formed in separate sections, including two O-rings fitted in complete circular grooves around annular members 30, 31, respectively, and at least one straight section fitted in at least one longitudinal groove in backing member 67.

It is important for effective sealing that the drum cover be drawn down tightly onto gasket 66. At the same time, it is desirable to be able to quickly remove the cover for cleaning and inspection. The releasable latching means 33 shown in detail in FIGS. 4-6 provides an advantageous device for achieving these objects. This latching device comprises a pair of threaded studs 68 and 69 welded to the top and bottom surfaces, respectively, of a lug 70 that, in turn, is welded on the centerline of backing member 67 near its left end. Similar latches 34 and 35 are attached near the middle and right end, respectively, of backing member 67, as shown in FIG. 1.

Threadedly mounted on studs 68 and 69 are a pair of camming nuts 71 and 72, respectively, the nuts being equipped with integral actuating handles 73 and 74. As best shown in FIG. 6, the camming nuts are adapted to engage the flanges of angle bars 75 and 76 that are welded to the opposed longitudinal edges of drum cover 32 when it has been wrapped around annular members 30 and 31.

The direction of the threads of studs 68 and 69 is such that camming nuts 71 and 72 are backed away from lug 70 when handles 73 and 74 are rotated to extend to the left beyond the end of the drum, as illustrated by handle 74 in FIG. 4 and nut 72 in FIG. 6. This requires that stud 68 have a left hand thread, while stud 69 has a conventional right hand thread. It will be apparent that with the handles of latching means 33, 34 and 35 in the positions shown in FIG. 1 when the latches are closed, the lower studs of latches 34 and 35 must also have left hand threads, and the upper studs of these latches have right hand threads. In all other respects, the three latches are identical.

When fastening the cover to the drum, all the camming nuts are first backed off to provide maximum clearance. After the cover has been wrapped in place, the handles of the camming nuts are rotated approximately 180°, thereby running the nuts in toward lug 70

and, at the same time, exerting additional closing force by the camming surfaces of the nuts.

Although the latching means of the preferred embodiment has been described in detail, it will be apparent that other arrangements incorporating similar principles can be used to obtain the same results.

Referring next to FIG. 7, in conjunction with FIGS. 1 and 2, a particular feature of the present invention is the arrangement of means spaced circumferentially around the inside of the drum for raising portions of the material in the bottom of the drum to a discharge point above the line of containers. As described above, the material raising means of the invention take the form of a plurality of open troughs 51. Each trough is preferably semi-circular in cross section and extends approximately the length of the cylindrical portion of the drum.

Each trough is mounted by means such as a stub shaft 77 attached by a clamp 78 to one end of the trough for pivoting rotation in a bushing 79 inserted through annular end plate 36. A corresponding stub shaft is attached to the opposite end of each trough coaxial with stub shaft 77 and is journaled in a bushing 80 fastened to the inner surface of end plate 37.

The other end of each stub shaft 77 extends through annular end plate 36 and carries a lever arm 81 equipped with a cam-following roller 82 at its outer end. The pivot axis for each trough preferably lies along the inner edge of the trough when the trough is in a first position with its opening facing forward in the direction of drum rotation (which is clockwise in FIG. 1).

A first stop means, such as pin 83, is attached to end plate 36 to prevent the trough from rotating backwards past this first position. A second stop means, such as pin 84, is attached to end plate 36 to prevent the trough from rotating in the opposite direction past a second position in which the trough opening faces backwards with respect to the direction of drum rotation. Thus the trough is constrained by pins 83 and 84 to pivot no more than approximately 180° between the first position and the second position.

The radial distance of the pivot axes of the troughs from the centerline of the drum is selected so that the outer lip of each trough is closely adjacent to the inner surface of the drum cover when the trough is in the first position. A stationary cam member 85, bolted to a slotted plate 86 that is fastened to frame member 87, is adjustably positioned for engaging the cam following roller 82 of each trough lever arm at a predetermined discharge point in the upper quadrant on the upward-movement side of the drum, the discharge point being at a level just above the outer edge of the shaker tray or delivery chute described earlier. Cam member 85 has a surface for contacting the cam follower that extends from a point inboard of the arcuate path described by the cam follower when the trough is in the first position in a direction for guiding the cam follower outboard to a point where the center of gravity of the trough has crossed a vertical plane through the pivot axis; so that the trough flips over by its own weight to the second position.

This action can be visualized from FIG. 7 in which the solid lines show the approximate orientation of the trough when in the first position just before reaching the discharge point, and the dot-dash lines show the orientation of the trough when in the second position

at the discharge point. It is apparent from the trough and pivot geometry that at a point approximately midway between the first and second positions, the center of gravity of the trough structure will pass from the left to the right of a vertical plane through the pivot axis. At this point, the trough will fall of its own weight until lever arm 81 strikes stop pin 84.

The advantage of aligning the pivot axis with the inner edge of the trough when the trough is in the first position is also clear from FIG. 7 because this assures that substantially all the material in the trough will fall onto the shaker tray when the trough is flipped to the second position, assuming the tray has been positioned with its outer edge as close as possible to the path of the pivot axis.

At some point in the travel of each trough between the discharge point and highest level of material on the downward-moving side of the drum it is necessary to return each trough to the first position and maintain it in that position until the force of gravity at some point on the upward-moving side of the drum will act to hold lever arm 81 against stop pin 83. To this end a cam track means 88 is mounted from frame 25 for engaging each cam follower in turn to lead it inboard to rest against the corresponding stop pin 83 before the trough enters the material at the bottom of the drum.

Although the starting point of cam track means 88 is shown in the lower right quadrant in FIG. 1, it may extend, if desired, upward and around to a point just above the discharge point. This latter arrangement prevents the troughs from swinging free as the drum rotates around to the lower right hand quadrant.

Finally, it has been found that granular materials tend to pile up ahead of each trough against the inner wall of the drum cover as the trough emerges from the material. To prevent this buildup and consequent sifting back as the trough continues in its upward travel to the discharge point, an additional cam member 89 is provided, as shown in the lower left arm drum quadrant in FIG. 1. Cam member 89 engages each cam follower in turn to rotate it a short distance away from pin 83 and then release it to fall back against the pin under the force of gravity. This movement tilts the trough slightly and then "flips" it back to the first position, thereby causing the excess material to drop back to the bottom of the drum.

The improvements in drum-type filling machines described above provide both individually and in combination better handling of granular products to maintain a high degree of size uniformity in the packaged product while substantially eliminating contamination of the surrounding work area.

What is claimed is:

1. In a machine for filling containers with granular material of the type that includes means for conveying containers in a linear path, a drum surrounding a portion of the conveying means with the drum axis extending generally in the direction of the linear path, means supporting the drum for rotation about its axis, means for rotating the drum on its support means, means for delivering to the interior of the drum material to be placed in the containers, means spaced circumferentially around the inside of the drum for raising portions of the material in the drum to a preselected discharge point above the line of containers, means for discharging the material from the raising means at the discharge point, and means for directing the material discharged

from the raising means to the containers as they are conveyed in the linear path, the improvement wherein the means spaced circumferentially around the inside of the drum for raising portions of the material in the drum to a discharge point above the line of containers comprises:

a plurality of elongated troughs extending parallel to the drum axis in spaced relation around the drum adjacent to the inner surface of the drum,

means for mounting each of the troughs at each end of the trough for pivoting about an axis parallel to the drum axis between a first position wherein the trough opening faces forward in relation to the direction of drum rotation and a second position wherein the trough opening faces backward in relation to the direction of drum rotation, and

means for rotating each of the troughs about its pivot axis from the first position in a predetermined direction to the second position as the trough passes the discharge point.

2. The machine of claim 1 wherein the axis about which each trough is pivoted is laterally displaced from the plane of symmetry of the trough, with the major portion of the trough lying outboard of the pivot axis in the first position and inboard of the pivot axis in the second position.

3. The machine of claim 1 wherein the means for mounting each trough for pivoting between a first position and a second position comprises:

a pair of stub shafts, one shaft fastened at one end of the trough and the other shaft fastened coaxially with the first shaft at the other end of the trough, a pair of bearings mounted on the drum for rotatably supporting the trough on the pair of stub shafts, a lever arm connected at one end to one of the stub shafts;

a first stop means mounted on the drum for preventing the trough from rotating past the first position in a direction opposite to the predetermined direction, and

a second stop means mounted on the drum for preventing the trough from rotating past the second position in the predetermined direction.

4. The machine of claim 3 wherein the means for pivoting each of the troughs from the first position to the second position as the trough passes the discharge point comprises:

a cam follower mounted on the other end of the lever arm, the lever arm extending from the stub shaft in a direction inboard and aft, with respect to the direction of drum rotation, of a line between the drum axis and pivot axis when the trough is in the first position, and

a stationary cam member mounted at the discharge point, the cam member having a surface for contacting the cam follower, the surface extending from a point inboard of the arcuate path described by the cam follower when the trough is in the first position in a direction for guiding the cam follower outboard to a point where the trough will rotate by gravity to the second position.

5. The machine of claim 4 further comprising: an additional stationary cam member mounted on the upward-moving side of the drum between a point at the level of material in the bottom of the drum and the discharge point, the additional cam member having a sur-

face for contacting the cam follower, the surface extending from a point inboard of the arcuate path described by the cam follower when the trough is in the first position to terminate at a point intermediate said arcuate path and the arcuate path described by the cam follower when the trough is in the second position for guiding the cam follower outboard to tilt the trough partially toward the second position and then to allow the trough to fall back to its first position so as to shake excess material from the trough after the trough emerges from the material in the bottom of the drum.

6. The machine of claim 4 further comprising: cam track means extending in an arcuate path from a first angular location with respect to the drum rotation after the discharge point to a second angular location before the discharge point for returning and holding the lever arm against the first stop means during that portion of the drum rotation.

7. In a machine for filling containers of the type that includes means for conveying containers in a linear path, a drum surrounding a portion of the conveying means with the drum axis extending generally in the direction of the linear path, means supporting the drum for rotation about its axis, means for rotating the drum on its support means, means for delivering to the interior of the drum material to be placed in the containers, means spaced circumferentially around the inside of the drum for raising portions of the material in the drum to a preselected discharge point above the line of containers, means for discharging the material from the raising means at the discharge point, and means for directing the material discharged from the raising means to the containers as they are conveyed in the linear path, the improvement for filling the containers with granular material with minimal losses wherein

the drum surrounding a portion of the conveying means with the drum axis extending generally in the direction of the linear path comprises:

a pair of annular members concentric with the drum axis and spaced apart to include between them the means for raising portions of the material to a discharge point and the means for directing the material discharged from the raising means to the containers,

a flexible rectangular cover of imperforate sheet material wrapped around the circumference of each annular member to form the shell of the drum, releasable means for drawing the cover tightly into frictional engagement with the circumference of each annular member,

means for sealing the circular line of contact between the cover and each of the annular members,

means for sealing the drum along the opposed longitudinal edges of the cover; and

the machine further comprises:

a first stationary barrier located at the entrance end of the drum and having an inlet opening that provides sufficient clearance for the entering containers without loss of significant amounts of granular material from the interior of the drum.

a second stationary barrier located at the exit end of the drum and having an outlet opening that provides sufficient clearance for the filled containers leaving the drum without loss of significant amounts of material from the interior of the drum.

first resilient seal means between the first stationary barrier and the entrance end of the drum for pre-

venting escape of significant amounts of material between the rotating drum and the first stationary barrier, and

second resilient seal means between the second stationary barrier and the exit end of the drum for preventing escape of significant amounts of material between the rotating drum and the second stationary barrier.

8. The machine of claim 7 wherein the means for sealing the drum along the opposed longitudinal edges of the cover comprises:

an elongated backing member fastened at one end to one of the annular members and at the other end to the other annular member, the backing member having an outer surface lying substantially on the cylinder defined by the outer circumferences of the annular members, the width of the surface being sufficient to underlie the opposed edges of the cover, and means for sealing between the outer surface of the backing member and each opposed edge of the cover.

9. The machine of claim 8 wherein the releasable means for drawing the cover tightly into frictional engagement with the circumference of each annular member comprises:

means for mounting at least one stud, threaded at both ends, in a position spaced from the outside surface of the backing member and perpendicular to the axis of the drum,

a first flange means attached to the outside of the cover adjacent to one of the opposed longitudinal edges at the axial location of the stud,

a second flange means attached to the outside of the cover adjacent to the other of the opposed longitudinal edges at said axial location,

a first camming nut threadedly mounted on one end of the stud for engagement with the first flange means, and

a second camming nut threadedly mounted on the other end of the stud for engagement with the second flange means, the engagement of the first and second camming nuts with the respective first and second flange means drawing the cover into tight frictional engagement with the circumference of each annular member as the camming nuts are turned in a direction to further engage them on the stud.

10. The machine of claim 7 wherein the drum further comprises:

a pair of frusto-conical sections, one section attached at its larger diameter to the inner diameter of one of the annular members and the other section attached at its larger diameter to the inner diameter of the other annular member, the two frusto-conical sections being coaxial with and extending outwardly from the respective annular members, whereby any of the granular material that may fall into the conical sections during the filling operation will be returned by the downward slope at the

bottom of each section to the portion of the drum between the pair of annular members.

11. In a machine for filling containers of the type that includes means for conveying containers in a linear path, a drum surrounding a portion of the conveying means with the drum axis extending generally in the direction of the linear path, means supporting the drum for rotation about its axis, means for rotating the drum on its support means, means for delivering to the interior of the drum material to be placed in the containers, means spaced circumferentially around the inside of the drum for raising portions of the material in the drum to a preselected discharge point above the line of containers, means for discharging the material from the raising means at the discharge point, and means for directing the material discharged from the raising means to the containers as they are conveyed in the linear path, the improvement for filling containers with granular material with minimum losses wherein

the drum surrounding a portion of the conveying means with the drum axis extending generally in the direction of the linear path comprises:

a pair of annular members concentric with the drum axis and spaced apart to include between them the means for raising portions of the material to a discharge point and the means for directing the material discharged from the raising means to the containers,

a flexible rectangular cover of imperforate sheet material wrapped around the circumference of each annular member to form the shell of the drum,

releasable means for drawing the cover tightly into frictional engagement with the circumference of each annular member,

means for sealing the circular line of contact between the cover and each of the annular members,

means for sealing the drum along the opposed longitudinal edges of the cover; and the machine further comprises:

a first stationary end plate located at the entrance end of the drum, the end plate having an inlet opening that provides just sufficient clearance to permit entry of the containers into the drum;

a second stationary end plate located at the exit end of the drum, the second end plate having an outlet opening that provides just sufficient clearance to permit exit of the containers from the drum;

an exhaust duct communicating with the interior of the drum and adapted to be connected to an exhaust system for creating a negative pressure inside the drum with respect to the surrounding atmosphere for preventing escape of any of the granular material through the inlet and outlet openings of the respective first and second end plates and between the first and second end plates and the ends of the drum during the container filling operation.

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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,913,634

DATED : October 21, 1975

INVENTOR(S) : Bernard C. Eisenberg

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 67, after "will become" delete "more".

Column 8, line 39, after "lower left" delete "arm".

Signed and Sealed this

tenth Day of February 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks