

[54] MACHINE AND METHOD FOR TRANSFERRING PREDETERMINED AMOUNTS OF MATERIAL

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[51] Int. Cl. ....B65b 1/06, B65b 3/26

[58] Field of Search ....53/35, 123, 126, 235; 141/78; 222/167

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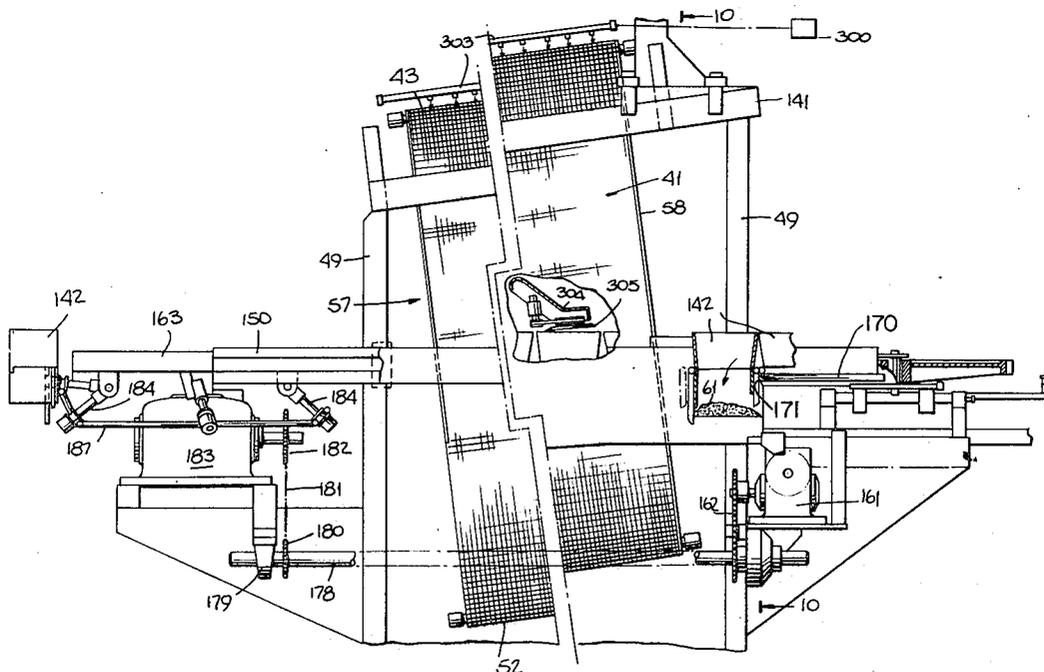
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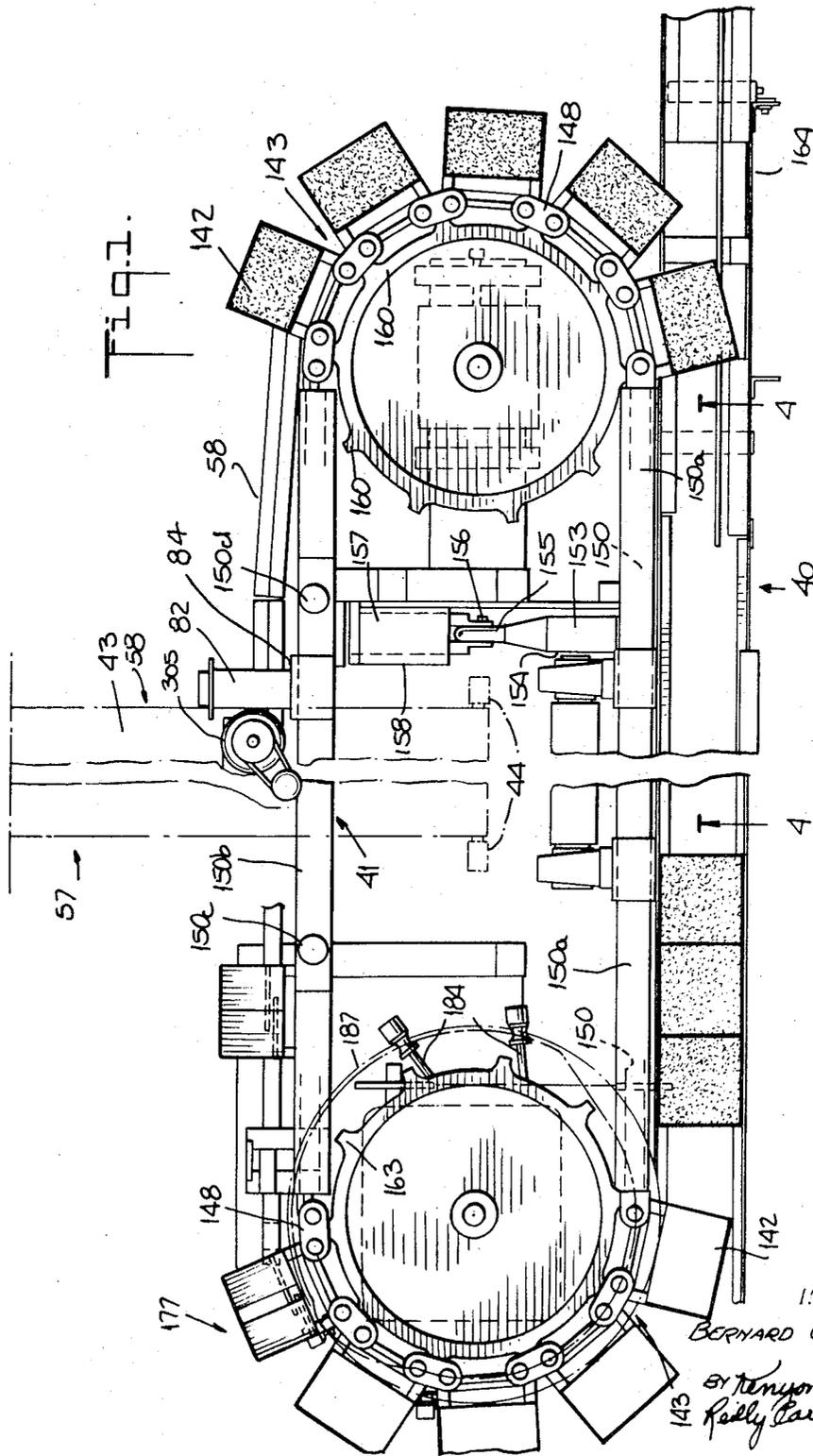
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[57] ABSTRACT

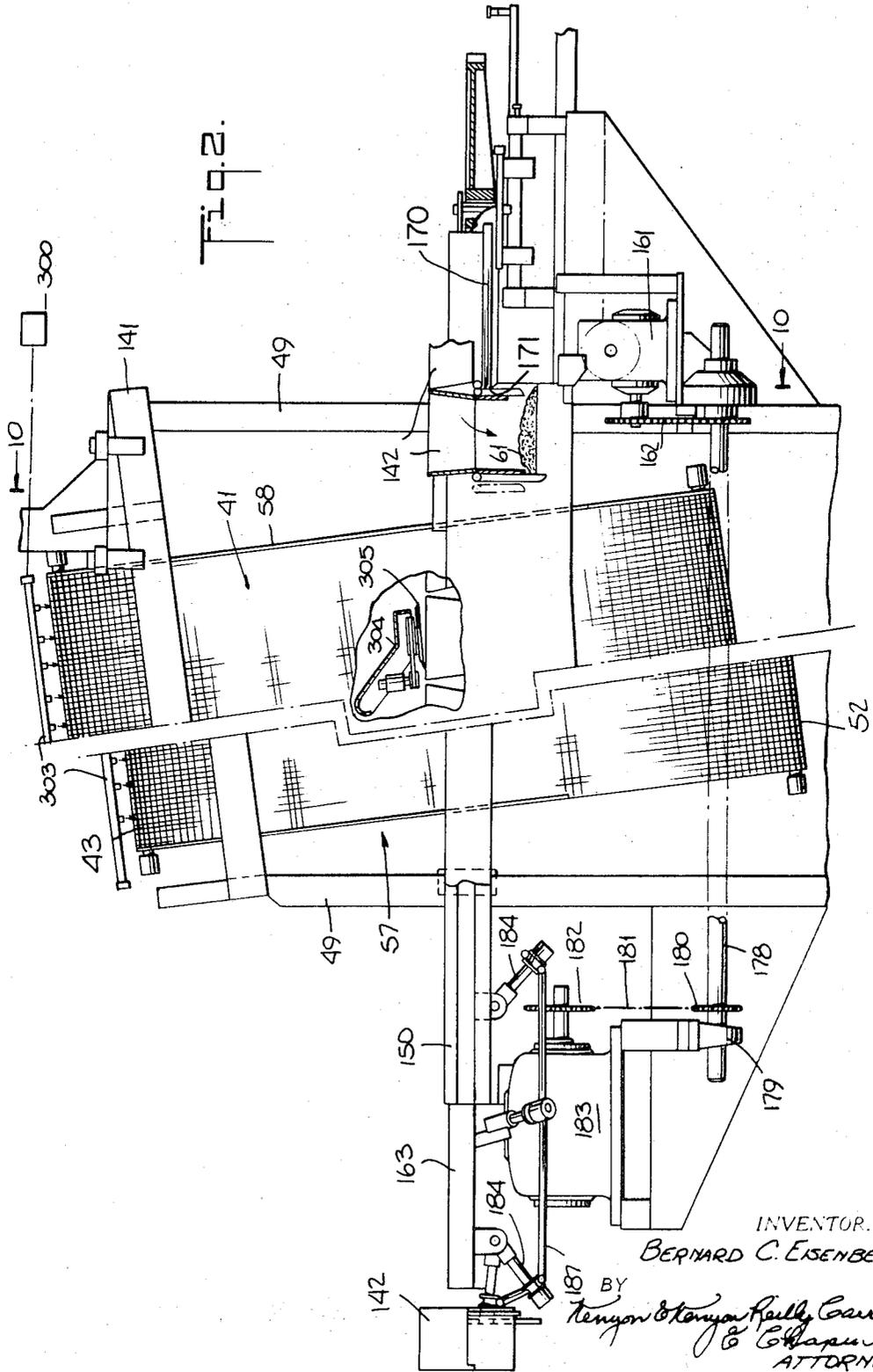
An inclined material delivery means is provided and has passing therethrough a plurality of intermediary receptacle means for receiving predetermined amounts of material to subsequently be transferred to a container. The intermediary delivery means is agitated to provide a uniform and precise amount of material and contains on the bottom thereof door members which synchronize movement of the container therewith in the discharge area. Cutting means are provided to aid in proper filling of the intermediary receptacles as well as air supplies to appropriately direct the material being packaged.

19 Claims, 14 Drawing Figures



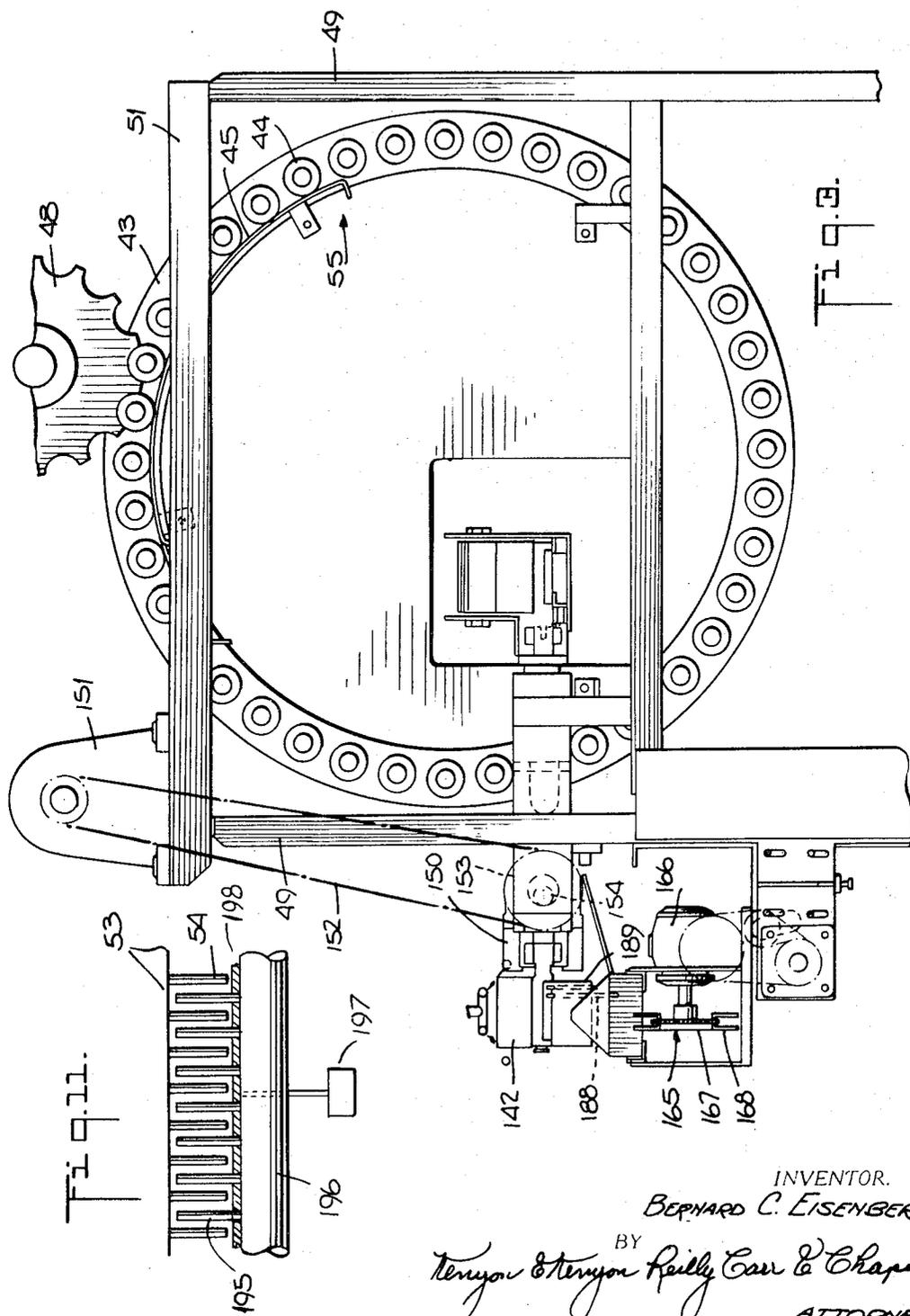


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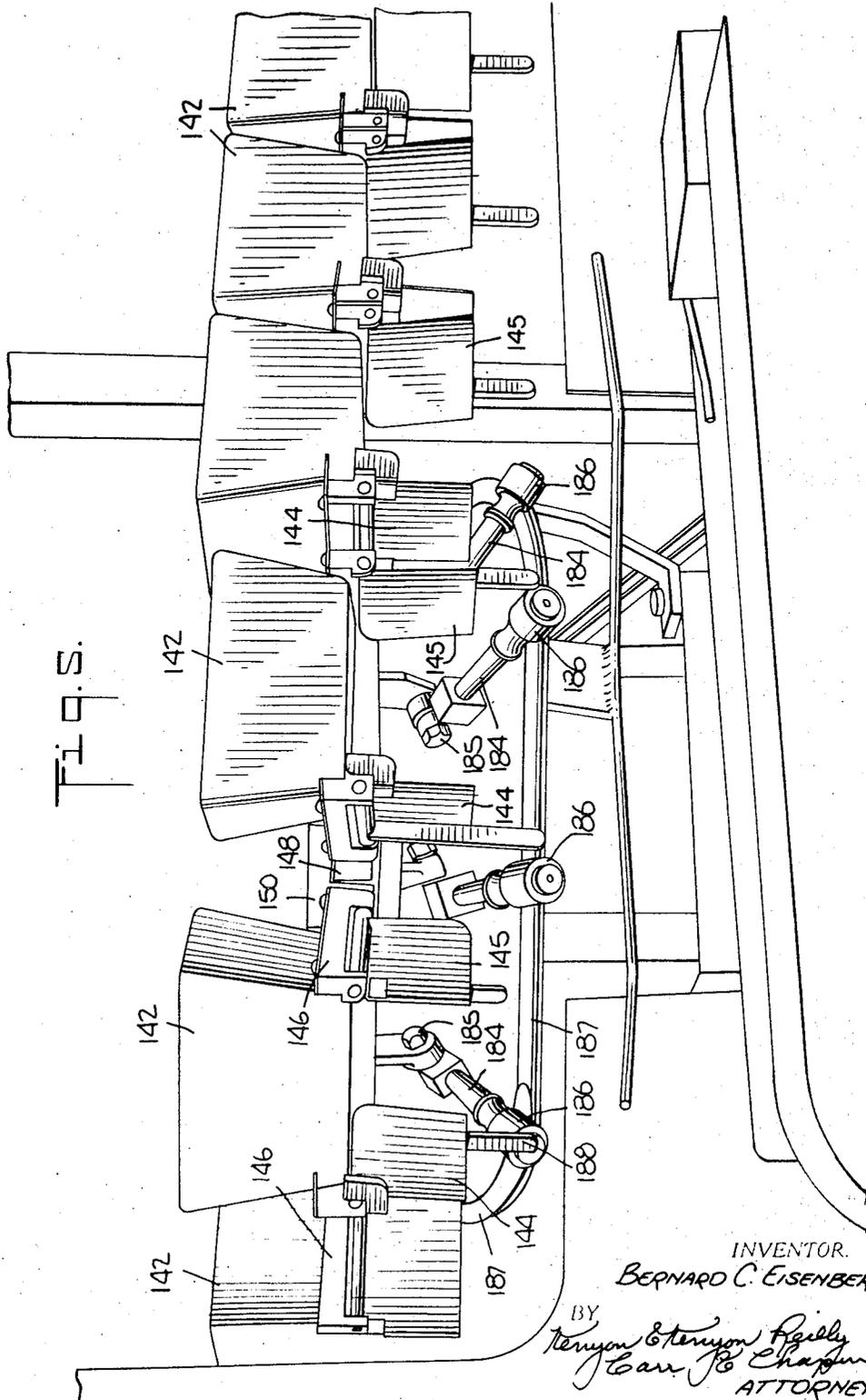
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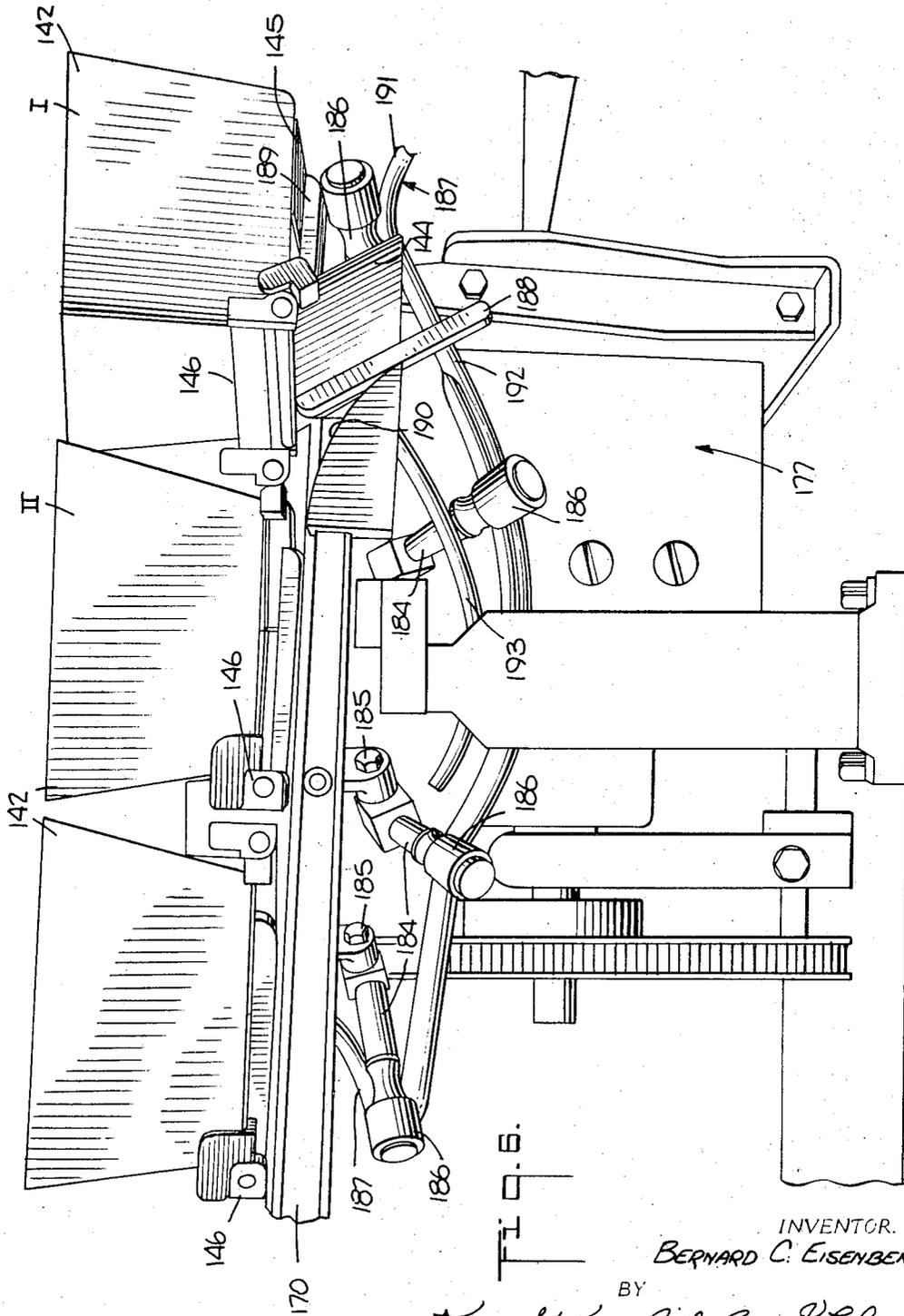
FIGS.

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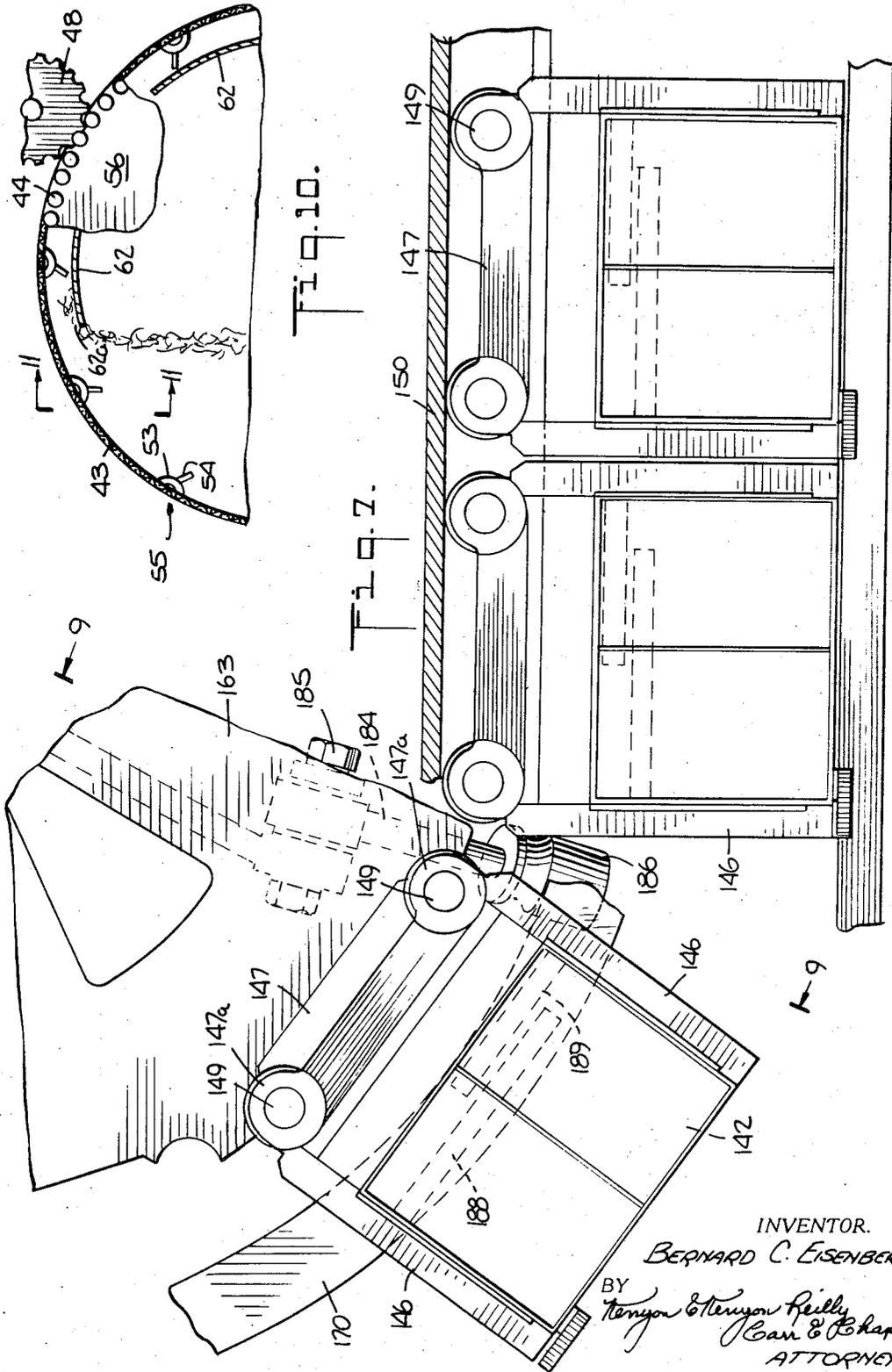


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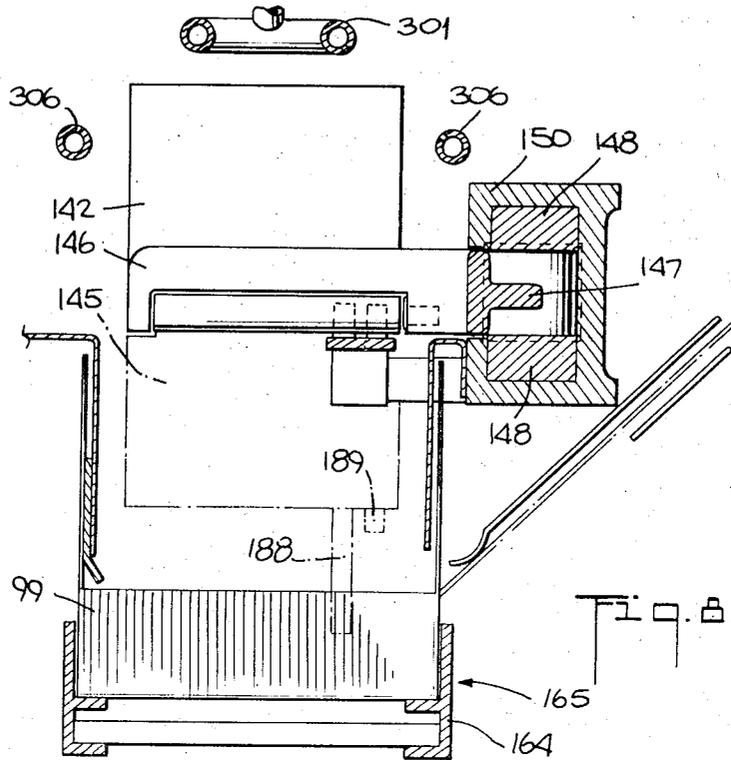


Fig. 8.

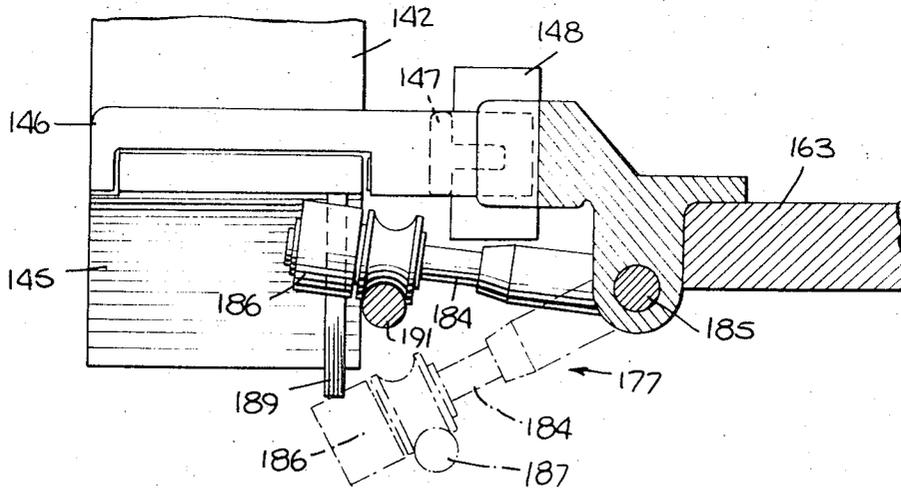
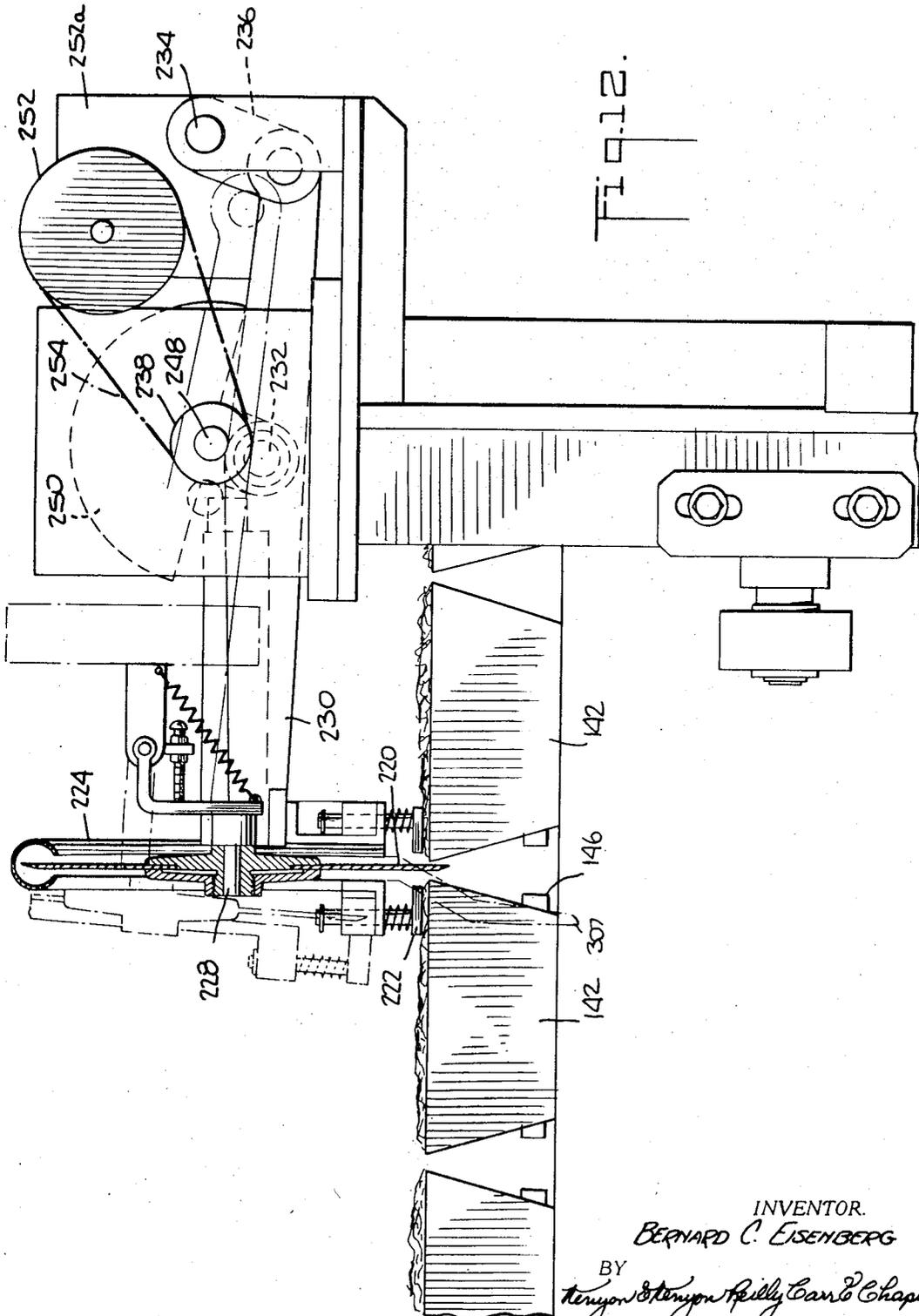


Fig. 9.

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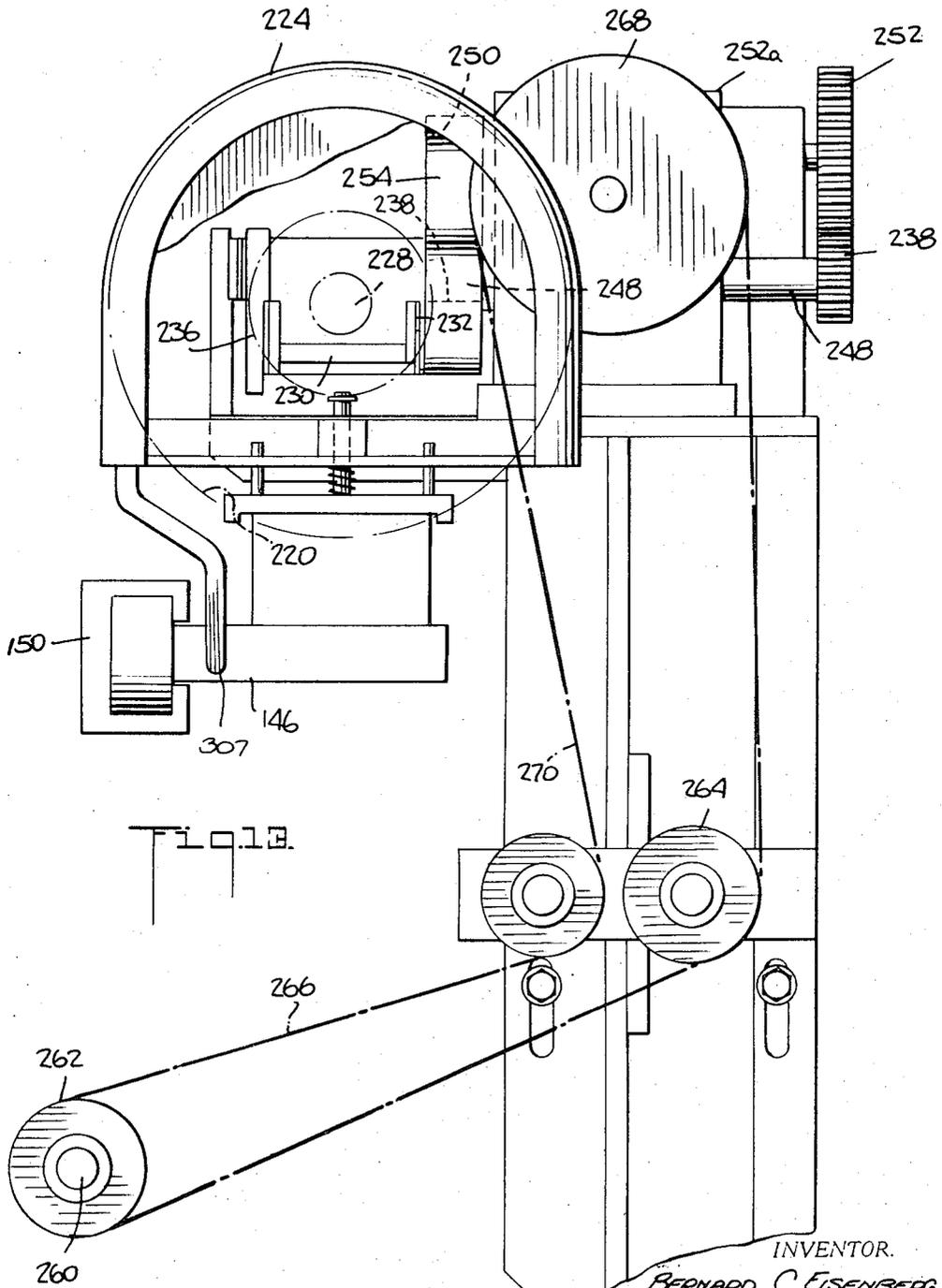
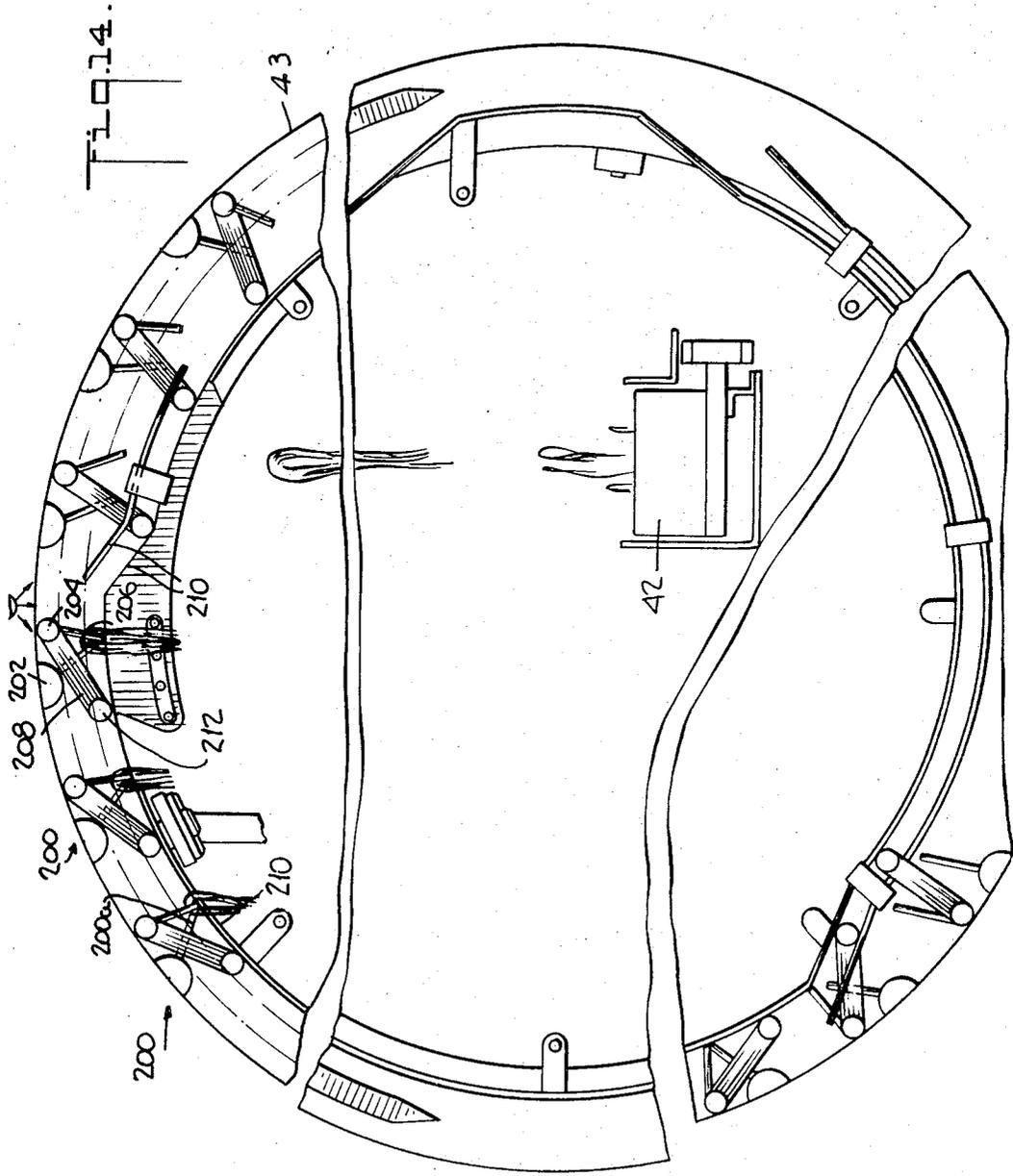


FIG. 10

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# MACHINE AND METHOD FOR TRANSFERRING PREDETERMINED AMOUNTS OF MATERIAL

## RELATED APPLICATIONS

This application is a division of my co-pending application Ser. No. 794,083 filed Jan. 17, 1969 now U.S. Pat. NO. 3,621,891 issued on Nov. 23, 1971.

## BACKGROUND OF THE INVENTION.

This invention relates to material packaging machines and more particularly to one wherein an intermediary receptacle is utilized to transfer the material to a container.

Heretofore, predetermined amounts of material have been transferred to containers by careful weighing of the container and the material after filling and then removing or adding material to establish a predetermined weight. In other instances, predetermined amounts of material have been obtained in a container by filling material into a receptacle of known volumetric capacity corresponding to a known weight, and then agitating the material from the receptacle into the container. Again, material is added or removed from the receptacle during filling in order to establish the predetermined volume.

Predetermined amounts of material have also been measured by weighing selected weights of material and holding these weights in storage until they can be delivered to the container. Whether weights or volumes are being controlled, the fundamental difficulty is that many materials, due to their extremes in form, cannot readily be placed into or maintained in a condition of uniform density. Consequently, variations in measuring such material may result.

Considerable difficulty has been encountered in filling flexible containers, such as paper-board containers, with a food product and especially containers in which a food product is subsequently subjected to freezing. Flexible containers such as paper-board boxes, bags, pouches and the like often cannot be filled by the methods and machines for filling rigid containers such as bottles, jars and cans. In addition, known machines and methods for filling such containers are at a disadvantage due to their complexity and the inexact quantities of food products which are transferred into the containers, while manual filling limits production and is costly. The necessary result is containers containing varying amounts of material. Where regulations or conditions make it mandatory to fill a minimum amount of material into every container, it has been the practice to place more food product in the container, on the average, than is stated on the label of the container. Only in this way can it be insured that none of the containers are underweight. More precise methods and machines would reduce this economical loss.

In my copending application, Ser. No. 623,994, filed Mar. 17, 1967, now U.S. Pat. No. 3,417,708 issued on June 30, 1970 I disclosed a machine and method which overcame most of the deficiencies of the prior art. Briefly stated, therein is disclosed a machine and method for transferring materials including receiving and transferring stations. Receptacle means are mounted on a conveyor defining a path which carries the receptacle means between the stations. The receptacle means are filled with a precise amount of material, and preferably food products, under agitated condi-

tions in the receiving station. The receptacle means are then conveyed to a discharge station wherein the precise amount of material is transferred to a packaging container. There are also contemplated means for substantially continuously moving the packaging containers during filling.

## SUMMARY OF THE INVENTION

In accordance with the present invention, receptacles are conveyed through the machine in a path extending between a receiving station and a discharging station. Adjacent to the receiving station the material is delivered to the receptacles by means of an inclined rotary drum. The receptacles are moved with a predetermined motion in order to agitate the material and thereby establish uniform density of material in the receptacle. At the same time a predetermined volume of material is established in the receptacle and, in view of the uniform density, a predetermined weight of material is obtained. Some of the surplus material is thrown out of the receptacle by the agitating motion. Cutting means are further provided to assist in removal of excess material from the receptacle means as well as means for directing the material to be ultimately packaged. After filling, the receptacle is advanced to the discharge station where the material is transferred from the receptacle to the receiving member, which by means provided herein moves in synchronism with the receptacle. In this way, the agitating motion is applied to the receptacle which is a permanent part of the machine adapted to withstand the force accompanying the agitation. Consequently, there is no need to unduly load the container during filling since it is only necessary to deliver the material from the receptacle directly into the container.

Accordingly, an object of this invention is to provide machines for filling containers with a precise amount of material.

Another object of the invention is to segregate a predetermined amount of material from a source thereof and transfer the predetermined amount into a container.

An additional object of the invention is to transfer a predetermined amount of material to a container which is insufficient to withstand rough handling or a degree of movement sufficient to assist in the transfer operation.

A further object of the invention is to fill comparatively non-rigid containers such as bags, pouches and paper-board or plastic boxes with a predetermined amount of material.

A still further object of this invention is to fill intermediary receptacles with a uniform density and without any excess material extending therefrom.

Another object is to provide means for delivering the receptacle means in conjunction with the container to a transfer area.

These and other objects, advantages and features of the invention will become more apparent from the following description taken in conjunction with the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary plan view of the bucket conveyor and agitating means of a machine constructed in accordance with the invention.

FIG. 2 is a fragmentary side elevation view of the same machine showing the inclined drum thereof and the end portions of the bucket conveyor.

FIG. 3 is a fragmentary view of the same machine showing a portion of the delivering station thereof including portion of the packaging container apparatus.

FIG. 4 is a fragmentary vertical section view of the delivering station taken along line 4—4 in FIG. 1 and showing a portion of the bucket conveyor apparatus and the packaging container apparatus, before, during and after discharge of the product into the packaging containers.

FIG. 5 is a fragmentary perspective view showing a portion of the bucket conveyor apparatus and apparatus for closing the doors of the buckets, prior to entry thereof into the receiving station.

FIG. 6 is another fragmentary perspective view of a portion of the bucket conveyor apparatus and apparatus for closing the doors thereof, showing the manner in which the bucket doors are closed.

FIG. 7 is a fragmentary plan view of one bucket in the conveyor, an instant after the doors thereof are closed, in the manner shown in FIG. 6.

FIG. 8 is a fragmentary vertical elevation section view taken along the line 8—8 in FIG. 4 and showing in detail a portion of the bucket conveyor chain, a bucket and a product packaging container.

FIG. 9 is a fragmentary vertical section view taken along the section line 9—9 in FIG. 7 and showing a portion of the apparatus used to close the bucket doors prior to entry of the buckets into the receiving station.

FIG. 10 is a fragmentary vertical section view taken along the line 10—10 in FIG. 2 and showing a movable rake element for combing any accumulation of material from the rake means within the interior of the rotating drum.

FIG. 11 is a fragmentary vertical section view taken along the line 11—11 in FIG. 10 showing a portion of the movable rake element.

FIG. 12 is a fragmentary vertical section showing a mechanism for cutting material extending between adjacent buckets.

FIG. 13 is a fragmentary front view showing the cutting mechanism of FIG. 12 and its drive mechanism.

FIG. 14 is a vertical section view of the interior of an alternate embodiment of the rotating drum shown in FIG. 10 showing the pincer type rake means for grasping the material and delivering it to the buckets passing through the receiving station location.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

In my U.S. Pat. No. 2,978,231 issued on Apr. 4, 1961 for Container Packer and my U.S. Pat. No. 3,217,760 issued on Nov. 16, 1965 for Machine and Method for Filling Containers, I have disclosed machines for filling substantially rigid containers which comprise a rotary drum having a substantially horizontal axis of rotation. Through the drum and substantially parallel to its axis of rotation, containers such as cans, bottles or jars are conveyed under vibratory conditions. Elements such as rakes in the rotating drum pick up material and carry it around the inside of the drum. When the rakes have travelled to the upper part of the inside of the drum, the material drops off into the moving containers therebelow. The moving containers are subjected to a

predetermined swinging or transverse motion during filling. By predetermination of the transverse motion of the containers, the amount of material entering the container is precisely controlled. Then the transverse motion applied to the containers causes the material to be delivered in a controlled manner until a desired amount of material is placed in the container. As a result, the container is filled to a precisely predetermined level.

In the patents referred to, a rotating drum is described which is adapted to receive the material to be placed in the containers. A conveyor moves the containers through the rotating drum in a longitudinal direction which is substantially parallel to the axis of rotation of the drum. Raking apparatus mounted within the drum adjacent the inner circumferential surface thereof combs and frees a portion of the material from the mass of material disposed adjacent to the lowest portion of the drum and advances the portion of material in response to the rotational movement of the drum. As the rakes engage and move the material, the material becomes untangled and the pieces of material are separated from one another so that they can be delivered into the containers.

Rotational movement of the drum advances the raking apparatus with the material engaged therein to a position where the material is released from the rakes and drops into the containers on the conveyor below. The elements of material having been advantageously separated and untangled from one another by the raking action fall toward and enter into the openings of the containers. My U.S. Pat. No. 2,978,231 describes one of the forms of the agitation required to fill the container to a predetermined precise quantity.

This invention is distinguished from filling packaging containers under agitated conditions while being passed through a rotating drum. In accordance with the apparatus and process herein described, permanent receptacle means are precisely filled under agitated conditions while being passed through an inclined rotating drum. In further distinction, the receptacle means are conveyed to a transfer station wherein the precise amount of material in the receptacle means is transferred to a receiving member. The receiving member such as a packaging container can be conveyed in register with the receptacle means.

With reference to the drawings, the machine of this invention includes a discharge station 40 (FIG. 4) and a receiving station 41 (FIG. 2). The receiving station 41 includes a rotating drum 43 (FIGS. 2, 3). The drum 43 is supported on a track 45 (FIG. 3) by means of a plurality of rollers 44. A similar support is provided at the opposite end of the drum. The drum 43 is mounted on uprights 49 (FIG. 3), inclined support beams 141 (FIG. 2) and support beams 51, whereby the longitudinal axis of the drum 43 forms an acute angle with a horizontal.

The drum 43 has an open mesh jacket 52 to facilitate passage of liquids and a plurality of support rails 53 mounted on the jacket parallel to the axis of the drum. Each support rail 53 has a plurality of tines 54 mounted thereon to form rakes 55. Stationary end plates 56 close the input 57 and output 58 ends of drum 43.

A variable speed motor (not shown) is mounted on support beam 51, and drives the drum 43 through sprocket 48 and rollers 44

Inclined support beams 141 orientates the rotating drum 43 upwardly with respect to the input end 57 (FIG. 2) of the drum. The food product to be packaged by the machine, for example whole spinach 61, is introduced to the drum through a hopper (not shown) at input end 57 (FIG. 2). The drum is inclined to assure that the food product does not gather at one end along the bottom portion of the drum. As the drum rotates the rakes 55 (FIG. 3) break up any clumps or wads of the food product along the bottom portion of the drum 43 and feed small quantities of the food product onto a curved distribution pan 62 (FIG. 10) that is bolted to end plates 56. Thus, rakes 55 pick up the food product and move portions of it in a rotary direction with the drum 43 until the moved portion is deposited by gravity on the distribution plate 62. The rakes 55 move the food product deposited on the distribution plate 62 to the end 62a thereof. The moved food product is dropped from the end of the distribution plate into the receptacle means, for example, buckets 142 that are conveyed on a chain track 143 (FIG. 1), in a manner more completely described below.

Instead of this method of material handling within the drum an alternative method is illustrated in FIG. 14. In that figure, a drum 43 is provided with a plurality of similar rake mechanisms 200 fixedly attached thereto by supports 202. However, between each support 202 which have a plurality of fixed pins 200a thereon, there is positioned a rotatable shaft 204 with a plurality of movable rakes positioned thereon. A lever arm 208 has one end attached to a shaft 204 and follows a control track 210 by means of a roller follower 212 on the other end of the lever arm. As the drum 43 rotates the fixed rake 200 and the movable rake 206 travel with the drum since they are mounted adjacent to the periphery of the drum 43. Roller follower 212 follows the path provided by the control track 210 as the drum rotates. The control track 210 is disposed with respect to the drum in positions which enable track 210 by means of follower 212 to open and close the movable rakes with respect to the fixed rakes and thereby form a pincer action between the two rakes. Thus as can be seen from FIG. 14, when adjacent pairs of fixed and movable rakes are travelling from an approximately 1:00 o'clock position to an approximately 8:30 o'clock position in rotation with the drum, the pairs of rakes are in the open position and can receive the material 61. When the roller follower and a pair of rakes passes the 8:30 o'clock point, the roller follower shifts position to cause the movable rake 206 to close with respect to the fixed rake 200, thus trapping the material 61 between the two rakes. The material thus trapped between the two rakes is carried during rotation of the drum 43 until it reaches the point of about 1:00 o'clock. Then the roller follower follows the control track and causes the movable rake 206 to open with respect to the fixed rake 200 thus causing the material 61 to fall from between the two open rakes. Thus the discharge of the material 61 is controlled.

In place of the fixed and movable rakes, any of the material handling constructions shown in my U.S. patents for use within a rotating filling drum can be employed. Thus, the drum can be fitted with the fixed buckets and chute of my U.S. Pat. No. 2,719,661 issued Oct. 4, 1965, the movable buckets and shaker pan of

my U.S. Pat. No. 2,937,670 issued on May 24, 1960, or with the movable buckets and shaker pan of my U.S. Pat. No. 2,978,231 issued on Apr. 4, 1961.

In the particular embodiment of receptacle means, shown for example in FIGS. 5, 6, the receptacle means are buckets 142 that have interlocking trap doors 144, 145 at the bottom portion thereof. Referring to FIG. 7 each bucket 142 is attached to a pair of supports at opposite end portions of the bucket. Brackets 146 are mounted upon chain blocks 147 which are provided with eyes 147a. Chain links 148 by means of pins 149 extending through eyes 147a pivotally connected blocks 147 together to form an endless conveyor chain (FIG. 1) 143 that is supported by chain track 150 and sprockets 160, 163; the chain 143 is propelled by sprockets 160, 163, in a manner more fully described below, to move the buckets 142 into and out of drum 43. At the discharge station 40, the chain 143 and track 150 are covered by cover plate 150a. At the receiving station 41, the chain 143 and track 150 are covered by cover plate 150b, that is flexibly hinged at 150c, 150d, for a purpose described below.

In order to facilitate the release of material or food product from the interior portion of each bucket, each bucket can be provided with a means for preventing adherence of material or food product to the interior of the bucket. For example, the surface of the interior portion of each bucket can be textured by the provision of a plurality of dimples thereon. Alternatively, a low friction type of coating may be provided on the interior of the buckets, for example "TEFLON" fluorocarbon resin material.

In order to fill buckets 142 with precise amounts of food products 61 an agitating mechanism is mounted on the frame of the machine at the output end 58 of drum 43. The agitating mechanism includes a motor 151 mounted on 51 end support beam 51 (FIG. 3). A chain drive 152 driven by the motor 151 actuates an eccentric drive mechanism 153 that includes a stub shaft 154 (FIGS. 1, 3). The eccentric drive mechanism 153 has a yoke 155 pinned by a pin 156 to a slider crank 157. The motion of the eccentric mechanism 153 reciprocates the slider crank 157 in and out of its jacket 158 periodically to engage the bucket track 143, thereby to reciprocate the track 143 at right angles to the movement of buckets 142. Consequently, the buckets 142 are shaken from side to side at a controlled rate that enables the buckets to be uniformly and accurately filled. The agitation of the buckets settles the material therein, eliminates voids within the buckets and minimizes the overhang of pieces of stringy food product over the side of the buckets. The agitation of the buckets results in uniform density of the material in the buckets and thereby uniform weight. Conventional machines have failed accurately to control weight since they fail to provide uniform density of food product being measured.

Referring to FIG. 1 the buckets 142, propelled on an endless conveyor chain 143 along track 150, enter the input end 57 of the drum 43. The buckets are moved through the drum and transversely oscillated by the above described agitating mechanism. At the same time, the drum is rotated to deposit food product 61 in the buckets. In one embodiment, the fully packed buckets 142 leave the drum at end 58 where they pass

underneath a roller 82 that is covered with resilient material. The roller 82 is adjustably mounted and serves to break or slice food product 61 overhanging the edges of buckets 142 at the location 84 where roller 82 intersects the buckets. The roller 82 also cuts material or food product 61 bridging the gap between adjacent buckets 142.

An alternate method of breaking or slicing the food product 61 overhanging the edges of the bucket 142 is illustrated in FIGS. 12 and 13 of the preferred embodiment. In FIG. 12 a vertically orientated circular cutting blade 220 is shown slicing spinach between two adjacent buckets 142. The overhanging spinach, which is sliced by circular cutting blade 220, is held taut by spring-loaded clamps 222. The circular cutting blade 220 is housed in a blade guard 224. The circular blade 220 is driven through the shaft of that blade, 228 by an air motor. The air motor is mounted on a lever arm 230 and the lever 230 is attached to the blade guard 224 in which the circular cutting blade 220 is mounted. The lever arm 230 is pivotally mounted to crank pin 232 at one point along its length and is connected at its end to a fixed pivot 234 through a swinging link 236.

A pulley 238 is attached to shaft 248. A crank driven by shaft 248 has crankpin 232 pivotally connected to arm 230. Counterweight 250 which is connected to shaft 248 compensates for the reciprocating unbalance of arm 230. Pulley 238 is driven by toothed belt 254 which in turn is driven by pulley 252 (FIG. 12). Pulley 252 is driven by angle drive 252a. As the blade enters between adjacent buckets 142 the blade severs any material bridged across the adjacent buckets. Since the arm 230 is subjected to both a vertical reciprocating motion and horizontal reciprocating motion as shown in FIG. 12, the blade can travel in the direction of buckets 142 while disposed between them without coming into contact with the buckets. Thus as pulley 252 rotates and causes the pulley 238 to rotate, the crank pin 232 and counterweight 250 will rotate about the axis of shaft 248. Since the crank pin 232 is attached to the lever arm 230 and the lever arm 230 is pivotally attached to the fixed pivot 234 through a swinging link 236, the rotation of the crank pin 232 about the axis of shaft 248 will cause a reciprocating motion of the lever arm 230 and thus a reciprocating motion of the circular cutting blade 220. The reciprocating motion of the circular cutting blade is timed to allow the blade to descent between adjacent buckets 142, as the buckets 142 pass beneath the circular cutting blade 220. To insure proper entry of the blade 220 between adjacent buckets 142, an indexing finger 307 is provided. As the blade 220 descends and prior to its entry between the buckets the indexing finger 307 engages bracket 146 mounted to the bucket 142. With the indexing finger 307 being guided along the bracket 146, the cutting blade 220 is guided into the spacing between adjacent buckets. Because of the cam like engaging surface of the indexing finger 307, misalignments up to the thickness of the finger are compensated.

FIG. 13 illustrates the drive mechanism for the reciprocating motion of the circular cutting blade 220. A power source such as a main drive shaft is connected to an axis 260 of the sprocket 262. The sprocket 262 drives the chain about idler sprockets 264. In turn the

chain drives sprocket 268 connected to angle drive 252a. Thus is provide a power drive of low speed for the reciprocating motion of the circular cutting blade 220. The high speed, low power drive for the rotation of the circular cutting blade 220 about its shaft 228 is provided by an air motor.

The buckets 142 are then carried in a semi-circular path to discharge station 40 by sprocket 160 (FIG. 1). Sprocket 160 is driven by chain 143 which in turn is propelled by sprocket 163. Sprocket 163 is driven through gear drive mechanism 183 in a manner more completely described below.

Discharge station 40 includes a carton or container conveyor 164 (FIGS. 1, 4) carrying a plurality of containers 99 directly underneath the filled moving buckets 142. A mechanism 165 (FIGS. 3,8) keeps each carton 99 in register with a corresponding bucket 142 prior to discharge. Mechanism 165 includes a worm gear reducer 166 with a right angle drive and a conveyor drive 167. The conveyor 164 includes a plurality of U-shaped clips 168 which push the container 99 along the conveyor 164 (FIG. 4). Buckets 142, immediately before discharge of their contents, ride on a track 170 which keeps the doors 144, 145 of the bucket closed until the bucket reaches the end 171 of the track 170 (FIG. 4). At this time, the doors fly open under the force of gravity and the weight of a door actuator engaging bumper 302 and the food product 61 drops into a container 99. To assist the dropping of the food product 61, an air supply 300 with nozzles 301 directed at the buckets 142 is supplied. Additionally, another air nozzle 306 may be placed alongside the bucket assembly 142, with the air therefrom directed upward to assist in returning any overhanging food product into the bucket (FIGS. 4, 8). This insures that all the food is removed from the bucket and transferred to the container 99. By means of forced air injected into and alongside the buckets, complete removal of the food product 61 therefrom is insured.

When the doors have opened to release the food product into a bucket below, a longitudinally extending brace 188 enters into container 99 and engages the inner surface of the leading wall of the container taken in the direction of the motion of the container. The actuator 302 affixed to the door engages a bumper guard 302a, thereby holding the door or brace 188 in a vertical plane. At this point the container has moved from engagement with clips 168 and the advancement of the container then is under control of braces 188 and 189. In this way the phasing of the container and the bucket adjacent thereto is maintained in a correct relationship as the discharging operation is completed.

The filled container then travels down the inclined portion 172 of the conveyor 164 to the next stage 173 of the packaging operation. This stage of packaging operation includes a second container conveyor 174, that is driven by a drive mechanism 175. Conveyor 174 carries the filled containers 99 away from the machine. The container conveyor 164 height with respect to the fixed bucket conveyor track 150 can be adjusted in a conventional manner to accommodate containers 99 of various depths. the sprocket

After discharge, buckets 142 are carried along the chain 143 to the second sprocket 163 (FIG. 1) which is part of the door closing mechanism 177 for closing the

doors 144, 145 of each bucket 142 prior to the reentry of the buckets 142 into the rotating drum. The sprocket 163 is driven by a drive mechanism 162 (FIG. 2) that includes a rotatable shaft 178 journaled in bearing 179, a main shaft 161 through a drive 162 rotate the shaft 178. A sprocket or gear 180 also mounted on the shaft 178 drives a chain belt 181 to rotate sprocket or gear 182 that actuates a gear drive 183 for rotating the sprocket 163. Rotation of the sprocket 163 carries the buckets 142 along a semi-circular path to the input end 57 of the drum 43.

The door closing mechanism 177 includes the sprocket 163 and a plurality of guide rods 184 pivotally hinged on pins 185 secured to the lower portion of sprocket 163 (FIGS. 5 and 9). Each guide rod 184 has a spool 186 on the end thereof that rides on an endless spool track 187 mounted beneath the sprocket 163.

The spool track 187 forms a closed curvilinear path seen in FIG. 5. As described above, each bucket 142 has a pair of interlocking doors 144, 145 at the bottom portion thereof that are held closed when the bucket rides on track 170 (FIG. 4). In particular, door 144 has a longitudinally extending brace 188 and door 145 has a similar but shorter brace 189 (FIG. 7). As the buckets 142 are moved in a semicircle by sprocket 163, the bucket door 144 reaches an upward sloping portion 190 in the track 170 (position I, FIG. 6). As bucket 142 moves past the incline 190 door 144 starts to move upward to the closed position thereof.

At the same time, the spool 186 (FIG. 6) associated with that bucket reaches the upwardly sloping portion 191 of spool track 187. Travel of this spool 186 over portion 191 of the spool track partially closes bucket door 145. Further upward movement of the door 144 places the long brace 188 against the bottom portion of the door 145 causing that door to continue to close. When the bucket 142 has passed the incline 190, the doors thereof are completely closed and are held closed by the track 170 (position II, FIG. 6).

In order to move the above mentioned spool 186 out of the way of the rapidly closing door 144 brace 188, the upwardly sloping portion 191 of the spool track 187 is immediately followed by a downwardly sloping portion 192 (FIG. 6). Moreover, supplementary spool track 193 located directly above the downward incline 192 forces the spool 186 down (by the positive interaction of the track 193 of the spool), until that spool has completely passed the track 170 incline 190. The closed buckets 142 are then conveyed into the rotating drum 43 for refilling.

In order to prevent undesired buildup of stringy food product 61 on the rotary drum 43 and rakes 55, air nozzles 303 connected to the common air supply 300 are directed at the perforated rotary drum 43 (FIG. 2). Air may be supplied either intermittently or continuously dependent upon the type of food product being packaged. Alternatively, the pan 62 can be modified as shown in FIG. 10 to include a retractable rake 194. One embodiment of the rake 194 can incorporate a plurality of retractable tines 195 (FIG. 11) that are mounted side by side on a bracket 196 that extends parallel to the axis of the drum 43. Bracket 196 is in turn fastened to an actuating mechanism 197 which permits the bracket to be withdrawn from the stationary plate 198. Such a movement of the retractable tines

195 prevents the accumulation of food products thereon. Preferably, the actuating mechanism 197 operates to withdraw the tines 195 once per revolution of the drum. Consequently, any buildup of any food product 61 on the distribution pan during a revolution of the drum 43 is prevented, since that food product tends to fall under gravity towards the bottom portion of the drum when the tines 195 are retracted.

To further assist in the removal of overhanging food product 61 in the buckets 142 a second cutter assembly 304 is provided (FIG. 2). A cutter blade driven in a manner similar to cutter blade 220 previously discussed is provided. The cutter blade 305 is horizontally disposed and slightly tilted to have its engaging edge in line with the top of buckets 142. This cutting action will remove any excess material from the top of the buckets in a manner similar to that utilized to remove it from between the buckets by cutter 220.

## 20 OPERATION OF THE PREFERRED EMBODIMENT

The material to be transferred in predetermined amounts by the machine of the invention is admitted to the interior of inclined rotating drum 43 by means of a hopper spaced adjacent thereto. The drum is driven in rotation and as a result rakes 55 carry the material from the bottom portion of the drum to distribution pan 62 adjacent the top portion of the drum (FIG. 10). As the rakes carry the material beyond the upper extremity of the curved pan 62, the material falls toward the path of travel of buckets 142 (FIGS. 2,10). Alternately, the pincer mechanism of FIG. 14 may be employed. The speed of rotation of the drum is selected to control the rate of delivery of the material adjacent to the path of travel of the buckets.

Buckets 142 are each attached to conveyor chain 143 which has a path of travel extending in part through the drum. The path of travel of the conveyor chain is substantially horizontal. Consequently, this path forms an acute angle with the axis of the tilted drum 43. The buckets are positioned on chain 143 by links 146 mounted in brackets 147 on the buckets (FIGS. 7, 8 and 9).

In order to insure that the buckets are filled with a predetermined amount of material during their passage through the rotating drum the track and thereby the buckets are subjected to a predetermined motion in order to agitate the buckets. As in the case of the speed of rotation of the drum the motion applied to the buckets through the guide rail can be controlled. In this way the frequency and amplitude of the agitation of the buckets enables the amount of material received by the buckets to be precisely controlled.

As the buckets filled with material advance out of the rotating drum, the upper portion of each of the buckets is engaged by the cutter assembly 304 in order to shear away any material which may extend over the top portion of the buckets (FIG. 2). Also, the excess material between the buckets is sheared away with the cutting mechanism shown in FIGS. 12 and 13. The filled buckets are then conveyed around a curved portion of the conveyor for approximately 180° and, as the curved portion terminates, the bucket doors 144, 145 are opened to release the food product. (FIG. 4). Forced air is provided through nozzles 301 to further assist removal of material from the buckets.

In the case where the machine of the invention is to be employed to fill containers such as cartons 99, the cartons are erected by a separate machine disposed adjacent to the transfer machine of the invention. The machine for erecting the cartons is synchronized with every bucket of the machine moving past the discharge station 40 (FIG. 4).

At the discharge station the material is transferred from the buckets to the cartons. In order to insure that the cartons are in alignment with the buckets and to direct the material from the buckets into the cartons, the conveyor 164 comprises spaced U-shaped clips 168 that push the containers 99 along until the opened door 144 begins to drag it along (FIG. 4). Conveyor 164 is driven in synchronism with the conveyor for the buckets 142.

Beyond the discharge station 40, the filled cartons can be conveyed from the transfer machine. At the exit end of the discharge station, sprocket 163 directs the buckets 142 through an approximately 180° movement to the input end 57 of the drum. At the same time, the bucket doors are closed by guide rods 184 and so are prepared to enter the rotating drum to receive a new fill of material.

Where the amount of material to be transferred is to be changed, the transfer machine is adjusted by changing the size of the buckets attached to conveyor chain 143. Changes in the material are compensated for by selecting the rate of rotation of the drum and the frequency and displacement of the buckets as they travel through the drum. Similarly, where the buckets are agitated, the frequency and displacement are selected in accordance with the material being transferred.

While certain embodiments of the invention have been shown and described herein, it is to be understood that changes, additions and substitutions can be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A machine for transferring predetermined amounts of materials to a container which comprises:
  - a. a plurality of receptacle means for receiving the material to be transferred;
  - b. means for delivering the material to be transferred to said plurality of receptacle means;
  - c. means for conveying said receptacle means with respect to the machine in a path extending from said delivering means to a position adjacent the containers;
  - d. means for agitating said receptacle means having the material therein to establish a precise predetermined amount of material received from said delivery means;
  - e. means disposed adjacent said receptacle means for removing and cutting excess material extending between adjacent receptacle means; and
  - f. means disposed adjacent to said conveying means for discharging the predetermined amount of material from said receptacle means to the container;
  - g. said delivering means including a rotatable drum having the interior thereof adapted to contain the material to be delivered and enclosing a portion of

said path of said conveying means, and means for rotating said drum about the longitudinal axis thereof which extends in the direction of movement of said conveying means, said longitudinal axis being inclined so that the input end of said conveyor means to said drum is lower than the output end of said conveying means to said drum.

2. A machine in accordance with claim 1 wherein said rotatable drum contains a perforated surface thereabout and means spaced adjacent thereto for directing fluid thereat to prevent the accumulation of material within the interior portion thereof.

3. A machine in accordance with claim 2 wherein said means for directing fluid comprises a plurality of nozzles disposed adjacent to the top of said drum.

4. A machine in accordance with claim 3 wherein said fluid is air.

5. A machine in accordance with claim 1 in which said means for delivering material into said receptacle means comprises:

- a. rake means mounted adjacent to the inner circumferential surface of said drum for conveying material from the lower portion to the upper portion of said drum in response to the rotation thereof; and
- b. a curved plate member stationarily mounted within the upper portion of said drum and spaced apart from and parallel to the interior surface of said drum, said plate member overlying the path of travel of said receptacle means, and being adapted to receive material from said rake means and direct the material toward said receptacle means.

6. A machine in accordance with claim 1 wherein said rotatable drum includes a plurality of fixed rakes mounted at predetermined intervals to the interior thereof, a rake means having the teeth thereof extending outwardly toward the interior surface of said drum and between said fixed rakes to remove any accumulation of material therefrom, and a means for retracting said rake means away from said fixed rakes to prevent the accumulation of material thereon.

7. A machine in accordance with claim 1 in which said plurality of receptacle means comprises a plurality of buckets mounted on said conveying means.

8. A machine for transferring predetermined amounts of materials to a container which comprises:

- a. a plurality of receptacle means for receiving the material to be transferred;
- b. means for delivering the material to be transferred to said plurality of receptacle means;
- c. means for conveying said receptacle means with respect to the machine in a path extending from said delivering means to a position adjacent the containers;
- d. means for agitating said receptacle means having the material therein to establish a precise predetermined amount of material received from said delivery means;
- e. means disposed adjacent said receptacle means for removing and cutting excess material extending between adjacent receptacle means including a cutting member mounted to move through a vertical cutters plane for cutting excess material extending between adjacent receptacle means, and means for passing said cutting member between adjacent receptacle means; and

f. means disposed adjacent to said conveying means for discharging the predetermined amount of material from said receptacle means to the container.

9. A machine in accordance with claim 8 wherein said vertical cutting member includes a rotary drive means and means for moving said cutting member along the path of said receptacle means and in conjunction therewith.

10. A machine in accordance with claim 8 which includes a frame member, a drive shaft mounted to said cutting member for imparting rotary motion thereto, a linkage pivotally mounted at one end to said frame member and at the other end pivotally mounted to said drive shaft to permit movement of said cutting member along the path of said receptacle means as said cutting member is passed therebetween, and resilient biasing means connecting said cutting member to said frame member.

11. A machine in accordance with claim 8 which further includes a second cutting means having a substantially horizontal cutting member with its leading edge disposed contiguous to the top of said receptacle means, and means for passing said horizontal cutting member across the top of said receptacle means and remove excess material therefrom.

12. In a machine for delivering fibrous material to a receiving means including a rotatable drum for containing the material to be delivered, means for directing the material to a receiving means, and means for rotating said drum, the improvement comprising a plurality of fixed rake members attached to the inner periphery of said drum and spaced circumferentially from one another, said rake members being substantially straight elongated tines disposed to form an acute angle with respect to said inner periphery of said drum wherein the fibrous elongated material to be delivered is collected, a plurality of movable rake members in the form of substantially straight elongated tines mounted and interposed between said fixed rake members, said movable rake members being pivotally mounted so that when the free ends thereof are moved adjacent to said fixed rake members they are adapted to grasp the fibrous material with respect to said fixed rake members, and means for actuating said movable rakes in conjunction with the rotation of said drum.

13. A machine in accordance with claim 12 wherein said means for actuating said movable rakes comprises an inner track within said drum, a plurality of lever arms each having one end engaged to follow said inner track and the other end thereof fixedly attached to said movable rakes and pivotally mounted with respect to the inner surface of said drum, said inner track being inclined near the approximate top of said drum to cause said lever arm to move said movable rake away from said fixed rake thereby causing the opening of said rakes and being further inclined at a point near the approximate bottom of said drum to cause said lever arm to move said movable rake adjacent to said fixed

rate thereby causing the closing of said rakes.

14. A machine in accordance with claim 12 which further includes means disposed adjacent said receptacle means for removing and cutting excess material extending between adjacent receptacle means.

15. A machine in accordance with claim 1 wherein said cutting means includes a cutting member mounted to move through a vertical cutters plane for cutting excess material extending between adjacent receptacle means, and means for passing said cutting member between adjacent receptacle means.

16. A machine in accordance with claim 13 wherein said vertical cutting member includes a rotary drive means and means for moving said cutting member along the path of said receptacle means and in conjunction therewith.

17. A machine in accordance with claim 13 which includes a frame member, a drive shaft mounted to said cutting member for imparting rotary motion thereto, a linkage pivotally mounted at one end to said frame member and at the other end pivotally mounted to said drive shaft to permit movement of said cutting member along the path of said receptacle means as said cutting member is passed therebetween, and resilient biasing means connecting said cutting member to said frame member.

18. A machine in accordance with claim 14 which further includes a second cutting means having a substantially horizontal cutting member with its leading edge disposed contiguous to the top of said receptacle means, and means for passing said horizontal cutting member across the top of said receptacle means and remove excess material therefrom.

19. A method of delivering fibrous or elongated material to a receiving means in a rotatable drum by means of rake members affixed thereto, the rake members being disposed in pairs thereof adapted alternatively to open and to close into a grasping relationship with respect to one another comprising the steps of:

- a. introducing material into the drum;
- b. rotating the drum about the longitudinal axis thereof, the movement of the drum causing the material at the approximate bottom thereof to be disposed upon the rake members in the open position;
- c. closing the rake members as they are rotated upwardly with the drum;
- d. lifting the material to the approximate top of the drum in the closed rake member;
- e. opening the rake members when they reach the approximate top of the drum thereby releasing the material contained therein;
- f. guiding the material to the receiving means; and
- g. trimming the excess material in the receiving means by passing a horizontally disposed cutter across the top of the receiving means and passing a vertically disposed cutter adjacent the leading and trailing edges of the receiving means.

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