July 16, 1963 C. W. RAUSCH 3,097,459

BAG FILLING MACHINE

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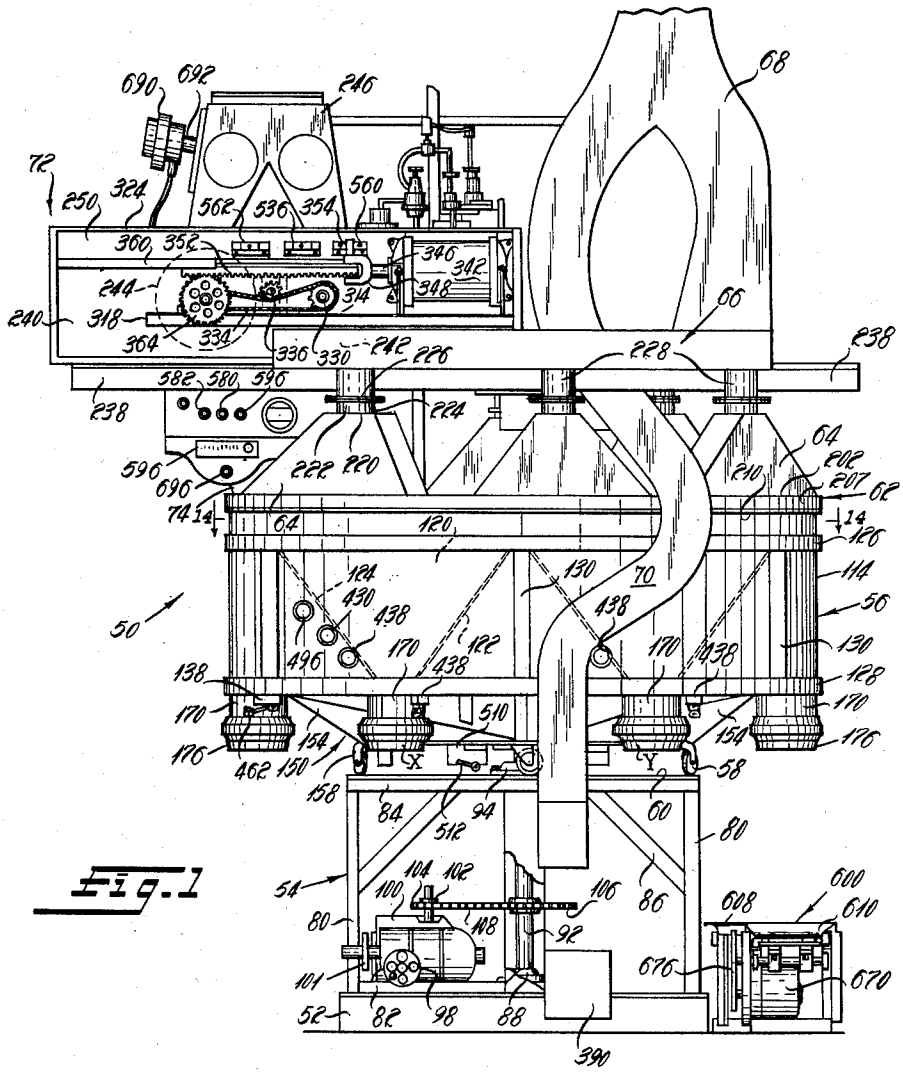


Fig. 1

INVENTOR
CLARENCE W. RAUSCH

BY Strauch, Nolan & Neale

ATTORNEYS

July 16, 1963 C. W. RAUSCH 3,097,459

BAG FILLING MACHINE

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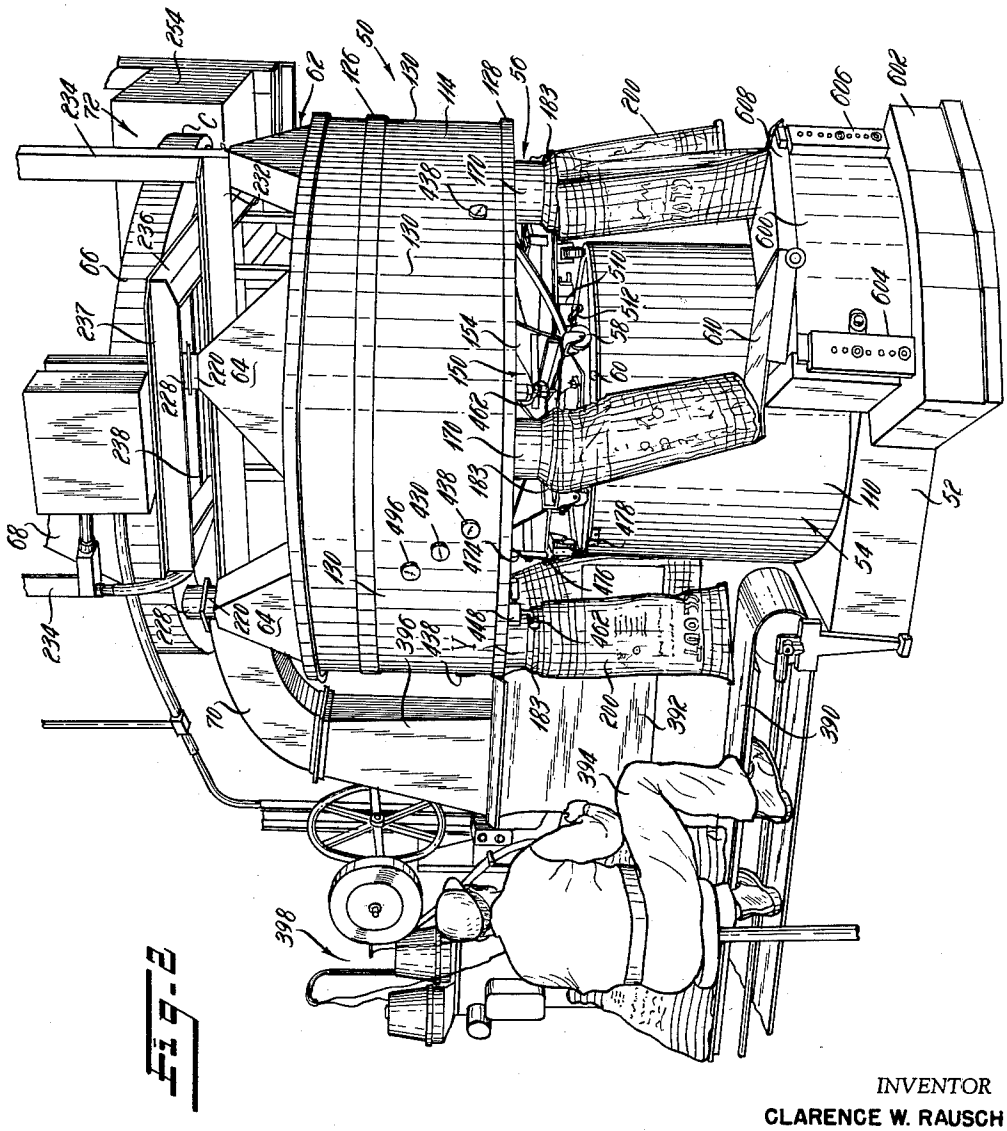


FIG. 2

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July 16, 1963 C. W. RAUSCH 3,097,459

BAG FILLING MACHINE

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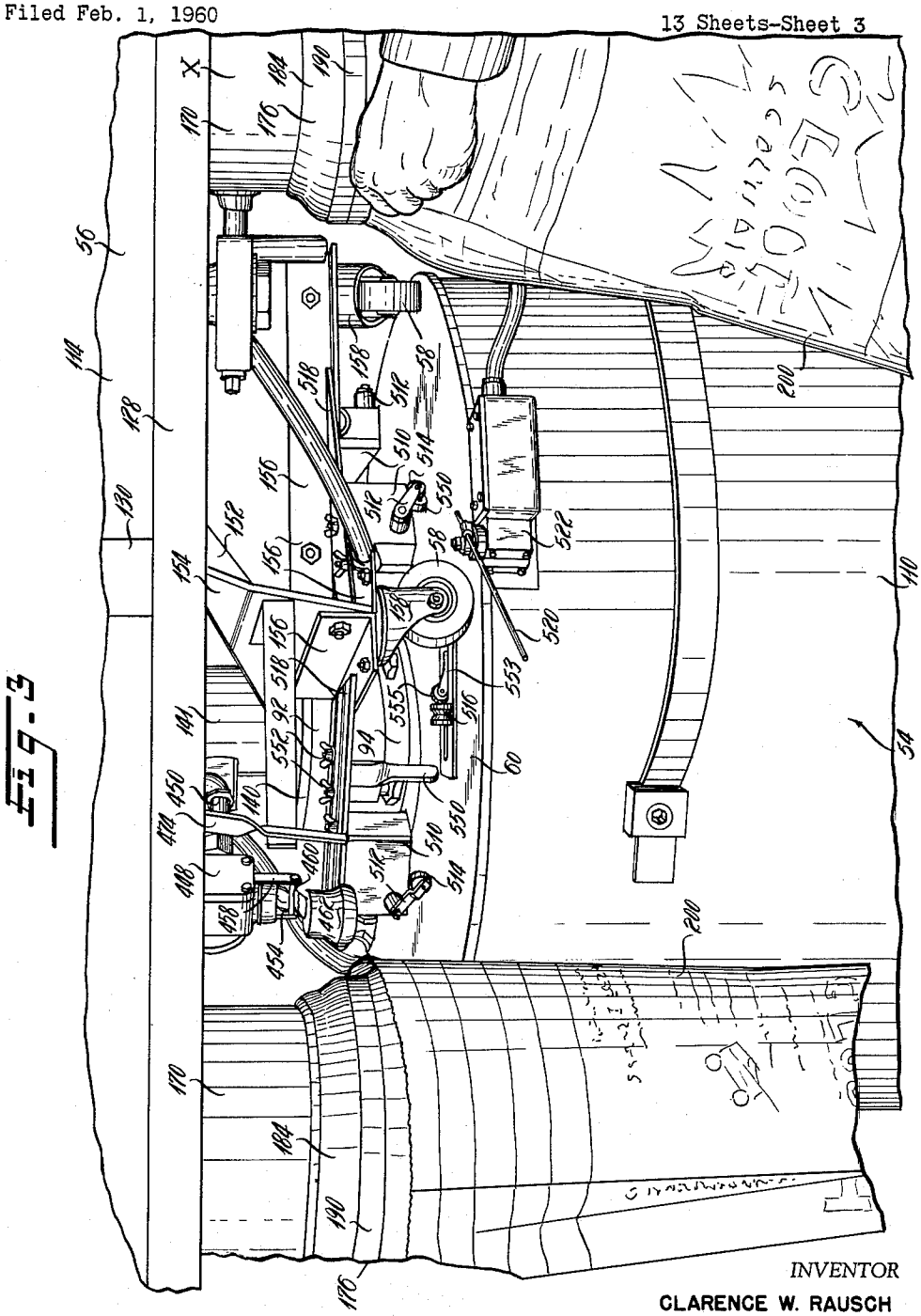


Fig. 3

INVENTOR
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July 16, 1963 C. W. RAUSCH 3,097,459

BAG FILLING MACHINE

Filed Feb. 1, 1960 13 Sheets-Sheet 4

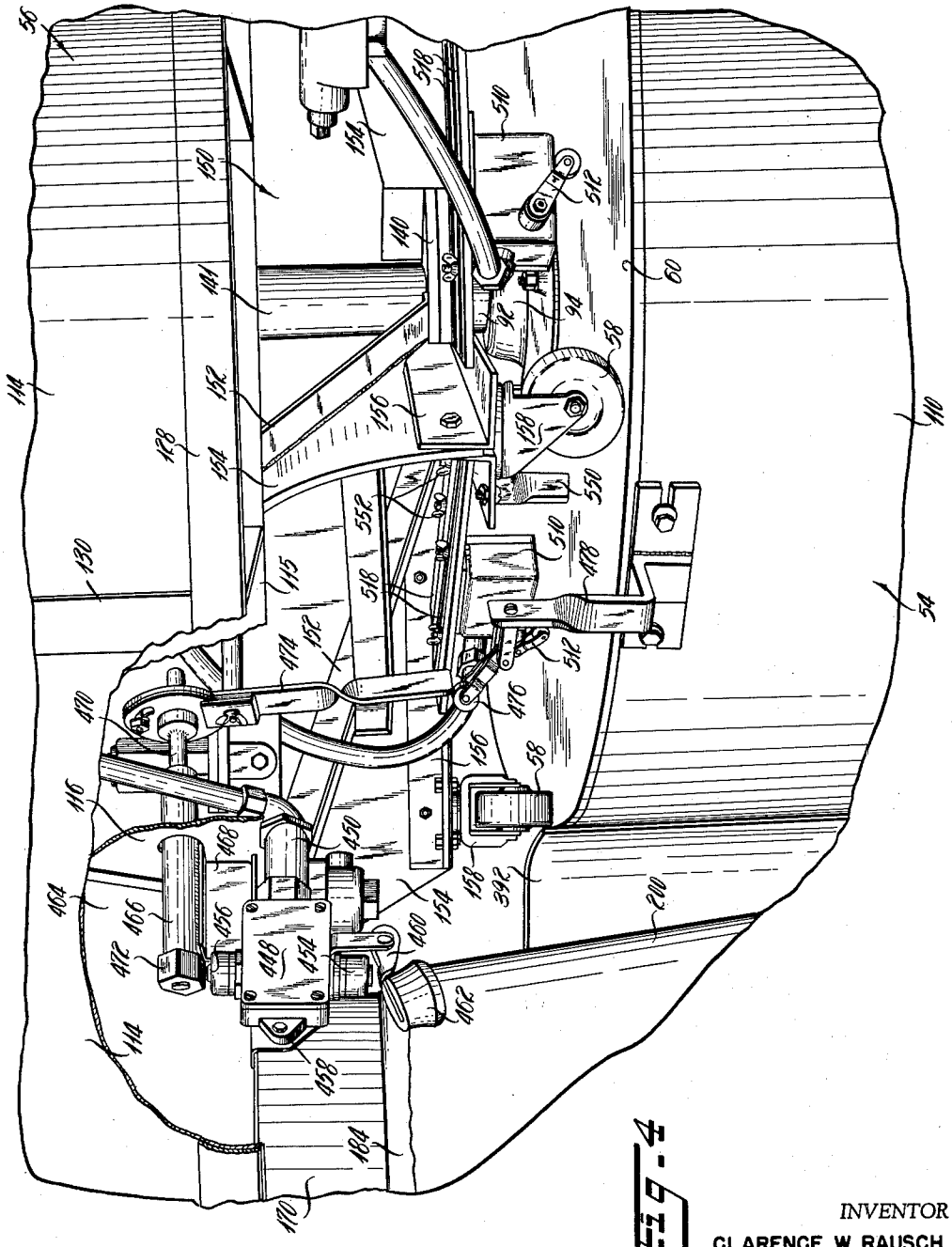


FIG. 4

INVENTOR
CLARENCE W. RAUSCH

BY Strauch, Nolan & Neale

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July 16, 1963 C. W. RAUSCH 3,097,459

BAG FILLING MACHINE

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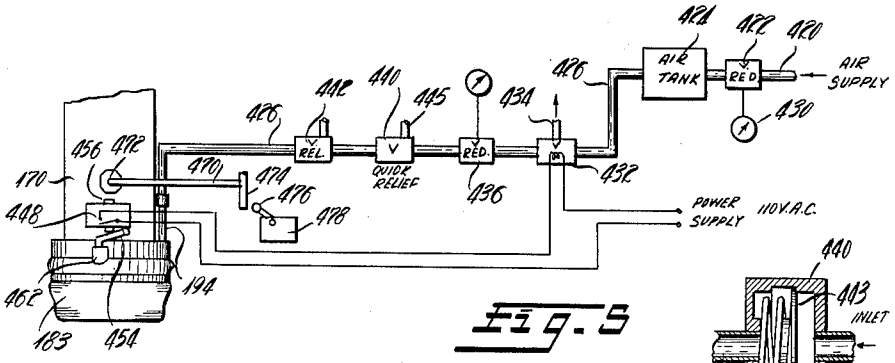


Fig. 5

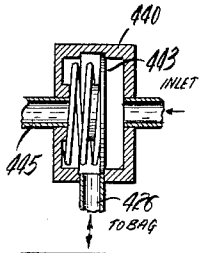


Fig. 5A

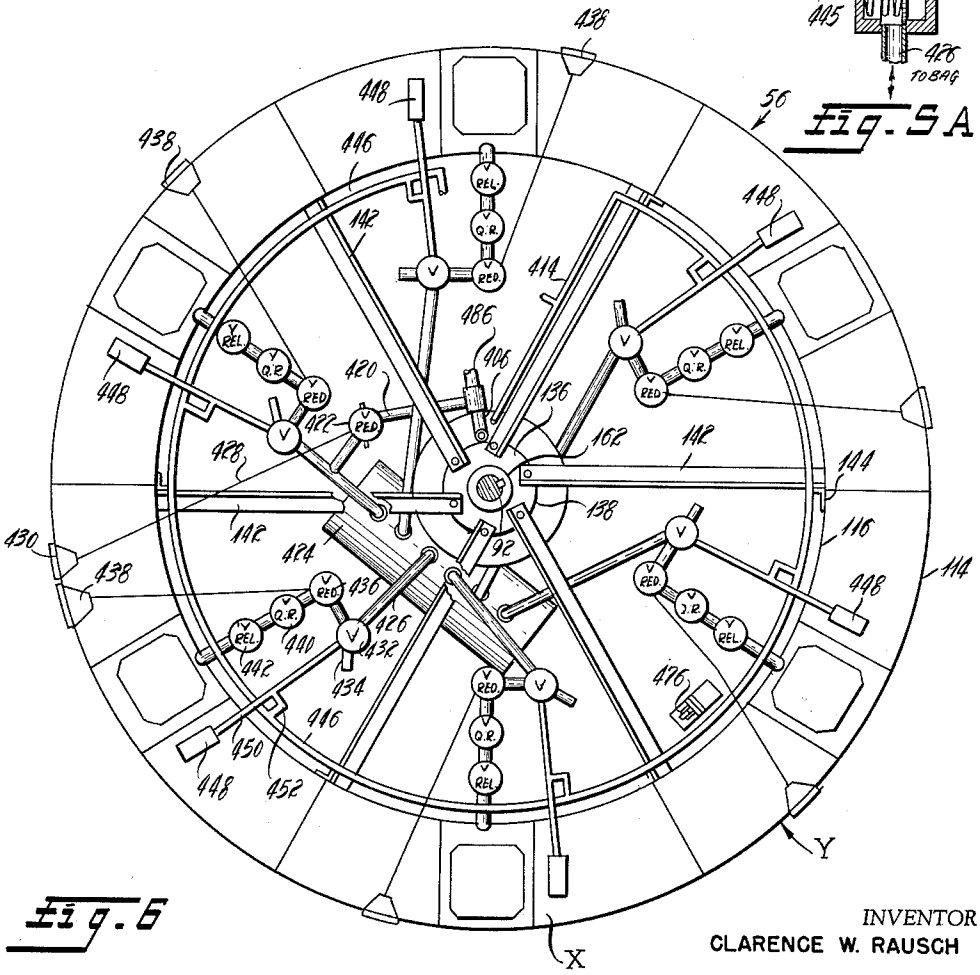


Fig. 6

INVENTOR
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BY Strauch, Nolan & Neale

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July 16, 1963 C. W. RAUSCH 3,097,459

BAG FILLING MACHINE

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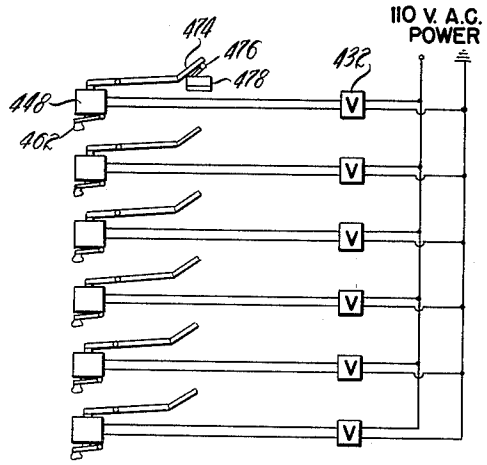


Fig. 1

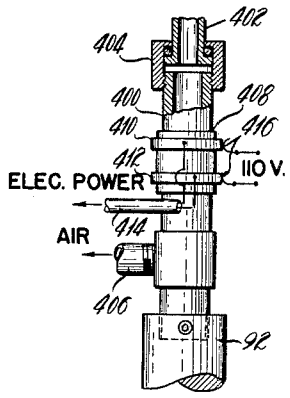


Fig. 8

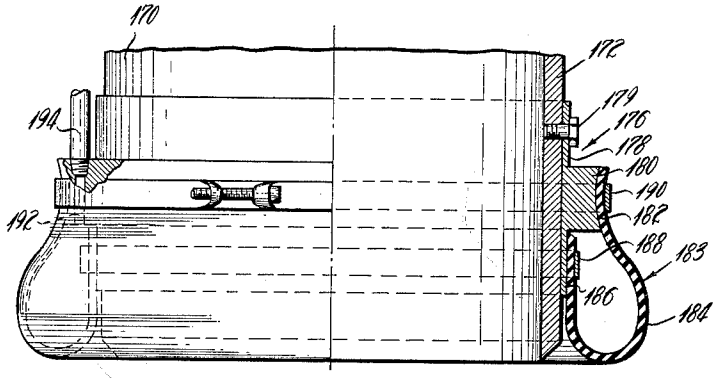


Fig. 9

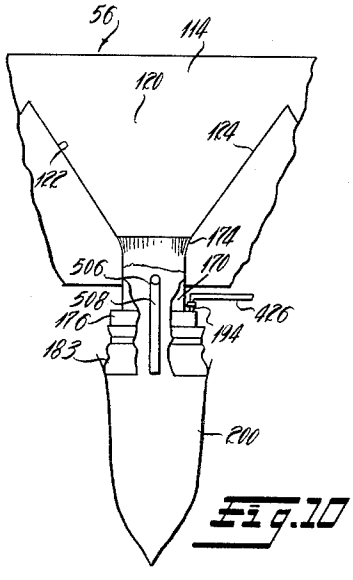


Fig. 10

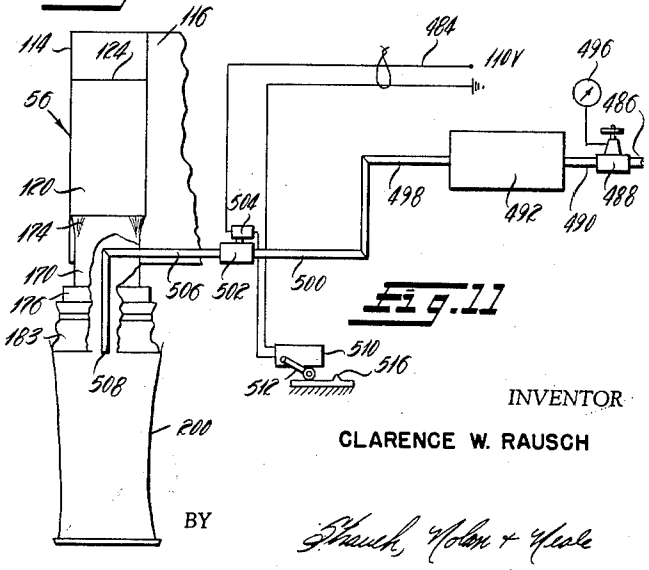


Fig. 11

INVENTOR

CLARENCE W. RAUSCH

BY

Rauch, Nolan & Yeale

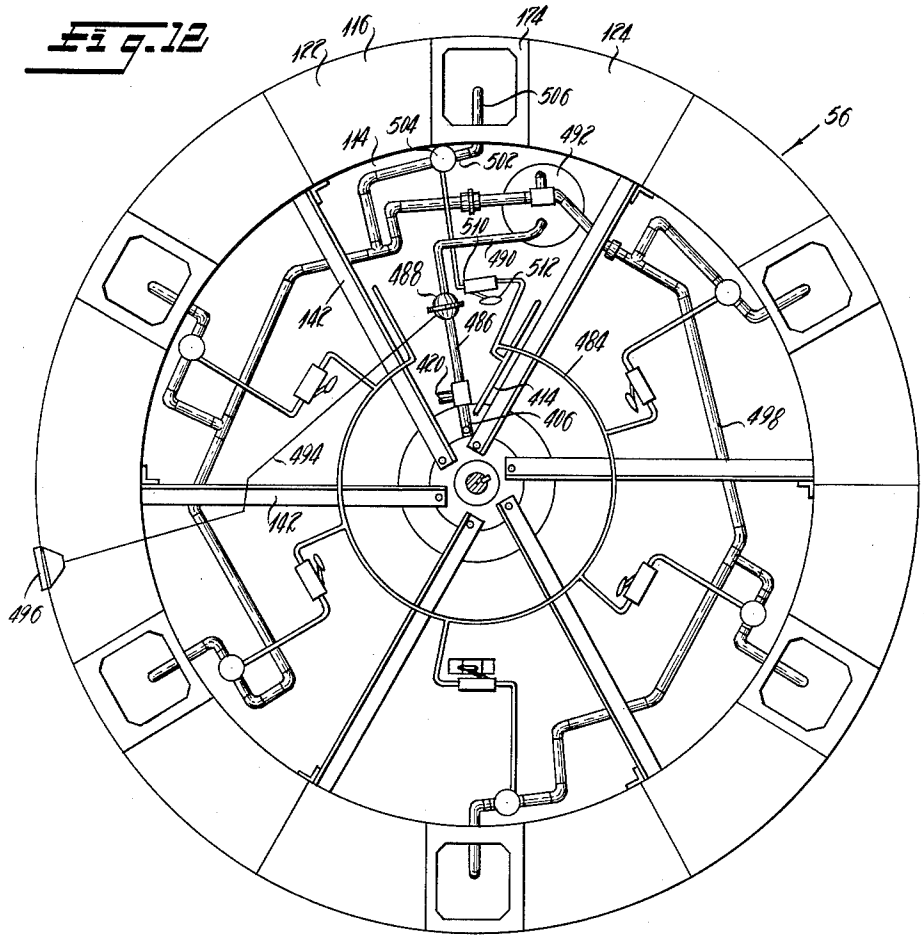
ATTORNEYS

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BAG FILLING MACHINE

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Fig. 12



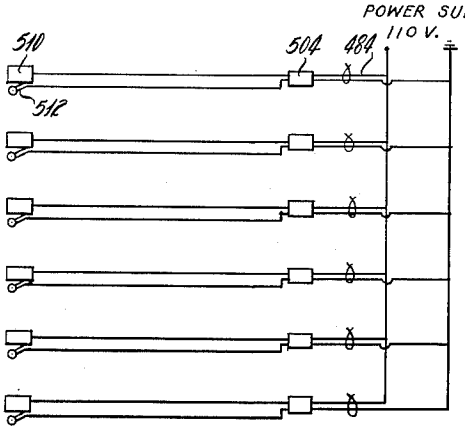


Fig. 13

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BY Strauch, Nolan & Neale

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July 16, 1963 C. W. RAUSCH 3,097,459

BAG FILLING MACHINE

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Fig. 14

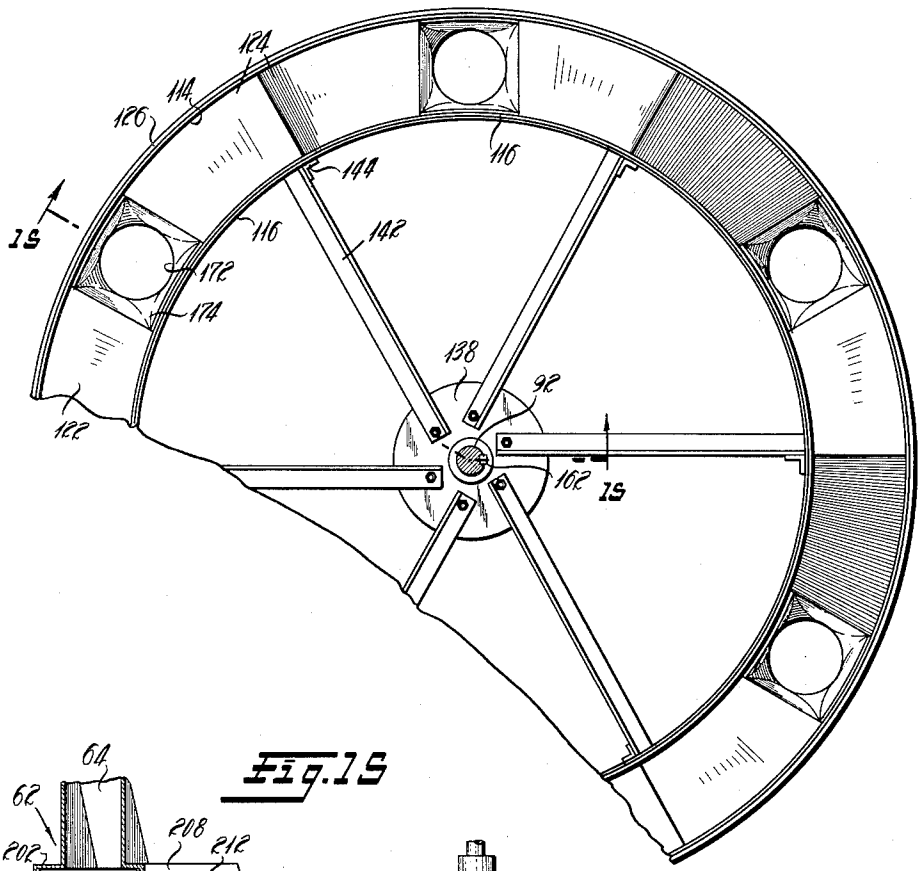
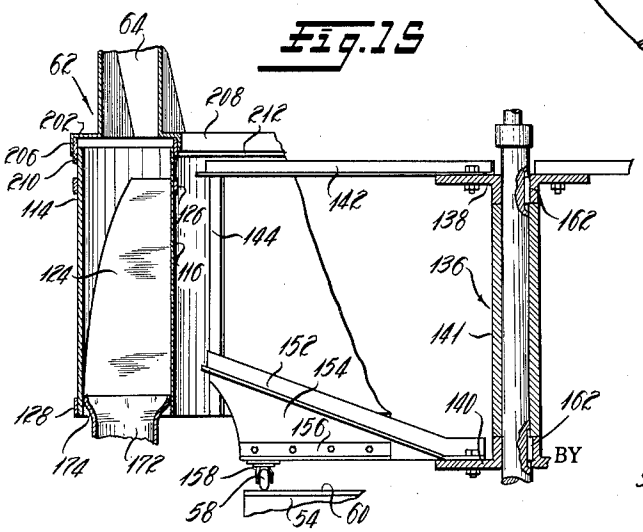


Fig. 15



INVENTOR
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Strauch, Nolan & Neale
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July 16, 1963 C. W. RAUSCH 3,097,459

BAG FILLING MACHINE

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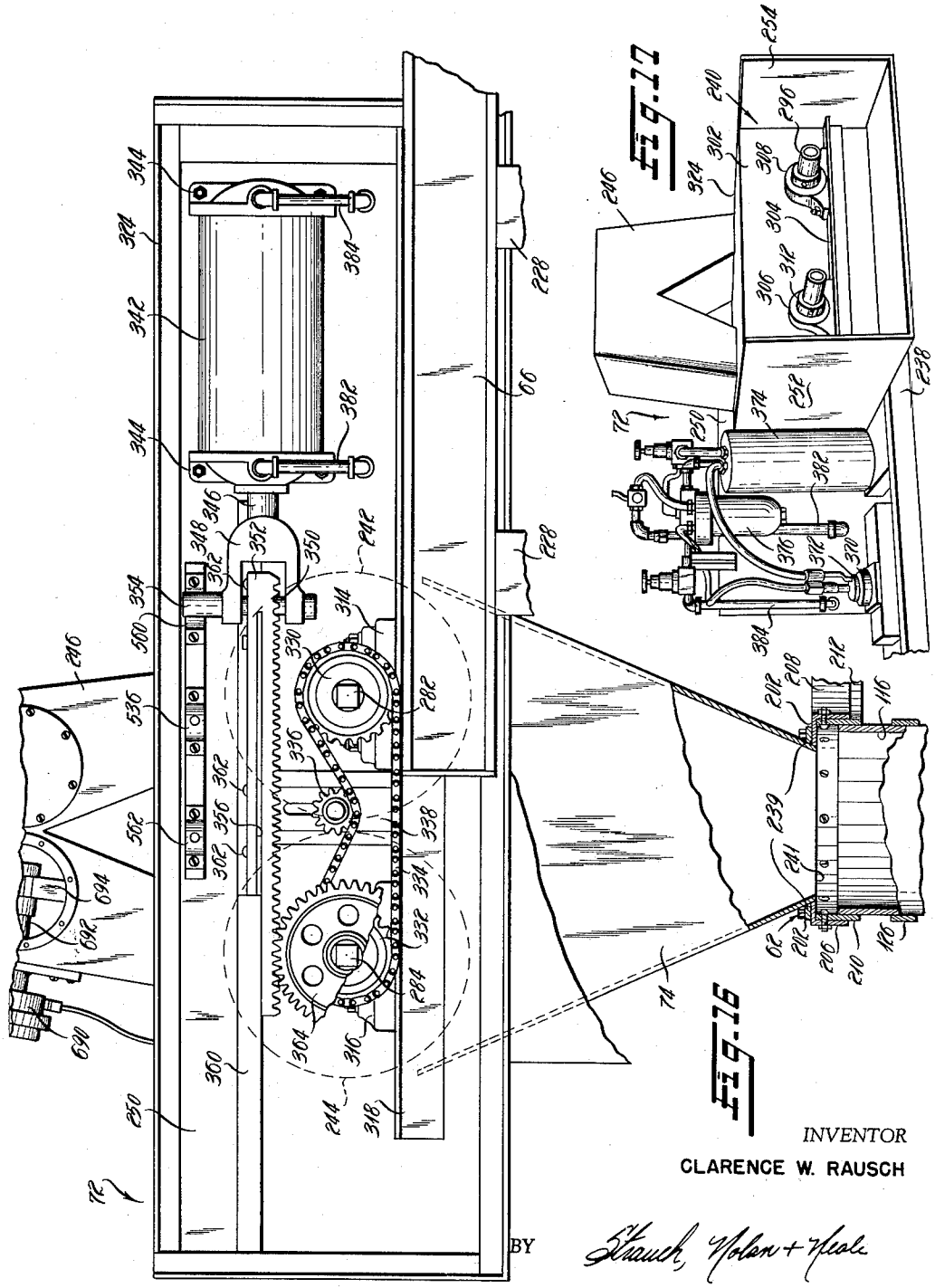


Fig. 17

Fig. 15

INVENTOR
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BY Strauch, Nolan + Neale

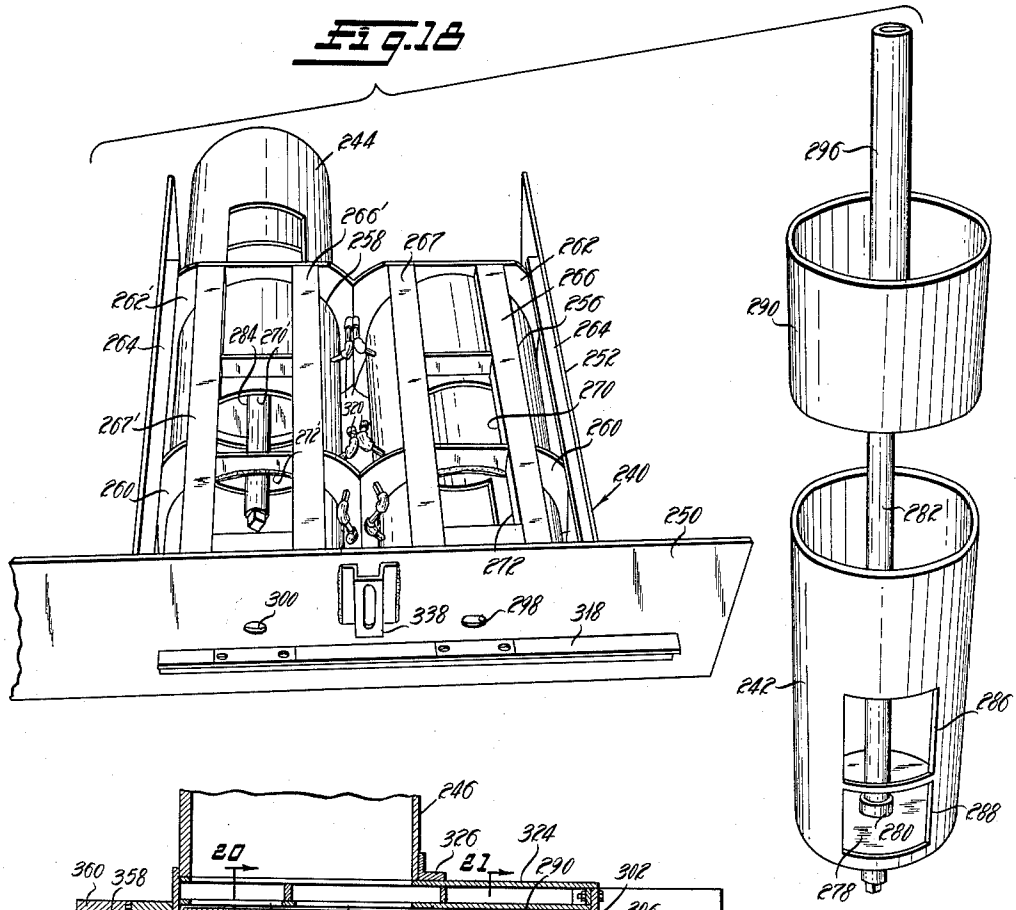
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July 16, 1963 C. W. RAUSCH 3,097,459

BAG FILLING MACHINE

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Fig. 18



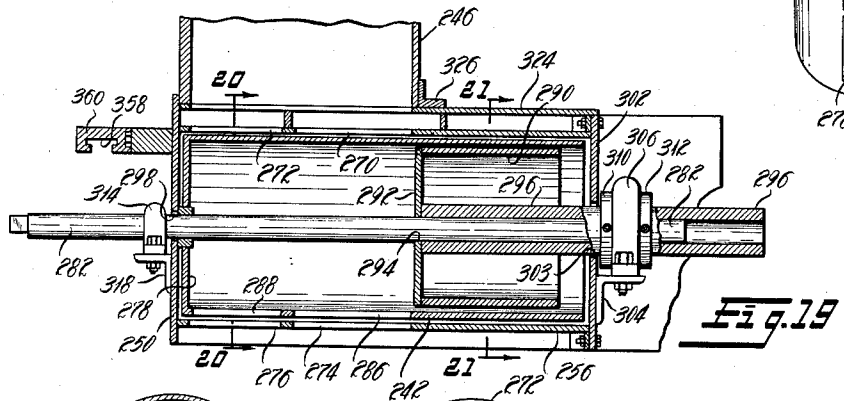


Fig. 19

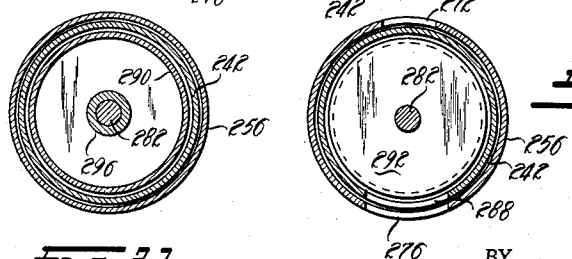


Fig. 20

Fig. 21

INVENTOR
CLARENCE W. RAUSCH

BY Strauch, Nolan & Neale

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July 16, 1963 C. W. RAUSCH 3,097,459

BAG FILLING MACHINE

Filed Feb. 1, 1960 13 Sheets-Sheet 11

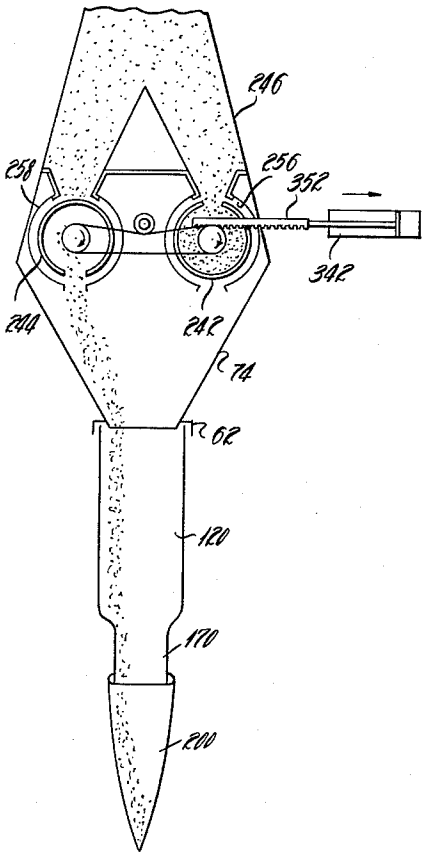


Fig. 22

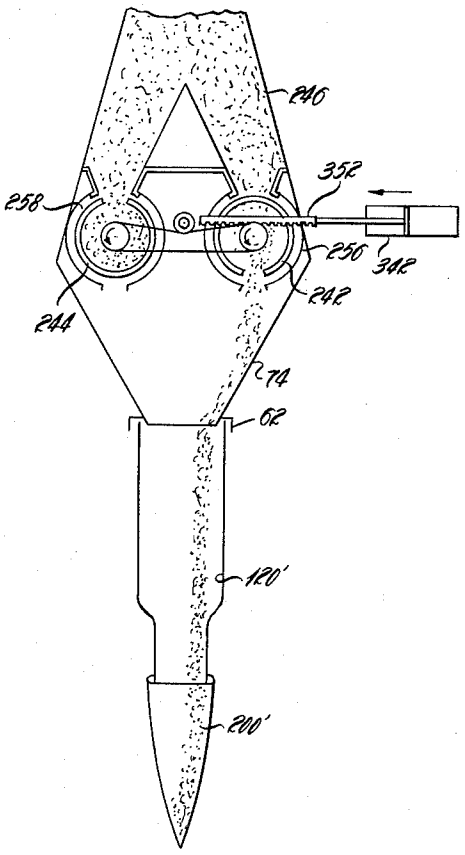


Fig. 23

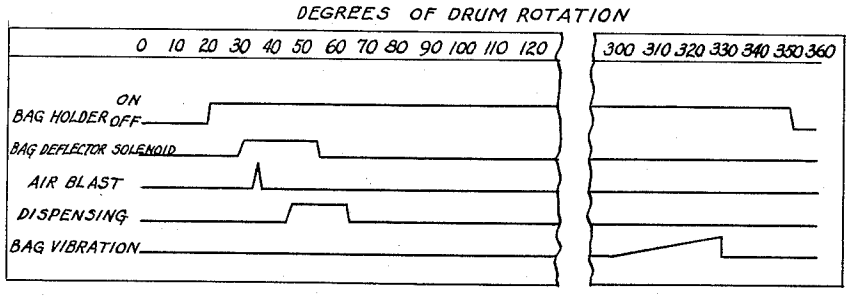


Fig. 21

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BY Strauch, Nolan + Neale

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July 16, 1963 C. W. RAUSCH 3,097,459

BAG FILLING MACHINE

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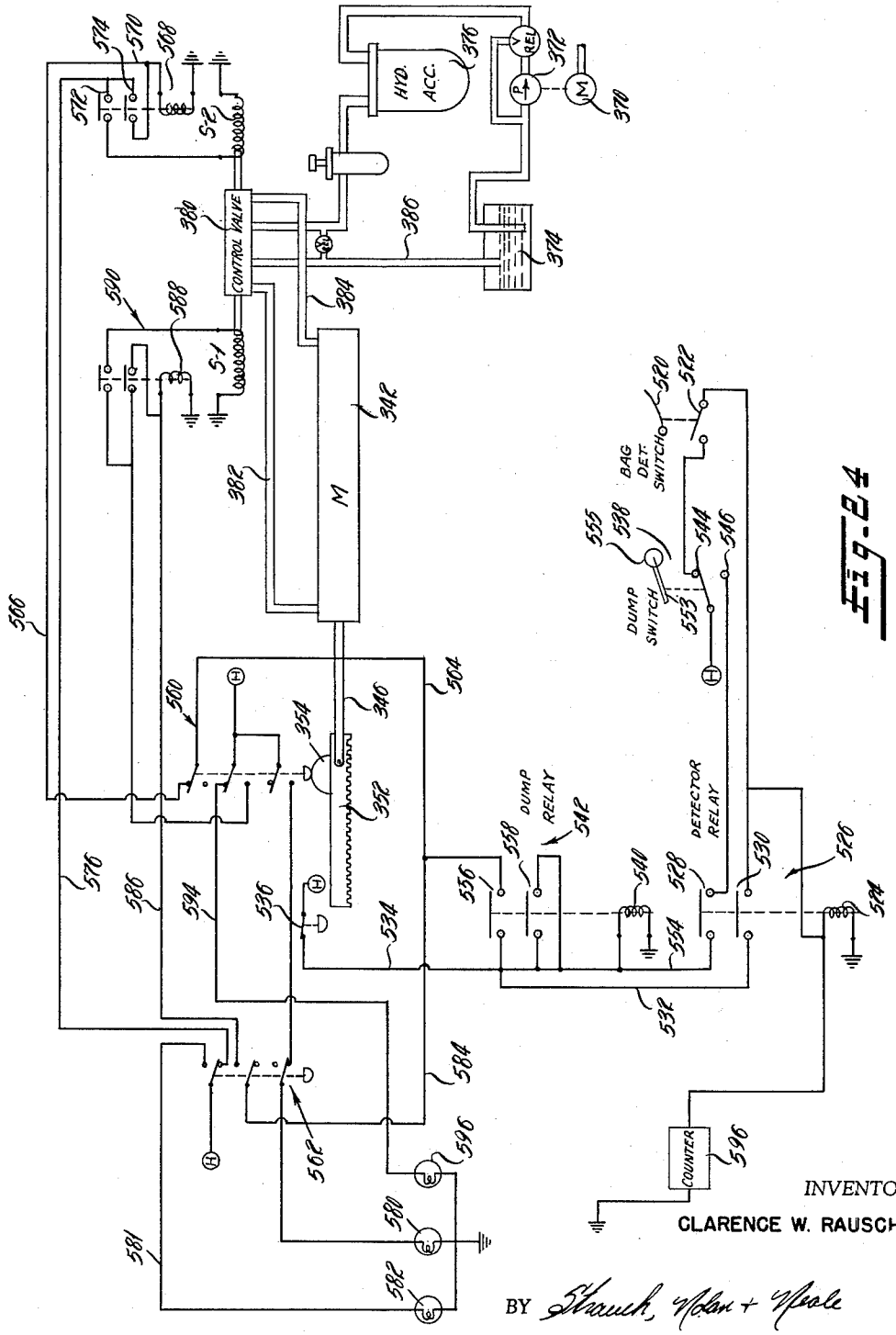


Fig-24

INVENTOR
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July 16, 1963 C. W. RAUSCH 3,097,459

BAG FILLING MACHINE

Filed Feb. 1, 1960 13 Sheets-Sheet 13

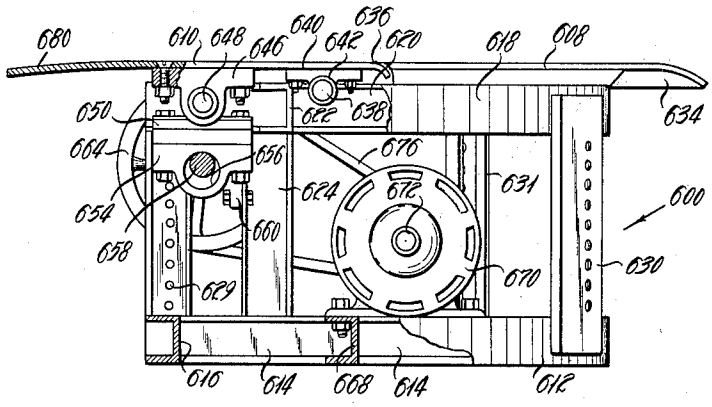


Fig. 25

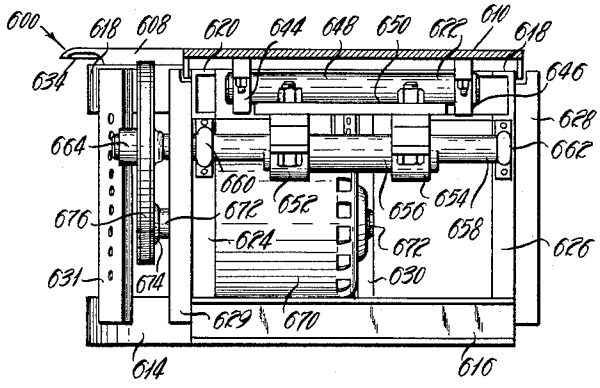


Fig. 26

INVENTOR
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BY Strauch, Nolan & Neale

ATTORNEYS

United States Patent Office 3,097,459 Patented July 16, 1963

3,097,459

BAG FILLING MACHINE

Clarence W. Rausch, Marysville, Ohio, assignor to The O. M. Scott & Sons Company, Marysville, Ohio, a corporation of Ohio

Filed Feb. 1, 1960, Ser. No. 5,918
28 Claims. (Cl. 53—59)

This invention relates to a machine for filling bags with material and is particularly related to a semi-automatic volumetric type bag filling machine for use with granulated materials.

Packaging machines of the class to which this invention applies generally require that an operator place the bags, which are received in a folded, flat condition, in position adjacent some type of filling device. The filling device will measure specific quantities of the material and introduce them through the filling nozzle into the bag. There are machines of this type on the market, one example of which may be seen in the Hohl et al. Patent No. 2,290,103.

In the previously available bag filling machines, much of the work necessary in presenting the bags to the machine, holding them, filling them and removing them was accomplished by manual operation or, alternatively, if any automatic operation was involved, it was accomplished through utilization of very complex operational components. The bag filling operation which led to development of this invention was packaging of new type chemical fertilizers, herbicides and insecticides in which the chemical carrier consists of extremely light particles of inert matter. The new materials, being much lighter than old materials, tended to float in the air displaced from the bags upon filling, creating a settling problem and also a greater amount of dust than the older and more heavy chemical carriers. This dust problem, together with the manual handling and filling of the bags in prior art machines, required that the machine operators wear masks and special, tight fitting clothing, which were uncomfortable, hot and to a large extent unsatisfactory to operator health. With today's methods of automatic production of the materials to be packaged, the slow manual operations in bag filling operations, attended by the dangers involved in working with dust producing materials, resulted in bottlenecks and high costs which cannot be tolerated in a competitive market.

In devising a satisfactory and acceptable automated bag filling machine, several important factors must be taken into consideration. It is desirable to have, in effect, an automatic assembly line operation whereby a bag can be placed in a machine over a filler nozzle, the bag then being automatically conditioned to receive the material with which it is to be filled. It should be automatically filled with the material and must accept the complete volumetric loading intended to be placed within the bag, and material entrained by the air displaced from inside the bag upon the introduction of the material must be reclaimed in some manner. If the material being packaged contains any quantity of dust, and this is particularly important where the material involves chemical components, there must be some way of preventing escape of any dust which is occasioned during the filling operation. In this automatic assembly line type of operation in which the bag being filled is carried past successive station points in a conveyor type system, there should be a safety provision whereby the filling operation cannot occur if a bag carrier has no bag placed upon it at the initiation of the assembly line function. There are other factors to be considered, one of which is the assurance that the contents within the bag are sufficiently settled below the upper opening of the bag to permit unimpeded closure of the bag upon removal from the machine.

Accordingly, with the above aspects in mind, a primary object of this invention resides in providing a novel semi-automatic bag filling machine.

A further object resides in the provision of an automatic bag filling machine including provision for holding bags to be filled under filler nozzles and having a complete air-tight hood attachment above the filler hoppers to prevent escape of dust, and enabling the material to settle in the bag. A further object of this invention in conjunction with the preceding object resides in providing a novel auxiliary eccentric bag shaker for completion of settling of light density material into the bag.

A still further object resides in the provision of an automated bag filling machine consisting of a rotatable drum-shaped series of hoppers rotated below a material dispensing device, with a bag filling nozzle under each hopper equipped to grip and hold a bag in open condition below the associated hopper as the drum rotates, a dispensing device positioned above the drum so all hoppers pass below the dispensing device outlet in their rotational path, and automatic control means activated by placing a bag on a nozzle for conditioning the bag to receive material, filling the bag with material and releasing the bag from the filler nozzle. In conjunction with this object, a still further object resides in providing a coordinated auxiliary conveyor system and sewing machine station to receive and close the bag after it is released from the nozzle.

Still another object of this invention resides in the provision of automatic safety features in a bag filling machine whereby if a filler station rotates beyond the start position without having a bag attached, there will be no subsequent filling operation for that station.

A still further object resides in providing a novel means for holding an open bag on the lower end of a filler neck including means for automatically releasing the holding action. In conjunction with this object, it is a further object to utilize an automatically controlled blast of air to condition the bag for filling by flexing it to an open position.

Still another object of this invention resides in the provision of a dual alternately operable volumetric measuring mechanism disposed with a common outlet successively cooperating with each of a plurality of annularly arranged hoppers passing below the outlet of the dual measuring mechanism during machine operation. In conjunction with this object, it is a still further object to provide an automatic control providing conjoint operation of the dual measuring mechanism in a manner whereby one of the measuring mechanisms will be filling from a storage bin while the other measuring mechanism is dumping a desired quantity of material into a bag filling hopper.

A still further object of this invention resides in the provision of a novel, cyclically reversing, rotary volumetric measuring mechanism having an adjustable measuring chamber, and automatic filling and dumping control mechanisms.

A further object resides in the provision in a bag filling machine of an annular series of hoppers secured on wheel like framework for rotation about a vertical axis and devices on each hopper to carry a bag to be filled under the associated hopper in communication with the hopper during rotation of the hoppers.

A still further object resides in the provision of a novel bag filling nozzle with an expansible bag holding resilient boot. In conjunction with this object a further object resides in the provision of a pressurized air source and semi-automatic controls for introducing and maintaining pressurized air into the boot and after a desired time lapse to release the pressurized air from the boot.

Still another object resides in the provision in com-

bination with a bag filling machine of an agitator table which is disposed in the assembly line path of depending, material filled bags for vibrating the bags so the material in the bags is completely settled to condition the filled bags for an operation to close their open ends.

Further novel features and other objects of this invention will become apparent from the following detailed description, discussion and the appended claims taken in conjunction with the accompanying drawings showing a preferred structure and embodiment in which:

FIGURE 1 is a partially broken-away front elevation view of a rotary drum type bag filling machine in accord with the present invention;

FIGURE 2 is a side perspective view of the machine in FIGURE 1 illustrating a bag vibrator and the conveyor belt to a sewing machine station;

FIGURE 3 is an enlarged perspective view illustrating details of some of the control components under the rotary drum;

FIGURE 4 is an enlarged perspective view illustrating details of the automatic bag release control;

FIGURE 5 is a schematic representation of one of the bag holding systems, the multiple arrangement of which can be seen in FIGURE 6;

FIGURE 5*a* is a detail sectional view of the quick relief valve used in each bag holding system;

FIGURE 6 is a schematic plan view of the bag holder system for the plural stations in the rotary drum assembly;

FIGURE 7 is a wiring diagram for the electrical controls for the plural bag holder units shown in FIGURE 6;

FIGURE 8 is a partially sectioned detail view illustrating a commutator arrangement located on the upper end of the drum shaft to provide pneumatic and electrical connections to the rotary drum assembly;

FIGURE 9 is a partially sectioned side view of one of the bag holders showing details of the inflatable bag holding boot and its clamping assembly;

FIGURE 10 is a schematic, partially broken-away side view of one hopper segment of the rotary drum assembly showing the two air lines leading to each of the bag filling stations;

FIGURE 11 is a schematic representation of one bag filler station and its air blast bag opening system, the multiple arrangement of the six air blast system being shown in FIGURE 12;

FIGURE 12 is a schematic plan view of the plural air blast bag opening systems for the six stations in the rotary drum assembly;

FIGURE 13 is an electrical circuit diagram for the controls of the air blast system for all bag stations shown in FIGURE 12;

FIGURE 14 is a plan view of the hopper drum seen from just below the dust collecting hood;

FIGURE 15 is a section view taken on line **15—15** of FIGURE 14 to illustrate internal bracing in the hopper drum;

FIGURE 16 is a partially sectioned, enlarged front elevation of the volumetric feed section, one of the cover plates on the gravity feed split inlet being omitted to show the flow sensing vane for the inlet flow indicator;

FIGURE 17 is a perspective rear view of the volumetric feed mechanism showing the adjustment sleeves and their support bearings;

FIGURE 18 is a pre-assembly perspective view of the volumetric dispenser dual chamber, cylinders and volume adjustment sleeves;

FIGURE 19 is a longitudinal section through one of the dual volumetric feed cylinders;

FIGURE 20 is a section taken on line **20—20** of FIGURE 19 showing the inlet and dispensing portion of the feed cylinders;

FIGURE 21 is a section taken on line **21—21** of FIGURE 19 showing the adjustment piston portion of the feed cylinders;

FIGURE 22 is a schematic view illustrating one of the volumetric cylinders dumping its load while the second cylinder is being filled from the storage bin chute;

FIGURE 23 is a view similar to FIGURE 22, but shows the two cylinders rotated 180° in reverse of the positions shown in FIGURE 22;

FIGURE 24 is a circuit diagram showing automatic controls for the volumetric feeder;

FIGURE 25 is a partially broken-away side elevation of the bag vibrator;

FIGURE 26 is a rear elevation view of the bag vibrator shown in FIGURE 25; and

FIGURE 27 is a timing chart to illustrate the relationship between machine operations during a cycle of drum rotation.

The present invention contemplates a unitary bag filling machine of rather compact construction operating on an assembly line basis and being essentially foolproof in operation. The machine is not fully automatic inasmuch as manual operation is required in the initial presentation of bags to the machine. In other words, on the machine as disclosed, an operator will place bags, preferably made of multi-ply paper, on the machine by fitting the open end of the bag over an expansible filler nozzle as the nozzle is moved past a first station during a cycle of operation. The operator manually trips a control which causes a part of the nozzle to expand and hold the upper end of the bag. The holding power of the nozzle assembly depends on air pressure utilized and in essence is limited only by the strength of the bag used. Subsequent to the first manual operation, machine operation, in filling, settling and placing the bag on a table or a conveyor for removal to a sewing machine operation station, is completely automatic.

A succession of bag filling nozzles are annularly arranged in vertical disposition on the underside of a rotating annular drum, segments of the annular drum being formed in hopper shape above each filling nozzle assembly. As the drum rotates, if a bag is positioned and held on a nozzle, the bag will trip a control which enables actuation of subsequent operations for that filler nozzle. The rotating hoppers pass in sequence under a volumetric dispensing mechanism, various limit control switches actuate an air blast mechanism to open the bag, and then cause the dispensing mechanism to discharge a specific volumetric amount of material into the hopper above the filler neck. The time lapse during a cycle of drum rotation, i.e., as the bag passes around the machine (approximately 330°), creates a time delay enabling particles of material, entrained by the air displaced from the bag by the material flowing into the bag, to settle back into the hopper and down through the filler nozzle neck back into the bag. The bag is then dragged over a vibrating mechanism which causes the material to settle completely into the bag away from its top end. As the drum continues its rotation, a control member automatically de-actuates the bag gripping portion of the filler nozzle neck, releasing the bag and permitting it to rest on a platform or a conveyor belt from whence it is carried to a station where a sewing machine operator closes and places the upper end of the bag into a sewing machine which is used to add a tape strip and sew the bag end closed.

The top of the annular arrangement of hoppers is covered by a unitary sealed hood arrangement leading to an exhaust duct system which creates a low vacuum, drawing displaced air from the bag being filled through the exhaust duct system. Air entrained dust from the material with which the bag is being filled (which is too light to settle back into the hopper) will pass through the exhaust duct system from whence it can be reclaimed if desired.

Referring now to the drawings, FIGURES 1 and 2 will provide an essentially complete showing of an over-all machine construction embodying the principles of the present invention. The exemplary semi-automatic ma-

chine **50**, as illustrated, is an upright mechanism having a drum shaped bag carrying and filling assembly **56** rotatable on a vertical axis and mounted on a base platform **52**.

Machine **50** consists essentially of four major components, the first being a lower support structure **54** which is secured to the base platform **52** and encloses the power mechanism for rotating the second major component, the combined hopper nozzle drum **56** which is coaxially rotatably mounted, in a manner to be later described, immediately above the lower support structure **54**. A series of support rollers **58** secured to the underside of the hopper nozzle drum **56** engage and roll in a circular path on the upper surface of a circular plate **60** which constitutes the top wall of lower support structure **54**. Rollers **58** will support the entire weight of the rotatable hopper nozzle drum **56**. Non-rotatably disposed above the hopper nozzle drum **56** is a third major component, an annular dust collecting hood assembly **62** which has a series of frustum shaped dust collecting hoods **64** leading into a horizontal U-shaped common dust collecting conduit **66** which in turn connects to an exhaust duct **68**. The S-shaped duct **70**, seen in FIGURE 1, is an auxiliary suction duct disposed with an intake above the sewing machine station.

The fourth major component of machine **50** is the volumetric measuring and dispensing mechanism **72** which is rigidly secured above the hood assembly **62** between the extended legs of the U-shaped manifold conduit **66**. The discharge passage **74** of the volumetric dispenser **72** connects to an opening in the top wall of the hood assembly **62** directly above the rotating path of the annular group of hoppers contained in the hopper nozzle drum **56**. This measuring and dispensing mechanism **72** is a self contained sub-assembly having dual dispensing cylinders, a power operator, power operator controls, divided inlet duct and a material inlet flow responsive device, all of which will be hereinafter described in further detail.

The lower support assembly **54** consists of a series of vertical beams **80** (FIGURE 1) secured as by welding or by bolts to a bottom base plate **82** which in turn is rigidly secured to the solid base **52** (e.g., a concrete foundation). Cross beams **84** are secured to the upper ends of vertical beams **80** providing a planar structure to which the circular top plate **60** is secured. Diagonal cross braces **86** extend from vertical legs **80** to provide intermediate support for the circular plate **60**.

Centrally located on the base plate **82** is a shaft end socket **88** containing a shaft end thrust bearing. A drum drive shaft **92** has its lower end disposed within the socket **88** against the thrust bearing and projects vertically up through the circular top plate **60**. Where shaft **92** passes through the circular plate **60**, it is rotatably journaled in a roller bearing assembly **94** which is secured to the circular top plate.

Rotational power is imparted to the drum drive shaft **92** through an electric motor **98**, an exemplary rating being ½ H.P., 1750 r.p.m. The output of motor **98** drives a gear reduction unit **100** through a variable speed pulley drive **101**. The output shaft **102** of the gear reduction unit **100** has secured on the end thereof a small sprocket wheel **104** and is disposed with its axis vertical and parallel to the axis of shaft **92**. A large sprocket wheel **106** non-rotatably secured to shaft **92** is arranged coplanar with the small sprocket **104** and a drive chain **108** interconnects the two sprockets to complete the drive path from motor **98** to the drum drive shaft **92**.

Drum shaft rotation is desirably somewhere between one (1) and five (5) r.p.m. depending upon the size of bag being filled and is adjusted to a desired value by the variable speed pulley drive **101**. A sheet metal plate **110** (FIGURE 2) wrapped around the lower support assembly **54** forms a finished covering.

The hopper-nozzle drum **56** is rotatably mounted coaxially and above the lower support structure **54**, using the upper plate **60** of the support structure as a circular weight supporting track. The drum assembly **56** includes an annular arrangement of six hoppers and is conveniently fabricated from two cylindrical metal sleeves **114** and **116** concentrically arranged to provide an annular arrangement of segmented chambers. The annular space between these two sleeves is divided into six equi-angular arcuate chambers, each chamber constituting a space for a bag filling hopper **120** formed by two cross plates **122** and **124**, shown in FIGURE 14 and in dotted lines in FIGURE 1, which are secured as by welding to both the outer sleeve **114** and the inner sleeve **116**. Plates **122** and **124** rigidly maintain the two sleeves in their spaced concentric arrangement. Steel bands **126** and **128** around the peripheral edges of the outer sleeve **114** provide added strength, and further additional strength is provided by exterior metal strips **130** extending vertically at the division lines between the hopper sectors. Annular bands **126** and **128** and vertical strips **130** are secured by welding to the exterior of the outer sleeve **114**.

Turning to FIGURES 14 and 15, a drum hub fitting **136** is located within the inner drum sleeve **116** and provides a connection to the drive shaft **92**. Hub fitting **136** is formed in a spool arrangement having two annular radial flange parts **138** and **140** and an intermediate sleeve **141**. A plurality of radially projected angle beams **142** are secured by bolts to the upper flange **138** and extend radially outward in a spoke-like arrangement into engagement with the inner drum sleeve **116** and are secured thereto by welding to vertical angle beams **144** welded to the inner sleeve **116**.

Viewing FIGURES 4 and 15, it will be seen that a lower wheel-like structure arrangement with drum **56** provides a rigid support assembly **150** and consists of a plurality of radially projected and upwardly inclined angle beams **152** and vertical support gussets **154** secured together by bolts or by welding as desired. Each beam **152** and attached gusset is secured between lower hub flange **140** and the lower part of a corresponding one of the vertical angle beams **144**. Rigidly secured to the lower edge of each gusset **154** is a pair of short horizontal angle beams **156**, to which is secured the base of the caster support rollers **58**. There are six of these rollers **58** equi-angularly disposed under the drum assembly **56** and, as has been described, the complete weight of drum assembly **56** is transmitted through these rollers **58** to the top plate **60** of the support structure **54**.

The inner hub connection **136** is non-rotatably secured to the drive shaft **92** by splined keyways and keys **162**. Thus, drive powered rotation of shaft **92** by motor **98** will rotate the hopper and nozzle drum assembly **56** on the upper plate **60** of the support structure **54**. As before noted, the speed reduction between motor **98** and drive shaft **92** provides a rotational speed of the drum assembly, as desired, at a rate of from 1 to 5 rotations per minute.

Turning back to FIGURES 1 and 2, a bag filler nozzle unit **170** is located at the lower end of each of the hoppers **120**. Each nozzle unit (see FIGURE 9 for details) consists of a sleeve **172**, the lower portion of which is cylindrical and the upper end of which is formed in a transition **174** which abuts against and is rigidly secured by welding to the bottom opening of an associated hopper **120** (see FIGURE 10). The lower cylindrical end of each nozzle sleeve **172** is provided with a bag holding device **176** which is a unitary assembly consisting of a cylindrical sleeve-like collar **178** slipped over the lower end of sleeve **172** and fastened thereto by a screw **179**.

Collar **178** has an integral intermediate external radial rim **180**, the periphery **182** of which is formed with a concave cross section. Collar **178** carries an expansible boot **183** formed from a piece of $\frac{3}{32}$ inch gum rubber tubing **184**, 9 inches long and 12 inches in a flat condition. These dimensions are actual dimensions utilized in one specific embodiment wherein the sleeve **178** has an outer

dimension of 7¼ inches. It is to be understood that these dimensions will vary depending upon the size and style of the bag being filled. One end of the gum rubber tubing **184** is slipped over the lower portion **186** of collar **178** and is secured thereon by a spring steel clamp **188**. The tubing **184** is then turned back upon itself and its other end placed over the concave periphery **182** of rim **180** and secured thereon by a second spring steel clamp **190**.

At the left hand side of FIGURE 8 will be seen a passageway **192** formed axially through the rim portion **180** of collar **178**. This passageway **192** provides for introduction and exhaust of pressurizing air to the interior of boot **183** and to this end a nipple **194** can be threaded into the uppermost exterior end of the passageway **192** and a suitable pressurizing conduit secured to the nipple, as will hereinafter be described. It is sufficient at this point to say that the conduit and nipple **194** are utilized to introduce and to maintain air under pressure into the boot **183** which will expand within the open end of a bag **200** as seen in FIGURE 10, creating a holding force against the inner periphery of the bag opening and maintaining the bag on the nozzle unit **170**. Each of the nozzle units **170** has an identical holding boot **183** with an individually controlled boot pressurizing conduit, as will be later described.

The hood assembly **62** which is non-rotatably disposed immediately above the rotating hopper nozzle drum assembly **56** will probably be best understood by reference to FIGURES 1, 2, 15 and 16. This assembly consists of a circular ring plate **202**. Six similarly shaped rectangular openings are provided through plate **202** into which is fitted the lower peripheral edge of one of the convergent hoods **64**. These hoods **64** are secured as by flanges and bolts or by welding to the annular plate **202**. The inner and outer peripheral edges of plate **202** are provided with depending annular flanges **206** and **208** which fit respectively over the upper outer peripheral edge of the outer drum sleeve **114** and the inner upper peripheral edge of the inner drum sleeve **116**. Rubber seal rings **210** and **212** are fastened to the inner sides of the depending flanges **206** and **208** and engage the peripheries of inner and outer drum sleeves **114** and **116** to provide an effective low pressure commutated seal between the stationary hood assembly **62** and the upper opening of the annular arrangement of hoppers **120** within the rotating hopper-nozzle drum assembly **56**.

Returning now to FIGURE 1, it will be seen that the small upper end **220** of each individual convergent hood **64** contains an annular vertical outlet duct **222**, the end of which is formed with an annular connection flange **224** by which the cylindrical duct **222** is securely fastened to a corresponding flange **226** on the lower end of an inlet duct **228** which depends from the U-shaped exhaust manifold **66**. Note that the open portion of the U-shaped manifold **66** fits around the volumetric measuring and dispensing mechanism **72**. The U-shaped exhaust manifold **66** supports the annular hood assembly **62** and in turn is supported by an arrangement of support beams **232** and **234** (FIGURE 2) which depend from an overhead support (not shown).

A lateral platform consisting of welded angle beams **236**, **237**, and **238** (FIGURE 2) extends across the support beams **232** and provides structure to carry the measuring and dispensing mechanism **72**, seen in FIGURE 1. At this point, it will be sufficient to note that the measuring and dispensing mechanism **72** consists of a dispensing cylinder carrier **240** which contains two dispensing cylinders **242** and **244**. These two dispensing cylinders **242** and **244** are disposed beneath a split inlet manifold **246**, the upper end of which is adapted to be connected to the lower end of a storage bin (not shown). The aforementioned discharge passage **74** from the measuring and dispensing mechanism **72** has its upper end rigidly secured to the lower portion of dispensing chamber **240**. The lower end of discharge passage **74** (see FIGURE 16) carries a flange **239** which is secured by screws to the annular hood plate **202** around an opening **241**.

Whenever a predetermined quantity of material is dispensed from one of the two cylinders **242** and **244** into the discharge passage **74**, the material will fall through the hood opening **241** into whichever individual hopper **120** is at that time passing below the discharge passage **74**, the material passing through the then adjacent hopper **120** and through its nozzle unit **170** into the open bag which is securely held on the associated nozzle boot **183**. Note: in FIGURE 1 the start position of a nozzle is indicated by nozzle X which is located to the left hand side of the sewing machine dust exhaust duct **70**. The final position, where the nozzle holder releases a bag, is indicated by nozzle Y which is located to the right hand side of the sewing machine exhaust duct **70**. These start and stop positions are for a machine installed for clockwise rotation. It is to be understood that this machine can also be constructed for counterclockwise rotation if an installation so requires.

The volumetric measuring and dispensing mechanism **72**, as has been previously noted, is a self-contained subassembly including an inlet for receiving material from a storage bin and an outlet for dispensing measured quantities by volume of that material sequentially into hoppers **120** and the rotating drum asembly **56**. Control tie-in between the volumetric measuring and dispensing mechanism and the rotating drum assembly is occasioned by means of electrical circuitry with switch controls which will be later described in detail. FIGURE 1 shows the dispensing mechanism **72** mounted above and on one side of the complete machine **50**. Details of this dispensing mechanism **72** will be described with reference to FIGURES 16–20, schematic illustrations of the dispensing operation are shown in FIGURES 22 and 23, the control circuitry shown in FIGURE 24 and a timing chart of the operations shown in FIGURE 27.

The dispensing mechanism **72** has the two aforenoted dispensing cylinders **242** and **244** contained in carrier framework **240**. FIGURE 18 illustrates the essential components of mechanism **72** during an intermediate stage of assembly. Carrier **240** is constructed with front plate **250** and two side plates **252** and **254**. Disposed in side by side parallel arrangement between the two side plates **252** and **254** are two tubes **256** and **258** constructed of heavy steel plate. As an example of construction, the front and side plates are made of ¼ to ½ inch thick steel plate.

The ends of both tubes **256** and **258** which are disposed adjacent the front plate **250** can be closed by an end plate which is bolted to front plate **250** or, as shown in FIGURE 19, the end of tubes **256** and **258** can abut the front plate **250** and be welded thereto. Auxiliary bracing rings **260** and **262** are welded to the circumference of the two tubes at an intermediate point and at the other end of the two tubes. The corresponding ring braces **260** and **260′** of the two tubes abut each other and also abut the two side plates **252** and **254** and, similarly, circular brace plates **262** and **262′** abut each other and the two side plates **252** and **254**. To provide a rigid assembly the plates **260** and **260′** and **262** and **262′** can be welded to each other and to the two side plates **252** and **254**. The carrier assembly thus fabricated will result in an extremely rigid unitary member with two parallel tubes **256** and **258** open at one end.

Extending along the top edge of each of side plates **252** and **254** and welded thereto are strips of angle iron **264**. Extending from front wall **250** to the rear brace rings **262** and **262′** are four angle strips **266**, **267** and **267′**. The lower edge of the depending flange of each angle strip **266** and **267** abuts and is welded to the outer surface of its associated tube, e.g., **256**, and the upper flanges of

these strips 266, 267, 266' and 267' lie in a common horizontal plane.

Adjacent the forward portion of the two tubes and between the pairs of angle strips 266, 267 and 266' and 267' the upper part of both tubes 256 and 258 are provided with openings 270 and 272 which can be designated as stationary filling ports. Immediately below the filling ports 270 and 272 are two further openings 274 and 276 constituting the stationary discharge ports.

Fitting into each of the stationary tubes 256 and 258 is an associated dispensing cylinder 242 and 244. In FIGURE 18 one cylinder 242 is shown disassembled from within its tube 256 while the other cylinder 244 is disposed half way into position in its corresponding tube 258. The exterior diameter of the dispensing cylinders 242 and 244 is such as to provide a close but rotatable fit within the associated stationary tubes 256 and 258. One end of the cylinders 242 and 244 is closed by an integral end plate 278. Secured in a hole coaxial of each end plate 278 is a heavy collar 280 and disposed through the collar 280 and projecting from both the closed and the open end of each of tubes 242 and 244 are respective shafts 282 and 284. The collars 280 are welded to end plates 278 and the shafts 282 are welded to the collars 280.

Each cylinder 242 and 244 has a pair of filling and dumping openings 286 and 288 formed in the cylindrical wall in such a position that when the cylinders are in position within the stationary tubes 256 and 258 they can be disposed coextensive with the stationary filling ports 270 and 272 or coextensive with the stationary discharge ports 274 and 276 depending upon the rotated position of the cylinder 242 within its associated tube 256. FIGURE 19 illustrates the coextensive relationship between cylinder ports 286 and 288 and the stationary discharge ports 274 and 276. If cylinder 242 were to be rotated 180° from the position shown in FIGURES 19 and 20, the ports 286 and 288 would be on the top side of the cylinder immediately in line with the filling ports 270 and 272. It will thus be seen that when either one of the cylinders 242 and 244 is in a rotated position so the ports in the cylindrical wall are adjacent the stationary filling ports 270 and 272, material can flow through the filling ports 270 and 272 into the rotatable cylinder. When the cylinder is then rotated 180°, the material within the cylinder can flow out through ports 286 and 288 and through the stationary discharge ports 274 and 276.

By varying the size of the chamber interior of the rotatable cylinders 242 and 244, the quantity of material capable of being received by the cylinder can be adjusted and to this end a volume adjustment piston 290 is provided for each of the dispensing cylinders 242 and 244. Piston 290 consists of a cylinder which has one end wall 292 provided with a coaxial aperture 294 to slidably fit over the cylinder shaft 282. Integral with piston 290 and welded to the interior of end wall 292 coaxial with the end wall aperture 294 is a piston sleeve 296 which freely slidably fits over shaft 282. The volume which can be received by the cylinder 242 may thus be decreased by moving piston 290 toward the end wall 278 and may be increased by withdrawing the piston away from the end wall 278.

The front end of the two cylinder shafts 282 and 284 extend through apertures 298 and 300 in the front dispensing carrier plate 250, projecting in front of the plate 250 a sufficient distance to enable drive gear and sprocket components to be non-rotatably secured to each shaft whereby, as will be described, the rotatable cylinders 242 and 244 may be simultaneously rotated backward and forward through an arc of 180°. The two dispensing cylinders are alternately arranged, i.e., one is receiving from its associated stationary tube filling ports while the other is discharging through the associated stationary tube discharge ports.

The rear end of the two stationary tubes 256 and 258 is closed by a rear plate 302 which includes apertures 303 permitting projecting of the piston sleeve 296 and associated enclosed shaft 282. Shown in FIGURES 17 and 19, an angle beam 304 is secured horizontally as by welding to the rear surface of rear plate 302 below the apertures in the plate. The angle beam 304 provides support for pillow block bearings 306 and 308 which rotatably receive the respective piston sleeves 296, the sleeves in turn providing the coaxial support for contained shafts 282 and 284. There are several ways in which the adjusted position of piston 290 within the associated dispensing cylinder can be axially maintained, e.g., set screws in the piston sleeve 296 can be provided at various axial locations to clamp against the interior shaft 282 or, as disclosed in FIGURE 19, the axial position of piston 290 can be maintained by collars 310 and 312 disposed adjacent either side of pillow block 306 and 308 and non-rotatably secured to the piston sleeve 296 by set screws. The forward ends of shafts 282 and 284 are supported in pillow blocks 314 and 316 (FIGURE 16) which are mounted on an angle beam 318 disposed horizontally against the front plate 250 and welded thereto.

The piping 320, seen in FIGURE 18, constitutes provision for injecting lubricant between the rotatable cylinders 242 and 244 and the stationary tubing 256 and 258. A cover plate 324 covers the open assembly shown in FIGURE 18 and is provided with openings directly above the stationary filler openings 270 and 272 and 270' and 272'. Cover plate 324 can be secured to the various angle beams 264, 266 and 267 by suitable screws and lubricant injection fittings (not shown) carried by the top plate 324 can be connected by suitable conduits to the tubing members 320 to provide lubrication access from the exterior of the carrier 240.

The split duct 246 (seen in FIGURE 1) has two discharge passages, one of which is disposed above the stationary filler openings 270 and 272 and the other of which in disposed above the corresponding stationary filling openings 270' and 272'. Flanges 326 around the bottom openings of the split duct 246 rest on the dispensing carrier cover plate 324 and the split duct 246 is secured to the carrier by suitable screws. As has been previously described, the upper end of the split duct 246 is secured to a suitable conduit leading from a material storage bin and so long as the storage bin has material therein that material will be gravity fed into the split duct 246 and thence through the lower passages to the stationary tube filler openings 270, 272, 270' and 272'.

If the rotatable cylinder 242 and 244 within the associated tubes is disposed in a position shown in FIGURE 19, passage through the filler openings 270 and 272 will be blocked by the solid cylindrical wall of cylinder 242 or 244. However, if the cylinder is rotated 180°, it will be clearly seen that material passing through the split duct 246 will completely fill the chamber between piston end wall 292 and the dispensing cylinder end wall 278. Then as the cylinder is rotated in a reverse direction 180°, the filler ports will again be closed and the volumetric quantity of material within the cylinder can find an egress through the cylinder openings 286 and 288 and the discharge openings 274 and 276 of the stationary cylinder. The aforedescribed hopper shaped discharge passage 74 is suitably welded under the carrier 240 to receive material which is dumped through the stationary cylinder discharge ports 274 and 276 regardless of which of the cylinders 242 and 244 is being discharged.

To provide conjoint and simultaneous rotation of the two cylinders 242 and 244, similar sized toothed sprocket wheels 330 and 332 are secured to the forward ends of respective shafts 282 and 284 in front of plate 250 and an endless chain 334, preferably of the roller link type, passes around the two sprocket wheels. Intermediate the

two shafts 282 and 284 is located an idler sprocket 336 which is mounted for vertical adjustment in a strip of channel beam 338 which is secured to the front plate 250 (FIGURE 18) by welding. Idler sprocket 336 is used to place proper tension on the drive chain 334.

As shown in FIGURE 16, the motive power for rotating the two dispensing cylinders 242 and 244 back and forth through a 180° arc of travel is provided by a fluid motor 342 which is the reciprocating piston type. The cylinder of motor 342 is secured to the dispensing carrier front plate 250 by bolts and nuts 344 and is so positioned that its piston rod 346 will reciprocate horizontally parallel to and in front of plate 250. The free end of piston rod 346 is provided with a yoke fitting 348 which connects by means of a cross pin 350 to a gear rack 352. Cross pin 350 extends up through the fork fitting 348 and carries a limit switch operating roller 354 on its upper end.

The front and back side faces of gear rack 352 include grooves 356 which enable gear rack 352 to be reciprocally guided in a T-shaped track 358 cut in the underside of a rack guide block 360. Shown in FIGURES 16 and 19, the rack guide block 360 is machined from solid bar stock and is rigidly secured to the front face of plate 250 by means of nuts and bolts 362. Alternatively, the guide block 360 could be fabricated of several parts.

Upon reciprocation of the motor piston rod 346, rack 352 will be reciprocated horizontally within its guide track 358. The teeth of rack 352 mesh with a gear wheel 364 non-rotatably secured on the end of dispensing cylinder shaft 284 in front of its associated sprocket wheel 332. When the rack 352 moves from right to left both cylinders 242 and 244 will be rotated in a counterclockwise direction and conversely when the rack 352 is drawn back from left to right, both cylinders 242 and 244 will be rotated in the clockwise direction. This reciprocation of the piston and its rod 346 is sufficient to provide at least a 180° rotation of both dispensing cylinders. Through controls to be described, the limit positions of the stroke of motor 342 are controlled to provide the 180° desired rotation of the dispensing cylinders.

Schematic FIGURE 22 illustrates the split duct 246 filled with material from a storage bin. In this view dispensing cylinder 242 is in a position to be filled through the filler openings of stationary tube 256 while dispensing cylinder 244 is positioned 180° opposite to that of cylinder 242 and material is dumped through its ports into the hopper shaped passage 74 from whence the material passes on down through the hood 62 into a hopper 120 and thence into a bag 200 which is held on the nozzle of hopper 120. FIGURE 23 illustrates the volumetric dispensing mechanism after a successive hopper 120' with another bag 200' comes to a position below the dispensing mechanism hopper shaped passage 74 which actuates the motor 342 to reciprocate the rack 352, rotating both dispensing cylinders 242 and 244 to their opposite 180° positions where it will be seen that dispensing cylinder 244 now is in position to be filled through the split duct 246 while dispensing cylinder 242 is dumping its material into the hopper 74 and thence into bag 200'.

Fluid motor 342 can be pneumatic or hydraulic, the latter being utilized in the disclosed embodiment. Motor 342 is double acting and its hydraulic operating system is mounted on the carrier assembly immediately behind the motor 342 and front plate 250. Any suitable hydraulic operating circuit for a double acting hydraulic motor will be acceptable, a relatively simple type of circuit being illustrated in the FIGURE 24 schematic diagram, in which an electric motor 370 drives a hydraulic pump 372 which has an intake side connected to hydraulic fluid reservoir 374. Pump 372 delivers fluid under pressure into a hydraulic accumulator 376 from whence the fluid goes through a control valve 380 which has a neutral position and positions for controlling both directions of travel of motor 342. The hydraulic circuit will include appropriate relief valves, by-passes and pressure reducing valves in accord with standard hydraulic system practice. Control valve 380 is preferably one which is spring loaded or biased in some manner to a neutral position, in which position the control passages 382 and 384 to opposite ends of the hydraulic motor 342 will be blocked to hydraulically lock the position of the piston within the cylinder of motor 342. In this position fluid under pressure from pump 372, which is in continuous operation whenever the machine is being operated, will pass through the control valve 380 and into return line 386 back to the reservoir 374. The two control positions of control valve 380 will be determined by operation of one or the other of two solenoids S1 and S2 which are in the electrical control circuit to be described hereinafter.

Controls

As the bag holding and filling drum 56 is rotated by motor 98, there is a definite sequence of events which is initiated by an operator placing a bag on one of the nozzles 170 at nozzle position X indicated in FIGURE 1. The sequence of events is illustrated in the timing chart of FIGURE 27. When a bag is placed on the nozzle, the operator trips a switch mechanism associated with that nozzle causing inflation of the nozzle boot to hold the bag on the nozzle. As the drum continues rotation the bag engages what is termed a bag detection switch. This bag detection switch controls the circuit which energizes the dumping circuit shown in FIGURE 24 and which will be fully described. A further 5° rotation of the drum will then activate a control, individual to that nozzle which is holding the bag that tripped the bag detector switch, to impart an air blast down through the nozzle into the bag which flexes the bag into a substantially open condition, which can be designated as a conditioning of the bag for reception of material. A further 10° drum rotation brings a trip mechanism, associated with the specific nozzle, into engagement with a dispensing mechanism dump switch which activates the dispensing mechanism control circuit shown in FIGURE 24 causing reciprocation of the motor 342 and rotating the two dispensing cylinders 242 and 244 180° which dumps the material from one of the cylinders through the associated hopper passage 74 and into the hopper 120 through its nozzle 170 and into the bag 200.

It will be realized from the timing chart on FIGURE 27 that dispensing occurs within approximately 20° of drum rotation. The drum has six hoppers arranged around its 360° periphery and therefore the hopper which is being used to fill the bag will remain under the discharge passage 74 for approximately 40° after dumping has been accomplished. This additional time lag permits any of the light density material which becomes entrained in the air passing upwardly out of the bag to fall back onto the sides of the hopper shaped passage 74 back into the hopper 120. Once the material is in hopper 120, of course, it travels with the drum as it continues to settle back into the bag. There is an additional time lapse as the drum continues rotation during which the material in the bag is gradually settling further into the bag. Near the end of the 360° rotation of the drum, the bag is dragged over a vibrator which, as will be later described, provides a rapid jogging of the bag to completely settle the material below the top open end of the bag before the bag is released by automatic release of the air in the boot of the nozzle.

The air in the boot on nozzle 170 is automatically released when that nozzle reaches the position Y shown in FIGURE 2. Note: in this position the bag is directly over the end of a conveyor belt 390 so the bag drops onto the belt leaning against the deflector shield 392, and the bag is carried to the sewing machine operator 394. The deflector shield 392 is curved over at its upper end to form a hood 396 which connects to the exhaust duct 70 and accordingly any dust which floats from the top of bag 200 when it is released from its nozzle 170 will pass up through the hood 396 and into the exhaust system 70. The operator 394 can grab the upper end of the bag, close it in a flat disposition and insert it into the inlet chute of

a commercially available bag end seaming sewing machine 398 from whence the conveyor belt 390 will carry the completely closed bag to a storage warehouse or other type of further processing facility.

Inasmuch as the semi-automatic and automatic operations reiterated above require a source of air and electric power in communication with the rotating drum assembly 56, a commutator adaptor (FIGURE 8) is fixed in the top end of the drum shaft 92. The commutator can consist of a short hollow sleeve 400 secured to the upper end of shaft 92 and locked therein by a set screw. The upper end of sleeve 400 can be rotatably coupled to a stationary conduit 402, which leads from a source of pressurized air at 80 p.s.i., through a rotatable seal coupling 404 of any suitable type. A supply conduit 406 leads from the interior of sleeve 400 down beside the drum hub sleeve 141, as shown in FIGURE 6, providing a source of air under 80 p.s.i. pressure. Sleeve 400 also carries a dielectric sleeve 408 to which are non-rotatably attached two electric commutator slip rings 410 and 412 which rotate with the drum assembly. The two leads of an electric power cable 414 are connected to respective ones of slip rings 410 and 412 by brushes 416 and a two line cable 414 connected to rings 410 and 412 passes down into the interior of the drum assembly 56. Current from a 110 volt source is supplied through brushes 416, the slip rings 410 and 412, to cable 414 and thence to appropirate component circuitry.

In describing the semi-automatic initial step, in other words, the placing of a bag on the boot 183 of a nozzle 170 and causing inflation of the boot 183 to firmly grip the upper end of a bag, reference will be made to FIGURES 4, 5, 6 and 7. With particular reference to FIGURE 6, the 80 p.s.i. air pressure conduit 406 in the center of the drum assembly 56 is tapped by a conduit 420 leading to a pressure regulator valve 422 which reduces the high pressure air supply to a low pressure, an exemplary value being 8 p.s.i., leading into an air reservoir tank 424 secured by suitable brackets to the interior structure of drum assembly 56. Six lines tap off of the air tank 424, one line leading to each of the bag holding nozzle assemblies and, inasmuch as the components and controls of each of these lines is identical, only one will be described in detail with reference to FIGURE 5 wherein the tap-off line is indicated as 426.

A suitable pressure indicating line 428 leads from the pressure regulator valve 422 to an exterior dial type air tank pressure indicator 430 located on the exterior cylindrical surface of drum assembly 56.

Conduit 426 leads from air tank 424 through suitable controls and is connected to the aforenoted nipple fitting 194 passing through the nozzle assembly collar 178 to the interior of boot 183. The first control component in conduit 426 is a two-way solenoid operated control valve 432 spring loaded to a position which blocks flow of air from tank 424 through conduit 426, at the same time, providing communication from its downstream side to atmosphere through exhaust duct 434. When the solenoid of valve 432 is energized, a through passage from the air tank 424 through conduit 426, valve 432, reducer 436 and valves 440 and 442 will be provided to the interior of boot 183 and, at the same time, exhaust outlet 434 will be blocked. In the conduit 426, between the control valve 432 and the boot 183, is an air regulator 436 set to regulate the pressure supply into the boot 183 at a desired pressure somewhere between 2 and 8 p.s.i. Normally this pressure is set at approximately 3 p.s.i. and is visually indicated by the individual bag pressure indicator 438, one of which is provided for each of the nozzle positions, as can be seen in FIGURE 1. Also included in the conduit 426 are a quick relief valve 440 and a safety relief valve 442, providing desired safety factors for each boot air supply assembly. When solenoid valve 432 is de-energized the air is exhausted and pressure decreases on the inlet side of quick relief valve 440 (see FIGURE 5*a*). In this situation the diaphragm 443 of valve 440 is spring biased to the position shown in FIGURE 5*a* and pressure from the nozzle boot 183 is quickly relieved through the quick relief conduit 445. When there is pressure on the inlet side of quick relief valve 440 the diaphragm 443 shifts to the left (FIGURE 5*a*), closes the exhaust 445 and provides passage from the inlet side to the bag holding boot 183. It is to be understood that all of the air pressure values recited herein are exemplary and that they may be varied somewhat to suit operational requirements.

The aforenoted electric conduit 414 provides power for the actuating control circuits including solenoids for all of the individual solenoid actuated valves 432 and to this end the electric source conduit 414 connects into a ring shaped conduit 446 which passes each of the nozzle assembly stations. Conduit 446 is suitably secured to the internal structure of the rotating drum assembly 56. Adjacent each nozzle assembly station there is located a switch box 448 (FIGURE 4) and an electrical conduit 450 is connected between the switch box 448 and the solenoid portion of the solenoid actuated valve 432. A short connecting conduit 452 provides sealed communication between the electrical ring conduit 446 and the individual conduit 450. Conduit 450 includes two electrical lines tapped into the two 110 volt power supply lines within the ring conduit 446.

A single-pole, single-throw, two-position switch located within the switch box 448 controls the power circuit to the solenoid of solenoid actuated valve 432 and this switch will remain in whichever position it is placed in. Each switch box 448 includes an "on" button 454 and an "off" button 456 and is secured immediately adjacent the associated nozzle assembly 170, being secured by a bracket 458 to the drum assembly 56. Pivotally secured to the underside of each switch box 448 is a lever type operator 460 which carries a hand bumper 462 on its free end. When an operator places a bag on the boot 183, he then merely lifts his hand, hits the bumper 462 which raises lever 460 against the "on" button 454, closing switch 448 which actuates and maintains the solenoid operated valve in an operated condition, permitting air supply reduced to approximately 3 p.s.i. from tank 424 to pass through conduit 426 and into the boot 183, causing the boot to expand and securely grip the inner periphery of the open end of a bag 200. As desired, switch 448 will remain closed until deliberately opened and thus air pressure within the boot 183 will be maintained as the drum assembly 56 rotates the particular nozzle assembly 170 from station X to station Y.

To release the bag 200 from boot 183, the "off" button of switch 448 must be operated to open the switch contacts, break the circuit and de-energize the solenoid which controls valve 432, thus permitting the air within the boot 183 to exhaust through conduit 434. To enable this release of boot pressure automatically, a cam operator 464 is provided at each of the nozzle stations. Operator 464 has a tubular sleeve 466 extending radially from a position interior of the inner drum sleeve 116 to a position adjacent the switch "off" button 456, and rigidly secured to drum assembly 56 by a bracket 468. Journaled within the sleeve 466 is a cam operating shaft 470, the exterior end of which has non-rotatably secured thereon a cam member 472 disposed immediately above the switch "off" button 456 and having a shape whereby a slight pivotal rotation of shaft 470 will cause the cam member 472 to engage the "off" button 456 and open the contacts of switch 448.

Pivotal movement of cam operating shaft 470 is occasioned by a lever member 474, adjustably secured on the inner end of shaft 470 and depending in a gravity maintained downward position. As the drum rotates the nozzle station into position Y, the lower end of cam operating lever 474 engages a roller 476 which is carried by bracket 478 secured to the side wall of the drum support 54 (see FIGURE 4). Since each of the nozzle assemblies includes one of these switch de-actuating assemblies 464,

passage of the associated operating lever 474 past the roller 476 will positively assure that the control switches 448 are in the open position causing the boots 183 to be automatically deflated as every nozzle assembly passes station Y.

Although the next operation in the sequence of events which occur during rotation of the drum assembly 56, after placing a bag on a nozzle at station X, is actuation of the bag detector switch, since the bag detector switch is a part of the integral control system for the dispensing mechanism, we will turn now to the automatic air blast system utilized to open and condition the bag which is held on an inflated boot. The air blast system will be described with reference to FIGURES 10, 11, 12 and 13 and FIGURE 3.

Referring to FIGURE 12, it will be seen that the main electrical conduit 414 ties in with a second ring conduit 484 which carries the two lines of the electrical power source and from which are tapped off six conduits to the actuating controls for the air blast mechanism. The source of air under pressure for the air blast is derived from the 80 p.s.i. air pressure source coming in through conduit 406 from whence a second tap 486 leads to a 40 p.s.i. pressure regulator 488 which reduces the high pressure incoming air to a 40 p.s.i. value passing through conduit 490 and into a second pressure tank 492 which is mounted to the internal structure of the drum assembly 56. An indicator line 494 leads from pressure regulator 488 to the air blast pressure indicator 496 which is located on the exterior surface of the drum assembly 56 and can be seen in FIGURE 1.

From the air tank 492, a common conduit 498 encircles the interior of the drum assembly 56 and provides a source of 40 p.s.i. air adjacent each of the nozzle assemblies 170 and, at each of the nozzle assembly stations, there is a tap-off through a solenoid control valve controlling air under pressure ejected through an air line and into the interior of the nozzle directed downward toward the nozzle opening. Each of these valve and nozzle inlet asemblies is identical and hence (referring to FIGURE 11) only one will be described in detail.

From the common conduit 498, a short conduit 500 leads to a simple on-off air control valve 502 which is spring loaded to the "closed" position and operable to the "open" position by a solenoid 504. From valve 502 an air line 506 passes through the wall of the bag carrying nozzle 170 and through a downwardly bent portion 508 to its open end. Thus, whenever an air valve 502 is moved to the "open" position, a blast of air under 40 p.s.i. will be directed downwardly through the nozzle opening and into a bag 200 held by the boot 183.

Energization of the solenoid 504 for the air blast line control valve 502 is by means of an associated single-pole, single-throw, on-off switch 510 spring loaded to the "off" position and in series connection with the 110 volt electric supply line 484. There are six of the switches 510, one for each of the nozzle stations and with reference to FIGURE 3, three of such switches 510 can be seen depending from a lateral brace arrangement between the horizontal angle beams 156. Each switch 510 is actuated by an integral operating lever 512, the end of which carries a roller 514. As the drum assembly 56 rotates a nozzle assembly 170 beyond the position X where a bag will be placed on the nozzle boot, the roller 514 on the end of lever 512 engages an abutment 516 secured to the top plate 60 of the support structure. As roller 514 rolls up over abutment 516, the switch 510 will be momentarily "closed" to energize the solenoid 504 opening valve 502 permitting an air blast to be directed through the conduit 500, 506 and 508 flexing the bag to an open position. Note that each of the switches 510 (FIGURE 3) is secured to the support plates 518 by wing nuts which pass through slots in the plate 518. This mounting enables adjustment of the limit switch assemblies 510 so the air blast will occur prior to tripping of the dispensing dump control circuit.

Dispensing Control Circuit

Referring now to FIGURE 24, and assuming that operation of the machine has just been initiated, the drum assembly 56 is started into rotation by turning on the power to the drive motor 98. With reference to FIGURE 2, an operator standing behind the shield 392 will take a folded bag, open the top of the bag and place it over the boot 183 of a nozzle assembly 170 in X position (see FIGURE 3), at the same time hitting the bumper 462 for that station upwardly. The bag 200 will thus be securely held on the boot of nozzle 170 and, as the drum assembly 56 rotates toward the left in FIGURE 3, the bag will engage a tickler rod 520 which extends horizontally from bag detector switch 522 mounted on the side of the support assembly 54 adjacent its top edge. Detector switch 522 is spring loaded to the "off" position and the light pressure of a bag passing rod 520 will deflect the rod and move the associated detector switch 522 to a closed position.

Turning now to FIGURE 24, when the bag detector switch 522 is moved to the closed position, a series circuit from one side of the 112 volt system to the other side is completed through the holding coil 524 of a detector relay 526. The detector relay has two sets of normally opened contacts 528 and 530 which are closed when the holding coil 524 is energized by closing of the bag detector switch 522. One set of the contacts, 530, upon being closed, provides a holding circuit for the relay 526 through coil 524 from line 532, line 534, through the normally closed contacts of a circuit breaking switch 536, to one side of the 110 volt system. With reference to FIGURE 16, the normally closed circuit breaking switch 536 is the center switch which is actuated by the piston rod switch actuator roller 354 at the midposition of its stroke, whether the stroke be in the forward or backward direction.

Back now to FIGURE 24, the detector relay 526 now being held in a closed position provides a closed circuit through its other set of contacts 528 from one side of a dump control switch 538 to the holding coil 540 of a dump relay 542. The dump switch 538 is a double-pole, single-throw switch, spring loaded to energize contact 544. The fixed terminal of switch 538 is connected to one side of the 110 volt system and normally closed contact 544 is connected in series with a contact of the bag detector switch 522. The normally open contact 546 of dump switch 538 when engaged by actuation of the dump switch will close a circuit energizing the dump relay holding coil 540.

There is only one dump switch 538 in the system and that switch is located under the support structure cover plate 60 inboard of its periphery within the track taken by drum support rollers 58. Immediately behind the air blast switch 510 for each of the nozzle assemblies is located a depending dump switch actuating finger 550. There are six of these fingers 550 and each one is adjustably mounted on the slotted plates 518 behind associated nozzle assemblies by wing nuts 552. Dump switch 538 has an operating lever 553 which can be seen in FIGURE 3. The end of lever 553 carries a roller 555 which projects above the level of plate 60 and is disposed in the path of travel of the lower end of all six fingers 550. Note that finger 550 lies immediately behind the associated air blast switch 510 so the air blast for the associated nozzle station 170 will occur prior to the time that finger 550 engages roller 555 to operate the dump switch 538.

Returning again to FIGURE 24, it will be seen that actuation of dump switch 538 will move the throw of switch 538 down to a closed contact position whereby a circuit is completed through detector relay contacts 528 and line 554 to the holding coil 540 of dump relay 542. This closes dump relay 542 which has two sets of normally open contacts 556 and 558. One contact of both

of the sets of dump relay contacts **556** and **558** is joined by a bridge which connects to a line **534** which derives its source of electrical power through the circuit breaking switch **536**. The other contact of one set of dump relay contacts **558** connects to the holding coil **540** of dump relay **542** and provides a holding circuit to maintain the dump relay **542** in a closed position regardless of the position of dump switch **538**.

Upon closing of the dump relay **542**, the second set of dump relay contacts **556** completes several circuits from one side of the 110 volt power source through the normally closed circuit breaking switch **536** to controls for operating the hydraulic motor **342**. If motor **342** is in the position illustrated in FIGURE 24, the cam operating roller **354** on piston rod **346** will be in engagement with a triple-throw, double-pole limit switch **560** to place that switch in its operated position, as shown. A similar triple-throw, double-pole limit switch **562** is shown in FIGURE 24 in its normal spring biased position. When the piston rod **346** of motor **342** is extended to its other limit position, the switch operator roller **354** will engage the push button of limit switch **562** to place it in an operated position opposite to that shown. Upon such a shift, when the roller **354** initially moves away from limit switch **560**, that switch will be spring biased into a position similar to the illustrated position of switch **562**.

However, assuming the parts are in the position shown in FIGURE 24, the closing and holding closed of dump relay **542** enables a circuit through the set of dump relay contacts **556**, through the uppermost contacts of right hand limit switch **560** to line **566** which is connected to the holding coil **568** of the forward motor control relay **570**, energizing that relay and closing its two sets of contacts **572** and **574**. One of the contacts of each of the two sets of contacts **572** and **574** is bridged and connects through line **576** to one of the contacts of the left hand limit switch **562** through the associated throw and to a hot side of the 110 volt power source. This provides a circuit through contacts **574** of forward motor relay **570** to the forward motor relay holding coil **568** providing an electrical lock-in for relay **570**. The other set of contacts in forward motor relay **570**, being closed, will energize a circuit to the motor hydraulic control valve solenoid **S–2**, shifting the control valve **380** to a position applying fluid pressure through line **384** against the back side of the piston within motor **342**, causing extension of the piston rod **346** toward the left. So long as the holding coil **568** of forward relay **570** is locked in electrically through the normally closed upper contact of limit switch **562**, the solenoid **S–2** will maintain the control valve in position to continue shifting the motor piston so its rack **352** moves toward the left. Looking at FIGURE 22, it will be seen that when the rack is in the right hand position, the dispensing cylinder **242** will be filled with material and when the rack progresses toward the left (FIGURE 23) to rotate both of cylinders **242** and **244** 180°, the cylinder **242** will dump its contents into the hopper **74** passing down through hopper **120** in the rotating drum assembly **56** and into the bag **200** which is maintained by the nozzle boot on the lower end of nozzle **170**.

As the motor **342** operates to shift the rack **352** to its left hand position, the limit switch actuator **354** will move into engagement with circuit breaking switch **536** and momentarily open its contacts before it progresses on past the switch toward its opposite limit position. Upon opening of switch **536**, the circuit through the holding coils **524** and **540** of detector relay and dump relay **542** will be momentarily broken, permitting these relays to open their sets of contacts, breaking the electrical lock-in to their holding coils. When this occurs, the hydraulic motor operating contacts **556** of dump relay **542** will be open, thus opening the circuit through line **564** and breaking any other circuit which may have been occasioned through either the detector relay or the dump relay.

When the rack **352** started its leftward movement and the switch operator **354** moved away from right hand limit switch **560**, the contacts of that limit switch returned under spring bias to normal position which broke a circuit through the upper set of contacts, and through line **566** to the holding coil **568** of motor forward relay **570**. As explained, this broken circuit does not de-energize the holding coil **568** which is electrically locked in through the lower set of forward relay contacts **574**. Now, when limit switch **560** moves to its normal position, there is a circuit completed through the lower throw of limit switch **560**, through the normaly closed lower throw of limit switch **562** to a yellow indicator light **580** which provides an indication to the machine operator that the motor **342** is in operation, in other words, the dispensing cylinders are being operated through a cycle of 180° rotation.

As soon as the dispensing cylinders **242** and **244** have rotated 180°, the limit switch operator **354** comes into engagement with the left hand limit switch **562** to move that limit switch to its operated position in which the throws are shifted to engage their upper contacts. At this point, the circuit through the lower contact of limit switch **562** to the yellow indicator light **580** is broken and the yellow indicator light **580** goes out. At the same time, the upper switch moves to close a hot circuit through line **581** to light **582** (which can be green) indicating that the motor is in its left hand position. The center throw of left hand limit switch **562** is moved to its upper position which readies a circuit from the open dump relay contacts **556** through a line **584**, limit switch **562**, line **586** to the holding coil **588** of the reverse relay **590**. This holding coil **588** cannot be energized because the circuit is open at the upper set of contacts, **556**, of the dump relay **542**. However, the circuit is ready for another sequence of operations which starts by the bag detector switch **522** being closed and then the dump switch **538** being closed which would energize the motor reverse relay **590** closing its contacts energizing the reverse solenoid **S–1** to shift the control valve to its opposite control position.

At the time the rack switch operator **354** shifts the left hand limit switch **562** to operated position and the upper throw is shifted to light the forward indicator light **582**, the circuit through line **576**, which has electrically locked-in the forward motor relay holding coil **568**, is broken releasing the forward relay **570** which de-energizes the forward solenoid **S–2** permitting the motor hydraulic control valve **380** to move to a spring loaded neutral position whereupon the movement of the motor **342**, and hence rack **352**, immediately ceases. Note also that one of the throws of right hand limit switch **560**, when in the operated position, provides a hot circuit through a line **594** to a motor reverse position light **596** (this light can also be green). These control lights, which show the position or the traveling movement of the motor **342**, can be seen in FIGURE 1 on a control panel just below the dispensing mechanism **72**.

It can be seen that, through the circuit arrangement with the two limit switches **560** and **562**, successive operations of the bag detector switch **522** and the dump switch **538** result in sequential forward shifting and reverse shifting of the hydraulic motor **342** which rotates the dispensing cylinders 180° alternately dumping cylinder **242** and then cylinder **244**.

Connected in parallel with the holding coil **524** of detector relay **526** is a "filled" bag counter **596** which registers one count each time the detector relay is shifted to a closed position by the bag detector switch. Inasmuch as the detector relay is locked in electrically upon being closed by a bag detector switch and is not released until dumping has occurred and the detector relay will not be closed again until the next bag passes the bag detector switch **522**, this will provide an accurate count of the bags being filled. If a station passes the bag detector

switch without a bag being held in position by the boot **183** the bag detector switch will not be closed and hence there will be no indication on the counter **596**, the detector relay **526** will not be closed, hence the dump relay cannot be actuated and there will be no dispensing of material into the hopper above the open nozzle.

Agitator Assembly

Although the bag agitator **600** is actually an auxiliary subassembly mounted beside the support base **54**, its operation is coordinated with and provides a necessary adjunct to the bag filling rotating drum assembly **56**, and it is therefore considered to be an integral part of the combination which is necessary when very light density materials, such as the recently developed high potency, vermiculite carrier, fertilizers, insecticides and herbicides, are being packaged. The agitator **600** can be seen in FIGURES 2, 25 and 26 and will be described with reference thereto. Agitator **600** is a solid, heavy, compact platform type agitator which is adjustable in height in order to accommodate various lengths of bags **200** as they pass in their circular paths above the agitator. Note that agitator **600** is disposed approximately 1½ stations ahead of the bag release station Y, shown in FIGURE 2.

The agitator consists of a solid base platform **602** rigidly secured to the floor of the shop where the bag machine is located. Vertically secured to the upper surface of base platform **602** are four channel beams, two of which, **604** and **606**, can be seen in FIGURE 2. These four channel beams are arranged as corner posts and provide facing vertical tracks by which the unitary agitator assembly **600** can be raised or lowered and secured to these channels **604** and **606** by means of bolts through associated holes formed through the mid portion of the channels **604**, **606** and the rear channels (not shown).

The upper table of the agitator is curved and spit into two parts, a front non-vibrating section **608** and a rear vibrating section **610**. The vibrator **600** is adjusted to a height position where the bottom of a bag **200** will just engage the table **608** as it passes on its circular path toward the conveyor belt **390** and the bag **200** will be dragged across front table **608** onto the rear table **610**. By mechanism now to be described, the rear table **610** is jogged up and down at a rate of roughly 400 cycles per minute and this jogging action will cause a positive settling of the light density material within a bag **200** to the bottom of the bag and assure that the material is well below the end of the nozzle assembly **170** so that, when the bag reaches station Y and is released from the nozzle boot **183**, the material will be well below the top level of the bag to permit an unimpeded sewing machine operation.

Turning now to FIGURE 25, the unitary agitator assembly **600** consists of a bottom framework of channel beams with curved side channels **612** and **614** joined by appropriate lengths of end channels **616** welded into a box-like assembly. A similar box-like framework of side channels **618** and **620** and intermediate cross channel **622** constitute an upper box-like frame assembly which is maintained in spaced relationship from the lower box-like assembly by vertical channel beams **624**, **626** and four corner channels **628**, **629**, **630** and **631**. These four corner channels **628–631** are provided with a series of vertically aligned holes and when the unitary agitator assembly **600** is placed in the aforenoted fixed vertical corner channels **604**, **606**, the corner channels **628–631** will ride within the larger fixed base channels **604**, **606**, etc., and the holes in both matching channels can be aligned and bolts secured therein to maintain the agitator **600** in its adjusted height position.

Secured on the front half of this rigid frame structure formed by the channel members **612–631** is an upper flat table structure **608**, the front edge of which is curved at **634** to enable the lower end of a bag to ride up on table **608**. The rear table **610** has its front edge **636** curved under the rear lip of front table **608** and the rear part of rear table **610** is pivotally supported on a rock shaft **638** by pillow blocks **640**. The rock shaft **638** extends laterally between the upper side channels **618** and **620**, being disposed in collars which are welded into the side channels. The rock shaft can be maintained stationary in the collars **642** by set screws.

Midway of the rear table **610** and on its underside are secured two pillow block bearings **644** and **646** which journal a cross shaft **648** which is welded on top of a flat plate **650**. Bolted to the underside of flat plate **650** are two pillow bearings **652** and **654** which journal an eccentric midportion **656** of a rotating shaft **658** which is horizontally disposed and journalled in two pillow block bearings **660** and **662** mounted respectively on vertical channels **624** and **626**.

Looking at FIGURE 26, the left hand end of shaft **658** projects a sufficient distance to carry a large V-belt pulley **664** which is non-rotatably secured to the shaft by a set screw. Rigidly mounted on cross beams **668** which are welded between the lower side channels **612** and **614** is an electric motor **670** secured with its shaft **672** parallel to the eccentric shaft **658**. Viewing FIGURE 26, the left hand end of shaft **672** carries a small diameter pulley **674** which, through a V-belt **676**, drives the large pulley **664**. Motor **670** is a one-half horsepower, 1750 r.p.m. electric motor and the drive reduction is slightly greater than 4:1 between pulley **674** and pulley **664**, providing roughly 400 jogs per minute to the rear plate **610**. Table **610** extends beyond the edge of the agitator and has a slightly downwardly curve rear end portion **680**. Inasmuch a the portion **680** is furthest from the rock shaft **638**, th bag receives the most severe vibrations as it approaches and slides off the end of the agitator **600**.

Looking at FIGURE 1, in the upper left hand corner there is a cylindrical component **690** having a shaft **692** extending into the split duct **246**. As seen in FIGURE 16, the end of shaft **692** has secured thereto a vane member **694**. The unit **690**, through its vane **694**, provides an indication of the presence of granulated material in the split duct **246** and thus, when the storage bin above duct **246** is empty and no material is provided to replenish the supply being taken from the split duct **246**, the flow indicator **690** will register through an electrical circuit to light the lamp **696** seen on the control panel of FIGURE 1, giving a warning to the machine operator that the supply is depleted.

The foregoing description completely describes an operative embodiment of applicant's novel bag filling semi-automatic machine.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. An automatic bag filling machine comprising: a rotatable device arranged with its axis of rotation vertical; a support structure disposed adjacent said rotatable device; means connected to said rotatable device for rotatably driving said rotatable device; means rotatably supporting said rotatable device on said support structure; said rotatable device comprising a drum structure having an annular group of vertical hopper devices coaxially arranged around its vertical axis, each hopper device having an upper material receiving opening and a bottom discharge nozzle, and means on each of said discharge nozzles enabling holding of the open end of a bag to be filled over the end of said associated discharge nozzle and providing a continuous peripherally sealed passage connection between the upper end of a retained bag and the associated

said discharge nozzle; an air-tight hood device nonrotatably secured to said support structure above and providing a commutated sealed cooperation with the material receiving openings of said hopper devices to prevent escape of dust and to enable particles of material being placed in the bags to settle back in the bag; a material dispensing device secured above the path of rotation of said hopper devices and above said hood device for measuring and dumping a desired quantity of material through said hood device and into and through a hopper of said rotatable device and thence into a conditioned bag on the associated said hopper; operating means in operative connection with said dispensing device; control means responsive to a predetermined rotational position of said rotatable device for actuating said operating means at a specific rotational position of said rotatable device whereby a hopper and bag held thereon will be in a position to receive the dispensed quantity of material; and means, having an operative control connection with said means for holding the bags, for automatically releasing a filled bag from said rotatable device.

2. A bag filling machine as defined in claim 1, including an automatic safety device in said dispensing device operating means so that if a hopper rotates beyond a machine start position without having a bag attached to its associated said discharge nozzle, there will be no subsequent dispensing operation for that hopper.

3. An automatic bag filling machine comprising: an overhead material dispensing device; a plurality of hoppers, each having a discharge nozzle; means on each of said discharge nozzles for holding bags to be filled under said discharge nozzles and which provides a continuous peripherally sealed connection between the upper end of a retained bag and the associated said discharge nozzle; means for rotating said hoppers as a unit under said dispensing device; an air-tight hood device attachment above and providing a sealed cooperation with said hoppers to prevent escape of dust and to enable particles of material being placed in the bags to settle in the bag; means responsive to hopper rotation for automatically operating said dispensing device; an automatic safety device in said means for automatic operation of said dispensing device so that if a hopper rotates beyond a machine start position without having a bag attached to its associated said discharge nozzle, there will be no subsequent dispensing operation for that hopper; means having a discharge device in each of said hopper discharge nozzles for imparting an automatically controlled blast of air down through a discharge nozzle to condition the bag for filling by flexing it to an open position; and said means for holding an open bag on the lower end of a hopper discharge nozzle includes means responsive to rotation of the associated hopper to a predetermined position for automatically releasing the holding action.

4. A bag filling machine comprising: a rotatable device arranged with its axis of rotation vertical; a support structure disposed adjacent said rotatable device; means for rotatably driving said rotatable device; said rotatable device comprising: a drum structure having an annular group of vertical hopper devices coaxially arranged around its vertical axis and drive connected to said rotatable driving means, rotatable journal means secured to said drum structure engaging said support structure and supporting said drum structure for rotation, a discharge passage means under and connected to the discharge end of each hopper device to receive and guide the passage of any material placed in its associated hopper, and each of said discharge passage means including a means enabling retention on said rotatable device of the open end of a bag in depending condition to be filled, over the end of said discharge passage means; dispensing means disposed above said rotatable device for measuring and dumping a desired quantity of material into and through said rotatable device into said conditioned bag; operating means in operative connection with said dispensing means; control means responsive to a predetermined rotational position of said rotatable device for actuating said operating means at a specific rotational position of said rotatable device where the bag will be in a position to be filled; and means having an operative control connection with said bag retention means for automatically releasing a filled bag from said rotatable device.

5. A bag filling machine as defined in claim 4, wherein said means on each discharge passage means enabling retention of a bag comprises: an annular, expansible bag end gripping boot device secured on the lower end of each said discharge passage means, conduit means connected in fluid communication with the interior of each said boot device, and means connecting and controlling introduction and release of air under pressure to said conduit means for selectively inflating and deflating each said boot device.

6. A bag filling machine as defined in claim 5, wherein each discharge passage means constitutes a tube and each said boot device comprises: a sleeve snugly fitted on the end of said discharge tube, a resilient tube, means clamping one end of said resilient tube in sealed fashion to said sleeve, the other end of said resilient tube being turned back over the clamped end, a second means clamping said other end of said resilient tube to said sleeve to form said resilient tube into said annular expansible boot on the exterior of said sleeve.

7. A bag filling machine as defined in claim 5, wherein said means connecting and controlling introduction and release of air under pressure to said conduit means comprises: means connecting a source of air under pressure to said conduit means; a control means in each of said conduit means adapted to be selectively actuated to introduce and maintain pressurized air into and to subsequently release pressurized air from the associated said boot device; and means on said control means to manually and automatically actuate said control means, said automatically actuated means being mounted on said drum structure and adapted to be engaged and actuated by a device fixed on said support structure as said drum structure rotates a discharge tube associated with the control means past a predetermined position on said support structure.

8. A bag filling machine as defined in claim 4, wherein a conduit means extends into and has a downwardly directed discharge within each discharge passage means, means connect a source of air under pressure to all of said conduit means, control means are provided in each of said conduit means adapted to be momentarily actuated to permit passage of pressurized air downwardly within the associated said discharge passage means, a trip device is secured on said support structure, and an actuator is provided on each of said control means adapted to engage said trip device and be shifted for momentarily actuating and then de-actuating its associated control means at a predetermined rotational position of said drum structure.

9. A bag filling machine comprising: a rotatable device arranged with its axis of rotation vertical; means for rotatably driving said rotatable device; said rotatable device comprising a plurality of vertical hopper devices arranged in an annular group coaxial with said axis of rotation of said rotatable device and each hopper device includes means enabling retention on said rotatable device at a position eccentric to its axis of rotation and under the hopper device of a bag in a depending condition to be filled; dispensing means disposed above said rotatable device for measuring and dumping a desired quantity of material into and through said rotatable device into said conditioned bag; operating means in operative connection with said dispensing means; said dispensing means comprising: a volumetric material dispenser having an upper inlet and a lower outlet, with said inlet mounted in fixed disposition above said rotatable device and adapted to receive material to be dispensed from a

supply source and with said outlet constituting a flow duct communicating with said rotatable device at a position under which the hopper devices will pass seriatim; said dispenser having dual horizontal measuring and dispensing cylinders; means rotatably mounting said cylinders; a wall opening in each said cylinder which when a cylinder is rotated to dispose the opening on the upper portion of a cylinder constitutes a cylinder filler opening disposed below said inlet and when the cylinder is rotated to locate the opening on the bottom portion of said cylinder disposed above said outlet, constitutes a cylinder discharge opening; means drive connecting said cylinders for conjoint similar rotation and with the wall opening of one cylinder disposed 180° opposite the wall opening in the other cylinder; said operating means including means for rotating said cylinders 180° in one direction and then 180° in the other direction; control means for said cylinder rotating means for actuating said operating means at a specific rotational position of said rotatable device where the bag will be in a position to be filled, for sequentially actuating and alternating the direction of operation of said cylinder rotating means responsive to passage of a bag carrying hopper device under said dispensing device; and each hopper device including means having an operative control connection with its associated said bag retention means for automatically releasing a filled bag from said rotatable device.

10. A bag filling machine as defined in claim 9, wherein said means for rotating said cylinders comprises: a power assembly including a motor with a reciprocating member connected to rotate said cylinders back and forth through a range of substantially 180°; and said control means selectively operates said power assembly so said reciprocating member has a predetermined travel between limit positions; said control means including electrical circuitry with an actuating control for sequentially alternatively operating said power assembly first in one direction to its limit position in that one direction and then in the other direction to its limit position in the other direction upon a sequence of two different actuations; and a trip means on said rotatable device for each said hopper device, each trip means being adapted to engage and actuate said actuating control one time as its associated hopper device rotates past a predetermined rotational position in its rotational path where the hopper device is disposed below the outlet of said dispensing means.

11. A bag filling machine as defined in claim 10, including detector means in said electrical circuitry responsive to the physical presence of a bag on a hopper device to prevent operation of said power assembly if said actuating control is engaged by a trip means associated with a hopper device upon which there is no bag.

12. A bag filling machine comprising: a rotatable device; means on said rotatable device enabling retention on said rotatable device at a position eccentric to its axis of rotation of at least one bag in a depending condition to be filled; means for rotatably supporting and driving said rotatable device with its rotational axis vertical; means disposed above said rotatable device for depositing a desired quantity of material into and through said rotatable device into said conditioned bag; means in operative connection with said depositing means controlled by the rotational position of said rotatable device for operating said depositing means at a desired rotational position of said rotatable device; and means having an operative control connection with said bag retention means for automatically releasing a filled bag from said rotatable device; said means for rotatably supporting and driving said rotatable device comprising: a support structure providing a horizontal circular track, drive means in said support structure including a rotatable motor and a drive train from said motor including a speed reduction means and a variable speed controller, a vertical shaft rotatably journalled in said support structure, coaxial with and projected vertically above said circular track, power transfer means connected from said drive means to rotatably drive said vertical shaft, roller support means provided on said rotatable device for engaging and rolling on said circular track, and means connecting said vertical shaft to rotate said rotatable device.

13. A bag filling machine as defined in claim 12, wherein automatic control means having coordinated and cooperating control components, portions of which being located on said support structure and other portions of which being located on said rotatable device, enable selective automatic control of said bag retention and release means and said depositing means dependent upon the rotatable position of said rotatable device relative to said support structure.

14. A bag filling machine comprising: a rotatable device, means on said rotatable device enabling retention on said rotatable device at a position eccentric to its axis of rotation of at least one bag in a depending condition to be filled, means for rotatably supporting and driving said rotatable device with its rotational axis vertical, means disposed above said rotatable device for depositing a desired quantity of material into and through said rotatable device into said conditioned bag, means in operative connection with said depositing means controlled by the rotational position of said rotatable device for operating said depositing means at a desired rotational position of said rotatable device, and means having an operative control connection with said bag retention means for automatically releasing a filled bag from said rotatable device; said rotatable device comprising: a drum structure having an annular group of vertical hopper devices coaxially arranged around its vertical axis and drive connected to said rotatable driving means; roller devices secured to said hopper devices engaging said supporting means and supporting said drum structure for rotation; a discharge tube under and connected to the discharge end of each hopper device to receive and guide the passage of any material placed in its associated hopper; an annular, expansible bag end gripping boot device on the lower end of each said discharge tube; conduit means connected in fluid communication with the interior of each said boot device; means connecting a source of air under pressure to all of said conduit means; control means in each of said conduit means adapted to be selectively actuated to introduce and maintain pressurized air into and to subsequently release pressurized air from the associated said boot device; means on said control means to manually and automatically actuate said control means, said automatically actuated means being mounted on said drum structure and adapted to be engaged and actuated by a device fixed on said supporting means as said drum structure rotates a dischage tube associated with the control means past a predetermined position on said base structure; said material depositing means comprising a volumetric material dispenser having an upper inlet and a lower outlet, with said inlet mounted in fixed disposition above said rotatable device and adapted to receive material to be dispensed from a supply source and with said outlet constituting a flow duct communicating with said rotatable device at a position under which the hopper devices will pass seriatim; said dispenser having dual horizontally disposed measuring and dispensing cylinders, means rotatably mounting said cylinders, a wall opening in each said cylinder which when a cylinder is rotated to dispose the opening on the upper portion of a cylinder constitutes a cylinder filler opening disposed below said inlet and when the cylinder is rotated to locate the opening on the bottom portion of said cylinder disposed above said outlet, constitutes a cylinder discharge opening, means drive connecting said cylinders for conjoint similar rotation and with the wall opening on one cylinder disposed 180° opposite the wall opening in the other cylinder, a power assembly including a motor with a reciprocating member connected to rotate said cylinders back and forth

through a range of substantially 180°, and a second control means to selectively operate said power assembly so said reciprocating member has a predetermined travel between limit positions; said second control means including electrical circuitry with an actuating control for sequentially alternatively operating said power assembly first in one direction to its limit position in that one direction and then in the other direction to its limit position in the other direction upon a sequence of two different actuations; a trip means on said drum structure for each said discharge tube, each trip means being adapted to engage and actuate said actuating control one time as its associated discharge tube rotates past a predetermined rotational position in its rotational path where the hopper device above said associated discharge tube is disposed below the outlet of said dispensing means; and detector means in said electrical circuitry responsive to the physical presence of a bag on a nozzle to prevent operation of said power assembly if said actuating control is engaged by a trip means associated with a tube upon which there is no bag.

15. A bag filling machine comprising: a rotatable device arranged with its axis of rotation vertical; a supporting means for said rotatable device; means on said rotatable device enabling retention on said rotatable device at a position eccentric to its axis of rotation of at least one bag in a depending condition to be filled; means for rotatably driving said rotatable device; dispensing means disposed above said rotatable device for measuring and dumping a desired quantity of material into and through said rotatable device into said conditioned bag; means in operative connection with said dispensing means controlled by the rotational position of said rotatable device for operating said dispensing means at a predetermined rotational position of said rotatable device where the bag will be in a position to be filled; means having an operative control connection with said bag retention means for automatically releasing a filled bag from said rotatable device; said rotatable device comprising: a drum structure having two coaxial annular walls and cross walls between said annular walls defining an annular group of vertical hopper devices coaxially arranged around its vertical axis and drive connected to said rotatable driving means; roller devices secured to said drum structure engaging said supporting means and supporting said drum structure for rotation; and means in communication with a bag retained on said rotatable device for reclaiming material entrained in air which escapes from the bag while being filled with material from said dispensing means; including said hopper devices, a dust collecting hood disposed over all of said hopper devices, exhaust duct means having a manifold connection to said hood, and seal means disposed between said hood and said annular walls of said rotatable drum structure, enabling said hood to effectivelv seal the upper ends of said hopper devices.

16. A bag filling machine as defined in claim 4, including agitator means adapted to coact with and agitate a bag of material while said bag is retained on said rotatable device.

17. A bag filling machine as defined in claim 16, wherein said agitator means comprises: a table device located under the rotational path of said bag retention means, said table device including a fixed support with vertical tracks and a shiftable horizontal platform adjustably secured for vertical positioning on said tracks thereby being adjustable in height so the bottom portion of a bag retained on said bag retention means will engage and be dragged across said horizontal platform by rotation of said rotatable device, means mounting a portion of said platform for vertical cyclic movement relative to the remaining portion of said platform, and a power driven eccentric device for oscillating at least a portion of said vibrating table.

18. A bag filling machine comprising: a base support structure providing a horizontal circular track; drive means in said base structure including a rotatable motor, and a drive train from said motor including a speed reduction means and a variable speed controller; a vertical shaft rotatably journalled in said base structure, coaxial with and projected vertically above said circular track; power transfer means connected from said drive means to rotatably drive said vertical shaft; a drum structure having an annular group of vertical hopper devices coaxially arranged around and drive connected to the projected end of said vertical shaft, rollers secured to said hopper devices engaging said circular track and supporting said drum structure for rotation by said shaft on said circular track, a discharge tube under and connected to the discharge end of each hopper device to receive and guide the passage of any material placed in its associated hopper, an annular, expansible bag end gripping boot secured on the lower end of each tube, a first conduit means extending into and having a downwardly directed discharge within each said tube, and a second conduit means connected in fluid communication with the interior of each said boot; means connecting a source of air under pressure to all of said first conduit means and to all of said second conduit means; a first control means in each of said first conduit means adapted to be momentarily actuated to permit passage of pressurized air downwardly within the associated said discharge tube; a second control means in each of said second conduit means adapted to be selectively actuated to introduce and maintain pressurized air into and to subsequently release pressurized air from the associated said boot; means on said second control means to manually and automatically actuate said second control means, said automatically actuated means being mounted on said drum structure and adapted to be engaged and actuated by a device fixed on said base support as said drum structure rotates a discharge tube associated with the second control means past a predetermined position on said base structure; a trip device on said base structure; an actuator on each of said first control means adapted to engage said trip device and be shifted for momentarily actuating and then de-actuating its associated first control at a predetermined rotational position of said drum structure; a stationary dust collecting hood disposed over all of said hopper devices; exhaust duct means having a manifold connection to said hood; seal means disposed between said stationary hood and the upper ends of said hopper devices; a volumetric material dispenser having an upper inlet and a lower outlet, with said inlet mounted in fixed disposition above said hood and adapted to receive material to be dispensed from a supply source and with said outlet constituting a flow duct communicating through said hood at a position under which said hopper devices will pass seriatim, said dispenser having dual horizontal measuring and dispensing cylinders with means in each cylinder for selectively adjusting the volumetric capacity of each cylinder, means rotatably mounting said cylinders, a wall opening in each said cylinder which when a cylinder is rotated to dispose the opening on the upper portion of a cylinder constitutes a cylinder filler opening disposed below said inlet and when the cylinder is rotated to locate the opening on the bottom portion of said cylinder disposed above said outlet, constitutes a cylinder discharge opening, means drive connecting said cylinders for conjoint similar rotation and with the wall opening of one cylinder disposed 180° opposite the wall opening in the other cylinder, a power assembly comprising a reciprocating member adapted to engage and rotate said cylinders back and forth through a range of substantially 180°, and a third control means to selectively operate said power assembly so said reciprocating member has a predetermined travel between limit positions; said third control means including electrical circuitry with an actuating control for sequentially alternatively operating said power assembly first in one direction to its limit position in that one direction and then in the other direction to

its limit position in the other direction upon a sequence of two different actuations; a trip means on said drum structure for each said discharge tube, each trip means being adapted to engage and actuate said actuating control one time as its associated discharge tube rotates past a predetermined rotational position in its rotational path where the hopper device above said associated discharge tube is disposed below the outlet of said dispensing means; detector means in said electrical circuitry responsive to the physical presence of a bag on a nozzle to prevent operation of said power assembly if said actuating control is engaged by a trip means associated with a discharge tube upon which there is no bag; and an agitator table located under the rotational path of said discharge tubes positioned immediately ahead of the rotational position of said drum structure where the pressurized air within the bag retaining boot is released, said agitator table having means enabling its height adjustment so the bottom portion of bags retained on said discharge tubes will engage and be dragged across said agitator table by rotation of said drum structure, and a power driven eccentric device for oscillating at least a portion of said agitator table.

19. For use in a bag filling machine, a drum structure having a hub construction, an annular group of hopper devices coaxially arranged around and rigidly secured to said hub construction, said hub construction adapted to be drivingly connected to a vertical rotary shaft, support rollers secured to the underside of said drum structure to support said drum structure for rotation by the shaft on a circular track, a depending tube under and connected to the discharge end of each hopper device to receive and guide the passage of any material placed in its associated hopper, an annular, expansible bag end gripping boot secured on the lower end of each tube, a first conduit means extending into and having a downwardly directed discharge within each said tube, a second conduit means connected in fluid communication with the interior of each said boot; means, adapted to connect to a source of air under pressure, connected to all of said first conduit means and to all of said second conduit means; a first control means in each of said first conduit means adapted to be actuated to permit, momentarily, passage of pressurized air downwardly within the associated said tube; a second control means in each of said second conduit means adapted to be selectively actuated to introduce and maintain pressurized air into and to subsequently release pressurized air from the associated said boot; means on said second control means to manually and automatically actuate said second control means, said automatically actuated means being mounted on said drum structure and adapted to be engaged and actuated by a trip device fixed on the circular track as said drum structure rotates a tube associated with the second control means past a predetermined position on the circular track; an actuator on each of said first control means adapted to engage a trip device on the circular track and thereby be shifted for momentarily actuating and then de-actuating its associated first control at a predetermined rotational position of said drum structure.

20. A bag filling machine as defined in claim 4, wherein said means on each discharge passage means enabling retention of a bag comprises: a discharge tube, an annular, expansible bag and gripping boot device secured on the lower end of each said discharge tube, conduit means connected in fluid communication with the interior of each said boot device, and means connecting and controlling introduction and release of air under pressure to said conduit means for selectively inflating and deflating each said boot device.

21. For use in a bag filling machine, a rotatable drum structure comprising: an annular group of vertical hopper devices coaxially arranged around a vertical axis and adapted to be drive connected to a rotatable driving means, roller devices secured to said hopper devices adapted to roll on a supporting track and to support said drum structure for rotation, a discharge tube under and connected to the discharge end of each hopper device to receive and guide the passage of any material placed in its associated hopper, and each of said discharge tubes includes a means enabling retention of the open end of a bag over the end of said discharge tube; each of said bag retention means comprising: an annular, expansible bag end gripping boot device secured on the lower end of each said discharge tube, conduit means connected in fluid communication with the interior of each said boot device, and means connecting and controlling introduction and release of air under pressure to said conduit means for selectively inflating and deflating each said boot device; and each of said means connecting and controlling introduction and release of air under pressure to said conduit means comprising: means, adapted to be connected to a source of air under pressure, connected to said conduit means, a control means in each of said conduit means adapted to be selectively actuated to introduce and maintain pressurized air into and to subsequently release pressurized air from the associated said boot device, and means on said control means to manually and automatically actuate said control means, said automatically actuated means being mounted on said drum structure and adapted to be engaged and actuated by a device fixed against rotation as said drum structure rotates a discharge tube associated with the control means past a predetermined rotational position.

22. For use in combination with a bag filling machine as defined in claim 20, said bag gripping boot device comprising: a sleeve adapted to be snugly fitted and secured on the end of said discharge tube, a resilient tube, means clamping one end of said resilient tube in sealed fashion to said sleeve, the other end of said resilient tube being turned back over the clamped end, a second means clamping said other end of said resilient tube to said sleeve to form said resilient tube into an annular expansible boot on the exterior of said sleeve.

23. For use in a bag filling machine having a non-rotatable trip device, a rotatable drum structure comprising: an annular group of vertical hopper devices coaxially arranged around a vertical axis and adapted to be drive connected to a rotatable driving means, roller devices secured to said hopper devices adapted to roll on a supporting track and to support said drum structure for rotation, a discharge tube under and connected to the discharge end of each hopper device to receive and guide the passage of any material placed in its associated hopper, each of said discharge tubes includes a means enabling retention of the open end of a bag over the end of said discharge tube, a conduit means extending into and having a downwardly directed discharge within each discharge tube, means connecting a source of air under pressure to all of said conduit means, control means provided in each of said conduit means adapted to be momentarily actuated to permit passage of pressurized air downwardly within the associated said discharge tube, and an actuator provided on each of said control means adapted to engage a non-rotatable trip device and be shifted for momentarily actuating and then de-actuating its associated control means at a predetermined rotational position of said drum structure.

24. For use in a bag filling machine, wherein a plurality of bag carrying and filling hopper devices are passed seriatim below an overhead material dispenser, said dispenser being a volumetric material dispenser comprising: a carrier structure; an upper inlet; a lower outlet; with said inlet mounted in fixed disposition above said hopper devices and adapted to receive material to be dispensed from a supply source and with said outlet constituting a flow duct communicating to a position under which the hopper devices will pass seriatim; said dispenser having dual horizontal measuring and dispensing

cylinders; means on said carrier structure rotatably mounting said cylinders; a wall opening in each said cylinder which when a cylinder is rotated to dispose the opening on the upper portion of a cylinder constitutes a cylinder filler opening disposed below said inlet and when the cylinder is rotated to locate the opening on the bottom portion of said cylinder disposed above said outlet, constitutes a cylinder discharge opening; means drive connecting said cylinders for conjoint similar rotation and with the wall opening of one cylinder disposed substantially 180° opposite the wall opening in the other cylinder, means for rotating said cylinders substantially 180° in one direction and then substantially 180° in the other direction, and control means for said rotating means for sequentially actuating and alternating the direction of operation of said rotating means adapted to be responsive to passage of a bag carrying hopper device under said dispensing device.

25. A dispenser as defined in claim 24, wherein said means for rotating said cylinders comprises: a power assembly including a motor with a reciprocating member connected to rotate said cylinders back and forth through a range of substantially 180°; and said control means selectively operates said power assembly so said reciprocating member has a predetermined travel between limit positions; said control means including electrical circuitry with an actuating control for sequentially alternatively operating said power assembly first in one direction to its limit position in that one direction and then in the other direction to its limit position in the other direction upon a sequence of two different actuations; and a trip means carried by each of the hopper devices, each trip means being adapted to engage and actuate said actuating control one time as its associated hopper device reaches a position in its passage below said dispenser, where the hopper device is disposed to receive the discharge from the outlet of said dispensing means.

26. A dispenser as defined in claim 25, including detector means in said electrical circuitry adapted to be responsive to the physical presence of a bag on a hopper device to prevent operation of said power assembly if said actuating control is engaged by a trip means associated with a hopper device upon which there is no bag.

27. A bag filling machine as defined in claim 4, wherein each of said discharge passage means with its bag retention means includes: a discharge nozzle means adapted to fit into and provide passage through the upper end of a bag and means to provide a complete sealed relationship between the nozzle means and the surrounding wall of a bag retained on said nozzle means.

28. A bag filling machine as defined in claim 4, further including means in communication with any bags retained on said rotatable device, and including said discharge passage means, for reclaiming material entrained in air which escapes from the bags while being filled with material from said dispensing means.

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