

June 6, 1967

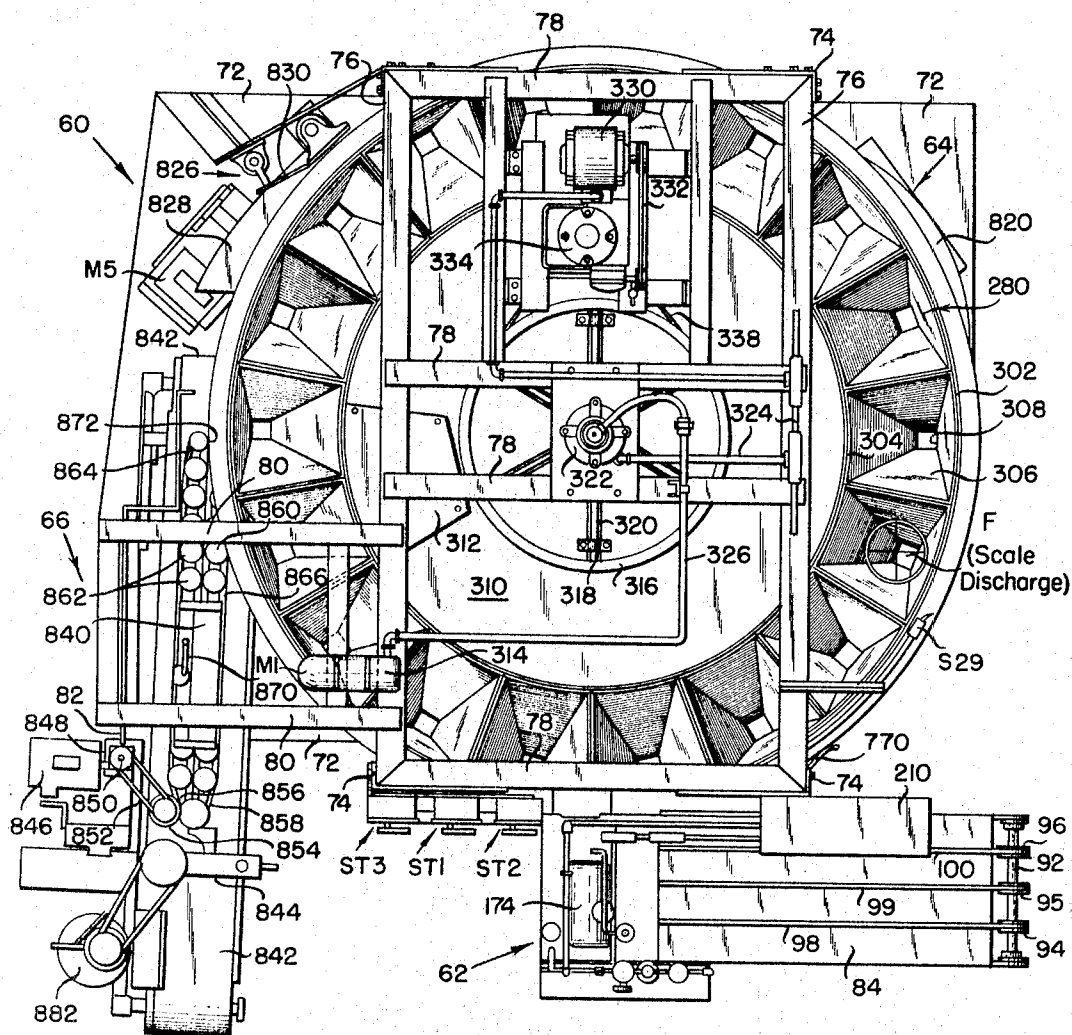
C. W. RAUSCH

3,323,280

AUTOMATIC PACKAGING MACHINE

Filed Feb. 19, 1963

33 Sheets-Sheet 1



INVENTOR
Clarence W. Rausch

BY

Stauch & Pohl

ATTORNEYS

June 6, 1967

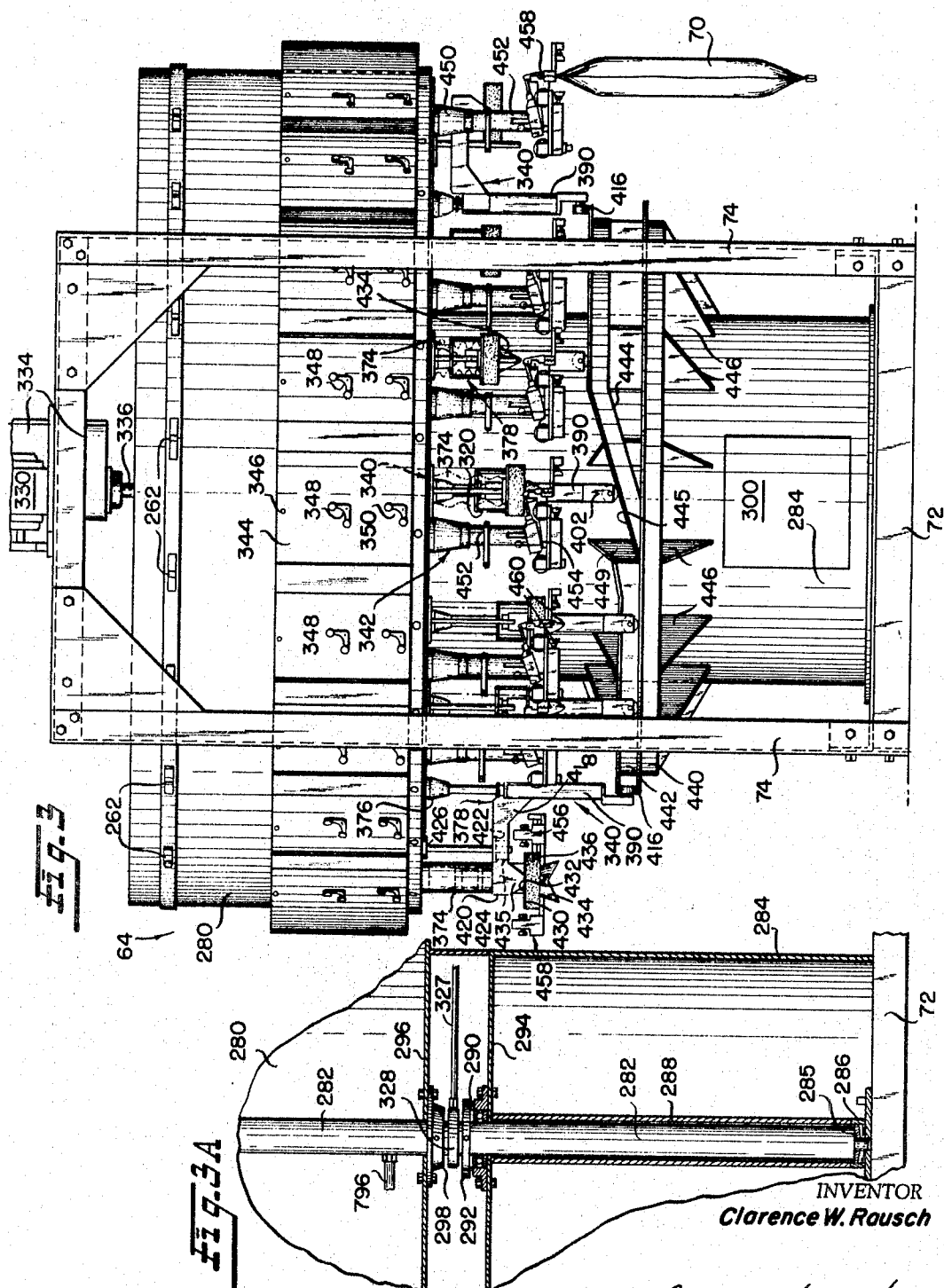
C. W. RAUSCH

3,323,280

AUTOMATIC PACKAGING MACHINE

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33 Sheets-Sheet 3



INVENTOR
Clarence W. Rausch

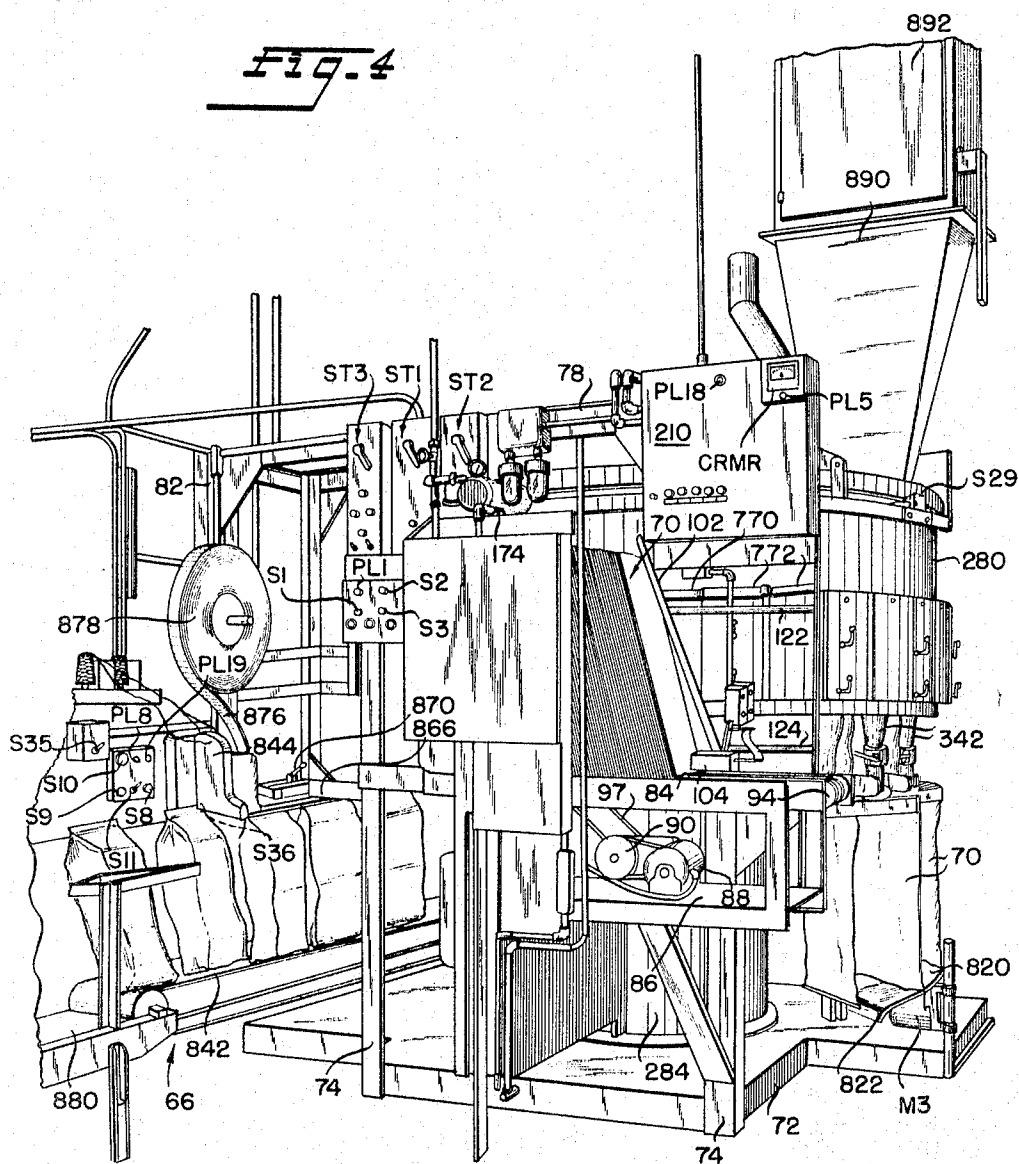
BY

Struck, Nolan & Hale
ATTORNEYS

C. W. RAUSCH

AUTOMATIC PACKAGING MACHINE

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BY

Struck upon 4 people

ATTORNEYS

June 6, 1967

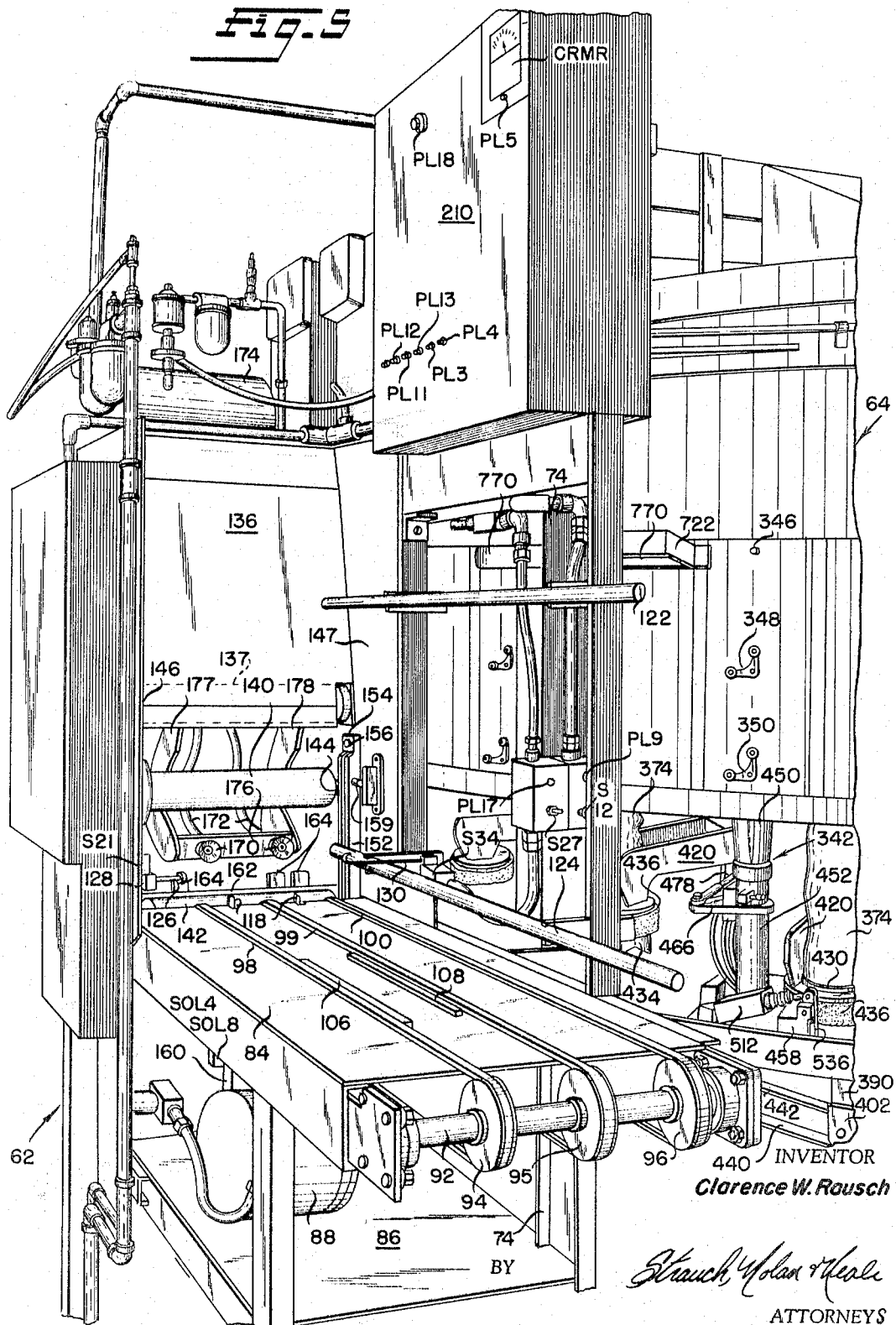
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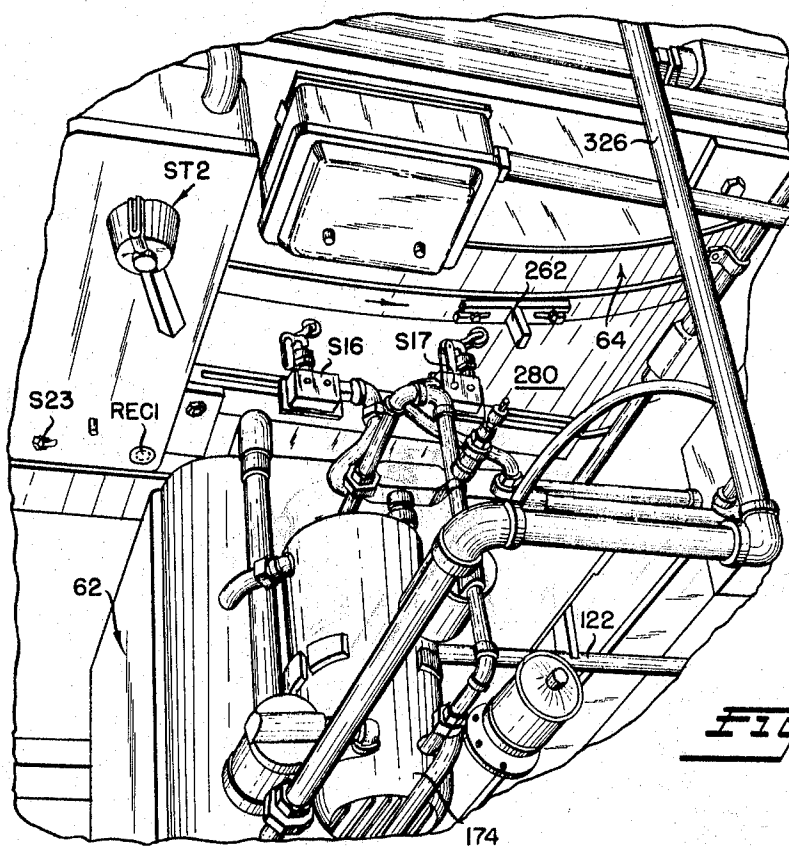


Fig. 9

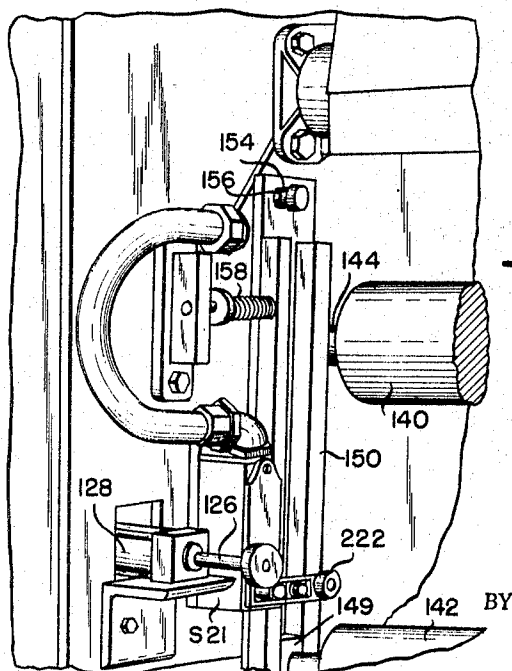


Fig. 6

INVENTOR
Clarence W. Rausch

Strauch, Nolan & Heale
ATTORNEYS

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C. W. RAUSCH

3,323,280

AUTOMATIC PACKAGING MACHINE

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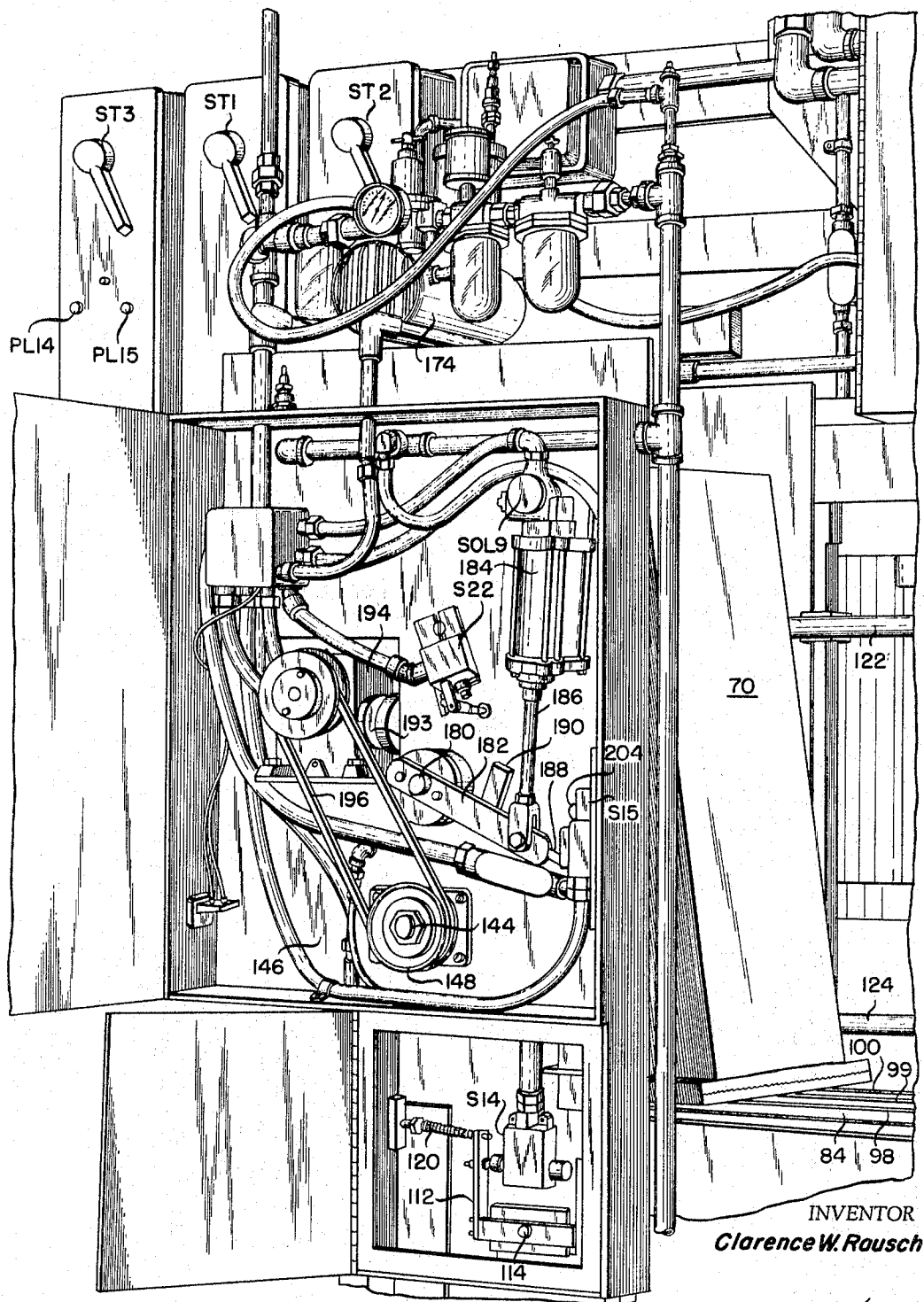


Fig. 7

BY

Clarence W. Rausch

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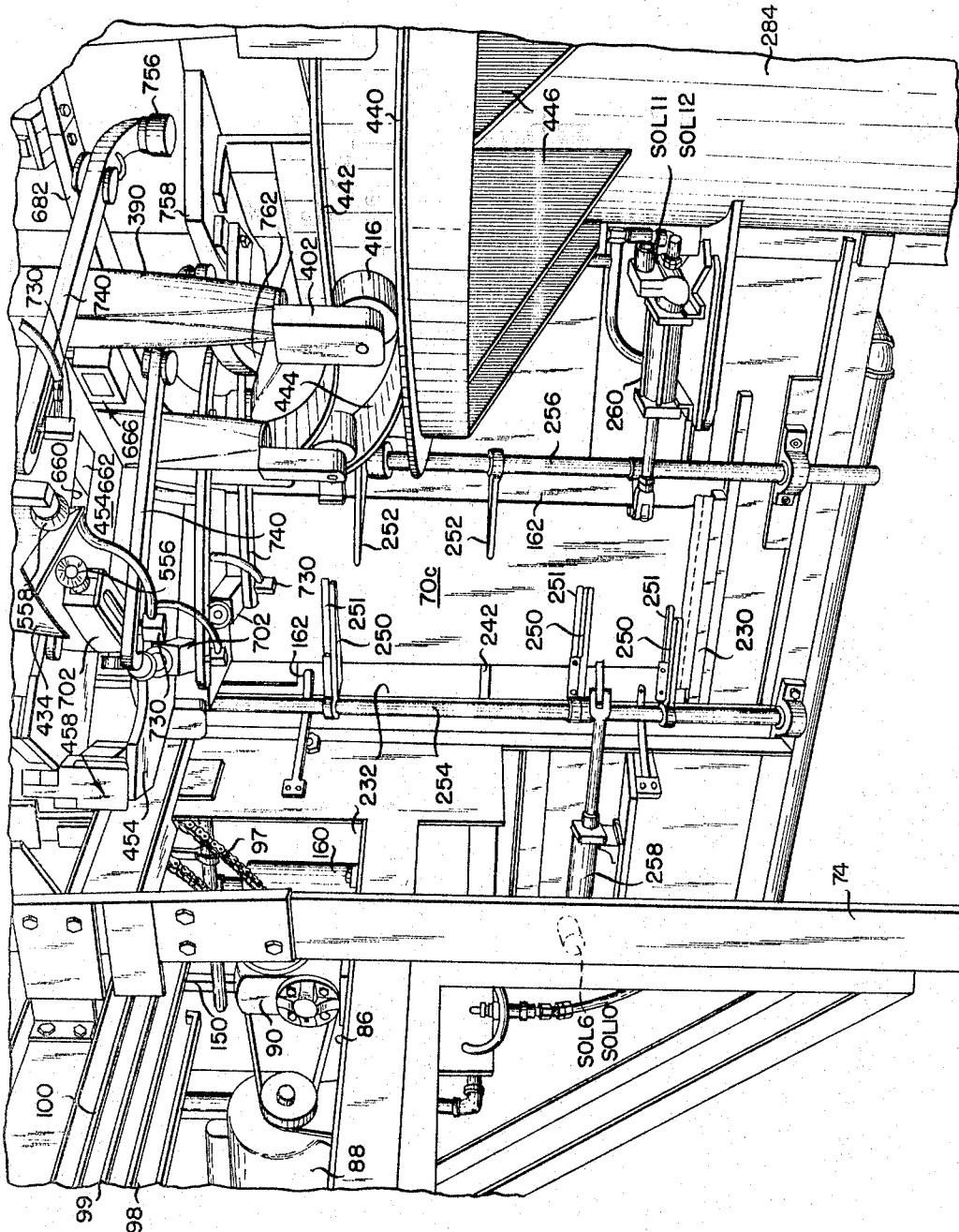
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AUTOMATIC PACKAGING MACHINE

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INVENTOR
Clarence W. Rausch

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Strauch, Urban & Weser

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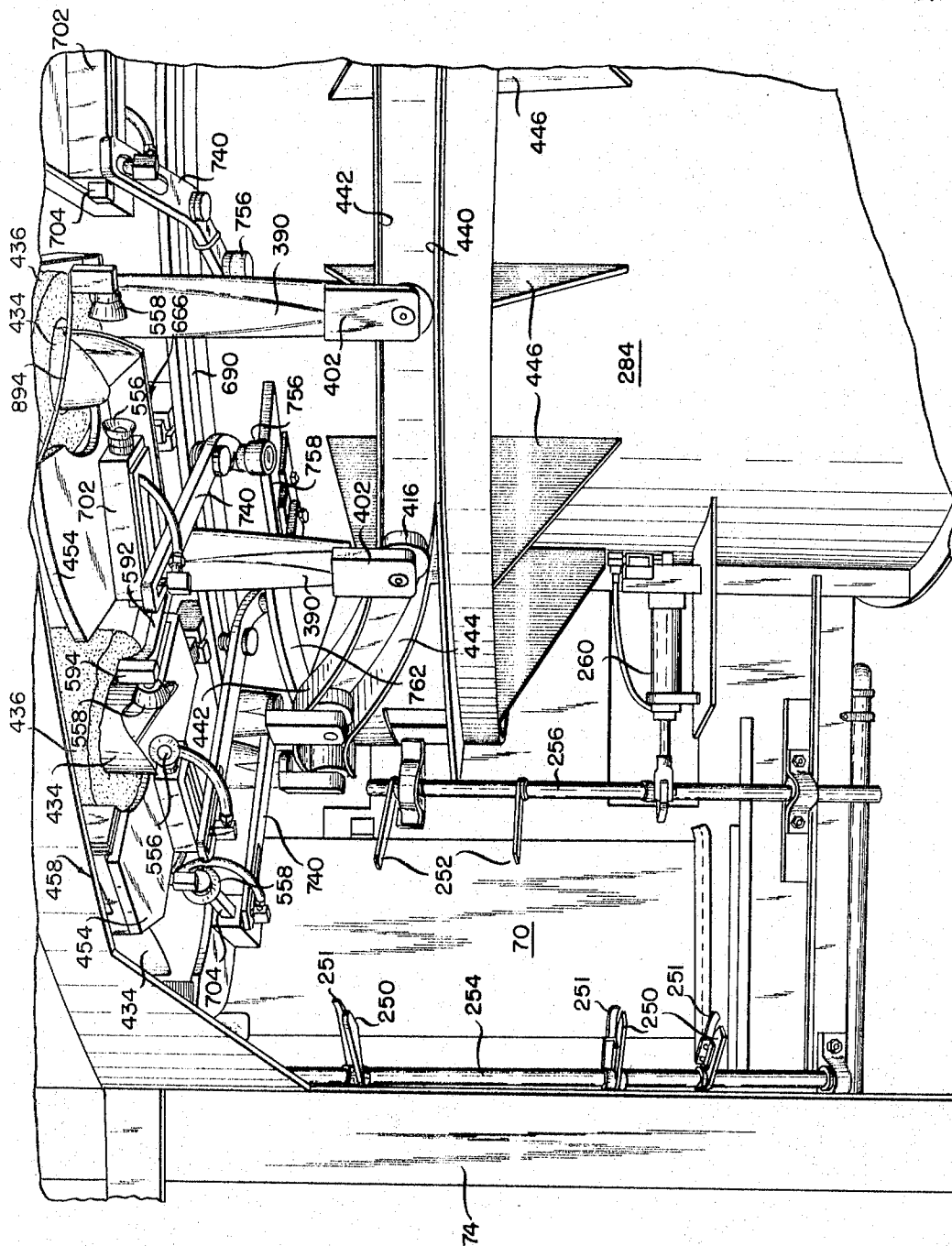
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AUTOMATIC PACKAGING MACHINE

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INVENTOR

Clarence W. Rausch

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Strauch, Nolan & Meale

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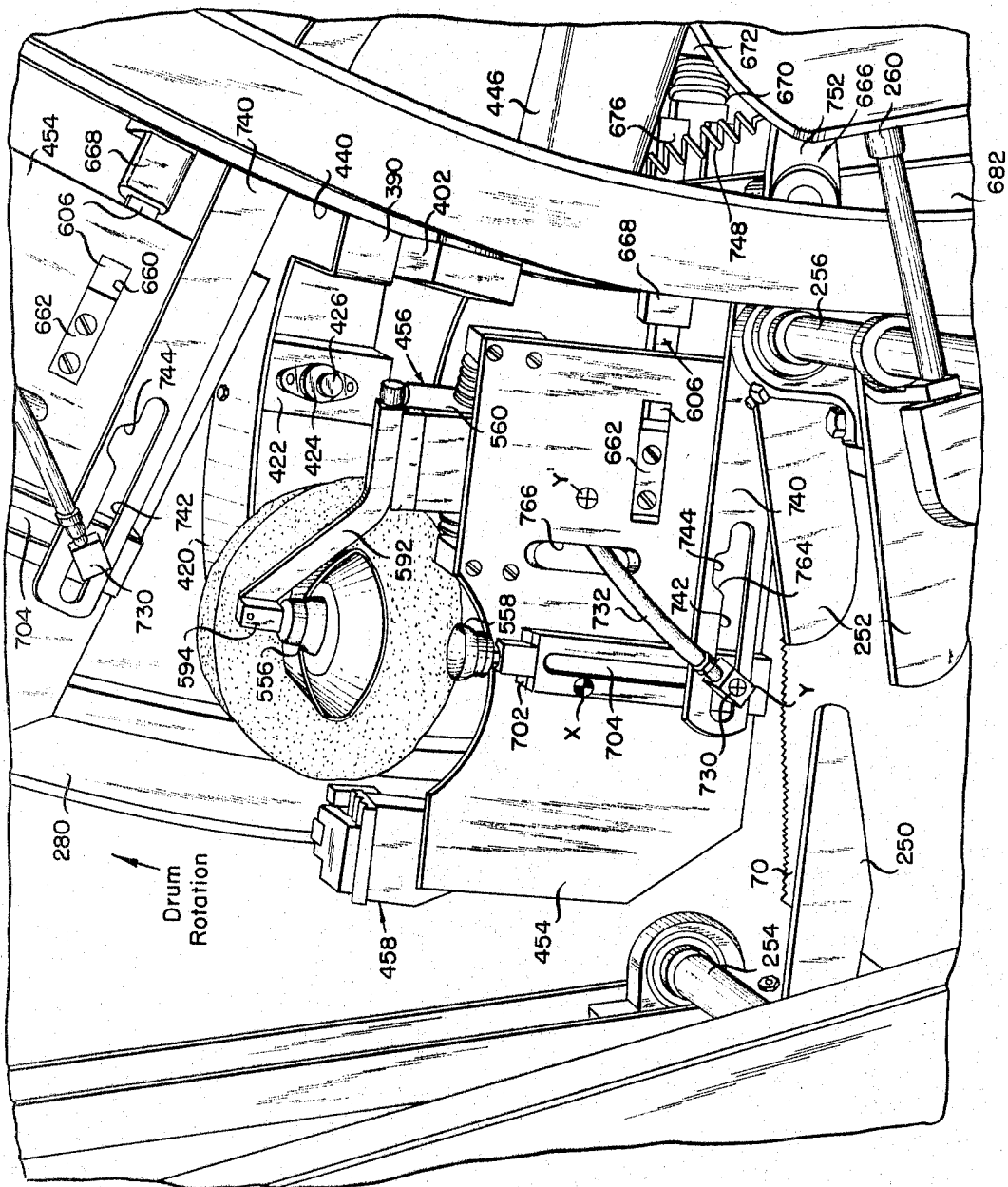


Fig. 11

INVENTOR
Clarence W. Rausch

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Stauch, Nolan & Moore

ATTORNEYS

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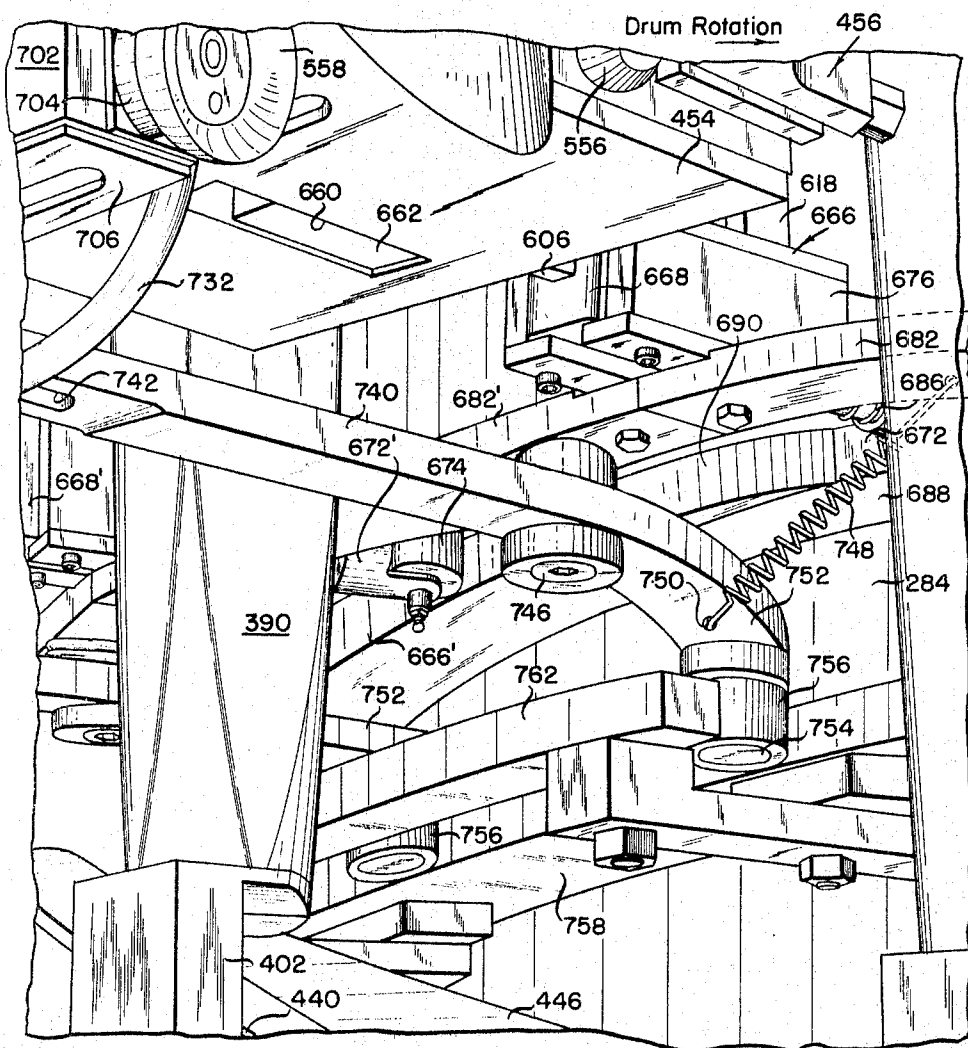


Fig. 13

INVENTOR

Clarence W. Rausch

BY

Strauch, Updegraff & Neale

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C. W. RAUSCH

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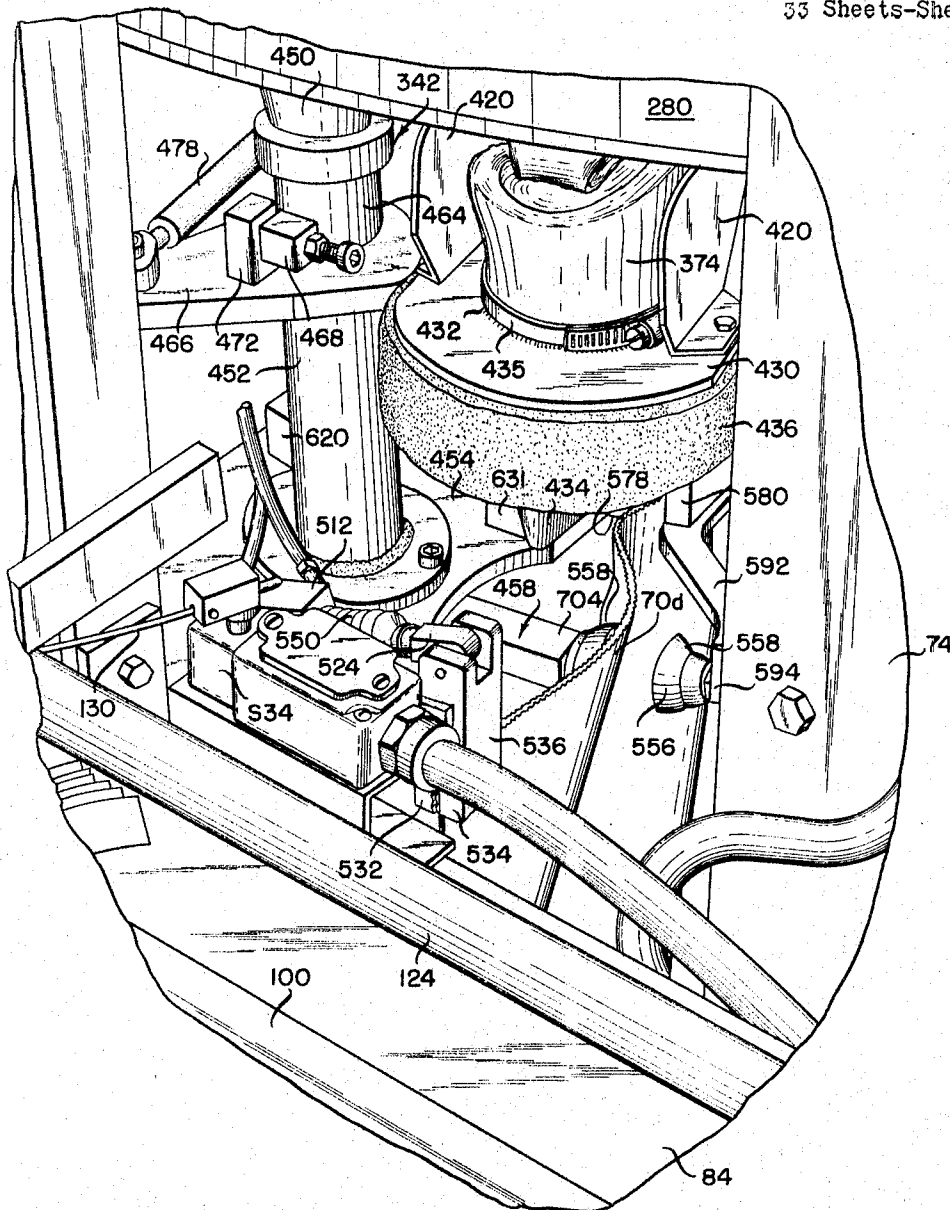


Fig. 14

INVENTOR

Clarence W. Rausch

BY

Clarence W. Rausch & Sons

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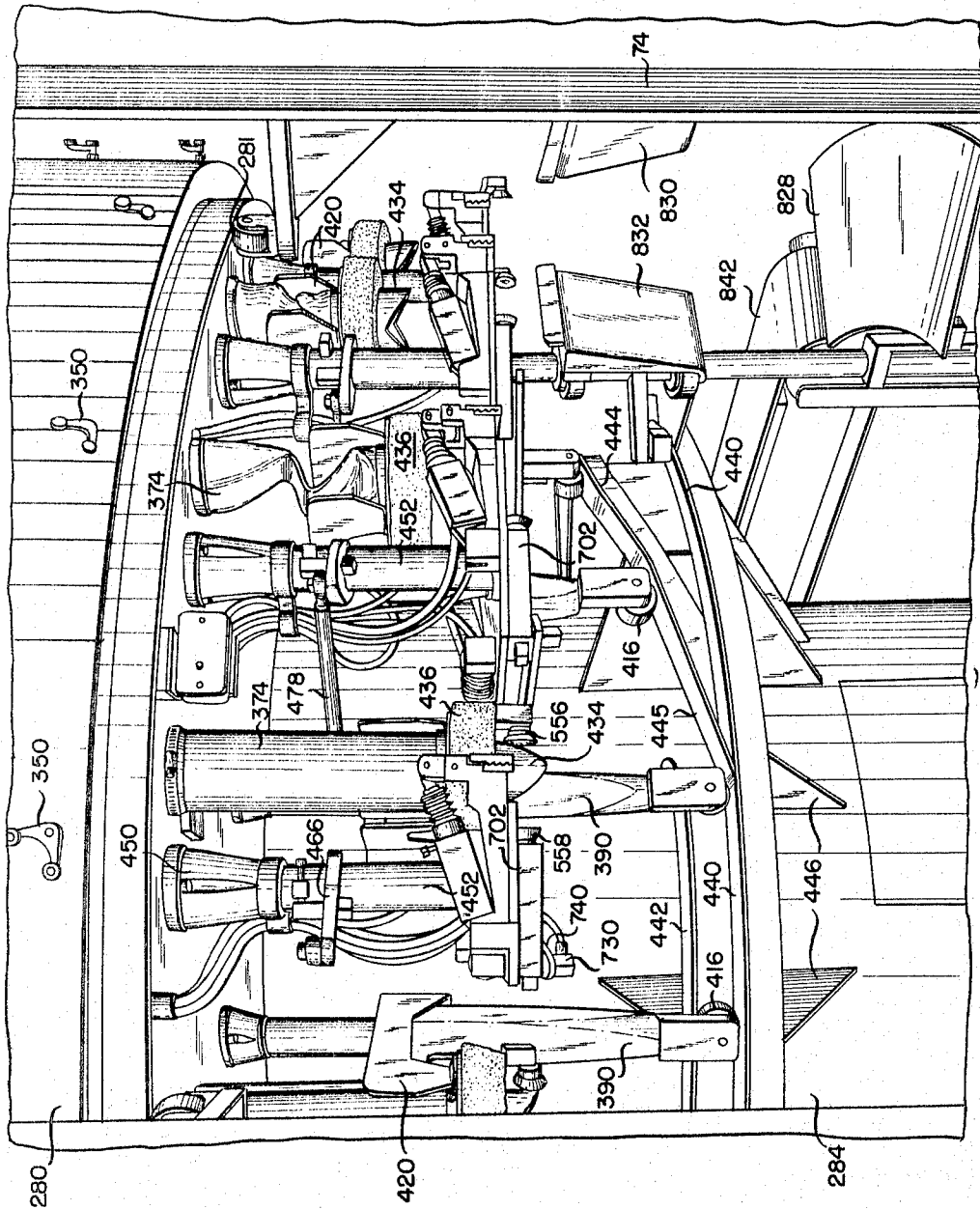


Fig. 15

INVENTOR

Clarence W. Rausch

BY

Strauch, Nolan & Heale

ATTORNEYS

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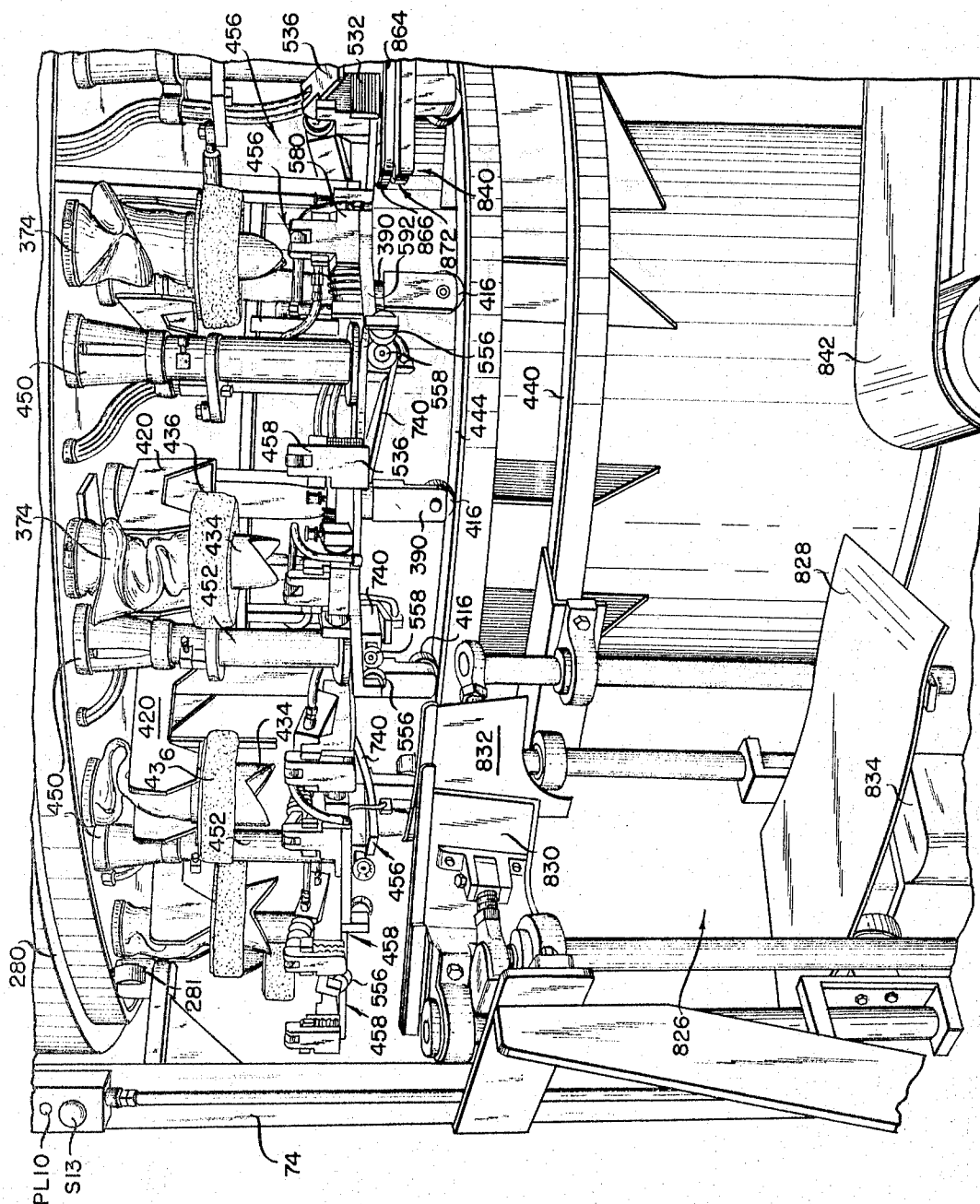


Fig. 17

INVENTOR
Clarence W. Rausch

BY

Strauch, Upman & Heale

ATTORNEYS

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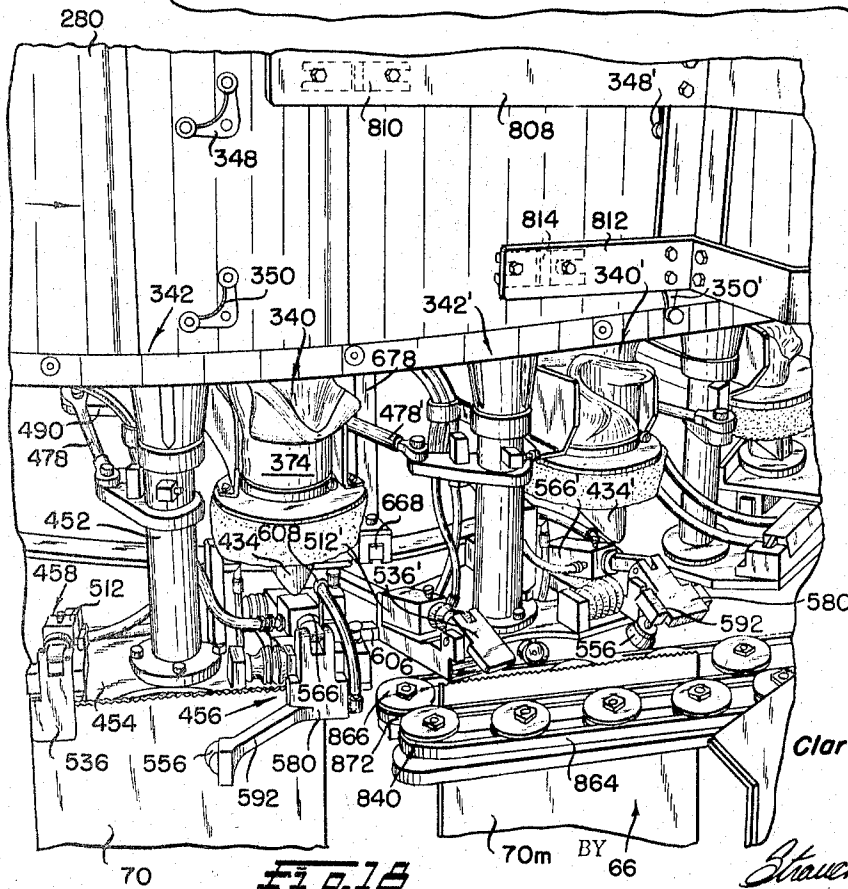
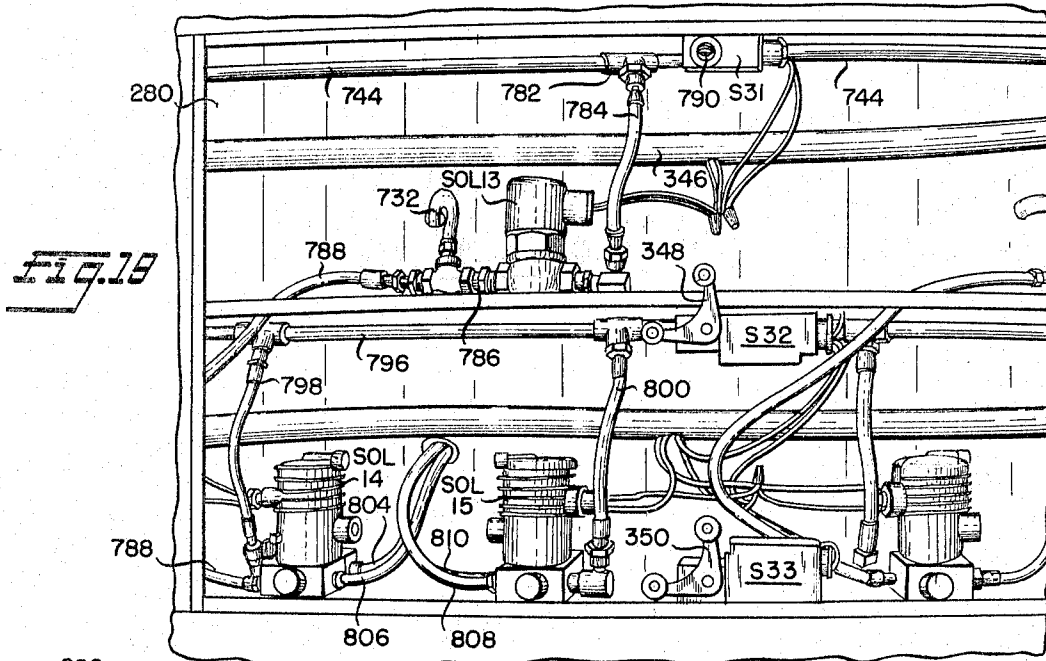
C. W. RAUSCH

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INVENTOR
Clarence W. Rausch

Shauch Nolan & Heale
ATTORNEYS

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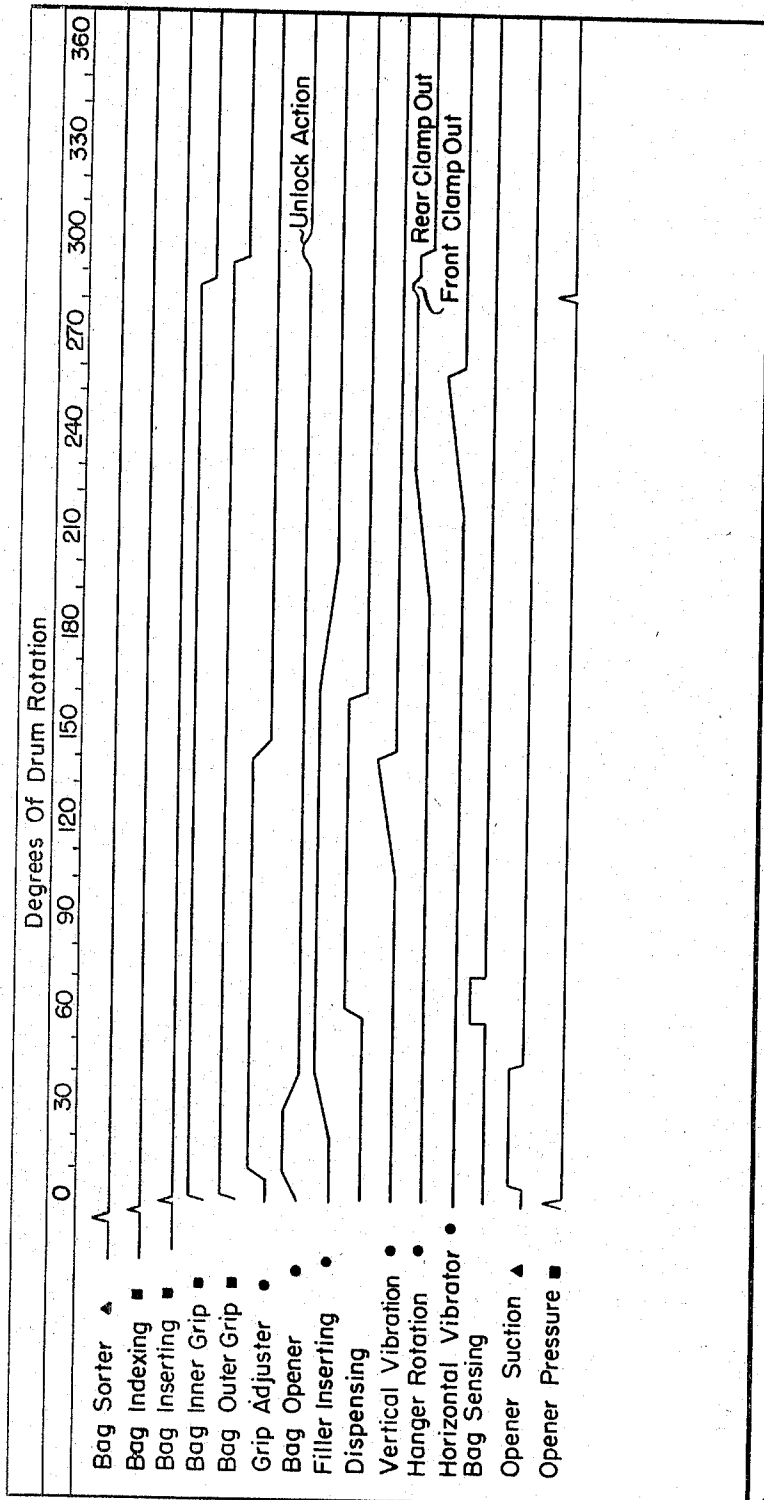
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LEGEND	
■	= COMPRESSED AIR OPERATED
▲	= VACUUM OPERATED
●	= CAM OPERATED

Fig. 20

INVENTOR
Clarence W. Rausch

Clarence W. Rausch

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C. W. RAUSCH

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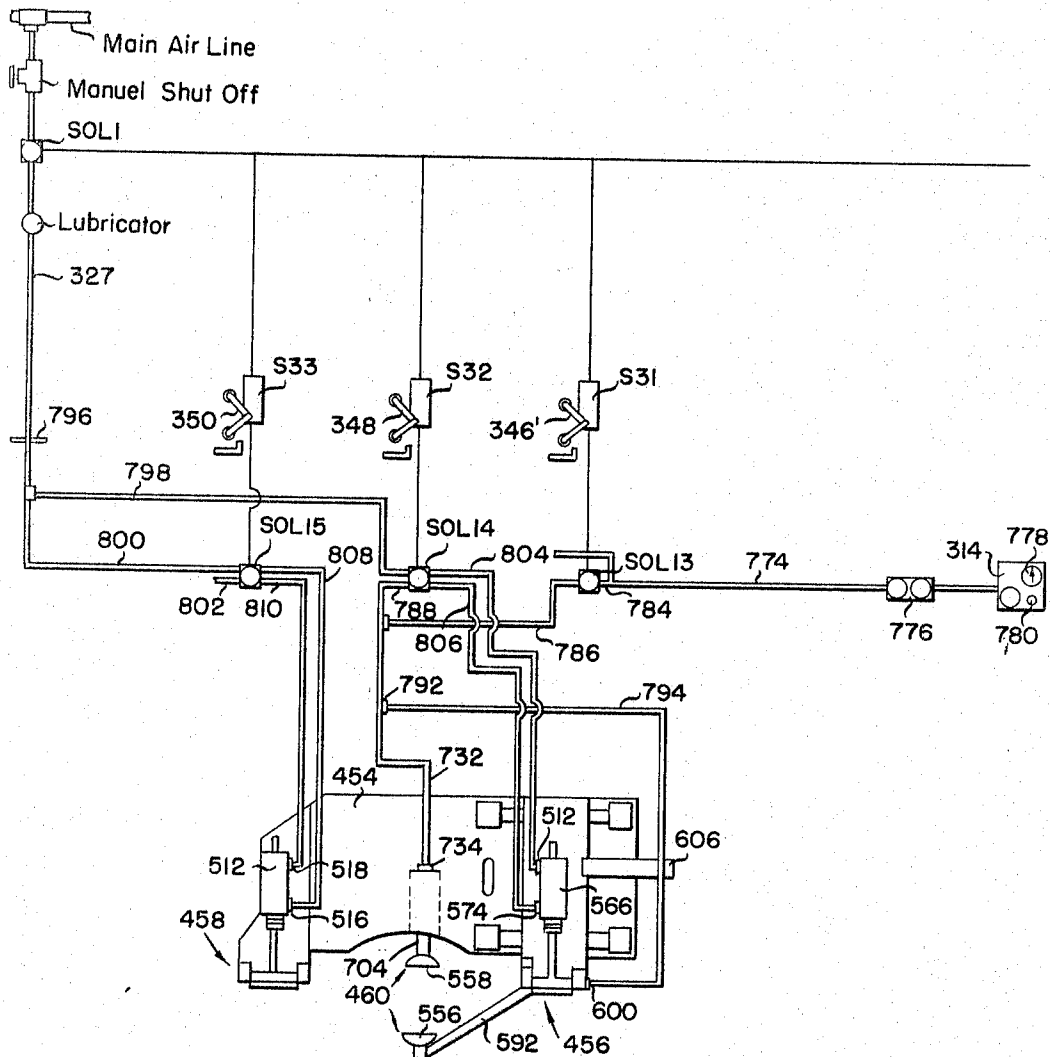


Fig. 21

INVENTOR

Clarence W. Rausch

BY

Strauch, W. P. & W. P.

ATTORNEYS

June 6, 1967

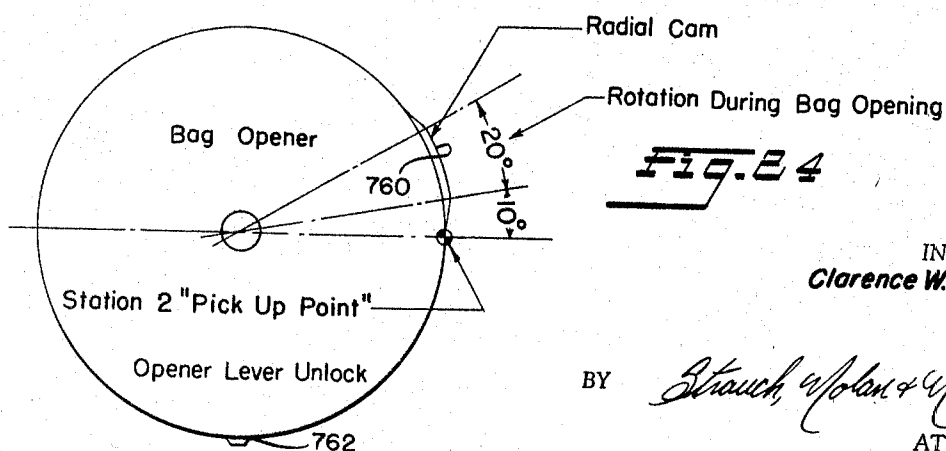
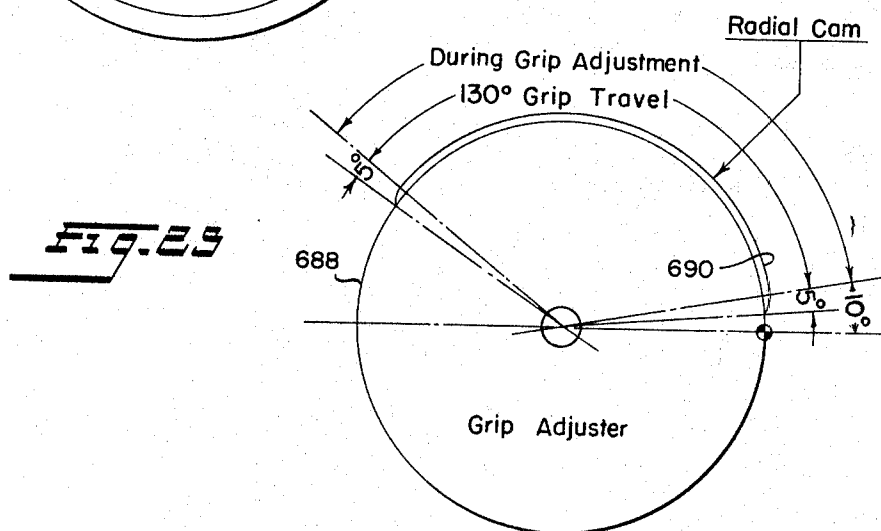
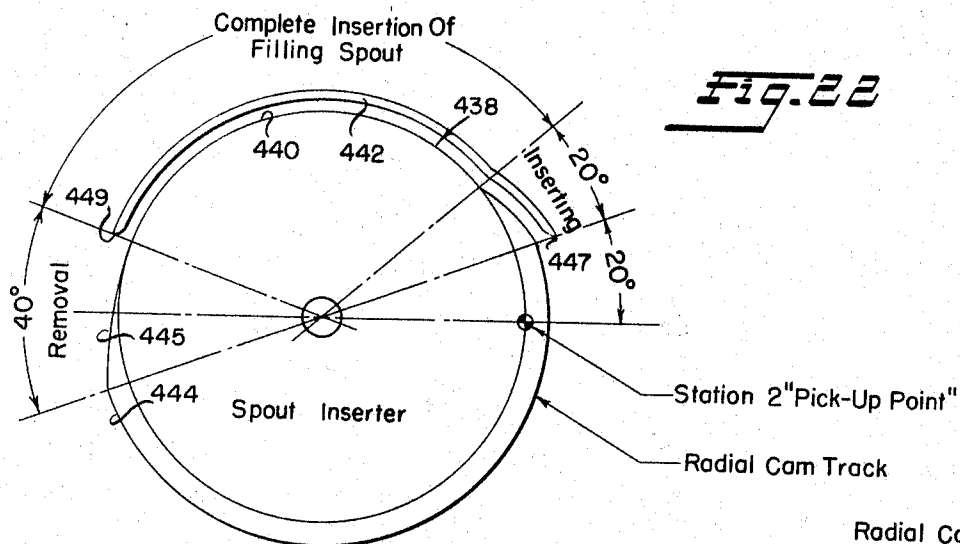
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INVENTOR
Clarence W. Rausch

BY

Strauch, W. J. & W. J.

ATTORNEYS

June 6, 1967

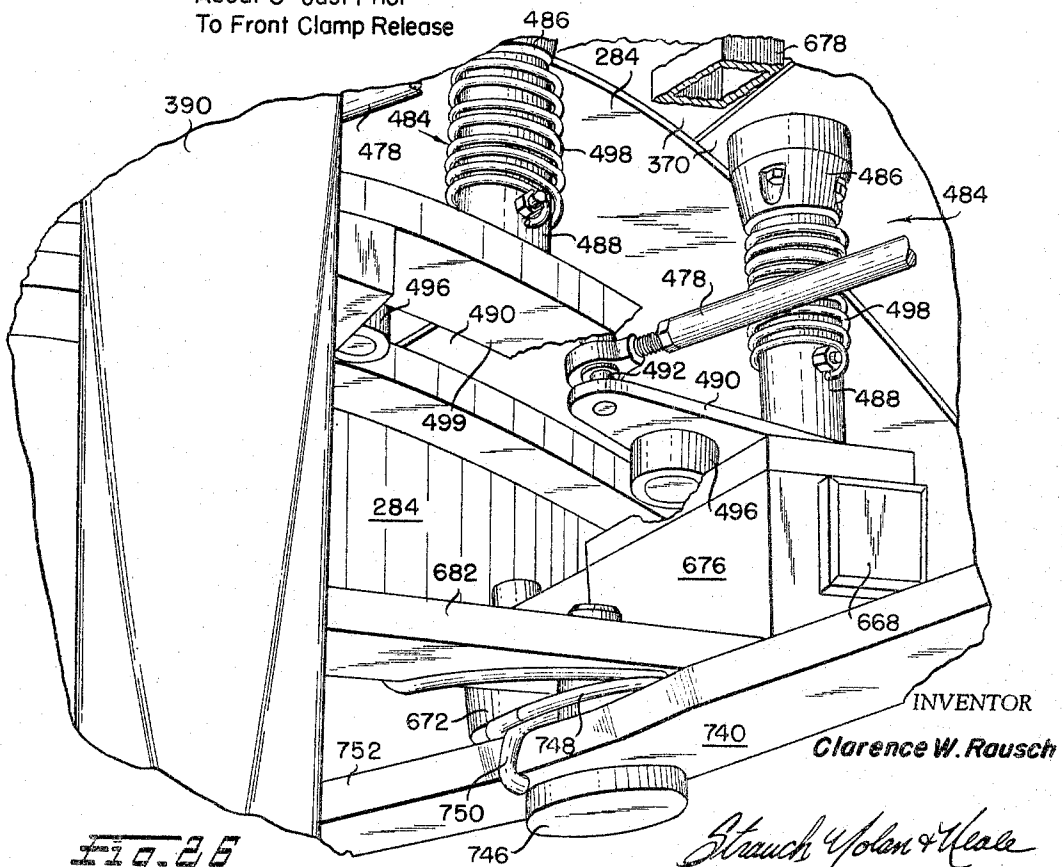
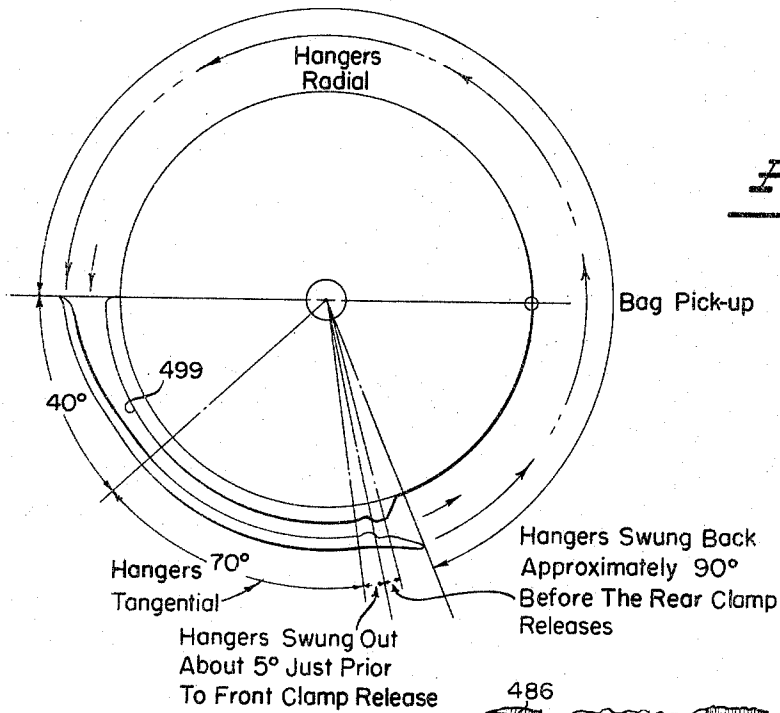
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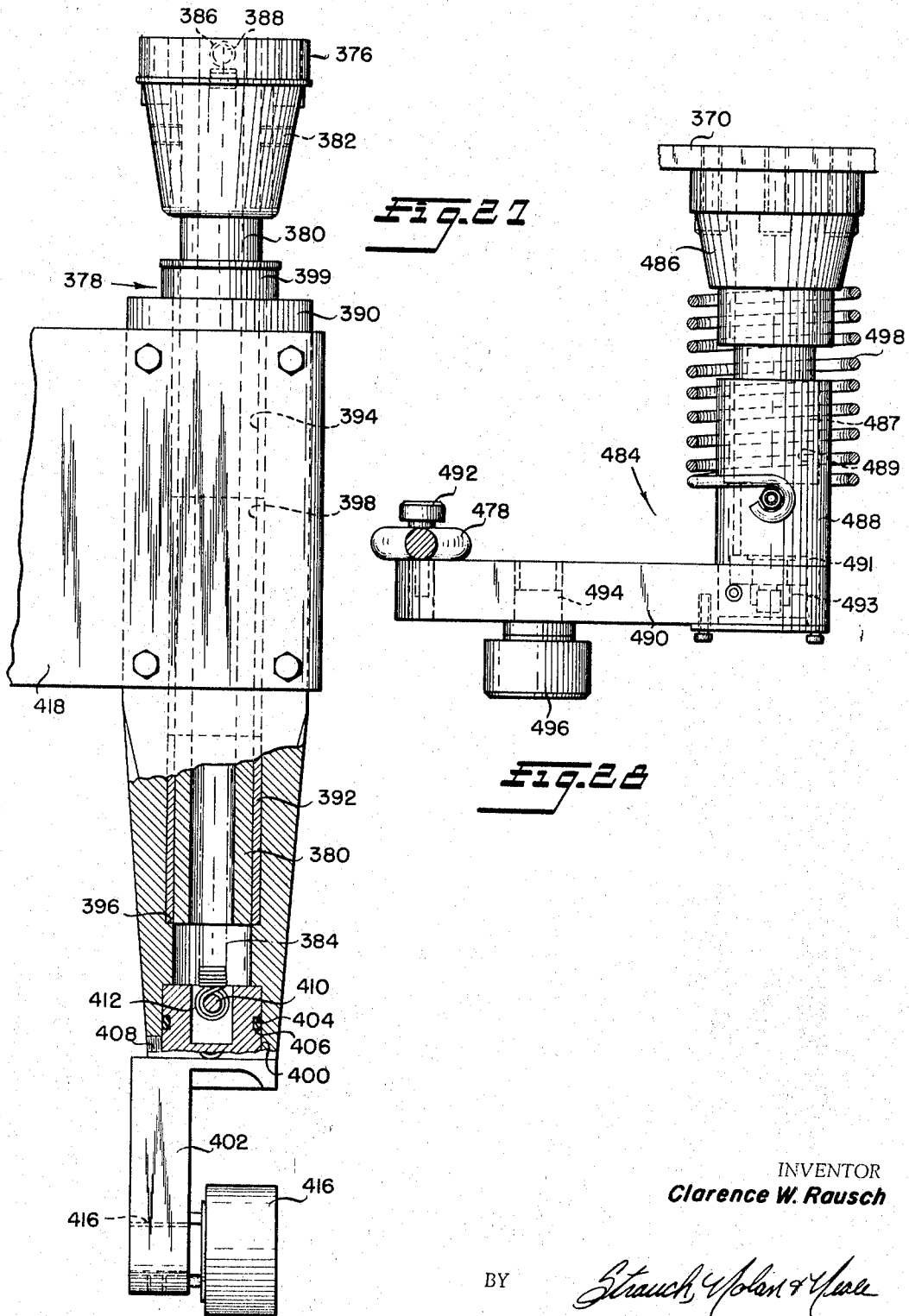
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AUTOMATIC PACKAGING MACHINE

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33 Sheets-Sheet 22



INVENTOR
Clarence W. Rausch

BY

Strauch, Updegraff & Updegraff
ATTORNEYS

June 6, 1967

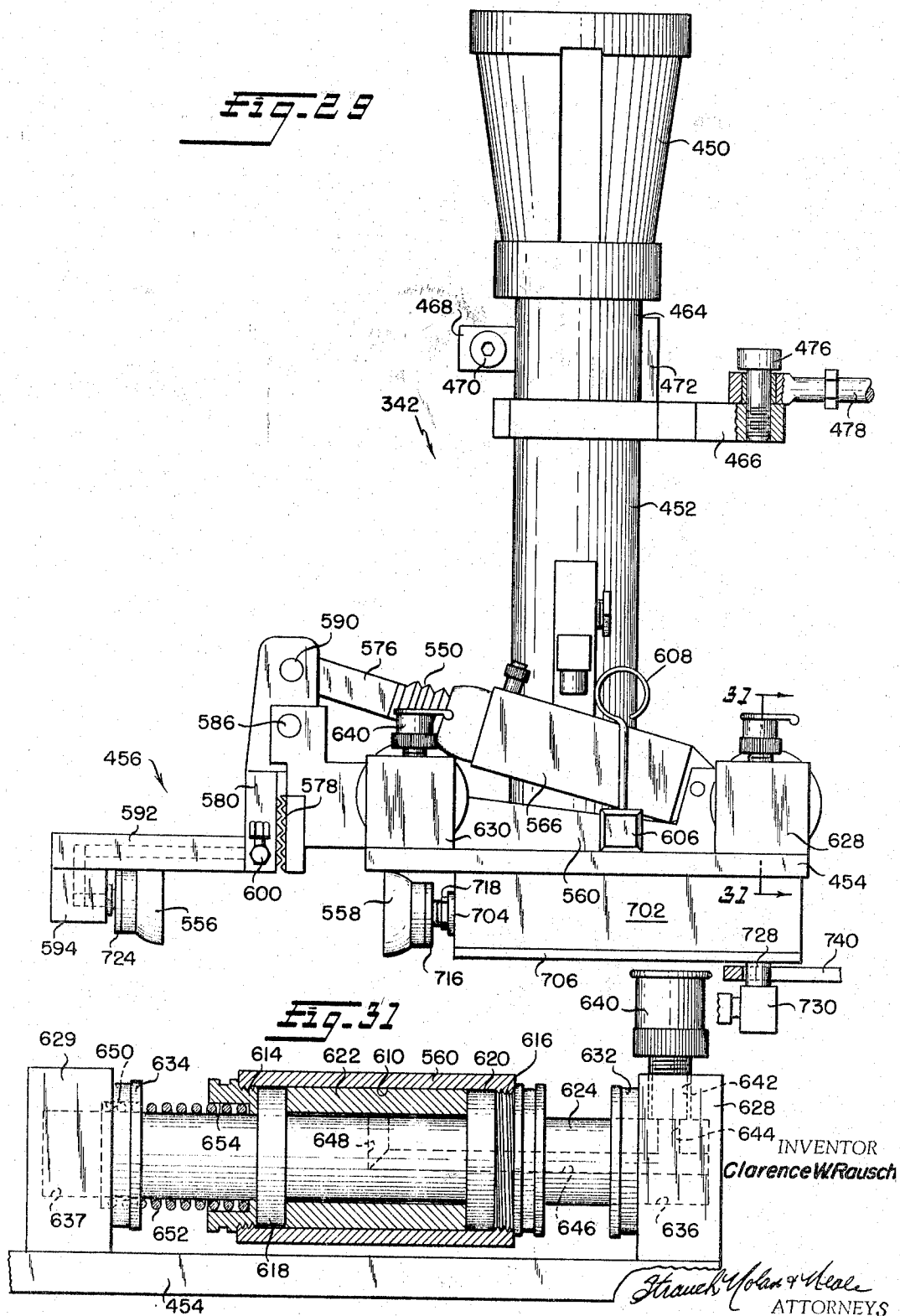
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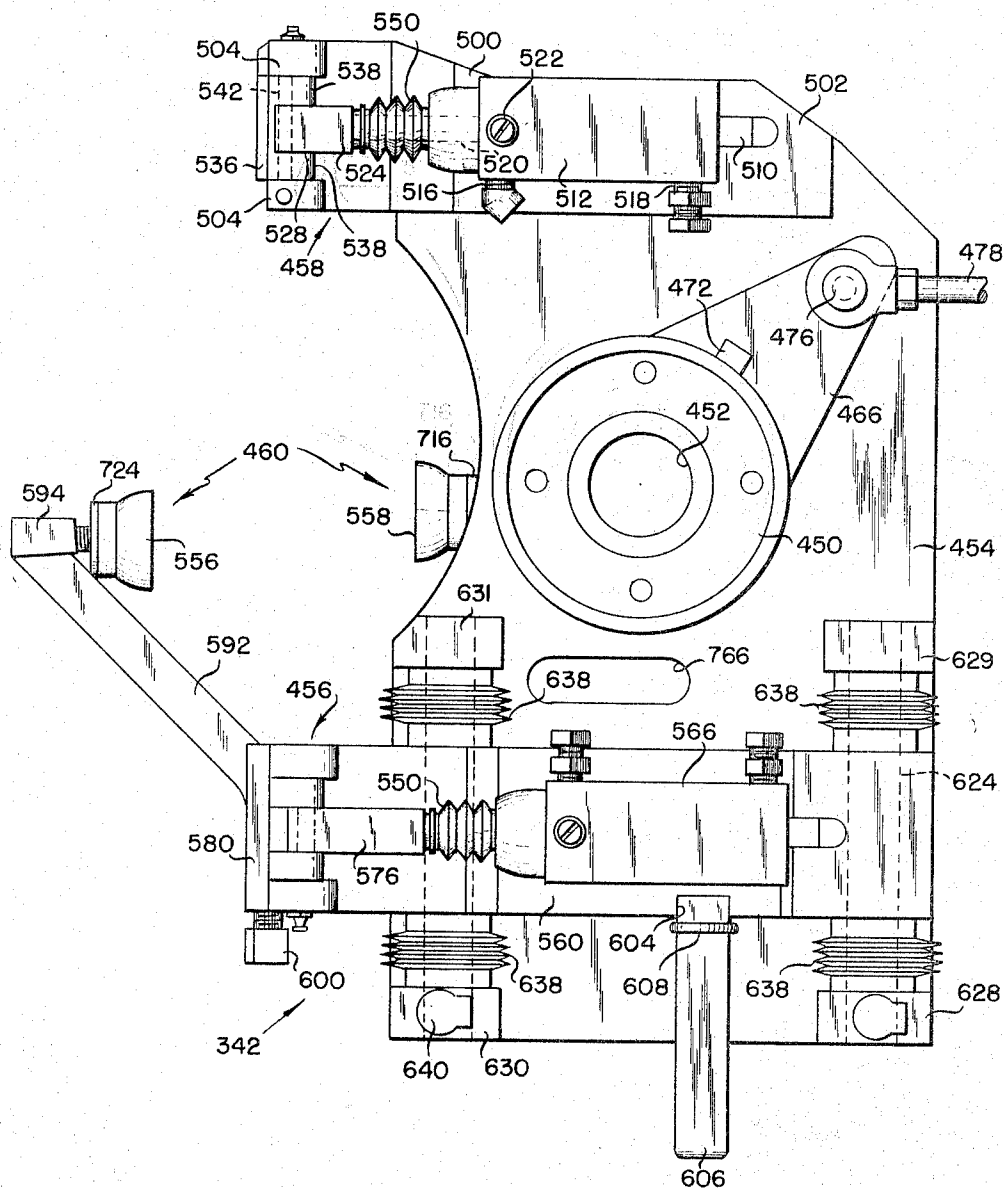


Fig. 30

INVENTOR
Clarence W. Rausch

BY

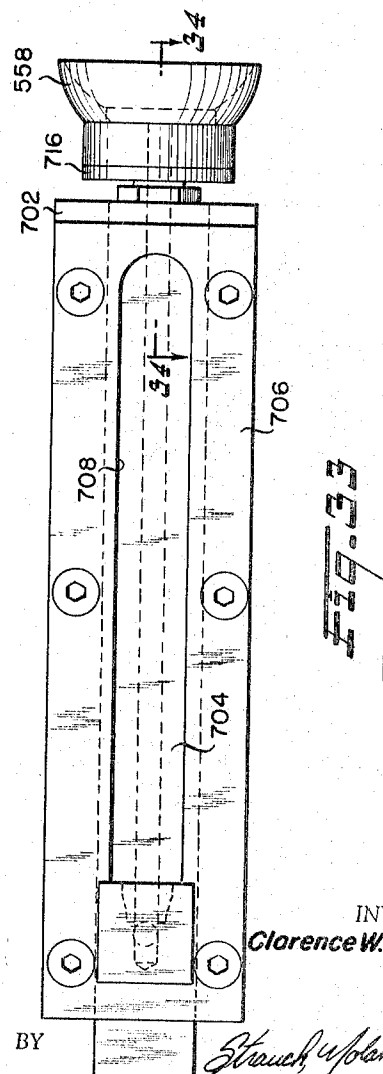
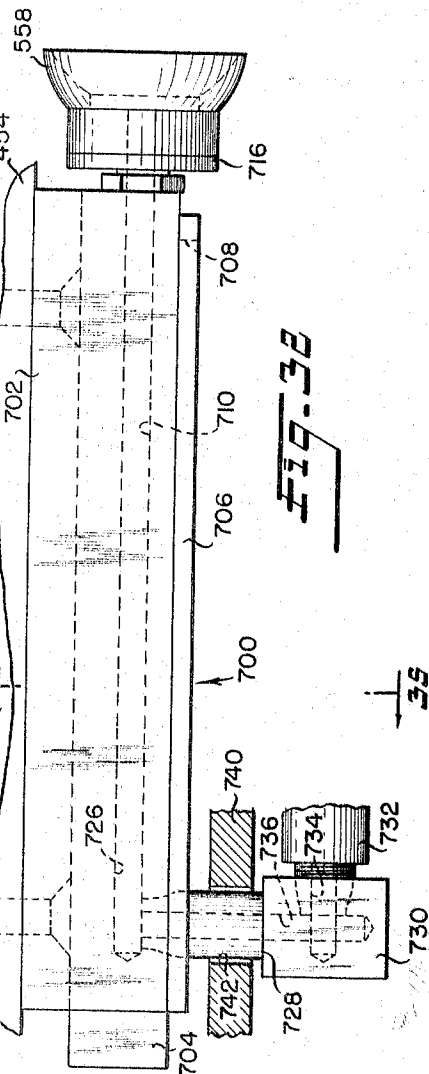
Strauch, Nolan & Hale

ATTORNEYS

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AUTOMATIC PACKAGING MACHINE

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Strauch, Updegraff & Yeale
ATTORNEYS

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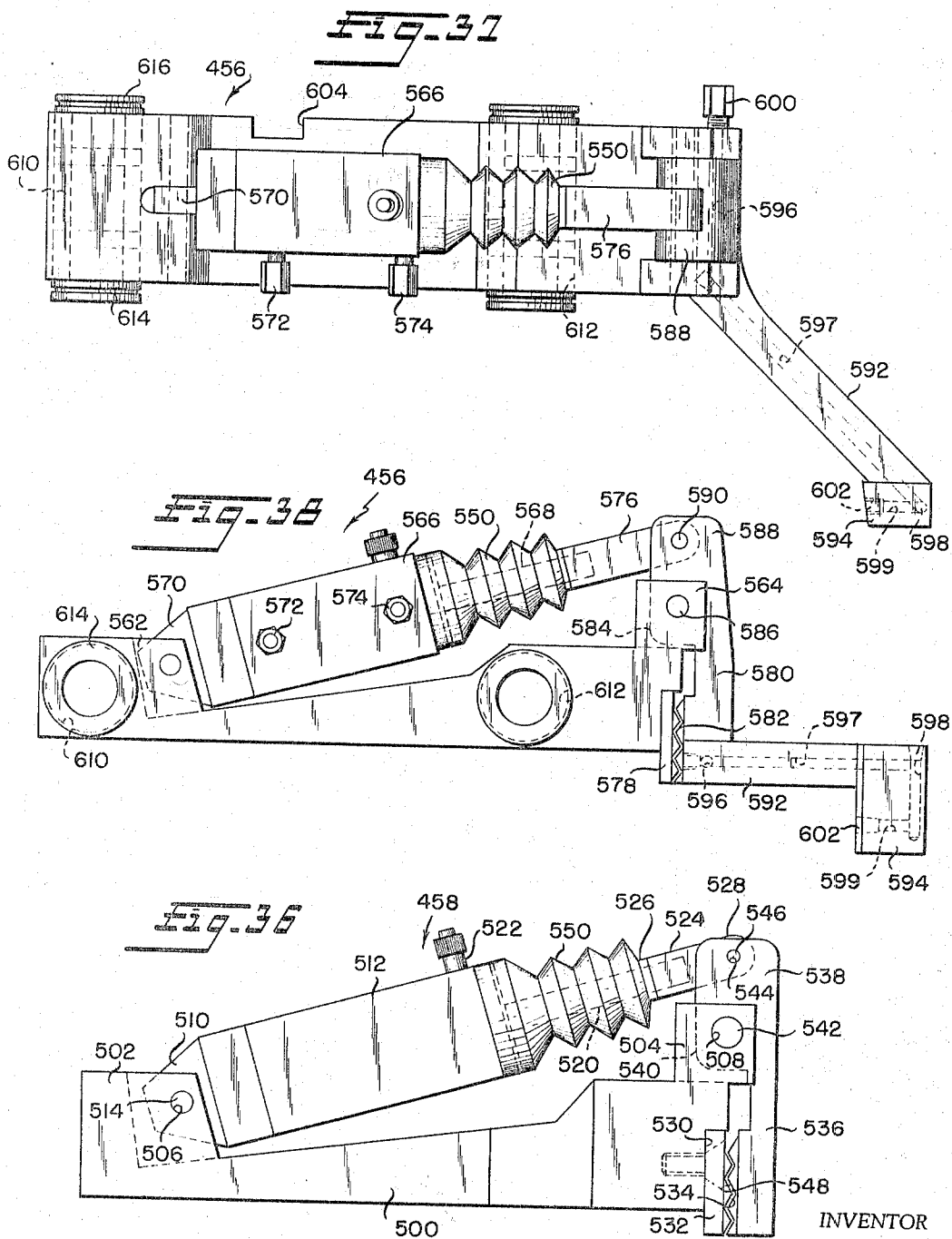
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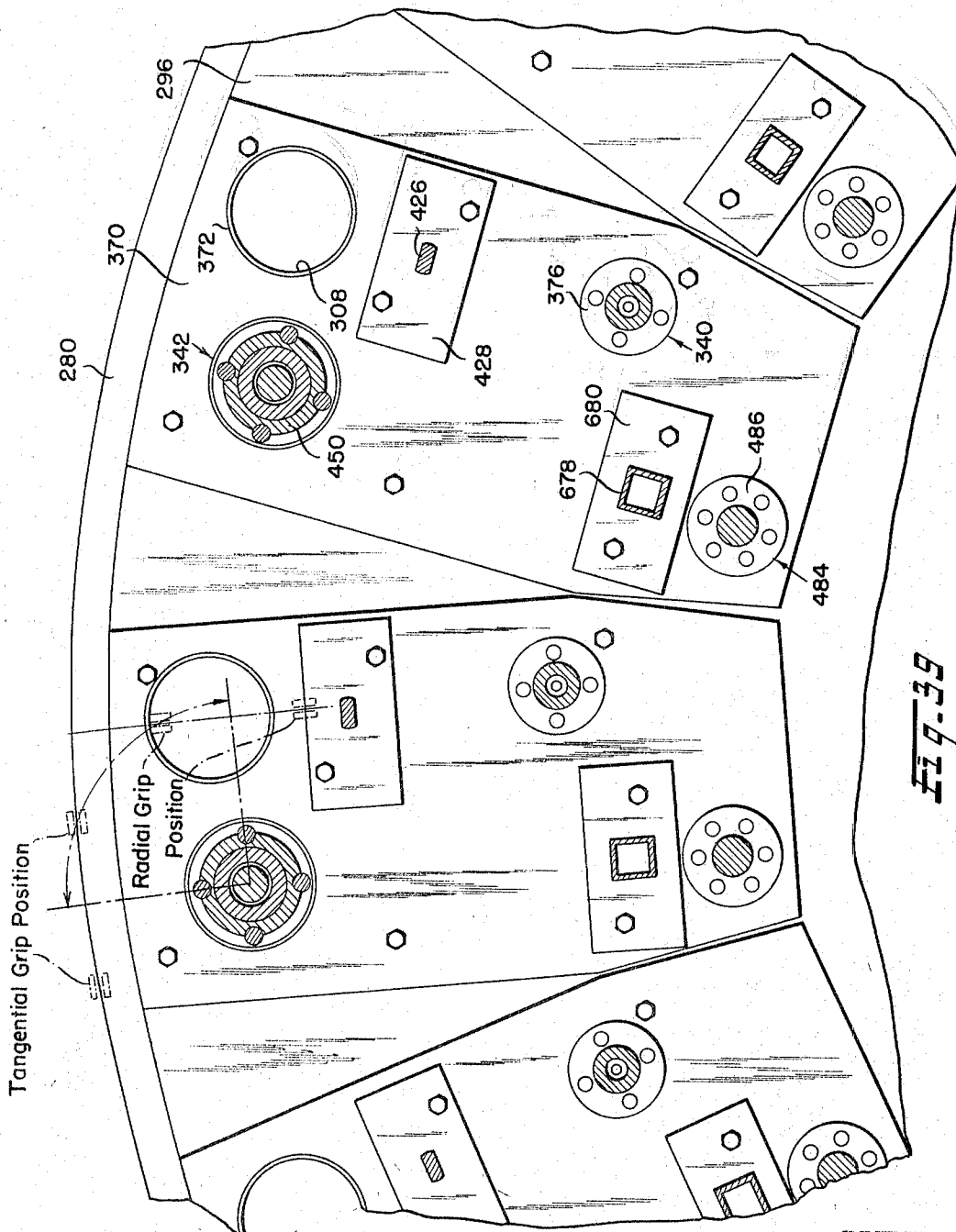
C. W. RAUSCH

3,323,280

AUTOMATIC PACKAGING MACHINE

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INVENTOR

Clarence W. Rausch

BY

E. Rausch, W. Rausch & W. Rausch

ATTORNEYS

June 6, 1967

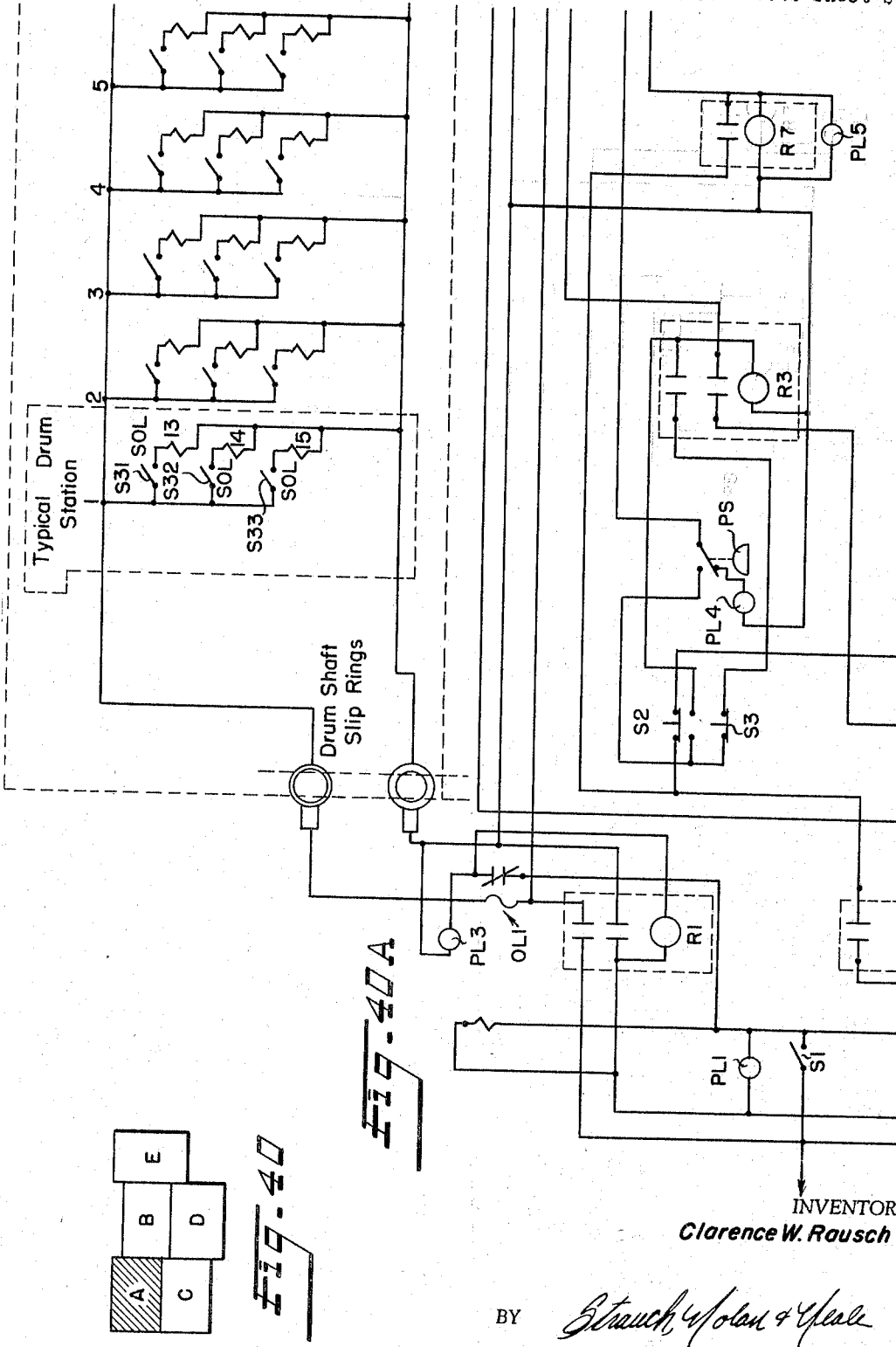
C. W. RAUSCH

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AUTOMATIC PACKAGING MACHINE

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33 Sheets-Sheet 28



INVENTOR
Clarence W. Rausch

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Strauch, Nolan & Yeale

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AUTOMATIC PACKAGING MACHINE

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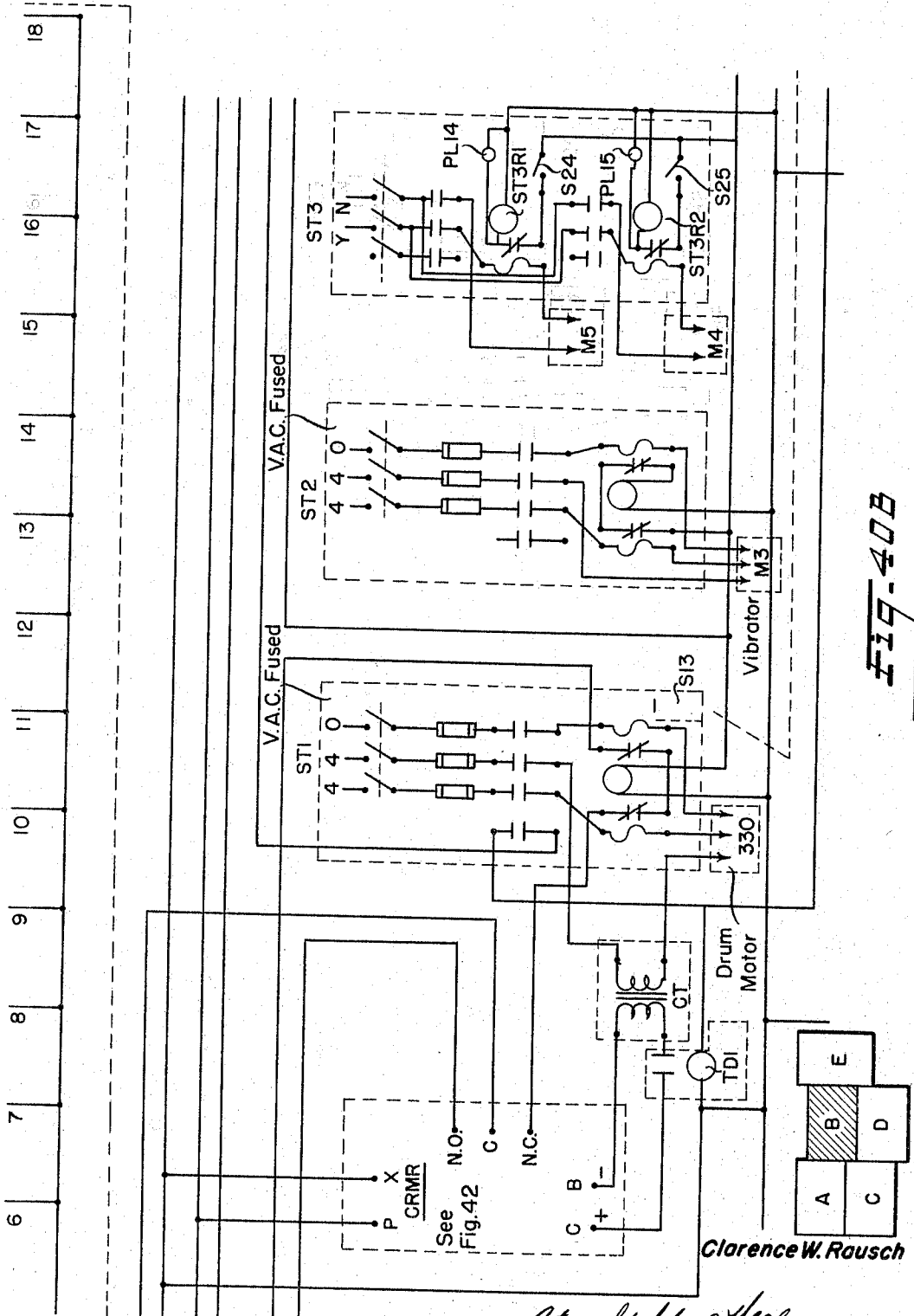


Fig. 40B

Brauch, Updegraff & Heale

ATTORNEYS

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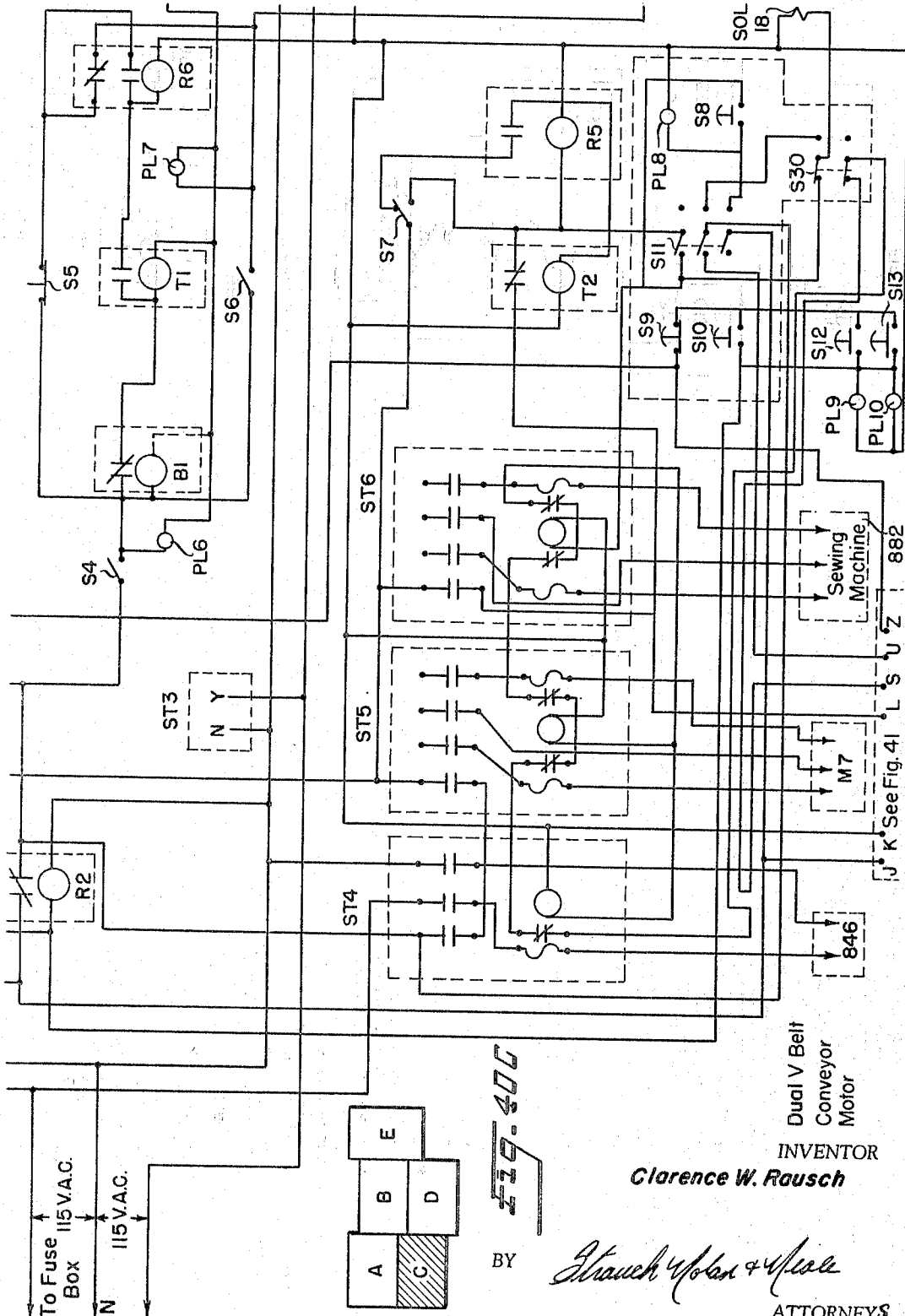
C. W. RAUSCH

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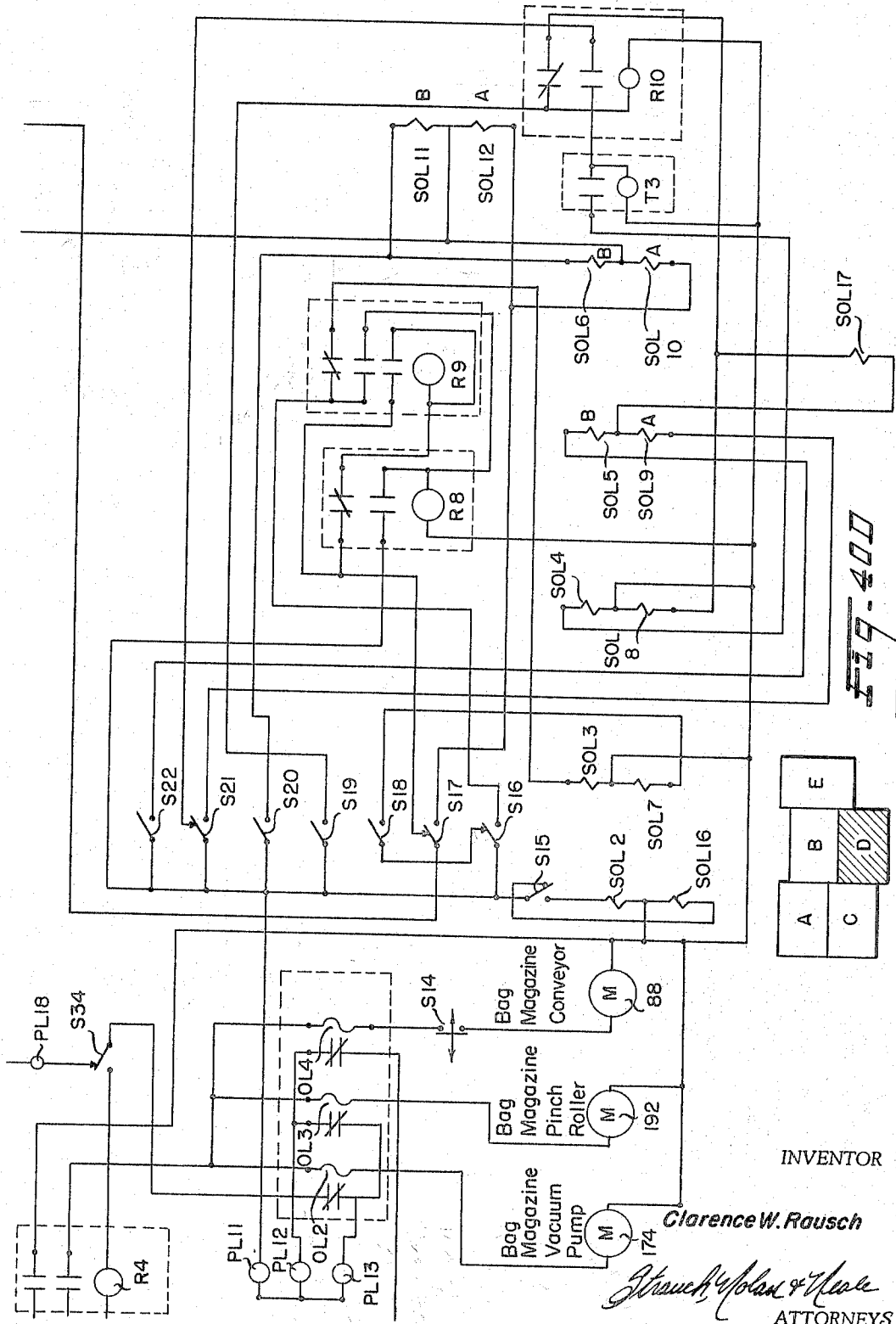
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C. W. RAUSCH

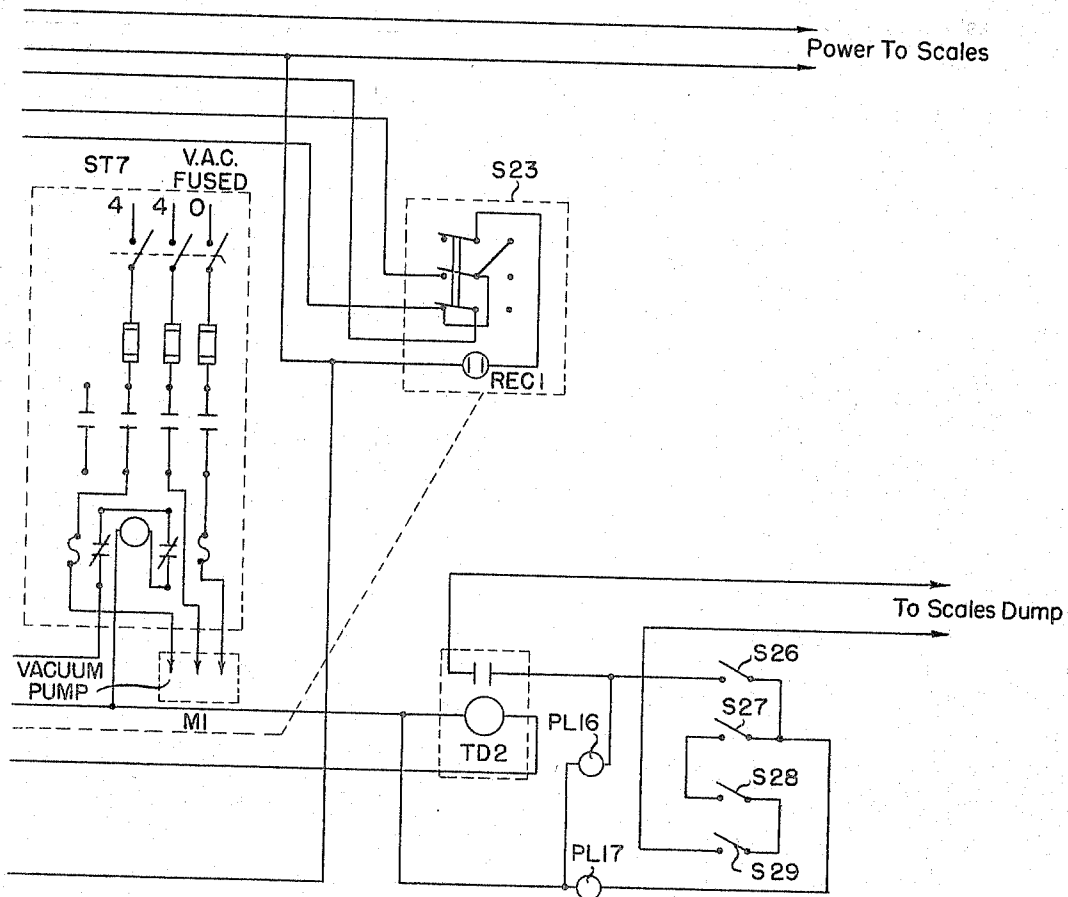
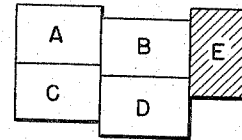
3,323,280

AUTOMATIC PACKAGING MACHINE

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Fig. 40E



INVENTOR
Clarence W. Rausch

BY

Strauch Nolan & Heale

ATTORNEYS

June 6, 1967

C. W. RAUSCH

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AUTOMATIC PACKAGING MACHINE

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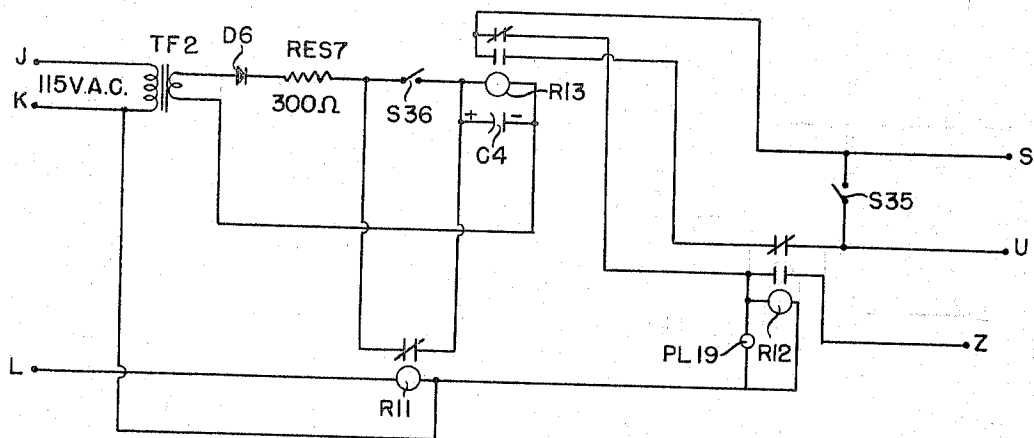


Fig. 41

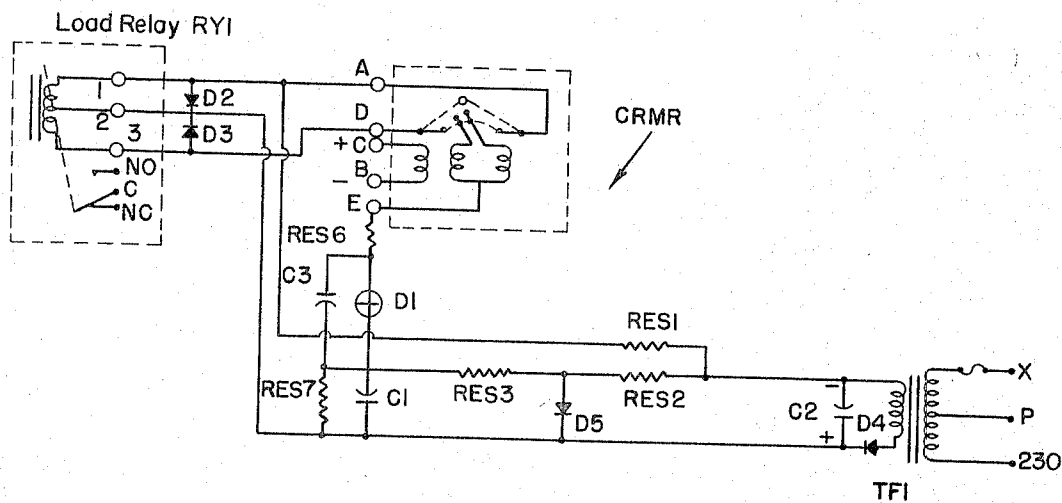


Fig. 42

INVENTOR
Clarence W. Rausch

BY

Clarence W. Rausch

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1

3,323,280

AUTOMATIC PACKAGING MACHINE

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

Filed Feb. 19, 1963, Ser. No. 259,495

97 Claims. (Cl. 53—188)

This invention relates to a machine which delivers, singles, opens, fills, closes and seals a bag. The accomplishment of these enumerated steps is completely automatic. More particularly, the invention relates to an automatic bag filling machine combination which includes a multiply bag magazine assembly having a folded bag singling dispenser, an intermediate conveyor for delivering such single folded bags to a bag opening, filling and closing device, in this instance a combination drum assembly, and apparatus which accepts the closed bag, delivers it to and through sewing station which fastens the closed end in an effectively sealed condition. The drum assembly is a rotary conveyor which accepts the bag, clasps it in desired position, opens the bag, inserts a filling device into the open end of the bag, fills the bag with a predetermined amount of material, withdraws the filling device, settles the material in the bag which conditions the bag for a smooth continuous transfer operation from the rotary drum to a linear conveyor which carries the closed, filled bag through the bag end sealing station from which the bag is delivered to a conveyor for transport to storage.

The invention includes three major subassemblies, the first of which will be designated as the bag magazine and singling dispenser. It has been previously known to associate a bag magazine and dispensing unit with a bag filling machine. However, no previously known machine accomplishes the singling dispensing and folded bag placement on a filling device in the manner in which the present invention accomplishes these steps. Most prior art devices rely upon manual placement of the bag on a filling station particularly when such filling stations are incorporated in a rotatable drum or turret type conveyor. No prior art machine is known in which a bag magazine and singling dispenser laterally conveys a vertically disposed single folded bag along a planar path radially into a station position with respect to a continuously rotating drum conveyor.

In the present invention, large multi-ply folded bags with one end closed, of the type used to package granular materials, for example, fertilizers, herbicides and pesticides are stacked on their closed ends in an approximately vertical arrangement on horizontally disposed parallel stretches of a plurality of endless belts, which form the bottom track of a magazine conveyor. The belts slowly move all of the folded bags toward a single bag dispensing unit at the end of the belt conveyor. A single bag is picked from the end of the magazine conveyor, shifted downwardly into a horizontally shiftable carriage which conveys the bag sideways along a vertically planar path to a position under a rotating drum conveyor and in front of the path of movement of a bag holding station, a plurality of which are disposed around the bottom of the drum. The rotational movement of the drum assembly will time the cyclic actuation of the bag dispenser and horizontal carriage so that each time a holding station on the drum comes into contact with and clamps a bag under a discharge station, the magazine dispenser subassembly unit is triggered to undergo a complete cycle of operation of singling and placing a bag in pick-up position for the next drum holding station.

The second subassembly, the turret or drum type bag filling conveyor includes a multiplicity of filling stations, each of which has mechanism to hold and manipulate a

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bag under a hopper discharge nozzle unit. The drum assembly, as it rotates, passes the bag in sequence through a series of operations at different stations situated around the rotatable path of the filling units on the drum. Filling of each bag is accomplished by timed control of a material dispenser, e.g., a dump scale or a volumetric dump mechanism. Timed actuation of the material dispensing mechanism per se is old. However, to applicants' knowledge, there is no prior art drum turret type bag filling mechanism in which a bag hanger mechanism (on a filling station on the drum assembly) receives a bag which is automatically inserted radially toward the axis of the drum, carries the bag through the material filling operation, after which the bag which still on the drum is rotated or swung about a vertical axis through an angle of approximately 90° so the top edge of the bag is linear and disposed tangential of the arc of drum rotation, and in which tangential position subsequent bag manipulations enable passage of the bag to a bag gripping dual belt type linear conveyor, such passage being accomplished as a smooth continuous operation in order to then enable conveyance of the bag in acceptable condition into and through a taping and sewing station. Although the final closing and sealing of the filled bag is discussed in terms of taping and sewing, it is to be understood that sealing could be accomplished in other ways, as by gluing, tape and glue or if plastic or plastic coated bags are used, the end could be sealed by heat.

Within the drum conveyor assembly, subcomponent bag hangers at each drum station are provided with novel individual bag openers. Specific operating controls, timed by drum rotation, enable simultaneous gripping of the two corners of the upper bag end as the bag is accepted from the magazine dispenser and assist in accomplishing desired cyclic opening, filling and closing of the bag, and subsequently releasing the two corners of the bag as the bag passes into the sewing machine conveyor. A novel inter-related action at the transfer point from the drum conveyor to the sewing machine conveyor is enabled by sequential release of the bag grippers together with the rotatable mounting of the bag hanger.

Dual, bag end gripper clamps on a rotatable drum or turret conveyor are old and are described and shown in an Allen et al. Patent 2,343,439 and a Heavin Patent 2,721,018. It is noted that in each of these prior art devices the two gripper clamps are always in an aligned position, fixed tangentially to drum rotation, i.e., the bag hanger and gripper assembly is never rotated relative to the drum as is true in the present invention. The above cited prior art references teach sequential releasing of the clamps as the bag is transferred from the drum to the dual belt conveyor passing to a sewing machine. Inasmuch as a distinctly different manner of movement of various portions of the bag occurs when it is arcuately conveyed by a rotatable conveyor than occurs when it is conveyed by a linear path conveyor such as the dual belt sewing machine, conveyor, difficulty has always been experienced in the prior art machine combinations at the precise point of transfer from one conveyor to the other. The result is often a tearing or slipping of the bag in the sewing machine conveyor belts so that future progress is not in a smooth, or aligned and desirable satisfactory manner. Applicants' device accomplishes this precise transfer operation with minimum disruption in operation by utilizing an inter-relationship of drum conveyor speed, belt conveyor speed, sequential releasing of the bag end grips and the unique ability to provide additive or subtractive increments of bag motion by controlled rotative movements of the bag hanger as the transfer operation is occurring.

The third subassembly is a taping and sewing machine and conveyor subassembly. A sewing machine and associated dual belt conveyor assembly is basically old, such assemblies being commercially available from several

sources. The aforementioned Allen et al. and the Heavin patent illustrate such a prior art combination. Nevertheless, the unique related coincidental actions between the bag hanger on the rotating drum and the sewing machine dual belt conveyor constitute an advance of material importance in the structural and functional relationship between sub-assemblies in the overall combination. Applicants have also incorporated automatic features in the control system of the complete assembly which enable control functions responsive to sewing machine conditions, e.g., thread and needle conditions, as will be described.

Accordingly, a primary object of this invention resides in the novel combination of a fully automatic bag packaging machine including a bag storage magazine and singling bag dispenser, a drum type bag filling conveyor and a dual belt conveyor and sewing machine assembly, all three major assemblies being structural and functionally automatically related.

A further object resides in the provision of a novel automatic bag filling machine including a bag magazine and singling dispenser with a conveyor for shifting a single folded bag into a pick-up position relative to a bag hanger station on a rotatable turret type bag filling conveyor.

Still another object resides in the provision of a novel folded bag magazine in combination with a singling bag dispenser and carriage with automatic control enabling a timed complete cycle of operation during which a bag is taken from the magazine, dispensed into the carriage, shifted to a position where the bag may be removed from the carriage, and the conveyor shifted back into position ready to start the cycle once again.

A still further object resides in a novel bag magazine and singling assembly wherein folded multi-ply bags rest on their closed ends in an upright manner stacked one against the other and wherein the closed ends rest on a slow-moving friction belt conveyor which maintains the bag in stacked position and toward the dispensing end of the bag magazine, the assembly including a dispenser by which single bags are removed from the front of the magazine stack and positively shifted downwardly by mating rollers into a horizontally shiftable bag carriage. The bag, still in its folded condition, being then shifted along a vertical planar path to a terminal position with the top of the bag in a position to be clamped and picked up by a moving bag hanger and carried away from the carriage for further operations.

Another object resides in the provision of an automatic bag magazine and singling dispenser wherein the dispenser singles a folded bag from the magazine and shifts it horizontally along a vertical planar path radially into a pick-up station position under a rotating drum conveyor.

Additional novel objects, insofar as the magazine assembly are concerned, reside in the subcombination of the magazine assembly with conveying friction belt tracks; the subcombination of single bag dispensing and horizontal carrier units; the subcombination of a bag magazine and a vacuum type single bag dispenser apparatus with a shiftable pinch roll singled bag shifting device; and the subcombination of a magazine dispenser together with a rotatable drum conveyor assembly.

A still further object resides in the provision of a novel turret type conveyor which includes a plurality of bag hanger mechanisms each of which enables automatic reception of a bag inserted along a radial vertical planar path toward the axis of the drum, and each of which hangers can carry the bag through a material filling location, over an agitator device and can rotate the bag relative to the drum through an angle of 90° so the bag may be passed tangentially from the rotating conveyor to an adjoining dual conveyor in a novel smooth continuous action.

Still another object resides in the provision of a turret type bag conveyor having a plurality of bag hangers, each having its individual bag opener and specific operating controls for accomplishing simultaneous clamping of the

two corners of the open bag end and sequential releasing of the two corners as the bag is passed away from the turret type conveyor.

A still further object resides in the provision of a novel combination of rotatable turret type bag conveyor with an adjoining dual belt conveyor wherein bag hangers on the turret conveyor are rotatable relative to as well as with the turret conveyor and are controlled and moved in timed coordination so hanger rotatable actuation in a planetary sense relative to turret rotation at precise times during the period of transfer of a bag from the turret conveyor to the dual belt conveyor enables the leading edge of the bag to be smoothly transferred and released from a turret bag hanger into clamping action between the travelling belts of a dual belt conveyor, and subsequently the rear end of the bag, which remains temporarily clamped in its hanger on the turret conveyor, is planetarily moved toward the dual belt conveyor at a slightly higher rate of speed than that of the dual belt conveyor so that the intermediate portion and trailing edge of the bag upper end is repositioned radially outwardly from the drum to smoothly pass at a proper rate into the dual belt conveyor, at which point the trailing edge of the bag is released from its hanger enabling the bag to pass completely into and under subsequent control of the dual belt conveyor.

Still further objects relative to the drum or turret conveyor reside in the provision of cyclically coordinated mechanical movements of bag hanger components such as bag end grip shifting, opener component shifting, filling nozzle insertion and removal and hanger planetary movement on the rotating drum; coordinated pneumatic operations of bag end grippers and bag openers during cyclic drum rotation; controls to accomplish and coordinate the foregoing operations; and details of construction of the bag hanger components.

Still another object resides in the provision of novel individual bag hanger pneumatic controls and operating components located on a rotating drum conveyor. In conjunction with this object a further object resides in the provision of a novel pneumatic control circuit which assures periodic cyclic blow-out cleaning of the pneumatic lines during a rotational cycle of the drum conveyor.

Another object resides in the provision of a unique overall automated bag packaging machine control having auxiliary control circuits responsive to subassembly condition for preventing runaway operation of the complete machine. In conjunction with this object further objects reside in provisions of unique electrical circuits including condition responsive components which cause shut down of bag singling and filling operations upon breakage or depletion of a thread supply at a bag sealing sewing machine station.

Further novel features and other objects of this invention will become apparent from the following 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 top plan view of a complete packaging machine constructed in accord with the present invention, it being noted that the charging apparatus is not included in this figure although its location "F" is marked;

FIGURE 2 is a diagram of the flow path of the bags through the machine, the path being superimposed on an outline of the plan view seen in FIGURE 1;

FIGURE 3 is a rear elevation view of the drum assembly portion of the machine seen in FIGURE 1;

FIGURE 3a is a detail section to illustrate some of the drum support structure not visible in external views;

FIGURE 4 is a perspective view looking at the front of the machine, i.e., the location of the bag magazine;

FIGURE 5 is an enlarged perspective view looking along the bag magazine table, the bag picking or singling vacuum cups and the fixed axis bag pinch roller being seen at the rear of the magazine table;

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FIGURE 6 is an enlarged detail view illustrating the pneumatic kicker which keeps the leading bags in straight alignment as they approach the end of the magazine, one of the safety limit switches and one of the spring loaded tracks for the vertically shiftable pinch roller also being depicted;

FIGURE 7 is an enlarged view showing the interior of the two panels seen in FIGURES 4 and 5 and illustrates operating switches, motors, belt drive and control linkages for the single bag dispensing mechanism located at the end of the bag magazine;

FIGURE 8 is a perspective elevation showing the left hand side of the bag magazine and illustrates additional pneumatic control lines, the back side of the bag singling mechanism, and the operating cylinder for the horizontal bag shifter together with control switches and cam operator on the horizontal carriage piston shaft;

FIGURE 9 (on sheet with FIGURE 6) is a perspective view looking down at the top of the control section of the bag dispenser and primarily illustrates the position of drum operated control switches and a station cam operator located on the drum conveyor, the switches controlling the cyclic operation of the bag singler dispenser and bag carriage in relation to the angular position of the drum assembly;

FIGURE 10 is a perspective view taken from a position under the drum assembly and next to the bag magazine, looking toward the station position where the bag carriage places a bag into position to be taken by the moving turret drum, some of the complex linkage located on the underside of the drum being illustrated in the upper portion of the picture. This view shows the bag carriage clamping fingers in the clamped position to hold the bag upright just prior to the time that the bag is gripped by a set of drum station grippers;

FIGURE 11 is a view taken from somewhat the same position as FIGURE 10 to illustrate the bag clamping fingers being withdrawn from their clamping position, this action occurring an instance after the bag is positioned in the manner shown in FIGURE 9, it being understood that the turret is continually rotating and at this point has now gripped and is tightly holding the upper end of the bag;

FIGURE 12 is a view looking up from directly below a bag filling station on the drum, the filling station having just passed the bag pick-up location and the right hand gripper has started to shift toward the left hand gripper, the bag being omitted in this view for clarity of disclosure;

FIGURE 13 is a perspective view looking upward at the cam tracks and their cam follower mechanisms located radially inward of each bag filling station and provides a view of a portion of the vertical filler nozzle raising cam and follower, the horizontal gripper shifting cam and cam follower and the horizontal bag opener cam and cam follower;

FIGURE 14 is a view looking down at the bag hanger station just prior to the upper end of the bag being opened, the inner grippers having been shifted toward the outer gripper to bow the upper end of the bag and the rear vacuum cup having been partially shifted toward its extended position to force the bowed bag against the front vacuum cup. Note: the filler nozzle with its foam plastic sealing collar is disposed in the raised position immediately above the gripping station;

FIGURE 15 is a perspective view from the upper quarter illustrating an opened bag with the filler nozzle having now been lowered into the open end of the bag with the foam plastic collar pressed in sealing engagement against the upper edges of the bag. Note the bag sensing switch wire which determines whether or not a bag is in position on a bag hanger as that hanger approaches the charging station;

FIGURE 16 is an enlarged perspective view from the

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rear of the machine to illustrate the bag filling nozzle raiser passing up a cam rise and withdrawing the filling nozzle from the hanger station, the horizontal bag vibrator being seen in the lower right-hand portion of this figure. Note that the illustrated hanger station furthest to the right is starting its swinging movement to rotate the grippers and the bag 90° into a tangential position;

FIGURE 17 is a view from the left hand-side of the machine showing the outlet side of the second bag vibrator station, the bag hangers which are seen at the left-hand side being those which are shown at the right side of FIGURE 16 and the entrance to the dual belt sewing machine station is illustrated at the far right hand side;

FIGURE 18 is a second view from the left hand side of the machine illustrating one of the hangers in which the bag has been swung 90°, away from under the filling nozzle and tangential to drum rotation, the immediately preceding hanger station having passed its bag to the dual belt sewing machine conveyor;

FIGURE 19 illustrates some of the control components located under the shell of the drum turret, each of the bag hanger stations including the group of components which are illustrated;

FIGURE 20 is a timing chart representing the operating conditions which occur relative to one bag hanging station during a 360° drum rotation;

FIGURE 21 is a circuit diagram showing the electrical and pneumatic controls associated with one bag hanger station on the drum assembly;

FIGURE 22 is a circular layout of the cam track (actually an axially changing track) for the filler spout inserter assembly;

FIGURE 23 is a circular layout of the cam track for the bag gripper shifter;

FIGURE 24 is a circular layout of the cam track for the bag opener shifter mechanism;

FIGURE 25 is a circular layout for the cam track (an internal cam track) for accomplishing bag hanger rotation, phantom lines being used to illustrate the path of the cam follower roller when not in engagement with the internal cam track;

FIGURE 26 is a partially broken away detail perspective, viewed from below and showing a portion of the hanger rotation cam track and two of the hanger rotation cam follower assemblies;

FIGURE 27 is an elevation view, partially sectioned, of one of the filler nozzle lifting tube assemblies, and illustrates the spring balanced telescoping cam follower which cooperates with the filler nozzle cam track;

FIGURE 28 is an elevation view illustrating one of the cam follower assemblies utilized for rotating the bag hanger;

FIGURE 29 is an elevation view of a bag hanger which is located on the drum radially outwardly of the cam follower assembly shown in FIGURE 28, the hanger and the follower being connected by a tie rod. A bag hanger unit includes the vacuum cup bag openers and the two bag grippers;

FIGURE 30 is a plan view of the bag hanger unit shown in FIGURE 29;

FIGURE 31 (on the same sheet with FIGURE 29) is an enlarged section view taken on line 31—31 of FIGURE 29;

FIGURE 32 is a partially sectioned, detail elevation view of the shiftable bag opening vacuum cup;

FIGURE 33 is a bottom view of the shiftable vacuum cup assembly shown in FIGURE 32;

FIGURE 34 is a section view taken on line 34—34 of FIGURE 33 and illustrates one of the vacuum cup connections;

FIGURE 35 is a section view taken on line 35—35 of FIGURE 32 and illustrates the channel track and vacuum cup slide member;

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FIGURE 36 is a detail elevation view of the fixed bag hanger gripper assembly;

FIGURES 37 and 38 are detail plan and side elevation views, respectively, showing the shiftable bag hanger gripper assembly;

FIGURE 39 is a bottom plan view of a section of the drum assembly illustrating several of the bag hanger and filling stations with various components and support members sectioned;

FIGURE 40 is a legend block showing the manner in which the circuit drawing FIGURES 40A-40E are placed together to provide the electric wiring diagram for the complete machine assembly;

FIGURE 41 is an electrical diagram of a sewing machine thread detector which can control the complete bag filling machine; and

FIGURE 42 is an electrical schematic showing a continuous reading meter relay circuit used in the electrical circuitry shown in FIGURE 40.

The present invention encompasses an automatic, unitary bag packaging apparatus which includes three major subassemblies all of which are correlated and coordinated in a compact construction to operate in an efficient assembly line manner. The apparatus is essentially foolproof in operation, being fully automatic from a bag storage location, to a point where completely filled, closed and sealed (sewed and taped) bags are mechanically delivered to a conveyor. In brief, from a folded bag storage magazine, which represents the starting position of the operation, bags are delivered singly, in folded condition to a continuously rotating drum type hopper conveyor. In the drum conveyor, which includes a plurality of bag holding and filling stations, the bag is received from the magazine and singling assembly, clamped, opened, filled with a predetermined quantity of material, agitated, formed into a rather flat condition for convenience in sewing and storage, the upper end closed and the bag transferred to a third subassembly which tapes and sews the closed end of the bag and finally delivers the bag for further processing, for example, to a conveyor for carrying the filled, sewed bags to storage rooms.

The plan view of the complete apparatus seen in FIGURE 1 provides an overall representation of the relative locations of the various major subassemblies, the complete packaging apparatus or machine 60 consisting of the bag storing magazine and single bag feeding assembly 62, the drum conveying and filling assembly 64 and the bag transfer conveyor and end sealing assembly 66. FIGURE 2 is a bag flow diagram depicted within an outline of the FIGURE 1 plan view, the flow path of a bag being depicted diagrammatically as it progresses through various positions from the storage magazine, through the drum type bag conveyor and filler thence through the transfer conveyor and sewing machine from whence it exits from the apparatus 60.

Bag flow path

Although the construction of the three major subassemblies will be more fully described hereinafter, at this point in the description and with reference to FIGURE 2, the progress of a bag through the machine will be generally described. When power and control circuits for the machine 60 are turned on by the operator, the storage magazine 62 is rendered operational to slowly feed a plurality of folded multi-ply bags 70 (having one end taped and sewn) toward the left-hand side of the magazine 62. Drum assembly 64 is empowered to continually rotate and in so doing, successively passes a plurality of bag holding stations, located under hoppers peripherally arranged around the outer portion of the drum, in a circular pattern. At the same time, the transfer conveyor and sewing machine assembly 66 is placed into operation, its sewing machine station being energized for automatic operation whenever a bag passes through the sewing machine in a manner well known to the art. By means of

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structurally and functionally inter-related mechanical, electrical and pneumatic control systems, which will be more fully described hereinafter, various operations are dependent upon drum rotation, drum rotational position and the presence of bags at certain stations during the automatic operation.

Still viewing FIGURE 2, the top open end edges of a group of folded bags 70 stored in the magazine 62 are represented by the lines seen at location A. During machine operation, bags 70 at A are being slowly moved to the left by a magazine conveyor to place them in proper disposition at the left end of the magazine where a single, still folded bag may be removed from the group of bags. Bags in the stack at location A are disposed approximately vertical (see FIGURE 4) with the bottom ends of the bags being already closed and sealed, as by taping and sewing, and the top end open even though the bag is folded. Note, the bags may be single or multi-ply, and the apparatus will accommodate bags with and without side gussets. However, the specific apparatus from which the figures of this application were derived, was constructed to package fertilizers, pesticides and herbicides and multi-ply, side gusseted bags measuring approximately 1' x 3' in folded condition, were used and can be seen in various ones of the figures.

From the left-hand end of magazine assembly 62, a single bag is removed and pulled slightly to the left from the stack at location B. As the rotating drum assembly 64 provides a control signal indicating that a bag holding station is approaching location C, the horizontal conveyor will shift the single bag from location B to location C just as bag clamps 456 and 458, located under an individual bag station on the drum assembly, are approaching location C. The radially innermost clamps 456 are designated as the forward clamps and the radially outermost clamps 458 as the rear clamps. When the bag 70c is in location C and the next approaching drum rotated bag station reaches location C, both of the front and rear clamps 456 and 458 will simultaneously snap closed over the front and rear corners of the folded but not sewn upper edge of a bag. Bearing in mind that the drum is continually rotating, the clamps will now securely hold and carry the single bag 70 in a counterclockwise direction as indicated by the arrows from locations C through I.

As the gripped bag passes from pick-up location C to location D, front clamp assembly 456 shifts toward the rear clamp assembly, bowing the bag 70d and at the same time a suction cup bag opener assembly 462 on that specific bag hanger station operates to move two vacuum cups toward each other to grip the two walls of the upper end of the bowed bag and then move apart, pulling the upper bag end to an open condition as illustrated at location E. At location E, the bag 70e is now opened and a material dispensing bag filler nozzle drops down into the upper open end of bag 70e.

As the gripped open bag 70f, with filler nozzle inserted, passes location F, a sensing device determines whether a bag is in the clamps. If a bag 70f is in position, a predetermined quantity of material will be dispensed into a drum hopper above and associated with the bag station and, through the discharge nozzle, into the bag 70f as the bag progresses on from location F to location G.

At location G, sufficient time has elapsed from the actual dispensing location F for the material to descend through the hopper and nozzle, filling of the bag 70g is completed and it progresses over a first settler or vibrator table at location H, which imparts initial agitation for the material now in the bag 70h and assures that it settles below and away from interference with the upper end of the bag while the nozzle is still in the bag. This action enables proper closing of the two sides of the upper end of that bag when it reaches location I. Between locations H and I the front and rear clamps are permitted to move apart and the discharge spout or nozzle is withdrawn

from the upper open end of the bag. Accordingly, when the bag 70i reaches location I the material which was introduced into the bag has been settled below the top of the bag, the spout has been removed from within the upper end of the bag and the forward clamps 456 shifted away from the rearward clamps 458 with the result that the upper open end of the bag has been drawn together in an aligned closed position as was true in location C.

As the filled bag 70i passes from location I through location J it, with its holder, is rotated about an offset vertical pivot axis in a clockwise direction, causing the forward clamps 456 to swing to a leading position and placing the bag 70j in a tangential position, relative to the rotational movement of the drum assembly. In a tangential disposition, bag 70k is passed through a second group of material settlers (including side patters) at location K which causes further settling of the material and a flat shaping of the bag 70k.

The bag 70k, still clamped on the drum, then passes tangentially to location L at which point there is an additional small increment of clockwise rotation of the bag 70e to swing the leading edge clamp assembly 456 slightly outwardly, the leading edge of bag 70e being immediately gripped just below the clamp assembly 456 by a dual belt transfer conveyor which provides entrance to assembly 66, the leading edge clamp assembly being simultaneously opened to release the leading edge of the bag 70e. Simultaneously with release of the leading edge clamp assembly, the bag holding device quickly pivots back counterclockwise to its previous tangential position while the upper edge of the bag 70e is passing into and being progressively gripped between the transfer conveyor dual belts, as will be explained more fully hereinafter. During the transfer between conveyors, there is a further small increment of counterclockwise rotation of the bag holder to swing the rear clamp assembly 458 outward which will add a slight increment movement to the rear end of the top of the bag 70m to avoid placing stress on the bag which is now being fed through and by the dual belt transfer conveyor. As illustrated, and as is conventional with previously known dual belt conveyors which carry a bag through a sewing machine station, the path of movement of the bag while in the belt conveyor is linear. However if necessary it could be slightly arcuate. As the rear clamp assembly 458 swings out it is opened, the rear corner of bag 70m is released and the bag is now fully gripped and being entirely carried by the dual belt transfer conveyor of assembly 66.

At this position in the rotation of the drum assembly, several other mechanical operations in the bag holder linkage occur and will be described hereinafter. However, as indicated at location M', both of the clamp assemblies are now open and the bag holding station undergoes a pivotal swing of 90° counterclockwise so the bag clamps will be in radial position, as they progress toward the pickup station C, to receive a new single bag. In the exemplary structure, there are eighteen such bag holding stations located on the drum assembly 64, it being understood that the number of such stations can be varied.

The dual belt transfer conveyor of assembly 66 now carries the bag toward a sewing station N at which point a length of tape is folded over the upper linear closed end of the filling bag 70m and the sewing machine automatically stitches and securely closes the end of the bag with the folded tape and stitched threads and the tape and threads are cut as the terminal end of the bag is sewn. After the bag passes through and away from sewing machine location N, it is resting on a belt conveyor at location O which can lead to further conveyors for carrying the bags 70o to storage locations.

The foregoing description will provide a general understanding of the operations which are successively, automatically accomplished as a bag progresses through the machine. This description now proceeds to specific structural details of the various assemblies and compo-

nents of the assemblies. In describing such details, the manner of handling of the bag and the inner-related operation of the structural components will be more specifically described, and for convenient correlation the following description will progress in essentially the same order as the bag flow path explained in the foregoing general description.

Bag magazine and singling assembly

Shown in FIGURES 1, 3 and 4, the complete machine 60 is assembled around and in part supported on a solid base 72 which may be made from reinforced concrete or as a built-up construction of metal plates. Vertical angle beams 74 joined by horizontal beams 76 and 78 (FIGURE 1) together with suitable cross braces provide a rectangular support structure surrounding the drum assembly 64. Additional structural beams 80 and 82 provide tie-in structure which aids in supporting and bracing the sewing machine and dual belt transfer conveyor assembly 66. Some of the bracing support for the bag magazine and associated mechanism is furnished by the front set of vertical beams 74 and connections through cross-beams 76 and 78.

The general arrangement of the bag magazine and singling assembly 62 is depicted in FIGURES 1, 4 and 5, with specific detail construction of the assembly and operating components illustrated in enlarged detail FIGURES 6-11, which will be specifically referred to as the description progresses.

With specific reference to FIGURE 5, and general reference to FIGURES 1 and 4, a horizontal bag magazine table 84 is rigidly secured, as by bolts or welding, to the front vertical support beams 74. Rigidly fastened under the table 84 is a support platform 86 which mounts the magazine conveyor electric drive motor 88 and a speed reduction transmission 90 (see also FIGURE 10). At each end of the magazine table 84, parallel pulley sheave axles 92 are journaled in suitable bearings on horizontal axes. Only one of the axles 92 can be seen in FIGURE 5. The other axle, located at the left end of table 84, is similar in construction but carries a sprocket tooth wheel in addition to three pulley sheaves aligned with respective ones of the three sheaves 94, 95 and 96 seen in FIGURE 5. The wheel with sprocket teeth, non-rotatable on the other axle, is connected by a link drive chain 97 (FIGURES 4 and 10) to the output of the speed reduction transmission 90. In lieu of a chain and sprocket drive, the conveyor magazine drive may consist of a belt and pulley wheels. Thus, when magazine conveyor motor 88 is energized it will provide drive rotation through the transmission 90 to the left-hand axle, and slowly drives three V-belts 98, 99 and 100 which pass over and around the three aligned sets of pulley sheaves on the two axles. Clearly shown in FIGURE 5, the upper parallel stretches of the three V-belts 98, 99 and 100 extend horizontally across the top of the magazine table 84 from right to left and provide a very slowly moving, track type horizontal conveyor. The three belts 98, 99 and 100 are made from a material which has a high coefficient of friction, such as a composition rubber and fabric reinforced, if desired, with wire cores.

Bags 70 (FIGURE 4) are initially placed on top of the magazine table 84 in a vertical aligned and horizontally stacked disposition. Note, the bags are slightly inclined toward the left-hand side of the magazine 62 and are maintained in this position by an elongate metal bar 102 pivotally secured at its lower end to a heavy weighted block 104. Although the weighted block is not shown in FIGURE 5, the two tracks 106 and 108, which can be screwed or welded to the magazine table 84 with their upper surfaces disposed slightly below the height of the belts 98, 99, 100, will serve as a guide for the weighted block 104 which can be manually shifted along the table to accommodate the number of bags on table 84. The pivoted iron bar 102 has sufficient weight to place a small force against

the upper ends of the stack of bags to prevent them from flopping backward as the lower ends of the bags are moved toward the left by the slowly moving conveyor belts 98, 99 and 100. The V belts 98, 99 and 100 slowly move the entire stack of bags 70 forward until the front bag is pressing against the left-hand end of the magazine.

Limit controls are provided which, when the main controls are "on," will automatically stop and start the magazine conveyor motor 88 depending upon the position of the entire stack of bags and the pressure of bags at the end of the bag magazine. The control circuit to the magazine drive motor 88 includes a switch S14 (FIGURE 7) which is actuated by a lever arm 112 secured on a rock shaft 114 to which are connected two trip fingers 118 seen at the end of table 84 in FIGURE 5. As the bags are slowly moved forward by the V belts 98, 99, and 100, the lower ends of the bags 70 apply pressure to the trip fingers 118 which can be forced slightly to the left to rock the shaft 114 (FIGURE 7) moving lever 112 against the action of compression spring 120 to operate the control switch S14 and, through circuitry described hereinafter, turn off the electric power supply to the belt drive motor 88. When sufficient bags 70 have been singly removed from the left-hand end of the magazine 62 to relieve the pressure on trip fingers 118, spring 120 forces lever 112 against switch S14 which is actuated to automatically start the magazine motor 88, causing further leftward movement of the supply of bags in the magazine.

Any suitable, commercially available speed reduction transmission 90 can be utilized in the drive train for the magazine conveyor, however it should be adjustable to enable selective variations in the rate of feed in the bag magazine such that a continuous overall machine operation can be obtained with an adequate supply of bags being maintained at the end of the bag magazine table 84 ready for single selection and injection into the rotary drum assembly 64.

Side edge alignment of the stack of bags 70 being fed across the bag magazine table is assured by the horizontally planar aspect of the upper stretches of the three V belts 98, 99 and 100, and engagement by the vertical rear edges of the stack of bags against the two smooth guide rods 122 and 124. A bag kicker or ram 126, more clearly seen in FIGURE 6 assures exact alignment of the bags adjacent the singling mechanism. Ram 126 is a rubber bumper on the end of a piston rod of a small reciprocating air motor 128. By means of ram 126 an abrupt ram pressure is applied to the front edges of several of the leading bags in the magazine, forcing such bags back against the guide rods 122 and 124. The ram operates each time a bag is removed from the front end of the stack.

A wire feeler 130, shown in FIGURE 5 just above the lower guide rod 124, is attached to a safety switch S34 in the magazine motor control circuit. So long as bags are present in the magazine, the wire feeler 130 will be swung clockwise to a position which maintains the safety switch S34 tripped and enables magazine operation. However, as soon as the magazine is depleted of bags, the wire feeler 130 can shift counterclockwise enabling operating of safety switch S34 to "off" which will cut off the power to the magazine components. This wire feeler safety switch can be deleted if desired, and switch S34 made into a manual switch.

The forward position of the front bags in the bag magazine 62 will be determined by the first bag 70 pressing against the front upper plate 136 (seen in FIGURE 5) and by the lower edge of the first bag pressing against the two trip fingers 118. Front plate 136, if desired, can be replaced by an idler roller 137 shown in dotted lines in FIGURE 5. The bags are removed one at a time and passed downwardly into a narrow horizontal carriage frame which is operable to shift the bag horizontally to a position for pick-up by the rotating drum assembly. Should the bag limiting plate 136 at the front of the maga-

zine be installed, it may be covered by a sheet of low friction smooth plastic, such as Teflon, which has an effective self-lubricant action and eliminates resistance to sliding of the bags downwardly over its surface.

Removal of single bag from magazine

The mechanism for removing single bags from the front of the magazine table 84 and passing them downwardly into the horizontal carriage will be described with reference to FIGURES 5-8 and 10, although FIGURES 5 and 7 are the primary figures utilized in this portion of the description. Seen in FIGURE 5 are two steel rollers 140 and 142. Roller 140 is fixed on an axle 144 (FIGURE 7) which is journaled on a fixed axis between two vertical support plates 146 and 147. Shown in FIGURE 7, the upper roller axle 144 projects through the front support plate 146 and has fixed thereto a driven pulley 148. Returning to FIGURE 5, the upper portion of the lower roller 142 can be seen positioned just beyond the two trip fingers 118. The axle of lower roller 142 is journaled in sliding bearing blocks which are guided for vertical shifting movement in two side tracks 150 and 152. A portion of one of the shiftable bearing blocks 149 can be seen in FIGURE 6. The front and rear roller guide tracks 150 and 152 are secured respectively to the inner sides of the vertical support plates 146 and 147 and provide vertical tracks enabling the lower roller 142 to be raised and lowered into and away from rolling contact with driven roller 140. Each track 150 and 152 is secured on a fixed pivot at its lower end and at its upper end is secured by a headed stud 154 which passes through a small arcuate slot 156, an arrangement enabling a slight shifting movement of the roller tracks when the lower roller is forced into engagement with, or presses a bag against, the upper roller 140. The upper ends of both tracks 150 and 152 are biased by a compression spring assembly 158 (FIGURE 5) in a direction toward the upper roller 140. Although not shown, a support yoke, on the under side of the roller 142 and secured to the two sliding bearing blocks 149, is connected to a two-way reciprocating air motor 160, a portion of which may be seen in FIGURES 5 and 10, located under the left hand end of table 84. The lower end of motor 160 is secured by a pivot bracket fastened to the bottom support platform 86. By suitable controls, as will be described, the air motor 160 can be energized to rapidly shift the lower pinch roller 142 upwardly into spring biased rolling engagement against and in front of the driven roller 140, and subsequently shift the lower roller back down again.

Immediately behind the lower shiftable roller 142 (seen in FIGURES 5 and 8) is a plate 162 providing a guiding wall for the single bags as they are passed downwardly into the horizontal carriage. Wall plate 162 is a sheet metal plate seen in FIGURE 8. Also seen in both FIGURE 8 and FIGURE 5 are several upstanding limit fingers 164, located at intervals across and integral with the top edge of the guide plate 162. Fingers 164 are limit abutments which determine the limit position of the lower edge of a singled bag when its lower end is pulled past the aforescribed trip fingers 118 and over to the left of the downwardly retracted lower roller 142.

A single folded bag is removed from the magazine stack by means of a swinging bag picker, incorporating two rubber suction cups 170, clearly shown in FIGURE 5. Suction cups 170 are connected by flexible lines 172 through suitable filter components to the suction side of an air pump 174 mounted on a small platform secured above the two vertical side plates 146 and 147 and the suction cups 170 are fastened to a cross arm 176 at the lower end of two curved lever arms 177 and 178. The two bag picker lever arms can be seen in FIGURE 8 with their upper ends fixedly secured to a rock shaft 180 journaled between the two vertical plates 146 and 147. One end of rock shaft projects through the front vertical

support plate 146 and secured on that end is a rocking lever 182, shown in FIGURE 7. The bag picking bail, constituted by the suction cup cross arm 176, the two lever arms 177 and 178 and rock shaft 180 is operated by a two-way air motor 184 shown in FIGURE 7. The upper end of air motor 184 is pivotally secured to the support plate 146 and its piston rod 186 extends downwardly and is pivotally connected to the end of the rock shaft lever arm 182. Lever arm 182 has affixed thereon, two switch operating lugs 188 and 190 which actuate switches S15 and S22 (FIGURE 7) to provide sequential operation of components in a manner as will be hereinafter described.

Also shown in FIGURE 7 is a portion of the drive transmission to the upper pinch roller 140. This transmission includes an electric motor 192 (seen in FIGURE 8) which drives, through a belt 193, a speed reduction transmission 194, the output of which drives a second belt 196 passing around the driven pinch roll pulley 148 on the end of the upper roller axle 144. When the main bag machine 60 is turned on, and bags are in the magazine, the pinch roller electric motor 192 is energized and hence the upper pinch roller 140 will be continually rotating. Note, the lower roller 142 is not power driven but is freely rotatable in its bearing blocks, and when the lower roller is forced upwardly to press a folded bag against the power driven upper roller, both rollers will rotate.

With reference now to FIGURES 5, 7 and 8, each time a single bag is removed from the magazine, the following sequence of operations occur: the suction cup operating pneumatic motor 184 is energized in a direction to retract its piston and pull piston rod 186 upwardly, moving lever arm 182 and the suction cup bail in a counterclockwise direction. The two suction cups 170 are thus swung forward between the upper roller 140 and the lower roller 142 to press against the front or left-most bag in the magazine. Suction is simultaneously applied to lines 172 with the result that the two cups 170 grip the wall of the front bag 70 near its lower end. The suction application to lines 172 is controlled by means of solenoid controlled valve units SOL2 and SOL16, shown in FIGURE 8, near the upper right-hand corner with an additional solenoid operated valve SOL17. When the suction cup bail is swung into bag pick-up position, the counterclockwise movement of bail operating lever 182 via its front end, switch operating lug 188 engages a roller operator 204 on vacuum control switch S15 (FIGURE 7) just prior to engagement of the second operating lug 190 with the operator of a bail cycle switch S22. Switch S15 energizes the solenoid controlled vacuum line valve SOL2 so that just as the vacuum cups 170 come in contact with the front bag, suction is applied through the lines 172 to the suction cups 170.

On the return cycle of the suction cup bail, switch S15 returns to its original position as lever 182 moves to its retract position and removes the suction from the two suction cups 170 by deenergizing the solenoid controlled valve SOL2 and energizing solenoid controlled valve SOL16, which cuts off the suction and simultaneously connects the suction cup lines 172 to an atmospheric exhaust port.

This suction gripping action occurs at the forward end of the arc of swing of the suction cup bail at which point, the second switch operating lug 190 on the bail rocking lever arm 182 engages a cycle switch S22 (FIGURE 7) which energizes a solenoid controlled pneumatic control valve SOL9 located at the upper end of the bail rocking air motor 184 to reverse its input and output connections and immediately reversing its direction of operation, i.e., extending the piston rod 186. This motor operation will rock the suction cup bail clockwise, away from a position between the two rollers 140 and 142. As the bag picker bail draws backward, the lower portion of the leading folded bag, held by the suction in cups 170, is pulled back with the bail, so the lower edge of the bag will flip over

and past the two trip fingers 118 to a position abutting the upper limit fingers 164 on back wall 162. As will be appreciated, this singling operation results in the lower portion of a single bag being pulled across the tracks to a position against the forward part of the driven roller 140 and behind the vertical tracks 150 and 152 of the shiftable lower roller 142.

Various timers and relays and other circuitry are included in a control box 210 seen at the upper part of FIGURE 5 and will be described in detail with reference to the circuit diagrams. However, one of the timers T3 (FIGURE 40D) which controls a solenoid operated valve SOL4 located under the magazine table 84 (FIGURE 5) to reverse the lower pinch roller air motor 160 is energized along with energizing of solenoid operated valve SOL8 to activate cylinder 160 and send the lower roller 142 up along its floating tracks 150 and 152, pressing the single bag which has pulled away from the magazine by suction cups 170, against the powered upper roller 140 which is rotating in the direction of the arrow in FIGURE 5. The resultant pinch roller rolling action forces the single folded bag to slide downwardly from adjacent the end of the magazine. The time period during which lower roller 142 is in the up position is controlled by the aforementioned timer T3 and when the prescribed time period for sliding a bag down to the horizontal carriage was elapsed, solenoid control valve SOL4 will reverse the connections to air motor 160 and bring lower roller 142 back down to its rest position. The initiation of the aforementioned roller operation is controlled by the horizontal carriage moving to a position to receive the downwardly shifted bag. As will be described, the horizontal carriage in moving to a bag receiving position, trips a roller lift and timer control switch S19 shown in FIGURE 8.

In FIGURE 8, located to the left and right of the pinch roller lift control switch S19 are two other control switches S18 and S20. Switch S20 is operated to close the bag holding gate, which will be presently described, and switch S18 is actuated when the horizontal bag carriage reaches its limit position whereat the bag can be picked up by the rotating drum assembly. Switch S18 serves as a reversing switch for the horizontal magazine cylinder actuation.

Shown in FIGURE 6 is a switch S21 having an extended roller operator arm 222. Switch S21, a two-position switch, is an override safety switch which through appropriate circuitry, normally prohibits operation of the suction cup bail to engage a new bag and completes a circuit to the pinch roller retract timer circuit, whenever the lower roller 142 moves to its up position engaging a selected bag against the powered roller 140. Whenever the roller 142 moves down, switch S21 is momentarily conditioned against spring bias to start a cycle of bail operation, a circuit being made to energize the bail motor solenoid control valve SOL9 which also momentarily energizes solenoid control valve SOL17 to momentarily direct a shot of air pressure into the spring loaded air cylinder motor 128 of the bag end ram 126 to force the front several bags into alignment against the two guide rods 122 and 124 each time a bag is removed from the magazine. As has been previously described the bag singling bail will automatically complete its cycle.

The horizontal bag carriage will be described with reference to FIGURES 8-11. In FIGURE 8 the location of a bag 70b, just after the rollers have slid the bag down from the magazine into the horizontal carriage is illustrated in dotted lines. At this instant the lower closed end of the bag 70b is abutted against a narrow bar track 230 which serves as the closed bottom end of a thin flat chamber the rear wall of which is provided by the aforedescribed plate 162. Bar track 230 is adjustable so it can be raised or lowered to accommodate various lengths of bags. The front wall of this flat chamber is provided by a vertical plate 232 shown in FIGURE 10. The aforedescribed rear wall 162, is located in a vertical plane and

projects radially toward the axis of the rotating drum assembly. As shown in FIGURE 8, the end of wall 162 is stepped and extends to a position under the path of movement of the bag holding stations on the drum assembly 64. However, the front wall 232 of the horizontal bag carriage chamber, as shown in FIGURE 10, terminates adjacent the outer periphery of the rotating drum assembly so that the forward side of the bag holding chamber which is directly under the drum assembly is open. The chamber construction permits a bag 70b to be slid along the bottom track 230 radially into the position shown by bag 70c where it can be picked up by a bag holding station on the rotating drum assembly and thence carried with the drum away from the horizontal carriage chamber.

Shown in FIGURE 8, the operator for the horizontal carriage is a long stroke, reciprocating air motor 236 secured, for horizontal extension of its piston rod 238, on an angle bracket strip 240 which, in turn, is rigidly fastened to the rear wall 162 of the flat bag chamber. The piston rod 238 is shown in extended position and a bag has been slid down into the flat chamber. Secured to the end of the piston rod 238 by means of studs extending horizontally through a guide slot 242 in plate 162 is a flat vertical pusher bar 244 (shown in dotted lines) disposed between the rear wall 162 and front wall 232 of the flat bag chamber. Also secured on the end of piston rod 238 is a switch operating trip cam 246 which is used to operate the three aforescribed switches S19, S20 and S18. When air motor 236 is energized to reciprocate its piston rod 238 into the cylinder, the pusher bar 244 is pulled to the left, engaging the vertical edge of a bag 70b located in the flat chamber and sliding the folded bag along the lower track 230 into the position of bag 70c, shown in FIGURE 10, for pick-up by the drum assembly. Immediately upon the horizontal sliding of a bag to pickup position, as in FIGURE 10, the horizontal carriage motor 234 is reversed by tripping of switch S18, which extends the piston rod to move the pusher bar back to a position enabling receiving of another bag from the magazine. This movement leaves the bag in a pickup position, the upper end of one such bag 70c being shown in FIGURE 8. While in pickup position, and before actual pickup by the drum conveyor 64, the bag is retained in its vertical position by a swinging gate assembly.

The gate assembly is shown in FIGURES 10 and 11 and consists of dual sets of holding fingers 250 and 252. Holding fingers 250 are secured by set screws to a vertically journaled shaft 254 while the other set of fingers 252 are similarly secured to a vertical journaled shaft 256. Both shafts are capable of being rocked, in opposite directions, about an approximate 90° arc of rotation by means of associated air motors 258 and 260 located on suitably fixed brackets at either side of the bag pickup position. Note: in FIGURE 10 the piston rods of the two air motors 258 and 260 are in an extended condition and have rocked the two shafts 256 and 254 to a gate closed condition where the fingers 250 and 252 lightly engage and press a pick-up positioned bag 70c against the rear wall 162 until such time as the upper end of the bag has been gripped by the clamps of a bag holding station on the rotating drum assembly. Additional spring leaves 251 can be added to fingers 250 and 252 to resiliently engage the bag 70c, if desired. FIGURE 11 illustrates the gate fingers 250 and 252 in the process of being rocked away from holding a bag, a gate opening action which occurs approximately simultaneously with the gripping of a bag by a clamping station on the drum assembly.

The rate at which bags are placed in the pickup position should be sufficient to assure that, if the storage magazine is full, a bag will always be in place at pick-up as a bag holder on the drum assembly 64 moves past the pick-up station and clamps and carries a bag on through the sequence of steps accomplished by the drum assembly.

The operation of the aforescribed bag magazine dispensing and horizontal carriage mechanism is initiated by a plurality of trip lugs located around the top periphery of the drum assembly 64, as shown in FIGURE 3, one such lug being associated with each bag holding station on the drum assembly 64. One of these lugs 262 can be seen in FIGURE 9, being illustrated as secured, for a slight adjustment, to the upper rim of the drum assembly. During continuous rotation of the drum assembly, as each of the bag holding station indicating lugs 262 moves past the empty bag pickup position it will sequentially actuate a first switch S16 and then a second switch S17. When the first switch S16 is actuated, a set of drum assembly bag clamps is approaching but has not reached the pickup station.

Referring to FIGURES 9 and 8, tripping of the switch S16 operates a solenoid control valve SOL3 (FIGURE 8), causing operation of the horizontal air motor 236 to retract its piston rod 238 and place a bag 70 into pickup position as has been just described. During this horizontal retraction movement of the horizontal carriage piston rod 238, the cam trip 246 on the end of the piston rod first actuates switch S20 and just before reaching the end of its stroke will slip pass the roller operator of switch S19, without effecting its operation. When the piston rod 238 reaches the end of its travel the cam trip 246 actuates switch S18. The circuit controlled by switch S20 energizes solenoid control valves SOL6 and SOL11 for the bag gate control cylinders 258 and 260, causing the bag gate fingers 250 and 252 to close by the time the carriage reaches its retract position, and the gate will hold the now positioned bag 70c in vertical disposition. As the piston rod 238 reaches the end limit of its stroke, the cam trip 246 will actuate the aforesaid third switch S18 and, as has been previously described, operation of switch S18 results in a reversal of the bag carriage motor. As the carriage motor piston rod 238 is moved again to its extended position the cam trip 246 first passes the roller operator of switch S19, and this direction of movement will cause switch S19 to be now actuated, however, as the cam trip 246 moves past the switch S20, that switch will not be actuated. When switch S19 is actuated, it initiates the circuits and the timer which controls cycling of the lower pinch roller up to press a single bag against the rotating upper roller to shift that bag down into the horizontal carriage chamber in front of the pusher bar 244 and then bringing roller 142 back down. When roller 142 shifts back down, it causes actuation of switch S21 to initiate a cycle of operation of the bag singling bail. At this stage, the cycle of the magazine and horizontal carriage assembly is completed, a bag has been singled by the bail and awaits downward shift, a bag 70b is in position in the carriage waiting to be moved to a pickup position when the next drum station indicating lug 262 actuates switch S16, and a bag 70c, as shown in FIGURE 10, is in position to be picked up by the drum assembly holder station which caused the preceding actuation of switch S16.

Returning to FIGURE 9, and bearing in mind that the drum assembly has continued to rotate during the aforescribed magazine and carriage cycle, it will be apparent that the drum holding station lug 262 after operating the switch S16, will be approaching contact with the operator of switch S17. By means of controls provided for each individual station on the drum assembly 64, as will be further described hereinafter, the upper end of the bag 70c which is in location at the pickup station will be gripped near the two corners by a set of clamps associated with an individual holding station on the drum assembly. Substantially simultaneously with the gripping of the upper end of the bag the aforesaid station position lug 262 will actuate the second switch S17 which controls a circuit to reverse solenoid control valves SOL10 and SOL12 of the bag holding gate motors 258 and 260,

causing those two motors to retract their piston rods, which actuation is occurring in FIGURE 11, to remove the two sets of fingers 250 and 252 from in front of the bag which is now clamped at its upper edge by a drum holding station.

As succeeding bag holding stations on the drum assembly approach the pickup station, associated station position lugs 262 on the drum will trip the horizontal cylinder actuating switch 264 causing the bag magazine and horizontal carriage assembly to cycle through a complete operation, as has been described hereinbefore.

Drum assembly

The rotating drum assembly 64 is supported on base 72 and is located within the rectangular frame work of vertical beams 74 and horizontal beams 76 and 78 shown in FIGURES 1 and 3. The rotating drum 280 is rigidly secured to a vertical axle shaft 282 shown in FIGURE 3a, the drum 280 being situated above a stationary cylindrical housing 284 which enclosed the shaft support bearings and also provides a fixed mounting for a plurality of cam tracks which will be hereinafter described.

Drum 280 could be rotatably supported in any desired manner, for example by a rotatably journaled shaft and external support rollers as disclosed in the aforementioned application, however, in the exemplary embodiment the rotating drum 280 is supported substantially entirely by its axle shaft 282 in the manner shown somewhat diagrammatically in FIGURE 3a, although external balance rollers, such as rollers 281, shown in FIGURES 16 and 17 can be utilized as desired. Located inside of the stationary housing 284, the lower end of drum axle 282 fits against a bearing 285 in a roller thrust bearing socket 286 secured by bolts to the machine base 72. Surrounding the axle 282 and resting on the thrust bearing socket 286 is a cylindrical sleeve 288 the upper end of which serves to help axially support a second journal bearing 290 secured to the top wall 294 of the fixed housing 284. Secured to axle shaft 282 and resting on the journal bearing 290 is a thrust collar 292. Shaft 282 extends through bearing 290, and the upper wall 294 of housing 284 and projects on through the lower wall 296 of the drum 280. A flange collar 298, bolted to the lower drum wall 296 and pinned to axle shaft 282 rigidly secures the drum 280 to the axle shaft 282. An access door 300, shown in FIGURE 3, in the stationary housing 284 permits access to the interior in order to lubricate the axle shaft bearings 286 and 290.

In FIGURE 1, the top of the rotating drum 280 is shown. Drum 280 is fabricated with two concentric cylindrical walls 302 and 304 providing an annular space divided by partition walls into a plurality of hopper shaped receptacles 306. Construction of hoppers 306 is with trapezoidal shaped plates in a manner similar to that described for the drum in the aforementioned application. The two cylindrical walls 302 and 304 and the hopper plates are welded into an integral extremity rigid construction with the aforescribed bottom plate 296 of the rotating drum extending to adjoin the lower edge of the outer wall 302 and being welded thereto. The discharge opening of each of the hoppers 306 aligns with an associated opening in the lower plate 296, the plates which form each hopper being welded to lower plate 296 adjacent the opening 308. Hopper openings 308 will be referred to hereinafter relative to the description of the various components associated with each hopper station.

A circular plate 310, dimensioned to fit within and in engagement with the inner drum wall 304, is welded thereto and constitutes the upper wall of the drum. Wall 304 is centrally apertured and encircles the axle shaft 282, being secured thereto by a flanged collar similar to the collar 298 which connects axle shaft 282 to the drum bottom plate 296. Although not shown, radial reinforcing beams are secured to the interior sides of the drum bottom plate 296 and the upper drum wall 310 to provide

rigidity and strength for the drum 280. An access door 312 in the upper drum wall 310 permits entrance to the interior of the drum for servicing electric and pneumatic lines.

Drum axle shaft 282 projects through and beyond the upper drum wall 310 and through a large diameter multiple sheave pulley wheel 316 which is rigidly secured to the upper wall 310 by clamping brackets 318 which embrace each of the pulley wheel arms 320 adjacent the rim of the pulley wheel and are bolted to the top wall 310. The drive power for rotating drum 280 is imparted by belts through the rim of pulley wheel 316 and, in effect, directly from the pulley rim to the drum wall 310, rather than through the pulley wheel's arms to the hub to the axle shaft 282, by means of clamps 318 to eliminate high torsional strain at the connection between the pulley wheel hub and the axle shaft. A drum vacuum pump 314 driven by motor M1 is mounted above the drum 280 on cross braces 80 and connects to vacuum line 326.

Embracing the upper end of the axle shaft 282, and supported by suitable braces connected to beams 76, is a combination electrical and pneumatic commutator unit 322 enabling, through electrical slip rings, the introduction of electrical power lines through conduits 324 to the drum interior and the communication of an air suction line 774 from the drum interior to suction line 326 to the vacuum pump 314. An external supply of air under pressure from a conduit 327 is introduced through a second pneumatic commutator 328, FIGURE 3A, in shaft 282 below the drum, and connects to a high pressure conduit 796, referred to hereinafter. The electrical power lines to the interior of drum 280 are utilized to operate various solenoids at each bag holding station, as will be described. The suction is used for the bag opening function and the high pressure air is utilized to operate various air motors located at each bag holding station.

The external electrical conduit 324 located on the structure support beams 76 also provides power and control connections to the drum drive motor 330 which, through a pulley and belt connection 332, drives a speed reduction transmission 334. The motor 330 and reduction transmission 334 are supported on a platform secured by suitable angle brackets to the upper support beams 78 and 76 with the output drive shaft 336 of the reduction transmission 334 projected downwardly as shown in FIGURE 3. Although not shown, a multiple sheave small diameter drive pulley is non-rotatably secured to the lower end of the transmission output shaft 336 and, by means of the belts 338 shown in FIGURE 1, provides the rotational force imparted through the aforescribed driven pulley wheel 316 to rotate drum 280. By making adjustments in the speed reduction transmission 334 the rotational speed of the drum can be varied. Desirably, it will be in the order of from $\frac{1}{2}$ to two (2) revolutions per minute. The exemplary embodiment include 18 hoppers and thus, if the rotation is two revolutions per minute, the machine can completely and automatically fill and process 36 bags per minute. This rate requires the bag magazine and singling assembly 62 to accomplish an operational cycle within approximately $1\frac{1}{2}$ seconds.

Bag filling station

Each of the drum hoppers 306 represents the inlet to a bag filling station on the rotating drum 280 and each bag filling station includes identical mechanisms, operating components, controls and operators for the controls. Accordingly, such units will only be described for one station.

Referring to FIGURE 3, below each hopper 306, a bag filling station includes a spout inserter 340 and a bag hanger assembly 342. Some of the operations for each of these stations, as they pass specific points during drum rotation, occur mechanically by means of cam actuation, as will be hereinafter described. Other operations are pneumatic, either pressure or suction, the pneumatic operation for each station being controlled by means of a

group of solenoid operated valves, electric switches and switch operators located on the exterior of drum 280 above each of the bag stations. The aforementioned groups of components are situated within an annular shell or ring wall which encircles the drum 280, the cylindrical exterior portion of the ring being fabricated from a plurality of panel plates 344 held by quick release fasteners to enable access for repair, replacement and servicing of various control and operator components associated with that station.

Near the upper edge of each plate 344 a micro-switch operating button 346 can be seen projecting through a hole in its associated plate 344. Switch button 346 controls an SPST switch S-31 (FIGURES 19, 21 and 38) spring loaded to "off" and controlling application of suction to the bag opener assembly, as will be hereinafter described. Below the switch button 346 are located an upper L-shaped switch operator 348 and a similar L-shaped lower switch operator 350. Small rollers are secured on the ends of each arm of the L-shaped operators 348 and 350, the operators constituting dual position actuators for two-position switches S-32 and S-33 (FIGURES 19, 21 and 40) which control the bag end clamps on the associated bag hanger. When the switch arms 348 and 350 are positioned as shown in FIGURE 3 the hanger clamps are closed, however, when these arms are positioned as shown in FIGURE 8 the hanger clamps are opened.

A little above the center of FIGURE 8, the ends of two trip fingers 352 and 354 are shown extending toward the drum, being secured in substantial vertical alignment to the inner wall 147 of the bag magazine. Trip fingers 352 and 354 are respectively located in the paths of rotation of the lower rollers of the upper and lower L-shaped switch arms 348 and 350. As the drum 280 rotates a bag holder station toward the bag pickup position, the lower rollers of both switch arms 348 and 350 associated with that holding station come into engagement with the tripping fingers 352 and 354 at the same instant that the aforescribed gate opening switch S17 (FIGURE 9) is engaged by the bag station trip lug 262. Rotation of the drum forces the two switch arms 348 and 350 to be rotated past a spring loaded dead center condition and the associated switches S-32 and S-33 are snapped to their opposite condition, represented by all switch operators 348 and 350 shown in FIGURE 3. By controls to be described, this action causes immediate closing of the bag gripping clamps. Simultaneously, at this point the associated station lug 262 seen in FIGURE 9, has closed switch S17 to open the bag holding gate, permitting the bag which is now clamped on a drum bag station to be carried away from the bag magazine. If desired, switch button 346 can be replaced by an L-shaped operator 346' (such as depicted in FIGURE 21) with a suitable double throw switch.

FIGURE 19 is an enlarged view illustrating the station control components which are located under the panel shell 344 above each bag holding station. Although the panel 344 is removed in this figure the two L-shaped operators 348 and 350 are shown attached to the rotary operating shafts of their associated switches S-32 and S-33, and the push button 346 is shown for the vacuum control switch S-31. Note, push button 346 is part of the vacuum control switch S-31 which controls the circuit to energize vacuum control solenoid valve SOL13. The upper L-shaped operator 348 is connected to the operating shaft of 2-position switch S-32 which controls a circuit for energizing a solenoid controlled 4-way valve SOL14 whereas the lower L-switch operator 350 is connected to the operating shaft of a 2-position switch S-33 which controls a second circuit for energizing a solenoid controlled 4-way valve SOL15. The two solenoid controlled valves SOL14 and SOL15 control the front and the rear bag end clamps, respectively on the associated bag hanger assembly, as will be hereinafter described. Suitable electric lines and pressure and vacuum conduits lead to the afore-

noted components from the interior of drum 280. The pneumatic circuits controlled by these various solenoid operated valves will be described more completely herein after with reference to FIGURE 21.

With temporary reference now to FIGURE 39, a portion of the underside of drum 280, as seen from below, is illustrated to show that below each hopper, a heavy metal plate 370 is rigidly fastened to the bottom plate 296 of drum 280. Plate 370 serves as an upper rigid support base from which the several mechanical bag holder station components are mounted. Each plate 370 includes an aperture, with a depending sleeve 372, aligned under the associated hopper opening 308, sleeve 372 serving to mount the upper end of a flexible cylindrical rubber boot 374 (illustrated by phantom lines in FIGURE 3). Radially inward of the boot sleeve 372 will be seen the flanged mounting cone 376 of the nozzle inserted assembly 340.

Both front and side views of the nozzle inserter assemblies 340 can be seen in FIGURE 3, the left and right-hand stations illustrating side views of the inserter assembly, and the remaining stations illustrating the front view. Enlarged details of the combination nozzle support and cam follower unit of an inserter assembly 340, are shown in FIGURE 27 which will be referred to in describing this assembly. However, many details of the inserter assemblies are also illustrated in FIGURES 12-18.

The elongate device seen in FIGURE 27 is the inserter raiser tube assembly 378 which includes an inner tubular shaft 380 with its upper end spigoted within the flanged upper mounting cone 376 and rigidly secured thereto by set screws 382. Inner shaft 380 is hollow to enclose a coil tension spring 384 having an upper end loop 386 anchored on a cross pin 388. Telescoped over the inside shaft 380 is an outer tube 390, the bore of which includes sleeve bearings 392 and 394 which reciprocally guide the outer tube 390 on the fixed inside shaft 380. Lower bearing 392 is maintained against a lower shoulder 396 in the outer tube 390 by a spacing sleeve 398, the upper sleeve bearing 394 and an upper end gland nut 399. The lower end of outer sleeve 390 is plugged by the spigot shank 400 of a roller clevis 402. Spigot shank 400 has an annular groove 404 holding an O ring 406 which seals the lower end of outer tube 390 and shank 400 is secured rigidly in the lower end by means of one or more set screws 408. A cross pin 410, located in a recess of the spigot shank 400 anchors the lower loop 412 of coiled tension spring 384.

Clevis 402 mounts a horizontal stub axle 414 to which is secured a large roller bearing 416, the latter serving as a cam follower roller. The strength of tension spring 384 is just sufficient to counterbalance the weight of the outer sleeve 390, clevis 402, roller 416 and other components, carried by the outer sleeve, which will now be described, so the inserter will, in essence, tend to stay wherever it is positioned up and down on the inner shaft 380. In any event, minimum force will be required to raise and lower the inserter. After assembly, a predetermined quantity of oil is placed inside of the two telescoped shafts 380 and 390 keeping bearings 392 and 394 lubricated and tending to damp any sudden telescoping action of the two members.

The upper portion of the slidable outer sleeve 390 is squared to provide convenient mounting surfaces for a sheet metal spout bracket 418, the bracket 418 being bent in a U-shaped configuration with the bracket arms projected radially outwardly and with the bight of the bracket around the upper end of outer shaft 390 and rigidly secured thereto by means of screws. Shown in FIGURE 3 the two arms 420 of bracket 418 project to positions on each side of the flexible rubber tube 374 which, as has been described, has its upper end connected to the discharge sleeve 372 around the associated hopper outlet 308. Between the inserter raiser tube unit 378 and the ends of arms 420, the arms 420 are con-

connected by a bridge member 422, the bridge member supporting a guide sleeve 424 (FIGURE 12) which in turn slidably receives a fixed vertically depending guide rod 426, the upper end of which is secured to a mounting plate bracket 428 which, as shown in FIGURE 39, is bolted to the station plate 370. Guide sleeve 424 and the guide rod 426 serve to maintain the shiftable tube 390 of the inserter raiser unit 378 non-rotatable relative to the inner shaft 380. This non-rotatable cooperation also maintains the axis of cam follower roller 416 radial with respect to the axis of the rotating drum.

Rigidly secured, as by screws (see FIGURE 14), to the lower ends of the outer portion of spout holding arms 420 is a circular metal plate 430 which is centrally apertured. Welded to the upper side of the plate and aligned with the plate aperture is a coupling sleeve 432, and depending from the bottom of the plate and aligned with the aperture is a spade shaped nozzle spout 434, the component which is lowered into an opened bag to enabling filling the bag. Sleeve 432 and spout 434 may be made from a single piece. The lower end of the flexible rubber tube 374 is clamped over the coupling sleeve 432 by a band clamp 435.

When the inserter shaft unit 378 is fully extended, i.e., lowered to its downward position by means of a cam track which will be described, the arms 420 also are lowered and lower the spade nozzle 434, which action concurrently extends the flexible tube 374 from a collapsed condition as shown in FIGURE 14 to its elongate position as shown in FIGURE 15. When the inserter shaft unit 378 is shifted back up to the retract spout condition, as is shown in the third station from the right-hand side of FIGURE 3 and in FIGURE 14, the arms and the spout 434 are raised toward the base of the drum 280, the rubber flexible tube 374 undergoing a plurality of folds as it collapses to permit the raising action.

A thick foam plastic annulus 436 fits over the discharge spout 434 in the manner of a collar and is bonded to the lower side of the spout plate 430 by suitable adhesive cement such as an epoxy resin. The foam plastic collar is pressed down on and is deformed around the stiff upper edges of a bag 70b whenever one of the spouts 434 is lowered into the open end of a bag 70 as it passes from position E to position F (FIGURE 2), thus sealing around the open bag end and preventing escape of material with which the bag is being filled, either in the form of dust or airborne particles. In conjunction with the feature of using collars made of deformable resilient material to seal against the open ends of the bags being filled, a hood can be arranged over the open upper ends of the hoppers around the drum annulus 280 in the manner of the evacuated hood shown and described in the aforementioned application.

The complete nozzle inserter assembly 340 is raised and lowered by means of the shiftable inserter tube unit 378, the follower roller 416 of which follows a cam track path which surrounds the support housing 284. The spout inserter cam track 438 is axial, although the diagrammatic layout shown in FIGURE 22 is radial, being constructed from shaped portions of angle iron 440, 442 and 444 with the several portions secured to the cylindrical walls of support 284 by gusset plates 446, as shown in FIGURE 3. The lower track 440 provides the limit position for the extended condition of the spout inserter assemblies 340 under which condition the nozzles are shiftable down and inserted into a bag, if a bag is located in the bag hanger associated with that nozzle. The flanged angle iron cam track section 442 is spaced from track portion 440 to enclose the follower roller and starts from an upper position approximately 20° from the pick-up location. It inclines downwardly to the location shown in FIGURE 3, and then continues horizontally for about 120° until the rise 445 of flanged intermediate angle iron portion 444 is approached. Thus,

as the drum rotates, the shiftable shaft follower roller 416 engages the under side of the entrance flange 447 on cam track 442 causing the roller to roll down toward the lower cam track 440 and extending the inserter assembly 378. As the drum continues rotating, the roller 416 passes the terminal end 449 of cam track 442 (which is near the rear of the machine as shown in FIGURES 3 and 16) and the roller engages the inclined cam rise 445 of cam track 444. Continued rotation of the drum forces the roller 416 up the rise 445 of track portion 444 shifting the inserter assembly 340 to its retracted position. The raised track portion 444 continues around the drum support 284 to a position 20° past the pick-up position where the roller 416 again engages the entrance 447 of cam track portion 442 and starts to again move the inserter assembly 340 to its extended position. While in extended position, the roller 416 is enclosed in a closed cam track to assure that the inserter does not inadvertently retract. The action of the spout insertion and retraction caused by coaction with the cam track 438 can be followed on the timing chart of FIGURE 20 as well as on the cam layout of FIGURE 22.

Bag station hanger assembly

The other major group of components at each hopper station on the drum 280 is the bag hanger assembly 342, the relationship of which to the associated station can be seen in FIGURE 3. Assembly details of a hanger assembly are shown in FIGURES 29 and 30. Each hanger assembly is mounted adjacent a filler nozzle inserter assembly under its associated hopper on one of the station plates 370 (FIGURE 39), being secured by a cone shaped mounting flange 450. Fixed against axial movement relative to the cone mounting flange 450, and journaled for rotation relative to the flange 450, is a tubular bag hanger support shaft 452. A depending fixed axle shaft (not shown) is non-rotatably secured within the flange 450 and tubular shaft 452 is journaled and retained on the axle in a manner of construction similar to that shown by dotted lines in FIGURE 28 which illustrates a cam follower assembly 486. Rigidly secured to the lower end of the hanger shaft 452, as by a mounting flange and screws, is a rigid flat plate 454, the plan view of which is clearly shown in FIGURE 30, and is also shown in diagrammatic FIGURE 21. Each bag hanger plate 454 serves as a mounting base for the front bag clamp assembly 456, the rear bag clamp assembly 458 and a bag opener assembly 460. Details of the assemblies and components mounted on plate 454 will be described in succeeding paragraphs.

Shown in FIGURE 29, a short cylindrical section 464, located just above an ear shaped yoke 466, is rigid with the mounting cone 450, whereas the ear shaped yoke 466 is rigidly secured, as by welding, to the upper end of the tubular hanger shaft 452. Yoke 466 constitutes a lever arm by which the hanger shaft 452, with the clamp assemblies and bag opener assembly, can be rotated relative to the drum hopper. The arcuate distance of rotation of hanger shaft 452 is determined by a first abutment lug 468, welded to the short non-rotatable cylindrical portion 464, and a second abutment lug 472 upstanding from and welded to the ear shaped yoke 466. Lug 468 incorporates an abutment limit screw 470 which can be adjusted to accurately determine the limit position of the hanger base at which the clamp assemblies are radial with respect to the drum. Secured in the end of yoke lever 466 is a headed end, threaded stud 476, the shank of which provides a pivot post for one end of a hanger operating link 478, shown in FIGURES 14 and 15.

Referring now to FIGURE 28, the bag hanger cam follower assembly 484 is illustrated in enlarged detail. In a manner similar to that of the bag hanger, the hanger cam follower assembly 484 is also secured to the station plate 370 under the drum (FIG. 39) by means of a cone shaped mounting flange 486, its location for convenience,

being radially aligned with the bag hanger 342 and located at the extreme inner end of plate 370. Fixed by set screws to the mounting cone 486 is a depending non-rotatable stub axle shaft 487. The vertical sleeve shaft 488 of cam assembly 484 is rotatable on the stub axle 487 by a sleeve bearing 489 and a roller bearing 491 and is axially maintained on the stub axle by a nut 493 threaded on a reduced diameter end of the axle shaft. Splined to the lower end of sleeve 488 is a radially extending heavy lever arm 490 and upwardly projected headed stud 492 is threadedly secured in the end of lever arm 490 to provide the second pivot post, to which the other end of the hanger operating link 478 is pivotally fastened. Midway of the lever arm 490, and extending downwardly, is a stub axle 494 which rotatably mounts a heavy roller bearing 496, the outer race of which constitutes a cam follower roller for the hanger cam follower assembly.

Surrounding the cam follower sleeve shaft 488 is a torsion coil spring 498, one end being anchored in the cone flange 486 and the opposite end being anchored to the sleeve 488. Spring 498 torsionally biases the sleeve 488 and its lever arm 490 in a direction forcing the follower roller 496 toward an outside radial cam track 499 (to be hereinafter described in further detail), which is secured, as by welding and/or bolts, to the non-rotatable, fixed cylindrical drum support housing 284. This spring biasing action normally through the means of operating link 478, positions the bag hanger so the aforescribed abutment screws 470 and 474 are engaged, thereby positioning the bag hanger with their clamp assemblies radially aligned relative to the axis of rotation of the drum.

FIGURE 25 is a layout of the hanger operating cam track 499 which is an enclosed track throughout the extent of its radially inwardly directed rise portion. FIGURE 26, a perspective view from below the hanger cam follower assemblies 484, illustrates two of the cam follower assemblies and the enclosed track 499, this view depicting a location near the J position in FIGURE 2, just as one of the bag hangers is being swung to its tangential disposition, the follower roller 496 being forced toward the drum base support 284. Note, the track 499 actually continues on to the right of the drawing figure around the drum support 284, but is broken away in order to illustrate the cam follower with clarity.

Bag station clamp assemblies

FIGURE 36 is an enlarged view of the rear bag clamp assembly 458 which, as an assembly, is mounted in a stationary location on the upper side of the hanger mounting plate 454 by suitable machine screws. In FIGURE 30, the edge of hanger plate 454 near the top of the drawing sheet, where the rear bag clamp assembly is mounted, is the radially outermost portion of the bag hanger when the hanger is disposed in radial position, as at the bag pick-up location C. However, when the hangers are swung to tangential disposition, the same edge constitutes the trailing edge of the bag hanger assembly.

Rear clamp assembly 458 includes a rugged block base or holder 500 which is secured to the hanger base plate 454. Holder 500 provides pivotal mounting bosses 502 and 504 to which are attached operable components of the rear bag clamp. Both pivot bosses include crossbores 506 and 508 and are slotted transversely of the cross bores. The bore 506 of boss 502 receives a pivot pin 514 which serves to pivotally secure a lug end 150 of a double acting pneumatic reciprocating motor 512 in the slotted boss. Such small pneumatic motors are commercially available or, alternatively, can be machined from block stock. Inasmuch as the details of such pneumatic motors are well known, they are not herein described.

Shown in the plan view of FIGURE 30, each such motor 512 has two fluid connections 516 and 518 respectively located at opposite ends of the expansible motor chamber. By suitable connections between the fittings 516 and 518 and control valves, as will be hereinafter de-

scribed with reference to FIGURE 21, air under pressure is selectively applied to one or the other end of the motor chamber and exhausted from the opposite end to cause reciprocation of the motor piston and its rod 520. If desired, a small manual bleed fitting 522 can be utilized to permit manual manipulation of the air motors. A pivot adapter 524 is secured as by threads and a lock nut 526 to the free end of piston rod 520, the terminal end of adapter 524 being formed as a blade 528 having therein a through cross bore.

The second slotted pivot boss 504 is disposed on the opposite end of holder 500 from the pivoted end of the air motor 512. Just below the second boss 504, a recess 530 in the end face of holder block 500 receives a rectangular steel plate 532 which constitutes the fixed bag gripping jaw of the stationary bag clamp assembly 458, the front face of the jaw plate 532 being formed with three or four large, horizontally disposed teeth 534. It has been determined that a few horizontal teeth, with deep serrations between each tooth to permit a firm interlock between the two gripping jaws, provides a more secure clamping action on the upper edges of a multiple ply bag than do a plurality of small teeth. Accordingly the large intermeshing teeth, as shown in FIGURES 36 and 38, are preferred.

The pivoted jaw 536 of the stationary clamp has an upper portion 538 provided with a wide fulcrum section 540 through which a lateral bore enables mounting of jaw 536 in the slotted boss 504 on a pivot shaft 542 disposed in the boss cross bore 508. Above the jaw fulcrum section 540, a short lever arm 538 provided with a cross bore 544 is slotted to receive the pivot blade end 528 of the piston rod adapter 524, the jaw and the adapter being pivotally connected by a pin 546. Adjacent the lower end of the pivotable jaw 536, on the side facing teeth 534 of the fixed jaw plate 532, are a plurality of teeth 548 shaped to interlock between the several teeth 534 on the fixed jaw when the movable jaw 536 is in closed position.

When pneumatic motor 512 is operated to extend its piston rod 520, the upper arm 538 of the movable jaw 536 is swung clockwise to pivot the jaw clockwise, as seen in FIGURE 36, forcing the teeth of the movable jaw into clamping arrangement against the teeth of the fixed jaw 532. Conversely, operation of pneumatic motor 512 to retract its piston rod 520 will swing the movable jaw 536 approximately 75° counterclockwise which completely shifts the movable jaw teeth up away from in front of fixed jaw 532, as illustrated by the opened clamps seen in FIGURE 18. The bellows-like element which covers piston rod 520 is a rubber dust protection boot 550, one end of which resiliently embraces the cylinder of the associated pneumatic motor 512 and the other end embracing the piston rod adapter 524. Dust protection over the smooth operating surface of piston rod 520 is desirable inasmuch as the material being packaged often creates considerable quantities of dust which, in many instances, is quite corrosive in its action on metals.

Because the machine operation becomes rather intricate, particularly in the positioning and repositioning of the complete bag holder assembly as well as in the coordinated operation of components on the holder, it must be kept in mind that the clamp assembly 458 which has just been described is mounted in a fixed relationship to the bag hanger support plate 454 and although referred to as the "rear" clamp assembly, when the bag hanger assembly is in the "radial" position, clamp assembly 458 is the radially outermost of the two clamp assemblies.

Turning now to FIGURES 37 and 38 for details and to FIGURES 29 and 30 for the assembly relationship, the front, or shiftably mounted, clamp assembly 456 will now be described. Shown in both of FIGURES 29 and 30, front clamp assembly 456 carries one of the rubber suction cups 556 of the associated bag opener assembly 460, the other rubber suction cup 558 being mounted under the hanger plate in a special track, as will be hereinafter

described. For convenience in illustration, the front clamp subassembly as illustrated in detail FIGURES 37 and 38 is shown without its suction cup attached.

As with the fixed rear clamp assembly 458, the shiftable front clamp assembly 456 is assembled on a component holder 560 which in a sense is similar to the fixed clamp assembly holder 500 and in another sense is considerably different. Holder 560 has a substantially identical slotted rear boss 562 with a cross bore, and a slotted front boss 564 also including a cross bore. A pneumatic reciprocating motor 566, identical to motor 512, has a reciprocating piston rod 568 with a lug end 570 pivoted in boss 562 and includes two operative fluid communication fittings 572 and 574 to the ends of the expansible chamber. A pivot bladed adapter 576, which is secured to the free end of piston rod 568 in a manner similar to that of adapter 524, is slightly longer than adapter 524, the additional length being necessitated because of the different manner of mounting the holder 560 of the shiftable front clamp assembly. Holder 560 also includes a fixed jaw plate 578 which, on the assembly hanger, is in vertical planar alignment with the fixed jaw 532 of the rear clamp assembly 458. Similarly, the shiftable clamp assembly 456 includes a movable jaw 580 which includes jaw teeth 582, the fulcrum point 584 about which the shiftable jaw 580 is pivoted in slotted boss 564 by means of a shaft 586 and an upper slotted arm 588 which is pivotally secured to the pneumatic motor adapter 576 by pivot pin 590.

In addition to the aforescribed parts of the shiftable clamp assembly with its movable jaw 580, which are similar to the stationary clamp assembly and its movable jaw 536, jaw 580 also includes a structurally integral extended arm 592 projected at an angle extending away from the pneumatic motor 566 and toward the rear clamp assembly 458 as shown in FIGURE 30. In the closed condition of the movable jaw 580, its extended arm 592 is disposed substantially horizontal and terminates in a depending boss 594 situated below the hanger mounting plate 454 and approximately midway between the front and rear clamp assemblies. Note: since the front clamp assembly is mounted for shifting movement toward and away from the rear clamp assembly, the depending lug 594 of arm 592 will also shift toward and away from the rear clamp assembly. Suitably drilled passages 596, 597, 598 and 599 provide a continuous fluid communication passageway from a pneumatic inlet fitting 600 in the side of jaw 580 to a tapped counter bore 602 situated on the side of depending lug 594 which faces the hanger assembly. Appropriate tapped plugs are provided at some of the open ends of the various drilled passageways, in a manner well known to the art, to provide a continuous closed passage from the inlet fitting 600 to the tapped counter bore which constitutes an outlet and to which is attached the suction cup 556 in a manner to be hereinafter described.

Shown in FIGURE 37, one of the sides of the front clamp assembly holder 560 is notched by a recess 604. One end of an operating push bar 606 is received within the recess 604 and rigidly fixed thereto as by welding, being disposed to extend horizontally along the upper surface of the hanger mounting plate 454 and projecting beyond the front edge of that plate. An upstanding conduit guide eye 608 is secured in the upper part of bar 606 with the eye disposed parallel to the length of the bar and closely adjacent the clamp assembly holder 560. Bar 606 and guide loop 608 can be seen in FIGURE 18 and the bar 606 will be again referred to hereinafter.

The front clamp assembly holder 560 includes two enlarged sections containing laterally disposed and parallel cross bores 610 and 612, one of which is adjacent the rear end of the holder and the other of which is spaced slightly to the rear of the front end of the holder. Referring to FIGURE 31, which shows cross bore 610, both of the ends of the two cross bores are threaded and receive grooved retainer rings 614 and 616. Clamped between the two retainer rings 614 and 616 are oil seal rings

618 and 620 and an interior sleeve 622 made of bearing material. Similar components are assembled in the front cross bore 612. The bearings within the two cross bores are slidably disposed on parallel horizontal shafts 624 and 626, the ends of which are rigidly secured in mounting blocks 628, 629, 630 and 631 which are secured, as by machine screws, not shown, on the upper surface of the hanger mounting plate 454, FIGURE 30. The two shafts 624 and 626 serve as parallel tracks which mount and rigidly guide the front clamp assembly 454 for limited sliding movement toward and away from the rear clamp assembly 458.

Still referring to FIGURE 31, the facing sides of the two pairs of shaft mounting blocks 628, 629 and 630, 631 are provided with an annular rimmed extension 632 and 634 surrounding the shaft receiving blind bores 636 and 637. The annular extensions 632 and 634 are similar in dimension to the grooved retainer rings 614 and 616 and serve as terminal embossments over which the ends of dust protection boots 638 (shown in FIGURE 30) are disposed.

One of each set of the shaft mounting blocks, for example, block 628 seen in FIGURE 29, is provided with a screw type grease storage cup 640 threaded into a vertical bore 642 in the top of block 628, bore 642 terminating in juxtaposition with a lateral cross bore 644 in that end of shaft 624 which is disposed in the socket 636. Cross bore 644 intersects an axial blind bore 646 leading to a mid point in shaft 624 where it intersects a short cross bore 648 leading to the exterior of the shaft adjacent the interior of sleeve bearing 622. Cup 640 and the passage through bores 642, 644, 646 and 648 enable lubricating of the sliding bearing 622.

At the left-hand side of FIGURE 31, the annular rim extension 634 is provided with a counterbored recess 650 for seating a strong coil compression spring 652 surrounding shaft 624 and seated at its opposite end in a similar counterbore 654 in the facing retainer ring 614. A second spring, like spring 652, is similarly placed on shaft 626 and the two springs work in conjunction to provide a strong bias force urging the complete front clamp assembly 456 toward the front of hanger mounting plate 454, i.e., in a direction perpendicularly away from the rear clamp assembly 458. The springs must be sufficiently strong to draw the top edge of a filled bag to an aligned closed position. Viewing FIGURE 30, the front clamp assembly 456 is shown substantially centered on its tracks 624 and 626 between the support blocks 628 through 631. Actually the normal position of the front clamp assembly under the biasing force of the springs 652 would be further toward the bottom of the figure whereas the operated position of the front clamp assembly against the force of the spring bias would be further toward the top of the figure. In the latter operated position, the two bag opener vacuum cups 556 and 558 are in approximate horizontal alignment, whereas in the spring biased position, cup 556 would be offset further away from alignment with cup 558 than is shown.

In FIGURE 29, the jaws of the front clamp assembly 456 are illustrated in a closed or clamped condition, during which the two vacuum cups 556 and 558 are located in an approximately horizontal planar relationship. However, when the pneumatic motor 566 is operated to its retract position, the movable jaw clamp 580 would be swung clockwise to an approximately 75 degree angle, as shown in FIGURE 18, which concurrently swings the vacuum cup arm 592 upwardly to a position where the cup 556 is above the level of the hanger mounting plate 454. The raising of the front vacuum cup and its support arm 592 to a position completely above the bag which had been clamped in the jaws, is necessary at the time that the bag is transferred to the dual belt conveyor 666, for reasons of clearance between relatively moving components.

When the front clamp assembly 456 is in the retract position, i.e., shifted away from the rear clamp assembly 458 by means of the spring bias force, the top edge of the bag gripped between the pairs of jaws of the front and rear clamp assemblies will be in a substantially straight disposition. In other words, the top of the bag will be closed and linear. However, when the slidable front clamp assembly has been positively positioned, against the force of its spring bias, closer toward the rear clamp assembly 458, the bag which is then held between the pairs of jaws of the two clamp assemblies will be bowed between the two clamp assemblies as is shown in FIGURE 14. The bowing will permit slack at the upper end of the bag sufficient to enable the two sides of the bag to be pulled away from one another to create the necessary top opening to receive a lowered nozzle spout 434 of the associated discharge assembly. While the upper end of the gripped bag is being maintained in the bowed condition, an operative cycle of the bag opening assembly 460 is accomplished, as will be hereinafter fully described.

Immediately under the front clamp assembly holder 560 and between the two tracks 624 and 626, the hanger mounting plate 454 is slotted at 660, as illustrated in FIGURE 12, to provide a third guide track which extends parallel to the two shaft tracks 624 and 626. Slot 660 receives a small rectangular block 662 which is rigidly secured to the bottom of clamp holder 560 by means of screws, the guide block 662 serving to positively maintain a straight shifting path of the front clamp assembly to prevent the possibility of cocking of the holder on the shaft tracks 624 and 626.

In FIGURES 12 and 13, the operating bar 606 is shown as extended horizontally from the front clamp assembly holder 560 and projecting radially inward relative to the vertical drum axis. To enable the reader to obtain a better perspective, it is noted that the specific bag hangers shown in FIGURES 12 and 13 are disposed with the two bag clamps aligned radially relative to the axis of the drum, for example, see the left-hand bag hanger shown in FIGURE 3, and positions C, D, E, F, G, H, and I of FIGURE 2.

To provide the power which is applied to the clamp assembly operating rods 606 of each bag hanger station to shift the front clamp toward the rear clamp, located radially inwardly of each hanger station is a clamp adjusting cam follower assembly 666, a bottom portion of one being shown in FIGURE 12. Lower perspective views of two such grip adjuster cam follower assemblies can be seen in FIGURE 13, identified as 666 and 666'.

Each clamp adjuster cam follower assembly 666 consists of a push bar 668 terminating in a cylindrical end portion 670 with a forked adapter 672, the adapter 672' being clearly shown in FIGURE 13, and a cam follower roller 674 being rotatably journaled in the forked adapter 672. The cam follower push bar 668 is slidably mounted for reciprocation radially of the drum axis in a rugged box shaped individual track unit 676 which can be conveniently made of several wall sections, as shown, or it may be milled from a solid block. In any event, rigidly secured to the top of each box track 676 is a vertical support tube 678 which extends upwardly to the associated drum station plate 370 (see FIGURE 39) where it terminates in a flanged plate 680 which in turn is fixed to the station plate 370 by means of screws. To provide additional support and rigidity for the plurality of unit box tracks 676, a plurality of ring segments, two of which 682 and 682' can be seen in FIGURE 13, are provided to connect adjacent box tracks 676, completely encircle the fixed drum support 284 and to rotate with the drum assembly.

In FIGURE 13, the bag clamp adjusting cam follower 668 is shown in its radially innermost position, being biased in that direction by a coiled compression spring 686 seated against the inner end of the box slide 676, encircling the cylindrical portion 670 of the cam follower 668 and seated at its other end against a shoulder

on the forked adapter 672. The force of compression spring 686 urges the follower roller 674 inwardly to roll along a cam track 688 which is made from heavy, flat, contoured stock fastened to the fixed non-rotatable drum support housing 274, as by welding. Cam track 688, as shown in the layout of FIGURE 23, is a radial cam which completely encircles the drum support housing and includes a radial cam rise 690 throughout a predetermined arc of rotation which determines that portion of drum rotation during which the bag must be maintained in the opened condition.

The terminal position of cam rise 690 can be seen in FIGURE 13, the cam follower 668 having passed off the rise and onto the low portion of the cam, under which condition the front bag clamp assembly is in its spring biased retract position, as can be seen by the guide block 662 being at the front end of the slot 660. However, the clamp shifter cam follower 668', which can be seen toward the left side of FIGURE 13, has its follower roller 674 riding on the cam rise 690 which has forced the cam follower 668' radially outward which in turn, by engagement with the operating bar 606 of the associated bag hanger station, pushes the front bag clamp assembly in opposition to its spring bias force toward the rear bag clamp assembly. Whenever the bag clamp shifting cam followers are riding the low dwell of the associated cam 688, which can conveniently be the surface of the cylindrical drum support 284, the outer end of the cam follower 668 will be slightly out of engagement with the end of the clamp shifter operating bar 606. This discontinuity between the cam follower 668 and the operating bar 606 permits desired rotational swivelling of the complete associated hanger assembly for purposes to be hereinafter described. Note that the support ring formed by all of the ring segments 682 and 682' also serves to support an additional cam follower at each station which will be now described in connection with the bag opener assembly.

Bag station bag opener mechanism

Various operating conditions of the components of the bag opener assembly 460 are seen in perspective FIGURES 10-18. Plan and side views of the opener assembly 460 are shown in FIGURES 29 and 30. Details of the slidable suction cup assembly 700 will be described with reference to FIGURES 32, 33, 34 and 35.

Referring to FIGURE 2, the bag opening operation is actually initiated as the front clamp assembly 456 starts its shift toward the rear clamp assembly 458 between locations C and D and when the clamp assembly shifting reaches the advance limit, the aforescribed suction cup 556 held by the shiftable clamp assembly 456, will be directly aligned with the reciprocable suction cup 558 (see FIGURE 12). As has been previously described, the suction cup 556 is carried by the inclined arm 592 which is integral with the movable jaw of the front clamp assembly. When the bag opening operation occurs a folded bag will have been picked up and clamped at its two upper corners by both the rear and front clamping assemblies 458 and 456. Because the front clamp assembly is shifted toward the rear clamp assembly as seen in FIGURES 12 and 14, the upper end of the bag will be flexed to a bowed slack (FIGURE 14) between the two clamp assemblies. During such flexed condition, the shiftable suction cup 558 is reciprocated toward the fixed suction cup 556 (see the left hanger in FIGURE 11 and also the hanger in FIGURE 14) forcing and pressing the bowed upper end of the bag against the fixed suction cup. At this instant, by means of the suction circuit controls, as illustrated in FIGURE 12 and to be hereinafter described, suction is simultaneously applied to both of the cups 556 and 558 causing the outer side walls of the bag top portion adjacent the respective suction cups to adhere by suction against the cups. While this suction is applied, the reciprocable

suction cup 558 is withdrawn from adjacent the fixed suction cup 556 (see the second hanger from the left in FIGURE 11), pulling one side wall of the bag top portion back with it, thereby accomplishing opening of the upper end of the bag between the corners which are still being held in the two clamp assemblies. As the actual opening of the bag end is occurring the nozzle 434 is being lowered, as is shown by successive hangers in FIGURE 11, until full insertion is accomplished as shown in FIGURE 15.

Shown in FIGURE 32, the reciprocable suction cup assembly 700 consists of a channel shaped guide piece 702 which is secured, as by screws, to the underside of the associated hanger plate 454. Disposed for sliding movement within the channel of guide 702 is a slide 704, preferably made from nylon or "Teflon," which negates the necessity of providing lubrication. Slide 704 is retained within the elongate channel guide 702 by a slotted plate 706 secured to the flanges of the channel 702, as by screws, with the slot 708 extending lengthwise of the channel track. A blind bore 710 extends from the cup end of slide 704 and at the cup end terminates in a threaded counterbore 712, which receives one threaded end 714 of a double end flanged adapter 716, threaded end 714 being secured in position in slide 704 by a lock nut 718. The opposite threaded end 720 of flanged adapter 716 projects through a base orifice in rubber suction cup 558, the suction cup being secured against the flange of adapter 716 by a retainer bushing 722 screwed on the short threaded end 720 on flange adapter 716. The fixed suction cup 556 is secured at the tapped bore 602 of depending lug 594 of the jaw arm 592 by means of a similar adapter 724 (FIGURE 29).

FIGURES 32, 33 and 35 illustrate the blind end of bore 710 in the nylon slide 704 intersected by a tapped bore 726 into which is threaded the end of a stud shank 728 having an enlarged head 730 adapted to be coupled to a pneumatic suction line 732 (FIGURE 12). The adapter head 730 includes a suction passage 734 in communication with the suction hose 732 and intersecting a bore 736 which passes through the shank 728 into communication through the tapped opening 726 with the elongate bore 710 in the nylon slide. Seen in FIGURE 35, the adapter shank 728 passes through the elongate slot 708 of track plate 706 and constitutes an operating link by which the slide 704 can be reciprocated back and forth in channel track 702. Reciprocation of the slide 704 with its associated suction cup 558 is accomplished by means of a cam follower lever 740, a small portion of which is illustrated in FIGURES 32 and 35, and various operating positions being illustrated in FIGURES 11-13. The cam follower lever 740 has a specially formed slot 742 through which the shank 728 of adapter 730 is projected.

Turning to FIGURES 12 and 13 wherein a substantially complete picture of the bag opener cam follower lever 740 is illustrated, slot 742 can be seen as essentially an elongate slot in a long arm of the follower lever 740. However, near the end adjacent the fulcrum point, is a recess notch 744, the purpose of which will be described hereinafter. Although the complete lever 740 can not be seen in FIGURE 12 the portion which is hidden can be seen in FIGURE 13 which also illustrates the fulcrum about which lever 740 is pivotally mounted on a post 746 secured in depending relationship adjacent its associated station on the segmented support ring 682, 682'. Above lever 740, on the post 746, is located a tension coil spring 748 one end of which is anchored to the support ring 682, 682' and the other end 750 being hooked into a hole anchored to the short follower arm 752 of the follower lever 740. Viewing FIGURE 12, the tension spring 748 provides a bias force tending to rotate the follower lever 740 counterclockwise which, through coaction between the elongate slot 742 and the shank of adapter 730 tends to withdraw the vacuum cup slide 704 to the position

shown in FIGURE 12. The end of the short cam follower arm 752 has affixed therein a stub axle 754 which serves to mount the cam follower roller 756.

The bag opener cam follower roller 756 follows a cam track 758 which is radially fixed, as by welding, to the stationary drum support housing 284 below the previously mentioned grip adjuster cam track 688. Cam track 758 has a short arc, illustrated in FIGURE 24, constituting a cam rise portion which serves to swing the cam follower lever 740 (as viewed in FIGURE 12) in a clockwise direction against the bias of tension spring 748 whenever the roller rides upon on the cam rise 760. This action of lever 740 swings its slotted end clockwise and, through the shank of adapter 730, reciprocates the vacuum cup slide 704 to its extended position which, in effect, abuts the fixed suction cup 556, although normally the multiple plies of the upper ends of a bag will be between the two cups. As indicated in FIGURE 24, the two cups are maintained in juxtaposed position for approximately 20 degrees of rotation of the drum after which point, retraction of the sliding cup 558 occurs when the cam follower 756 drops off the terminal end of the cam rise 760 and permits counterclockwise rotation of the cam follower lever 740 to retract the slide. Throughout the remainder of a complete 360° rotation of the drum, it is desirable that the shiftable suction cup 558 be retained in its retracted position and it is imperative that the reciprocable suction cup be positively retained in this position while the associated bag hanger passes the position of bag transfer (positions L and M in FIGURE 2) to the dual belt sewing machine conveyor, as shown in FIGURE 18.

Turning temporarily to FIGURE 2 it will be noted that each bag hanger has its grip surfaces of the aligned clamps disposed radial relative to the drum axis at every position from the pick up position C through to position I. At the latter position the hanger is rotated substantially 90 degrees to place the aligned bag clamp grip surfaces in a tangential position relative to drum rotation. (Both the radial and tangential positions of the clamps are illustrated by phantom lines in FIGURES 39, which is drawn to a substantially accurate scale from a production drawing.) During this 90 degree swinging of the bag hanger, the opener slide 704 is swung to a new position which is substantially aligned with the slot 742 in lever 740. This swinging rotation occurs about a vertical axis passing through the point X seen in FIGURE 12, causing the slide adapter 730 to swing counterclockwise from point Y to Y' which swings the follower lever 740 clockwise as the adapter shank bears against the side of slot 742. As the shank reaches point Y' it will drop into the aforedescribed notched recess 744 in the follower lever slot 742. Therefore, even though the slot 742 in this condition is substantially aligned with the reciprocatory path of the suction cup slide 704, the slide 704 is effectively locked against inadvertent extended movement so long as the bag hanger station remains in its tangential position. The bias of the opener lever tension spring 748, acting against lever 740 aids in maintaining the slot recess 744 pressed into interlocked engagement with the shank of the slide adapter 730.

Even though the slide 704 is effectively locked against reciprocation while the bag hanger is in the tangential position, upon reverse rotation of the hanger to place the bag clamps back in a radial position after transfer of the bag to the dual belt sewing machine conveyor, the shank of slide adapter 730 is swung out and away from the recess notch 744 back into the main track of slot 742 over the slightly curved recess edge 764 seen in FIGURE 12. A small increment of pivotal movement applied to lever 740 aids in the unlocking action.

The hose line 732, which is coupled to the slide adapter 730, passes through a slot 766 in the hanger plate 454 to the upper side of the bag hanger where it is grouped in a bundle with other vacuum and pressure lines from the front vacuum cup 556 and the two pneumatic motors

512 and 566, the bundle of pneumatic lines passing upwardly adjacent the hanger post 452 and into the outer shell of the drum wherein suitable connections to the pneumatic control circuit are made.

Hanger station controls

In addition to the cam operated mechanical movements of each bag hanger assembly with associated shifting clamp assembly, bag opener mechanism and nozzle inserting assembly, a group of control components are also provided for each hanger station and, as has been previously described herein, such control groups are located on the side of the drum 280 immediately above the associated hanger assemblies.

The control group components are located under the shell panels 344 whereas mechanical operators for the controls are disposed exterior of the panels. The panels and the exterior operators as illustrated in FIGURE 3 show the operator buttons 346 for switches S-31 which control suction to the bag opener cups, located around the upper edge of the annular shell formed by all of the panels 344. From the timing diagram, FIGURE 20, it is seen that suction is applied to the bag opener approximately 10° after the bag pick-up position which is represented by 0° on the scale and also, the suction is applied as soon as the opener shifter has advanced the shiftable suction cup 558.

To accomplish operation of the opener suction switch operator button 346, a cam bar, contoured to have a circular form matching that of the annular panel shell is mounted on a bracket 772 (see FIGURES 4 and 5) secured to the vertical support channel 74 immediately above the bag magazine conveyor. The cam bar 770 has a length which extends approximately 30° of drum travel and is disposed in the path of the group of suction operating switch buttons 346. The inclined leading portion of cam bar 770 is engaged by a bag hanger station suction switch button 346 just as the opener shifter slide is advanced to press the suction cups against the upper sides of a bag and the switch button 346 is maintained depressed by cam bar 770 for approximately 30° of drum travel until that button 346 passes the rear edge of the cam bar 770, at which point the inserter nozzle has been lowered into the opened end of the bag and there is no longer any need for suction to be applied to the suction cups.

With reference now to FIGURES 19 and 21, the bag hanger pneumatic control components and their operation will be described. Shown near the upper portion of FIGURE 19 is a suction line or manifold 774 which completely encircles the drum with tap-offs at each bag hanger station. Suction is created in line 774 by means of the afore-described auxiliary vacuum pump 314 located above the drum 280. Shown in FIGURE 21, the connections of line 774 to vacuum pump 314 is through a filter unit 776, also above the drum and connected to the line is a suction gauge 778 and a pressure relief valve 780.

At each of the bag hanger stations a T-fitting 782 is connected into the manifold vacuum line 774 to provide a branch conduit 784 connected to the inlet side of a solenoid operated two-way valve SOL13. The outlet branch 786 from solenoid control valve SOL13 passes through a second T-fitting which is connected via conduit 788 to the exhaust outlet of a four-way solenoid control valve SOL14. The other line, which is connected via the second T-fitting to the suction solenoid control valve outlet line 786, is the aforedescribed suction conduit 732 which leads to the outlet fitting 734 in the end of the nylon slide 704 for the shiftable suction cup 558 associated with the hanger.

The vacuum control switch operating button 346, for the specific bag station being described, is seen at the top edge of FIGURE 19 and projects toward the viewer from its associated micro-switch S-31, the latter being secured to the top rim of the shell braces. By conventional electric leads, micro-switch S-31 controls an electrical power circuit from the electric power line manifold 790 to the sole-

noid control valve SOL13. Thus, whenever the circuit to solenoid control valve SOL13 is energized due to actuation of micro-switch S-31 by its control button 346, valve SOL13 is opened, applying suction from the suction manifold 774 to lines 732 and 788. Inasmuch as line 788 is the exhaust conduit from the four-way solenoid control valve SOL14, the suction applied thereto, being blocked by valve SOL14, will have no effect. However, the suction applied to line 732 is applied through a further T-fitting 792 (FIGURE 21) to a second branch conduit line 794 which is connected to the outlet fitting 600 of the fixed suction cup 556. Suction is thereby applied to both of the bag opener suction cups 556 and 558 whenever solenoid control valve SOL13 is opened.

When the switch operating button 346 is released, it is spring biased to the off position, opening switch S-31 and de-energizing the solenoid of solenoid control valve SOL13. Valve SOL13 is normally biased to the closed position whenever the solenoid is de-energized, hence, when button 346 is released, suction from manifold line 774 is cut off and no longer is applied to the opener suction cups 556 and 558.

Note: the connecting conduit 788 between conduit 732 and the exhaust port of the forward solenoid control valve SOL14 is incorporated to apply a pressure flow of air in conduit 732 due to exhausting of either side of the expansible chamber pneumatic motor 566 whenever the motor is operated. This pressure flow passes through the lines 732 and 794 and out through the openings in the two suction cups 556 and 558, occurring whenever the front clamp assembly is closed or opened. Thus, for every complete cycle of rotation of each bag hanger station, two pressure blasts (represented by the bottom line on timing chart, FIGURE 20) are applied out through the suction cups and serve as a means for keeping the suction cups and lines to the suction cups clear of any dust particles which may be drawn into the cups from near the top edges of the bags at the time the top bag edges are opened.

It will be recalled that a high pressure air line 327 (FIGURE 3A) passes into the drum 280 through the commutator unit 328. Through internal connections, the pressure line 327 is in communication with a high pressure manifold line 796, shown in FIGURES 19 and 21, which encircles the drum and has two branch tap-offs for each station. One of the station branch pressure conduits 798, leads to the inlet of a solenoid control valve SOL14 while the second station branch conduit 800 leads to the inlet of solenoid control valve SOL15. The exhaust port of solenoid control valve SOL14 is connected, as has been described, to the conduit 788, which is connected to the suction cups, whereas the exhaust port of solenoid control valve SOL15 merely exhausts to atmosphere within the panel shell.

Two control conduits 804 and 806 from solenoid control valve SOL14 are connected to the control ports at each end of the expansible chamber of the front clamp assembly pneumatic motor 566. In FIGURE 19, the illustrated positions of the L-shaped operators 348 and 350 which control operation of the clamp assembly pneumatic motors 566 and 512, condition the electrical power control circuits to "open" and the associated solenoids of the solenoid control valves SOL14 and SOL15 are de-energized. In de-energized condition, the solenoid control valves SOL14 and SOL15 are spring biased to the position which applies pressure through lines 806 and 808, respectively, to the rear ends of associated pneumatic motors 506 and 512 and the second lines 804 and 810, respectively, connect from the front ends of motors 566 and 512, through the control valves to atmospheric exhaust causing operation of the motors to extend their piston rods and close the clamp jaws. Whenever the upwardly extended arm of either of the operators 348 and 350 engages a fixed trip lug on the support structure, and the operators are flipped

to swing the lower arms to a downward vertical position, the associated micro-switches S-32 and S-33 are closed which applies electrical power to the associated solenoid control valves SOL14 and SOL15 to reverse the four-way valve pressure and exhaust connections to the motor control conduits causing retraction of the piston rods which opens the associated clamps. Note: by the aforesaid circuitry, each of the pneumatic motors 566 and 518 are independently operated by means of their respective associated operators 348 and 350.

In FIGURE 8, the two operators 348 and 350 for the pneumatic motors of the front and rear clamp assemblies, are illustrated with the lower arm extending downwardly, in other words, the position which conditions the two motors to open the clamps. As the drum rotates in the direction of the arrow seen between the two operators 348 and 350, the rollers on the downwardly directed arms of the operators engage the radial lugs 352 and 354 on fixed support structure and will be simultaneously flipped to the switch open position, i.e., with the upper arms directed vertically upward. The simultaneous operation of both operators simultaneously closes both the front and the rear clamp over a bag at the pickup position.

Turning to FIGURE 18, the two switch operators 348 and 350 are seen in the switch off position, with their upper arms extended upwardly. The drum will be rotating in the direction of the arrow and the associated hanger 342 can be seen immediately below the operators with the clamps still holding the bag 70. The leading edge of the bag is just approaching the position where the hanger will be swung outwardly several degrees to place the leading edge of the bag into the inlet 872 between the dual belt conveyor 66.

It will be recalled, from the description hereinbefore, that when the leading edge of a bag 70 initially passes between the dual belts 864 and 866, the front clamp assembly 456 must be opened to immediately release the corner of the bag. Almost directly above the front clamp assembly 456 in FIGURE 18, will be seen a bracket 808 which is positioned closely adjacent the periphery of the panel shell of drum 280 and slightly radially outward from the path of the roller on the upper arm of operator 348. The roller passes behind the bracket 808 and as the drum rotational position is reached when it is desired to open the front clamp assembly 456, a lug 810 which is secured on the back side of bracket 808 is engaged by the upper roller of operator 348, whereupon continued drum rotation flips the upper operator 348 to its switch closed position with the lower arm directed downwardly. As has been described in conjunction with the circuit shown in FIGURE 21, the operator 348 immediately closes its switch S-32, energizing the front clamp assembly pneumatic motor 566 to withdraw the piston rod and swing the shiftable clamp jaw 580 upward to the bag released position. That condition is shown by jaw 580' of the bag hanger assembly 342' immediately to the right of bag hanger assembly 342. Also illustrated, in FIGURE 18, is the raised position of the front suction cup 556', it being noted that both the cup and its support arm 592 are raised above the level of the dual belt conveyor 66 enabling mechanical clearance to prevent damage to the front vacuum cup and its support arm.

Below the bracket arm 808 is a second, shorter bracket arm 812 disposed in alignment with the operating roller on the upper arm of bag clamp assembly operator 350. Secured on the inner side of bracket arm 812 is an operating lug 814. The upper roller of operator 350 comes in engagement with operating lug 814 just as the rear clamp assembly 458 passes over the inlet to the dual belt conveyor 66, releasing the rear corner of the bag which is then completely held by the dual belt conveyor. Both of the operator lugs 810 and 814 are adjustably secured to their associated brackets 808 and 812 to enable accurate predetermined release positions for both the front clamp assembly 456 and the rear clamp assembly 458. The transfer operation to the dual belt conveyor is quite

critical and must be accomplished with a smooth operation and in a manner to prevent tearing and ripping of the bags as they transfer.

Bag vibrators and patters

Per se, the bag vibrator tables and the side patters are conventional items but, inasmuch as they are considered part of the complete apparatus, they will be herein briefly described. The (vibrators) provide an operation on the bags, as the bags are carried around by the drum assembly, which assures complete settling of the material placed into the bags and also accomplishes proper shaping of the filled bags to enable a satisfactory, smooth, completely automatic operation.

In FIGURE 1, the first bag vibrator table 820 is shown located on the machine base 72 just beyond the filling or dispensing station. The table 820, also seen in FIGURE 4, is an arcuate plate with a downwardly leading edge 822 and is situated at a sufficient height so the bottom of the filled bag is resting on and dragged across the table 820 as the drum proceeds in its rotation. Table 820 is jogged up and down by an electric motor M3, providing a settling action for the material which has just been dispensed into the bag at the preceding dispensing station F shown in FIGURE 2. The upper surface of table 820 is preferably covered by smooth plastic sheeting such as "Teflon" to reduce the friction resulting from dragging the bag across the table.

The second vibrator assembly 826 is actually a dual form of vibrator, including a vertical vibrating table 828 as shown in FIGURE 1 and two side patting plates 830 and 832. Both the table 828 and the side plates 830 and 832 are driven in a cyclic oscillation through eccentric drive connection from associated motor and transmission assemblies 834 located under the table 828. The operation of the table 828 and the side patters 830 vibrate the material within a bag and concurrently pat the bag into a relatively flat configuration for ease in stacking after the bags have passed from the sewing machine and conveyor assembly 666. The second vibrator assembly 826 can be seen in the diagrammatic showing of FIGURE 2, the entrance to the vibrator being shown in FIGURE 16 and the exit being shown in FIGURE 17. Again it is preferable that a sheet of plastic such as "Teflon" be secured to the upper surface of the vertical displacement vibrating table 828 to reduce friction as the bags are dragged through the vibrator.

Transfer conveyor and sewing machine assembly

The plan view of the transfer and sewing machine assembly 66 is shown in FIGURE 1, most of the components can be seen in the perspective view FIGURE 4, and details of the dual belt conveyor can be seen in FIGURES 17 and 18. A dual belt conveyor and sewing machine are commercially available as a unitary assembly and will not be described in specific detail although the cooperative organization of such an assembly relative to the rotating drum, and particularly with relation to the bag holders and the overall machine operating circuitry, will be described.

Looking first at FIGURE 1, the assembly 66 actually consists of three subassemblies, the dual V-belt conveyor 840 the traveling flat belt conveyor 842 and the taping and sewing machine 844. The dual belt conveyor 840 and the traveling belt conveyor 842 are driven by electric motors 846 and M7 through suitable gear reductions such as 848 and various transmissions. Both belt conveyors, of course operate at the same speed. Inasmuch as traveling flat belt conveyors are well known, the transmission there-to will not be described in any further detail.

The drive to the dual belt conveyor 840, FIGURE 1, is accomplished by means of an upper take-off shaft 850 from the gear reduction 848 through sprockets and a drive chain 852 to an input transmission 854 which rotates two V-belt pulley drive sheaves 856 and 858 at

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the same speed and in opposite directions. The two drive pulleys 856 and 858 are also the exit pulleys for the dual belt conveyor 840 which consists of parallel lines of idler pulley sheaves 860 and 862 disposed in a straight, horizontal, planar arrangement leading from the drum conveyor bag transfer point L (see FIGURE 2) to the entrance to the sewing machine 844. Two endless V-belts 864 and 866 pass respectively around the sets of aligned sheaves 862 and 860 and over the respective drive sheaves 856 and 858.

By means of a conventional eccentric adjuster 870, one of the sets of sheaves which is spring biased as a unit toward the other set of sheaves, e.g., sheaves 860, with their endless belt 866 can be adjustable shifted as a unit so the outer surface of V-belt 866 can be pressed tightly against the outer surface of V-belt 864 on the other set of idler sheaves 862. The depth of V-belts 864 and 866 is greater than the depth of the grooves in the idler sheaves 860 and 862, thus, there is a dual endless clamping track with facing surfaces having a high coefficient of friction extending from the dual belt conveyor entrance 872 along a straight horizontal path to the entrance position to the sewing head in sewing machine 844. Opposed power driven rotation of the drive sheaves 856 and 858 thus provides a moving, linear dual belt track, the clamping stretches of which are situated at a level just below the lower edges of the front and rear clamp assemblies 456 and 458 on the bag hanger stations.

The entrance 872 to the dual belt assembly 840 is clearly shown in FIGURE 18 and a bag 70m is shown completely held between the linear tracks of the dual belts and progressing in a direction toward the sewing machine 844.

About one and one-half inches of the top edge of bag 70m in FIGURE 18 extends above the belts of the dual belt conveyor 840 and constitutes the portion which was gripped by the bag clamps on the holding station 342'. This portion of the upper edge of the bag is now available to be enclosed by a folded tape 876 (see FIGURE 4) which feeds from a tape roll 878. The tape feeder and cutter are conventional items and are not shown herein, however, as the folded tape 876 is placed over the upper edge of the bag, the leading edge progresses on through the sewing machine 844 and the taped upper end is then securely stitched closed as the bag, carried by the traveling belt conveyor 842, completes its passage through and proceeds on away from the sewing machine 844 to a further belt conveyor 880 (FIGURE 4) which carries the completely filled, closed and stitched, or otherwise sealed, bags for further disposition. A code imprinting or embossing device can be installed adjacent the tape roll for placing a production code on the tape, if such an operation is desired.

The tape folder, applicator and cutter and the sewing machine and its drive motor 822 are commercially available items and their controls are conventional excepting for special electrical safety circuits and control devices incorporated into the sewing machine control circuit, as will be described in conjunction with the overall machine circuit.

Material dispenser

Viewing FIGURE 4, located above the drum 280 is a hopper shaped material passage or chute 890 with its converging bottom discharge end disposed immediately adjacent and above the path of the upper ends of the aforescribed drum hoppers 306. The open discharge end of chute 890 is located at position F in FIGURE 2, the chute 890 being rigidly secured to support framework or other convenient fixed installation. The upper end of the material directing chute 890 is fixed underneath and receives the discharge of a dump scale device 892 which is commercially available. Located above and feeding the scale device 892 are material storage bins or hoppers (not shown).

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Scale device 892 automatically weights a desired quantity of material and retains it for discharge through the directing chute 890 into a specific hopper 306 upon demand by the machine controls when a hopper with a bag attached to its associated bag hanger passes below the directing chute 890. A wire sensing finger 894, seen in FIGURES 11 and 15, operates a safety switch in a control circuit that prevents dumping of the scale 892 in the event no bag is located on the hanger passing under the dispensing chute 890. Single or double scale dumps can be utilized depending upon the speed at which the machine is to be operated. For example, by using double scales wherein one will be measuring the desired quantity while the other is dumping, drum rotational speed can be almost doubled.

Furthermore, if it is desired that the material be dispensed in volumetric quantities rather than by weight, a volumetric dispenser such as disclosed in the aforesaid co-pending application, may be utilized in place of the dump scale device 892 and suitable correlated controls will be used.

Electrical components

The below listed index includes groups of various electrical circuitry components with a brief description of the function of and the reference character which identifies the component on the circuit diagram represented by FIGURES 40A-40E.

Reference character prefixes identify different kinds of components, for example: S—switches; PL—pilot or indicator lights; M—electric rotary motors; SOL—solenoid operator for control valves (also represents the included valve); ST—motor starter relays; PS—pressure switch; CT—current transformer; REC—receptacle; TD—time delay relay; R—relays; OL—overload cut-off; T—timers; BI—bin indicator; CMCR—continuous reading meter relay; TF—transformer; D—rectifier; RES—resistor; C—capacitor.

Following the index list of electrical components and their function will be a description of the complete machine operation related primarily to the electrical components which are included in the circuit diagram.

Where appropriate, the index will indicate a structural drawing figure illustrating the physical location of the component.

- | Ref. No.: | Item and function |
|-----------|---|
| S1 | A main key switch S1 (FIGURES 4 and 8) turns on power for the entire machine circuit. It energizes a relay R-1, and also energizes motor starter ST4 and ST5. |
| S2 | In its normal operating condition, the switch S2 (FIGURES 4 and 8) energizes a relay R3 which energizes motor starters ST1, ST2, ST3 and ST7. |
| S3 | Switch S3 (FIGURE 8), when operated, breaks the circuit that holds in relay R3, relay R3 will drop out and let motor starters ST1, ST2, ST3 and ST7 open. |
| S4 | When switch S4 (FIGURE 8) is closed, a magazine assembly control relay R4 is energized, furnishing power to the bag injector. This switch is in series with switch S34 (FIGURE 40D). |
| S5 | Reset switch S5 (FIGURE 8) interrupts the circuit that holds a low bin responsive relay R6 closed and energizes magazine control relay R4 which restarts bag injector after having been shut down by a low level bin safety circuit indicator BI. |
| S6 | Switch S6 (FIGURE 8) by-passes the low level bin indicator circuit control BI, timer T1, and relay R6. |
| S7 | Switch S7 energizes sewing machine control relay R5 and sewing machine starter ST6. After relay R5 is energized, a timer T2 is started. Each time switch S7 is activated within a set time, timer T2 is automatically reset. |

- S8—Switch S8 (FIGURE 4), a push to test switch energizes sewing machine starter ST6 when switch S11 is switched to its sewing machine test position.
- S9—Switch S9 (FIGURE 4), a reset switch drops out relay R2 which closes motor starters ST4 and ST5 only after switch S10, S12 or S13 (stop) has been pushed.
- S10—Switch S10 (FIGURE 4), a stop switch located at the sewing machine, energizes relay R2 which shuts down everything except relay R1 and solenoid SOL1.
- S11—Switch S11 (FIGURE 4) is shown in "run" position and can be switched from "run" to "sewing machine test." When S11 is in "run" position everything can be run normal. When S11 is in "test" position, the normal control circuit is interrupted and switch S8 (sewing machine test) is placed in the circuit.
- S12—Switch S12 (FIGURE 5) parallels stop switch, and is a second stop switch S10 accomplishing the same thing as switch S10 at a second location.
- S13—Stop switch S13 parallels S10 and is placed at a third location, at the rear of the machine.
- S14—Switch S14 (FIGURE 40D) is a bag pressure responsive switch which turns the bag magazine conveyor motor 88 (see also FIGURE 7) on and off.
- S15—Switch S15 (FIGURE 7) energizes solenoids SOL2 and SOL16 (controlling bag magazine vacuum cups and bag injector shown in FIGURE 8) and turns vacuum on and off.
- S16 and S17—When the bag injector is first turned on, relay R9 is closed through NC contacts of switch S17 (see FIGURE 9). The first tripping of switch S17 opens relay R9. Switch S16 is tripped again, which activates cylinder 236 (See FIGURE 8) which pulls the bag into pick up position¹.
- S16 (Normal)—After the above operation once occurs, switch S16 thereafter operates solenoid SOL3 only and furnishes power through NC contacts to switch S18.
- S17 (normal)—Switch S17 energizes solenoids SOL10 and SOL12 to open the bag holding gate.
- S18—Switch S18 (FIGURE 8) energizes solenoid SOL7 which reverses the horizontal carriage cylinder 236.
- S19—Switch S19 (FIGURE 8) energizes solenoids SOL8 and SOL17, also energizes relay R10 and starts timer T3.
- S20—Switch S20 (FIGURE 8) energizes solenoids SOL10 and SOL12 which closes the bag holding gate.
- S21—Switch S21 (FIGURE 6) energizes solenoid SOL9A (FIGURE 7) sending the bag picker vacuum cup bail in to pull a bag out. S21 also drops out relay R10.
- S22—Switch S22 (FIGURE 7) energizes solenoid SOL9B in reverse direction to reverse the bag picker bail.
- S23—When switch S23, (FIGURE 8) seen in circuit diagram FIGURE 40E, is in "run" position, the machine control circuit is normal; when S23 is switched to "remote" control, the control circuit is interrupted and starter ST1 is controlled only by a remote control button used for trouble shooting and adjustments.
- S24—Switch S24, (FIGURE 8) seen in circuit diagram FIGURE 40B, controls motor starter relay ST3R1.
- S25—Switch S25 (FIGURE 8) controls motor starter relay ST3R2.
- S26—Switch S26, (FIGURE 8) seen in circuit dia-

- gram FIGURE 40E, controls the scales dump circuit, on and off.
- S27—Switch S27 also controls the scales dump circuit, on and off.
- S28—Switch S28 is a bag detector switch (FIGURE 15) operated by a wire feeler. It is held closed as the drum rotates and a bag is located on a hanger passing the switch. This switch is connected in series with switch S26, S27 and S29.
- S29—Switch S29 (FIGURE 4) is tripped by a drum station lug 262 and energizes a circuit to dump the scales 892 when switches S26, S27 and S28 are closed.
- S30—Switch S30 (FIGURE 40C) is a sewing machine brake release switch. When S11 is switched to "test" and S30 is switched to "Brake Release," SOL18 is energized to release the sewing machine brake. S30 will also interrupt the bag machine control circuit to prevent starting the machine.
- S31—Switch S31 is one of eighteen similar switches, located at a typical one of eighteen drum stations (FIGURE 19) and energizes an associated solenoid valve SOL13.
- S32—Switch S32 is one of eighteen located at a typical drum station and energizes a solenoid valve SOL14.
- S33—Switch S33 is one of eighteen located at a typical drum station and energizes a solenoid valve SOL15.
- S34—Switch S34, shown in circuit diagram FIGURE 40D lights a pilot light PL18 when the bag supply is low (FIGURES 5 and 14), and releases the magazine assembly control relay R4. This switch may be a manual switch rather than a bag feeder automatic switch, in which case the pilot light PL18 is not used.
- S35—Switch S35 (FIGURE 41) is a by-pass switch to a thread detector in the sewing machine station.
- S36—Switch S36 is cyclically operated by tension of the thread to the sewing machine needle and sends pulses to relay R13 and capacitor C4, the relay staying closed when receiving normal pulses.
- PL1—Pilot light PL1 (FIGURE 8) is on when power is turned on.
- PL3—Pilot light PL3 (FIGURE 5) is connected to the over-load relay OL1 of the drum circuit. When "on," the circuit is closed. When "off" the over-load relay OL1 has opened.
- PL4—Pilot light PL4 (FIGURE 5) is "on" when air pressure is low as indicated by pressure switch PS.
- PL5—Pilot light PL5 (FIGURE 5), when "on" shows that an over-load condition of meter relay RY1 (FIG. 42) has shut the drum off.
- PL6—Pilot light PL6 (FIGURE 8) shows when switch S4 is on or off, being "on" when S4 is on.
- PL7—Pilot light PL7 (FIGURE 8) is "on" when switch S6 is closed. When switch S6 is open, pilot light PL7 is "on" to show that material is above a desired level in the bin. When PL7 goes "off," bin level is low.
- PL8—Pilot light PL8, (FIGURE 4) seen in circuit diagram FIGURE 40C, is "on" when switch S11 is in "sewing machine test" position.
- PL9 and PL10—Pilot light PL9 (FIGURE 5) and PL10 are "off" during normal running condition, and are "on" when any of the stop buttons S10, S12 and S13 has been pushed.
- PL11—Pilot light PL11 (FIGURE 5) is "on" when the over-load relay OL2 circuit for the pneumatic pump motor 174 is closed.
- PL12—Pilot light PL12 (FIGURE 5) is "on" when the over-load relay OL4 circuit for bag magazine conveyor motor 88 is closed.

¹ This operation occurs every time bag injector is turned on.

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- PL13—Pilot light PL13 (FIGURE 5) is "on" when the over-load relay OL3 circuit for the singling pinch roller motor 192 is closed.
- PL14—Pilot light PL14 (FIGURE 7) is "on" when starter relay ST3R1 (FIGURE 40B) is energized. 5
- PL15—Pilot light PL15 (FIGURE 7) is "on" when starter relay ST3R2 is energized.
- PL16—Pilot light PL16 (FIGURE 40E) shows when scales weight is reached and is ready to dump.
- PL17—Pilot light PL17 (FIGURE 5) parallels PL16 and also shows when scales weight is reached and is ready to dump. 10
- PL18—Pilot light PL18 (FIGURE 5) is "on" when there is a low bag supply for the bag injector. This light is not used if switch S34 is a manual switch. 15
- PL19—Pilot light PL19, (FIGURE 4) seen in circuit diagram FIGURE 41, is "on" when the thread to the needle breaks which causes all components of everything to shut down, with the exception of a 115 v. circuit to the drum and the air pressure. 20
- M1 (314)—Motor M1 drives the drum vacuum pump 314 (FIGURE 1).
- 330—Motor 330 drives the drum (FIGURE 1).
- M3—Motor M3 drives the first bag settler or vibrator 820 (FIGURE 1). 25
- M4—Motor M4 drive the bag side patters 830 and 832².
- M5—Motor M5 drive the second bag settler or bottom patter 828². 30
- 846—Motor 846 drives the dual V-belt bag conveyor 864 (see FIGURE 1) leading to the sewing head.
- M7—Motor M7 drives the bottom flat belt conveyor 842 to the sewing machine.
- 882—Motor 882 drives the sewing machine head 844. 35
- 174—The combination unit of vacuum pump and motor 174 (FIGURE 1) provides vacuum and pressure for the bag injector.
- 192—Motor 192 (FIGURE 8), drives the fixed axis roller 140 for the bag injector. 40
- 88—Motor 88 (FIGURE 4) drives the V-belts for the bag magazine conveyor.
- SOL1—Solenoid SOL1 turns the primary air supply on and off. 45
- SOL2—Solenoid SOL2 controls suction to suction cups 170 on the bag injector swinging bail.
- SOL3—Solenoid SOL3, when energized, causes the horizontal carriage to move a bag from the bag injector to the drum pick-up station. 50
- SOL4—Solenoid SOL4, when energized, lowers the bag injector motor 160.
- SOL5—Solenoid SOL5, when energized, moves the bail with the singling suction cups 170 out.
- SOL6—When solenoid SOL6 is energized, the inside bag holding gate is closed. 55
- SOL7—When solenoid SOL7 is energized, horizontal carriage motor 236 is reversed to its bag receiving position.
- SOL8—When SOL8 is energized, the shiftable axis pinch roller 142 is raised to operating position. 60
- SOL9—When solenoid SOL9 is energized, pneumatic motor 184 moves the bail with the suction cups 160 in, which grips a bag to be pulled out for the bag injector. 65
- SOL10—When solenoid SOL10 is energized, pneumatic motor 260 opens the inside bag holding gate.
- SOL11—Solenoid SOL11, when energized, causes closing of the outside bag gate. 70
- SOL12—Solenoid SOL12, when energized, causes opening the outside bag gate.

² Second vibrator 826.

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- SOL13—Solenoid SOL13 is one of eighteen and is located at a typical drum station. When SOL13 is energized, it opens the line to bag opener suction cups 556 and 558.
- SOL14—Typical station (18 stations) solenoid SOL14, when energized, activates pneumatic motor 466 and opens the front bag hanger clamp assembly 456.
- SOL15—Typical station (18 stations) solenoid SOL15, when energized, activates pneumatic motor 512 and opens the rear bag hanger clamp assembly 458.
- SOL16—Solenoid SOL16, when energized, releases suction from the singling bail suction cups.
- SOL17—Solenoid SOL17, when energized, sends the piston rod 125 of ram cylinder 128 out to impact and align the front bags on the bag injector conveyor.
- SOL18—Solenoid SOL18, when energized releases the brake on the sewing machine.
- ST1—Starter for drum drive motor 330.
- ST2—Starter for first vibrator motor M3.
- ST3—Starter relay ST3R2 for side patter motor M4 in second vibrator. Starter relay ST3R1 for bottom vibrator motor M5 in second vibrator.
- ST4—Starter for dual V-belt conveyor drive motor 846.
- ST5—Starter for flat belt conveyor motor M7.
- ST6—Starter for sewing machine motor 882.
- ST7—Starter for the drum vacuum pump motor M1.
- PS—Air pressure switch PS must be closed before the relay R3 can be energized to start the drum. When air pressure drops below a set pressure, PS opens and relay R3 drops out, stopping drum.
- CT—Current transformer CT is hooked between starter ST1 and Motor 330. CT is hooked in series with Motor 330 and provides the signal to meter relay RY1 (FIGURE 42).
- REC1—Receptacle REC1 (FIGURE 40E) permits plugging in a remote control button to control the starter ST1 when switch S23 is in remote control position.
- TD1—Time delay relay TD1 is energized after the starter ST1 closes and provides a small time delay to allow for the starting surge of current for motor 330. After the set time delay, relay TD1 places the meter relay RY1 into the control circuit.
- TD2—Time delay relay TD2 is energized when starter ST1 is closed. This prevents the scales from dumping more than one time in the same bin if the drum is stopped in the position where switches S28 and S29 are closed.
- R1—Relay R1 is a 115 V. A.C. control relay for the drum vacuum system and the scales power.
- R2—Relay R2 is in the stop circuit. When R2 is energized it interrupts power to the control circuit, shutting down everything but relay R1 and solenoid SOL1.
- R3—Relay R3 is in the drum control circuit. After relay R3 is energized, motor starters ST1, ST2, and ST3R1 and ST3R2 are energized.
- R4—Relay R4 (FIGURE 40D) is the 115 v. A.C. control relay for the bag magazine assembly.
- R5—Relay R5 is in the control circuit for the sewing machine.
- R6—Relay R6 is in the low level bin control circuit.
- R7—Relay R7 is in the meter relay over-load control circuit.
- R8 and R9—Relays R8 and R9 are in the bag magazine and injector control circuit. They are used when first starting the bag injector to prevent the jamming of a bag behind cylinder 128 if the bag injector was previous shut off in a certain position.

- R10**—Relay R10 is in the reversing circuit for roller pneumatic motor 160.
- R11**—Relay R11 (FIGURE 41) is in the control circuit for the thread detector.
- R12**—Relay R12 is also in the control circuit for the thread detector.
- R13**—Relay R13 is a milliampere relay used in the main control of the thread detector circuit.
- OL1**—Overload relay OL1 (FIGURE 40A) provides overload protection for the 115 V. A.C. drum circuit.
- OL2**—Overload relay OL2 provides overload protection for the magazine vacuum pump and motor 174.
- OL3**—Overload relay OL3 provides overload protection for pinch roller electric motor 192.
- OL4**—Overload relay OL4 provides overload protection for magazine conveyor electric motor 88.
- T1**—Timer T1 (FIGURE 40C) is in the low level bin control circuit.
- T2**—Timer T2 (FIGURE 40C) is in the circuit that determines and controls the length of time that the sewing machine will run when there are no bags present.
- T3**—Timer T3 (FIGURE 40D) determines the time period that cylinder 160 is up, after which T3 energizes solenoid SOL4 to lower the roller cylinder 160.
- B1** Bin indicator B1 is in the control circuit for low level bin control (FIGURE 40C).
- CRMR Circuit**—Meter relay CRMR (see circuit in FIGURE 42) is a continuous reading meter relay. Meter relay CRMR has a variable set of contacts which can be adjusted by a set point indicator. The meter relay receives its signal from the current transformer CT (FIGURE 40B) which is hooked in series with drum motor 330. If motor 330 draws more current than that for which the CRMR is set, by the indicator, the meter closes the contacts in the meter relay which energizes the overload relay RY1 of the CRMR circuit. When RY1 closes, relay CRMR is energized which then energizes relay R2 and shut down everything but solenoid SOL1 and relay R1.
- TF2**—Transformer TF2 (FIGURE 41) reduces 115 V. A.C. to 10 V. A.C. for the thread detector circuit.
- D6**—Rectifier D6 (FIGURE 41) rectifies 10 V. A.C. to approximately 6 V. effective D.C. for the thread detector circuit.
- RES7**—Resistor RES7 is a limiting resistor 3000 ohms in series with diode D6 for the thread detector circuit.
- C4**—Capacitor C4 is connected in parallel with the coil of thread detector relay R13, thus making the milliampere relay R13 a timed relay. C4 is sufficiently large to hold relay R13 energized for a period of time at least equal to a stitching cycle, and preferably two or three times the period of a stitch cycle.
- Slip Rings**—Rotary slip rings seen in the upper left hand corner of FIGURE 40A are two stationary carbon brushes riding on separate brass rings which rotate with the drum. This is the means for supplying the interior drum circuit with 115 V. A.C.

Complete machine operation (electrical)

This portion of the description is presented with primary reference to FIGURES 40, 41 and 42.

When it is desired to start the bag machine, switch S1 is turned to "on" position, energizing the drum vacuum relay R1 and solenoid SOL1. With the sewing machine switch S11 in "run" position, motor starter ST4 and ST5 for the dual V-belt and flat belt conveyors are energized.

With the bin level by-pass switch S6 in "off" position,

turn switch S4 "on." This will start the bin indicator motor and if sufficient material is in the bin, the BI switch will be "on" to energize magazine control relay R4. If a situation should exist where inadequate or no material was present in the bin when switch S4 was turned on, the BI switch would not be actuated, but timer T1 would be permitted to start. After a preset time period, timer T1 activates a circuit which energizes low level bin control relay R6 which in turn remains energized and prevents the starting of bag injector assembly, even upon a subsequent flow of material into the storage bin. To restart the bag injector, reset switch S5 must be pushed to release bin control relay R6 and then, with material present in the bin, energizing of the magazine control relay R4 will result.

With bin level by-pass switch S6 in "on" position, BI, T1 and R6 would be by-passed and when switch S4 is turned "on," relay R4 would be energized regardless of the bin level condition. After relay R4 is energized the bag injector starts and magazine control relay R9 is also energized. A supply of bags in the bag magazine holds the automatic bag supply switch S34 closed and the injector pinch roller motor 192 will start. When switch S34 is a manual switch, it will be placed in closed condition by the operator. After the magazine conveyor motor 88 runs long enough to pull the bags tight against the pressure fingers for switch S14, conveyor motor 88 will shut off. If the bag magazine supply subsequently becomes too low, the magazine supply sensing switch S34 opens and stops the pinch roller motor 192 or, alternatively, if switch S34 is a manual switch, the operator can open it to stop the motor 192 when the bag supply is low.

To start the drum, starters ST4 and ST5 must be energized and air pressure must be up to running pressure to close the PS switch. Switch S2 is then pressed to energize the drum control relay R3. Relay R3 sends energized through the NC contacts of switch S3. When relay R3 closes, starters ST1, ST2, ST3 and ST7, are energized. When starter ST1 closes, time delay relays TD1 and TD2 are energized.

After the drum has started its rotation, the first actuation of station trip switch S16 (shown in FIGURE 9) energizes the magazine relay R8. The second station trip switch S17 is then actuated by drum rotation and releases the magazine safety relay R9. This sequence occurs each time the magazine and bag injector switch S4 is turned on, and constitutes a safety procedure to prevent the jamming of a bag behind the roller 142 if the bag injector is shut "off" in a certain phase of its cycle.

After the preceding sequences of initial control action occurs, switch S16, whenever subsequently tripped, will energize SOL3 to activate horizontal carriage pneumatic motor 236 in retract direction. On the in-stroke, motor 236 actuates switch S20 which energizes the bag gate closing solenoids SOL6 and SOL11. When motor 236 reaches its end-of-stroke, switch S18 is actuated to energize SOL7 which reverses the direction of the horizontal carriage motor.

As the drum rotation continues, after the tripping of switch S16, the second station trip switch S17 is actuated and energizes bag gate opening solenoids SOL10 and SOL12.

As the horizontal carriage motor 236 accomplishes its reverse or extension stroke, switch S19 is actuated and energizes roller reverse operating relay R10 and timer T3 and the roller raising solenoid SOL8 which activates the roller lifting pneumatic motor. After a preset time period, the timer T3 energizes roller lowering solenoid SOL4 to reverse the roller lifting motor, and as the roller 142 approaches its retract location, it will actuate switch S21 (FIGURE 6) which releases the roller reversing relay R10 and energizes bail operating solenoid SOL9. SOL9 activates the bail operating air motor 184 (FIGURE 7) which, on its inward stroke first actuates switch S15 which de-energizes the bail suction "cut-off" solenoid SOL16 and

energizes bail suction "on" solenoid SOL2. As bail motor 184 completes its inward stroke, terminal switch S22 is actuated to energize a solenoid SOL5 which reverses the direction of bail motor 184. On its reverse stroke, bail motor 184 actuates switch S15 back to its original position which de-energizes suction "on" solenoid SOL2 and energizes suction "cut-off" solenoid SOL16.

All eighteen (18) drum bag hanger stations operate in accord with the following sequence.

As the drum continues its rotation, bag clamping operating switches S32 and S33 are actuated by trips 352 and 354 (FIGURE 8). Switch S32 de-energizes the front clamp solenoid SOL14 and switch S33 de-energizes rear clamp solenoid SOL15. Subsequently, drum rotation actuates bag vacuum control switch S31 to "on" during a short increment of drum travel, energizing vacuum line station solenoid SOL13. As the drum carries the hanger station on to the scales dispensing position F, with scales cocking switches S26 and S27 in "on" position, and the wire feeler operated bag sensing switch S28 held on by a bag on the hanger, a dump switch S29 is activated by a trip lug 262 mounted on the drum and associated with the specific bag hanger. Trip switch S29 actuates the dump scales and a specific quantity of material is dispensed into the drum hopper.

Further drum rotation carries the bag through the operating bag vibrators to the sewing area where the leading edge of the bag is picked up by the dual V-belt guides. After the leading edge of the bag is picked up, the front clamp switch S32 on the drum is actuated which energizes the bag hanger front clamp solenoid SOL14. As the trailing edge of the bag enters the V-belts the rear bag clamp switch S33 is actuated and energizes bag hanger rear clamp solenoid SOL15.

With the bag in the dual V-belt conveyor and approaching the sewing head, a bag sensing sewing machine start switch S7 is actuated. Switch S7 energizes the sewing machine motor starter ST6 and the sewing machine control circuit relay R5. After relay R5 is energized, the sewing machine running timer T2 starts its time cycle. As each succeeding bag actuates switch S7, the running timer T2 is automatically reset. If no bags arrive at the sewing machine within a predetermined timer period, timer T2 opens its contacts and releases starter ST6 and relay R5.

Sewing thread detector (optional)

When the sewing machine motor starter ST6 is energized the relay R11 in thread detector circuit (see FIGURE 41) will be energized. However, before relay R11 is energized, its NC contacts are connected in parallel with a thread detector switch S36 which keeps a control circuit relay R13 energized. However, when ST6 is energized and it energizes relay R11 the NC contacts will open. However, even though energized relay R11 breaks the direct circuit to relay R13, the control relay R13 will remain temporarily energized by the discharge of capacitor C4. When sewing machine motor starter ST6 closes, the sewing head starts to stitch and stitch cycled impulses, via switch S36 (activated by cycling tensioning and slackening in the thread to the needle), intermittently energize relay R13 and recharges capacitor C4 to keep relay R13 energized. If the sewing thread breaks, the thread detector switch S36 is no longer cycled and thus will stay open which permits a complete discharge of capacitor C4 and the control relay R13 will be released. When relay R13 is released a further control relay R12 is energized and interrupts the main bag machine control circuit, shutting down everything except drum vacuum and scale power relay R1 and air supply solenoid SOL1. To restart the machine, switch S9 can be pushed to release the thread detector safety relay R12 and to energize motor starters ST4 and ST5. The thread detector by-pass switch S35 by passes thread safety relay R12 and drum start relay R3 so the thread detector cycling switch S36 has no effect on the machine control circuit.

When test switch S11 is switched from "run" to "sewing machine test," the bag machine control circuit is interrupted and sewing test switch S8, a push-to-test switch, is placed in circuit. When switch S8 is pushed, sewing machine motor starter ST6 is energized. When switch S8 is released the starter ST6 drops out.

When remote control switch S23 is switched from "run" to "remote control," the machine control circuit is interrupted and the remote button receptacle REC1 is placed into the circuit. With a cord from a remote control button switch plugged into receptacle REC1, so long as the button is held in, the drum drive motor starter ST1 will be energized.

Meter relay circuit

The meter relay receives a signal from the current transformer CT connected in series with drive motor 330.

When drive motor starter ST1 closes, a time delay relay TD1 is energized after a predetermined delay period to allow for the starting surge of current; TD1 closes and places the meter relay CRMR (FIGURE 42) in the control circuit. If drum drive motor 330 draws more current than the meter relay is set for, the meter hand closes the contacts in the meter relay which energizes overload relay RY1 in the CRMR circuit. When overload relay RY1 closes, meter controlled relay R7 (see FIGURE 40A) is energized to then energize the stop circuit relay R2 which shuts off power to everything but the vacuum and scales relay R1 and the drum air supply solenoid SOL1.

Stop buttons

Whenever stop switches S10, S12 or S13 are pressed, the stop circuit relay R2 is energized and interrupts the machine control circuit to shut down everything except relay R1 and solenoid SOL1. To restart the machine, switch S9 may be pushed. This action will release the stop relay R2 and start the motor starters ST4 and ST5. Also the switch S2 can be used instead of switch S9 to restart the machine. When switch S2 is pushed, stop relay R2 is released, resulting in energizing of starters ST4, ST5 and then starters ST1, ST2, ST3 and ST7 will be energized.

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 combination comprising: a rotary turret type bag filling conveyor including at least one folded bag hanger, opener, filler and closing means including bag gripping means enabling acceptance of a folded flat bag while the folded flat bag plane is disposed substantially in a plane including the axis of said rotary conveyor; a bag magazine assembly including a bag singling dispenser means with an intermediate horizontal carriage conveyor defining a radially disposed flat bag plane along which singled folded bags delivered while substantially disposed in a vertical planar path radial to the axis of said turret conveyor and into a pick-up position for acceptance by said bag holding, opening, filling and closing means incorporated on said rotating turret assembly; said rotating turret assembly comprising means for accomplishing a rotational cycle of operation of said bag holding means to accept the folded bag and open, fill and close said bag and condition said filled bag for transfer to a further conveyor; a third assembly comprising a transfer conveyor, which constitutes said further conveyor, for accepting and gripping the now closed but previously opened end of a filled

bag from said turret conveyor and including a device for effectively sealing the closed upper end of an accepted filled bag.

2. A bag filling machine comprising: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag, said rotary turret type bag filling conveyor comprising: a non-rotatable support structure, a rotatable structure, and a plurality of bag hanger and filler stations and station mounting means securing said stations on said rotatable structure, each station including means for accepting securing and opening individual closed folded bags during rotation of said rotatable structure, said station mounting means also mounting said means for securing and opening the bags on said rotatable structure for incremental planetary rotation relative to said rotatable structure, to enable acceptance of closed folded bags from said dispenser and passage of filled bags to said transfer conveyor means.

3. A bag filling machine as defined in claim 2, wherein said bag end sealing device comprises a sewing machine assembly; and said control means includes a plurality of operational condition detector means and means in operative connection between said detector means and said power means responsive to disruption of various machine component operations to shut down machine operation.

4. A bag filling machine comprising: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag, and wherein said rotatable turret type bag filling conveyor comprises: a rotatable annulus providing an annular arrangement of vertical passage means, means in said power means for rotating said turret conveyor, a plurality of bag hanger and filler stations, one disposed under each said passage means, and each station including means for securing and opening individual folded bags while station is rotating comprising: suction cup bag openers, individual pneumatic circuits, controls and control operating components located on said rotating annulus, said circuits and controls including a pneumatic means providing periodic cyclic blow-out cleaning of the pneumatic circuits to said suction cup openers during a rotation cycle of the turret conveyor.

5. A bag filling machine comprising: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and

through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag, and wherein said rotatable turret type bag filling conveyor comprises: a rotatable annulus, means in said power means for rotating said annulus; a plurality of bag hanger devices mounted under and on said annulus, each of said devices enabling automatic reception of a folded vertical bag disposed along a radial vertical planar path relative to the axis of said turret in a position where the bag top edge intersects the path of said bag hanger devices, and each of said hanger devices including means adapted to accept, clamp, open, carry a bag through material filling location and permit filling, and provide rotation of the bag relative to the rotation of said annulus to enable swinging of said bag to a tangential disposition for a smooth uninterrupted transfer to said adjoining transfer conveyor.

6. A bag filling machine comprising: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag, and wherein said rotatable turret type bag filling conveyor comprises: an annular arrangement of a plurality of bag hangers, each hanger including its individual upper bag end corner grippers, means for shifting said grippers relative to each other to enable bowing of the upper end of said bag, an individual bag opener means associated with said grippers, operator means for said grippers and for said opener means, and coordinated operating controls for said operator means enabling during a cycle of hanger operation, simultaneous clamping of the two upper corners of a folded bag end, opening of said bag, closing of said bag and subsequent release of the bag as it reaches a position for transfer from the turret type conveyor to said end sealing assembly transfer conveyor.

7. A bag filling machine as defined in claim 6, wherein said rotatable turret type bag filling conveyor comprises a drum made from an annulus of hoppers, said power means includes means to rotate said drum, said upper bag end grippers comprises two upper bag corner grippers; said operating controls being timed by drum rotation and enabling said simultaneous gripping action by said two bag corner grippers on the upper end of a folded closed bag as a hanger reaches a bag pick-up position during drum rotation and engages a bag at said pick-up position, and accomplishing desired cyclic opening of the bag, filling of the bag and closing of the upper end of the bag, and subsequent sequential release by said two bag corner grippers to enable passage of a bag to said transfer conveyor.

8. The bag filling machine turret type filling conveyor assembly as defined in claim 7, where each said bag hanger is planetarily mounted on said drum to enable an inter-related epicyclic motion of the upper gripped end of the bag on the hanger at the position of transfer of the bag from said turret conveyor to said bag gripping transfer conveyor means, said epicyclic motion being coordinated, by said control means with the sequential release of said two bag corner grippers to enable smooth automatic continuous motion transfer of the bag from said turret conveyor to said transfer conveyor means without detrimental bag shifting or tearing of the upper end of the bag as the transfer is accomplished.

9. An automatic bag filling machine comprising: a bag feed assembly including a magazine for folded bags and

singling dispensing means; a turret type bag conveying and filling assembly; and an upper end bag sealing assembly including a sealing device and a conveyor means for receiving bags from said turret conveyor and passing the bag to said end sealing device; said turret conveyor assembly including an annulus of a plurality of open bottom hopper means having top openings, a plurality of bag hanger devices at circumferentially spaced locations under associated hopper means, automatic control means including independently and pneumatically operated bag end clamps at each said bag hanger device adapted to grip the inner and outer upper edge corners of a radially disposed bag dispensed to a pick-up position under said turret conveyor, mechanical means operative in response to turret rotation subsequent to gripping a picked-up bag for accomplishing a relative shift of said bag end clamps toward each other to bow the upper end of the clamped bag, suction cup bag end opening means cyclically operative in response to rotation of said turret means subsequent to bowing of the upper end of said bag to grip opposite sides of and open the upper end of the bag while held by the bag end clamps, a dispensing bag filling spout, having a shiftable flow communication passage means with the lower end of an associated hopper, adapted to be dropped into the opened upper end of a bag gripped in said hanger during and responsive to further rotation of said turret means, means providing a sealed connection between said filling spout and the open end of said bag upon insertion of said spout, dispensing means above said turret operated automatically in response to movement of an open bag with an inserted nozzle into filling position for dispensing into said hopper, and thence filling said bag with, a predetermined quantity of material, said dispensing means including a safety control device preventing operation of said dispensing means if no bag is positioned in said hanger clamps, means operated in response to rotation of said turret means for planetarily rotating the bag hanger with the gripped bag to a position approximately tangential to the path of movement of said hanger station, means for removing the filling spout from the bag and permitting separating movement of said bag end clamps to pull the open end edges of said bag to closed alignment; said conveyor means for receiving filled bags being located adjacent the tangential path of movement of said tangentially disposed bag end grips; means operative in response to drum rotation when the leading bag end grip approaches an inlet to said receiving conveyor for imparting an outward shift to the leading edge of said bag and simultaneously inserting the leading edge of said bag into the inlet of said receiving conveyor; means operative simultaneously with the acceptance of the bag leading edge into the inlet of said receiving conveyor for releasing said leading edge clamp; means responsive to drum rotation operative immediately subsequent to release of said leading edge clamp for imparting an incremental planetary movement to said bag hanger to cause the rear bag clamp to swing outwardly and impart an additive increment of movement of said bag in relation to the angular velocity of said hanger due to turret conveyor rotation and, at the same time, placing the rear edge of said bag in alignment with the front portion of said bag passing into receiving conveyor; means operative automatically as said rear clamp reaches a position immediately adjacent the inlet to said receiving conveyor for accomplishing release of said rear clamp, whereby a filled bag is smoothly and without disruption of continuous movement transferred to said receiving conveyor with the closed upper end portion of said bag conditioned to be sealed as it passes through the bag end sealing station; and means operative in response to further drum rotation immediately after transfer of a bag to said receiving conveyor for planetarily swinging the bag hanger clamps back to a disposition radial with respect to the turret axis as the bag hanger again approaches the pick-up position.

10. A bag filling machine comprising: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag and sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled closed and sealed bag, and wherein said transfer conveyor means includes a linear, upper bag end gripping conveyor; and said rotary turret type conveyor includes means for accepting and clamping the closed but unsealed upper corners of a single folded bag dispensed from said dispenser at a desired turret station, opening the upper end of the accepted bag, inserting a material filling device into the open end of the bag, filling the bag with a predetermined amount of material, withdrawing the filling device, settling the material, rotating the bag in a planetary movement on said turret conveyor to provide incremental planetary movement to the turret carried bag to enable a smooth transfer operation of the bag from the rotary turret conveyor to said linear conveyor, said linear conveyor accepting and conveying the closed filled bag through the bag end sealing operation.

11. A bag filling machine comprising: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag, and wherein said transfer conveyor means includes a dual V-belt bag end gripping type of conveyor leading to said bag end sealing device; and said turret type conveyor assembly includes an annular arrangement of vertical passages, a plurality of bag hanger stations located on the under side of and associated with individual ones of said passages; said dual V-belt conveyor is located adjacent the periphery of said turret conveyor for accepting a bag from said turret conveyor and passing it to and through said end sealing device; means are provided to drive said turret conveyor at a specific angular velocity; means are provided to drive said dual V-belt conveyor at a specific linear velocity greater than said turret angular velocity; and means connecting said bag hangers to said annular arrangement of passages in a manner enabling incremental planetary movement relative to the rotational axis of said turret type conveyor and include coordinating means operative at the position of bag transfer from said turret conveyor to said dual V-belt conveyor to accomplish a precise bag transfer operation with minimum disruption in operation by enabling an inter-relationship of turret conveyor speed and dual belt conveyor speed with sequential releasing of the two upper ends of the bags and with additive and subtractive increments of planetary bag motion relative to the constant rate of turret rotation during precise instances in the period of the bag transfer operation.

12. A bag filling machine comprising: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing

device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag, and wherein said transfer conveyor is a dual belt upper bag end gripping conveyor; a plurality of bag hangers are fixed on and rotatable with said turret conveyor and are mounted for rotation relative to turret conveyor rotation; means control and move said hangers in timed coordination to drum rotation so that hanger rotation in a planetary sense relative to turret rotation occurs at precise times during the transfer of a bag from said turret conveyor to said dual belt conveyor thereby enabling the leading edge of the upper portion of a bag to be smoothly transferred and released from a turret bag hanger into clamping action between the travelling belts of said dual belt conveyor, and subsequently planetarily shifting the rear end of the bag, which remains temporarily clamped in its hanger on the turret conveyor toward the dual belt conveyor to provide total bag movement at a rate of speed at least equal to that of the dual belt conveyor so that the intermediate portion and trailing edge portion of the bag upper end is repositioned radially outwardly from the drum to enable smooth transfer of the bag into said dual belt conveyor, upon completion of which, the trailing edge of the bag is released from its hanger enabling the bag to pass completely into and under subsequent control of said dual belt conveyor.

13. A bag filling machine comprising: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag, and wherein said bag magazine and singling dispenser includes means actuated, in response to a turret conveyor condition, through an operational cycle whereby a folded bag singled from the magazine is shifted horizontally along a vertical planar path substantially radial to the axis of said turret conveyor into a pickup station position under said rotating turret conveyor; and said turret conveyor includes rotating means for automatically picking up a bag from said pick-up station.

14. A bag filling machine comprising: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag, and wherein said rotating turret assembly includes mechanism for gripping, opening, filling and closing a bag; and said bag magazine assembly associated with said drum conveyor includes means for accomplishing singling, dispensing and placement of a vertically disposed folded bag into a radial planar disposition, to the axis of said turret conveyor located at a position of intersection with the rotary path of movement of a bag gripping mechanism on said turret type conveyor.

15. A bag filling machine as defined in claim 14, including control and operating means for accomplishing an automatic cyclic actuation of said bag magazine assembly in response to a signal representative of the approach of a bag gripping device on said turret conveyor to said position of intersection.

16. A bag filling machine comprising: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag, and wherein said folded bag magazine assembly with dispenser comprises: a bag singling mechanism with cyclically oscillatory suction gripping means for separating one bag from a stack of bags in said bag magazine, a singled bag transfer device including a driven pinch roll and shiftable pinch roll movable toward and away from the driven pinch roll; and control means enabling timed actuation of movement of said singling gripping means along a path which intersects the path of shift of said shiftable pinch roll, timed for moving actuation into and away from an intersecting position during a period different from the period of operative shifting actuation of said shiftable pinch roll.

17. A bag filling machine comprising: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag, and wherein said folded bag magazine assembly and dispenser comprise: a folded bag storage device with travelling base means for storing a plurality of bags resting with their bottom ends on said base means; a single bag dispensing and vertical shifting apparatus, including means enabling singling of a bag from said storage device with its bottom end down and shifting the bag downward; a horizontal carrier means disposed below said singling and shifting means, enabling reception by said horizontal carrier of a singled bag in a vertical planar disposition; means for shifting said horizontal carrier together with a vertical bag along a vertical planar path to a horizontal transfer location; and means for temporarily retaining a folded bag in said transfer location while said horizontal carrier returns to said position below said singling and shifting means for a further singled bag.

18. A bag filled machine comprises: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag, and wherein said folded bag magazine assembly com-

prises: a folded bag magazine having an exit end and including a powered conveying means for progressively moving the stored bags toward the magazine exit end; a singling bag dispenser at said exit end including a singling mechanism for removing a single folded bag from said magazine and a carriage for horizontally shifting a singled folded bag along a vertical planar path and depositing said bag in vertical disposition at a transfer position; automatic control means operatively connected to said magazine, said singling mechanism and said carriage enabling a complete, timed cooperation cycle of operation of said bag magazine singling dispenser and carriage, in response to a demand signal from said turret conveyor calling for depositing of a folded bag in said transfer position, causing the horizontal shifting of a previously singled bag to the transfer position, movement of the horizontal carriage back to a position to receive a further singled bag, delivery of a singled bag into said carriage and accomplishing initiation of singling of the front bag from said bag magazine to a position awaiting shifting into said carriage.

19. A bag filling machine as defined in claim 18, wherein a vertical folded bag holding means is located at said transfer position in planar alignment with the vertical planar path of horizontal shift of said carriage and said holding means includes shiftable gate means for selectively maintaining a bag received from said carriage in said holding means and for permitting removal of said held bag by said turret conveyor assembly in a direction transverse to the said planar path.

20. A bag filling machine comprising: a folded bag storage magazine assembly with a singling bag dispenser; a rotary turret type bag filling conveyor assembly; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag, and wherein said bag magazine assembly comprises: a bag magazine; a juxtaposed bag singling assembly adjacent an exit end of said magazine; said magazine having support means enabling a plurality of multi-ply bags to rest on their sealed bottom edges in an upright manner, horizontally stacked one against another and including a powered friction belt conveyor means as the base of said magazine with automatic controls for maintaining close horizontal stacking of said bags in position adjacent the exit end of the bag magazine; said singling assembly enabling a single bag to be separated from the exit end of said magazine stack and including automatically operated relatively shifting pinch rollers means for moving the singled bag downward; a horizontally shiftable bag carriage having one limit position disposed to receive downwardly shifted bags and operable for shifting movement to pass said downwardly shifted bag horizontally along a vertical planar path to a second limit position which is a terminal transfer position to said turret conveyor wherein the top of the bag is disposed in position to be clamped and picked up and carried away by a moving bag hanger on said turret conveyor passing along a path transverse to said planar path.

21. An automatic bag filling machine comprising: a bag feed assembly including a magazine for folded bags and singling dispensing means; a turret type bag conveying and filling assembly; and an upper end bag sealing assembly including a sealing device and a conveyor means for receiving filled bags from said turret conveyor and passing the bag to said end sealing device; said magazine assembly being arranged adjacent said turret assembly and enabling storing of folded bags in an upright position

resting on their sealed bottom ends, said magazine assembly including as a base structure a friction belt type conveyor with operating means controlled automatically in response to stored bag position at the exit end of the friction conveyor, a suction cup single bag picker at said exit end of said friction conveyor for separating the leading bag from the magazine, a pinch roller bag singling mechanism for shifting a picked single bag downwardly, a horizontal bag carriage for receiving a downwardly shifted single bag with operating means for laterally shifting a received, singled and still folded bag in an upright position along a planar path approximately intersecting the axis of said turret conveyor to place the folded bag in a pick-up position directly under the path of rotation of bag hanger pickup stations located on the underside of said turret conveyor, the paths of movement of the upper edge of the bag during lateral shift and of the hanger devices on said rotatable turret conveyor coinciding at said pick-up position; said turret conveyor assembly including an annulus of a plurality open bottom hopper means having top openings, a plurality of bag hangers devices at circumferentially spaced locations under associated hopper means, automatic control means including independently and pneumatically operated bag end clamps at each said bag hanger device adapted to grip the inner and outer upper edge corners of a radially disposed bag in said pick-up position, mechanical means operative in response to turret rotation subsequent to gripping a picked-up bag for accomplishing a relative shift of said bag end clamps toward each other to bow the upper end of the clamped bag, suction cup bag end opening means cyclically operative in response to rotation of said turret means subsequent to bowing of the upper end of said bag to grip opposite sides of and open the upper end of the bag while held by the bag end clamps, a dispensing bag filling spout, having a shiftable flow communication passage means with the lower end of an associated hopper, adapted to be dropped into the opened upper end of a bag gripped in said hanger during and responsive to further rotation of said turret means, means providing a sealed connection between said filling spout and the open end of said bag upon insertion of said spout, dispensing means above said turret operated automatically in response to movement of an open bag with an inserted nozzle into filling position for dispensing into said hopper, and thence filling said bag with, a predetermined quantity of material, said dispensing means including a safety control device preventing operation of said dispensing means if no bag is positioned in said hanger clamps, means operated in response to rotation of said turret means for planetarily rotating the bag hanger with the gripped bag to a position approximately tangential to the path of movement of said hanger station, means for removing the filling spout from the bag and permitting separating movement of said bag end clamps to pull the open end edges of said bag to closed alignment; said conveyor for transferring a filled bag to the end sealing station comprising a dual V belt conveyor having an entrance to said V belt located adjacent the tangential path of movement of said tangentially disposed bag end grips; means operative in response to drum rotation when the leading bag end grip approaches the inlet of said dual belt conveyor for imparting an outward shift to the leading edge of said bag and simultaneously inserting the leading edge of said bag into the inlet of said dual belt conveyor; means operative simultaneously with the acceptance of the bag leading edge into the inlet of said dual belt conveyor for releasing said leading edge clamp; means responsive to drum rotation operative immediately subsequent to release of said leading edge clamp for imparting an incremental planetary movement to said bag hanger to cause the rear bag clamp to swing outwardly and impart an additive increment of movement of said bag in relation to the angular velocity of said hanger due to turret conveyor rotation and, at the same time, placing the rear edge of said bag in align-

ment with the front portion of said bag passing into the dual belt conveyor; means operative automatically as said rear clamp reaches a position immediately adjacent the inlet to said dual belt conveyor for accomplishing release of said rear clamp, whereby a filled bag is smoothly and without disruption of continuous movement transferred to the dual belt conveyor with the closed upper end portion of said bag conditioned to be sealed as it passes through the bag end sealing station; and means operative in response to further drum rotation immediately after transfer of a bag to said dual belt conveyor for planetarily swinging the bag hanger clamps back to a disposition radial with respect to the turret axis as the bag hanger again approaches the pick-up position.

22. A bag filling machine comprising: a folded bag magazine, dispenser and transfer conveyor assembly; a rotatable turret type bag filling conveyor assembly; power means for operating said assemblies and providing continuous rotation of said turret type bag filling conveyor assembly; and means rendered operable responsive to turret conveyor rotational position to accomplish automatic singling and transferring of a closed folded bag from said magazine, dispenser and conveyor assembly to said rotatable turret conveyor assembly during continuous rotation of said turret conveyor assembly.

23. An automatic bag filling machine comprising: a rotary turret type bag filling conveyor including a bag holding, opening, filling and closing device; a bag magazine assembly having a bag singling dispenser means and including a horizontally shifting carriage conveyor for delivering folded flat bags singled from the magazine, said conveyor having a flat planar shaped folded bag guide means substantially disposed with its flat planar shape along a vertical plane path including the axis of said turret conveyor and enabling shifting of a folded flat bag into a pick-up position for acceptance by said bag holding, opening, filling and closing device incorporated on said rotary turret assembly; said rotary turret assembly also comprising means for accomplishing operation of said device to accept the folded flat closed bag, open and fill said bag and close and condition said filled bag for transfer from said turret conveyor.

24. A bag filling machine comprising: a rotary turret type bag filler and conveyor including mechanism for gripping, opening, filling and closing a bag; and a bag magazine and dispensing unit associated with said turret conveyor for accomplishing singling, dispensing and placement of a folded closed bag into a position of intersection with the rotary path of movement of said mechanism on said turret conveyor for gripping a bag; said magazine and dispensing unit comprising: a folded bag magazine disposed adjacent said turret conveyor and enabling storing of folded bags in an upright position resting on their sealed bottom ends and including a friction belt base conveyor with operating means controlled automatically in response to stored bag position at the exit end of said friction conveyor, folding bag singling means at said exit of said friction conveyor for separating the leading bag from said magazine and shifting the separated single folded bag downwardly, and means for receiving and placing a downwardly shifted single bag into said position of intersection for pick-up by said turret conveyor.

25. A bag filling machine as defined in claim 24 wherein said means for receiving the downwardly shift bag comprises: a horizontal carriage means with operating means for laterally shifting a received, singled and still folded bag in an upright position along a planar path approximately intersecting the axis of rotation of said turret conveyor to place the folded bag in a pick-up position directly under the path of rotation of said bag gripping mechanism located on the underside of said turret conveyor, the paths of movement of the upper edge of the lateral bag shift and of said gripping mechanism

on said turret conveyor coinciding at a bag pick-up position.

26. A bag filling machine as defined in claim 24, wherein said folded bag singling means includes a suction cup single bag picker to initially separate the leading bag from said magazine before it is shifted downwardly.

27. A bag filling machine as defined in claim 26, wherein said folding bag singling means further includes a pinch roller conveyor for folded bags operable to grip and downwardly shift a bag separated by said bag picker.

28. A bag filling machine comprising: a rotary turret type bag filler and conveyor having a vertical axis of rotation with a bag hanger mechanism for holding and conditioning bags while on and rotating with said turret conveyor; and a bag magazine and singling dispenser including a horizontal transfer conveyor defining a flat bag plane including the axis of turret rotation, along which plane a singled folded bag is substantially disposed and shifted by said horizontal transfer conveyor radially with respect to the axis of said turret conveyor into a folded bag pick-up position relative to said bag hanger mechanism on said turret type conveyor.

29. A bag filling machine as defined in claim 28, said turret conveyor with bag hanger mechanism comprising: a rotatably mounted annulus of a plurality of open bottom hopper means, a plurality of bag hanger devices at circumferentially spaced locations under associated ones of said hopper means; automatic means including control means and independently operated bag end clamps at each said bag hanger device disposed in common alignment with each other and with the turret axis at least at said pick-up position and thereby adapted to grip the inner and outer upper edge corners of a said radially disposed folded bag.

30. A bag filling machine as defined in claim 29, wherein said turret conveyor with bag hanger mechanism further comprises: mechanical means operative in response to annulus rotation subsequent to the gripping of a picked-up bag for accomplishing a relative shift of said bag end clamps toward each other to bow the upper end of the clamped bag; means cyclically operative in response to rotation of said turret means, subsequent to bowing of the upper end of said bag, to open the upper end of the bag gripped by the bag end clamps; means to place a predetermined amount of material into and through a hopper, above an opened bag, into the opened bag; and means to close the bag and release the clamps holding the filled bag.

31. A bag filling machine as defined in claim 29 wherein said turret conveyor with bag hanger mechanism further comprises: means to open the gripped bag; a bag filling spout, having shiftable flow communication passage means with the lower end of an associated hopper, adapted to be placed into the opened upper end of a bag gripped in said hanger during and responsive to further rotation of said turret means; dispensing means above said turret operated automatically in response to movement of an open bag with an inserted nozzle into filling position for dispensing into and through said hopper into said bag, a predetermined quantity of material; means for removing said filling spout responsive to further rotation of said turret conveyor; and means rendered operable subsequent to spout removal to release the bag from said clamps.

32. A bag filling machine as defined in claim 31, wherein said turret conveyor with bag hanger mechanism further comprises: a safety control device in said dispensing means preventing operation of said dispensing means if no bag is positioned in said hanger clamps.

33. A bag filling machine comprising: a rotary turret type bag filler and conveyor with a bag hanger mechanism for holding and conditioning bags while on and rotating with said turret conveyor; and a bag magazine and singling dispenser including a horizontal transfer conveyor for shifting a singled folded bag along and substantially dis-

posed in a vertical planar path radially with respect to the axis of said turret conveyor into a folded bag pick-up position relative to said bag hanger mechanism on said turret type conveyor; said turret conveyor comprising: a rotatably mounted annulus of a plurality of open bottom hopper means, a plurality of bag hanger devices at circumferentially spaced locations under associated ones of said hopper means, automatic means including control means and independently operated bag end clamps at each said bag hanger device adapted to grip the inner and outer upper edge corners of said radially disposed folded bag in said pick-up position, mechanical means operative in response to annulus rotation subsequent to the gripping of a picked-up bag for accomplishing a relative shift of said bag end clamps toward each other to bow the upper end of the clamped bag to enable opening and filling of the bag, means operable subsequent to filling the bag to permit separating movement of said bag end clamps to pull the open end edges of said bag to closed alignment, means operated in response to rotation of said turret means for planetarily rotating the bag hanger with the gripped bag to a position approximately tangential to the path of movement of said hanger station, and means operative in response to further turret conveyor rotation for releasing the clamped gripping of the upper edge of said bag and relinquishing control of said bag.

34. A bag filling machine as defined in claim 33 wherein said means for releasing said upper edge of the bag is rendered operative in response to turret rotation to first release the leading edge clamp and includes further means responsive to drum rotation operative immediately subsequent to release of said leading edge clamp for imparting an incremental planetary movement to said bag hanger to cause the rear bag clamp to swing outwardly and impart an additive increment of movement of said bag in relation to the angular velocity of said hanger due to turret conveyor rotation; means operative automatically subsequent to said additive planetary increment of rotation for accomplishing release of said rear clamp, whereby a filled bag may be passed off of said turret conveyor in a straight path; and means operative in response to further drum rotation immediately after complete release of a bag for planetarily swinging said bag hanger clamps back to a disposition radial with respect to the turret conveyor axis as said bag hanger device again approaches said pick-up position.

35. A bag filling machine comprising: a rotary turret type bag filler and conveyor with a bag hanger mechanism for holding and conditioning bags while on and rotating with said turret conveyor; and a bag magazine and singling dispenser including a horizontal transfer conveyor for shifting a singled folded bag along and substantially disposed in a vertical planar path radially with respect to the axis of said turret conveyor into a folded bag pick-up position relative to said bag hanger mechanism on said turret type conveyor; said turret means with bag hanger mechanism comprising: a rotatably mounted annulus of a plurality of open bottom hopper means; a plurality of bag hanger devices at circumferentially spaced locations under associated ones of said hopper means; automatic means including control means and independently operated bag end clamps at each said bag hanger device adapted to grip the inner and outer upper edge corners of a radially disposed folded bag in said pick-up position; mechanical means operative in response to annulus rotation subsequent to the gripping of a picked-up bag for accomplishing a relative shift of said bag end clamps toward each other to bow the upper end of the clamped bag; bag end opening means cyclically operative in response to rotation of said turret means, subsequent to bowing of the upper end of said bag, to grip opposite sides of and open the upper end of the bag gripped by the bag end clamps; a bag filling spout, having shiftable flow communication passage means with the lower end of an associated hopper, adapted to be placed into the opened upper end of a

bag gripped in said hanger during and responsive to further rotation of said turret means; dispensing means above said turret operated automatically in response to movement of an open bag with an inserted nozzle into filling position for dispensing into and through said hopper into said bag, a predetermined quantity of material, said dispensing means including a safety control device preventing operation of said dispensing means if no bag is positioned in said hanger clamps; means for removing said filling spout from the bag and permitting separating movement of said bag end clamps to pull the open end edges of said bag to closed alignment; means operated in response to rotation of said turret means for planetarily rotating the bag hanger with the gripped bag to a position approximately tangential to the path of movement of said hanger station; means operative in response to further drum rotation for imparting an outward shift to the leading edge of said bag and simultaneously releasing gripping of the leading edge of said bag and relinquishing control of said bag leading edge; means responsive to drum rotation operative immediately subsequent to release of said leading edge clamp for imparting an incremental planetary movement to said bag hanger to cause the rear bag clamp to swing outwardly and impart an additive increment of movement of said bag in relation to the angular velocity of said hanger due to turret conveyor rotation; means operative automatically subsequent to said additive planetary increment of rotation for accomplishing release of said rear clamp, whereby a filled bag may be passed off of said turret conveyor in a straight path; and means operative in response to further drum rotation immediately after complete release of a bag for planetarily swinging said bag hanger clamps grip back to a disposition radial with respect to the turret axis as said bag hanger device again approaches said pick-up position.

36. A bag filling machine as defined in claim 35 wherein a foam plastic collar means on said bag filling spout provides a sealed connection between said filling spout and the open end of a bag into which said spout is inserted.

37. An automatic bag filling machine comprising: a folded bag feed assembly including a magazine for folded bags and bag singling dispensing means; and a rotary turret type bag conveying and filling assembly; said magazine being disposed adjacent said turret assembly, enabling storing of folded bags in an upright position resting on their sealed bottom ends and including: a friction belt base conveyor with operating means controlled automatically in response to stored bag position at an exit end of the friction conveyor, a suction cup single bag picker at said exit end of said friction conveyor for separating the leading bag from said magazine, a pinch roller, bag singling mechanism for shifting a picked single bag downwardly, a horizontal carriage means for receiving a downwardly shifted single bag including operating means for laterally shifting a received, still folded single bag in an upright position along a planar path approximately intersecting the axis of rotation of said turret conveyor to place the folded bag in a pick-up position directly under the path of rotation of bag hanger pick-up devices located on the underside of said turret conveyor, the paths of movement of the upper edge of the lateral bag shift and of the hanger pick-up devices on said turret conveyor coinciding at said pick-up position; and said turret means comprising: a rotatably mounted annulus of a plurality of open bottom hopper means; a plurality of bag hanger devices at circumferentially spaced locations under associated ones of said hopper means; automatic means including control means and independently operated bag end clamps at each said bag hanger device adapted to grip the inner and outer upper edge corners of a radially disposed folded bag in said pick-up position; mechanical means operative in response to annulus rotation subsequent to the gripping of a picked-up bag for accomplishing a relative shift of said bag end clamps to-

ward each other to bow the upper end of the clamped bag; suction cup bag end opening means cyclically operative in response to rotation of said turret means, subsequent to bowing of the upper end of said bag, to grip opposite sides of and open the upper end of the bag gripped by the bag end clamps; a bag filling spout, having shiftable flow communication passage means with the lower end of an associated hopper, adapted to be placed into the opened upper end of a bag gripped in said hanger during and responsive to further rotation of said turret means; means providing a sealed connection between said filling spout and the open end of said bag; dispensing means above said turret operated automatically in response to movement of an open bag with an inserted nozzle into filling position for dispensing into and through said hopper into said bag, a predetermined quantity of material, said dispensing means including a safety control device preventing operation of said dispensing means if no bag is positioned in said hanger clamps; means for removing said filling spout from the bag and permitting separating movement of said bag end clamps to pull the open end edges of said bag to closed alignment; means operated in response to rotation of said turret means for planetarily rotating the bag hanger with the gripped bag to a position approximately tangential to the path of movement of said hanger station; means operative in response to further turret rotation for imparting an outward shift to the leading edge of said bag and simultaneously releasing gripping of the leading edge of said bag and relinquishing control of said bag leading edge; means responsive to drum rotation operative immediately subsequent to release of said leading edge clamp for imparting an incremental planetary movement to said bag hanger to cause the rear bag clamp to swing outwardly and impart an additive increment of movement of said bag in relation to the angular velocity of said hanger due to turret conveyor rotation; means operative automatically subsequent to said additive planetary increment of rotation for accomplishing release of said rear clamp, whereby a filled bag is passed off of said turret conveyor; and means operative in response to further drum rotation immediately after complete release of a bag for planetarily swinging said bag hanger clamps back to a disposition radial with respect to the turret axis as said bag hanger device again approaches said pick-up position.

38. A bag filling machine as defined in claim 37, including control and operating means for accomplishing an automatic cyclic actuation of said feed assembly in response to a signal representative of the approach of a bag hanger device on said turret conveyor to said position of bag pick-up.

39. A bag filling machine comprising: a rotary turret type bag filling conveyor assembly with a hopper annulus, bag hangers and means mounting said bag hangers under said annulus for planetary movement relative to turret conveyor rotation; a bag end sealing assembly including a bag end sealing device and a bag gripping transfer conveyor means leading from said turret conveyor assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating said two assemblies to provide completely automatic operations on a folded bag placed in a turret conveyor hanger through said turret assembly thence through a transfer operation of said transfer conveyor to egress from said sealing device of a completely filled, closed and sealed bag.

40. A bag filling machine comprising: a bag end sealing apparatus with a linear, upper bag end gripping conveyor; power means to operate said linear conveyor; a rotary turret type bag filling conveyor including means for accepting and clamping the closed but unsealed upper corners of a single folded bag at a desired turret station, opening the upper end of the bag, inserting a material filling device into the open end of the bag, filling the bag

with a predetermined amount of material, withdrawing the filling device, settling the material, rotating the bag in a planetary movement on said turret conveyor to provide incremental planetary movement to the turret carried bag to enable a smooth transfer operation of the bag from the rotary turret conveyor to said linear conveyor, said linear conveyor accepting and conveying the closed filled bag through a bag end sealing operation; and means for rotating said turret conveyor.

41. A bag filling machine comprising: a bag end sealing apparatus with an upper bag end gripping dual belt type bag conveyor; power means to operate said dual belt conveyor; a turret type rotary bag filling conveyor comprising a multiplicity of bag filling stations, each of which includes a material discharge spout means and mechanism to hold and manipulate a bag under the associated said discharge spout means, and bag passage hoppers disposed in said turret assembly immediately above and in flow communication with an associated said discharge spout means; said turret assembly including mechanism operable during successive angular positions, of turret rotation to manipulate said bag, in sequence, through a series of operations enabling bag end opening, nozzle spout inserting, material filling, and planetary rotation of said bag into positions enabling transfer of the bag to said bag gripping dual belt type conveyor, in a smooth continuous operation enabling subsequent satisfactory positioning and conveyance of the bag in said dual belt conveyor to and through a bag end sealing operation; and power means to rotate said turret conveyor.

42. A bag filling machine comprising: a bag end sealing apparatus including a dual V-belt bag end gripping type of conveyor leading to a bag end sealing device; a turret type bag filling conveyor assembly including an annular arrangement of vertical passages, a plurality of bag hanger stations with turret mounting means enabling incremental planetary movement of each said hanger station relative to the rotational axis of the turret located on the under side of and associated with individual ones of said passages; said dual V-belt conveyor being located adjacent the periphery of said turret conveyor for accepting a bag from said turret conveyor and passing it to and through said end sealing device; means driving said turret conveyor at a specific angular velocity; means driving said dual V-belt conveyor at a specific linear velocity greater than said turret angular velocity; and means connecting said bag hangers to said annular arrangement of passages and including coordinating means operative at the position of bag transfer from said turret conveyor to said dual V-belt conveyor to accomplish a precise bag transfer operation with minimum disruption in operation by enabling an inter-relationship of turret conveyor speed and dual belt conveyor speed with sequential releasing of the two upper ends of the bags and additive and subtractive increments of bag motion enabled by said means mounting said hanger stations to said turret relative to the constant rate of turret rotation during precise instances in the period of the bag transfer operation.

43. A bag filling machine comprising: a rotatable turret type bag filling conveyor; an adjoining dual belt conveyor; a plurality of bag hangers on and rotatable with said turret conveyor and mounted for additional rotation relative to turret conveyor rotation; means controlling and moving said hangers in timed coordination to drum rotation so that hanger rotation in a planetary sense relative to turret rotation occurs at precise times during the transfer of a bag from said turret conveyor to said dual belt conveyor thereby enabling the leading edge of the upper portion of a bag to be smoothly transferred and released from a turret bag hanger into clamping action between the travelling belts of a dual belt conveyor, and subsequently planetarily shifting the rear end of the bag, which remains temporarily clamped in its hanger on the turret conveyor, toward the dual belt conveyor to

provide total bag movement at a rate of speed at least equal to that of the dual belt conveyor so that the intermediate portion and trailing edge portion of the bag upper end is repositioned radially outwardly from the drum to enable smooth transfer of the bag into said dual belt conveyor, upon completion of which, the trailing edge of the bag is released from its hanger enabling the bag to pass completely into and under subsequent control of said dual belt conveyor.

44. An automatic bag filling machine comprising: a turret type bag conveying and filling assembly; and an upper end bag sealing assembly including a bag end sealing device and a conveyor means for receiving bags from said turret conveyor and passing the bag to said end sealing device; said turret means including a plurality of bag hanger devices at circumferentially spaced locations under a plurality of associated open bottom hopper means having inlet openings at the upper side of said turret conveyor, automatic control means including independently operated bag end clamps at each said bag hanger device adapted to grip the inner and outer upper edge corners of a radially disposed bag in a pick-up position, mechanical means operative in response to turret rotation subsequent to gripping a picked-up bag for accomplishing a relative shift of said bag end clamps toward each other to bow the upper end of the clamped bag, suction cup bag end opening means cyclically operative in response to rotation of said turret conveyor subsequent to bowing of the upper end of said bag to grip opposite sides of and open the upper end of the bag gripped by said bag end clamps, a dispensing bag filling spout having a shiftable flow communication passage means with the lower end of an associated hopper means adapted to be moved down into the opened upper end of a bag gripped in said hanger device clamps during and responsive to further rotation of said turret conveyor; dispensing means above said turret conveyor operated automatically in response to movement of an open bag with an inserted nozzle into filling position for dispensing into said hopper means, and thence filling said bag with, a predetermined quantity of material; means operated in response to rotation of said turret conveyor for planetarily rotating each bag hanger device with a gripped bag to a position approximately tangential to the path of movement of said hanger device station; means for removing the filling spout from the bag and permitting separating movement of said bag end clamps to pull the open end edges of said bag to closed alignment; said conveyor for transferring a filled bag to the end sealing station comprising a dual V belt conveyor having an entrance to said V belt located adjacent the tangential path of movement of said tangentially disposed bag end clamps; means operative in response to turret conveyor rotation when the leading bag end clamp approaches the inlet of said dual belt conveyor for imparting an outward shift to the leading edge of the bag and simultaneously inserting the leading edge of the bag into the inlet of said dual belt conveyor; means operative simultaneously with the acceptance of the bag leading edge into the inlet of said dual belt conveyor for releasing said leading edge clamp; means responsive to drum rotation operative immediately subsequent to release of said leading edge clamp for imparting an incremental planetary movement to said bag hanger device to cause the rear bag clamp to swing outwardly and impart an additive increment of movement of the bag in relation to the angular velocity of said hanger device due to turret conveyor rotation, at the same time placing the rear edge of the bag in alignment with the front portion of the bag passing into the dual belt conveyor; means operative automatically as said rear clamp reaches a position immediately adjacent the inlet to said dual belt conveyor for accomplishing release of said rear clamp, whereby a filled bag is smoothly and without disruption of continuous movement transferred to the dual belt

conveyor with the closed upper end portion of the bag conditioned to be sealed as it passes through said bag end sealing station; and means operative in response to further drum rotation immediately after transfer of a bag to said dual belt conveyor for planetarily swinging the bag hanger clamps back to a disposition radial relative to the turret axis as said bag hanger device again approaches the pick-up position.

45. A folded bag automatic handling device comprising in combination: a bag magazine; a bag singling mechanism with cyclically oscillatory suction gripping means for separating one bag from a stack of bags in said bag magazine; a singled bag, transfer device including a driven pinch roll and shiftable pinch roll movable toward and away from the driven pinch roll; and control means enabling timed actuation of movement of said singling gripping means along a path which intersects the path of shift of said shiftable pinch roll, timed for moving actuation into and away from an intersecting position during a period different from the period of operative shifting actuation of said shiftable pinch roll.

46. A folded bag automatic handling device comprising in combination: a folded bag storage device with traveling base means for storing a plurality of bags resting with their bottom ends on said base means; a single bag dispensing and vertical shifting apparatus, including means enabling singling of a bag from said storage device with its bottom end down and shifting the bag downward; a horizontal carrier means disposed below said singling and shifting means, enabling reception by said horizontal carrier of a singled bag in a vertical planar disposition; means for shifting said horizontal carrier together with a vertical bag along a vertical planar path to a horizontal transfer location; and means for temporarily retaining a folded bag in said transfer location while said horizontal carrier returns to said position below said singling and shifting means for a further singled bag.

47. A folded bag automatic handling device comprising in combination: a folded bag magazine having an exit end and including a powered conveying means for progressively moving the stored bags toward the magazine exit end; a singling bag dispenser at said exit end including a singling mechanism for removing a single folded bag from said magazine and a carriage for horizontally shifting a singled folded bag along a vertical planar path and depositing said bag in vertical disposition at a transfer position; automatic control means operatively connected to said magazine, said singling mechanism and said carriage enabling a complete, timed cooperation cycle of operation of said bag magazine singling dispenser and carriage, in response to a demand signal calling for depositing of a folded bag at said transfer position, causing the horizontal shifting of a previously singled bag to the transfer position, movement of the horizontal carriage back to a position to receive a further singled bag, delivery of a singled bag into said carriage and accomplishing initiation of singling of the front bag from said bag magazine to a position awaiting shifting into said carriage.

48. A folded bag automatic handling device as defined in claim 47, wherein a holding means for a vertically disposed folded bag is located at said transfer position in planar alignment with the vertical planar path of horizontal shift of said carriage; and said holding means includes shiftable gate means for selectively maintaining a bag received from said carriage in said holding means and for permitting removal of said held bag in a direction of transverse to the said planar path.

49. A folded bag automatic handling device comprising: a bag magazine with a juxtaposed bag singling assembly adjacent an exit end of said magazine; said magazine having support means enabling a plurality of multi-ply bags to rest on their sealed bottom edges in an upright manner, horizontally stacked one against another and including a powered friction belt conveyor means as the base of said magazine with automatic controls for main-

taining close horizontal stacking of said bags in position adjacent the exit end of the bag magazine; said singling assembly enabling a single bag to be separated from the exit end of said magazine stack and including automatically operated relatively shifting pinch roller means for moving the singled bag downward; and a horizontally shiftable bag carrier means with a carriage having one limit position disposed to receive downwardly shifted bags and operable for shifting movement to pass said downwardly shifted bag horizontally along a vertical planar path to a second limit position which is a terminal transfer position wherein the top of the bag is disposed in position to be clamped and picked up and carried away along a path transverse to said planar path by another device.

50. A folded bag automatic handling device comprising: a bag storage magazine with a juxtaposed singling device, said magazine having structural means for storing a plurality of folded bags in vertical disposition on their sealed bottom ends in a horizontal stack, said structural means including horizontally disposed parallel stretches of a plurality of endless loop means providing base means, on which the bottom of said bags are resting, and constituting a bag magazine conveyor for slowly moving all folded bags in said magazine toward a single bag exit position at the end of said conveyor; means to single the end bag from the stack of bags on said conveyor and to shift said singled bag downwardly; a horizontally shiftable carriage means disposed in position below said singling means for accepting said downwardly shifted single bag and conveying the bag sideways in a vertical planar path to a transfer position for subsequent removal for further operations.

51. A folded bag automatic handling device as defined in claim 50, including automatic control means enabling a complete timed cooperation cycle of operation of said bag storage magazine singling device and carriage means in response to a demand signal calling for depositing of a folded bag in said transfer position, causing the horizontal shifting of a previously singled bag to the transfer position, movement of the horizontal carriage means back to a position to receive a further singled bag, delivery of a singled bag into said carriage means and accomplishing initiation of singling of the front bag from said bag magazine to a position awaiting shifting into said carriage means.

52. A folded bag automatic handling device comprising: a bag storage magazine and folded bag singling and dispensing means; said magazine enabling storing of folded bags in an upright position resting on their sealed bottom ends and including a friction belt type base conveyor with operating means controlled automatically in response to stored bag position at the exit end of the friction conveyor; said singling and dispensing means including a single bag picker at said exit end of said friction conveyor for separating the leading bag from the magazine, a pinch roller bag singling mechanism for shifting a picked single bag downwardly, a horizontal bag carrier means for receiving a downwardly shifted single bag and operating means for said horizontal carrier means for laterally shifting a received, still folded bag in an upright position along a planar path to place the folded bag in a transfer position for further operations.

53. A folded bag automatic handling device as defined in claim 52, wherein said single bag picker comprises a swinging bail device with suction gripper means adapted to be swung into engagement with the leading bag in said magazine, grip its surface and to be swung back to pull the bottom portion of the leading bag away from said magazine to a position where said pinch roller mechanism can embrace the lower portion of said leading bag and roll the entire bag downward from the exit end of said magazine.

54. A folded bag automatic handling device as defined in claim 52, wherein said magazine includes fixed vertical

guide means along one side engaged by one of the vertical edges of a folded bag in the stack of vertical bags, an operable bumper means disposed on the other side of said magazine adjacent the exit end of said magazine adapted to be operated to bump the other of the vertical edges of the leading bags in said bag to force said one edges of the leading bags against said fixed guide means just prior to the leading bag being singled, and means for periodically automatically operating said bumper means when bags are being singled and dispensed.

55. A folded bag magazine assembly for storing and maintaining a supply of folded bags at a discharge location, comprising: structural means to support a plurality of folded bags resting in an upright manner on their bottom sealed ends and stacked horizontally one against the other, said structural means including a base platform comprising endless friction belt track, motor means for slowly concurrently driving all said endless belts for creating a force on the bottom ends of all said stacked bags to move them toward said magazine discharge location, including means automatically terminating and initiating operation of said movable track, depending upon location of bags at the end of said magazine.

56. A folded bag magazine as defined in claim 55, wherein vertical bag edge guide means adjacent one of the edges of said base platform and periodically operated ram means are provided adjacent the other edge of said base platform and is adapted, when operated, to engage the edges of at least one leading bag to force the bag into alignment against said side guide means.

57. A bag filling machine including a continually rotatable turret type bag filler and conveyor comprising: a non-rotatable support structure; a rotatable structure; power means for continually rotating said rotatable structure; and a plurality of bag hanger and filler stations mounted on said rotatable structure, each station including means for securing and opening individual folded closed bags during continual rotation of said rotatable structure.

58. A bag filling machine including a rotatable turret type bag filler and conveyor comprising: a non-rotatable support structure; a rotatable structure; and a plurality of bag hanger and filler stations and station mounting means securing said stations on said rotatable structure, each station including means for securing and opening individual folded bags during rotation of said rotatable structure; said station mounting means also mounting said means for securing and opening the bags on said rotatable structure for incremental planetary rotation relative to said rotatable structure.

59. A bag filling machine as defined in claim 58, including means connected to each station mounting structure and responsive to rotation of said rotatable structure for imparting an increment of planetary rotation from a first position to a second position and back to said first position.

60. A bag filling machine as defined in claim 58, wherein said means for securing and opening said bag comprises: bag upper edge gripping clamps, one for each corner of the bag upper edge; an independently operable two-way motor for clamping and unclamping each clamp; means operative upon said bag clamps providing relative motion of the two clamps toward and away from each other; opposed suction cups located between said two clamps, means mounting at least one of said cups for relative movement toward and away from each other; pneumatic circuits, controls and control operating components located on said rotatable structure for selectively connecting suction to both said cups; means to relatively move said cups toward and away from each other; and coordinated means responsive to annulus rotation and operative on said clamp moving means, said cup moving means and a said pneumatic operating component for accomplishing relative movement of said clamps toward each other, relatively moving said cups through a cycle of movement, and applying suction to said cups during their cycle of movement.

61. A bag filling machine as defined in claim 60, wherein said means for moving said clamps are mechanical and comprise cam means, a cam follower means and spring means, said cam means being secured on said non-rotatable structure, and said cam follower means and spring means being disposed on said rotatable structure at a hanger station, connected to relatively move said clamps and biased by said spring means into engagement with said cam means.

62. A bag filling machine as defined in claim 61, wherein said cam follower means comprise a multiple part linkage including a disruptable connection operable only when said station mounting structure is in a desired position of incremental planetary rotation.

63. A bag filling machine as defined in claim 60, wherein said means for moving said cups are mechanical and comprise cam means, a cam follower means and spring means, said cam means being secured on said non-rotatable structure, and said cam follower means and spring means being disposed on said rotatable structure at a hanger station, connected to relatively move said cups and biased by said spring means into engagement with said cam means.

64. A bag filling machine as defined in claim 63, wherein said cam follower means comprises means enabling relative movement of said cups by said cam follower when said station mounting structure is in a desired position of incremental planetary rotation and enabling a positive mechanical interlock between said cam follower and said at least one movable cup when said station mounting structure is swung to another position of incremental planetary rotation.

65. A bag filling machine as defined in claim 60, wherein controls for said motors are provided on said rotatable structure, and actuators for said controls are provided on said non-rotatable structure to selectively enable simultaneous and sequential operation of said two motors associated with a hanger station.

66. A bag filling machine including a rotatable turret type bag filler and conveyor comprising: a rotatable annulus providing an annular arrangement of vertical passage means; a non-rotatable support structure for said annulus; means for rotating said annulus; and a plurality of bag hanger and filler stations, one disposed under each passage means, each station including means for securing, opening and incrementally rotating said individual folded bags planetarily relative to the rotational axis of the turret conveyors while said annulus is rotating.

67. A bag filling machine including a rotatable turret type bag filler and conveyor comprising: a rotatable annulus providing an annular arrangement of vertical passage means; a non-rotatable support structure for said annulus; means for rotating said annulus; and a plurality of bag hanger and filler stations, one disposed under each passage means, each station including means for securing and opening individual folded bags while said annulus is rotating; said means at each bag station comprising means to hold the upper ends of folded bags, suction cup opener means to pull the sides of the upper bag end open, pneumatic circuits, controls and control operating components individual to each station, said circuits and controls including provision of a pneumatic control circuit providing periodic cyclic blowout cleaning of the pneumatic lines to said suction cup opener means at least once during a rotation cycle of the turret conveyor.

68. A bag filling machine as defined in claim 67, wherein the means to hold the bags include two-way pneumatic motors; and said pneumatic control circuit providing periodic blow-out of the pneumatic lines to said suction cup opener means includes a by-pass control rendered operative during the inoperative condition of said bag opener means to direct the exhaust of at least one of said two-way motors into the pneumatic lines to said suction cup opener means, whereby operation of said one two-way

motor will result in said blow-out cleaning of the suction lines.

69. A bag filling machine including a rotatable turret type bag filler and conveyor comprising: a rotatable annulus providing an annular arrangement of vertical passage means; a non-rotatable support structure for said annulus; means for rotating said annulus; a plurality of bag hanger and filler stations, one disposed under each passage means, each station including means for securing and opening individual folded bags while said annulus is rotating; a vertically shiftable bag filling means mounted at each hanger station in fluid connection with an associated one of said passage means; and means, responsive to annulus rotation, connected to said filling means to lower said filling means into an open end of a bag held on said hanger means and to raise said filling means away from the bag after material has been dispensed through said associated passage means and said filling means into the bag.

70. A bag filling machine as defined in claim 69, wherein said filling means includes: a spout subassembly comprising an apertured circular metal plate, a coupling sleeve secured to the upper side of said plate and aligned with and surrounding the plate aperture, a spade shaped nozzle spout secured to the bottom side of said plate in alignment with said aperture and a thick collar of easily deformable resilient material, of sufficient radial dimension to engage the upper edge of a bag into which the spout is inserted, secured to the underside of said plate surrounding said nozzle spout; and means mounted on said annulus and connected to said plate for shifting said nozzle subassembly in a fixed path and maintaining the nozzle non-rotatable relative to the fixed path.

71. A bag filling machine as defined in claim 70, wherein said coupling sleeve and said spade shaped nozzle spout constitute an integral unit inserted through said aperture and welded to said circular plate.

72. A bag filling machine as defined in claim 70, wherein said nozzle collar is a thick foam plastic annulus and is secured to the lower side of said circular plate by suitable adhesive cement.

73. A bag filling machine as defined in claim 70, wherein said means for shifting said nozzle subassembly comprises a vertical telescoping, elongate, cam follower device and bracket means laterally projecting from and connected between the cam following portion of said device and said plate.

74. A bag filling machine as defined in claim 73, wherein a spring means, internal of said telescoping cam follower device connects between the telescoping portions to effectively balance the telescoping members against gravity forces.

75. A bag filling machine including a rotating turret type bag filling conveyor comprising means for automatically picking up a folded bag disposed vertical in planar disposition substantially radial to the axis of said turret conveyor at a pickup station position under the rotating turret conveyor and during subsequent rotation planetarily swinging the bag to a position tangential with respect to the path of movement of the bag due to rotation of the turret conveyor; and means automatically operative on the bag while on the turret conveyor and intermediate the pick-up position and the position where the bag is swung to tangential position for placing a desired amount of material in the bag.

76. A bag filling machine comprising: a rotary turret type conveyor including means for accepting and clamping the closed but unsealed upper corners of a single folded bag at a desired turret station, opening the upper end of the bag, inserting a material filling device into the open end, filling the bag with a predetermined amount of material, withdrawing the filling device, settling the material, rotating the bag in a planetary movement on said turret conveyor to provide incremental planetary movement to the turret carried bag to enable a smooth transfer

operation of the bag away from the rotary turret conveyor.

77. A bag filling machine including a rotatable turret type bag filler and conveyor comprising: a rotatable annulus; means for rotating said annulus; a plurality of bag hanger devices mounted under and on said annulus, each of said devices enabling automatic reception of a folded vertical bag disposed along a radial vertical planar path relative to the axis of said turret in a position where the bag top edge intersects the path of said bag hanger devices, and each of said hanger devices including means adapted to accept, clamp, open, carry a bag through a material filling location and permit filling, and provide rotation of the bag relative to the rotation of said annulus to enable swinging of said bag to an approximately tangential disposition for a smooth uninterrupted transfer to an adjoining conveyor.

78. A bag filling machine including a rotatable turret type bag filler and conveyor comprising: a rotatable annulus; means for rotating said annulus; a vibrating bag settler under said annulus; a plurality of bag hanger devices mounted under and on said annulus, each of said devices enabling automatic reception of a folded vertical bag disposed along a radial vertical planar path relative to the axis of said turret in a position where the bag top edge intersects the path of said bag hanger devices, and each of said hanger devices including means adapted to accept, clamp, open, carry a bag through a material filling location and permit filling, pass the filled bag over said settling means and provide rotation of the bag relative to the rotation of said annulus to enable swinging said bag to a tangential disposition for a smooth uninterrupted transfer to an adjoining conveyor.

79. A bag filling machine including a rotatable turret type bag filler and conveyor and means to continually rotate said conveyor, said conveyor comprising: an annular arrangement of a plurality of bag hangers, each hanger including its individual upper bag end corner pincer type grippers, means for shifting said grippers relatively toward each other to enable bowing of the upper end of said bag, an individual bag opener means on each hanger associated with said grippers, operator means for said grippers and for said opener means, and coordinated operating controls for said operator means enabling, during continual rotation of said turret type conveyor through a cycle of hanger operation, simultaneous clamping of the two upper corners of a folded bag end, opening of said bag, closing of said bag and subsequent release of the bag by said operator means as it reaches a position for transfer away from the turret type conveyor.

80. A bag filling machine including a rotatable turret type bag filler and conveyor and means for rotating said conveyor, said conveyor comprising: a plurality of bag hangers, means operatively associated with each hanger for gripping the upper end of a folded bag, means operatively associated with each hanger and including said gripping means for opening the upper end of a folded bag; means adjacent each hanger, including a filling device with a nozzle, for inserting said nozzle into the open end of a bag on an associated hanger and subsequently removing said nozzle, and means to impart planetary movement to each bag hanger relative to the turret rotational movement of each hanger; control and operating means cyclically coordinated with turret rotation to enable a predetermined cycle of operation of all said means associated with each bag hanger and including coordinated pneumatic operators and controls for said bag gripping means and said bag opener means.

81. A bag filling machine including a rotatable turret type bag filler and conveyor comprising: a drum made from an annulus of hoppers, power means to rotate said drum, a subcomponent bag hanger at each hopper station mounted on the lower side of said drum, each bag hanger being provided with individual upper bag end openers and two upper bag corner pincer type grippers; oper-

ating control means timed by drum rotation enabling simultaneous gripping of the two corners of the upper end of a folded closed bag as a hanger reaches a bag pick-up position during drum rotation and engages a bag at said pick-up position, and accomplishing desired cyclic opening of the bag, filling of the bag and closing of the upper end of the bag, and subsequent sequential release of the two gripped corners of the bag to permit the bag to be passed off the turret conveyor.

82. A bag filling machine having a turret type bag filler and conveyor means comprising: a rotatably mounted annulus of a plurality of open bottom hopper means rotatable over a bag pick-up position; a plurality of bag hanger devices at circumferentially spaced locations under associated ones of said hopper means; automatic control means including independently operated bag end clamps at each said bag hanger device adapted to grip the inner and outer upper edge corners of a radially disposed folded bag in said pick-up position; mechanical means operative in response to annulus rotation subsequent to the gripping of a picked-up bag for accomplishing a relative shift of said bag end clamps toward each other to bow the upper end of the clamped bag; suction cup bag end opening means cyclically operative in response to rotation of said turret means, subsequent to bowing of the upper end of said bag, to grip opposite sides of and open the upper end of the bag gripped by the bag end clamps; a bag filling spout, having shiftable flow communication passage means with the lower end of an associated hopper, adapted to be placed into the opened upper end of a bag gripped in said hanger during and responsive to further rotation of said turret means; for dispensing material into and through said hopper into the bag; means for removing said filling spout from the bag and permitting separating movement of said bag end grips to pull the open end edges of said bag to closed alignment; means operated in response to rotation of said turret means for planetarily rotating the bag hanger with the gripped bag to a position approximately tangential to the path of movement of said hanger station; means operative in response to further drum rotation for releasing said bag while in an approximately tangential position.

83. A bag filling machine as defined in claim 82 wherein said means for dispensing material into and through said hopper into the bag comprises: dispensing means above said turret operated automatically in response to movement of an open bag with an inserted nozzle into filling position for dispensing into and through said hopper into said bag, a predetermined quantity of material, said dispensing means including a safety control device preventing operation of said dispensing means if no bag is positioned in said hanger clamps.

84. A bag filling machine as defined in claim 82 wherein said means operative in response to further drum rotation for releasing the bag comprises: means for imparting an outward shift to the gripped leading edge of said bag and simultaneously releasing gripping of the leading edge of said bag to relinquish control of said bag leading edge; means responsive to drum rotation operative immediately subsequent to release of said leading edge clamp for imparting an incremental planetary movement to said bag hanger to cause said rear bag clamp to swing outwardly and impart an additive increment of movement of said bag in relation to the angular velocity of said hanger due to turret conveyor rotation; means operative automatically subsequent to said additive planetary increment of rotation for accomplishing release of said rear clamp, whereby a filled bag is passed off of said turret conveyor; and means operative in response to further drum rotation immediately after complete release of a bag for planetarily swinging said bag hanger clamps back to a disposition radial with respect to the turret axis as said bag hanger device again approaches said pick-up position.

85. For use in a container filling apparatus, a container filling spout subassembly comprising: an apertured metal

plate, a coupling sleeve secured to the upper side of said plate and aligned with and surrounding the plate aperture, a spade shaped nozzle spout secured to the bottom side of said plate in alignment with said aperture and a thick collar of easily deformable resilient material, of sufficient radial dimension to engage the upper edge of a container into which the spout is inserted, secured to the underside of said plate surrounding said nozzle spout, a subassembly support structure; and means mounted on said support structure and connected to said plate for shifting said nozzle subassembly in a fixed path and maintaining the nozzle non-rotatable relative to the fixed path.

86. A filling spout subassembly as defined in claim 85, wherein said coupling sleeve and said spade shaped nozzle spout constitute an integral unit inserted through said aperture and welded to said plate.

87. A filling spout subassembly as defined in claim 85, wherein said collar is a thick foam plastic annulus secured to the lower side of said plate by suitable adhesive cement.

88. A filling spout subassembly is defined in claim 85, wherein said means for shifting said nozzle subassembly comprises a vertical telescoping, elongate, cam follower device and bracket means laterally projecting from and connected between the cam following portion of said device and said plate.

89. For use in a rotatable turret type bag filler and conveyor having a plurality of bag hanger stations rotatable about a vertical axis, a bag hanger station comprising: means to hold the upper ends of depending folded bags, suction cup opener means to pull the sides of the upper bag end open, pneumatic circuits, controls and control operating components including provision of a pneumatic control circuit providing periodic cyclic blow-out cleaning of the pneumatic lines to said suction cup opener means.

90. A bag filling machine as defined in claim 89, wherein the means to hold the bags include two-way pneumatic motors; and said pneumatic control circuit providing periodic blow-out of the pneumatic lines to said suction cup opener means includes a by-pass control rendered operative during the inoperative condition of said bag opener means to direct the exhaust of at least one of said two-way motors into the pneumatic lines to said suction cup opener means, whereby operation of said one two-way motor will result in said blow-out cleaning of the suction lines.

91. A bag filling machine as defined in claim 2 including automated bag packaging machine control having auxiliary control means and circuits responsive to a subassembly inoperative condition for preventing continued operation of the complete machine.

92. A bag filling machine comprising: a folded bag storage magazine assembly comprising: structural means to support a plurality of folded bags resting in an upright manner on their bottom sealed ends and stacked horizontally one against the other, said structural means including a base platform and bag magazine conveyor comprising a plurality of endless friction belt tracks, motor means for slowly concurrently driving all said endless belts for creating a force on the bottom ends of all said stacked folded bags to slowly move them toward a single bag exit position at the end of said magazine, means automatically terminating and initiating operation of said movable tracks, depending upon location of bags at the end of said magazine; means to single the end bag from the stack of bags on said magazine conveyor and to shift said singled bag downwardly; a horizontally shiftable carriage means disposed in position below said singling means for accepting said downwardly shifted single bag and conveying the bag sideways and disposed along a vertical planar path to a transfer position where a turret conveyor can accept the bag; a rotary type bag filling conveyor assembly adjacent said transfer position and including means to accept a bag disposed in said transfer position; a bag end sealing assembly including a bag end sealing device and bag gripping transfer conveyor means leading from said turret conveyor

assembly to said bag end sealing device; means including power means and control means structurally and operatively inter-relating all of said three assemblies to provide completely automatic operations on a folded bag from a position in said bag magazine assembly to and through said turret assembly thence to and through said sealing assembly to the egress from said sealing device of a completely filled, closed and sealed bag.

93. A folded bag magazine assembly as defined in claim 55, wherein said endless friction belt track means comprises a plurality of endless friction belt tracks.

94. A bag filling machine comprising: a rotary turret type bag filler and conveyor with a bag hanger mechanism for holding and conditioning bags while on and rotating with said turret conveyor; and a bag magazine and singling dispenser including a horizontal transfer conveyor for shifting a singled folded bag along and substantially disposed in a vertical planar path radially with respect to the axis of said turret conveyor into a folded bag pick-up position relative to said bag hanger mechanism on said turret type conveyor; said turret conveyor comprising: a rotatably mounted annulus of a plurality of open bottom hopper means, a plurality of bag hanger devices at circumferentially spaced locations under associated ones of said hopper means, automatic means including control means and independently operated bag end clamps at each said bag hanger device adapted to grip the inner and outer upper edge corners of a said radially disposed folded bag in said pick-up position, mechanical means operative in response to annulus rotation subsequent to the gripping of a picked-up bag for accomplishing a relative shift of said bag end clamps toward each other to bow the upper end of the clamped bag, suction cup bag end opening means cyclically operative in response to rotation of said turret means, subsequent to bowing of the upper end of said bag, to grip opposite sides of and open the upper end of the bag gripped by the bag end clamps, means to place a predetermined amount of material into and through a hopper above an opened bag, into the opened bag and means to close the bag and release the clamps holding the filled bag.

95. A bag filling machine including a rotatable turret type bag filler and conveyor comprising: a drum made from an annulus of hoppers, power means to rotate said drum, a subcomponent bag hanger with mounting means at each hopper station mounted on the lower side of said drum, each bag hanger being provided with individual upper bag end openers and two upper bag corner pincer type grippers; operating control means timed by drum rotation enabling simultaneous gripping of the two corners of the upper end of a folded closed bag as a hanger reaches a bag pick-up position during drum rotation and engages a bag at said pick-up position, and accomplishing desired cyclic opening of the bag, filling of the bag and closing of the upper end of the bag, and subsequent sequential release of the two gripped corners of the bag to permit the bag to be passed off the turret conveyor; said mounting means planetarily mounting each said bag hanger on said drum to enable an inter-related epicyclic motion of the upper gripped end of the bag on the hanger at the position of transfer of the bag from the turret conveyor to another upper bag end gripping conveyor and said epicyclic motion being coordinated, by said control means, with the sequential release of said two bag corner grippers to enable smooth automatic continuous motion transfer of the bag from the turret conveyor to the other conveyor without detrimental bag shifting or tearing of the upper end of the bag as the transfer is accomplished.

96. For use in a rotatable turret type bag filler and conveyor having a plurality of bag hanger and filler stations, a bag hanger means including means for securing and conditioning individual closed folded bags to be opened, means to open said conditioned bags, and dependent support means adapted to be secured to a rotatable turret structure, and rotatable means connecting

said bag hanger means with its said means for securing and opening bags to said dependent support for incremental rotation of said bag hanger about a vertical axis.

97. For use in a rotatable turret type bag filler and conveyor having a plurality of bag hanger and filler stations: a bag hanger means including means for securing and conditioning individual closed folded bags to be opened, and means to open said conditioned bags; said means for securing and opening said bag comprising: bag upper edge gripping clamps, one for each corner of the bag upper edge; an independent two-way motor for clamping and unclamping each clamp; means mounting said bag clamps to enable relative motion of the two clamps toward and away from each other; opposed suction cups located between said two clamps, means mounting at least one of said cups for relative movement of the two cups

toward and away from each other; and pneumatic circuits enabling connecting a suction to both said cups.

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