June 17, 1969 A. P. GAUSMAN 3,449,888

PACKAGING MACHINE

Filed Sept. 15, 1965 Sheet 1 of 5

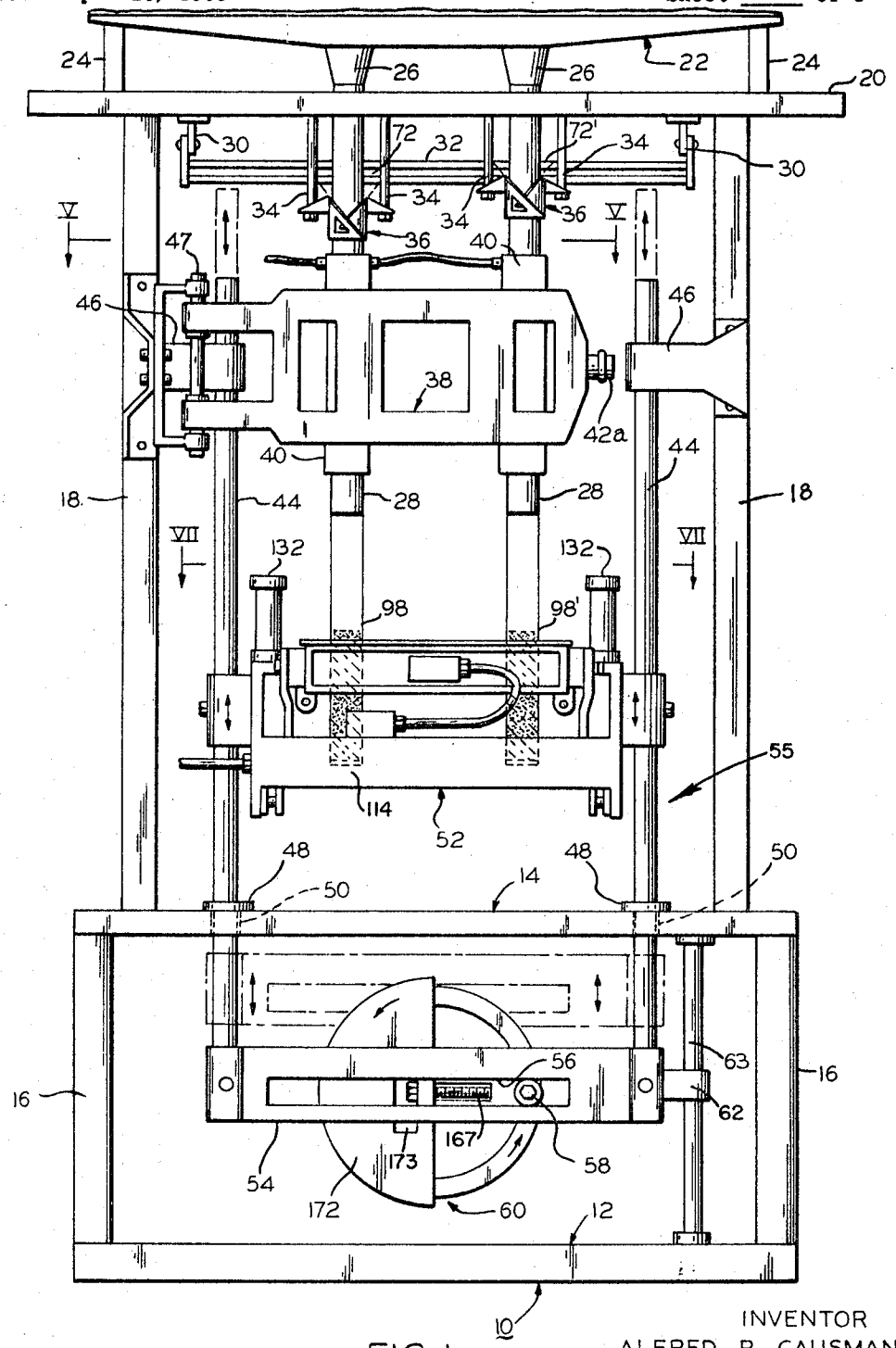



FIG. 1

INVENTOR
ALFRED P. GAUSMAN

BY

Hill, Sherman, Meroni, Gross & Simpson

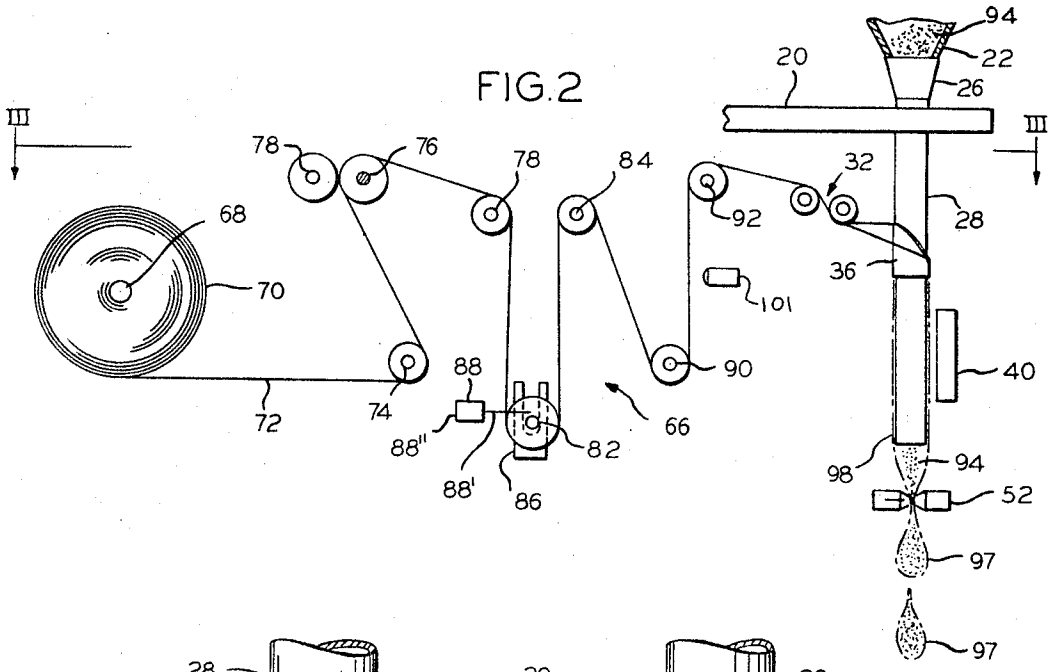
ATTORNEYS

June 17, 1969 A. P. GAUSMAN 3,449,888

PACKAGING MACHINE

Filed Sept. 15, 1965 Sheet 2 of 5

FIG. 2



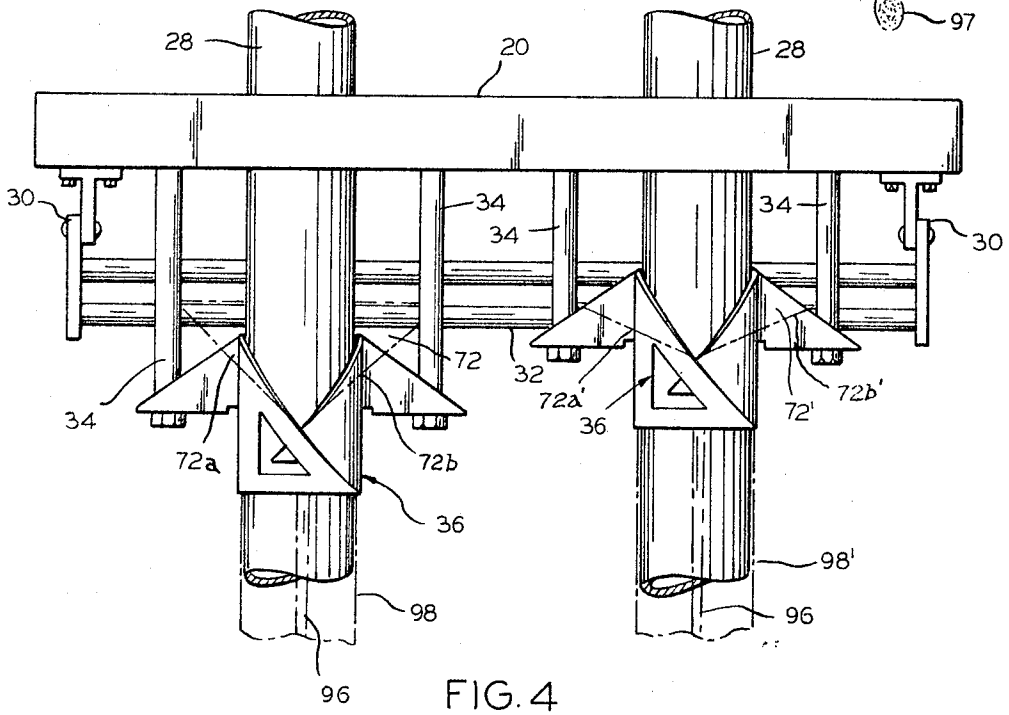




FIG. 4

INVENTOR
ALFRED P. GAUSMAN

BY
Hill, Sherman, Meroni, Gross & Simpson
ATTORNEYS

June 17, 1969 A. P. GAUSMAN 3,449,888

PACKAGING MACHINE

Filed Sept. 15, 1965 Sheet 3 of 5

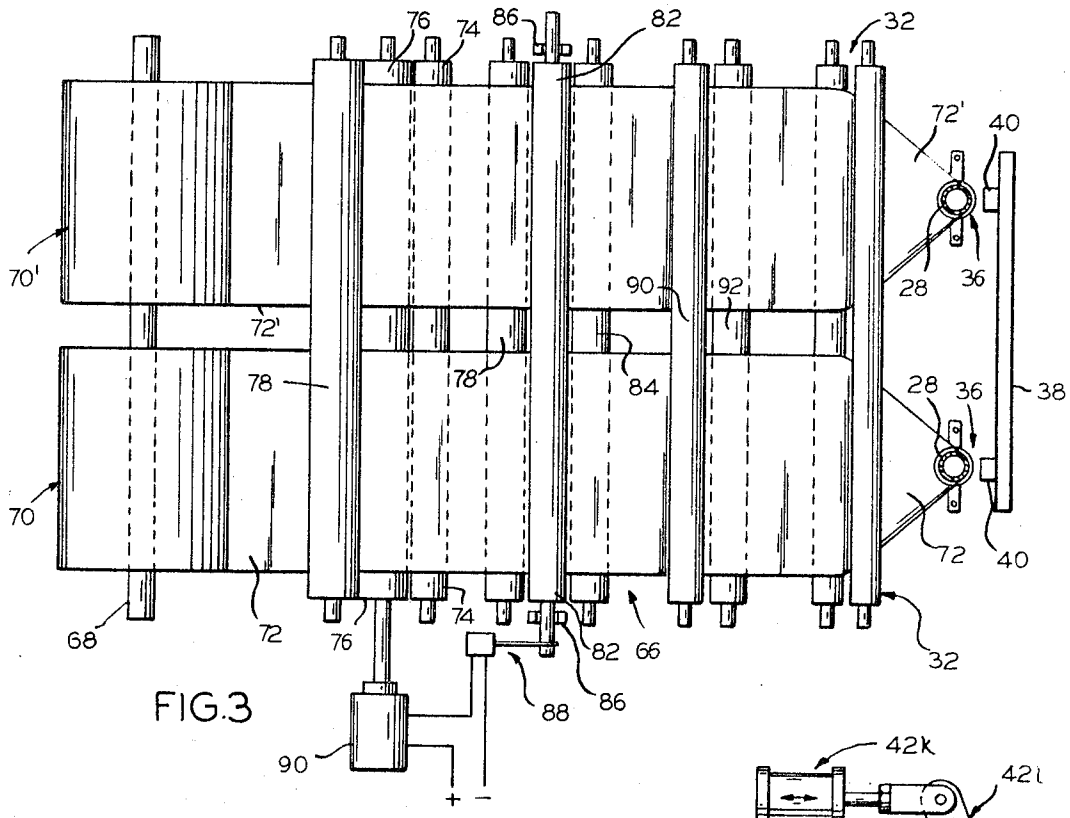



FIG.3

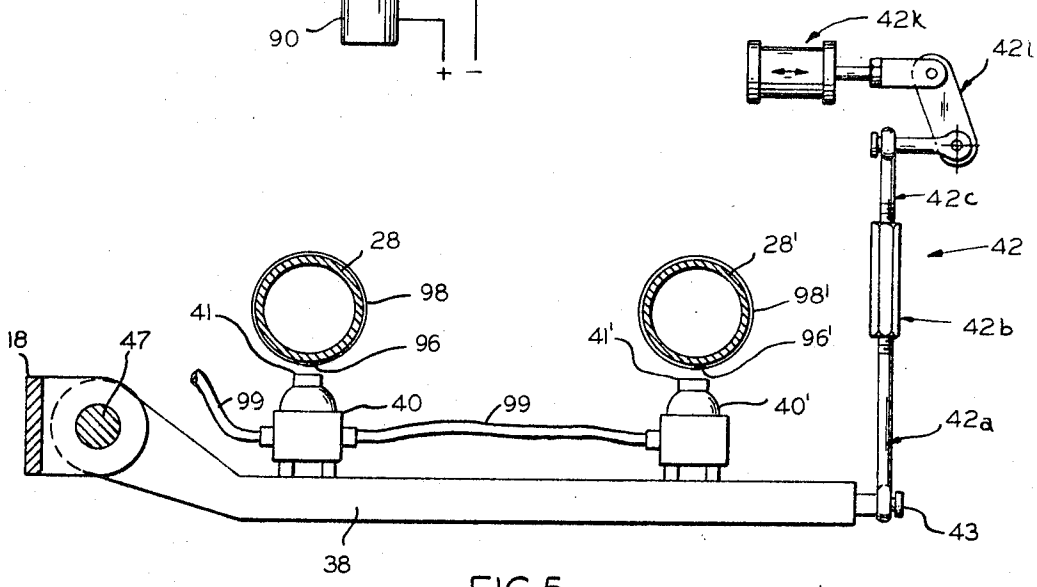



FIG.5

INVENTOR
ALFRED P. GAUSMAN

BY
Hill, Sherman, Meroni, Gross & Simpson
ATTORNEYS

June 17, 1969 A. P. GAUSMAN 3,449,888

PACKAGING MACHINE

Filed Sept. 15, 1965 Sheet 4 of 5

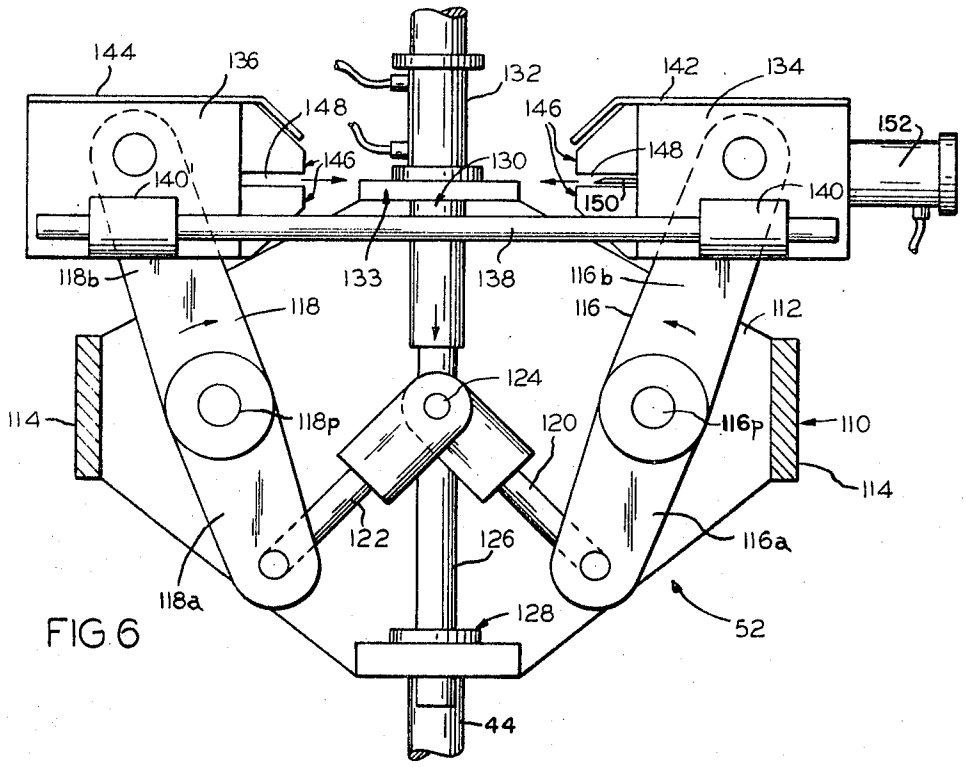



FIG. 6

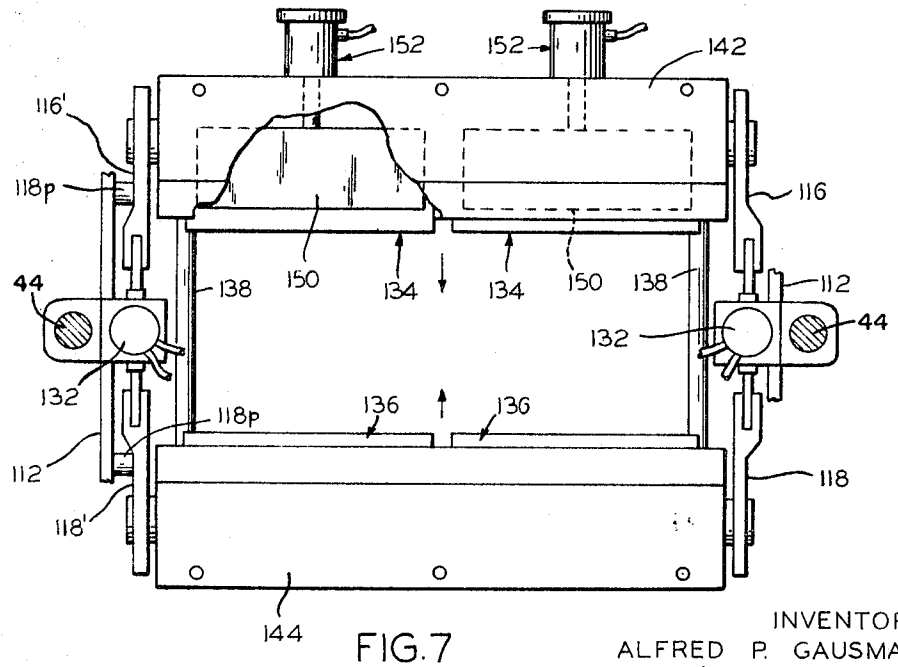



FIG. 7

INVENTOR
ALFRED P. GAUSMAN

BY
Hill, Sherman, Meroni, Gross & Simpson
ATTORNEYS

June 17, 1969 A. P. GAUSMAN 3,449,888

PACKAGING MACHINE

Filed Sept. 15, 1965 Sheet 5 of 5

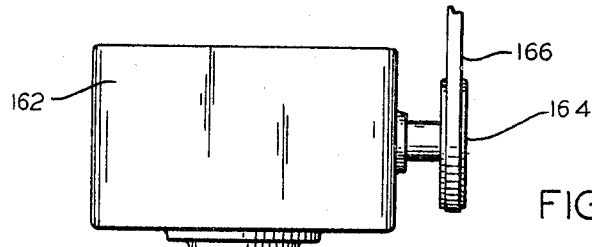



FIG. 9

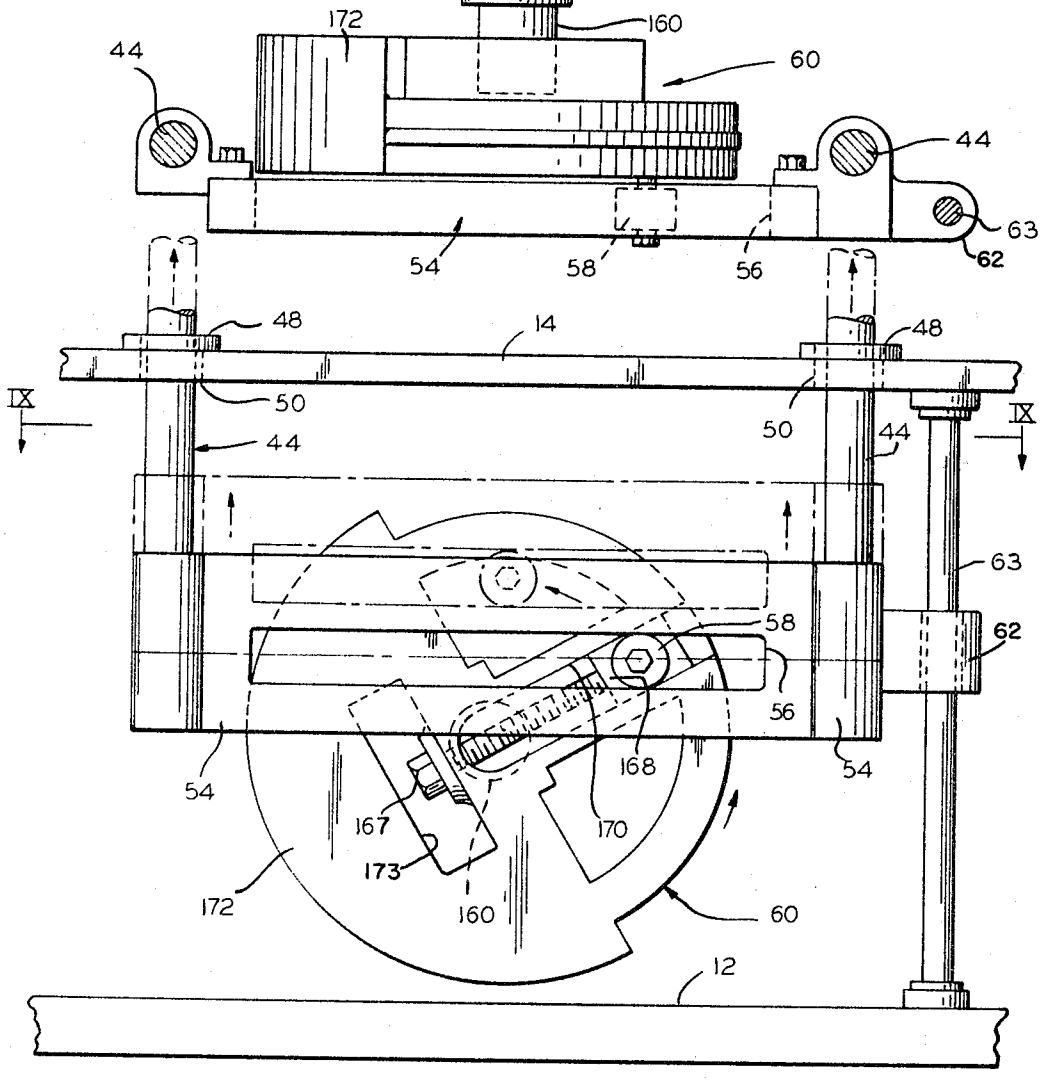



FIG. 8

INVENTOR
ALFRED P. GAUSMAN

BY
Hill, Sherman, Meroni, Gross & Simpson

ATTORNEYS

United States Patent Office 3,449,888
Patented June 17, 1969



3,449,888

# PACKAGING MACHINE

Alfred P. Gausman, Sheboygan, Wis., assignor to Hayssen Manufacturing Company, Sheboygan, Wis., a corporation of Wisconsin

Filed Sept. 15, 1965, Ser. No. 487,459
Int. Cl. B65b 9/12, 51/30
U.S. Cl. 53—182 6 Claims

## ABSTRACT OF THE DISCLOSURE

An automatic gravity feed packaging machine has a vertically reciprocably operable carriage mounting a sealing, pull-down and cut-off mechanism and is driven through a counterbalancing eccentric driving means having a stroke-adjusting connection with a yoke at the lower end of the carriage.

The present invention relates to automatic packaging. Specifically it relates to an improved vertical or gravity-fed automatic packaging machine of the Zwoyer type.

The general principles of the Zwoyer automatic packaging machine are described in expired U.S. Patent No. 1,986,422 which issued to Walter R. Zwoyer on Jan. 1, 1935. The early automatic packaging machines of this type employed continuous cellophane sheets to form the packages. The cellophane was fed from a roll to forming bars which formed it into a tubular shape about a hollow cylinder. The now tubular-shaped sheets were sealed along their longitudinal seams about the cylinder by a heated pressure wheel to form a continuous cellophane tube. These tubes were then sealed transversely or horizontally by a pair of heated dies which clamped about the cellophane tube below the end of the hollow cylinder. A measured quantity of the product to be packaged was discharged through the hollow cylinder into the cellophane tube to rest against the newly formed horizontal seam. The die mechanism, while clamped against the tube advanced downward a predetermined distance carrying the tube and the product with it. The dies were then released and raised to their original position and again used to form a horizontal seam or seal, thereby enclosing the discharged measure of the product in the tube between horizontal seams. Another measured quantity of the product could then be discharged through the hollow cylinder into the tube and the process repeated. The result of this process was a string of sealed packages not unlike the familiar string of "hot dogs" or sausage links. The process was completed by a knife mechanism located below the lowest position of the transverse sealing dies. This mechanism cut the tube or string of packaged products along the middle of the horizontal seals thereby forming individual packages.

While the basic Zwoyer process and machine remain in common use, they have from time to time been improved and adapted to suit modern products and packaging materials. Cellophane has been largely replaced by polyethylene as the package material, the longitudinal tube-sealing wheel by a pulsating vertical longitudinal bar and an automatic labeling mechanism has been incorporated into the machine as shown in U.S. Patent No. 3,000,155 which issued on Sept. 19, 1961 to the present inventor. The heat sealing mechanism has been improved and the separate knife element has been eliminated by incorporating automatic cutting into the transverse seal dies as shown by U.S. Patent No. 3,050,916 which issued on Aug. 28, 1962 to August R. Zellouer and the present inventor. The present invention constitutes a still further advance in this type of packaging machine.



With the increased tempo of modern production, it has become necessary to increase the speed of packaging to match that of production. Machines must run faster and break down less. Moreover, the press of competition and the high cost of capital make it mandatory that machines such as automatic packaging machines be economically constructed with a minimum of parts, a maximum service life, and a minimum of required service and maintenance during that service life. When attempting to increase the speed of conventional Zwoyer-type packaging machines, serious problems were encountered. The horsepower requirements of the operating motor greatly increase with the increased speed. Wear on the machine parts increases, the plastic packaging material tends to tear, break, deform and/or jam under the increased speed conditions. With conventional machines, vibration and incidence of part fracture increase, thereby materially limiting the service life of the machine. Excessive vibration also prevents installation of these machines near sensitive production or testing equipment and detracts from the desirability of working conditions near the machines. Furthermore, these problems are multiplied several fold in a Zwoyer packaging machine incorporating more than one thermoplastic packaging tube and product feeding cylinder. Yet, for reasons of economy such a multi-tube construction is virtually required to package the output of modern production plants. It is, therefore, a specific object of the present invention to achieve an automatic packaging machine of the Zwoyer type having a plurality of product feeding tubes which is capable of high speed operation with low vibration and long service life and is of a simplified and economical construction.

It is the general object of the invention, however, to provide a new and improved vertical-fed packaging machine.

It is a further object of the invention to provide such a packaging machine in which vibration is reduced.

It is a specific object of the invention to provide a vertical-fed packaging machine of the Zwoyer type which is capable of high speed operation with reduced tearing, breaking, deforming and/or jamming of the packaging material.

It is a further specific object of the invention to provide a Zwoyer-type vertical-fed packaging machine which overcomes one or more of the above-mentioned indesiderata.

It is another object of the invention to provide a new and improved Zwoyer type vertical-fed packaging machine which admits of easy and simplified adjustment in the size of the package.

It is a still further object of the invention to provide a new and improved Zwoyer-type vertical-fed packaging machine that is of simplified and economical construction.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The organization and manner of operation of the invention, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings, in the several figures of which like reference numerals identify like elements, and in which:

FIG. 1 is a front elevational view of a vertical-fed automatic packaging machine constructed in accordance with the principles of the present invention with moved positions of parts in dashed outline;

FIG. 2 is a schematic side view of the roller arrangement for feeding a thermoplastic sheet or other packaging material sheet to the tube-forming and product-discharg-

ing cylinder and package sealing and cutting mechanism of the packaging machine with parts removed for clarity and shown partly in section;

FIG. 3 is a top plan view, partly in section, of the roller arrangement and associated parts as seen from line III—III of FIG. 2;

FIG. 4 is a fragmentary enlarged detailed front elevational view of the packaging tube forming mechanism of the packaging machine of FIG. 1 with parts drawn to a different scale for purposes of illustration;

FIG. 5 is a top plan view, partly in section, of the longitudinal seal forming mechanism and associated parts of the machine as seen from line V—V of FIG. 1;

FIG. 6 is a side elevational view, partly in section of the transverse seal forming dies and cutting device and associated parts of the packaging machine with parts broken away and some interior parts shown by dashed lines;

FIG. 7 is a top plan view, partly in section with parts broken away to show interior parts and some interior parts shown by dashed lines of the transverse sealing dies and cutting device and associated parts depicted in FIG. 6 as seen from line VII—VII in FIG. 1;

FIG. 8 is an enlarged detailed front elevational view with parts broken away of a portion of the machine shown in FIG. 1 with parts in moved position and with still further moved position shown in dashed outline; and

FIG. 9 is a top plan view, partly in section, of the portion of the packaging machine shown in FIG. 8 as seen from line IX—IX in FIG. 8 with some interior parts shown by dashed lines.

On the drawings:

Referring to FIGURE 1 of the drawings, there is depicted an automatic packaging machine incorporating the present invention and generally indicated by the numeral **10**. The packaging machine **10** includes a framework having a relatively thick metal base plate **12** over which is mounted a metal table **14** supported by a number of upstanding legs **16**. The table **14** is spaced apart from and over the base plate **12** in a plane approximately parallel to the base plate **12**. Affixed to the upper surface of the table **14** are two generally vertical spaced frame members or standards **18**. At the top of the standards **18**, and affixed between them, is a hopper platform **20** which also lies in a plane parallel to that of the base plate **12** and the table **14**. Affixed to the upper surface of the platform **20**, above the packaging machine framework formed by the base plate **12**, the table **14**, legs **16**, standards **18** and platform **20**, is a hopper **22** of which only the bottom portion is shown. The hopper **22**, which is supported upon the platform **20** by a plurality of brace members **24**, may include product measuring and discharging mechanisms similar to that shown in the above-mentioned Zwoyer patent. At the bottom of the hopper **22** and two spaced hollow funnel-like conical sectional hopper feed-outs **26**. The depending feed-outs **26** are affixed along their lower circular ends of two further depending hollow forming cylinders **28** which pass through the platform **20** and extend downward between the standards **18** towards the table **14**. The cylinders **28** lie about two parallel spaced vertical axes and extend therealong approximately one-half of the distance from the platform **20** to the table **14**.

Affixed to the underside of the platform **20** by means of conventional brackets **30** is a horizontal packaging material feeder roller **32** which forms part of a unique high-speed packaging sheet feed which will be described in connection with FIGS. 2 and 3.

Also affixed to the underside of the platform **20** are two pairs of depending support bars **34**. Each bar pair **34** is adjacent to, spaced from, and flanking on opposite sides, the cylinders **28**. The support bars **34** support a pair of folding arms **36** in juxtaposition to and curved about cylinders **28**. The folding arms **36** are each positioned about the cylinders **28** at a point along their axes slightly below the elevation of the flexible packaging material feeding roller **32** which lies behind and parallel to the plane defined by the cylinders **28**. Below the folding arms **36** is suspended a hinged frame **38** for supporting a pair of longitudinal sealers **40** along and adjacent to the pair of forming cylinders **28**. The longitudinal sealers **40** and the frame **38** are hinged in a conventional manner to a vertical hinge pin **47** affixed to one standard **18**. The frame **38** is hinged for motion in a horizontal direction to and away from the cylinders **28** through a plurality of vertical planes. The movement of the frame **38** and consequently the sealers **40**, is determined by a mechanism **42**, which will be explained in connection with FIG. 5. Only the end view of the frame folding arm **42***a* of the mechanism **42** is depicted in FIG. 1.

Also positioned between the standards **18** are two movable vertical shafts **44** which are spaced apart from each other in a plane approximately the same as that defined by the forming cylinders **28**. The shafts **44** each flank, on opposite outer sides, the pair of forming cylinders **28**. The movable shafts **44** are each positioned in a bearing sleeve member **46** affixed to respective ones of the standards **18** at approximately the elevation of the frame **38**. The shafts **44** pass through and extend beneath the table **14** through a pair of shaft bearings **48** and openings **50** in the table **14**. The shaft bearings **48** with the bearing members **46** rigidly determine the vertical axis along which each of the movable shafts **44** may travel.

Rigidly affixed to and supported between the shafts **44**, above the table **14** and below the forming cylinder **28**, is a vertical sealing die and cutting device or mechanism generally indicated as **52**. The mechanism **52** attains a result similar to the mechanism described in the above-mentioned U.S. Patent No. 3,050,916, but differing structure of the mechanism **52** will be described in detail in connection with FIGS. 6 and 7.

In accordance with the invention, also rigidly affixed to and spanning the shafts **44** between the table **14** and the base plate **12**, is a horizontal cross member or yoke **54** which, with the shaft **44** and the mechanism **52**, constitutes a movable carriage generally indicated at **55**. The yoke **54** has a horizontal elongated slot **56** so that it can serve as a follower with an eccentric in the form of a rotating cylinder or cam roller **58** is engaged. The cam roller **58** is carried by a rotatable drive wheel **60** along one radius thereof. The wheel **60** and yoke **54** form, with associated mechanism described in greater detail in connection with FIGS. 8 and 9, the prime moving mechanism of the machine **10**.

Also affixed to the yoke **54** is an aligning member **62** having a vertical shaft bearing through which passes a vertical aligning shaft **63** which is rigidly affixed to the upper surface of the base plate **12** and to the lower surface of the table **14** and reaches therebetween.

Referring now to FIGS. 2 and 3, there is depicted, in accordance with the invention, a packaging sheet material feed mechanism **66** for the automatic packaging machine **10**. This mechanism **66** is of special utility when employed in conjunction with a polyester film-type packaging material. The feed mechanism **66** includes a packaging material roll-bearing axle **68** for supporting two rolls **70**, **70'** of continuous flexible packaging material. The rolls **70**, **70'** are coaxial with the axle **68** and occupy different but adjacent segments of the axle **68**. A sheet **72**, **72'** is fed from each of the rolls **70**, **70'** around a single horizontal axis roller **74** from which it travels at a predetermined upward angle to an overhead driven roller **76**. Facing and in frictional contact with the plastic sheet **72**, **72'**, adjacent and along the roller **76** is a parallel smoothing or helper roller **78**. The helper roller **78** serves to insure proper drive friction between the driven roller **76** and the sheets **72**, **72'**, and prevents overflow or run-over of the sheets **72**, **72'** beyond the rollers **76** and **78** when the driven roller **76** is stopped or slowed. After

leaving the driven roller **76**, the sheets **72** and **72'** pass over a first turning roller **78** and descend in a vertical plane to a sensing roller **82**. The sheets **72** and **72'** pass under the sensing roller **82** and rise thereafter in a vertical plane to pass over a second turning roller **84**. The sheets **72**, **72'** thus form a U-shaped sling between the turning rollers **78** and **84** for carrying the sensing roller **82**. The sensing roller **82** is mounted for motion in a vertical direction in a U-shaped support **86**. Positioned adjacent to one end of the sensing roller **82** is a vertical motion sensing device **88** comprising a horizontal movable trigger **88'** and an electrical switch **88''** operatively connected to the trigger arm **88'**. The switch **88''** operates to complete the electrical circuit to an electric drive motor **90** which drives the roller **76**.

After passing over the second turning roller **84**, the sheets **72**, **72'** move horizontally to pass under a positioning roller **90** and afterwards rise generally vertically to a third turning roller **92** and proceed in a generally horizontal direction to a pair of feeding rollers **32**. From the rollers **32**, the sheets **72**, **72'** proceed to arms **36** about the forming cylinder **28**, about which the sheets are shaped by the folding arms **36** into a cylindrical or tubular shape. The now tubular shaped sheets **72**, **72'** are sealed by the sealing mechanism **40** along the longitudinal seam to form packaging tubes **98**, **98'**. Thereunder the tubes **98**, **98'** are transversely sealed and cut by the mechanism **52** in a horizontal direction at the transverse seal. Prior to cutting, the tubes **98**, **98'** are filled by the product **94** to be packaged which is discharged from the hopper **22** through the hopper feedout **26** into the cylinders **28** from which it passes into the plastic tubes **98**, **98'**.

In FIG. 4 are shown the folding arms **36**, rollers **32** and packaging material sheets **72**, **72'**. Each of the sheets **72**, **72'** passes from the roller **32** in a sheet or plane configuration and pass into a funnel or trough-like configuration between the rollers **32** and the arms **36** and form below the arms **36** a tubular configuration about the cylinder **28**. The side edges **72***a*, **72***b* and **72***a'* and **72***b'* of each sheet **72**, **72'**, which are parallel before and at the roller **32**, converge between the roller **32**, and the arms **36** are overlapped along the cylinders **28** to cleave together and form a seam **96**, **96'** of the packaging tubes **98**, **98'**.

In FIG. 5 is depicted the hinged sealer supporting frame **38** having two spaced longitudinal seam sealers **40** juxtaposed to the longitudinal seams **96**, **96'** of the packaging tubes **98**, **98'** surrounding the forming cylinders **28**, **28'**. The sealers **40**, **40'** are provided with electrical connections **99** for developing a pair of heated vertical surfaces **41**, **41'** which, when brought into compressive contact with the seams **96**, **96'**, form therealong a longitudinal seal. The frame **38** is hinged to the standard **18** by a vertical hinge pin **42** for movement away from and toward the cylinders **28**, **28'**. The frame moving mechanism **42** is attached to the unhinged swinging vertical end of the longitudinal sealer frame **38** by means of a pin **43**. The moving lever **42** is constructed from an adjustable sleeve bolt **42***b* joining together two similar arms **42***c*, **42***c'*. The arm **42***c* is affixed in a pivotal manner to an L-shaped moving member **42L** which is pivotally affixed for rotation of the junction of the L members to the standard **18** or another suitably affixed portion of the framework. The longer member of the L-shaped member **42L** is attached to, in a pivotal manner, an air-operated cylinder **42***k*.

Referring now to FIG. 6, there is depicted the transverse or vertical sealing die and cutting mechanism generally indicated at **52**. This mechanism includes a frame **110** comprising four side walls enclosing an opened top and bottom rectangular area. The frame includes two oppositely disposed vertical end walls **112** generally in the shape of a blunt-pointed diamond. The walls **112** and the frame **110** are rigidly affixed to the shafts **44** and move with them relative to the remainder of the machine **10**. Completing the frame is a second pair of oppositely disposed vertical side walls or panels **114** rigidly affixed to and bridging between the end walls **112**. Within the rectangular frame **110** and pivotally affixed to each of the end walls **112** is a pair of levers **116**, **118** mounted at a point away from their longitudinal ends for radial motion in a vertical plane parallel to the end walls **112**. Only one pair of pivoted levers will be described, it being understood that the other pair is identical but disposed on the opposite wall. The levers **116**, **118** each have a short arm segment **116***a*, **118***a*, and a long arm segment **116***b*, **118***b* lying along the same axis but extending from the pivotal mountings **116***p*, **118***p* in opposite directions to, respectively, the closer and further ends of the lever arms **116**, **118**. Pivotally attached to the remote end portions of the shorter arm segments **116***a*, **118***a* are respective ends of a pair of activating arms or toggle links **120**, **122** which are pivoted at their other ends about a common pivot **124** or a vertically reciprocable actuating or push rod **126**. The arms **120**, **122** and levers **116**, **118** lie in approximately the same vertical plane. The push rod **126** is supported for movement relative to the frame **110** in bearing sleeves **128** and **130**. These sleeves define the axis of the push rod **126** vertically in juxtaposition to the vertical center line of the end wall **112**. The push rod **126** is controlled by an air piston **132** mounted on a horizontal seating **133** at the upper edge of the wall **112**. The pivoted lever arms **116**, **118** and arms **120**, **122** define a W-shaped mechanism with the central peak or point of the W at the pivot **124**. Activation of the air piston **132** moves the rod **126** and therefore the point of pivot **124** which in turn moves the activating arms **120**, **122** and pivots levers **116**, **118**. This has the effect of moving the radial position of the longer lever arm segments **116***b*, **118***b*. Pivotally affixed to these longer arm segments **116***b*, **118***b* of the lever arms **116**, **118** are the die and cutting housings **134**, **136**. These housings **134**, **136** are maintained in horizontal orientation by a simple guiding horizontal bar **138** and horizontal bearing sleeve **140**, **140'** apparatus. The die housings **134**, **136** each have a projected shield **142**, **144** positioned above them. The die housings **134**, **136** each have heated, pressure contact dies or sealers **146** which are brought into contact with the packaging tubes **98** to form the transverse package seal. Approximately midway vertically in the sealing surface of each of the dies **146** there is provided a horizontal slot **148**, which lies in the same plane for both of the sealing die housings **134**, **136**, and in which is movable a knife member **150** mounted for horizontal motion under the control of air valves **152**. The knife **150** is mounted to move horizontally out from the slot **148** of the die housing **134** into the slot **148** of the die housing **136** in response to activation of the air piston **152** when the die housings **134**, **136** are in sealing contact. As may best be seen in the view of FIG. 7, this knife portion extends for nearly the entire horizontal direction of the dies. The mechanism **52** is provided with two pairs of dies and die housings **134**, **136** mounted horizontally adjacent and affixed to one another within the frame **110** with common covers or shields **142**, **144** each covering two adjacent housings. Although a double unit construction has been described and is preferred for ease of manufacture, and for maintaining standardization and interchangeability of parts with single forming cylinder packaging machines, it will be appreciated that a single unit construction for the adjacent dies and a single knife unit may be employed.

The double unit construction is also preferred to facilitate the individual aligning of the packaging tubes **98**, **98'** when the packaging sheets **72**, **72'** with printing on them are used. In this case the sheets **72**, **72'** are reprinted with a design or label which should extend or be situated in a particular relationship on the finished packages **97**. The sheets of material are kept in register with the packages by means of a sensing device such as a photocell **101** (FIG. 2) positioned adjacent each of the sheets **72**, **72'** in the feeding mechanism **66** between roller **90** and roller **92**

to sense the printing or an indicia spaced on the sheets **72**, **72'**. In response to the sensing of the indicia by photocell **101** adjacent to a particular one of the sheets **72**, **72'**, the corresponding die **146** of that sheet is retracted a short distance approximately ⅛ of an inch in one embodiment by means of a solenoid situated and operatively connected for that end in mechanism **52** to release the package **97** and to stop the downward movement of the tubes **98** or **98'**. When the packaging sheets **72** or **72'** are in correct register the die **146** will release the package at nearly the bottom-most point of travel for the mechanism **52** which mechanism will continue downward to complete the cycle of its motion. The use of two dies **146** with two tubes allows for independent control of the register of the sheets **72** or **72'** for the respective packaging tubes **98**, **98'**. When no printing is used on sheets **72**, **72'** or when the printing is of such a nature as to make register unnecessary, the photo-electric cell **101** and the die moving mechanism may be disengaged and the packaging machine **10** operated as hereinafter described.

In FIGS. 8 and 9 there is depicted the packaging machine prime moving mechanism for moving the shafts **44** vertically through the sleeves **48** and the openings **50** in the table **14**. The shafts **44** and the mechanism **52** affixed thereto, are moved vertically by the action of the cam roller **58** in the slot **56** of the yoke member **54**. The cam roller **58** is mounted on and driven in an arc by the wheel **60** which is keyed at its center to be driven by an axle **160**, as may be seen in FIG. 9. The axle **160** is the output taken from a transmision or speed reducer **162**. The speed reducer **162** is, in turn, driven by a pulley **164** and pulley belt **166** system which is preferably operated from an electric motor (not shown) of a suitable rating. The radial distance from the axle **160** of the driving cylinder **58** and therefore the extremes of vertical travel of the yoke **54** and the sealing mechanism **52** are variable. The radial distance may be varied by turning the head of an adjusting bolt **167** which moves a cam roller trolley **168** in a radial track **170** of the wheel **60**. The wheel **60** is provided with a heavy lead counterbalance **172** with a center of mass positioned along the diameter of the cam roller **58** but on the opposite side of the axle **160**. The weight **172** serves to counteract the moment about the axle **160** placed upon the cam roller **58** by the yoke **54**. This counter-balance **172** has the effect of reducing vibrations caused by the necessary rapid reversals of acceleration of the moving shaft members **44** and die mechanism **52**. This wheel structure further has the effect of reducing the peak power load upon the prime mover as it tends to absorb energy during the down stroke of the yoke **54** and to impart energy thereto during the upstroke. As will be observed in FIG. 8, the head of the adjusting bolt **167** is so located that it is accessible through an opening **173** in the counterweight **172** when the carriage is raised and the opening is free below the yoke **54**.

## OPERATION

The above-described automatic packaging machine **10** functions, in overall operation, to produce from the packaging material rolls **70**, **70'** on the axle **68** and from the product **94** contained in the hopper **22**, a containous succession of pre-sized, sealed packages **97** containing preselected amounts of the product **94**. The finished packages **97** are normally conveyed away from the table **14**, to which they would otherwise fall, by an inclined slide or a continuous belt apparatus (not shown).

In accomplishing the forming of the packages, the lead-off sheets **72**, **72'** from the rolls **70**, **70'** are threaded through a unique feed mechanism **66** (FIGS. 2, 3). Each sheet **72**, **72'** is fed from the mechanism **66** to a pair of folding arms **36** wrapped about the forming cylinder **28**. After passing the arms **36**, each of the packaging material sheets **72**, **72'** is in the form of a tube **98**, **98'** about the cylinder **28** with a vertical longitudinal seam **96**. **96'** This seal is sealed by a longitudinal sealer **40** to produce a tube **98** which extends below the bottom end of the cylinder **28**. This tube is transversely sealed and cut at spaced intervals by the mechanism **52**, while the product **94** is discharged into the tube **98** from the cylinder **28**.

The packaging operation is carried on in a continuous cycle having two phases: a downstroke phase in which the tubes **98**, **98'** are drawn down with the carriage **55**, and an upstroke phase in which the tubes **98**, **98'** remain essentially stationary. At the start of the upstroke phase of the packaging cycle, a pair of packages formed from the tubes **98**, **98'** have been completed and released from the machine **10**. At this point in the cycle, the rotating wheel **60** is in an orientation with the cam roller **58** in its lowest position directly below the axle **160** and just above the base plate **12**. Similarly at this point in the cycle, the yoke **54**, shafts **44** and mechanism **52**, constituting the carriage **55**, are at their lowest positions. The sealing die and cutting mechanism **52** is in its open position with the housing **134** and housing **136** separated as in FIGS. 6 and 7. The tubes **98**, **98'** extend from the forming cyclinders **28** to approximately the lowest point of travel for the mechanism **52** at which point they are transversely sealed.

The carriage moving mechanism (FIGS. 8, 9) is driven from the pulley **164** through the speed reducer **162** and axle **160** which rotates the wheel **60** at substantially constant speed aided by the stored potential energy and momentum of the counterbalance **172**. At the start of the upstroke phase of the packaging cycle, the cam roller **58** bears against the upper surafce of the slot **56** of the yoke **54** and raises the carriage **55**.

At the quarter revolutions point, the carriage **55** has risen to its midpoint above its lowest level by the distance from the axle of the wheel **60** to the cam roller **58** (FIG. 1, solid lines). The die mechanism **52** and the carriage **55** continue to rise about the depending tubes **98**, **98'** until the cam roller **58** reaches its highest position (FIG. 8, dashed lines). The cycle then enters its second phase with the drive wheel **60** and its cam roller **58** moving the carriage downward as the wheel continues to rotate.

The use of the novel packaging machine drive comprising the wheel **60**, the adjustable cam roller **58** and the slotted yoke **54** has several advantages, which are especially useful in the high speed packaging machine **10**. The easy adjustability of the length of travel of the carriage **55** by adjusting the bolt **167**, which changes the radial distance of the cam roller **58**, allows for easy change in the length and size of the individual packages **97**. The drive provides for a minimum of vertical movement of the die housings of the mechanism **52** during the engagement and the disengagement of the dies to the tubes **98**, **98'**. This decreases the possibility of tearing the packaging material during this operation. Furthermore, the yoke-rotating wheel combination provides a continuous and gradual increase and decrease of the velocity of the tubes **98**, **98'** during the downstroke phase of the packaging cycle, while the employment of the counterbalance **172** decreases vibration and tends to maintain the wheel **60** rotating at a constant speed.

The air pistons **132** of the mechanism **52** (FIG. 6) are activated at the start of the downstroke phase to depress the push rod **126**, move the arms **122**, **126** against the levers **116**, **118** and to thereby bring the die housings **134** and **144** together upon the tubes **98**. With the sealing elements or sealers **146** clamped transversely against the sealing the tube **98**, the mechanism **52** and the carriage **55** travel downwards. The dies **146** remain clamped upon the tubes **98**, **98'** during this downward movement, and draw the tubes **98**, **98'** with them. This advances the sheets **72**, **72'** from the roller **32** across the folding arms **36**. Upon reaching the bottom position, the air pistons **132** are reversed and the mechanism **52** returned to its open position. The carriage has then returned to

its starting position completing the packaging cycle which may be repeated.

Sometime during the descent of the carriage **55**, preferably just before the separation of the housings **134, 136**, the air pistons **152** of the mechanism **52** are energized to drive the knife members **150** horizontally from the housings **134** into the slots **148** of the housings **136**, cutting the tubes **98, 98'** horizontally. Also during the downstroke phase of the cycle, a predetermined quantity of the product **94** is discharged into each tube **98, 98'** from its associated cyclinder **28**. For some products, the clamping action of the housings **134, 136** will be sufficient to drive the product away from the area of contact and allow adequate transverse seal to be formed. For these products, a continuous feeding hopper arrangement is adequate. Normally, however, a preselected weight or volume discharge device must be employed.

The vertical or longitudinal sealers **40, 40'** are brought into contact with the seams of the tubes **98, 98'** by activating the air piston **42***k* during the first or carriage **55** upstroke phase of the cycle. The air piston **42***k* rotates the shaped member **42L** to pivot the frame **38** via the arms **42***a*, **42***b*, **42***c*. The piston **42***k* is operated to seal the seams **96, 96'** by pressing the heated surfaces **41, 41'** of the sealers **40, 40'** against the seams **96, 96'**, and the cylinders **28**. During this first part of the packaging cycle, the tubes **98, 98'** are stationary and the longitudinal seal may be accomplished by the vertically stationary sealers **40, 40'** without harm to the tubes **98, 98'**.

As the tubes **98, 98'** are drawn down by the carriage **55** in the second part of the packaging cycle, the sheets **72, 72'** are drawn over the rollers of the feed mechanism **66** (FIGS. 2, 3). The immediate effect of this is to raise the movable or floating roll **82**, triggering the switch **88** and activating the motor **90**. The motor **90** drives a predetermined length of the sheets **72, 72'** toward the forming cylinders **28**, causing the roller **82** to lower, open circuiting the switch **88**. In this manner, the feed system **66** automatically provides for tension and flow of sheets **72, 72'**. During the actual operation of the high speed machine **10**, the drive roller **76** may be in continuous motion as the mechanism **66** will tend to average the start and stop movement of the tubes **98, 98'**.

In summary, the machine passes through two phases in every production cycle. During the first phase, the carriage **55** rides up astride the tubes **98, 98'** and the sealers **40, 40'** are moved against and seal the seams **96, 96'**. During the second phase mechanism **52** of the carriage **55** clamps against, seals, cuts and moves the tube **98** downward with the carriage **55**. This advances sheets **72, 72'** over the folding arms **36** to form an additional length of the tubes **98, 98'**. In response to the movement of the sheets **72, 72'**, the packaging material feed mechanism **66** feeds an additional length of packaging material sheets **72, 72'** to the tube forming cylinders **28**.

The easy and rapid passage of the machine through the phases of cycle and into successive cycles is materially aided by the described novel packaging machine driving arrangement and packaging material feed mechanism which allows for easy adjustment of the package size, reduces vibration, and reduces deforming or tearing of the packaging material.

It is now apparent that a new and improved vertical-fed packaging machine has been provided. The machine is capable of high speed operation with low vibration and long relatively service-free life. The described machine of the Zwoyer type is further capable of operation with reduced instances of tearing, breaking, and deforming of the packaging material even under relatively high speed conditions.

Although modifications might be suggested by those skilled in the art, it will be understood that I wish to embody within the scope of the claims herein all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

**1.** In a vertical feed automatic packaging machine of the type in which individual packages are formed and sealed:

a vertically reciprocably mounted generally quadrangular carriage having a spaced pair of vertical carriage members with a transverse combination sealing, pulling and cut-off mechanism on and between an upper portion thereof and a slotted yoke on and between a lower portion thereof;

means for guiding said carriage members for vertical reciprocations;

drive mechanism comprising a member mounted to rotate about a fixed horizontal axis and a driving eccentric operationally coupling it to said yoke for thereby driving said yoke and thus the entire carriage reciprocably in response to rotation of said member;

and a counterbalancing weight on said member eccentrically located on the opposite side of said axis from said driving eccentric.

**2.** A machine as defined in claim **1** including means carried by said member between said driving eccentric and said weight for adjusting the radial distance of said eccentric from said axis.

**3.** A machine as defined in claim **2** in which said adjusting means comprise a bolt operatively connected to said eccentric, said weight having an opening therein and said bolt having a head accessible in said opening.

**4.** A machine as defined in claim **1** including stabilizing means and means slidably connecting said yoke to said stabilizing means.

**5.** A machine as defined in claim **4** in which said stabilizing means comprise a vertical rod, and said means connecting the yoke to the stabilizing means comprise a bearing slidably engaging said rod.

**6.** In a vertical-feed automatic packaging machine of the type in which individual packages are formed and sealed:

a vertical frame;

means on the upper portion of the frame supporting at least one depending, forming and filling tube;

means for supplying sheet-form packaging material about said tube;

means carried by the frame and cooperative with the tube for sealing the packaging material thereabout into tubular form;

a vertically reciprocable carriage including spaced apart vertical guide rods and comprising a combination sealing, pull-down and cut-off head mechanism carried fixedly by said rods operatively below said tube;

guide bearings on said frame vertically reciprocably guiding said rods;

a transverse yoke carried by the lower end portions of said rods and means operatively connected to said yoke for driving the yoke and thereby said carriage in vertical reciprocal cycles in which said mechanism is operative to engage said tubular material by successive vertical package increments, seal the tubular material transversely thereacross, pull the tubular material downwardly along and below said tube past said sealing means, and cut off the successive sealed package increments therefrom;

said mechanism comprising a frame having means securing it fixedly to and between said carriage rods with an opening defined by the mechanism frame for descent therethrough of the tubular material from said tube;

respective opposed combination clamping, sealing and cut off die assemblies including houings and generally vertically extending supporting levers pivotally connected at their upper ends to said housings and intermediately pivotally attached to said mechanism frame at opposite sides of a vertical path for said tubular material through such frame;

means maintaining the housings in horizontal orientation comprising a horizontal bar and bearing means therefore on the housings;

and means for rocking said levers to move said housing along said bar into clamping, sealing and cut off relation to the tubular material and comprising a toggle linkage operatively connected to said levers and means mounted on said mechanism frame operatively driving said toggle links to operate said levers.



**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,475,950 | 7/1949 | Eaton | 53—180 X |
| 2,826,021 | 3/1958 | Vandenberg et al. | 53—180 X |
| 3,358,419 | 12/1967 | Bjork et al. | 53—180 |


TRAVIS S. McGEHEE, *Primary Examiner.*

# UNITED STATES PATENT OFFICE
# CERTIFICATE OF CORRECTION

Patent No. 3,449,888 June 17, 196

Alfred P. Gausman

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

In the heading to the printed specification, lines 3 to 5, "assignor to Hayssen Manufacturing Company, Sheboygan, Wis., a corporation of Wisconsin" should read -- assignor, by mesne assignments, to Hayssen Manufacturing Company, Sheboygan, Wis., a corporation of Delaware --. Column 3, line 55, "and" should read -- are --. Column 4, line 44, after "with" insert -- whic --. Column 11, after line 9, insert the following claim:

7. In a vertical-feed automatic packaging machine of the type in which individual packages are formed and sealed:

a vertical frame;

means on the upper portion of the frame supporting at least one depending, forming and filling tube;

means for supplying sheet-form packaging material about said tube;

means carried by the frame and cooperative with the tube for sealing the packaging material thereabout into tubular form;

a vertically reciprocal carriage;

means for guiding the carriage to move adjacently below said tube;

means for driving said carriage reciprocably;

means on the upper portion of said carriage below the lower end of said tube and comprising mechanism for engaging the tubular material by package increments lengths below said end of said tube and transversely sealing the tubular material, drawing it downwardly and cutting off the sealed tubular lengths as packages;

said mechanism comprising a generally horizontal frame mounted fixedly on the upper portion of said carriage and defining an opening for descent therethrough of the tubular material from said tube;

respective opposed combination clamping, sealing and cut off die assemblies including housings and generally vertically extending supporting levers pivotally connected at their upper ends to said housings and intermediately pivotally attached to said mechanism frame at opposite sides of a vertical path for said tubular material through such frame;

means maintaining the housings in horizontal orientation comprising a horizontal bar and bearing means therefore on the housings;
and means for rocking said levers to move said housings rectilinearly along said bar into and out of clamping, sealing and cut off relation to the tubular material and comprising a toggle linkage operatively connected to said levers and means mounted on said mechanism frame operatively driving said toggle links to operate said levers.

Column 12, after line 6, insert the following references:

| | | | |
|---|---|---|---|
| 51,029 | 11/1865 | Ellinwood | 74-49 |
| 3,008,278 | 11/1961 | McCalley | 53-182 |
| 3,061,989 | 11/1962 | Newell et al. | 53-182 |
| 3,221,474 | 12/1965 | Hoffmann et al. | 53-182 |

In the heading to the printed specification, line 8, "6 Claims" should read -- 7 Claims --.

Signed and sealed this 11th day of August 1970.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents