

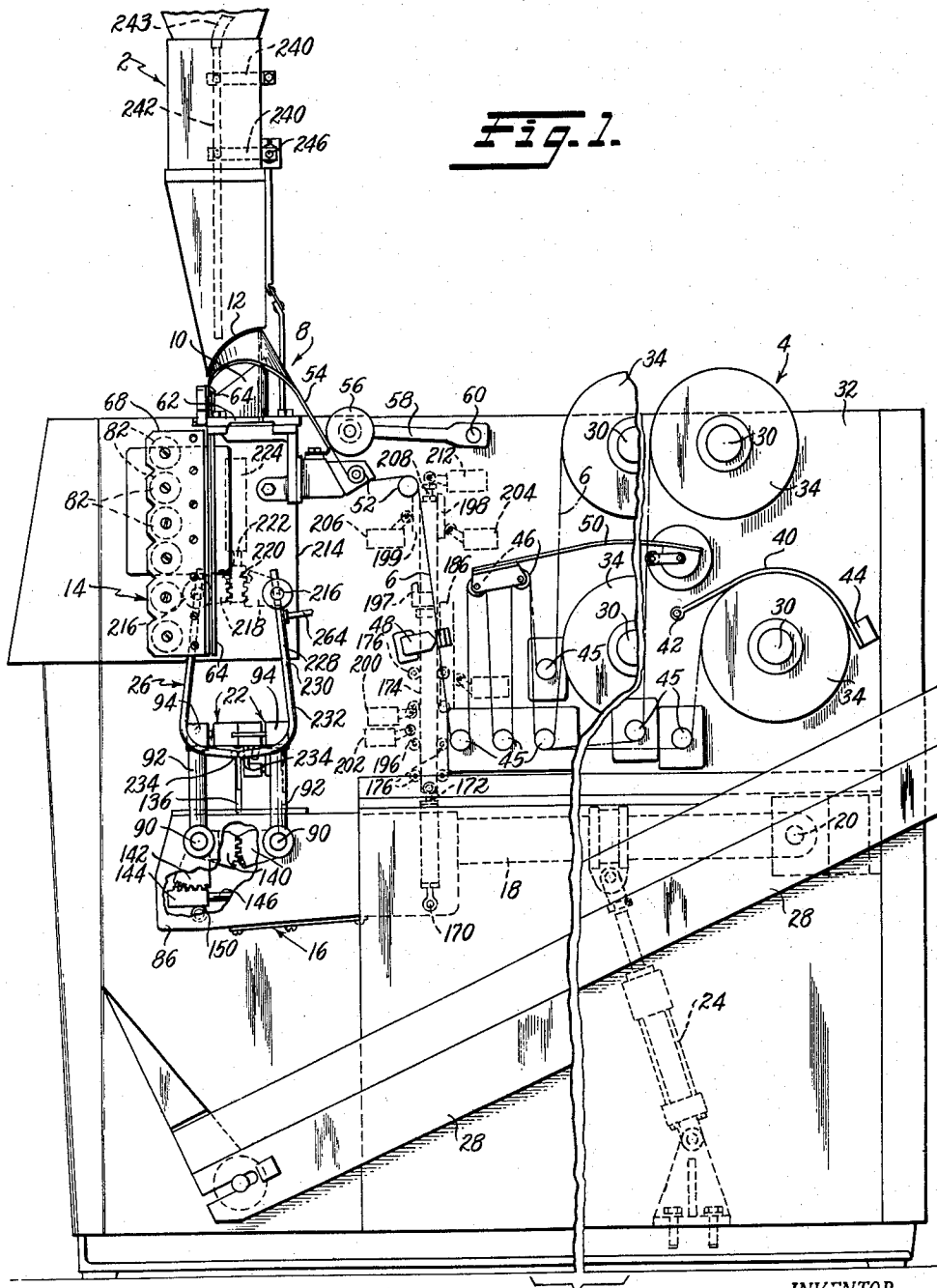
Sept. 27, 1960

G. W. TEW
PACKAGING MACHINE

2,953,882

Filed May 8, 1959

6 Sheets-Sheet 1



INVENTOR.
Gilbert W. Tew
BY *Bacon & Thomas*
ATTORNEYS

Sept. 27, 1960

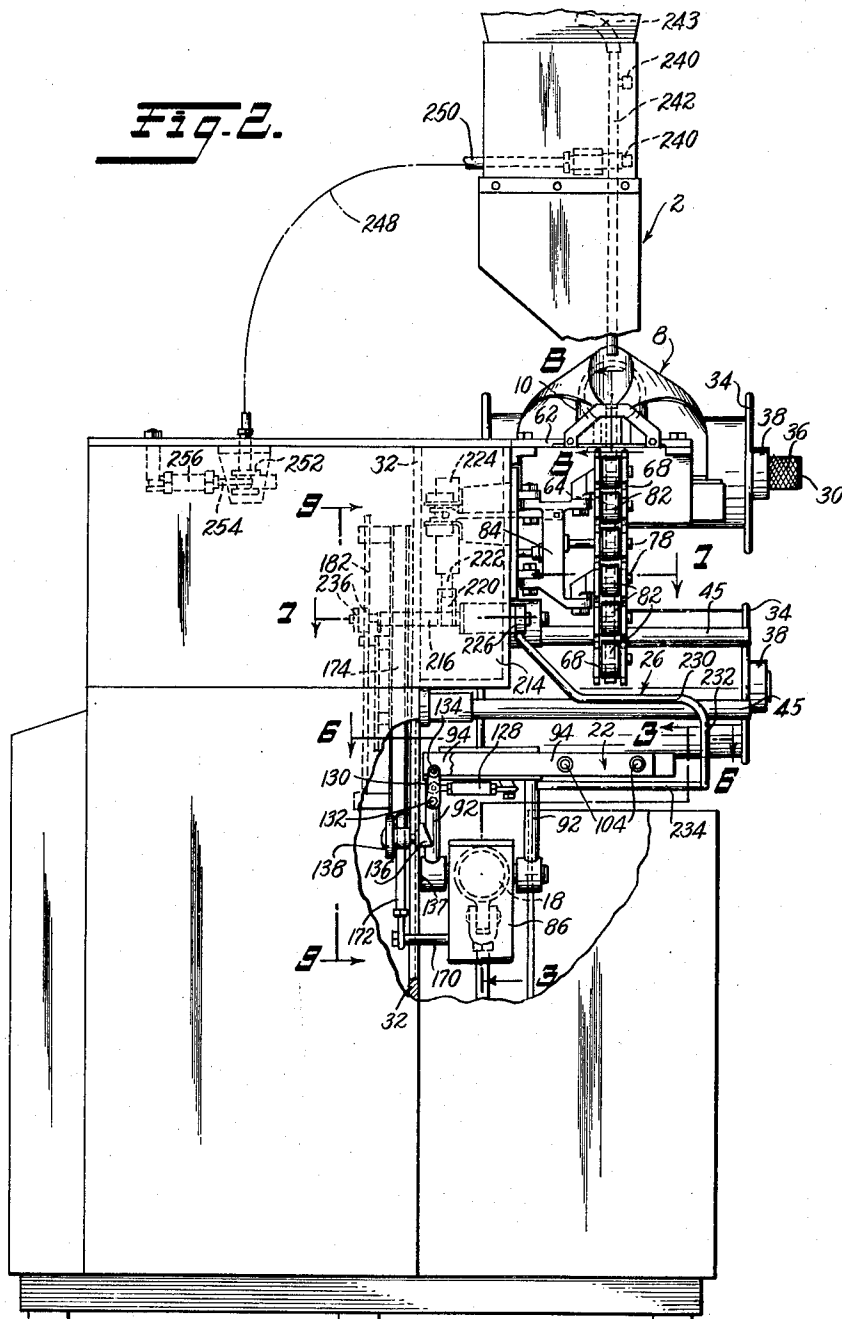
G. W. TEW

2,953,882

PACKAGING MACHINE

Filed May 8, 1959

6 Sheets-Sheet 2



INVENTOR.

Gilbert W. Tew

BY

Bacon & Thomas

ATTORNEYS

Sept. 27, 1960

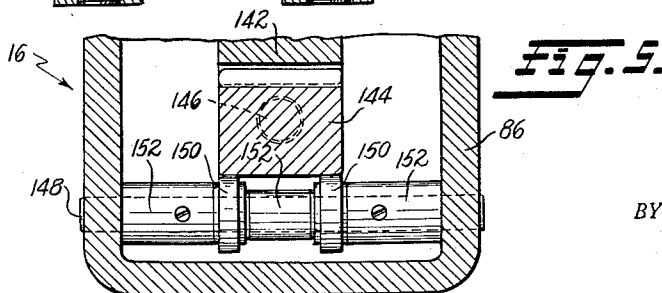
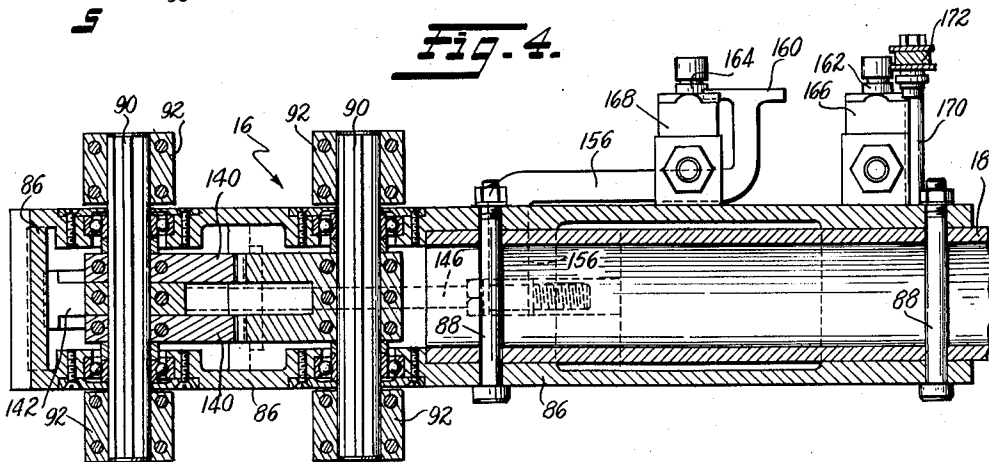
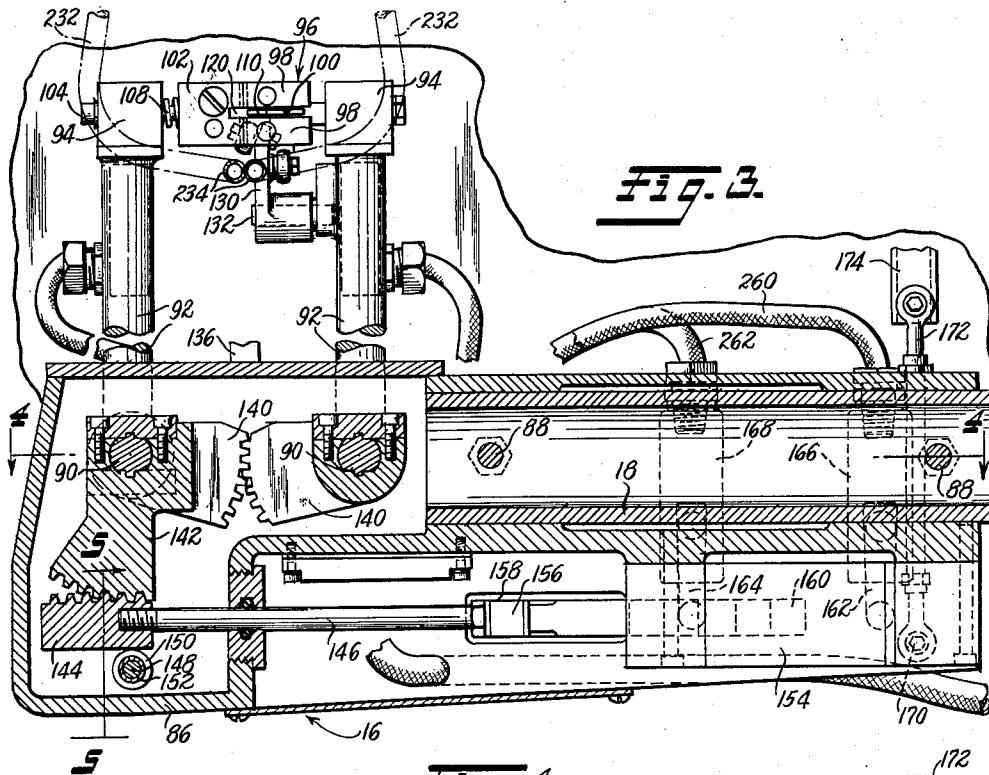
G. W. TEW

2,953,882

PACKAGING MACHINE

Filed May 8, 1959

6 Sheets-Sheet 3



INVENTOR.
Gilbert W. Tew
BY *Bacon & Thomas*
ATTORNEYS

Sept. 27, 1960

G. W. TEW

2,953,882

PACKAGING MACHINE

Filed May 8, 1959

6 Sheets-Sheet 4

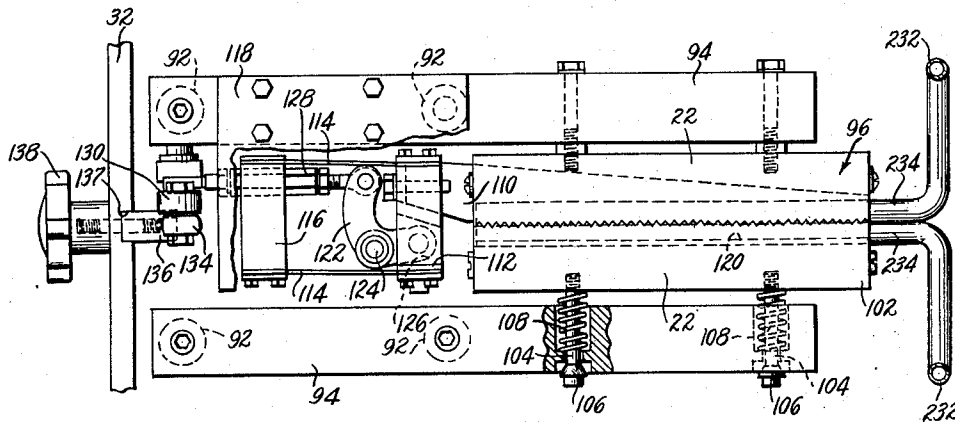


Fig. 6.

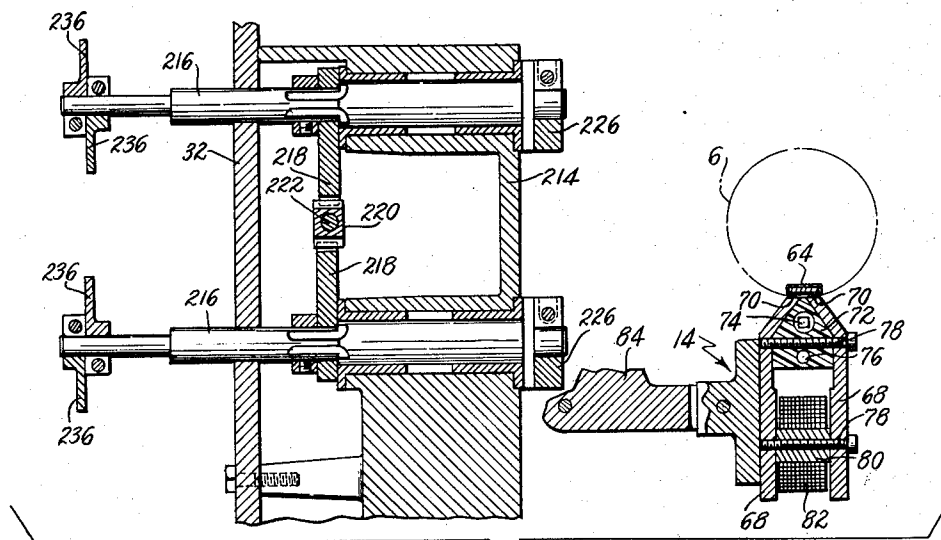


Fig. 7.

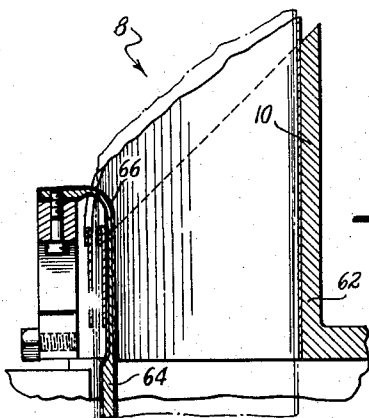


Fig. 8.

INVENTOR.
Gilbert W. Tew
 BY *Bacon & Thomas*
 ATTORNEYS

Sept. 27, 1960

G. W. TEW
PACKAGING MACHINE

2,953,882

Filed May 8, 1959

6 Sheets-Sheet 5

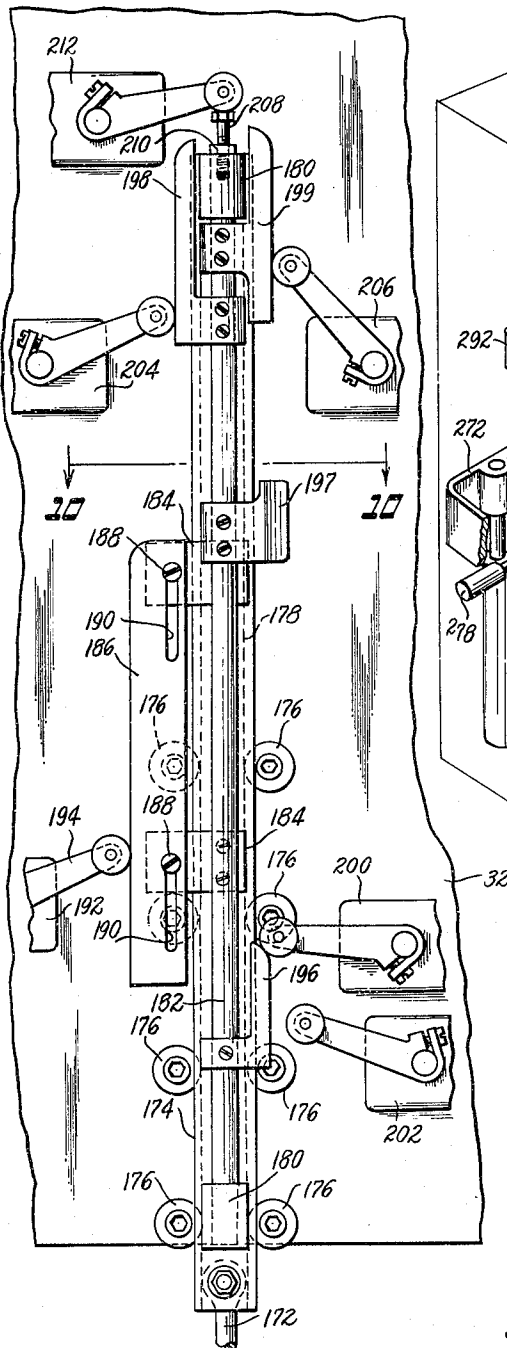


Fig. 9.

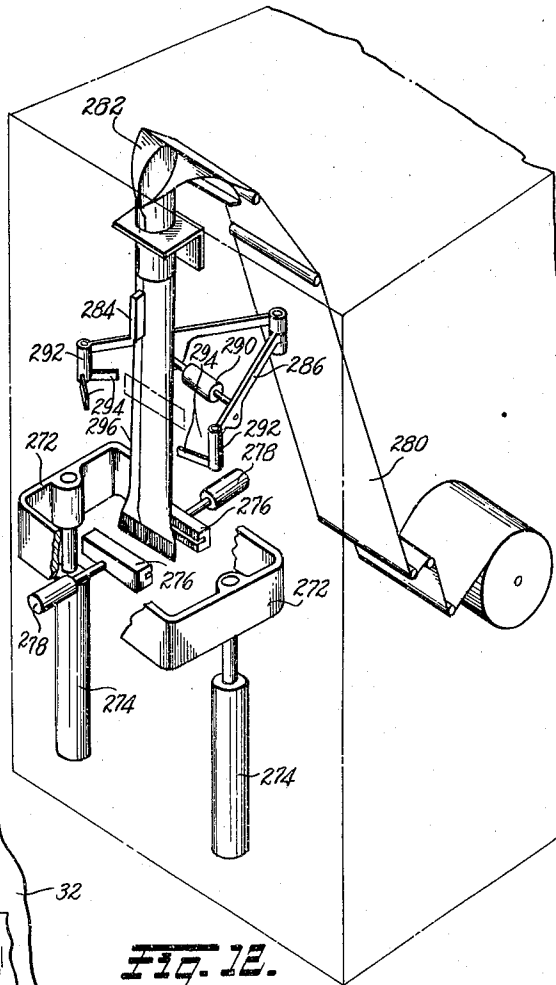


Fig. 12.

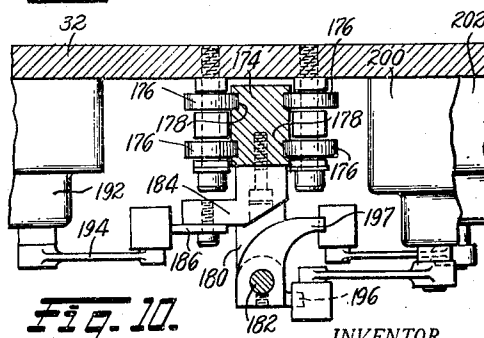


Fig. 10.

INVENTOR.
Gilbert W. Tew
BY
Racon & Thomas
ATTORNEYS

Sept. 27, 1960

G. W. TEW
PACKAGING MACHINE

2,953,882

Filed May 8, 1959

6 Sheets-Sheet 6

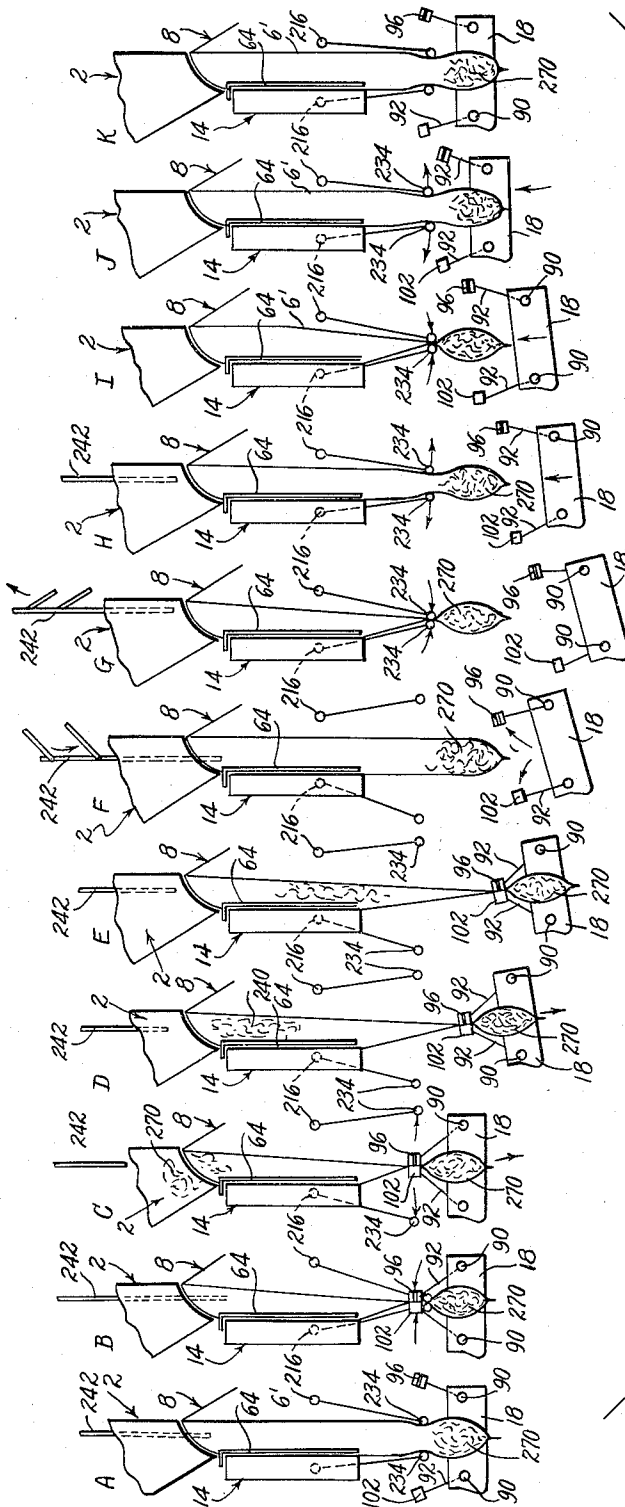


Fig. 11.

INVENTOR.
Gilbert W. Tew

BY

Bacon & Thomas

ATTORNEYS

1

2,953,882

PACKAGING MACHINE

Gilbert W. Tew, Durham, N.C., assignor to Sperry Rand Corporation, Wilmington, Del., a corporation of Delaware

Filed May 8, 1959, Ser. No. 811,867

10 Claims. (Cl. 53—126)

This invention relates to machines for forming filling and sealing bags, the bags being formed from a continuous web of material.

In brief, the machine comprises a tube-forming device adapted to guide the web of bag-forming material into a hollow tubular form, without employing an inner mandrel. The tube thus formed is longitudinally sealed and periodically drawn through the tube-forming means, filled with successive charges of product, transversely sealed and severed. The means for periodically drawing the tube through the former comprises a pivoted arm having relatively movable gripping and transverse sealing jaws thereon. The swinging arm or draw bar thus reciprocates about a fixed axis and its jaws are automatically actuated to grip the tube as the arm starts its downward movement and to form a transverse seal during such downward movement. The machine also includes clipper elements adapted to pinch the tube from opposite sides after the product has been placed therein to fracture any of the product that extends up into the zone in which the next transverse seal will be formed. The clipper elements of this invention are novel in construction and relationship to the rest of the machine and are readily adapted to different types of operation.

The pivoted draw bar is preferably operated by a reciprocatory fluid motor, although other forms of driving mechanism may be employed, but is so driven that the driving means need not always operate through a complete cycle. In other words, the driving means for the draw bar is such that the draw bar can be stopped at any selected point within its full range of movement whereby bags of different lengths may be formed, without performing any mechanical adjustments on the machine.

The machine of the present invention draws the bag-forming material into hollow tubular form without the use of internal mandrels or the like. Product-directing means direct the successive charges of product into the tube as it is being formed and the delivery of the charges of product thereto are so timed and controlled that they enter the tube just as the draw bar starts to draw more material through the tube-forming device. Thus, there is very little tendency for the product to "bridge" across the entry to the formed tube.

The machine also includes a reciprocatory plunger operated in timed relationship to the cycles of the draw bar and to move downwardly into a feed hopper directing the product into the tube just after the product should have passed into the formed tube. Thus the plunger insures against bridging of the product at that point. The plunger also constitutes means for directing a stream of air into the formed tube so as to distend the same to facilitate progress of the product to the bottom or sealed end of the tube.

It is therefore an object of this invention to provide a machine for more efficient and rapid packaging and sealing of certain products.

Another object is to provide a machine for the rapid

2

packaging of products heretofore difficult to package at high speeds.

Still another object of this invention is to provide a machine of the type set forth embodying novel construction features whereby the machine is readily adapted to different types of cycles and for producing different lengths of bags without making any structural changes, adjustments or substitutions.

A further object is to provide a packaging machine of the type set forth involving a novel draw bar arrangement, novel clipper devices, and a novel relationship between the draw bar and clipper devices.

A still further object is to provide a packaging machine as set forth embodying a novel clipper construction and operating means whereby the operation of the clippers may be varied at will without making mechanical adjustments or changes in the machine.

Additional and further objects and advantages will become apparent to those skilled in the art as the description proceeds in connection with the accompanying drawings, wherein:

Fig. 1 is a side elevational view of a machine embodying the present invention with certain parts thereof broken away to facilitate illustration and other parts shown in a somewhat schematic manner;

Fig. 2 is an end elevational view of the machine of Fig. 1 as viewed from the left end of Fig. 1;

Fig. 3 is a fragmentary sectional view, on an enlarged scale, taken along the line 3—3 of Fig. 2;

Fig. 4 is a horizontal sectional view taken along the line 4—4 of Fig. 3;

Fig. 5 is a vertical sectional view, on a further enlarged scale, taken along the line 5—5 of Fig. 3;

Fig. 6 is a view taken along the line 6—6 of Fig. 2, showing the parts in enlarged scale;

Fig. 7 is an enlarged horizontal sectional view taken substantially along the line 7—7 of Fig. 2;

Fig. 8 is an enlarged fragmentary sectional view taken along the line 8—8 of Fig. 2;

Fig. 9 is an enlarged view of the control cam assembly as seen along the line 9—9 of Fig. 2 but on an enlarged scale;

Fig. 10 is a transverse sectional view taken along the line 10—10 of Fig. 9;

Fig. 11 is a composite figure consisting of a series of schematic sketches illustrating sequential steps in a cycle of operation of the machine of this invention; and

Fig. 12 is a schematic perspective illustration of an alternative form of machine embodying the principles of the present invention and shown with certain parts broken away to facilitate illustration.

The machine of the present invention finds particular utility in the packaging of products such as potato chips or the like and enables the packaging thereof at unusually high speeds and in a reliable and efficient manner. However, the invention is not limited to machines for packaging potato chips or any other particular product even though the description herein will be made with reference to potato chips or the like as the particular product.

The present machine is intended to be used in combination with a suitable weighing apparatus adapted to weigh predetermined quantities of the product and deliver the same to the present machine for packaging. By reference to Figs. 1 and 2 the machine is shown as including a hopper 2 arranged to receive successive charges of the product from a weighing device. The machine shown is provided with means, generally indicated at 4, for supporting a supply of web material from which packages are to be formed. The material may be paper or plastic film or any other suitable web material capable of being handled in the manner described. The web

material 6 is guided through suitable guiding rolls and the like to a tube former 8. The tube former 8 is designed to guide and direct the web 6 to the interior of the hollow tubular guide portion 10 without the benefit of internal mandrels and leaving the interior of the formed tube free of obstructions. The hopper 2 is configured, at its lower end 12, to conform closely to the shape of the end of the formed tube at the entrance end of tubular guide 10. From the tube former 8 the formed tube extends downwardly past a longitudinal sealing device 14 adapted to heat-seal the longitudinal edges of the web to form a longitudinally seamed tube extending downwardly from the tube former 8.

A draw bar assembly 16 includes an arm 18 pivoted about a fixed axis 20 on the machine frame and carrying transverse sealing jaws 22 (Fig. 1) pivotally mounted thereon for opening and closing movements on opposite sides of the formed tube previously referred to. A hydraulic motor 24 effects swinging movements of the arm 18 and mechanism to be described later effects simultaneous pivotal movements of the jaws 22 to open or closed position. Clipper devices 26 are arranged with movable clipper elements on opposite sides of the formed tube and movable to approach each other and to flatten the tube between them after the product has been deposited therein. Thus the clippers fracture or break any potato chips or the like extending upwardly to such a degree that they would interfere with the end seal of the bag. The clippers are then opened to permit any fragments of the chips to fall into the bag and the jaws 22 may then be closed and the draw bar 18 lowered to advance the web material and form a further section of tube. During its downward movement the draw bar assembly moves past a fixed cam arrangement that effects severing of the filled and sealed bag portion from the end of the formed tube and such filled and sealed bag is finally dropped onto a take-away conveyor 28 for delivery to a desired delivery station.

The machine shown in Fig. 1 makes provision for supporting an adequate supply of web material. A plurality of spindles 30 are mounted to extend outwardly from a side plate 32 of the machine with their outer ends unsupported and thus the spindles 30 are adapted to have reels 34 easily applied thereto or removed therefrom. Each of the spindles 30 is threadedly supported by the plate 32 and is provided with a knurled outer end portion 36 (see Fig. 2). Thus the operator may, by slightly lifting the outer end of a shaft 30, rotate the same to threadedly adjust it in an axial direction and thus provide for proper tracking adjustment of the web 6 as it is withdrawn from a reel 34. Suitable removable flange devices 38 (Fig. 2) are provided to hold the reels 34 on their respective shafts 30. Each of the reels 34 is provided with a brake device 40 (only one of which is shown in Fig. 1) pivoted at one end to the machine frame at 42 and having a weight 44 at its other end to control the tension in the web drawn therefrom.

From the particular reel being used at the time, the web is fed over idler rolls 45 and movable tension rolls 46 past a photoelectric registering device 48. The tension rolls 46 are carried by a spring arm 50 mounted on the machine frame and operable to maintain tension in the web 6 at all times. With the reel arrangement shown multiply bags may be formed by feeding material from more than one reel at the same time.

After the web 6 passes photoelectric device 48 it is directed over further guide rolls 52 and onto the guiding hood 54 of tube-forming device 8. The tube-forming member 8 does not constitute a part of the present invention and so will not be described in detail herein. As the web 6 first engages the hood 54 it is also engaged by friction rollers 56 (only one shown in Fig. 1) carried at the outer ends of arms 58 pivotally mounted on plate 32, at 60. The rollers 56 are preferably provided with rubber or the like peripheries and are rotatably mounted

on the arms 58 through one-way clutch devices whereby the rollers 56 rotate freely in a forward direction to permit feed of the web 6 to the tube former 8 but frictionally prevent movement of the web 6 in the opposite direction.

Since the brake devices 40 cause the web 6 to be held under tension, the spring arm 50, carrying tension rollers 46, will at all times be deflected downwardly to a certain degree depending on the amount of tension predetermined by the brake devices. If it were not for the one-way clutch arrangement in rollers 56, the web 6 could be withdrawn back toward the supply by the stressed spring arm 50 and thus draw the formed tube back up toward the tubular guide 10 when the jaws 22 release the tube at the end of each cycle. However, the rollers 56 prevent such retrograde movement and the formed tube remains stationary when released by the jaws 22. The photoelectric registering device 48 is preferably mounted on the machine plate 32 in such manner that it may be adjusted so as to properly detect spaced marks of the web 6, spaced apart a distance corresponding to the length of the bags to be formed therefrom. The purpose and operation of this registering device will be discussed in greater detail later.

As the web 6 is guided and directed by the tube former 8 into hollow tubular form, it is further so controlled and directed that its longitudinal edges overlap at the left side of the tube former seen in Fig. 1 and shown in somewhat greater detail in Fig. 8. The tube former 8 is carried by a bracket 62 removably mounted on the machine frame whereby tube formers may be replaced with formers for bags of different diameters. The bracket 62 further supports a backing bar 64 of paramagnetic material and arranged to extend downwardly inside the formed tube inwardly of the overlapping longitudinal edges of the web material. As shown in Fig. 8, the backing bar 64 is of reduced section at its upper end portion 66 whereby the upper end portion is relatively flexible.

The longitudinal heat-sealing assembly 14 is shown in section in Fig. 7 and comprises a pair of side or pole plates 68 of paramagnetic material and so configured that their forward edge portions 70 extend longitudinally of the formed tube and directly opposite the backing bar 64 inside the formed tube. Between the spaced edges 70 of the plates 68 is a non-magnetic heat-conducting body 72 having a suitable heat element 76 therein and a thermostatic control element 74. At longitudinally spaced positions along the heat sealer 14, the plates 68 are secured together by bolts 78 passing through spacer members 80 of paramagnetic material. About each spacer member 80 is an electrical coil 82. As evident from Fig. 1, a plurality of the coils 82 are provided in the assembly 14. When the coils 82 are energized by having direct current passed therethrough, an electromagnet is produced which attracts the backing bar 64 and firmly clamps the overlapping longitudinal edges of the formed tube between the heated body 72 and backing bar 64 to heat-seal the tube under pressure. When the coils 82 are de-energized the resilient neck portion 66 of the backing bar 64 causes the backing bar to move away from the edges 70 and heated body 72 sufficiently to provide adequate clearance for longitudinal movement of the formed tube in a downward direction without dragging on either bar 64 or edges 70. The longitudinal heat-sealing assembly 14 constitutes the subject matter of an independent invention more fully described and claimed in a copending application. The longitudinal heat sealer 14 is shown in Fig. 7 as being mounted on a supporting arm 84 pivotally mounted on the machine so that it may be completely withdrawn from the tube former or adjusted in a radial direction. The mounting and adjustment of the longitudinal heat sealer is more fully described in the copending application referred to.

The pivoted draw bar 18, and particularly the outer

end portion thereof, is shown in greater detail in Figs. 3 through 5, to which reference is now made. In Figs. 3 and 4 numeral 18 designates the main tubular arm portion of the draw bar and is shown supporting a head casting 86 fixed thereto by transverse bolts 88. Parallel transverse shafts 90 are journaled in the head casting 86 and each shaft is provided with a pair of upstanding arms 92 at its ends, there being one arm of each pair on each side of the head casting 86. The head casting 86 extends to a position alongside the formed tube where it extends downwardly from the tube former 8, previously described. By referring now to Fig. 2 it will be seen that the arms 92 are likewise located to one side of the path of downward travel of the formed tube. Brackets 94 (see Fig. 6 also) are secured to the upper ends of arms 92 and extend laterally past opposite sides of the path of movement of the formed tube. One of the brackets 94 has fixedly mounted thereon one of the jaws 22 comprising a composite jaw assembly 96 comprising upper and lower members 98 with a slot or space 100 therebetween. The other bracket 94 supports the other jaw 22 and here designated as sealing jaw 102, mounted on the other bracket 94 by means of studs 104, fixed to the jaw 102 and extending loosely through openings in the other bracket 94. Each of the studs 104 is provided with a head 106 complementary to a portion of the opening through which the stud extends and each stud is further surrounded by compression spring 108 arranged to snugly and firmly seat the heads 106 in their complementary openings to thereby position the jaw 102 in a predetermined and controlled position in alignment with the jaw 96. The jaws 102 and 96 are provided with suitable heating elements whereby they are maintained at a sufficiently high temperature to effect heat sealing of the web 6 when the formed tube is gripped between the jaws. Springs 108 also insure the correct sealing pressure between the jaws.

In the space 100 between elements 98 of jaw 96, a knife 110 is positioned. The knife 110 is rigidly fixed to a block 112 (see Fig. 6) which is, in turn, supported by parallel leaf springs 114 from a supporting block 116 fixed to a plate 118 mounted on one of the brackets 94. Thus the knife 110 is mounted for movement in a direction transverse to its length and is maintained by the described structure in a position always parallel to its original position. As will be obvious, movement of the block 112 downwardly as seen in Fig. 6 will cause the knife 110 to move outwardly of the slot 100, past the interface between jaws 96 and 102, and at least partially into slot 120 in jaw 102. Such movement of the knife 110 will obviously sever the tube clamped between the jaws with a transverse heat seal above and below the line of severance.

To effect such movement of the knife 110 a bell crank 122 is pivotally mounted on the plate 118, on axis 124 and is provided with an end portion 126 loosely pinned to the block 112. The other end of the bell crank 122 is connected, by adjustable link 128, to a lever 130 (see also Figs. 2 and 3) pivotally carried by a leg 92 on a pivot pin 132. The upper end of the lever 130 is provided with a cam-engaging roller 134. The frame plate 32 of the machine is provided with a cam element 136 arranged in the path of travel of the roller 134. The cam 136 is preferably adjustable along a suitable slot 137 and held in adjusted position by a hand nut 138. As the draw bar 18 moves downwardly the jaws described effect the transverse seal of the formed bag and when the roller 134 passes cam 136, lever 130 is swung in a clockwise direction as seen in Fig. 2, thus moving link 128 to the right. When the link 128 moves to the right it swings bell crank 122 (Fig. 6) in a clockwise direction to move block 112 downwardly as seen in Fig. 6 and thus the knife 110 is caused to sever the sealed bag.

Referring again to Figs. 3 to 5, each of the shafts 90

is provided with a gear sector 140 fixed thereto. Actually, as shown in Fig. 4, the sectors 140 comprise axially spaced concentric sector portions. The sectors 140 are in mesh with each other and function to insure equal and opposite pivotal movements of the legs or arms 92 and thus equal and opposite movements of the jaws 96 and 102 relative to the formed tube. The outermost shaft 90 is provided with a further gear sector 142 fixed thereto and extending downwardly into mesh with a short section of rack bar 144 fixed on the end of piston rod 146 (see also Fig. 5). A transverse shaft 148 supports backup rollers 150 bearing against the back of rack bar 144 and holding the same in proper mesh with the teeth of sector 142 while permitting longitudinal movement thereof. As shown in Fig. 5, the backup rollers 150 are held in the desired spaced relationship and in proper relation to the rack bar 144 by suitable spacers 152.

The piston rod 146 is attached to the piston of a suitable reciprocatory hydraulic motor 154, not shown in detail since it may be of any conventional form. A bracket 156 is secured to the piston rod 146, extends outwardly through a slot 158 in a side of the draw bar head structure and is configured so that its head 160 reciprocates and is arranged to actuate levers 162 and 164 of switches 166 and 168, respectively. The purpose for these switches will be described later.

A post or the like 170 extends laterally from the head casting 86 and is pivotally connected to the lower end of a link 172. The upper end of link 172 is pivotally connected to a cam bar 174 (see also Figs. 9 and 10). The bar 174 is supported and guided for rectilinear movement by a plurality of guiding rollers 176 on the inner face of frame plate 32 and which rollers engage longitudinal trackways 178 in opposed edges of the bar 174. Thus, as the pivoted draw bar 18 swings upwardly and downwardly the cam bar 174 is caused to reciprocate longitudinally in timed relation to movement of the pivoted draw bar and the position of the cam bar is indicative of the position of the draw bar. End brackets 180 are fixed to the cam bar 174 and support a cam rod 182 in spaced parallel relation to the cam bar 174. A pair of cam brackets 184 are fixed to the cam bar 174 and support a cam element 186. The cam element 186 is secured to the brackets 184 by screws 188 passing through slots 190 in the cam element 186 whereby the latter is adjustable longitudinally of the cam bar 174. A switch 192 having an operating arm 194 is mounted on the plate 32 in position to be engaged and actuated by the cam element 186. A plurality of cam elements 196, 197, 198 and 199 are mounted on the cam rod 182 for selective adjustment therealong and for cooperation, respectively, with fixed switches 200, 202, 204, and 206. A stud 208 is threaded into the end of cam bar 174 and is threadably adjustable therein, being held in a desired position of adjustment by lock nut 210. The stud 208 cooperates with and actuates a further switch 212. The function and purpose for the various switches thus described will be more fully set forth later.

Referring again to Figs. 1 and 2, and Figs. 6 and 7, the frame plate 32 carries a housing 214 in which is journaled a pair of shafts 216. Each of the shafts has a gear sector 218 rigidly fixed thereon and with both gear sectors meshing with a double-faced rack bar 220. The rack bar 220 is mounted on a piston rod 222 constituting a part of a fluid motor 224. Thus, when fluid motor 224 is actuated to reciprocate a piston therein (not shown) in either direction the rack bar 220 causes gear sectors 218 to rotate shafts 216 in opposite directions. At its outermost end each shaft 216 carries a fitting 226 to which a portion of the clipper device 26 is secured. Each of the clipper devices is a hollow tubular structure having one end mounted in one of the fittings 226 and extending generally downwardly and outwardly therefrom and then horizontally outwardly at a level above

the uppermost position of the jaws 22. The horizontal portions 230 terminate in downwardly extending support portions 232 outwardly of the free ends of the transverse sealing and clamping jaws 22. The support portions 232 extend downwardly and are then turned inwardly to form clipper elements 234. The clipper elements 234 extend inwardly on opposite sides of the formed tube. As will be obvious, rocking of the shafts 216 will cause the clipper elements 234 to move toward and from each other. The range of movement is from the position shown in Fig. 6 where the clipper elements are in substantial contact with each other to laterally spaced positions of such spacing that the brackets 94 may pass between the clipper elements with the sealing jaws gripping the formed tube. In like manner the arms supporting the sealing jaws are swingable outwardly to such an extent that the jaws 93 and 102 can be separated to move vertically outside the clipper elements 234 even though the latter are not in the fully closed position of Fig. 6, all as will be more fully described later.

Referring again to Fig. 7, the innermost ends of the shafts 216 are provided with adjustable cams 236 thereon. The cams 236 are arranged to cooperate with fixed switches (not shown) constituting an interlock or safety feature between different elements of the machine, as will also be described in more detail later.

The hopper 2, through which the product is fed into the formed tube, is supported in any suitable manner on the machine and is provided with a pair of parallel links 240 pivotally mounted thereon and extending to the inside of the hopper. A hollow tubular plunger 242 is pivoted to the inner ends of the links 240 for vertical movement within the hopper. The parts are so proportioned that when the plunger is moved downwardly about the fixed axes of links 240 its lower end extends into the entrance portion to the formed tube within the tube former 8. The plunger 242 is hollow and open at its lower end and is further provided with an air hose 243 to supply air to the interior of the plunger 242. The lower end of the tubular plunger is open so that air admitted through hose 243 is blown downwardly through the tube former 8. The hose is connected to a supply of compressed air through a valve by which the air may be selectively controlled to issue from 242 as a strong blast, as a steady stream, or by which the air may be shut off.

One of the links 240 is fixed to its pivot shaft 246 which is in turn fixedly connected to the driven core 248 of a flexible shaft 250 (shown in fragment in Fig. 2). The other end of the flexible shaft core 248 is connected to a gear 252 meshing with a rack 254 carried by the piston rod of a pneumatic motor 256. Thus as the piston (not shown) of the motor 256 is driven in one direction, the gear 252 and core 248 are rotated and thus effect downward swinging movement of the link 240 to which the flexible shaft is connected. Thus downward swinging movement causes the plunger 242 to move downwardly in the manner previously described.

The fluid motors 24, 154, 224 and 256 are preferably controlled by solenoid-operated valves (not shown). The solenoids controlling those valves are controlled by the various switches referred to herein and certain of the valve solenoids are controlled by the photoelectric registering device 48 previously described. To facilitate illustration, applicant has omitted the valves, solenoids, and circuits therefor since the addition of those features to the drawings would render this disclosure unduly complicated. It is well within the realm of the skilled mechanic to make the necessary connections and circuits and to provide the required valves and solenoids to accomplish the functions and operations described hereafter.

The structures thus far described may be interconnected and controlled in various ways, as will be suggested. A contemplated mode of operation is to arrange the controls so that the photoelectric registry device 48 controls a solenoid-operated valve (not shown) which in

turn controls operation of hydraulic motor 24 for swinging the draw bar 18 about its fixed pivot. Thus, as the draw bar moves downwardly it draws the formed tube downwardly and the web 6 past photoelectric device 48 and will continue to move downwardly until a registry mark on web 6 actuates the control 48 and results in immediate closing of the fluid supply valve for motor 24 to thus stop downward movement of the draw bar 18. At the same time the control 48 actuates a control valve for fluid motor 154, whereby the jaws 22 are abruptly opened to discontinue drawing the web 6 through the tube former at the instant a registry mark reaches the element 48 and even though the draw bar 18 may continue to move downwardly, due to inertia or otherwise.

The switches 166 and 168 (Fig. 3) control appropriate solenoid-actuated valves arranged to effect opening and/or closing of the clipper devices by controlling the flow of actuating fluid to the fluid motor 224. The switch 168, actuated by head 160 when the sealing jaws 96 and 102 are in closed position, actuates the control valve for motor 224 to open the clippers, that is, to move the clipper elements 234 outwardly away from each other. The switch 166 is actuated when the jaws 96 and 102 are in their open position and effect closing of the clippers. Appropriate electrical conductors 260 and 262 connect the switches 166 and 168 to the solenoid-operated valve (not shown). If desired for "fast" operation the clippers can be caused to close by the control 48, at the time it opens jaws 22.

Referring now to Fig. 9, the switch 192 is arranged to control the dumping of a weighed charge of product into whatever delivery system is employed for delivering the weighed charge to the hopper 2. The cam 186 is so positioned that the charge will be dumped from the weigher at such time that it will reach the entrance of the tube former 8 at just about the same instant that jaws 96 and 102 close on the formed tube and start to draw the same downwardly through the former. Thus it is necessary that the switch 192 be actuated at some time prior to commencement of tube drawing to give the product time to reach the tube so as to move therewith through the former 8.

The switch 200 is arranged in a circuit to control the pneumatic motor 256. Thus the switch 200 is actuated as the draw bar leaves substantially its upper limit of movement and causes the plunger 242 to move downwardly to the lower position previously described to break any "bridge" of product that might have been formed. The plunger 242 is caused to retract by the same signal from control 48 that causes sealing jaws 96 and 102 to open. A blast of air through the hollow plunger 242 is projected into the tube to distend the same so that the product can fall freely into the bottom thereof. This blast of air is initiated by the signal from control 48, and its duration is the period while sealing jaws 96 and 102 are opening. The switch 202 is a draw bar limit switch arranged to stop downward movement of the draw bar 18 in the event of failure of the photoelectric registry device or during operations wherein the web is unprinted or not provided with bag length-designating marks thereon. Obviously cam 197 can be preset to actuate switch 202 after any predetermined or desired distance of downward movement of the draw bar and can thus be set to predetermine the length of successive bags independently of the photoelectric control.

Switch 204 is actuated as the draw bar 18 approaches a limit of its movement for the purpose of controlling the fluid to motor 24 to effect deceleration of the draw bar before actual stopping thereof. It would obviously be undesirable to stop the relatively heavy draw bar structure abruptly at either end of its movement.

In previous description cams 236 and the ends of shafts 216 for the clipper devices were described as engaging interlock switches. Those switches are arranged in cir-

9

cuit with such a switch as 206 of Fig. 9 and which are also in a circuit controlling the motor 24. Thus unless the switches controlled by the cams 236 are in predetermined condition, indicative of the proper relative positions, the jaws 96 and 102 and draw bar 18 cannot be actuated. This safety feature prevents movement of the draw bar or jaws at any time when collision with the clippers would result. The detailed arrangement of the cams 236, its interlocking switches and the circuits involved need not be described in detail since the arrangements will be obvious to those skilled in the art and their inclusion herein would unduly lengthen and complicate this disclosure.

The switch 212, operated by adjustable stud 208, also controls the motor 24 to start the draw bar 18 downwardly and initiate a cycle of operation. However, the switch 212 is preferably arranged in a circuit (not shown) so that it cannot start operation of the draw bar unless the weighing device associated with the machine has completed a cycle and delivered a charge of product to this packaging machine. Thus, if a charge of product was not started on its way in time to reach the tube former 8 when draw bar 18 reaches its uppermost position, the mere actuation of switch 212 will not initiate another cycle operation of the machine, the draw bar will remain stationary in its upper position until the weighing device has cycled and a long enough time interval has elapsed to permit the product to reach tube former 8, then the switch 212 will have conditioned the control circuit so that motor 24 can operate to start a cycle of operation. If the weighing device has properly cycled by the time the draw bar reaches its upper limit, the actuation of switch 212 immediately starts another cycle of operation.

It is to be understood that suitable motors or other power devices and pumps are provided to supply the present machine with the necessary air and/or oil under pressure to operate the motors and other instrumentalities described. Further, it is obvious that driving means and controls therefor, other than the fluid motors and valves referred to, may be used if desired.

As previously described, the clipper devices 26 are formed of hollow tubes. Fig. 1 shows a connection 264 whereby air under pressure may be admitted to the interior of the righthand clipper element 234. It is intended that a similar air conduit be supplied for the lefthand clipper device also so that both may be supplied with air under pressure when desired. The clipper elements 234 are provided with a longitudinally spaced series of openings on their adjacent inner sides so that air jets issuing therefrom will impinge upon a tube or bag therebetween, for purposes to be described hereafter.

Fig. 11 shows a sequence of steps constituting one complete cycle of operation of the present machine when arranged for packaging certain products, such as, for instance, potato chips. The controls and interlocks previously described are understood to be so arranged as to effect the sequences to be described herebelow and it is recognized that those skilled in the art can readily arrange the controls for such purposes.

In Fig. 11, sketch A shows the condition of the parts after the draw bar has returned to its upper position and defines the commencement of a cycle of operation. In this figure the parts are shown in a highly schematic manner but the reference numerals assigned thereto are the same as used heretofore in describing the structural elements.

In sketch A the product 270 has settled to the bottom of the formed tube 6', draw bar 18 is in its uppermost position with jaws 96 and 102 opened, clipper elements 234 are in an intermediate position, not fully opened nor fully closed. The longitudinal sealing device 14 is de-energized and plunger 242 has been retracted from its lowermost position. Assuming that a charge of product has left the weighing machine and is on its way to the

10

hopper 2, the switch 212 will have been closed by the draw bar 18 reaching the uppermost position and a new cycle of operation will have been initiated. To start the cycle of operation, the clipper elements 234 close upon the tube immediately above the product therein and the jaws 96 and 102 close on the tube immediately above the clippers 234 (sketch B). The closing of the clippers flattens the tube somewhat and expels some of the air from the lower end thereof so that a relatively flat finished bag will be produced. If desired, air can be expelled from the clippers at this time to impinge on the bag and further assist in flattening it. The clippers 234 then immediately open to the position of sketch C and the next charge of product 270 has just reached the entrance to tube former 8 as the draw bar 18 starts its downward movement. It is to be noted that, in sketch C, the clippers 234 open fully just before the draw bar 18 starts downwardly so that the clippers will not interfere with the jaws 96 and 102 which had closed on the tube above the clippers. Sketch D shows the draw bar moving downwardly and drawing web material through the tube former 8 and the product 270 falling into the tube thus formed. At this time the plunger 242 has started downward again and air is issuing from the lowermost end thereof to distend the formed tube whereby the product 270 may enter the same freely and move downwardly therewith. In sketch E the plunger is shown approaching its lowermost position and the draw bar has nearly reached the limit of its downward movement. At about this time the knife previously described operates to sever the formed tube above the lowermost charge of product so that subsequent opening of the jaws will drop a finished sealed bag of product onto the take-away conveyor 28. At F enough web 6 has been drawn to form another complete bag and photoelectric device 48 has operated to open the jaws 96 and 102 and thereby terminate drawing of the web material through the tube former. This same photoelectric device 48 operates to stop the downward drive of the draw bar 18 and cause it to decelerate. At the same time the plunger 242 has been drawn to its lowermost position to insure the breaking of any bridge of product at the entrance to the tube former and a blast of air is directed downwardly through the plunger 242 to distend the formed tube to the practical limit shown whereby the product 270 may settle as far toward the bottom therein as possible. As the jaws 96 and 102 start opening toward the position shown, the web of material stops moving. The opening of jaws 96 and 102 actuates switch 166, causing the longitudinal sealing device 14 to be energized and thus heat-seal the overlapping edges of the web material. Switch 166 also causes the clippers 234 to close on the formed tube above the product 270, as shown in sketch G. By this time the draw bar 18 has decelerated to its lowermost movement and starts to move upwardly. It is to be noted at this point that the clippers 234 flatten the formed tube at a position somewhat below the zone in which the next transverse seal will be made. Thus if any of the product extends upwardly into the sealing zone the clippers 234 will break the same and then upon opening to the position of sketch H, the fragments are permitted to drop into the bottom of the bag and thus clear the zone to be transversely sealed without leaving oil, salt or other contaminants from the product in the zone at which sealing will take place.

As shown in sketches H and I, the clippers 234 move from their fully closed position of sketch G to the intermediate position of sketch H and then to fully closed position at sketch I and to an intermediate position at sketch J. This particular step or "second clip" is optional and is caused by an automatic timing circuit (not shown) well known to those skilled in the art. This second clip follows automatically after initiation of the first clip described at G. This second clip may obviously be eliminated, if desired. It is to be noted that from G to K the

draw bar 18 is moving upwardly with its jaws in fully opened position. After the first clip shown at G and the second clip shown at I, the clipper elements 234 open only to the intermediate position shown at H, J and K. Thus the draw bar can move upwardly with its jaws fully opened and there will be no interference between the jaws 96 and 102 on the one hand, and the clipper elements 234 on the other. Thus the jaws may pass the position of the clippers to the final position shown at K, which is identical to that shown at A and is the position of starting a new cycle of operation. The longitudinal sealing device 14 remains energized from the position of sketch F through that of sketch J but is de-energized at the time the draw bar 18 reaches its upper position to start a new cycle. Immediately following the air blast at sketch F, a stream of air continues to blow through the plunger 242 down into the tube to hold the same distended until just prior to the closing of the jaws at the commencement of the next cycle. The clippers may also have air jets issuing therefrom and impinging on the formed tube in the interval from H to J to vibrate the tube and cause the product to settle therein. The jets may be in alternating or intermittent blasts and may be employed in place of the "second clip" at I.

In the modification shown in Fig. 12, which is a schematic showing, the draw bar comprises a boxlike structure 272 driven in vertical reciprocation by a pair of hydraulic piston motors 274. The transverse sealing and clamping jaws 276 are slidably mounted on opposite sides of the draw bar box 272 and moved together or apart by fluid motors 278. The web of sheet material 280 is fed through the tube former 282 and drawn there-through by the draw bar mechanism. A longitudinal seal is provided by sealing means schematically shown at 284. A clipper assembly comprises pivotally mounted arms 286, pivotally mounted on the machine frame at 288 and moved together or apart by a fluid motor 290. At their outer ends the arms 286 are provided with vertically elongated pivot elements 292 at the lower ends of which clippers 294 are pivotally mounted. The clipper elements 294 are arranged in pairs and are actuated by means (not shown) to open or close in the manner of scissors. The range of movement of the arms 286 is such that the bearing structures 292 are always within the vertical projection of the box 272 but movable outwardly away from the formed tube 296 sufficiently to clear the ends of the jaws 276. When the arms 286 are moved toward each other to the limit of their movement, the clippers 294 of each pair extend along opposite sides of the formed tube to about the middle thereof so that the two pairs of clippers effect "clipping" completely across the formed tube. With the clipper elements 294 in the open position and the arms 286 at the limit of their movement toward each other, the jaws 276 open sufficiently to clear the ends of the clipper elements 294. The control means and interlocking features described in connection with Figs. 1 through 11 may be considered to be present in this modification also, and the cycle of operation may be scheduled to repeat exactly those steps described in connection with Fig. 11.

In the structure described hereinabove, the cycle of operation is designed to clip or break portions of the product that extend upwardly into the zone of the upper transverse seal. Many products that may be packaged with this machine are sufficiently compact and of such nature that clipping of the type heretofore described is not necessary. Many such products, however, are sufficiently heavy so that if dropped into the distended bag as shown at sketch F of Fig. 11, the weight of the product would in many instances rupture the bottom transverse seal, which is still hot, the sealing jaws having just opened. The present machine and the clipper structure herein described is readily adapted to the prevention of such defective operation by arranging the clippers to close on a bag at a position just above the bottom transverse seals

of sketches F through K. As the draw bar reaches the position of sketch E and just prior to opening of the sealing jaws, the clippers may be closed immediately thereabove to pinch the formed tube therebetween and effect a temporary closure thereof above the heat-seal just made. The clippers will thus be held closed until the product has dropped to the bottom of the bag, the weight thereof being supported by the closed clippers rather than by the hot seal. The clippers could be retained in the closed position during upward movement of the draw bar and opened jaws and held in closed position until the draw bar starts its downward movement at the next cycle, thus giving the transverse heat-seal the maximum amount of time to cool and harden before the weight of the product is applied thereto. The clippers would then open long enough to permit passage of the jaws therebetween and then close again to repeat the described cycle.

The various modifications of apparatus shown and described herein are obviously adapted to other modes and cycles of operation from those specifically set forth and described. It will be obvious to those skilled in the art that the sequence of steps or the nature of successive steps may be modified by using the same basic apparatus shown herein and it is contemplated that other modes of operation be encompassed within the scope of the appended claims.

I claim:

1. In a packaging machine; tube-forming means, means for guiding a continuous web of material through said tube-forming means to form a longitudinally sealed tube, cyclically operable means for forming a transverse seal across said tube and for drawing a predetermined length of material through said tube-forming means; means for periodically feeding product into said tube in timed relation to operation of said cyclically operable means; clipper means comprising elements extending transversely of said tube on opposite sides thereof and mounted for movement toward and from each other to flatten said tube therebetween, means responsive to movements of said cyclically operable means for controlling operation of said clipper means, said cyclically operable means including opposed sealing and clamping jaws extending transversely of said tube on opposite sides thereof, and means mounting each of said jaws with at least one end thereof free, said clipper elements being carried by means extending outwardly of said free ends of said jaws whereby said jaws may move longitudinally of said tube either between said clipper elements or outwardly thereof.

2. A machine as defined in claim 1 wherein said jaws clampingly engage said tube to form a transverse seal at a position closely adjacent said clipper means but spaced therefrom in a direction away from a previously formed transverse seal.

3. In a packaging machine; tube-forming means, means for guiding a continuous web of material through said tube-forming means to form a longitudinally sealed tube, a draw bar device comprising an arm mounted for swinging movement about a fixed axis spaced laterally of said tube, a portion of said arm being movable along an arcuate path adjacent and generally tangent to the axis of said tube, relatively movable jaws on said portion of said arm for gripping and pulling said tube through said tube-forming means, and driving means for cyclically swinging said arm about said fixed axis.

4. A machine as defined in claim 3 wherein said driving means comprises a reciprocatory fluid motor.

5. A machine as defined in claim 3 wherein said portion of said arm extends alongside said tube, said jaws being pivotally mounted on said arm on spaced axes and extending laterally thereof on opposite sides of said tube, and operating means for simultaneously swinging said jaws in opposite directions about said spaced axes.

6. A machine as defined in claim 3 wherein said driving

13

means comprises a selectively reversible motor device, and detecting means adjacent said web of material for detecting the advance of a predetermined length thereof and for controlling said motor device.

7. A machine as defined in claim 3 including a control cam device movably mounted on said machine, and means drivingly connecting said arm to said control cam device for controlling the operation of portions of said machine in timed relation to the movements of said arm.

8. A machine as defined in claim 7 wherein said control cam device comprises an elongated bar, means guiding said bar for longitudinal rectilinear movement on said machine, a rod, means mounting said rod on said bar in spaced parallel relation thereto, a plurality of switches adjacent said cam device, and a plurality of cams adjustable along said rod and said bar and respectively engageable with said switches to operate the same and thereby control the operation of said portions of said machine.

9. In a packaging machine; tube-forming means at one side of a portion of said machine, means for guiding a continuous web of material downwardly through said tube-forming means to form a longitudinally sealed tube, cyclically operable means mounted for generally vertical movement on said side of said portion of said machine, below said tube-forming means and having a pair of tube-gripping and sealing jaws thereon, said jaws extending outwardly of said side and terminating in free outer ends, a pair of clipper devices pivotally mounted on said portion on spaced axes above said jaws, each of said clipper devices including a support portion extending outwardly of said side above said jaws and then downwardly outwardly of the free ends of said jaws, and a clipper portion on the lower end of said support portion and ex-

14

tending inwardly toward said side and below said jaws whereby said jaws may be moved toward or from each other between said support portions and said clipper portions and also in said generally vertical direction either between or laterally outwardly of said clipper portions.

10. In a packaging machine; tube-forming means, means for guiding a continuous web of material through said tube-forming means to form a longitudinally sealed tube, cyclically operable means for forming a transverse seal across said tube and for drawing a predetermined length of material through said tube-forming means; and clipper means comprising elements extending transversely of said tube on opposite sides thereof and mounted for movement toward and from each other to substantially completely flatten said tube therebetween, said clipper elements being hollow and provided with outlet openings on the sides thereof adjacent said tube, and means for supplying air under pulsing pressure to the interiors of said hollow elements whereby pulsing jets issuing from said outlet openings impinge on the sides of said tube.

References Cited in the file of this patent

UNITED STATES PATENTS

25	1,353,210	Bates	Sept. 21, 1920
	1,986,422	Zwoyer	Jan. 1, 1935
	2,160,367	Maxfield	May 30, 1939
	2,486,759	Pfeiffer	Nov. 1, 1949
	2,649,671	Bartelt	Aug. 25, 1953
30	2,861,406	Holsman	Nov. 25, 1958
	2,837,882	Hull	June 10, 1958
	2,899,875	Leasure	Aug. 18, 1959