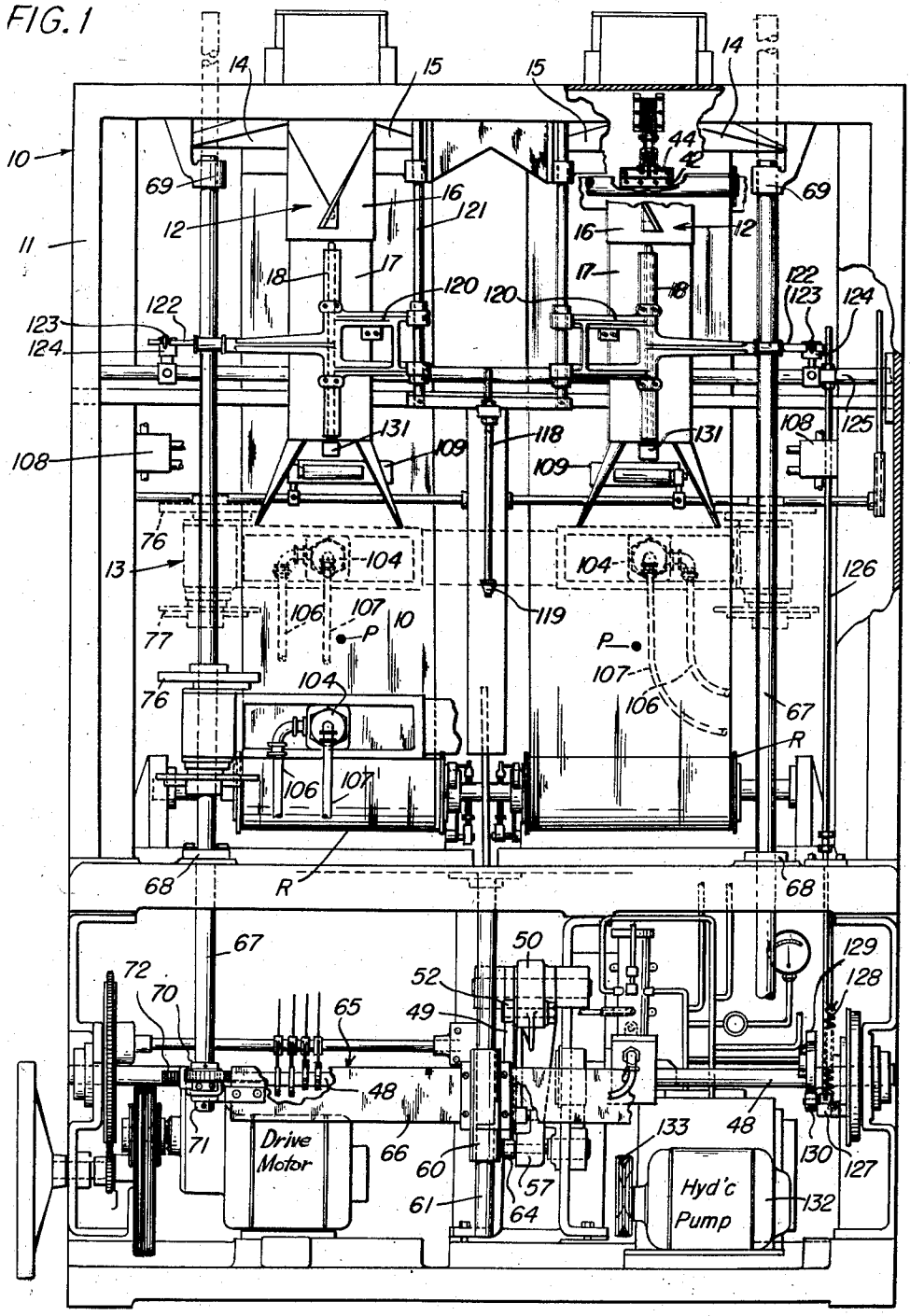
Jan. 20, 1959 W. R. ZWOYER 2,869,298

AUTOMATIC PACKAGING MACHINE

Filed Jan. 15, 1954 7 Sheets-Sheet 1

FIG. 1



Jan. 20, 1959 W. R. ZWOYER 2,869,298

AUTOMATIC PACKAGING MACHINE

Filed Jan. 15, 1954 7 Sheets-Sheet 2

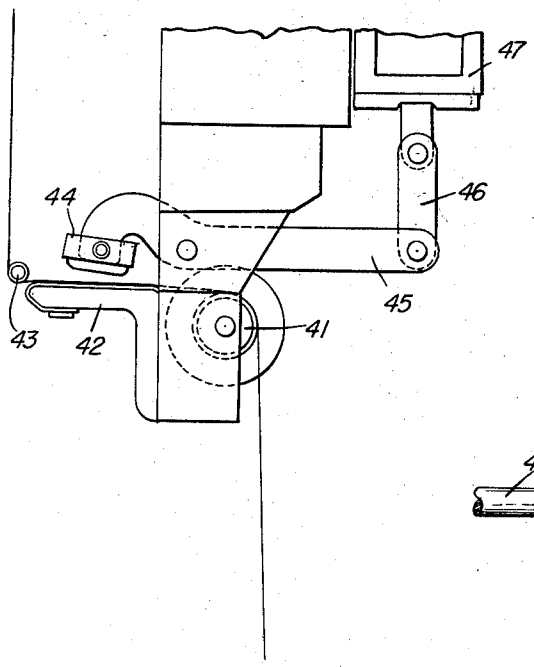


FIG. 7

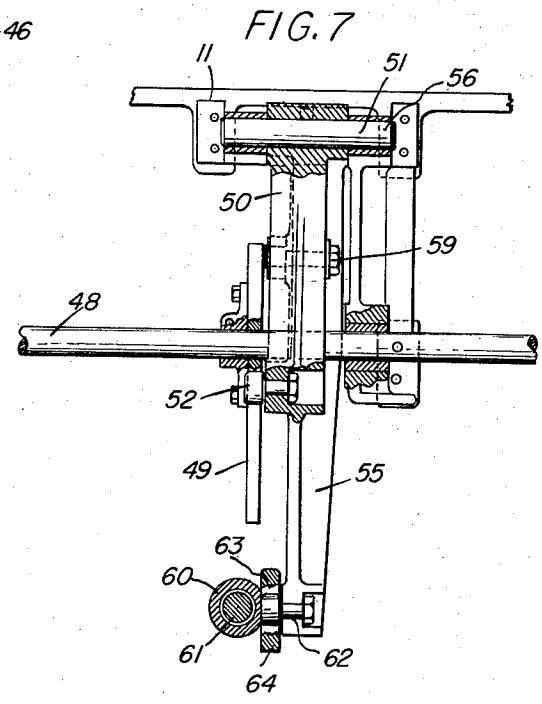
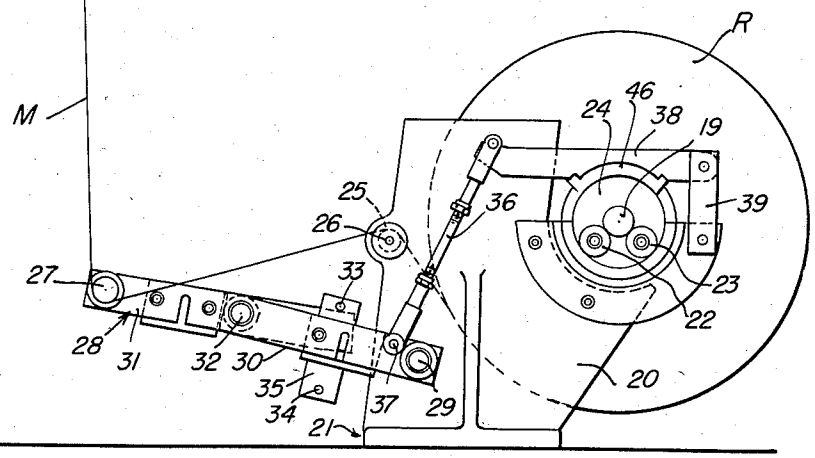


FIG. 2



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Jan. 20, 1959 W. R. ZWOYER 2,869,298

AUTOMATIC PACKAGING MACHINE

Filed Jan. 15, 1954 7 Sheets-Sheet 3

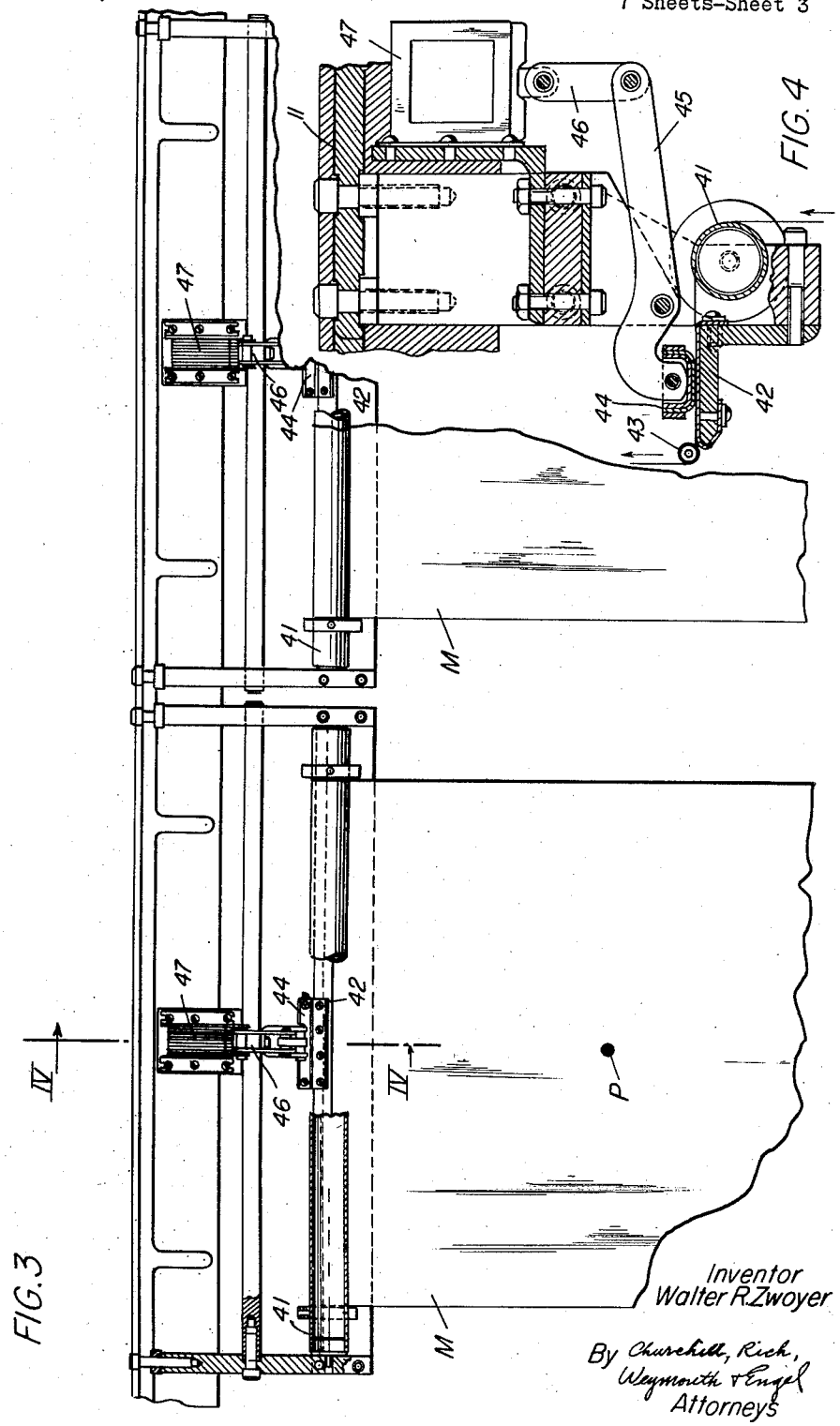


FIG. 4

FIG. 3

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AUTOMATIC PACKAGING MACHINE

Filed Jan. 15, 1954 7 Sheets-Sheet 4

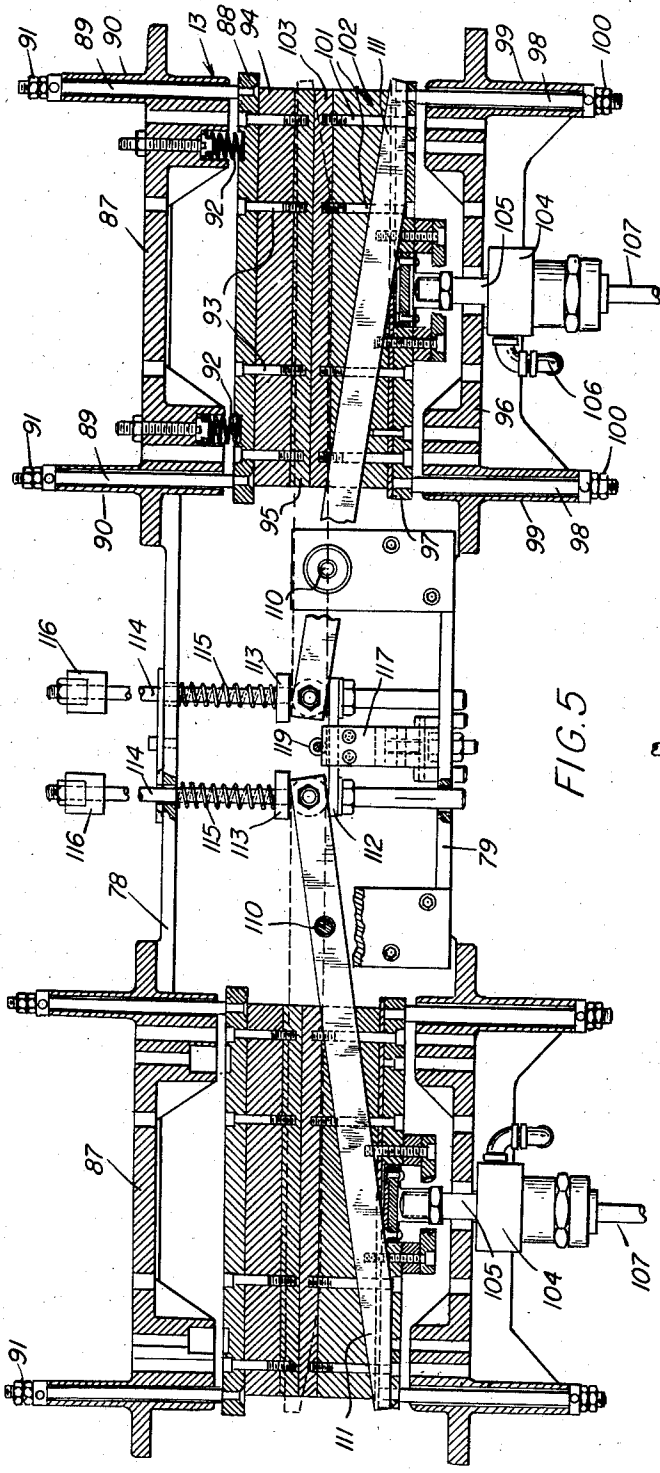


FIG. 5

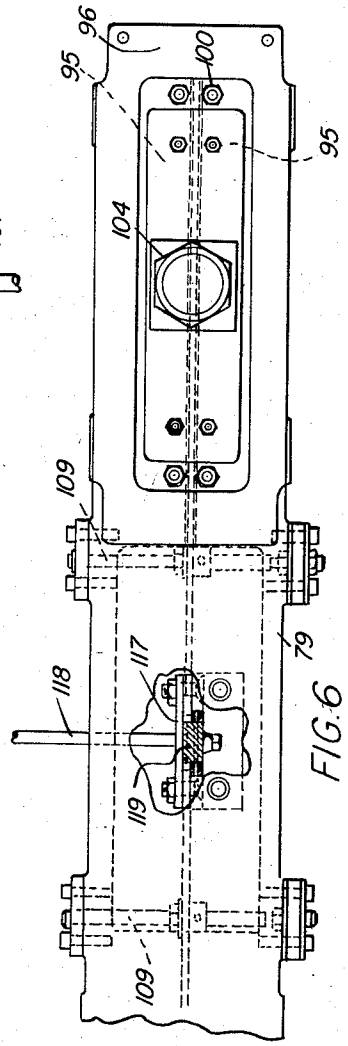


FIG. 6

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AUTOMATIC PACKAGING MACHINE

Filed Jan. 15, 1954 7 Sheets-Sheet 5

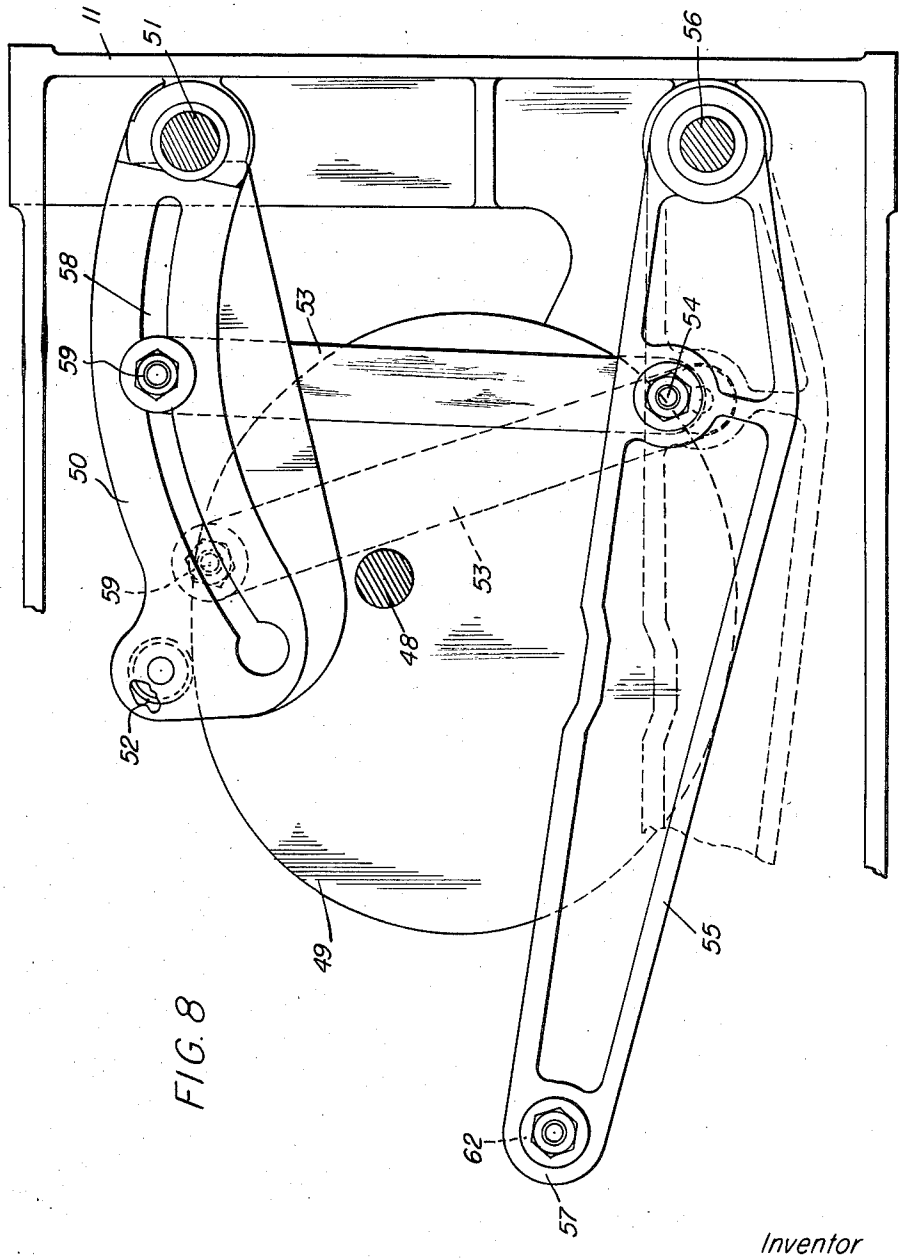


FIG. 8

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Jan. 20, 1959 W. R. ZWOYER 2,869,298

AUTOMATIC PACKAGING MACHINE

Filed Jan. 15, 1954 7 Sheets-Sheet 6

FIG. 9

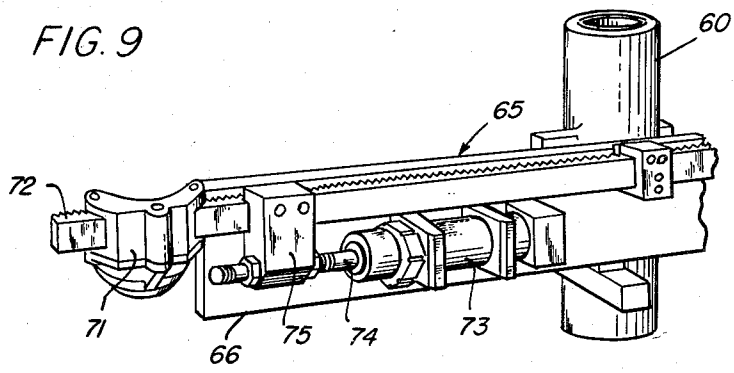
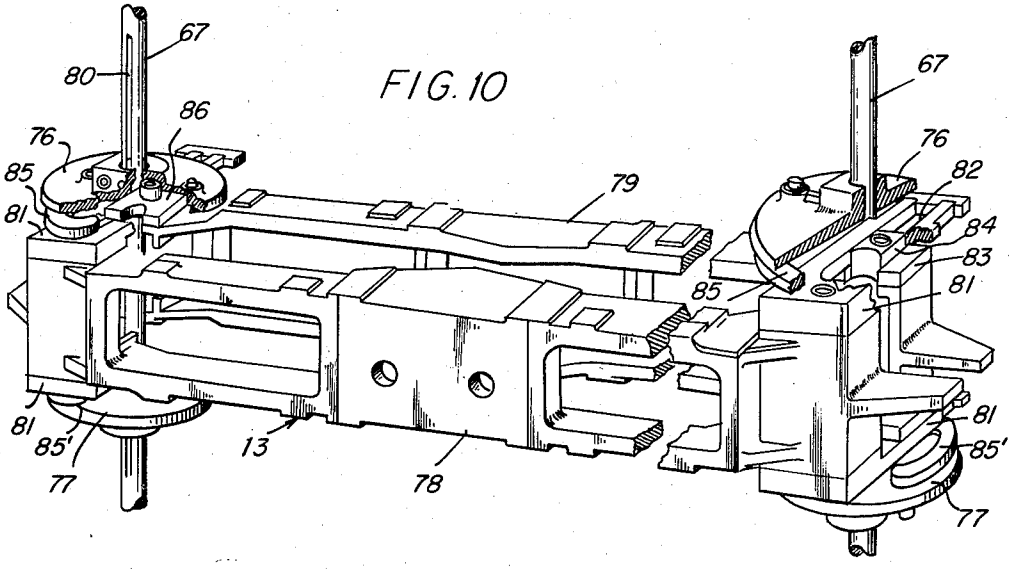


FIG. 10



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Jan. 20, 1959 W. R. ZWOYER 2,869,298

AUTOMATIC PACKAGING MACHINE

Filed Jan. 15, 1954 7 Sheets-Sheet 7

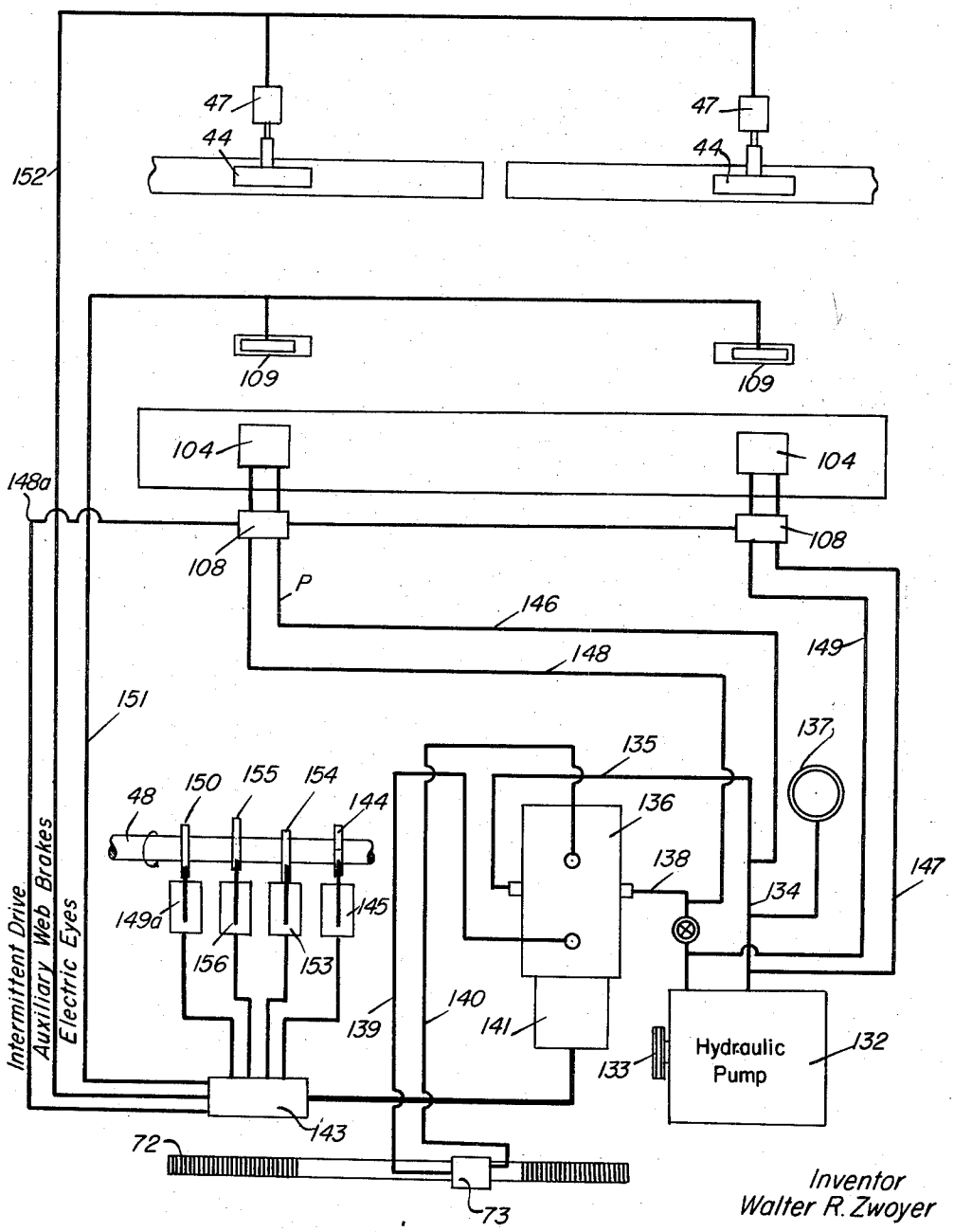


FIG. 11

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United States Patent Office

2,869,298

Patented Jan. 20, 1959

2,869,298

AUTOMATIC PACKAGING MACHINE

Walter R. Zwoyer, Maywood, N. J., assignor, by mesne assignments, to Package Machinery Company, East Longmeadow, Mass., a corporation of Massachusetts

Application January 15, 1954, Serial No. 404,242

17 Claims. (Cl. 53—51)

This invention relates to an automatic packaging machine, and more particularly to a packaging machine wherein ribbon-like packaging material is formed into a tube which is transversely sealed at spaced intervals, and severed into like packages, the packages being filled between successive sealing steps.

It is impracticable to print lettering, designs or other identification upon filled packages formed upon machines of the subject type. For this reason, such identification is applied to the ribbon-like material from which the tube is formed before the material reaches the packaging machine. Application of the identification is repeated at intervals spaced along the ribbon or web of packaging material to correspond to the lengths of the successive packages to be formed. The machine is then adjusted to draw out from its tube former, one after another, sections of tube having the predetermined package length.

At this point difficulty arises. Even minute variation in machine setting from the predetermined package length will be multiplied by repeated package formation until the identification upon the individual package is widely displaced from acceptable position. Furthermore, like unacceptable displacement may result from variations in longitudinal tension upon the packaging material, or even slight expansion or contraction of the web caused by variations in temperature or humidity, or by over-running of the machine, or from other causes.

It has now been found possible to construct a packageing machine of the subject type wherein pre-applied identifications are precisely positioned on each package produced by the machine. This result is obtainable regardless of even minute errors in machine setting, overrunning, variations in tension on the packaging material, expansion or contraction of the latter from any cause, or as a result of any other contingency.

Thus, a clamp is reciprocated to grip, transversely seal and draw out repeatedly from the tube former a package length of the tube produced thereby. According to the invention, the clamp is moved in drawing-out direction for a distance greater than the predetermined package length, and an actuator or identification on the package being drawn out controls clamp-opening mechanism whereby the package length may be determined wholly by the position of the identification on the package. Furthermore, the invention contemplates a clamp which simultaneously seals transversely the top of a filled package and the bottom of an unfilled package, combined with automatic severing means carried by the clamp for cutting apart the completely sealed filled package and the bottom-sealed unfilled package. Still further, the invention includes a constant-tension brake for maintaining substantially uniform the tension of the web material, the tube formed therefrom, and the unfilled package. Additionally, the invention contemplates a stop brake upon the machine for holding the web and the tube immobile at the instant when the jaws of the clamp are opened, to prevent any possibility of drawing the package out beyond that point.

A preferred form of the invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a front elevation of a packaging machine constructed and arranged according to the invention, certain parts being broken away to reveal other parts of the machine;

Fig. 2 is a side elevation of the packaging material supply reel, the constant tension brake, and the stop brake of the packaging machine, the last-named unit being shown in non-braking position, and the whole being shown on an enlarged scale with respect to Fig. 1;

Fig. 3 is a broken rear elevation of a portion of the upper part of the packaging machine illustrating the positioning and action of the stop brake shown in Fig. 2, certain parts being broken away and certain other parts being shown in section;

Fig. 4 is a broken vertical section taken on the line IV—IV of Fig. 3, shown on an enlarged scale, the stop brake being shown in braking position;

Fig. 5 is a plan view, shown partly in horizontal section, of the clamp or draw bar of the machine;

Fig. 6 is a fragmental elevation, shown partly broken away and in section, of the clamp illustrated in Fig. 5;

Fig. 7 is a fragmental plan view, shown partly in section, of the part of the mechanism for reciprocating the clamp illustrated in Figs. 1, 5 and 6;

Fig. 8 is a fragmental side elevation, shown on a greatly enlarged scale, of the mechanism illustrated in Fig. 7;

Fig. 9 is a fragmental perspective view of the cross-head assembly of the automatic packaging machine;

Fig. 10 is a fragmental perspective view of the frame which carries the reciprocable clamp of the machine illustrated in Figs. 5 and 6 together with certain operating parts of the frame; and

Fig. 11 is a diagrammatic illustration of the electrical control and operating mechanism and of the hydraulic operating system of the machine.

In the embodiment of the invention which is illustrated in the drawings, there is shown a duplex packaging machine **10** comprising a frame **11**, a pair of tube formers **12** disposed side-by-side in the frame, and a reciprocable clamp **13** adapted to grip, transversely seal, and draw out from each tube former a package length of tube at each reciprocation of the clamp.

Each tube former **12** is of known construction, comprising a pair of former arms **14** and **15**, an outer former tube **16** and an inner former tube **17** concentrically spaced within the outer former tube and extending below the latter. Thus, a ribbon or web of packaging material passing upwardly and over the former arms **14** and **15** of each tube former and downwardly between an outer former tube **16** and an inner former tube **17**, has its longitudinal edge portions brought into overlapping engagement where they are sealed to form the tube. This operation is well understood in the art, and one method of performing it is disclosed in Patent No. 1,986, 422, granted January 1, 1935, to Walter R. Zwoyer.

Although it is presently contemplated that the tube and the packages formed therefrom will be made of heat-sealable material, and that all seals will be made by the application of heat and pressure, other types of packaging material and other types of seal are included within the purview of the invention. In the embodiment here illustrated the longitudinal overlapping edge portions of the web are heat sealed by a horizontally swinging vertical sealing bar **18** to form the tube.

Since the packaging machine **10** here illustrated embodies duplicate package producing mechanisms, description of the apparatus will be simplified from this point on by referring to but a single package producing mechanism. It will be understood, however, that the apparatus so described is duplicated, side-by-side, in the machine.

Where a single operating unit, as the reciprocable clamp 13, coacts with both of the duplicate package producing mechanisms, this fact will, of course, be fully developed.

The ribbon or web of packaging material M of which the tube is continuously produced is fed to the tube former 12 from a roll R of the material. See Fig. 2. Before being wound to form the roll R, the web M is printed with successive arrangements of lettering, designs or identifications to appear upon the successive packages. It is also provided with indexing or actuating means for controlling the opening of the reciprocable clamp 13, in a manner later to be described. Accordingly, there is applied longitudinally along the web M, spaced successively at distances equal to the length of the packages to be produced, markings, or actuators, which may take a variety of forms. In the present embodiment the opening indexing means is a portion P of the design or identification on each package.

The roll R of packaging material is fixed upon a spindle 19 which extends between spaced vertical flanges 20 of a supporting frame 21. One such flange is illustrated in Fig. 2. The ends of the spindle 19 are rotatably supported by pairs of rollers 22 and 23 horizontally journaled in the vertical flanges 20; and each end of the spindle 19 has a braking drum 24 fixed thereto.

The packaging material M is drawn from the roll R, as required, to produce the tube and the succession of packages formed therefrom. Thus, the material M, as it leaves the roll R, first passes over a roller 25 parallel to the spindle 19 and journaled, as at 26, in each of the vertical flanges 20. From the roller 25, the web of packaging material M passes under a guide roller 27, and thence upwardly toward the tube former 12.

The guide roller 27 is journaled between two articulated arms 28 of a constant tension brake whereby the tension of the packaging material is maintained substantially constant between the roll R and the drawn out and transversely sealed tube. The articulated arms 28 are coaxially pivoted, as at 29, to the vertical flanges 20 of the supporting frame 21, and each arm comprises two segments. A rear segment 30 of the articulated arm is pivoted at one end to the pivot 29, and at its other end to a forward segment 31 of the arm, as by an intermediate pivot 32. The far end of the forward segment 31 carries one end of the guide roller 27. The rear end of the forward segment 31 extends beyond the intermediate pivot 32 toward the pivot 29 of the articulated arm 28, and between stop pins 33 and 34 fixed in a vertical plate 35 rigidly attached transversely of the rear segment 30. Accordingly, relative angular movement of the forward and rear segments about the intermediate pivot 32 is limited. A longitudinally adjustable rod 36 or turnbuckle is pivoted at one end, as at 37, to the rear segment 30 of the articulated arm; and is pivoted at its opposite end to a brake lever 38, which is in turn pivoted to the supporting frame 21 through a tie bar 39. A brake shoe 40 is carried by the brake lever 38 in position to coact with the braking drum 24 in braking rotation of the roll R of packaging material.

From the foregoing, it will be evident that increased tension upon the web of packaging material M will tend to lift the brake shoes 40 from the braking drums 24, thereby relieving such tension. Conversely, diminishing tension upon the web will permit the weight of the articulated arms to pull the brake shoes with greater force against the braking drums, thereby increasing the tension upon the web. Thus, substantially constant tension upon the web is assured. Because of the articulation of the arms 28, action of the brakes is not sudden. Increasing or decreasing tension upon the web M is relieved or augmented in stages: first by movement of the forward segments 31 about the intermediate pivots 32, then by movement of the entire articulated arms 28 about the pivots 29. Small or temporary variations in web tension are therefore quickly compensated by the weight and angular movement of the forward segments 31 alone. Larger or more sustained differences in tension are compensated by action of the entire brake.

Accordingly, substantially constant tension may be maintained upon the web of packaging material and the tube formed therefrom during operation of the packaging machine. Consequently, there will be no variation in the distance between lettering, designs or other identification upon successive packages due to variation in tension.

Clearly the roll support and the constant tension brake apparatus here disclosed may be suitably duplicated for supplying more than one web of packaging material to each tube former, where a multi-layer or a side seam package is to be produced.

From the guide roller 27, the web of packaging material M moves upwardly to an upper guide roller 41, where it changes direction by substantially 90° to pass over a horizontal shelf 42 on the packaging machine, and thence past a direction-change roller 43 to the former arms 14 and 15 of the tube former 12. A stop brake 44 (Figs. 2 and 4) carried by a lever 45, operated through a link 46 by a solenoid 47, acts to clamp the web M upon the horizontal shelf 42 and stop all movement thereof, in a manner which will later be explained.

The web of packaging material is formed as a tube by the tube former 12, in well-known manner, being drawn through the tube former by the reciprocable clamp 13. To this end the clamp is reciprocated between a point adjacent the discharge end of the tube former 12, where the clamp grips the tube, and a point at a distance below the tube-gripping point slightly greater than the length of the package to be produced. The clamp is operated to release the gripped tube at exact package-length distance from the tube gripping point in a manner which will be later described.

The clamp 13 is reciprocated by mechanism operated from a main shaft 48, driven by an electric motor through a gear train (Fig. 1). The initial unit of this mechanism is an operating cam 49 (best shown in Fig. 8) fixed to the shaft 48. An adjustable rocking lever combination is reciprocated by the cam 49 and comprises an auxiliary lever 50 which is pivoted to the frame 11 of the machine at 51 and carries at its unpivoted end a follower roller 52 adapted to maintain contact with the working surface of the operating cam; a connecting rod 53 which is pivoted, at 54, to a rocker arm 55, which is in turn pivoted to the frame 11, as at 56. As a result of this construction, rotation of the main shaft 48, and with it the operating cam 49, rocks the auxiliary lever 50, and through the connecting rod 53, the rocker arm 55, the working end 57 of which is available to give reciprocating movement to suitably disposed elements of the machine. The auxiliary lever 50 has therein a longitudinal slot 58 curved in an arc drawn with a radius equal to the effective length of the connecting rod 53 centered upon its pivot 54 on the rocker arm 55. Accordingly, the unpivoted end of the connecting rod 53 may be clamped to the auxiliary lever 50 by means of a bolt 59 extending through its unpivoted end and through the longitudinal slot 58 to adjust the amplitude of the rocking motion of the rocker arm.

The working end 57 of the rocker arm 55 is suitably connected to a slide bushing 60 reciprocable upon a vertical rod 61 fixed in the lower part of the machine. See Figs. 1 and 7. Accordingly, oscillation of the rocker arm 55 reciprocates the slide bushing 60 up and down upon the vertical rod 61. As here shown, the working end of the rocker arm is operably connected to the slide bushing through a trunnion 62 horizontally pivoted to the working end of the rocker arm and disposed in a horizontal slot 63 formed in a lug 64 fixed to the slide bushing 60. See Fig. 7. Such connection translates the arcuate reciprocation of the rocker arm 55 into vertical reciprocatory motion of the slide bushing.

Transversely fixed to the slide bushing 60 is a cross-head assembly 65, including a horizontal support bar 66 from which the clamp 13 is reciprocated vertically as the slide bushing is moved up and down. To this end, vertical rotary shafts 67 are carried at the ends of the horizontal support bar 66, extending upwardly therefrom. The vertical rotary shafts are fixed against axial movement with respect to the horizontal support bar. The shafts 67 are also respectively rotatable at the ends of the reciprocable clamp 13, at which they are likewise fixed against relative axial movement. As a result, vertical reciprocation of the slide bushing 60, and with it the cross-head assembly 65, similarly moves the reciprocable clamp 13. The vertical rotary shafts 67 extend upwardly from the cross-head assembly through and above the machine frame 11, being movable axially through suitable guides 68 and 69 fixed to the machine frame. The cross-head assembly 65 and the reciprocable clamp 13 are thereby held in a fixed vertical plane in which they reciprocate together.

The packaging machine 10 is so constructed that the fixed vertical plane in which the cross-head assembly 65 and the clamp 13 reciprocate together extends substantially centrally through the two tube formers 12 of the machine. Furthermore, the jaws of the clamp 13 (later to be particularly described) lie on opposite sides of this plane. When open, the jaws of the clamp lie on opposite sides of the tubes produced by the tube formers. At the top of the vertical reciprocation of the clamp 13 the jaws are closed to grip and transversely seal the two tubes substantially in this fixed vertical plane. The jaws remaining closed, downward movement of the clamp 13 and the cross-head assembly 65 with the working end 57 of the rocker arm 55 draws out the package length of tube from each tube former 12. The length of tube so drawn out may be adjusted by suitably positioning and fixing the unpivoted end of the connecting rod 53 upon the auxiliary lever 50.

It is necessary that the tube formers 12 function uniformly in suitably producing successive package lengths of longitudinally sealed tubes, regardless of adjustment of the machine to produce different lengths of package. It is therefore desirable that the clamp 13 always grip the formed tubes at the same minimum distance below the delivery ends of the tube formers 12. Adjustments of the machine to produce longer or shorter package lengths are therefore made to vary reciprocation of the clamp only below such fixed upper level. The machine is designed to effect this result in a very simple manner. The operating cam 49 is first turned to position the roller 52 at the highest point of its movement. Then the working end 57 of the rocker arm 55 is positioned, independently, at its highest point. This point corresponds to the position of the clamp 13 at its minimum distance below the delivery ends of the former tubes. With the auxiliary lever 50 and the rocker arm 55 in such positions, the positioning and clamping of the free end of the connecting rod 53 within the longitudinal slot 58 in the auxiliary lever 50 along the slot 58 functions to lengthen or shorten the amplitude of reciprocation of the clamp 13 but does not vary its uppermost position. Such adjustments can be readily made, since the center of the arcuate slot and the pivot point of the rocker arm 55 are coincident.

The jaws of the clamp 13 are opened and closed by rotation of the vertical rotary shafts 67. Such rotation is effected by the cross-head assembly 65 by which the lower ends of the rotary shafts are carried.

The lower ends of the vertical rotary shafts 67 are fixed in pinion wheels 70, one of which is shown in Fig. 1. The pinion wheels are journaled in opposite bastion-like ends 71 of the horizontal support bar 66 and are rotated by a horizontal rack bar 72 slidable longitudinally of the support bar. In order to move the horizontal rack bar 72 longitudinally of the horizontal support bar 66, a piston (not shown) is reversably operated in well-known manner in a cylinder 73 (Fig. 9) fixed to the horizontal support bar. The piston rod 74 of this mechanism extends out of the cylinder 73 parallel to the length of the horizontal rack bar 72, to which it is adjustably attached by a connecting block 75. Thus, hydraulic pressure may be applied to the cylinder 73 to move the rack bar 72 longitudinally in either direction; and, as the rack bar is so moved, it rotates both pinion wheels 70 to turn both vertical rotary shafts 67 in like direction.

The source, timing and control of the hydraulic pressure which operates the rack bar 72 will be described at a later point in this specification.

The manner in which the vertical rotary shafts 67 reciprocate, open and close the clamp 13 will now be described. Fixed to each shaft 67 are two spaced discs 76 and 77 which rotate therewith. See Fig. 10. Both discs 76 are coplanar as are both discs 77. A longitudinal slot 80 in each shaft makes it possible to loosen and slide axially thereof, without rotation, the discs carried by each shaft for access to otherwise inaccessible parts. Between the spaced discs 76 and 77 on each vertical rotary shaft, the respective ends of the clamp 13 are held against movement axially of the shaft. The clamp is therefore reciprocated vertically with the vertical rotary shafts 67. The gripping jaws of the clamp (later to be particularly described) are carried respectively by supporting members 78 and 79 of the clamp, the ends of which are positioned between the spaced discs 76 and 77 on the respective shafts.

Fixed at the top and bottom of each end of the supporting member 78 is a guide member 81 projecting at right angles thereto toward and beyond the coacting member 79. The guide members 81 provide rectangular guide spaces 82 extending at right angles to the length of the supporting members. Fixed at the top and bottom of each end of the supporting member 79 is a coacting member 83 which has thereon an outwardly projecting slide member 84 positioned within the guide space 82 of the adjacent guide member 81 and having parallel sides in sliding contact therewith. Thus the supporting members 78 and 79 may be moved toward and away from each other while maintaining mutually parallel position. Toggle mechanisms well known in the art, elements 85 and 85' of which are partly seen in Fig. 10, are connected to the discs 76 and 77 and to the guide member 81 and the coacting member 83. Rotation of the vertical rotary shafts 67 operate these toggle mechanisms to move the supporting members 78 and 79 toward and away from each other in a manner well understood in the art.

The jaws of the clamp 13 (Fig. 5) are carried respectively by the supporting members 78 and 79. Thus, two frame members 87 are conveniently fixed symmetrically at equal distances on each side of the center of the supporting member 78, and a plate 88 is movably attached to each frame member by means of rods 89 having ends fixed in the plate 88 and extending through tubular lugs 90 formed integrally with the frame member 87. Nut assemblies 91, threaded in locking relationship upon the outer ends of the rods 89, make contact with the outer ends of the tubular lugs 90 to limit separation of the plate 88 and the frame member 87 under the influence of springs 92 compressed between the frame member and the plate. Bolts 93 extend beyond the plate 88 to fix thereto a carrying block 94 on the face of the plate away from the frame member 87. The bolts also function to fix to the face of the block 94 away from the plate 88 a pair of horizontal gripping and sealing members 95 suitably vertically spaced apart for a purpose which will presently appear.

Similarly, two frame members 96 are conveniently fixed symmetrically at equal distances on each side of the center of the supporting member 79, and a plate 97 is movably attached to each frame member by means of rods 98 having ends fixed in the plate 97 and extending through tubular lugs 99 formed integrally with the

frame member 96. Nut assemblies 100, threaded in locking relationship upon the outer ends of the rods 98 make contact with the outer ends of the tubular lugs 99 to limit separation of the plate 97 and the frame member 96. Bolts 101 extend beyond the plate 97 to fix thereto parallel, vertically spaced carrying blocks 102 on the face of the plate away from the frame member 96. The space between such blocks is coplanar with the space between the pair of horizontal gripping and sealing members 95. The bolts 101 also function to fix to the faces of the carrying blocks 102 away from the plate 97 separate gripping and sealing members 103, the space between the gripping and sealing members being substantially equal to that between the two carrying blocks 102.

The plate 97 and the elements carried thereby are moved toward and away from the frame member 96 by means of a reversible piston (not shown) operating in a cylinder 104 fixed to the frame 96. The piston rod 105 of the reversible piston is suitably connected to the plate 97. Pressure may be admitted to the cylinder 104 through a conduit 106 to move the plate 97 toward the frame member 96, or through a conduit 107 to move the plate reversely. A solenoid-operated, spring return two-way valve 108 (Figs. 1 and 11) of known construction, may be electrically operated to supply pressure to the cylinder 104 through the conduit 106 and exhaust pressure through the conduit 107, or to supply and exhaust pressure reversely, in timed sequence as the machine functions.

Thus, with pressure applied to the piston in cylinder 104 to move the plate 97 away from the frame member 96, the jaws of the clamp may be closed by rotation of the vertical rotary shafts 67 to grip the tube transversely. Such gripping will be in vertically separated horizontal parallel bands between the meeting opposed gripping and sealing members 95 and 103. The springs 92 permit suitable self adjustment between the jaws. The meeting faces of the gripping and sealing members are preferably provided with the conventional inter-fitting projections and they may be electrically heated to heat-seal the tube in a manner too well known in the art to require specific illustration.

From the foregoing, it will be apparent that, with the gripping and sealing members 95 and 103 in clamping position, the clamp 13 may be opened by rotating the vertical rotary shafts 67 to separate the supporting members 78 and 79 as heretofore described. However, the clamp may be opened independently of the vertical rotary shafts and without separating the supporting members by suitably supplying pressure within the cylinder 104. Thus, as the clamp 13 grips the formed tube adjacent the discharge end of the tube former 12 and draws it downwardly toward the bottom of the reciprocation of the clamp, the cylinder 104 and related parts provide means for opening the clamp 13 before full movement thereof in the drawing downwardly direction. As hereinbefore stated the purpose in having the stroke of the clamp longer than the cut-off on the printing of the formed package is to allow for stretch or shrinkage of the web material and of course the stroke must be longer than any possible increase in length of the web due to stretch.

In operating the packaging machine, adjustment is made for moving the clamp 13 in drawing-downward direction for a distance which is slightly greater than the predetermined package length. The piston in the cylinder 104 is then operated in response to a marker or actuator upon the package being drawn out before full downward movement of the clamp has been completed. As here shown, an electric eye 109 is fixed in the machine and focused upon the package as it leaves the tube former 12, being responsive to the portion P of the design printed upon the web at package length intervals. Upon responding to the portion P, the electric eye 109 actuates the solenoid-operated valve 108 to open the clamp. Clearly some other form of marker or actuator might be applied to the web.

In gripping and transversely sealing the tube, the clamp 13 simultaneously seals the bottom of the tube length which it draws from the tube former 12 and the top of the package length of tube drawn from the tube former during the previous reciprocation. The vertical spacing of adjacent gripping and sealing members 103 and 95 on the respective coacting jaws provides space between the two transverse seals. Such vertical spacing also provides for accommodation within the clamp of novel automatic severing means whereby the transversely sealed tube may be severed to separate the filled and top-sealed package from the tube as the succeeding package length is drawn from the tube former. This novel automatic severing means will now be described.

Pivoted, as at 110, to each side of the center of the supporting member 79 and movable into the space between the carrying blocks 102 and between the gripping and sealing members 95 and 103, are knives 111, the longitudinal edges of which nearest the gripping and sealing members are sharpened. The knives 111 have unsharpened portions extending toward one another from their respective pivots 110 and the adjacent ends of the knives are each held between a yoke 112 and a pair of collars 113, fixed upon rods 114 which project in parallel loosely through the central portions of both supporting members 78 and 79. A coil spring 115 surrounds each rod 114, unattached thereto, between the supporting member 78 and the collar 113. Stop blocks 116 are fixed upon the ends of the rods 114 outside of the supporting member 78.

Accordingly, when the clamp 13 is opened, the supporting member 78 bears upon the stop blocks 116 to pull the yoke 112 in the direction of movement of the supporting member 78. The yoke thus turns the knife blades about their pivots into the space between the adjacent carrying blocks 102. A horizontally pivoted latch 117, thereupon falls by gravity behind the yoke to hold it in this position. As the jaws are closed at the upper end of their movement, the springs 115 are compressed against the collars by the supporting member 78 thereby urging the knives to turn about their pivots to enter the spaces between the pairs of gripping and sealing members 95. Such motion is prevented, however, by the latch 117. It is therefore necessary to trip the latch when it is desired to have the knives 111 sever the tube between the transverse seals. Means for tripping the latch is provided by a depending vertical rod 118 of suitable length which is fixed to the frame 11 to extend between the open central portions of the clamp when the latter is at or near its uppermost position. The vertical rod 118 carries at its lower end a conical dog 119 having its base uppermost. The open clamp by-passes the conical dog in its upward reciprocation; but when the clamp is closed to grip the tube, the yoke-engaging end of the latch is in a position above the base of the conical dog 119 and in overlying relation thereto. As the clamp moves downwardly, the yoke-engaging end of the latch is lifted by the dog whereupon the knives 111 are thereby released to the action of the compressed springs 115 and fly within the spaces between the adjacent grip and sealing members to sever the sealed tubes.

As the jaws of the clamp 13 are opened adjacent the bottom of their downward movement, each package length of tube which the clamp has pulled from the tube formers 12 and transversely sealed at its lower end is filled, in well-known manner, through the inner former tube 17. At the same time, and during the upward movement of the open-jawed clamp, the sealing bar 18 on each unit of the machine swings into and remains in operative position. In such position, each sealing bar presses the overlapped unsealed longitudinal edge portions of the next section of tube to be pulled out by the clamp 13 against

the inner tube 17 and there seals said overlapped longitudinal edges together.

Each sealing bar 18 is carried by a frame 120 pivoted to a vertical cylindrical bar 121 about which the frame swings horizontally to move the sealing bar into and out of sealing position. An arm 122 of the frame 120 extends on the opposite side of the sealing bar 18 from the vertical bar 121 to which the frame is pivoted. The end of the arm 122 is engaged by the hooked end 123 of an actuating rod (not fully shown) which is pivotally connected to a crank 124 fixed to a horizontal shaft 125, which extends behind both tube formers 12 and is journaled in opposite sides of the machine frame 11. The horizontal shaft 125 is periodically turned to cause the hooked end 123 of the actuating rod to move the arm 122, the frame 120 and the sealing bar 18 into sealing position, and then to turn these elements out of sealing position. To this end, an elongated rod 126 is connected at one end to the crank 124, and at its opposite end to a lever 127 pivoted in the lower part of the frame 11. The lever 127 is biased by a spring 128 to move the elongated rod and turn the crank 124 so as to swing the sealing bar 18 into sealing position. A cam 129 upon the main shaft 48 of the machine periodically acts upon a roller 130 carried by the lever 127 to move the lever against the action of the spring 128, and with it the elongated rod, the crank, the hooked end of the actuating rod, and the frame 120 to swing the sealing bar 18 out of sealing position. Electric conductors (not shown) connected into a junction box 131 carried by each sealing bar serve to supply the energy for heating the bar to effect heat-sealing.

Since rotation of the main shaft 48 of the machine operates both the operating cam 49 which reciprocates the clamp 13 and the cam 129 whereby the sealing bar 18 is swung out of sealing position, relative adjustment of these cams upon the main shaft properly relates the drawing out and tube sealing operations.

Rotation of the main shaft 48 also continuously operates a hydraulic pump 132 through a connection (not shown) to a pulley 133 of the pump. See Fig. 1. The pump 132 supplies the hydraulic pressure which operates certain parts of the packaging machine hereinbefore described. Thus the pump supplies hydraulic pressure to the cylinder 73, the piston of which moves the rack bar 72 longitudinally of the horizontal support bar 66 to rotate the vertical rotary shafts 67. The pump 132 also supplies hydraulic pressure to the cllinders 104 whereby the clamp 13 is opened before it completes its downward movement. All of this is effected in a manner which is best illustrated in the diagrammatic showing of Fig. 11, to which reference will now be made.

The hydraulic pump 132 supplies hydraulic pressure through a main pressure conduit 134 and an extension 135 to a valve cylinder 136. A pressure gauge 137 is shown as connected to the main pressure conduit 134. A main return conduit 138 extends from the valve cylinder 136 to the intake point of the hydraulic pump. Conduits 139 and 140 connect the valve cylinder 136 with opposite ends of the cylinder 73 which operates the horizontal rack bar 72. This connection is made in such manner that a piston within the valve cylinder 136 may alternately connect one end of the cylinder 73 and then the other to the pressure conduit 134, and at the same time connect the end of the cylinder opposite to that connected to pressure to the return conduit 138. Thus, the valve cylinder may be operated to move the horizontal rack bar 72 alternately in opposite directions.

A solenoid 141 is slidable in the valve cylinder 136 to operate its valve opening and closing piston in one direction, and an opposing spring (not shown) operates such piston oppositely, all in well-known manner. An electric circuit 142 (represented by a single line) extends from an electric distributor 143 to the solenoid 141 to energize the latter. A cam 144 adjustably fixed on the main shaft 48 of the machine operates a micro-switch 145 connected with the distributor 143 to close and open the electric circuit 142, and thereby to operate the solenoid 141 periodically as the packaging machine 10 is operated and the main shaft revolves.

Hydraulic pressure is supplied somewhat similarly by the hydraulic pump 132 to the cylinders 104 which open the clasp 13 before full movement thereof in drawing out direction. Such pressure is controlled in its application to the cylinders by the two-way valves 108 which are directly connected to the hydraulic pump 132. As here shown, conduits 146 and 147 lead from the main pressure conduit 134 to the two-way valves 108, and conduits 148 and 149 connect the respective two-way valves to the main return conduit 138.

The solenoids of the two-way valves 108 are energized through an electric circuit 148*a* (indicated as a single line) extending from the electric distributor 143 to the both valves. The circuit 148*a* is closed in the distributor by coaction of two mechanisms. One is a micro-switch 149*a* operated by a cam 150 on the main shaft 48 of the packaging machine. The other is a circuit including the electric eye 109. The cam 150 is set upon the main shaft to operate the micro-switch at a position of the clamp 13 about three-quarters of an inch before it reaches the bottom of its downward stroke. However, the two-way valve 108 may not open until the electric eye 109 has responded to the marking P upon the web. Connection is therefore made between the electric eye 109 and the electric distributor 143, such connection being shown as a single line 151. Action of the electric eye therefore completes the closing of the circuit 148*a* as by well-known sequential relay action.

Similar provision is made for actuating the solenoids 47 to operate the stop brakes 44 and halt all movement of the webs as the jaws of the clamp 13 are opened. To this end, a circuit, illustrated by the single line 152, connects the solenoids 47 of both stop brakes with the electric distributor 143. A microswitch 153, operated by a cam 154 set upon the main shaft to operate the micro-switch 153 when the clamp is about three-quarters of an inch above the lowermost position of its downward movement, acts to close the circuit 152. However, as in the case of the two-way valve circuit just described, the circuit 152 cannot be closed until the electric eye acts. Accordingly, the electric eye circuit 151 is connected, in well-known manner, as by sequential relay within the electric distributor 143, to permit closing of the relay 152 only as the electric eye responds to the marker P upon the package.

In order that the electric eye may not respond or "fire" when not needed for operation of the machine, a cam 155 actuates a micro-switch 156 which breaks the circuit 151 through the electric eye within the electric distributor 143 after the electric eye has functioned. The cam 155 and the micro-switch 156 act to close the circuit 151 again after the clamp 13 has again begun its downward movement.

The embodiment of the invention here described and illustrated in the drawings is presented merely as an example of how the invention may be given form and applied. Other forms, embodiments and applications of the invention, coming within the proper scope of the following claims, will of course, suggest themselves to those skilled in the packaging art.

What I claim is:

1. In a packaging machine wherein a tube is formed from web material, and a clamp is reciprocated to transversely grip, seal and draw out a substantially vertical direction, a package length of tube during which drawing out the material to be packaged is charged into the partially formed package, in combination, means for closing said clamp upon the tube to grip and seal the tube, means for then moving said clamp downwardly in drawing-out direction for a distance greater than the predetermined

package length, means for opening said clamp before full movement thereof in drawing-out direction, and a stop brake for engaging the material of the tube rearwardly of the formed tube to stop movement thereof, and means operative in response to a marker on the package being drawn out for simultaneously operating said clamp opening means to release the clamping hold on the tube and cause said stop brake to grip the material rearwardly of the formed tube and prevent movement thereof.

2. In a packaging machine wherein a tube of web material is formed into a tube, a tube former, reciprocable means comprising jaws for gripping, transversely sealing and advancing beyond said tube former for a distance greater than the predetermined package length, a tube of web material formed thereby having uniformly spaced markings thereon, a brake for clamping the web material prior to entering said tube former to stop all motion of the web including that of the tube in said tube former, and a stationary electric eye responsive to a marking on the tube for simultaneously timing the opening of the jaws of said reciprocable gripping means before the end of its advancing stroke and the clamping of said brake.

3. A packaging machine according to claim 2 wherein there is a guide over which the web material passes before entering said tube former, and the brake is adapted to clamp against the web material passing over said guide.

4. A packaging machine comprising a tube former; a clamp for gripping, transversely sealing and drawing out from said tube former a length of tube for a distance greater than the predetermined package length; a pair of vertical reciprocatory and rotary shafts between which said clamp is carried and by which said clamp is reciprocated in a direction axially of said shafts; mechanical means for reciprocating said shafts axially thereof; for a distance greater than the package length to be formed, mechanism for rotating said shafts, a toggle mechanism operable by rotation of said shafts to open and close the jaws of said clamp at the lower and upper ends of the reciprocating movement of the shafts; and a fluid-operable means for additionally and independently opening the jaws of said clamp before the shafts reach the lower end of their movement.

5. A packaging machine according to claim 4 wherein the mechanism for rotating said shafts and for additionally and independently opening the jaws of said clamp are hydraulically operable.

6. A packaging machine according to claim 5 wherein an electric eye, responsive to a marker on the package drawn out from said tube former controls operation of said hydraulically operable means for opening the jaws of said clamp before the shafts reach the lower end of their movement.

7. A packaging machine wherein web packaging material is formed as a tube which is transversely sealed to form packages, said machine comprising: a tube former for receiving the web packaging material and forming the tube; a clamp having coacting jaws for gripping, transversely sealing and drawing out of said tube former a predetermined package length of tube; a pair of vertical rotary shafts between which said clamp is carried and by which said clamp is reciprocated in a direction axially of said shafts; means for reciprocating said shafts in unison axially thereof; in combination with hydraulically-operated mechanism operably connected to said shafts for rotating said shafts; a toggle mechanism operable by rotation of said shafts to open and close the jaws of said clamp; a hydraulic cylinder for additionally and independently opening the jaws of said clamp before the shafts reach the lower end of their movement; and a stop brake positioned to grip and hold stationary the web packaging material and the tube formed therefrom when the jaws of said clamp are open.

8. A packaging machine according to claim 7 wherein an electric eye, responsive to a marker on the package drawn out from said tube former controls operation of said cylinder for opening said clamp and simultaneously also controls operation of said stop brake.

9. A packaging machine according to claim 7 wherein the jaws of said clamp comprise horizontal, vertically divided coacting gripping and sealing surfaces and wherein automatic package severing means is carried by said clamp to move between said divided surfaces between the time of clamping of the jaws and the opening thereof.

10. In a packaging machine wherein a web of packaging material is drawn through a tube former to produce a tube: a clamp, said clamp comprising a pair of coacting jws whereby the tube produced by the tube former may be gripped transversely thereof, drawn downwardly from the tube former in successive package lengths, and transversely sealed, each of said jaws having two horizontal, vertically-spaced gripping faces for meeting complemental gripping faces on the coacting jaw to grip and transversely seal the tube along two parallel hands; an automatically operable knife disposed between the parallel gripping faces of said jaws to move transversely between said gripping faces during the time of clamping of the jaws and the opening thereof for severing the transversely sealed tube between the two parallel seals formed by said clamp, a spring loaded latch means normally holding the knife within one of the jaws and a latch opening means disposed in the line of movement of the clamp to trip the latch means upon downward movement of the clamp to permit the spring to move the knife between the parallel sealed bands and into the other jaw.

11. A packaging machine according to claim 10 wherein the knife is pivotally mounted within the clamp and means are carried by the clamp for moving the knife to its normal operative position as the jaws of the clamp are opened.

12. In a packaging machine wherein a tube is formed from web material, and a clamp is reciprocated to grip, seal and draw out a package length of tube, in combination, means for closing said clamp upon the tube, means for then moving said clamp in drawing-out direction for a distance greater than the predetermined package length, and means for opening said clamp to release the tube before full movement of the clamp in drawing-out direction.

13. A packaging machine according to claim 12, wherein said means for opening said clamp is controlled by an actuator on the tube being drawn out.

14. A packaging machine according to claim 12 wherein an electric eye responsive to a marking on the web material from which the tube is formed controls the means for opening the clamp before full movement thereof in drawing-out direction.

15. A packaging machine according to claim 14 wherein the markings on the web material are spaced longitudinally therealong at intervals equal to the predetermined length of the packages to be produced by the machine, and the electric eye is responsive to the marking on a web material length of the tube which is being drawn from the tube former by the clamp to control the point in said movement at which said clamp is opened.

16. In a packaging machine of the class described, a tube former for producing from web packaging material a tube from which sections may be transversely sealed and severed to provide a succession of packages; actuating means spaced longitudinally along such web at intervals equal to the predetermined lengths of the packages to be produced by the machine; a clamp for repeatedly engaging and pulling away from said tube former the tube produced thereby, said clamp having gripping and sealing jaws whereby the tube is gripped and transversely sealed as said clamp engages such tube and pulls it away from said tube former; means for reciprocating said clamp toward and away from said tube former through an amplitude greater than the predetermined package length; means coordinated with said reciprocating means for closing the gripping and sealing jaws of

said clamp at its point of reciprocation nearest said tube former; and means for opening the gripping and sealing jaws of said clamp upon reaching the end of its movement in drawing out direction; in combination with mechanism operated by said actuating means on the web for actuating said jaw opening means before full movement thereof in drawing out direction.

17. A packaging machine wherein web packaging material is drawn over a tube former to produce a tube; a clamp comprising a pair of coacting jaws whereby the tube produced may be gripped transversely thereof, sealed and drawn downwardly from the tube former in successive package lengths, means for moving the clamp in drawing-out direction for a distance greater than the predetermined package length and means for opening the clamp to release the tube before full movement of the clamp in drawing-out direction; each of said jaws having two spaced parallel gripping faces for coacting with complemental gripping faces on the coacting jaw

to grip and transversely seal the tube along two parallel bands; a knife disposed between the parallel gripping faces in one jaw and movable between the parallel gripping faces of the complemental jaw when the jaws are closed for severing the transversely sealed tube and means for operating the knife before full movement of the clamp in the drawing-out direction.

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UNITED STATES PATENT OFFICE

Certificate of Correction

Patent No. 2,869,298 January 20, 1959

Walter R. Zwoyer

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 10, line 69, after "out" insert —in—; column 11, line 39, after "and" strike out "a"; column 12 line 12, for "jws" read —jaws—; line 18, for "hands" read —bands—.

Signed and sealed this 28th day of April 1959.

[SEAL]

Attest:
T. B. MORROW,
Attesting Officer.

ROBERT C. WATSON,
Commissioner of Patents.