United States Patent

[11] 3,587,204

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[54] **CLINCHING APPARATUS**
10 Claims, 19 Drawing Figs.

[52] **U.S. Cl.** **53/138,**
24/27, 24/30.5, 29/211, 29/243.57
[51] **Int. Cl.** **B65b 51/04,**
B65d 77/12
[50] **Field of Search** 53/138, 138
(A), 198 (A), 182; 29/208 (D), 210 (D), 211 (D),
243.56, 243.57, 243.58, 33.50

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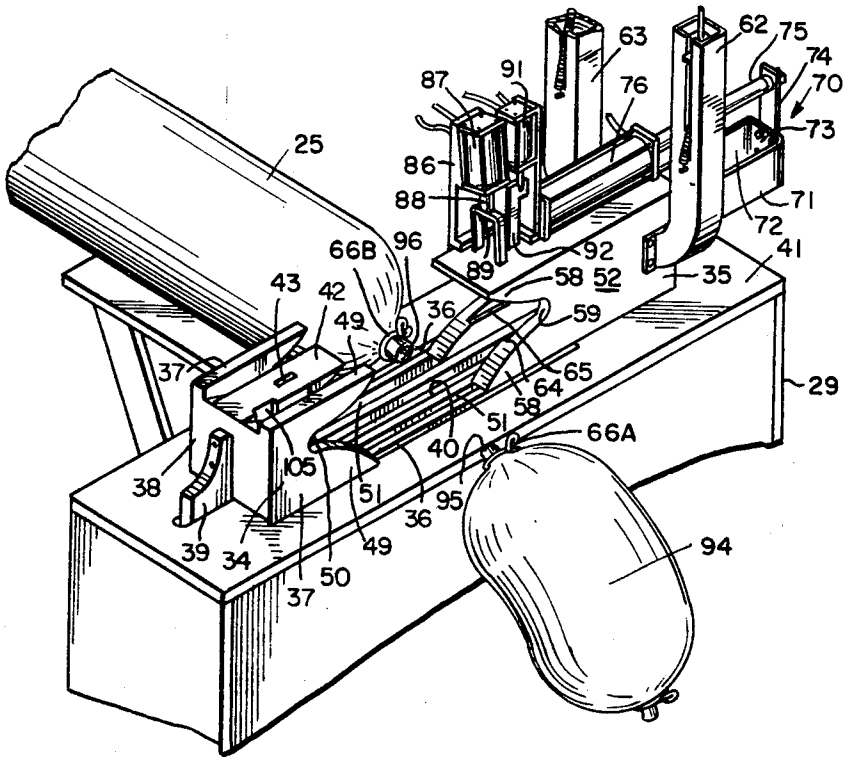
Assistant Examiner—Neil Abrams
Attorney—Hood, Gust, Irish, Lundy & Coffey

ABSTRACT: A machine for forming, from flexible sheet material, a continuous tube while filling the tube, advancing the filled tube past a closing station, and there transversely ensmalling the tube to define a neck region of significant length in the direction of tube movement, feeding two clinching staples formed of ductile material into straddling relation with said neck region at longitudinally spaced points thereof, bending said staples into clinching relation to said neck region to define, when the tube is formed of materials such as polyethylene film, moistureproof, substantially airtight tube closures, and severing the neck region between said closures. In one form of the invention, force is separately applied to both legs of each staple to move said legs past each other in the clinching operation; in another form, pressure is applied by a reciprocating plunger to one leg only of each staple while the other leg is held stationary; and in a third form, an oscillatory member is engaged in an eye at the distal end of one leg of each staple to drag that staple end past the stationarily held end of the other staple leg. With or without slight structural modification, the machine may be used in a slightly different manner to close and clinch the mouth of conventional bags.

A novel staple for optimum use in the machine is also disclosed.

Additionally a novel handtool for declinching such staples to open the packages delivered by the machine is included in the disclosure, such tool being usable, if desired, to apply, or to reapply, such staples for initially forming, or for subsequently reclosing, such packages.



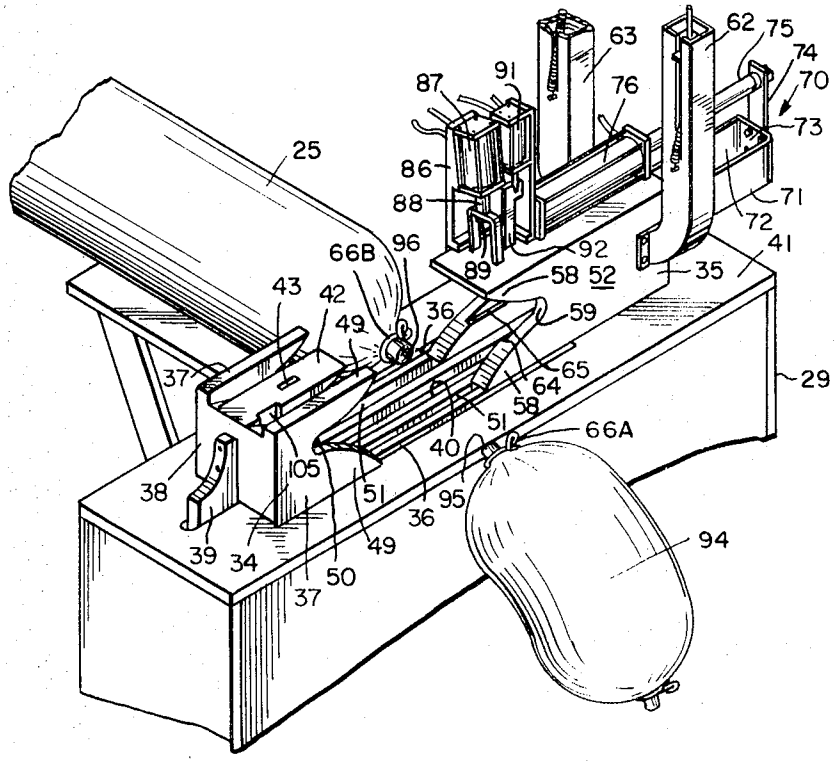


Fig. 1

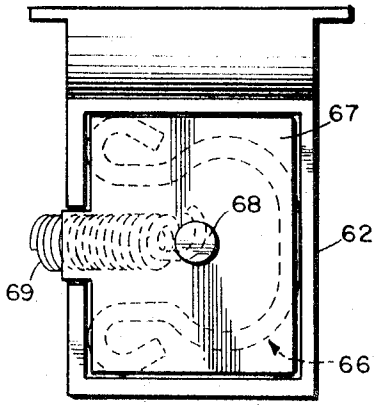
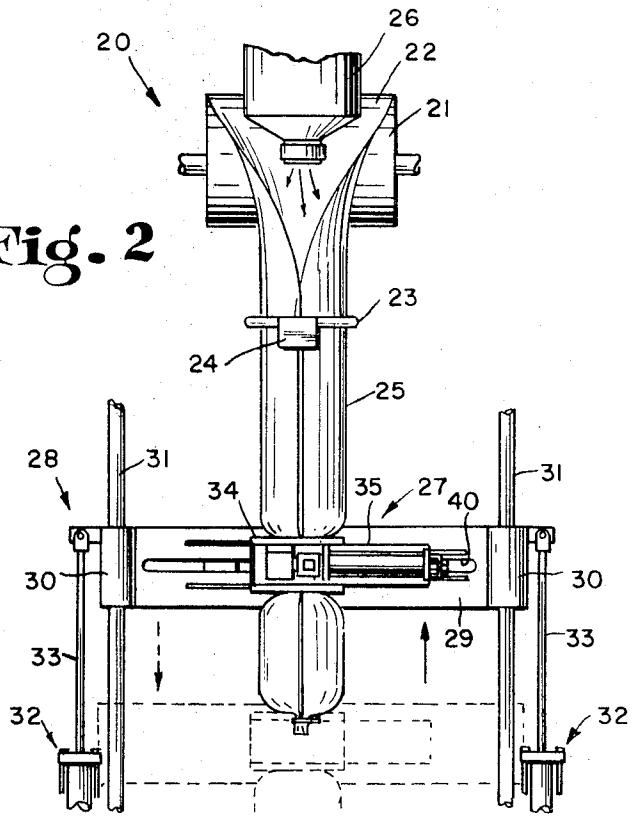


Fig. 1a

Fig. 2



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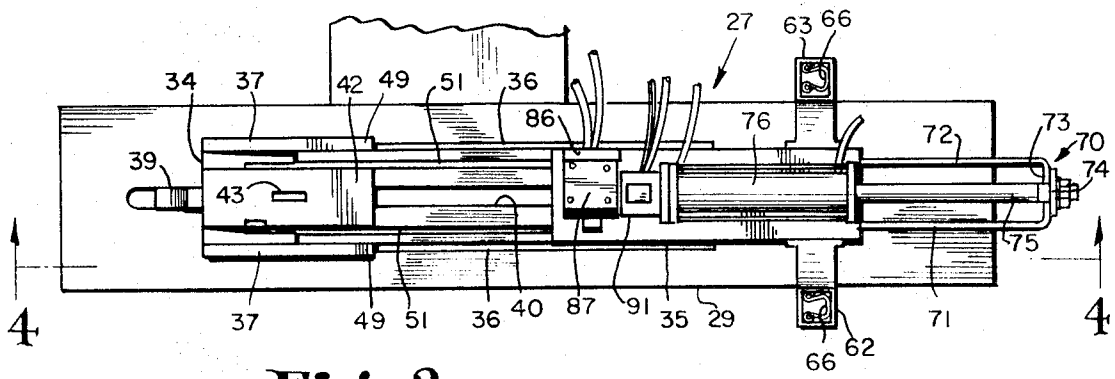

Fig. 3

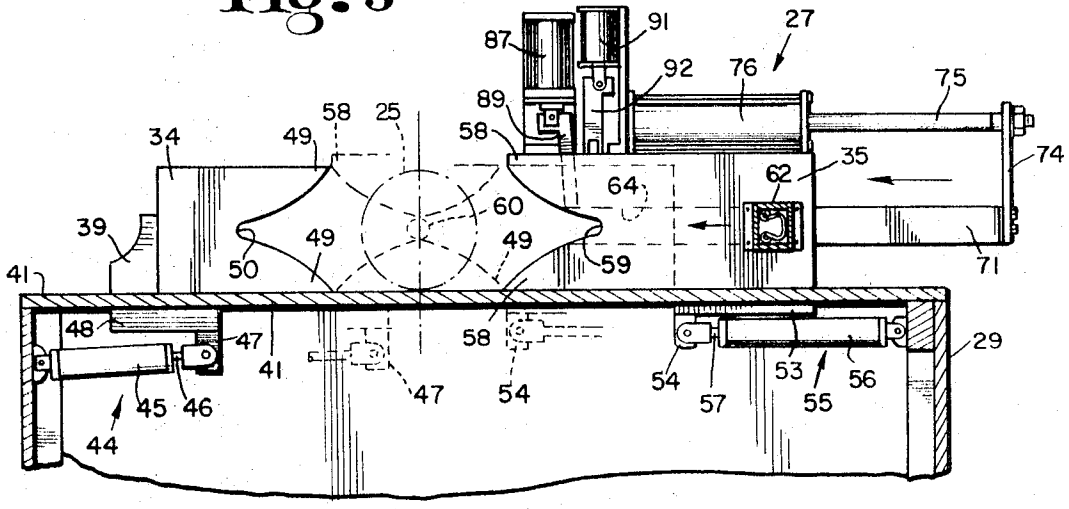

Fig. 4

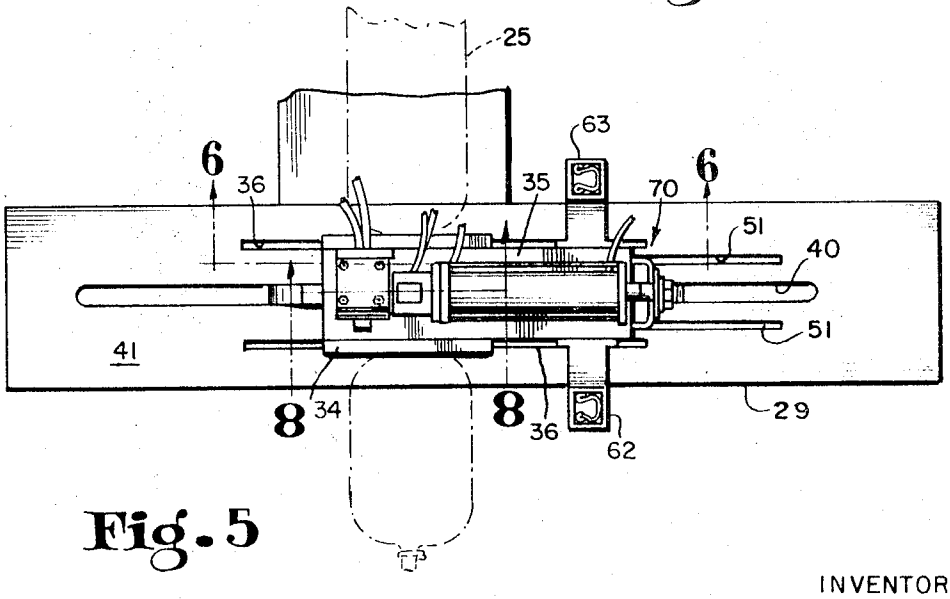

Fig. 5

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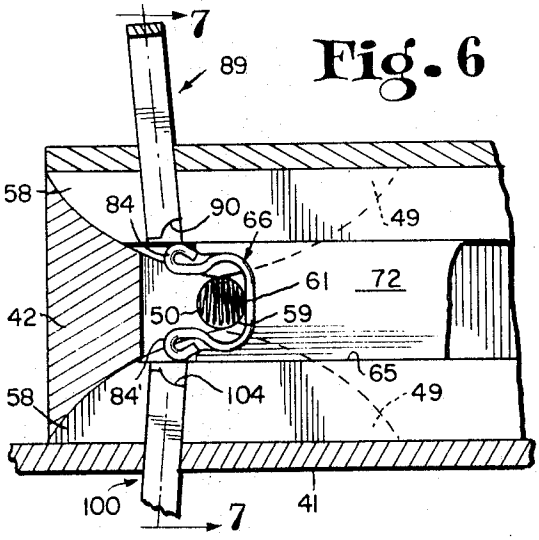

Fig. 6

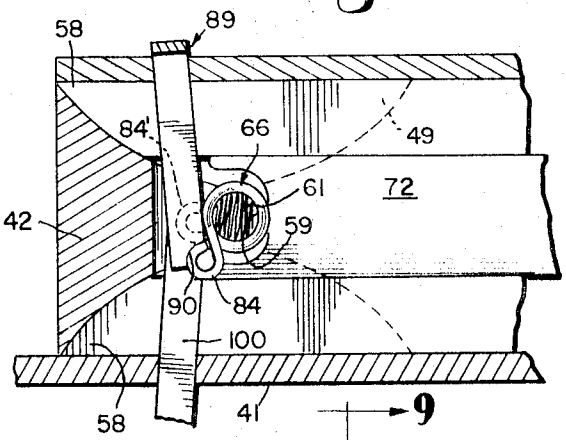

Fig. 6a

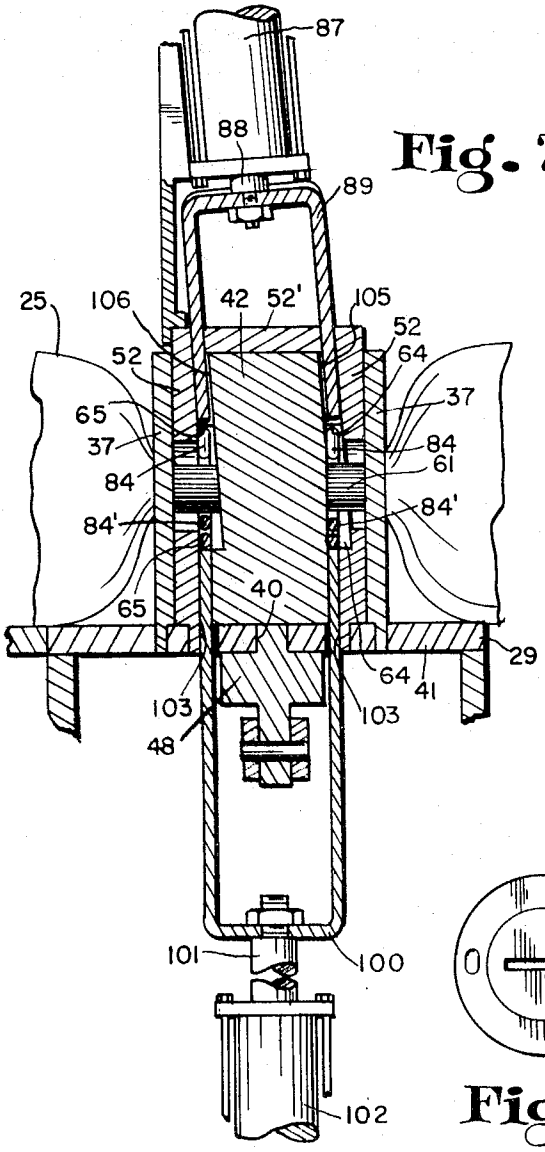

Fig. 7

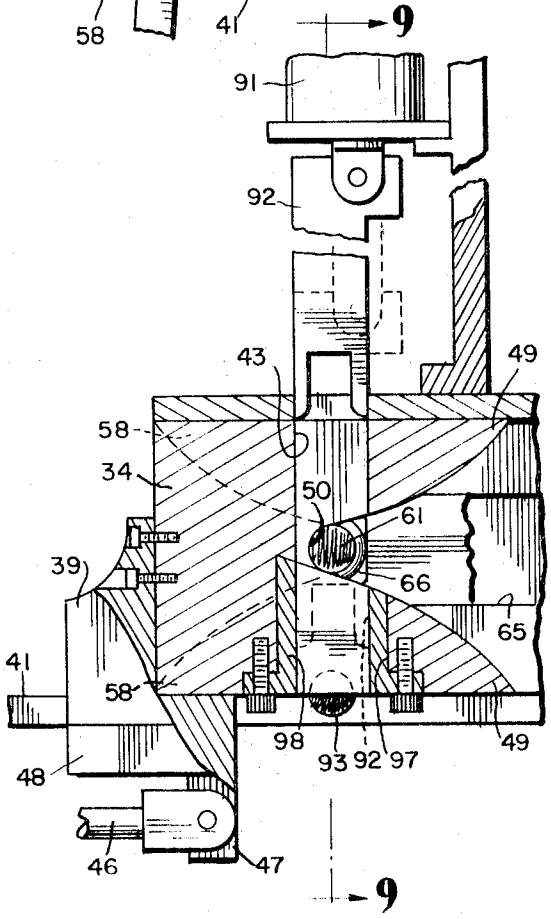

Fig. 8

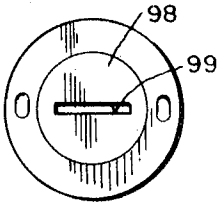

Fig. 8a

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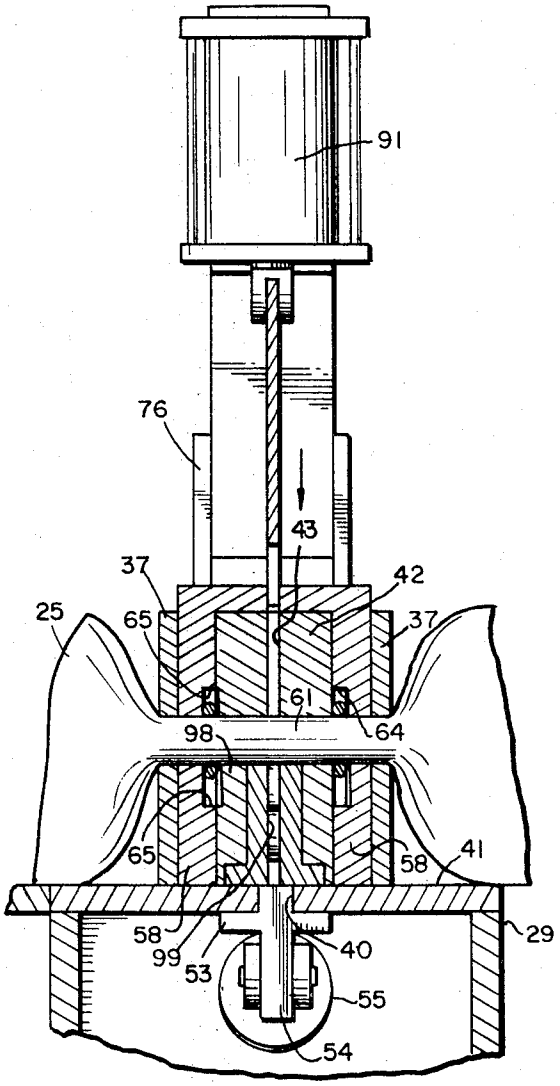

Fig. 9

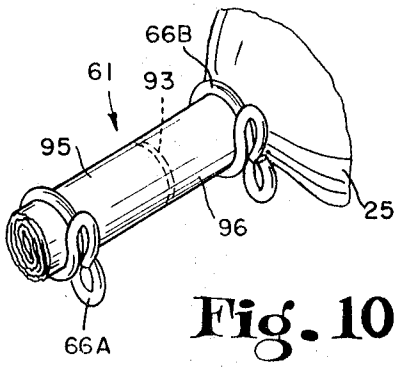

Fig. 10

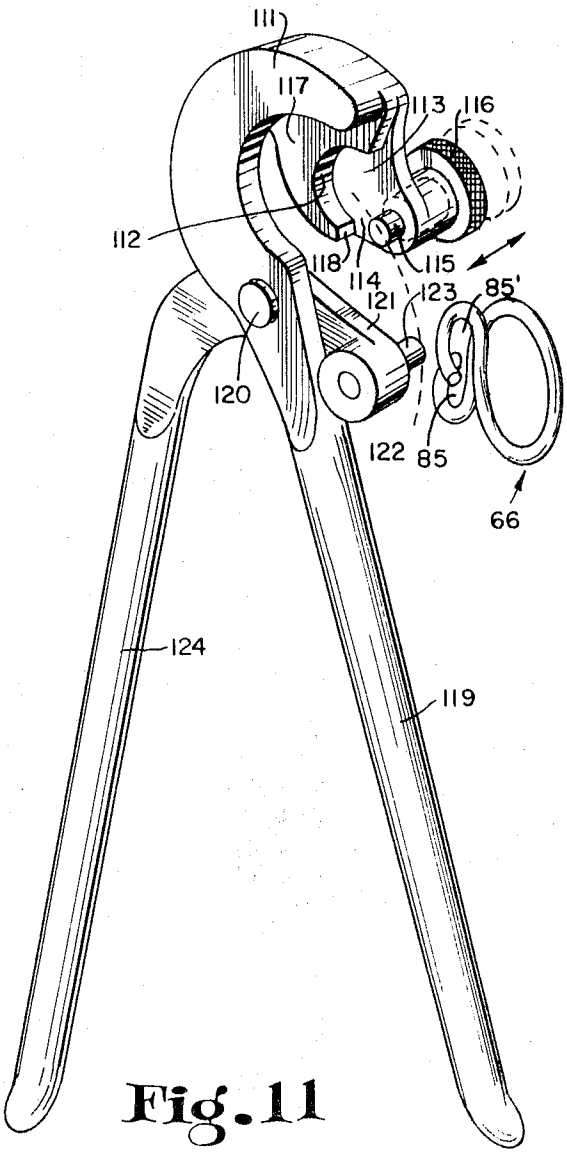

Fig. 11

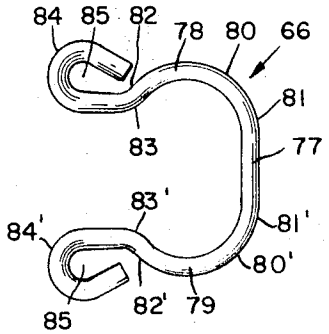

Fig. 12

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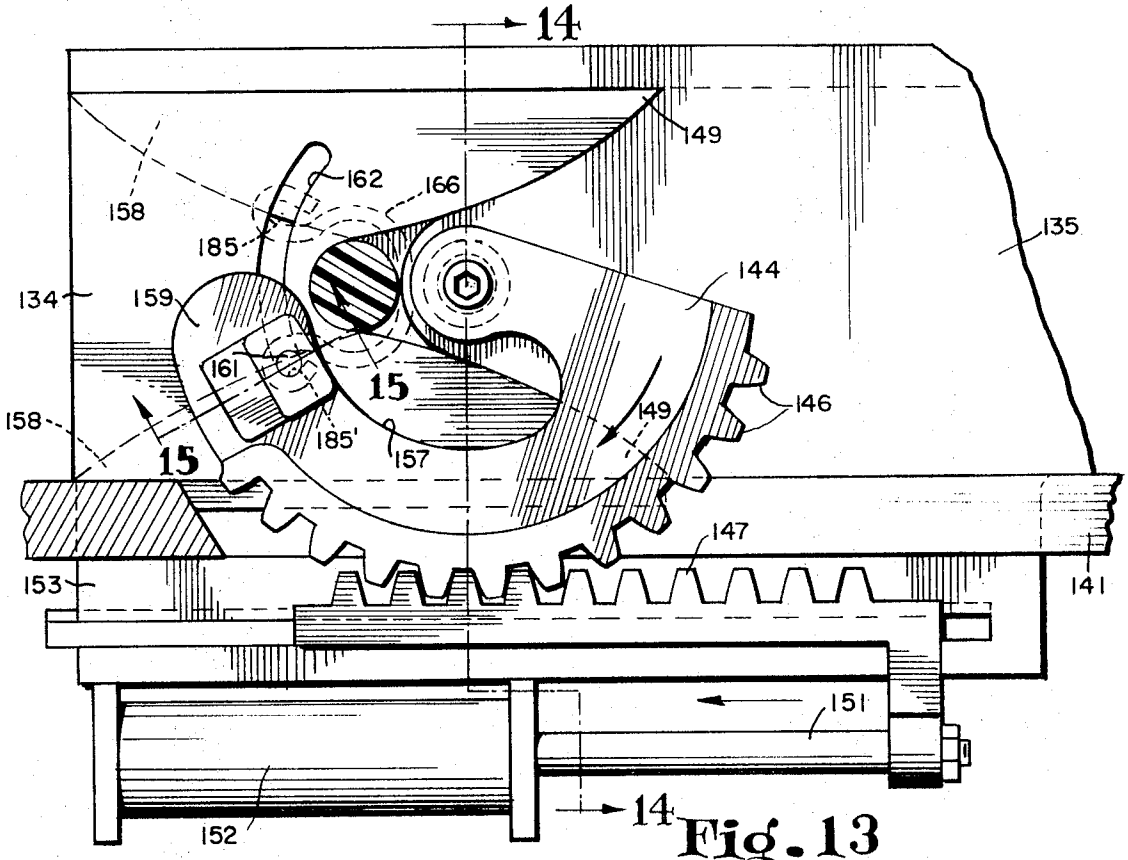

Fig. 13

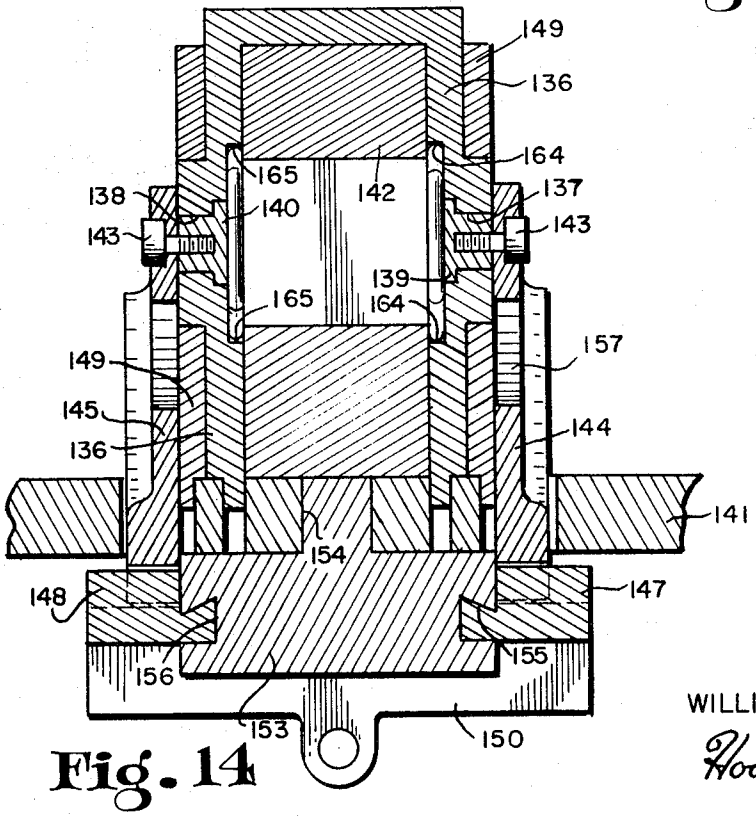

Fig. 14

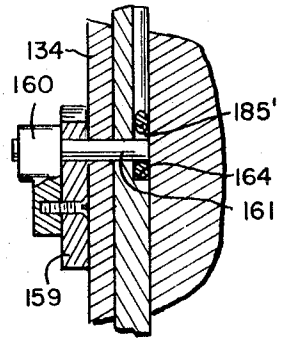

Fig. 15

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CLINCHING APPARATUS

The present invention relates to a clinching apparatus and is primarily directed to a mechanism operable to act upon a continuous, flexible tube, filled with fluent, fibrous or discrete material, at intervals to reduce the cross-sectional dimensions of the filled tube to define a neck region of significant length, to apply clinching staples at longitudinally spaced points in said neck region and then to sever the neck region at a point between the clinching staples, whereby packages, closed at their opposite ends, will be successively formed and delivered from the mechanism. Thus, the primary object of the invention is to provide improved mechanism for thus forming and filling such a tube, producing such closures at spaced intervals in the tube and successively delivering such individualized, closed packages.

A further object of the invention is to provide a novel form of staple particularly adapted for use with such a mechanism.

A still further object of the invention is to provide a novel handtool constructed and designed for cooperation with such novel staple to declinch the same from such a package in order to open the package, and to reclinch such a staple upon a partially emptied package in order to reclose the package. Another object of the invention is to provide a handtool which, under certain circumstances, could be used in the initial formation of such packages from a continuous, filled, flexible tube.

Sill further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the forms illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that change may be made in the specific constructions illustrated and described, so long as the scope of the appended claims is not violated.

FIG. 1 is a somewhat diagrammatic, perspective illustration of the mechanism comprising a closing station in such a system, the parts being shown in the conditions which they will occupy immediately after severance of a tube neck region and withdrawal of the ensmalling jaws;

FIG. 1*a* is a top plan view of a staple magazine, drawn to an enlarged scale;

FIG. 2 is a somewhat diagrammatic elevation of a complete mechanism, including tube-forming, filling and advancing assemblies, drawn to a reduced scale and with the parts arranged for substantially vertical downward advancement of the filled tube;

FIG. 3 is a plan view of the closing station;

FIG. 4 is a vertical section, taken substantially on the line 4–4 of FIG. 3;

FIG. 5 is a view similar to FIG. 3, but showing the jaws in closed, neck-forming association;

FIG. 6 is an enlarged, fragmentary, vertical section taken substantially on the line 6–6 of FIG. 5, showing a lower clinching plunger means associated with the upper plunger means, the plungers being ready for engagement with a staple;

FIG. 6*a* is a view similar to FIG. 6 but showing the parts in the positions which they assume at the end of the clinching operation;

FIG. 7 is a transverse section taken substantially on the line 7–7 of FIG. 6;

FIG. 8 is a fragmentary section taken substantially on the line 8–8 of FIG. 5 and drawn to the scale of FIGS. 6, 6*a* and 7;

FIG. 8*a* is a plan view of the punching dye which appears in FIG. 8;

FIG. 9 is a fragmentary sectional view taken substantially on the line 9–9 of FIG. 8;

FIG. 10 is a fragmentary, enlarged perspective view of an ensmalled neck region defined by clinched staples and suggesting the location at which a slug of tube material will be punched out to sever such neck region to define separate neck sections;

FIG. 11 is a perspective illustration of a handtool usable to clinch or declinch staples of the character illustrated in FIG. 11;

FIG. 12 is an enlarged elevational view of a novel staple intended for optimum use in the machine herein illustrated;

FIG. 13 is a fragmentary, partially sectioned elevation of a modified form of staple-clinching mechanism at a closing station otherwise similar to that illustrated in FIGS. 3—9;

FIG. 14 is a section taken substantially on the line 14–14 of FIG. 13; and

FIG. 15 is a fragmentary section taken substantially on the line 15–15 of FIG. 13.

Referring more particularly to the form of invention illustrated in FIGS. 1 to 9, it will be seen that the reference numeral 20 in FIG. 2 indicates generally a forming and filling station comprising a roller 21 over which is fed, from a source (not shown) a continuous strip 22 of flexible material such as sheet plastic, paper, cloth, burlap or any other similarly versatile sheet material. As the strip 22 leaves the roller 21, it is threaded through a forming mechanism 23 whereby it is curved into tubular form, the overlapping edges of which are sealed as they pass through a heat sealer unit 24 to define a continuous tube 25. The forming and sealing means 23 and 24 may be conventional units, well known in the art, and therefore have been illustrated diagrammatically and need not be described herein in detail. I have suggested a feed hopper 26 located adjacent the roller 21 to deliver material in advance of tube formation so that, as the closed tube emerges from the units 23 and 24, it will be filled. The present invention has been designed primarily for packaging hay or other fibrous fodder; but it will be understood that it may be used, as well, for packaging other materials which may be fluent or discrete and may or may not be vegetable in character.

A closing station is indicated generally by the reference numeral 27 and may include tube-advancing means, as indicated generally by the reference numeral 28. In the illustrated embodiment of the invention, the closing station includes a table or base 29 which, in the illustrated embodiment of the invention, is supported from sleeves 30, 30 at its opposite ends, said sleeves being slidably supported upon guide rods 31 31. Fluid motors 32, 32 include piston rods 33, 33 operatively connected to the sleeves 30, 30 and jointly controlled to move the table 29 between its solid line position and its broken line position shown in FIG. 2. As will appear from the following description, such reciprocation of the table 29 will advance the filled tube 25 by equal successive steps.

Cooperating jaw members 34 and 35 are operatively supported upon the table 29. Slideways 36 are formed in the roof 41 of the table 29 to receive the lower edges of the sidewalls 37, 37 of the jaw member 34 to guide said member in its reciprocating movement upon said table. As is most clearly illustrated in FIGS. 1 and 4, the rear wall 38 of the member 34 carries a bracket 39 which penetrates a longitudinal slot 40 in the table roof 41. Spaced from the sidewalls 37, 37 is the central body portion 42 of the member 34, and said portion 42 is formed with a slot 43 (FIGS. 1 and 8) for a purpose which will become apparent.

As is most clearly illustrated in FIG. 4, a double-acting fluid motor 44 comprises a cylinder 45 pivotally anchored upon a wall of the table 29 and a piston rod 46 pivotally connected to a tongue 47 depending from a broad block 48 fixed to the bracket 39 and engaging the lower surface of the table roof 41 to retain the member 34 against upward movement relative to said table. Obviously, activation of the motor 44 will reciprocate the jaw member 34 upon the table 29.

The sidewalls 37, 37 and the central body 42 of the member 34 are formed to define fingers 49, 49 which are separated, at their distal ends, by a distance exceeding the corresponding dimension of the tube 25, and which converge toward their proximal ends to define a base 50.

Slideways 51 are formed in the roof 41 of the table 29 to receive the lower edges of the sidewalls 52, 52 of the jaw member 35 to guide said member in its reciprocating movement upon said table. As is clearly to be seen in FIG. 1, the jaw member 35 is so proportioned, relative to the jaw member 34, that, when the two jaw members are moved toward each other, the sidewalls 52, 52 will be received in the spaces

between the central body 42 and the sidewalls 37 of the jaw member 34, while the roof 52' of the jaw member 35 overlies the body portion 42 of the jaw member 34. See, also, FIG. 7. An element of the jaw member 35 penetrates, and is guided in, the slot 40 and carries a broad block 53 (FIGS. 4 and 9) bearing against the under surface of the table roof 41 to retain the jaw member 35 against upward movement relative to said table. A tongue 54 depends from said block and a double-acting fluid motor 55, comprising a cylinder 56 suitably anchored to the table 29 and a piston rod 57 pivotally connected to the tongue 54, is operable to reciprocate the jaw member 35 upon said table top.

Like the jaw member 34, the jaw member 35 is formed to define fingers 58, 58 which are separated, at their distal ends, by a distance exceeding the corresponding dimension of the tube 25, and which converge toward their proximal ends to define a base 59.

Referring, now, to FIGS. 1, 2 and 4 to 7, it will be seen that, with the parts in the positions of FIG. 1, the table 29 may be moved from its dotted line position in FIG. 2 to its solid line position in that FIG., whereby the separated jaws 34 and 35 are moved toward the left relative to the filled bag 25. Now, when the motors 44 and 55 are activated to advance the jaws toward each other, the distal ends of the fingers 49 and of the fingers 58 straddle the filled bag and, as the jaws continue to move, that section of the filled bag which is located between the sidewalls 37, 37 of the jaw 34 will be transversely crumpled and ensmalled, the filling material being squeezed longitudinally both forwardly and rearwardly, to define a neck region 61 of significant length. It will be seen that, as the jaws reach their ultimate positions of advancement, the base regions 50 and 59 of the respective finger pairs will cooperate to define a closed figure of reduced transverse dimensions. In the illustrated embodiment of the invention, that figure is a circle 60, most clearly to be seen in FIGS. 4 and 6a.

A magazine 62 is supported upon, and opens through, one sidewall 52 of the jaw member 35, and a similar, but allochirally arranged, magazine 63 is similarly supported upon, and opens through, the opposite sidewall of said jaw member. The magazine 62 opens into a trackway 64 on the inner surface of the one sidewall 52 while the magazine 63 opens into a similar trackway 65 in the other sidewall of said member. Each magazine contains a supply of novel staples 66, later to be described in detail. A plate 67 rests upon the stack of staples in each magazine and is urged toward the discharge end of its magazine by a spring 69 engaging a pin 68 fixed to said plate, and suitably anchored, for instance, on a sidewall of the magazine, whereby the staple currently at the discharge end of the magazine is resiliently urged toward entrance into its trackway member 35.

A plunger 70 comprising spaced, parallel legs 71 and 72 respectively arranged to ride in the trackways 64 and 65, includes also a base 73 provided with an upstanding post 74 to which is connected the piston rod 75 of a double-acting fluid motor 76 anchored to the member 35. With the plunger in its illustrated, retracted position, a staple 66 from each magazine 62 and 63 will be positioned in the respective trackways 64 and 65. If, now, the motor 76 is energized to move the plunger 70 toward the left, those staples will be engaged by the forward ends of the plunger legs 71 and 72 and will be moved toward the left within the member 35.

Referring, now, to FIG. 12, my novel staple will be described in detail. Each such staple is formed from relatively stiff, ductile material, which may be spring wire stock. It comprises a base 77 which may be rectilinear, as shown, or which may be slightly curved. The staple is formed to provide substantially allochiral arms 78 and 79 curving oppositely, but in the same general direction, at 80 and 80' from opposite points 81 and 81' at the respective ends of the base 77. The curves 80 and 80' extend through subtended angles of more than 90° but less than 180°, and then, at the points 82 and 82', the arms are curved in the opposite direction as at 83 and 83' and extend, in substantially parallel relation substantially perpendicular with the base portion 77, whereafter they are curled outwardly as at 84 and 84' through subtended angles exceeding 180° to define eyes 85 and 85'. This specific structure lends itself admirably to the modes of operation to be described, whereby the staple may be readily clinched about the crumpled neck region to provide, when a sheet material such as polyethylene is used for the container, a moistureproof and substantially airtight closure. The eyelets 85, 85' not only provided excellent means for gripping or engaging the distal ends of the staple legs, but also guard against puncturing the container as the staple is brought into straddling relation with the neck region and manipulated relative thereto.

Quite obviously, the staple may be made in any size to conform to the machine or tool, and to the container, with which it is to be used.

As will be apparent from the drawings and from the above description, when the jaws 34 and 35 have been closed upon the tube 25 in the manner illustrated in solid lines in FIG. 2, the motors 32, 32 may be energized to retract their piston rods 33, 33, thereby moving the table from its solid line position to its broken line position and advancing the filled tube 25 by reason of the gripping engagement of said jaws with said tube. During such advancement, or thereafter, the motor 76 may be activated to shift the plunger 70 toward the left, whereby the staples 66 disposed in the trackways 64 and 65 will be advanced toward the left. The stroke of the piston rod 75 is such as to move said staples, which are resting in the respective trackways with their curled ends 84, 84' facing the neck region 61, into straddling relation with said neck region as shown in FIG. 6. The two staples will be spaced apart, in the direction of length of the neck region 61, by a dimension substantially equal to the width of the central body portion 42 of the jaw member 34. At this time, of course, the legs 71 and 72 of the plunger 70 bar the delivery mouths of the magazines 62 and 63 to prevent delivery of the next staple in each magazine to the trackway 64 or 65.

Upon an upstanding bracket 86 fixed to the jaw member 35 is mounted a double-acting fluid motor 87 whose piston rod 88 carries a two-fingered plunger 89. The fingers of the plunger 89 penetrate suitable openings in the roof of the member 35 in registry with the trackways 64 and 65, respectively. As is most clearly shown in FIG. 6, the distal end of each such finger is preferably formed with a contoured recess 90 conforming to the curl 84 at the distal end of arm 78 of a staple 66 straddling the neck region 61. Now, when the motor 87 is activated to drive the plunger 89 downwardly, the recessed end of the plunger finger will engage the staple arm 78 and force the same downwardly, the arm 79 being held against movement by its engagement in the trackway 64 or 65, until the curl 84 at the end of the arm 78 passes the curl 84' of the arm 79, thus clinching the staple into position on the neck region 61 to close that neck region.

Alternatively, and preferably, a cooperating two-fingered plunger 100 will be connected to the piston rod 101 of a second motor 102, the fingers of said plunger 100 penetrating suitable openings in the roof 41 of the table 29 and slots 103, 103 in the bottom of the jaw member 34 into registry with the trackways 64 and 65. Preferably, the distal ends of said fingers will be formed with recesses 104 to conform to the curls 84' at the ends of the arms 79 of the staples. In this arrangement, the motors 87 and 102 will be concurrently energized so that both curls 84 and 84' will be concurrently moved to pass each other to achieve the clinching engagement of the staples with the tube neck region.

Preferably, the axis of the motor 87 will be canted upwardly and to the left as viewed in FIG. 7 in order to encourage passage of the curl 84 past the curl 84', and it will be canted upwardly and to the left as viewed in FIG. 6 in order more closely to follow the somewhat arcuate movement of the curl 84 as the staple is bent. Similarly, the axis of the motor 102 will be canted downwardly and to the left as viewed in FIG. 6 so that the plunger fingers will follow the somewhat arcuate movement of the curls 84' of the respective staples as the sta-

ples are bent to clinching condition. In this form of the invention, suitable grooves 105 and 106 are formed in the body portion 42 of the member 34 for passage of the fingers of the plunger 89.

The condition of the neck region 61 after clinching of two staples 66A and 66B is illustrated in FIG. 10. Either before or after withdrawal of the plungers 89 and 100, the neck region 61 is severed by suitable means. As illustrated, a further fluid motor or solenoid 91 is suitably mounted upon the jaw member 35 and is operatively connected to a punch 92 which, as is most clearly illustrated in FIG. 8, is preferably bifurcated at its distal end. Energization of the power means 91 will drive the punch 92 downwardly to straddle and move past the neck region 61, punching out a slug 93 of tube material and thus separating a package 94 of filled tube material closed at both of its ends and leaving a neck section 95 beyond the staple 66A and a neck section 96 beyond the staple 66B. For facilitating this punching operation, the body 42 of the jaw member 34 is preferably provided with a socket 97 opening through its lower surface to receive a die 98 formed with a slot 99 to be entered by the distal end of the punch 92. It will be apparent that the lower end of the slot 99 registers with the slot 40 in the roof 41 of the table 29, whereby the slugs 93 may drop through for discharge.

The plunger 70 may be withdrawn, of course, at any time after clinching of the staples has been completed, as may the plungers 89 and 100. After withdrawal of all of the plungers, the motors 44 and 55 will be reversed to separate the jaw members 34 and 35, whereafter the table 29 may be returned to the solid line position of FIG. 2 and then the jaw members 34 and 35 may be again advanced to form a new neck region the filled tube 25 to start a new cycle.

In FIG. 11, I have illustrated a novel tool usable for hand application of staples either to a continuous, filled tube or to the mouth of a conventional bag. Such tool comprises a first jaw 111 formed to provide a socket 112 having an open end or mouth 113, said socket having a floor 114 at one side and being open at its opposite side. At a point beyond the socket mouth 113, a pin 115 reciprocably penetrates the floor 114 and carries a knurled knob 116. A tongue 118 guards the lower or inner boundary of the socket mouth 113. The pin 115 is shiftable between a position in which its distal end is substantially flush with the floor 114 and a position in which its distal end lies substantially in the plane of a table surface 117 bounding the socket 112. An extended handle 119 is integral with, or fixedly connected to, the jaw 111.

A pivot or connecting member 120 mounts a second jaw 121 for pivotal movement relative to the jaw 111. At its distal end, the jaw 121 is formed to provide a head 122 carrying a fixed pin 123 which projects toward the floor 114 of the jaw 111; and a handle 124 is integral with, or fixed to, the jaw 121.

The parts are so proportioned and designed that, as the handles 119 and 124 are moved toward each other, from their illustrated positions, the pin 123 will move in an arc about the pivot 120 into and past a position in which the distal end of the pin 123 barely clears the distal end of the pin 115, in its solid line position, while the two pins are in coaxial alignment.

It will be appreciated that a staple may be clinched in place on a radially ensmalled region of a tube 25 or a crumpled mouth region of a conventional bag, through the use of the tool of FIG. 11 by engaging one of the tool pins in one eye and the other in the other eye of a staple straddling such a region, while the tool is substantially in the position illustrated, and then bringing the handles together to clinch the staple onto the neck region. The same operation may be followed in reclosing a package which has been opened by removal of the staple, and from which part of the contents has been removed.

In such an operation, the crumpled container region is crowded past the points 83, 83′ of a staple. Then the tool of FIG. 11 may be brought into association with the staple and the pin 123 may be entered in the eye 85′. The handles 119 and 124 will then be adjusted until the eye 85 registers with the bore in which the pin 115 is mounted, the pin 115 being in its dotted line position. Now, the pin 115 may be moved into its solid line position to enter the eye 85. If, now, the handles 119 and 124 are brought together, the pin 123 will be moved in a counterclockwise direction past the pin 115, and into the socket 112, dragging with it the eye 85′ while the eye 85 is held stationary by the pin 115 and by engagement of the tongue 118 with the staple leg 78 near the point 82. Thus, the eye 85′ will be moved past the eye 85, the rounded surfaces of the eyes coasting to cause the leg 85′ to cam toward the jaw 121 to pass the leg 78. Desirably, but not necessarily, staples to be applied by the tool of FIG. 11 may be given a preliminary twist in the base region to offset the distal end of leg 79 from the general plane of the staple.

Obviously, the tool may be reversely used to open clinched staples, if it should be desired, for any reason, to open a package in that manner.

In FIGS. 13 to 15, I have shown a modified form of clincher mechanism in which the plunger 89 or 100 is replaced by oscillatory mechanism which accomplishes the clinching step. In this form of the invention, a left-hand jaw 134 and a right-hand jaw 135, similar in most respects to the jaw members 34 and 35 and similarly mounted on the table 29, cooperate in the manner above described to produce a crumpled neck region in the continuous, filled tube. In this instance, the jaw member 135 is formed with channels 136 for the accommodation of the fingers 149 of the jaw member 134.

The sidewalls of the member 135 are formed with aligned bores 137 and 138 receiving, respectively, bushings 139 and 140 for the reception of headed trunnion screws 143, 143. As in the previous embodiment, the jaw members are supported in slideways in the tabletop 141 and the body of the jaw member 135 is formed to accommodate the central body 142 of the jaw member 134.

Gear sectors 144 and 145 are journaled, respectively, upon the trunnion screws 143. Each such gear sector is formed with teeth 146 meshing, respectively, with a pair of racks 147 and 148 connected by a crossbar 150.

The piston rod 151 of a double-acting fluid motor 152 fixed to a broad block 153 which is secured to the jaw member 135 by means of a tongue penetrating the slot 154 in the tabletop, is operatively connected to the crossbar 150 so that, by activation of the motor 152, the racks 147 and 148, which are respectively slidably mounted in trackways 155 and 156 in said block 153, may be reciprocated relative to said jaw member 135.

Each gear sector is formed with an arcuate cutout 157 defining an arcuate finger 159 which is arranged, when the fingers 158 of the jaw member 135 and the fingers 149 of the jaw member 134 are in fully overlapping condition, to reach beyond the neck region of the tube.

Near its distal end, each arcuate finger 159 carries a solenoid 160 operative to project and retract a pin 161. When the jaws have been closed to establish the ensmalled neck region, and when staples 166 have been advanced into straddling relation with said neck region in the manner above described, the solenoid 160 is activated to project the pin 161 through an arcuate slot 162 in the sidewall of the jaw member 134 and into the eye 185′ of the associated staple. Now, the motor 152 is energized to retract its piston rod 151, moving the racks 147 and 148 in a clockwise direction as viewed in FIG. 13 and dragging the eye 185′ past the eye 185, which is held stationary by engagement in its trackway 164 or 165 to clinch the staples to the neck region of the filled tube. Now, the pin 161 is retracted, the piston rod 151 is again projected, thus returning the gear segment, in a counterclockwise direction as viewed in FIG. 13, to a position in which their fingers 159 will clear the neck region of the tube, whereafter the jaws 134 and 135 may be separated. Of course, the neck region will be severed between the two clinched staples, in the manner above described, before the jaws are so separated.

The underlying principle of the present invention may, if desired, be used for closing and clinching the mouths of filled, conventional bags. In such a case, the open, mouth portion of

a bag could be fed to, for instance the machine of FIG. 1 to project between the rear fingers 49 and the rear fingers 58. Then with the magazine 62 empty or blocked, the jaws 34 and 35 could be moved together to crumple and close the bag mouth, whereafter actuation of the motors 76 and 87 would apply and clinch a single staple to secure the bag mouth in closed condition. The punch 92, of course, would not be used in such a case. In fact, a machine intended solely for closing and sealing the mouths of conventional bags could be wholly devoid of the forward sides of the jaws 34 and 35, of the magazine 62, of the punch 92 and of the forward leg of each of the plungers 70, 89, and 100.

I claim:

1. In a packaging machine, means for supporting a continuous, filled tube of flexible material for longitudinal movement through a closing station, said closing station including a pair of jaw members, each jaw member being formed to provide a pair of fingers flaring from a base toward the fingers of the other jaw member and away from each other in a direction transverse to the length of said tube and to a degree exceeding the tube diameter, means for rectilinearly moving said jaw members toward and away from each other from an open position in which the distal ends of the fingers of one jaw member are separated from the distal ends of the fingers of the other jaw member by a distance exceeding the diameter of said tube to a closed position in which the fingers of one jaw member overlap the fingers of the other jaw member to entrap and ensmall a portion of said tube to define a neck therein, a magazine for substantially U-shaped, flexible staples carried by one of said jaw members, means operable when said jaws are in said closed position to move a staple from said magazine into straddling relation with said tube neck, and means operable while said jaws are in said closed position to flex said staple into gripping and closing relation to said neck.

2. The machine of claim 1 including power means, operable while said jaws are in said closed position, to move said jaws concurrently away from said supporting means to advance said tube longitudinally, and after said jaws are moved to open position to return said jaw concurrently toward said supporting means.

3. The machine of claim 1 in which each jaw member is provided with two pairs of such fingers, the finger pairs of each jaw member being spaced apart in the direction of length of said tube with the finger pairs of one jaw member being arranged closely to straddle the finger pairs of the other jaw member when said jaw members are in closed position, a second staple magazine, said staple-moving means being operable to move one staple from each magazine substantially concurrently into such straddling relation with said tube neck with said staples being longitudinally spaced from each other along said neck and said staple-flexing means being effective to flex both of said staples.

4. The machine of claim 3 including power means, operable while said jaws are in said closed position, to move said jaws concurrently away from said supporting means to advance said tube longitudinally and after said jaws are moved to open position to return said jaws concurrently toward said supporting means, and including means carried by one of said jaws and effective, after said jaws have been moved away from said supporting means but before said jaws are moved to open position, to sever said neck between said staples.

5. In a packaging machine, means for moving a continuous, filled tube of flexible material in the direction of length of said tube through a closing station, said closing station comprising a mating pair of relatively movable jaws, each such jaw being formed to provide a pair of fingers separated, at their distal ends by a distance exceeding the corresponding dimension of said tube and converging toward their proximal ends to define a base, means for producing relative movement between said jaws, from a position in which the distal ends of the fingers of one jaw are spaced from the distal ends of the fingers of the other jaw sufficiently to receive said tube therebetween, to a position in which the bases of said jaws cooperate to define a closed figure having transverse dimensions significantly less than such corresponding dimension, whereby a region of said filled tube is crumpled to a neck when said jaws are closed upon it, means carried by one of said jaws and movable relative thereto to feed a generally U-shaped, flexible staple into straddling relation with such neck, and means carried by one of said jaws and movable relative thereto to engage one leg of such a staple, while such staple is in such straddling relation, to flex such staple to a degree sufficient to move the distal end of said one leg past the distal end of the other leg of said staple, thereby clinching said staple about said neck.

6. The machine of claim 1 in which each of said jaws is formed to provide two pairs of such fingers spaced apart in the direction of travel of said tube, said staple-feeding means acting to feed two such staples into such straddling relation at points spaced apart in the direction of travel of said tube, and said last-named means acting upon both of said staples so to clinch the same.

7. The machine of claim 6 including means carried by one of said jaws and movable relative thereto to sever said tube at a point within said neck region between said two clinched staples.

8. The machine of claim 1 in which said staple-flexing means is a member mounted for oscillation about an axis parallel with the line of travel of said tube, an abutment element carried by said member at a point spaced radially from the axis of oscillation of said member, movable relative to said member and engageable with one leg of such a staple, while said staple is in such straddling relation, and power means for turning said member so to flex said staple.

9. The machine of claim 8 in which said one staple leg is formed with an eye adjacent its distal end, said abutment element being a pin mounted for reciprocation relative to said member, upon an axis parallel with said axis of oscillation, to enter and withdraw from said eye.

10. The machine of claim 9 including power means for reciprocating said pin.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,587,204 Dated June 28, 1971

Inventor(s) William Wallace George

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

In the Abstract, line 21, "mouth" should be -- mouths --.
Column 1, line 27, "Still" is misspelled.
Column 4, line 8, "provided" should be -- provide --.
Column 5, line 32, after "region" insert -- in -- so that the line reads "34 and 35 may be again advanced to form a new neck region in".
Column 6, line 67, "segment" should be -- segments --.
Column 7, line 40, (Claim 2, line 5) "jaw" should be -- jaws --.
Column 8, line 30, (Claim 6, line 1) "1" should be -- 5 --.

Signed and sealed this 21st day of December 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents