

March 31, 1964

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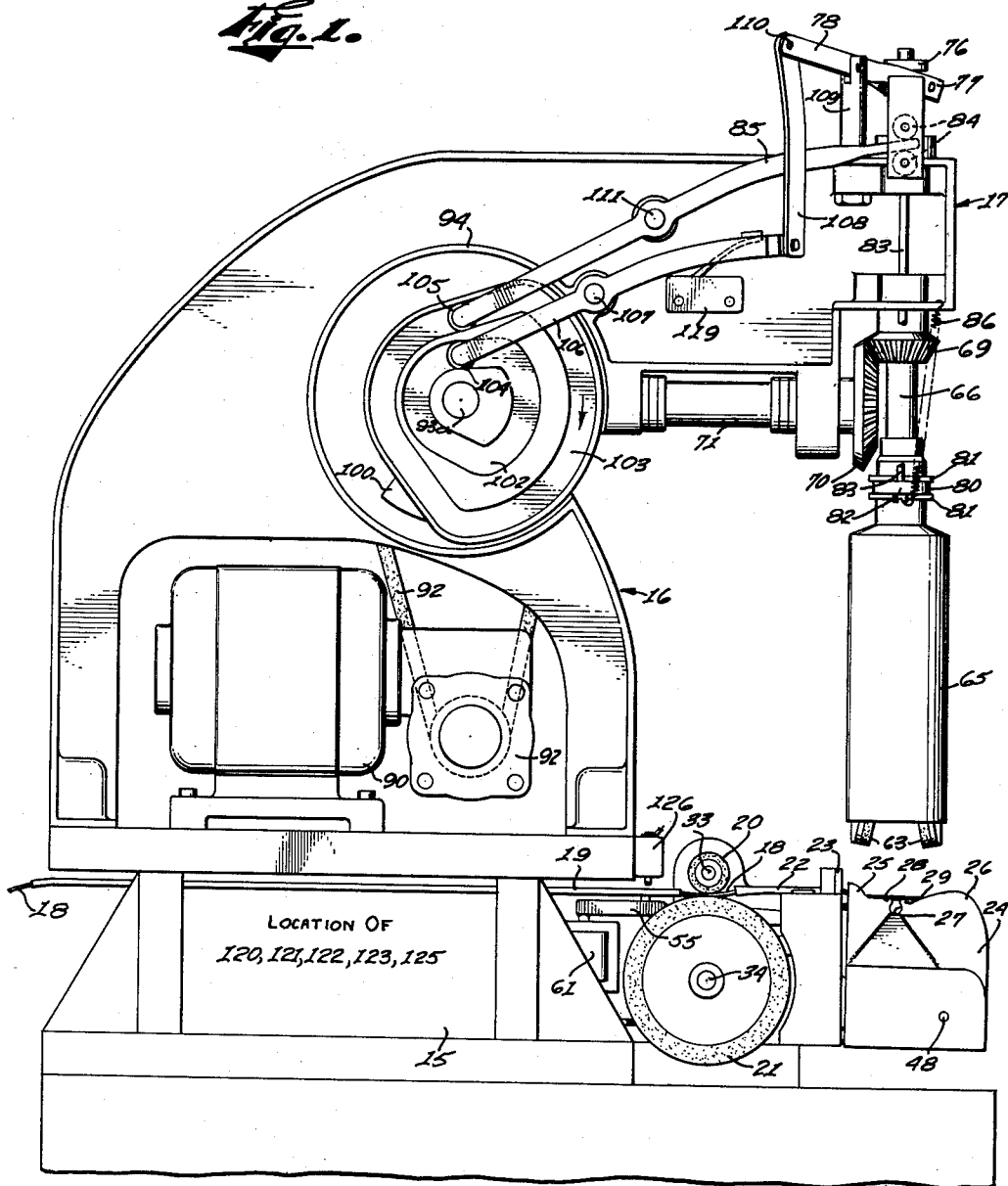
3,126,684

BAG CLOSING MACHINE

Original Filed Nov. 4, 1957

6 Sheets-Sheet 1

Fig. 1.



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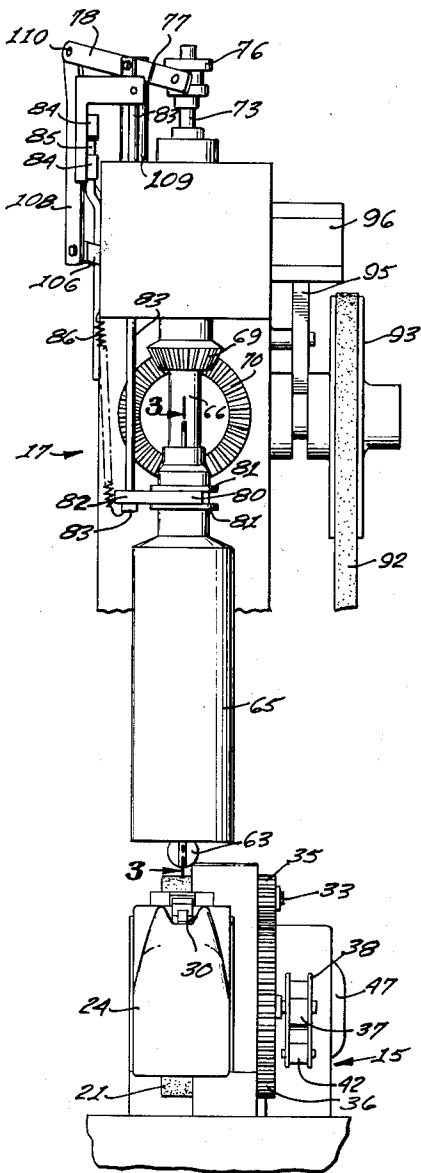


Fig. 2.

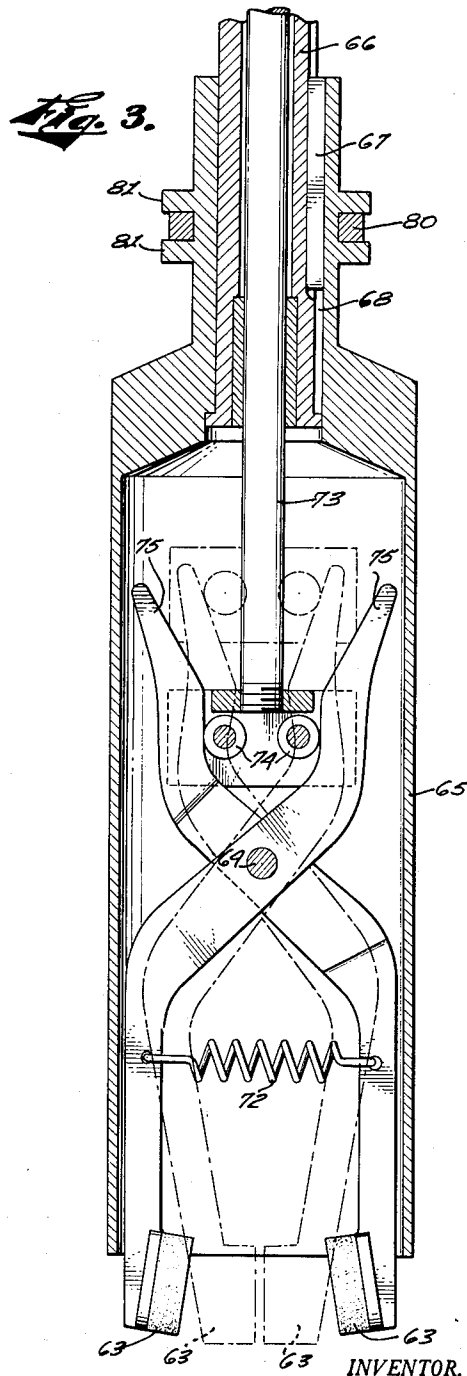


Fig. 3.

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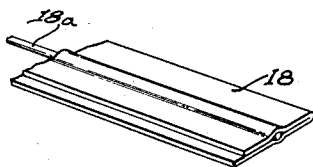
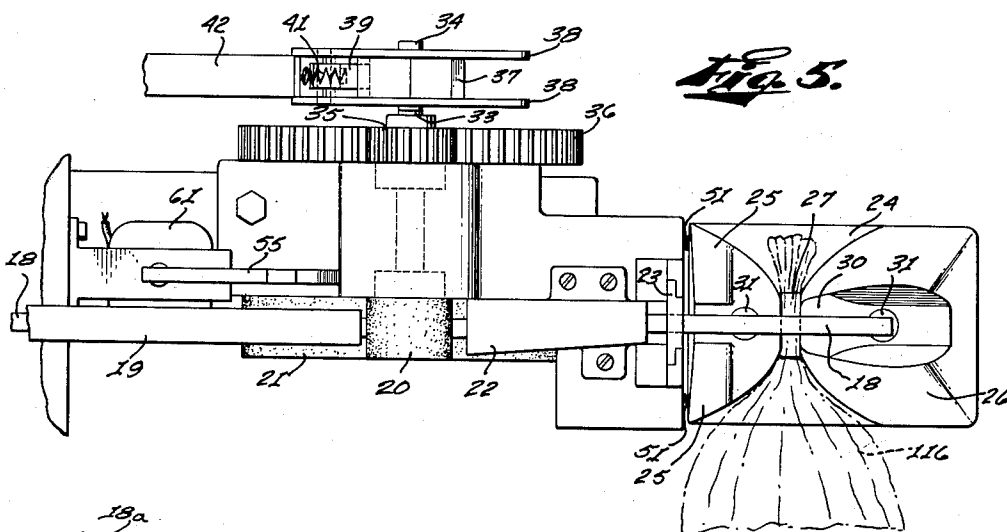
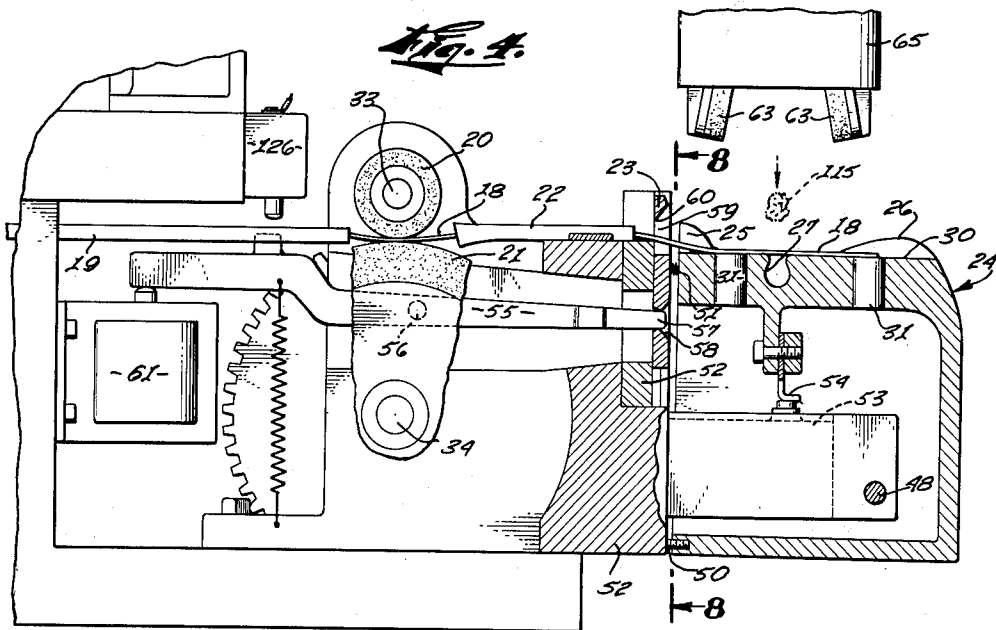
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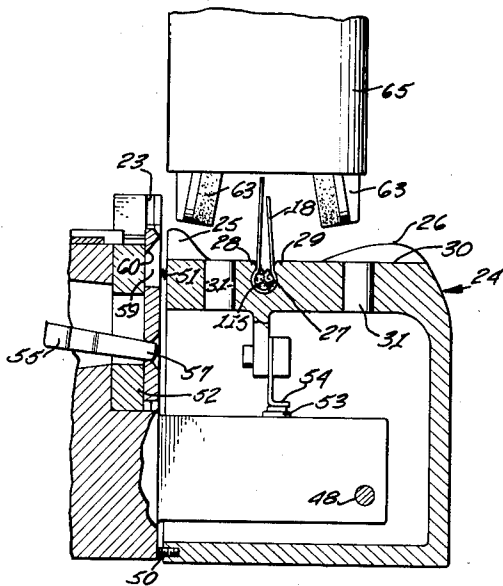


Fig. 6.

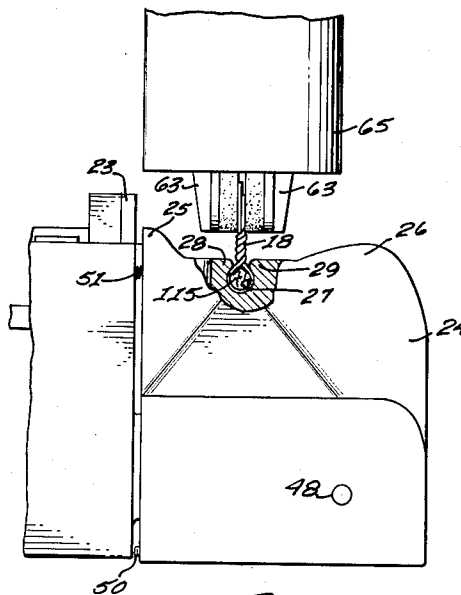


Fig. 7.

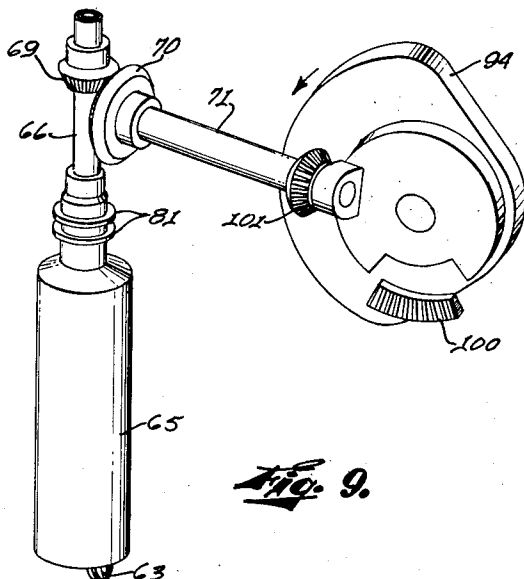


Fig. 9.

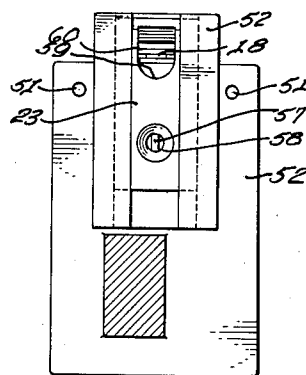


Fig. 8.

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Fig. 11.

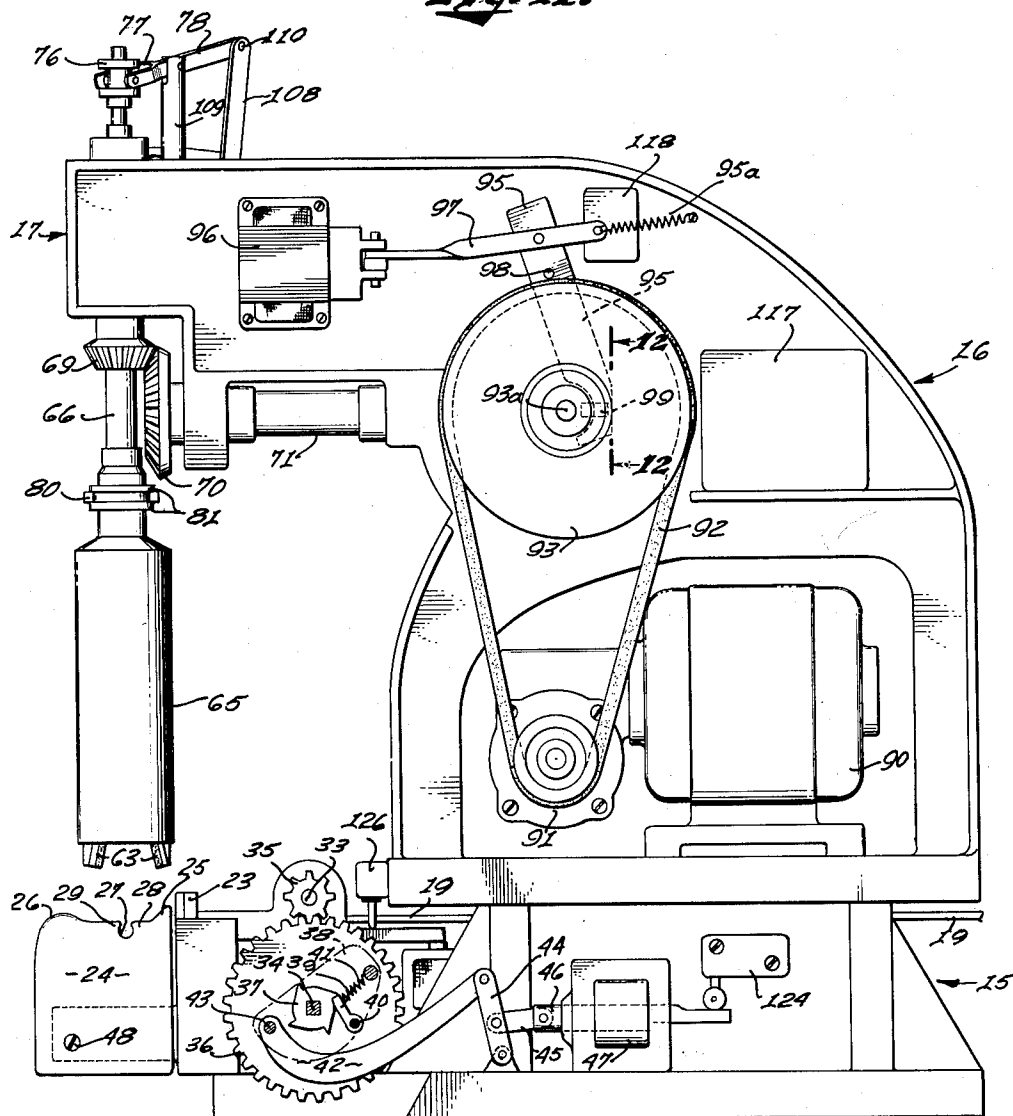
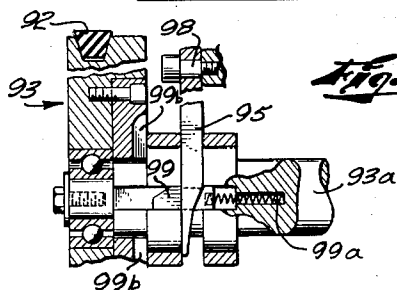


Fig. 12.



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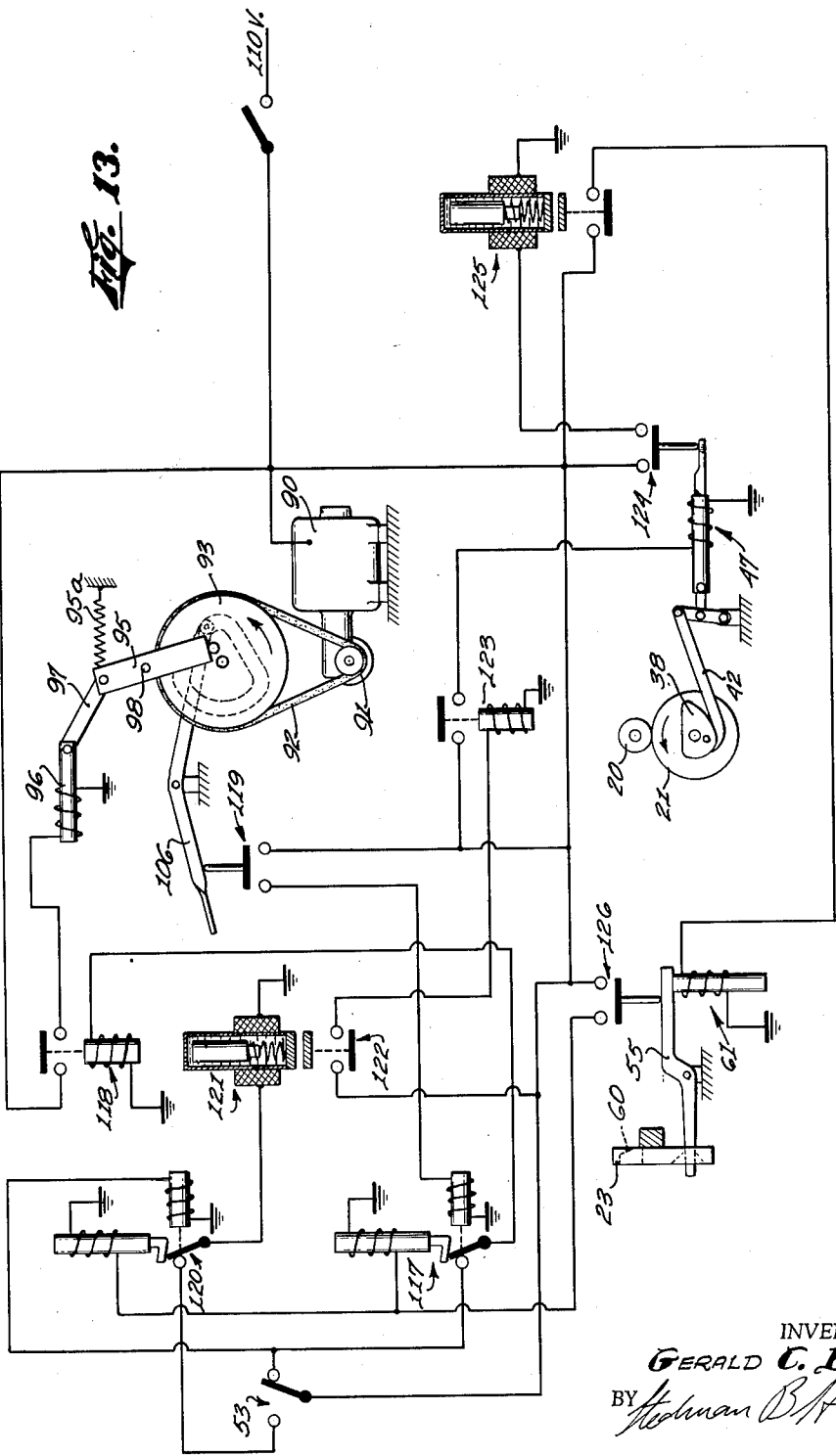
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BAG CLOSING MACHINE

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Continuation of application Ser. No. 694,154, Nov. 4, 1957. This application Nov. 13, 1961, Ser. No. 153,778
3 Claims. (Cl. 53—135)

This application is a continuation of the application Serial No. 694,154, filed November 4, 1957, entitled "Bag Closing Machine."

This invention relates to bag-closing machines and more particularly relates to machines for wrapping a strip of stiff but pliable fabric around the neck of a bag and then twisting the fabric to effect a closure of the bag.

The use of cellophane bags for wrapping fresh vegetables in marketable packages has become wide-spread. The purchaser buys a complete package, marked with its price, transparent so that the cleanness and freshness of the enclosed vegetables can be seen, and closed to prevent entry of air, moisture, and dust, instead of selecting the vegetables from a pile which many others may have handled. Meats are also marketed in the same type of bags, particularly dressed poultry, and when placed in a refrigerator still sealed in the bags, will remain fresh for a longer period than meats which are exposed to the atmosphere or to dirty wrappings. The bags are closed with a practically air-tight seal by wrapping their neck tightly with a stiff tape consisting of a fine wire encased in a ribbon of paper. Such wire-and-paper tapes are commercially known as plant-ties, their first general use having been for the purpose of tying growing plants to supporting stakes.

It is an object of this invention to provide a machine which will largely remove the factor of manual labor from the tying and sealing of bags with plant-ties.

Another object of this invention is to provide a machine which will expedite the work of sealing meats, vegetables, and the like articles in bags.

A more specific object of this invention is to provide a machine which will cut a suitable length of tape from a roll of plant-ties, wrap the cut length around the neck of a bag placed on the machine, and twist the ends of the cut length around each other so that the wire reinforcement effects a tight, neat, but readily removable seal.

In this connection it will be appreciated that a machine-operation may be made to cut and twist a tape of shorter and more uniform length than may be successfully employed in manual operations, and it is a further object of this invention to provide a machine which will economize in the length of tape used.

In terms of broad inclusion, I have provided a machine in which a roll of tape of the stiff plant-tie type is fed intermittently through a cutter which cuts suitable short lengths therefrom. At the instant of severance from the roll, the cut piece of tape is disposed across a saddle. When the neck of a bag is placed in the saddle on the tape and is pressed down, the shape of the saddle causes the center of the tape to drop into the bottom of the saddle and the ends of the tape to turn upwardly. Cam-actuated fingers, disposed above the saddle then descend, are closed upon the two ends of the tape, are revolved to twist the ends together, release the twisted ends, and ascend again to the starting position of their cycle. The neck of the bag lying in the saddle, is thereby tightly closed. The cycle may be repeated practically as fast as a skilled operator may place the necks of successive bags in the saddle, the dwell period of the cams permitting a short interval for placement of the bags.

In the accompanying drawings, illustration of one em-

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bodiment of my invention, FIG. 1 is a side elevational view of my bag-closing device;

FIG. 2 is an end elevational view, taken from the right of FIG. 1;

FIG. 3 is a vertical sectional view, on an enlarged scale, on the line 3—3 of FIG. 2, and showing the finger mechanism for grasping and twisting the ends of the tapes;

FIG. 4 is a partly elevational, partly sectional view, on a slightly enlarged scale, of the tape cutter and saddle mechanism shown in FIG. 1, parts being broken away to show interior driving mechanism;

FIG. 5 is a plan view of the mechanism shown in FIG. 4, a bag also being shown in phantom to illustrate placement of the neck thereof in the saddle.

FIG. 6 is a longitudinal vertical sectional view of the cutter, saddle, and finger mechanism at the instant the fingers are about to close upon the tape;

FIG. 7 is a side elevational view of the mechanism of FIG. 6, the saddle being shown in section for purposes of better illustration and the fingers being shown as having completed twisting of the tape;

FIG. 8 is a transverse vertical sectional view on the line 8—8 of FIG. 4, showing the tape cutter;

FIG. 9 is a schematic perspective view showing the timing cam and a related gear-sector in relation to a bevel-gear shaft by which the finger mechanism is rotated;

FIG. 10 is a perspective view of a plant tie.

FIG. 11 is an elevational view from the opposite side from FIG. 1;

FIG. 12 is a sectional view on line 12—12 of FIG. 11; and

FIG. 13 is a schematic view of the electric wiring system, the parts being arranged, for convenience in identification, in the general manner of FIG. 11.

Having reference now to the details of the drawings, I have shown in FIGS. 1 and 11 a machine comprising a base section 15 containing the aforesaid tape-feeding mechanism, tape-cutting mechanism, and saddle; a section 16 supported on the base section 15 and housing driving and timing mechanism; and a section 17 suspended from the section 16 above the saddle and containing the fingers and the mechanism by which they are operated.

Suitable tape-supplying means, such as a roll, not shown, supplies a pliable tape 18 through a guide 19 to feed rollers 20 and 21 and thence through another guide 22 to a tape-cutting shear 23 and to a saddle 24. The saddle 24 has two raised portions 25 and 26, which might be compared to the pommel and cantle of an actual horse-saddle, and between them it has a transverse groove 27. The groove 27 has convergent but spaced shoulders 28 and 29 defining a gap of slightly less width than the diameter of the groove below the gap. The groove 27 may, for example, be circular in cross-section and the gap between the shoulders 23 and 29 may subtend a radial angle of slightly less than 180°. When a piece of tape of the plant-tie type, having a wire reinforcement 18a, is placed across the groove 27 from one raised saddle portion 25 to the other raised saddle portion 26, and that part of the tape bridging the groove 27 is pressed down into the groove, the two ends of the tape emerging from the groove will converge on the lines of tangency of the inner walls of the shoulders 28 and 29. Thus the ends of the tape will be in a position to be grasped and twisted together, such a tape being inelastic and holding any shape it is forced to take. To hold a cut piece of tape bridging the groove 27 and at right angles to it, the raised portions 25 and 26 have a shallow groove 30 at a right angle to the groove 27 and extending downward only to the top of the groove 27, so that the groove 30 acts as a guide for the tape. The por-

tions 25 and 26 also are provided with in-set magnets 31, which attract and align the wire of the tape, but are not strong enough to prevent the ends of the tape from departing from the magnets and extending upwardly as heretofore described when the center of the tape is forced down into the groove 27.

The feed rollers 20 and 21, which feed the tape 18 forward to the saddle 24, are mounted respectively on the shafts 33 and 34 of gears 35 and 36, of which gear 36 is the driver and gear 35 is the driven gear. The feed of the tape is intermittent: that is, the tape is fed across the saddle 24, is stopped, is cut, the several portion is utilized to tie a bag, and the tape is again moved forward across the saddle. To achieve this intermittent motion, the gear 36 is ratchet-driven and the ratchet in turn is moved by a solenoid-operated lever.

The gear 36 and a ratchet wheel 37 are keyed to shaft 34 which is mounted to rotate freely in the base section 15. A double wrist plate 38 is mounted on the shaft 34 to rotate freely thereon, having a plate on either side of the ratchet-wheel 37. A pawl 39 is mounted on a wrist-pin 40 connecting the plates of wrist-plate 38, and is urged by a spring 41 against the ratchet wheel 37. A rod 42 is connected to a second wrist-pin 43 on the wrist-plate 38. It will be seen that reciprocation of the rod 42 causes oscillation of the wrist-plate 38, in turn causing the pawl 39 to turn the ratchet-wheel 37 and gear 36 intermittently. The rod 42 is reciprocated by a lever 44 connected by a link 45 to the plunger 46 of a solenoid 47.

The saddle 24 is mounted to pivot upon a pivot pin 48 and tilts within a very narrow range because of the proximity of the shear 23, from which its spacing is regulated by a set-screw 50. When pressed downward the saddle 24 presses against springs 51, reacting against the shear-housing 52. The springs 51 return the saddle 24 to its untilted position. The interior of the saddle 24 is hollow and accommodates a micro-switch 53, which is operated by pressure of a finger 54. The micro-switch 53 has two closed positions, between which it shifts in response to pressure or release by the finger 54, responsive in turn to the tilting of the saddle 24.

The shear 23 is moved up and down to cut the tape 18 in response to movement of a lever 55 mounted on a pin 56. One end 57 of the lever protrudes through an opening 58 in the shear 23. The tape 18 is led through another opening 59 in the shear and the tape is sheared by the downward movement of the cutting edge 60 of the shear, downward to effect cutting.

Mounted directly above the saddle 24 are a pair of fingers 63 for grasping the ends of a cut piece of tape 18 and twisting them. The fingers 63 are tong-like in their action and are pivoted on a pin 64 the ends of which are held in the walls of a cylinder 65. The cylinder 65 is vertically slidable on a sleeve 66, being keyed thereto by a key 67 and keyway 68, to prevent relative rotation. The sleeve 66 is carried rotatably by the upper frame section 17, and carries a bevel gear 69. A second bevel gear 70, on the end of shaft 71 journaled in the frame section 17, drives the gear 69 and gives rotative movement to the sleeve 66 and thence to the cylinder 65 and fingers 63. This movement is intermittent, as will be hereinafter explained.

The fingers 63 are urged together by a spring 72, and are separable by a plunger 73 carrying rollers 74 which is so mounted as to descend between the upper ends 75 of the fingers 63 and to force them apart (see FIG. 3). The plunger 73 extends upward above the frame 17 and carries at its upper end a double collar 76 which is engaged by a yoke 77 on a lever 78 and capable of lifting the plunger 73 while still permitting it to revolve. As the rollers 74 are always in contact with the upper finger ends 75, rotation of the fingers will of necessity revolve the plunger 73.

The cylinder 65 is supported by a collar 80, engaged between two flanges 81 on the cylinder 65, and having a lug 82 to which is attached the lower end of a rod 83. The upper end of the rod 83 is provided with a pair of rollers 84, between which extends the end of a lever 85. Elevation of the lever 85 lifts the cylinder 65 and the enclosed fingers 63, and depression of the lever 85 causes the cylinder 65 and fingers 63 to descend to a point where the fingers may grasp the ends of a cut piece of tape 18. Although the lever 85 transmits the motive power for moving the cylinder 65, it may be assisted in lifting the cylinder by a spring 86 stretched between the lug 82 and the frame section 17.

The shaft 71, the lever 78, and the lever 85 are all driven from a motor 90, reduction gear 91, belt 92, and fly-wheel 93. The fly-wheel 93 rotates freely on a shaft 93a to which a cam and gear wheel 94 is keyed by a clutch bar 95. It will be understood that the motor 90 runs constantly during operation, and that the cam and gear wheel 94 turns intermittently when engaged by the clutch bar 95. Energizing of a solenoid 96 pulls a bar 97 to which the clutch bar 95 is pivotally connected, causing the clutch bar 95 to pivot on pin 98. The clutch bar 95, when so pivoted, releases a key 99 which connects the shafts 93a to the fly-wheel 93. The key 99 is spring-biased by a spring 99a to engage grooves 99b of the fly-wheel 93. When the clutch bar 95 is pulled in the opposite direction by a spring 95a, it cams the key 99 out of engagement with the fly-wheel 93 and into engagement with the clutch bar 95 itself, thereby stopping rotation of the shaft 93a.

The cam and gear wheel 94, shown in one aspect in FIG. 1 and in obverse aspect in FIG. 9, has a gear sector 100 which makes contact with a bevel gear 101 mounted on the shaft 71. On the opposite side of the cam and gear wheel 94 are two cams, 102 and 103, the one inside the other, and followed respectively by cam followers 104 and 105. The cam follower 104 is mounted on a lever 106 pivoted at 107 and carrying at its far end a link 108. The link 108 is pivotally connected to the lever 78 on the far side of a pivot post 109 and pivot pin 110 from the yoke 77. The cam follower 105, which, being on the outer cam 103, has a greater degree of movement than the cam follower 104, and acts prior to and later than cam follower 104 is on the lever 85, which is pivoted at 111 and which, as hitherto explained, extends between the rollers 84 to actuate lifting and depression of the rod 83.

Operation of the machine will be described concurrently with the description of the electrical apparatus for effecting such operation (see FIG. 11). Let it be supposed that a cut piece of tape 18 rests upon the saddle 24, bridging the groove 27. The neck 115 of a bag 116 is placed across the tape and forced down into the groove, cause the ends of the tape to rise and come together, so that they may be grasped by the fingers 63. Forcing the bag neck 115 downward tilts the saddle 24 upon the pivot 48, causing the micro-switch 53 to shunt power through latching relay 117 (FIG. 12) and thence through power relay 118 to solenoid 96 (FIG. 2). The solenoid 96 moves the clutch bar 95 to engage the key 99 between the fly-wheel 93, and the shaft 93a of the cam and gear wheel 94, the fly wheel being constantly turned by the motor 90. The key 99 will rotate with the fly-wheel, leaving the clutch bar in place.

Rotation of the cam and gear wheel 94 moves both the lever 85 and the lever 106. The lever 85, acting through rollers 84, rod 83 and collar 80, forces the cylinder 65 downward, and also, of course, the enclosed fingers 63. Immediately following, the lever 106, acting through the link 108, lever 78, and yoke 77, forces the plunger 73 upward to let come together the upper ends of the fingers 63 and to close the lower ends of the fingers upon the cut piece of tape. At this instant the gear sector 100 engages the bevel gear 101, causing rota-

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tion of the shaft 71. Gears 69 and 70 consequently cause rotation of the sleeve 66, which through the key 67 and keyway 68 cause rotation of the cylinder 65 and fingers 63. Thus the tape 18, caught by the fingers 63 around the bag neck 115, is twisted and the bag neck is closed.

When the cam cycle has progressed to the point where the cylinder 65 has reached the bottom of its stroke, the lever 106 throws switch 119 which unlatches the latching relay 117, breaking the current at the latching relay, terminating action of the solenoid 96 and freeing the clutch bar 95. The cam and gear wheel 94 will continue to revolve until the key 99 comes into contact with the clutch bar 95 and is cammed thereby out of the fly-wheel 93, contact between the key and the clutch bar serving to stop rotation of the shaft 93a. At this instant, movement of all the parts mounted on the upper frame structure 17 ceases, to be resumed only when the micro-switch 53 again shunts power through the latching relay 117.

The operator now lifts the tied bag from the saddle 24, allowing the springs 51 to tilt the saddle upward and causing the finger 54 to throw the micro-switch 53 in the opposite direction. This shunts power through latching relay 120 to a time-delay 121. The time-delay 121 delays a fraction of a second and closes switch 122, thus shunting power to power-relay 123. The power-relay 123 energizes solenoid 47 by which rod 42, wrist plate 38, and ratchet wheel 37 are moved to cause rotation of the tape feed rollers 20 and 21. The tape 18 is thus advanced across the saddle 24.

As solenoid 47 reaches its most advanced position (in advancing the tape 18) it closes a switch 124, causing power to flow through a time-delay 125 to a solenoid 61. The purpose of the time-delay 125 is to allow the tape to settle upon the saddle 24 before it is sheared. When the solenoid 61 is energized, it moves the lever 55 which operates the shear 23. The cutting edge 60 of the shear 23 is pulled down upon the tape 18, severing the tape and leaving the severed piece extending between the magnets 31 in the saddle 24. As the lever 55 completes moving the shear 23, it touches a micro-switch 126. Micro-switch 126 is in circuit to both of the latching relays 117 and 120, and causes both of these last-named relays to change positions in which they may begin a subsequent cycle of operations. Both the solenoids 47 and 61 are returned to their starting position.

The above-described cycle of operations can be performed nearly as fast as an operator can pick up a bag, place its neck in the groove 27, remove it and replace it with another bag. It will be seen that the dwell-times of the time-delays 121 and 125 occur while the operator is removing a tied bag and bringing in another bag to be tied, so that the only enforced delay is the fraction of a second when the fingers 63 are twirling the tape.

It will of course be obvious that the arrangement of the electrical and mechanical parts of the machine such as is described in the foregoing specification may be varied almost without limit. I wish it understood that this specification and the accompanying drawings are examples of the art, and that the spirit and scope of my invention resides in the appended claims.

I claim:

1. In a machine for closing a bag with a pliable tape: a saddle;

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means for supplying said tape in a path across said saddle;

a groove in said saddle, transverse to said path, over which said tape may pass;

an axis upon which said saddle tilts in response to pressure;

means for restoring said saddle to its original position when pressure is removed from said saddle;

means responsive to position-restoring motion of said saddle for advancing said tape so as to cause said tape to pass over said groove;

means further responsive to position restoring motion of said saddle for shearing from said tape the portion of said tape then overlying said saddle;

said groove having shoulders adapted to force convergently upright the end parts of said sheared portion of said tape when the part of said sheared portion overlying said groove is forced by pressure into said groove; and

means responsive to tilting of said saddle under said pressure for grasping and twisting said end parts of said sheared portion of said tape.

2. In a bag-closing machine:

a saddle, pivotally mounted for tilting movement;

a groove in said saddle, transverse to the direction of tilting, for receiving the neck of a bag;

means responsive to the tilting of said saddle in one direction for advancing a tape across said saddle so that said tape spans said groove and for then severing that portion of said tape overlying said saddle; shoulders on the margins of said groove for bending convergently the end parts of said overlying portion of said tape when an intermediate part of said portion is pressed into said groove, as by a bag neck; fingers mounted adjacent said groove for longitudinal, closing and rotary movement;

a first cam and connecting means for moving said fingers longitudinally to the vicinity of said tape end parts;

a second cam and connecting means for closing said fingers on said tape end parts;

gear means then rotating said fingers to cause twisting of said tape end parts; and

means responsive to tilting of said saddle in the other direction for actuating said first and said second cam and said gear means.

3. In a bag-closing machine:

the apparatus set forth in claim 2 including a source of power;

a wheel on which said first and said second cams and a portion of said gear means are mounted; and

a clutch connecting said source of power and said wheel;

said last named means responsive to tilting of said saddle actuating said clutch.

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