

March 29, 1966

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3,242,633

BAG TYING MACHINE

Filed March 4, 1963

6 Sheets-Sheet 1

FIG. 1.

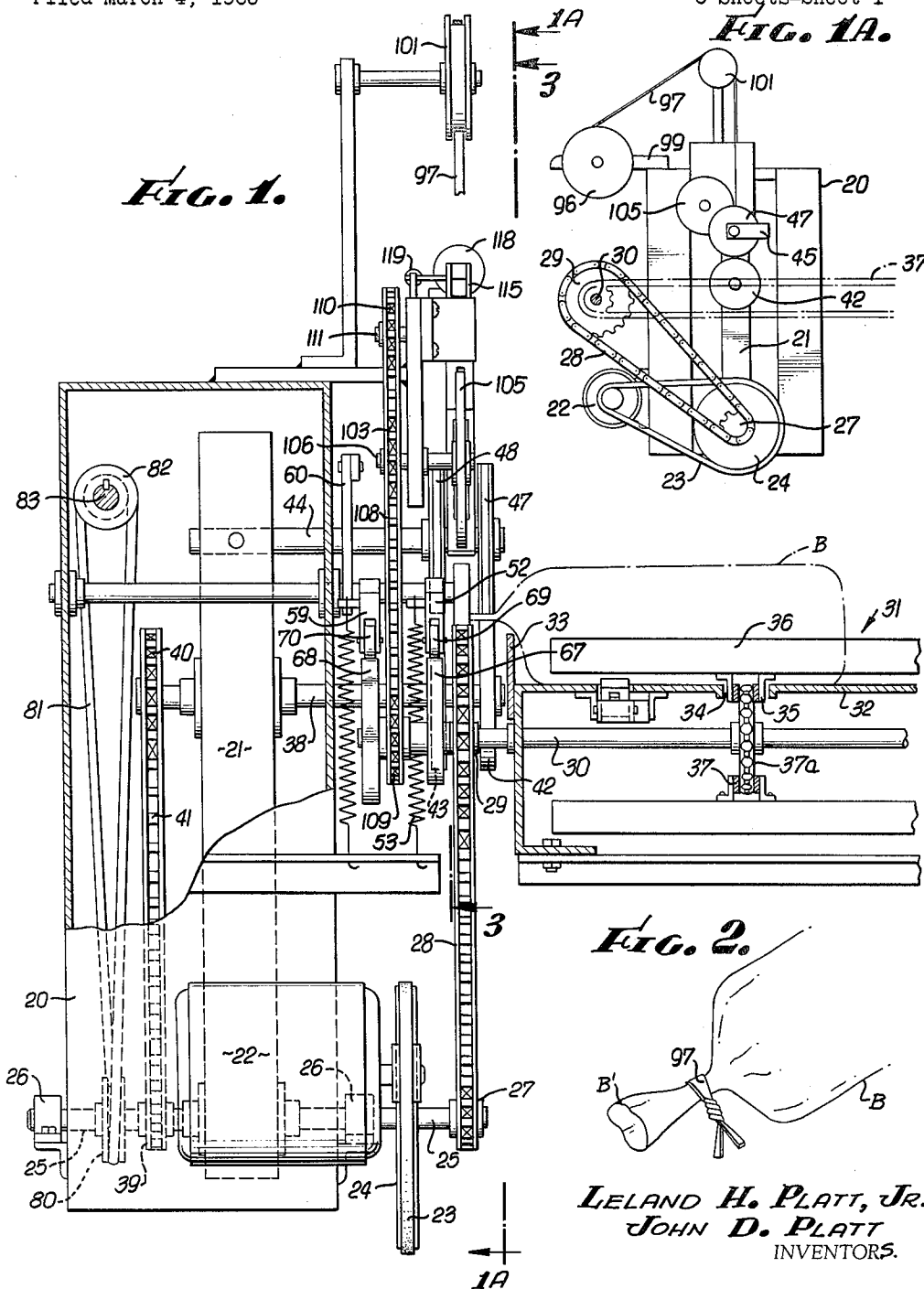
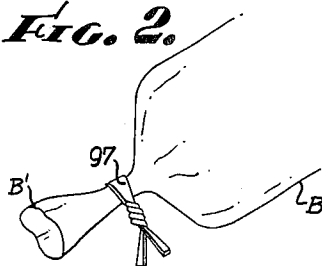


FIG. 2.



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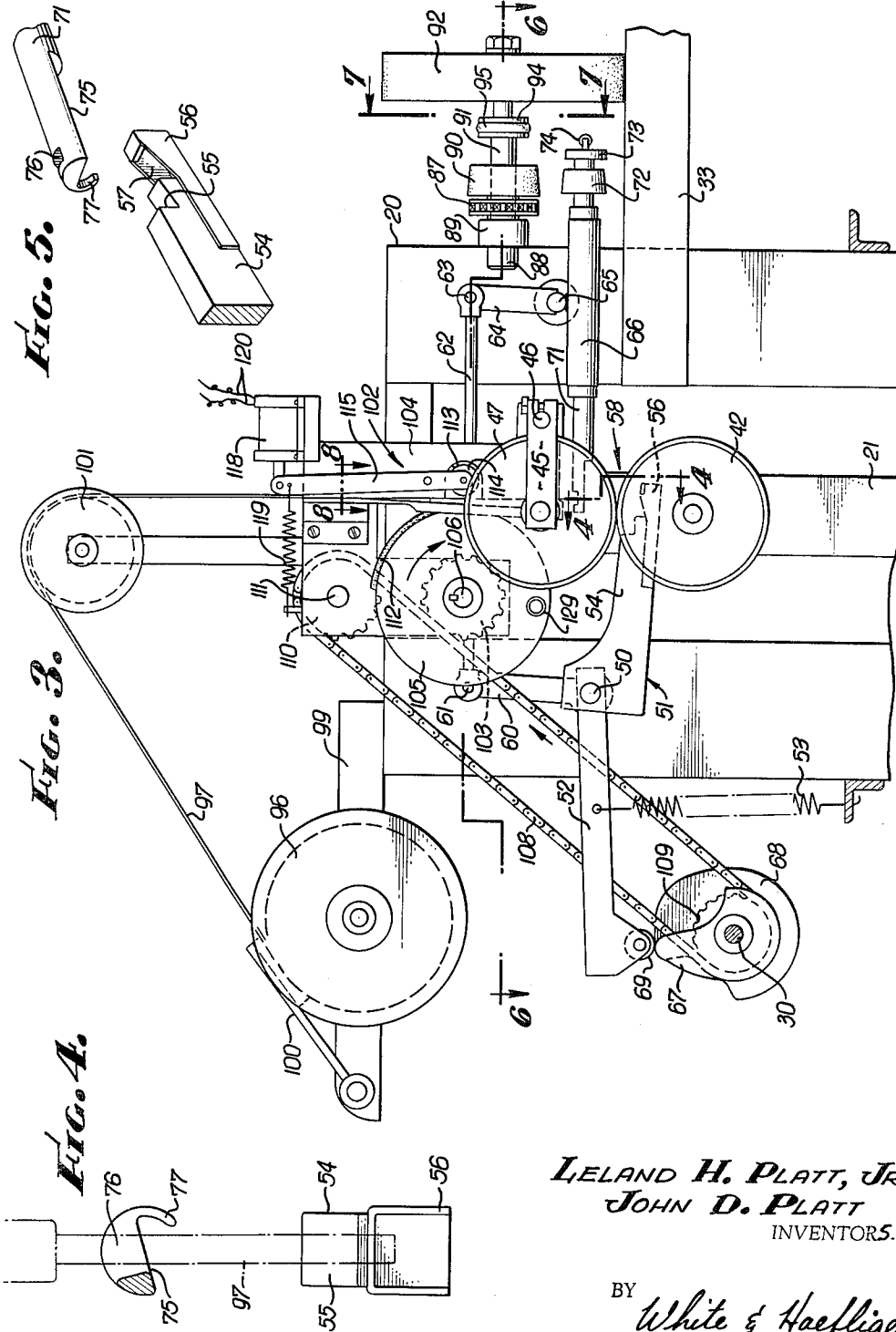
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FIG. 6.

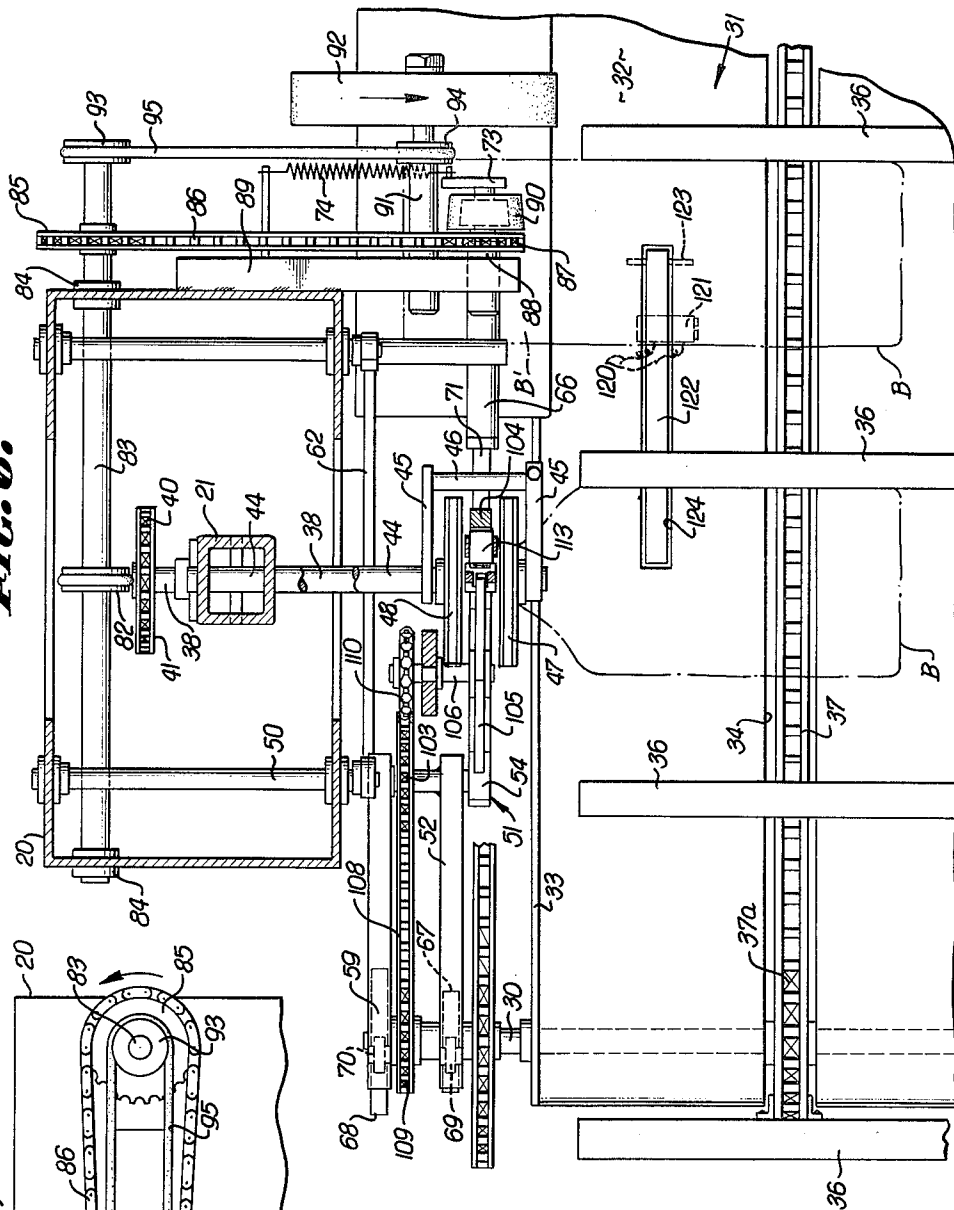


FIG. 7.

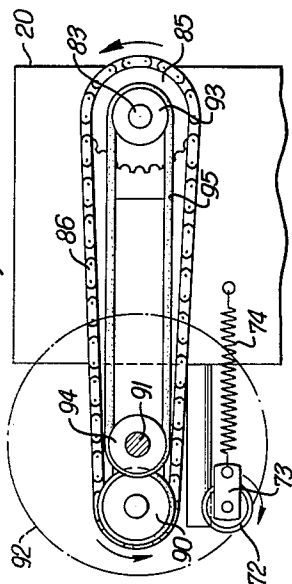
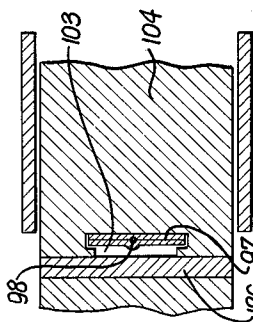


FIG. 8.



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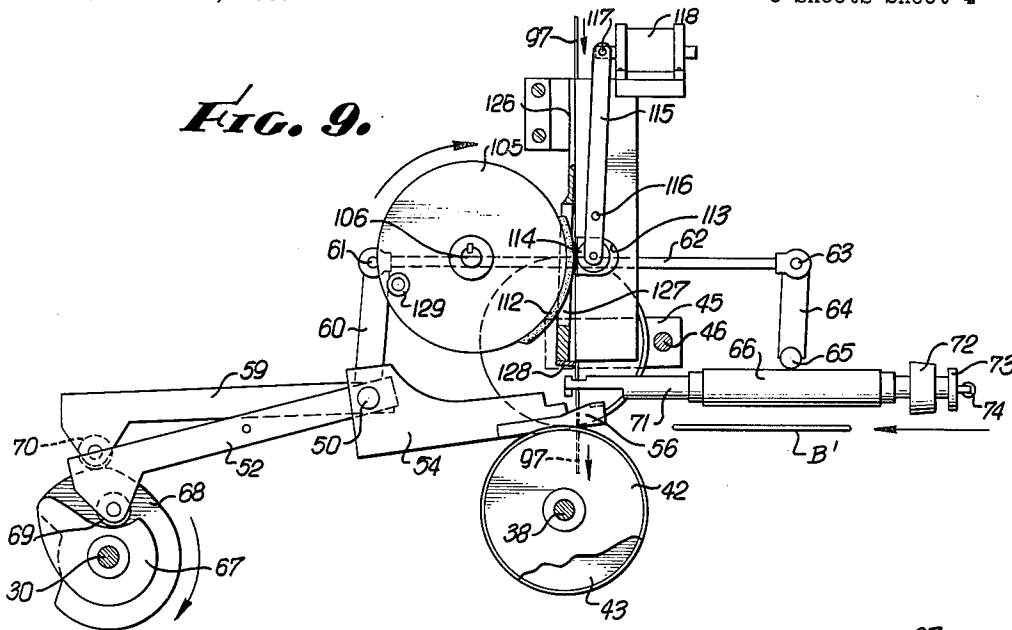


FIG. 9.

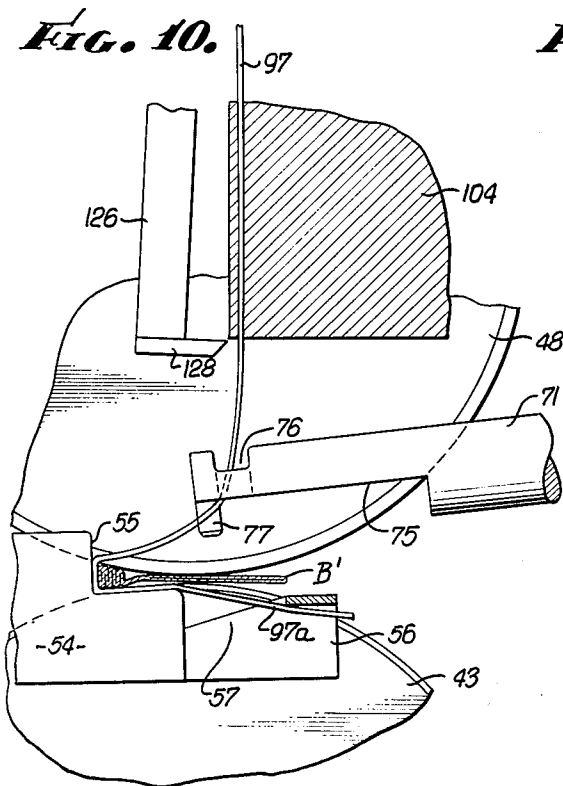


FIG. 10.

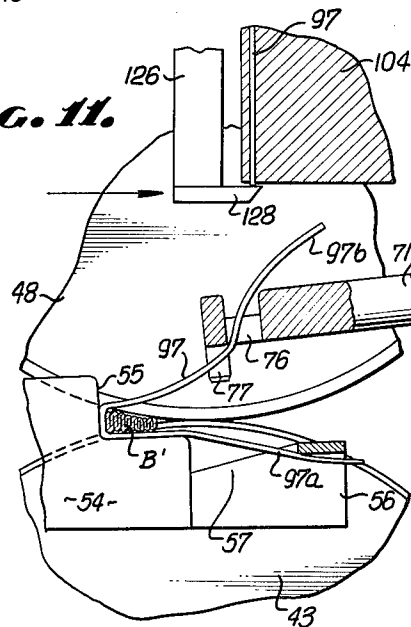


FIG. 11.

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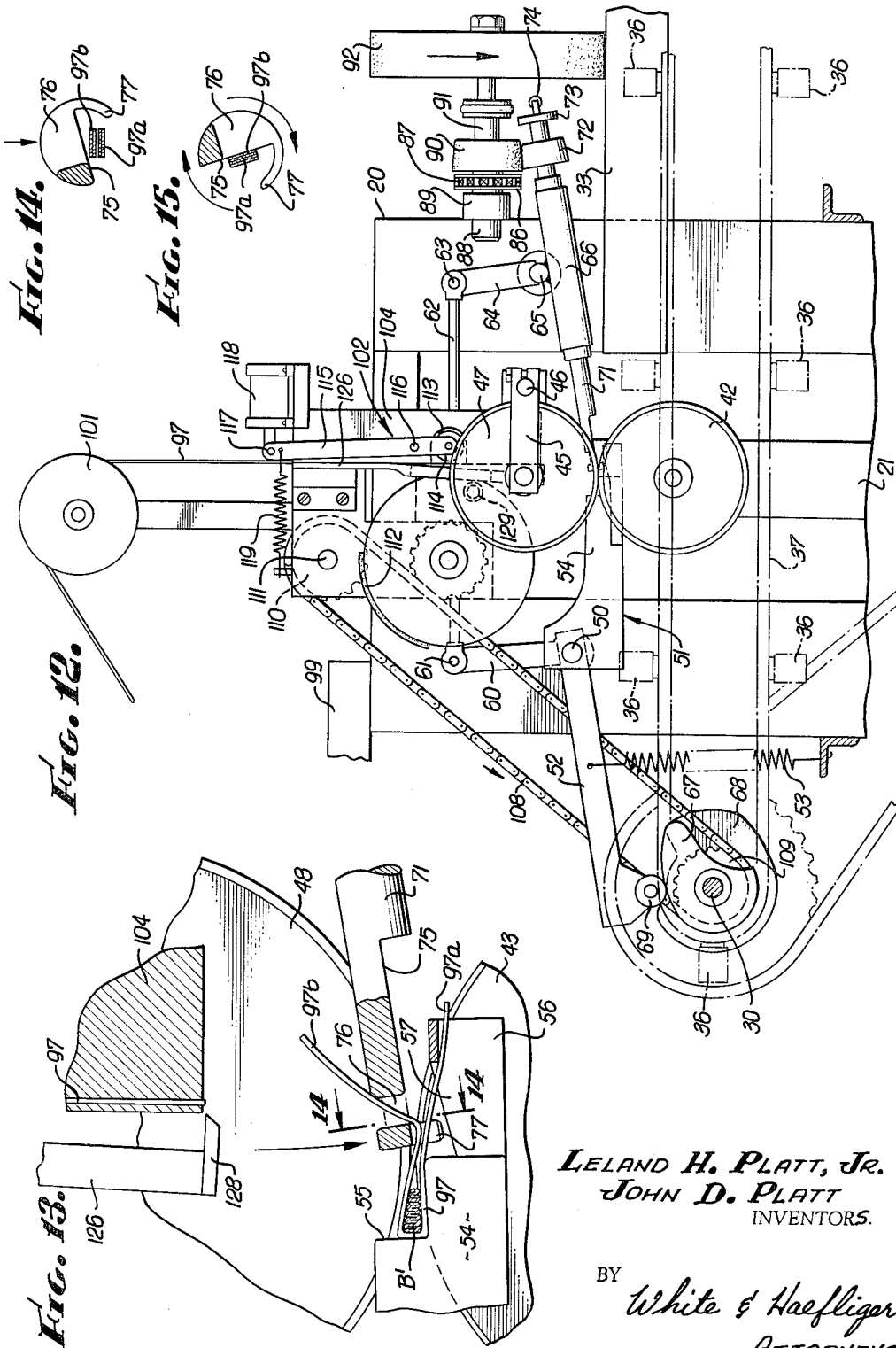
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FIG. 16.

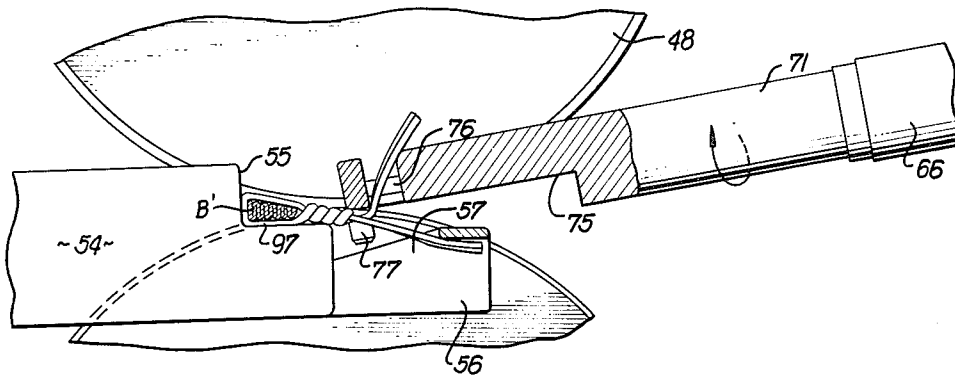


FIG. 17.

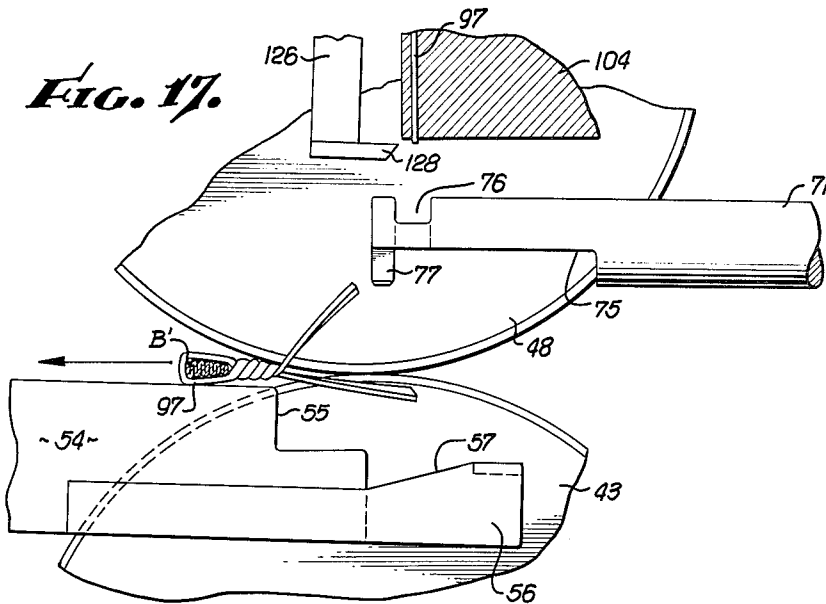
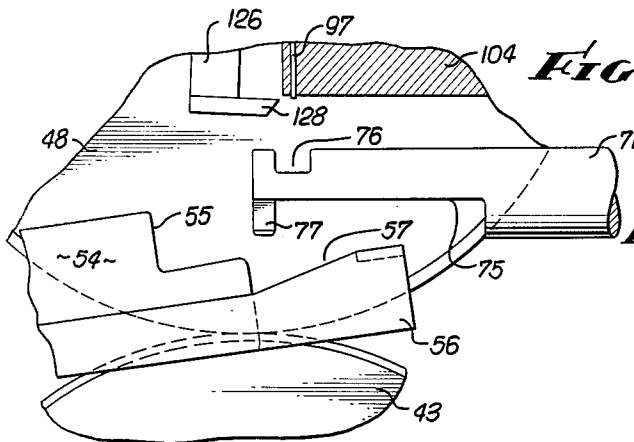


FIG. 18.



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3,242,633

BAG TYING MACHINE

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Filed Mar. 4, 1963, Ser. No. 262,427
13 Claims. (Cl. 53—135)

This invention has to do generally with improvements in machines for closing flexible bags such as polyethylene bags which are extensively used for the packaging of various commodities such as produce and bakery goods. More particularly, the invention relates to improvements and new closing techniques as applied to the general types of machines disclosed in the L. H. Platt, et al. Patents 2,821,055, 2,840,967, 2,867,066 and in co-pending application Serial Number 91,831, now Patent No. 3,099,116.

Generally considered, the present type of machine operates to receive product-containing bags with their neck extents open, and to gather and close the necks by the application of fastener means thereto, all at a high production rate.

As typified by the earlier Platt patents referred to above, one practice has been to retain the closed bag necks by the application thereto of adhesive tape, as by adhering the ends of tapes applied to opposite sides of the bag necks. That form of fastener, while suitable for retaining the bags in closed condition, has the disadvantage that the tapes are relatively difficult to open initially and reapply by hand between removals of the bag contents.

A subsequent development was substitution of adhesive tape by plastic clip-like fasteners slotted to receive the gathered bag necks and removable and reapplicable thereto between usages of the packaged product.

The present invention is occasioned by the desire for a form of closure which is more easily and conveniently removable from the bag and reapplicable thereto, than either the adhesive tape or clip forms previously used. It is found to be more convenient to retain the bag necks by a twistable strand of material capable of maintaining its twisted condition. Accordingly, as herein used, the term "strand" will be understood to mean an appropriate material in strand form capable of retaining a twisted condition about the bag necks. For this purpose a paper or plastic tape-like material which may or may not be internally reinforced as by wire, has been found to be suitable.

More specifically, the invention has for its object to provide an improved machine having essentially the following features:

(1) Means for advancing the open neck bags to a tying station;

(2) Means at that station in the path of the bag advancement acting to compactly gather the bag necks; and

(3) Means also at the tying station operating in predetermined timed relation with the bag advancement and neck compaction, to loop about and twist the tying strand about the gathered neck.

In accordance with the invention, we provide at the tying station means such as peripherally proximate wheels together with a blocking means operating to arrest and cause folded compaction of the bag necks being advanced between the wheels, and provide also at the tying station a rotatable twister means operating to receive severed lengths of the strand and to twist them about the bag necks, all in closely timed relation with the bag advancement, movement of the blocking means into and out of the bag path and a cut-off mechanism acting to sever predetermined tape lengths.

A particular and further object relates to the relationship between the strand projected into the bag advance-

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ment path, and the effect of the bags themselves in producing initial doubling of the strands about the bag necks just preceding the twisting operation. In accomplishment of the object, provision is made for feeding into the bag path the strand in flexible condition so that it is deflectible by the bag as it advances to the blocking means, all in a manner such that the bag travel produces a strand doubling effect. Provision also is made for so accommodating the free ends of the doubled strand that they are accessible for tying together by the twisting mechanism.

The invention has various additional features and objects, such as conditioning of the tape feed for operation only in the presence of bags to be closed, all of which together with the objects discussed in the foregoing, will be more fully understood from the following detailed description of an illustrative embodiment of the invention shown by the accompanying drawings in which:

FIG. 1 is a view showing the machine in end elevation with a portion of the housing broken away to show internal structure;

FIG. 1A is a fragmentary reduced scale elevation taken on line 1A—1A of FIG. 1;

FIG. 2 is a perspective showing of the tied bag neck;

FIG. 3 is a fragmentary elevation taken in the plane of line 3—3 of FIG. 1;

FIG. 4 is a fragmentary enlarged section on line 4—4 of FIG. 3;

FIG. 5 is another fragmentary illustration showing in perspective the twister and blocking element;

FIG. 6 is a sectional plan view taken on line 6—6 of FIG. 3;

FIG. 7 is a section on line 7—7 of FIG. 3;

FIG. 8 is a fragmentary enlargement taken on line 8—8 of FIG. 3;

FIG. 9 is a fragmentary illustration of certain of the parts as they appear in FIG. 3, positioned during the tape feeding interval;

FIGS. 10 and 11 are enlarged fragmentary views showing the relationships of the twister, blocking element and tape cutter in sequential operating stages;

FIG. 12 is a view similar to FIG. 3 showing the parts in twister actuating condition;

FIG. 13 is a view similar to FIGS. 10 and 11 showing the positions of the parts at the start of the tape twist;

FIGS. 14 and 15 are views taken on line 14—14 of FIG. 13, showing sequential rotative movements of the twister; and

FIGS. 16, 17 and 18 are views similar to FIG. 13 illustrative of the tape twisting to completion and displacement of the parts for the bag release.

The machine is shown to comprise a housing 20 containing an upstanding support 21, see FIGS. 1 and 6, which serves to mount certain shafts as hereinafter described. Preferably, though not necessarily, the entire machine is powered by a single motor 22 which drives by way of belt 23 pulley 24 keyed to master shaft 25 extending through bearings 26, the housing 20 and support 21. The shaft 25 carries a terminal sprocket 27 which by way of chain 28 and sprocket 29 drives a combination cam and conveyor shaft 30.

Referring particularly to FIGS. 1 and 6, the bag conveyor assembly generally indicated at 31 is shown to comprise a smooth surface stationary table 32 having along its inner edge an upstanding bag net guide plate 33, the table being longitudinally interrupted or slotted at 34 to accommodate attachments at 35 connecting a succession of equally spaced pusher bars 36 with an endless chain 37 driven by sprocket 37a on shaft 30. Thus during operation of the machine, the pusher bars 36 travel at uniform speed to advance product-containing bags B along the table surface, the bags being placed on their sides with

their unfilled or neck portions B' open. As will be apparent, the bags advance at uniform spacing and at a rate and fixed relation to the rotative speeds of shafts 25 and 30, so that the operation of other parts of the machine from these shafts occurs in predetermined relation to advancement of the bags and their arrival at the later described tying station.

The support 21 mounts a shaft 38 driven from shaft 25 by way of sprockets 39, 40 and chain 41, the shaft serving to mount and rotatably drive a pair of axially spaced wheels 42 and 43. The support 21 mounts a second stationary shaft 44 which terminally carries a yoke composed of arms 45 and their interconnection 46, see FIG. 6, within which is carried a pair of wheels 47 and 48 which are rotatable but not driven, these wheels being in close peripheral proximity to or contact with the rotatably driven wheels 42 and 43. Either or both pairs of wheels may be given rubber or like surfacing to prevent bag slippage.

Referring to FIGS. 6, 9 and 12, the housing 20 mounts a horizontal shaft 50 the outer end of which carries a blocking element generally indicated at 51 which oscillates with or about the shaft, the element having rigidly attached thereto an arm 52 which is cam displaced against the resistance of spring 53. The element 51 is shown to comprise a body 54 presenting at 55, see FIG. 5, a bag blocking shoulder, beyond which the body carries an extension 56 forming a vertically through opening 57 for passing the strand or tape material as later described. The area generally denoted at 58 and accommodating the terminal portions of the blocking element, contacting surfaces of the wheels 42-43 and 47-48, as well as the terminal of the later described twister, is referred to as the bag tying station since it is at this location that the bag neck is gathered and the severed tape length is twisted about it.

Shaft 50 also mounts an oscillatory crank composed of arms 59 and 60, see FIG. 9, the latter being pivoted at 61 to a link 62 which in turn is pivoted at 63 to a line 64 fixed at 65 to a tubular twister body or barrel 66.

Shaft 30 carries a pair of cams 67 and 68, the former of which is traveled by follower 69 on the blocking element arm 52, the surface of cam 68 being engaged by follower 70 carried by arm 59. Thus during a complete rotation of the shaft 30, the blocking element 54 oscillates about shaft 50 between the terminally elevated position of FIG. 9 and the terminally lowered position of FIG. 3. Simultaneously, and in the operating relation later described, cam 68 displaces arm 59 and the twister body 66 between the upper and lower oscillatory limits corresponding to FIGS. 9 and 12.

The body or barrel 66 contains a rotatable twister shaft 71 carrying at its outer end a friction frusto cone 72 and an arm 73, see FIG. 7, connected to spring 74, the arm 73 being rotatable with the twister shaft in response to the later described drive, and spring 74 serving to restore the normal or inactive oscillatory position of the twister upon discontinuance of the drive. As particularly shown in FIGS. 5, 14 and 15, the twister shaft 71 has a terminal extent flattened at 75, toward the end of which the shaft has a tape-passing opening at 76 and a hook extremity at 77.

In reference now to the twister drive, shaft 25, see FIG. 1, carries a fixed pulley 80 driving by way of belt 81 pulley 82 on shaft 83 rotatable in bearings 84, see FIG. 6, and carrying sprocket 85 which by chain 86 drives sprocket 87 on shaft 88 journaled within support 89 mounted on the side of the housing 20. Shaft 88 carries a friction frusto cone 90 engageable with the similar friction element 72 in the FIG. 12 position to transmit the tie twisting rotation to the twister shaft 71. In the FIG. 3 positions, the friction elements 7 and 90 are disengaged so that rotation of the twister shaft is arrested in predetermined rotative position by the action of spring 74, to properly position the shaft terminal opening 76 for reception of the tape as will later appear.

The support 89 journals a second shaft 91 terminally carrying a brush 92 rotatably driven from shaft 83 by pulleys 93 and 94 carrying belt 95. The purpose of brush 92 is to straighten out the bag neck portions as they approach the tying station. Thus, referring to FIG. 6, as the bags are advanced by the conveyor, the open necks at B' come beneath the brush 92 which by its rotation as indicated, tends to smooth out and generally flatten the bag necks.

Considering now the strand feed, and first in reference to FIG. 3, a reel 96 carrying for example laminated plastic tape 97 containing a stiffening wire 98, see FIG. 8, is mounted on support 99, a suitable braking device 100 being used to restrain the reel rotation sufficiently that the tape will feed in unslackened condition. From the reel 96, the tape passes over sheave 101 and thence downwardly to the tying station through a feed and cut-off mechanism generally indicated at 102. As shown in FIG. 8, the tape 97 passes down through recess 103 in a vertically positioned member 104 in a manner permitting the lower free end of the tape to pass down through opening 76 in the twister and opening 57 in the blocking element 54, as best illustrated in FIG. 9.

The tape is intermittently fed to the tying station in equal predetermined lengths by wheel 105 carried on shaft 106 which also carries a sprocket 107 driven by chain 108 carried by sprocket 109 on shaft 30 and an idler sprocket 110 on shaft 111. The placement of sprocket 107 in relation to the direction of the chain travel, thus rotates wheel 105 clockwise as viewed in FIGS. 3, 9 and 12. The wheel carries a segmental circular pad 112, the arcuate extent of which corresponds with the lengths of the individual tapes to be severed, the pad being made of rubber or other material resistant to slippage against the tape.

Member 104 contains a recess 113 within which is contained a pressure roller 114 carried by and between the lower terminals of a pair of links 115 pivoted at 116 to the support 104, the upper ends of the links being pivotally connected at 117 to the shaft of solenoid 118. Normally, or when the solenoid is deenergized, links 115 are maintained by spring 119 in the FIGS. 3 and 12 position in which roller 114 is retracted from pressural engagement with the tape 97. Solenoid 118 is appropriately connected by leads 120 to a mercury switch 121 carried by the underside of a bar 122, see FIG. 6, pivoted at 123 and normally projecting up through slot 124 in the table 32 a distance such that an advancing bag B will depress the bar and close switch 121 to energize the solenoid 118. The bag pushers 36 however clear and do not influence the bar 122. Thus the solenoid is conditioned to cause roller 114 to coast with the feeder wheel 105 in advancing the tape to the tying station, only by the presence on the conveyor of a bag capable of closing the switch 121. Accordingly, the tape will not feed when the machine is running without bags, and the tape will not feed during any conveyor interval in which a bag may be absent.

As best illustrated in FIGS. 8 and 9, at the inside of support 104 is mounted the upper end of a knife 126 which below is slotted at 127 to receive the periphery of wheel 105, the lower end of the knife carrying a cutter 128, or the knife proper which is displaceable from the tape passing outer position of FIG. 10, to the FIG. 11 cutting position in which the blade 126 comes closely beneath the bottom surface of support 104. Longitudinally considered, the knife 126 normally assumes the FIGS. 9 and 10 position of deflection away from support 104. Actuation of the knife to sever the tape results from the knife engagement by a roller 129 carried by wheel 105. Thus rotation of the wheel engages the roller against the knife at the side of its slot 127 to deflect the knife against its resilience to the FIG. 11 tape cutting position.

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The operation of the machine will be understood by reference to the sequence of operations upon a bag B starting with its passage and neck straightening beneath the brush 92. The conveyor advances the bag with its neck directed along the guide 33 so that the leading edge of the bag enters between the wheel pairs 47-48 and 42-43 as best illustrated in FIG. 9. Just before arrival of the bag neck B' to the wheel throat, the blocking element 54 will have become elevated in conformance with cam 67, and the twister terminal elevated in conformance with cam 68, to receive the tape 97 through the twister opening 76 and blocking element opening 57. The corresponding part positions appear also in FIG. 18 depicting the start of the tape segment feed. The blocking element and twister then lower to the FIGS. 10 and 11 positions in which the blocking shoulder 55 is brought into the path of the bag neck, such lowerings being simultaneous with downward feeding of the strand to final position.

In passing between the wheels 47-48 and 42-43, the bag neck is flattened in the sense of being reduced down to its material thickness and the leading edge of the bag is thrust against the blocking shoulder 45. As the wheels continue to rotate, they progressively advance and fold the bag neck compactly against the blocking shoulder, as according to the FIGS. 10 and 11. At this point it may be observed that the bag edge initially contacts the tape hanging away from the blocking shoulder, and at about midpoint of the tape length to be severed, the point of severance being determined by cutting deflection of the knife 126 by roller 129 as previously explained. Referring to FIG. 11, completion of the bag neck compaction occurs about simultaneously with or instantaneously preceding the tape severance, all in a manner such that the tape thus has become doubled about the gathered bag neck, with one extent 97a of the tape being received within the blocking element opening 57, with the other tape extent 97b being held within the twister opening 76.

Cam 68 then operates to swing the twister 71 down to the FIG. 13 position at which the strands are brought close together and hook 77 is positioned at an elevation below the lower strand 97a. As the twister is thus swung downward, the friction drive elements 72 and 90 are engaged, producing rotation of the twister and in relation to the tape as illustrated in FIGS. 14 and 15 so as to twist the tape through a number of turns sufficient for secure retention of the gathered bag neck, see FIG. 16. Cam 68 thereupon causes rotation-arresting upward release of the twister, and cam 67 swings the blocking element 54 down to the FIG. 17 position out of the path of the bag neck so that the latter may be advanced by the conveyor from the tying station.

With respect to the tape feed, presence of the bag on the conveyor will have energized solenoid 118 to press roller 114 toward the tape. Thus starting with the condition depicted by FIG. 18, commencement of the tape feed occurs when the feeder wheel pad 112 rotates to a point opposite the roller 114, the continued frictional engagement of the pad against the tape causing advancement of the latter to a length corresponding to the pad extent.

The operating cycle is completed upon elevated restoration of the blocking element following the FIG. 17 clearance of the bag. Thus, in sequence cam 67 swings the blocking element up to the FIGS. 9 and 18 position for reception a successive tape length, and then brings the element downward to the FIGS. 10-11 blocking position.

We claim:

1. Apparatus for both gathering and closing the necks of thin flexible bags at an essentially single location in a path of bag advancement, comprising a blocking means positioned at a tying station in said path, feeding means for feeding a strand to said station, additional means operating to feed the bag necks in flattened condition

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against said blocking means and thereby compactly gather the bag necks at said station and also operating to produce relative transverse convergent movement between the bag neck and strand into engagement with each other so that the strand is doubled about the gathered bag neck at said station, and twisting means operating to twist together the doubled portions of the strand immediately upon said doubling of the strand and while the gathered bag neck remains at said station.

2. Apparatus according to claim 1, in which said bag feeding and compacting means includes endless moving surfaces on peripherally proximate axially spaced wheels receiving the bag neck therebetween in flattened condition in which the bag neck is advanced against the blocking means.

3. Apparatus according to claim 1, comprising a conveyor means for advancing a succession of the bags with their neck portions open to said bag feeding means, and means controlled by the presence of a bag on said conveyor to render operable said strand feeding means.

4. Apparatus according to claim 1, comprising also a conveyor for advancing a succession of the open neck bags to said feeding means, and in which said blocking means is movable into and out of the bag path and in which said blocking means, strand feeding means and twisting means all are operated in predetermined relation to the operation of said conveyor.

5. Apparatus according to claim 1, in which said strand feeding means comprises means for feeding the strand into the path of the advancing bag so that the bag acts to displace the strand against said blocking means and to deflect the strand in doubled configuration about the bag neck being folded and compacted against the blocking means.

6. Apparatus according to claim 5, comprising means for severing a length of the strand to leave substantially equal terminal lengths thereof at opposite sides of the strand engagement against the blocking element.

7. Apparatus according to claim 5, comprising also means acting to sever the strand after its contact and displacement by the bag.

8. Apparatus according to claim 5 wherein said twisting means includes a rotary shaft having a strand twisting terminal extent adjacent said station and having a transverse opening therein aligned with said strand feeding means and passing the strand transversely of the shaft and retaining the strand when doubled about the gathered bag neck whereby to effect positive twisting of the strands.

9. Apparatus according to claim 8 wherein twisting means operates said twisting shaft intermittently, and includes apparatus restoring the shaft to predetermined rotational orientation when stationary to align the opening with the strand.

10. Apparatus for gathering and closing the necks of thin flexible bags, comprising conveyor means for advancing a succession of the bags at predetermined intervals with their neck portions open, a blocking element positioned at a tying station in the path of said neck portions, means mounting said element for oscillatory movement into and out of the bag path, rotating peripherally proximate wheels receiving and flattening the bag necks between them and operating to fold and compactly gather the bag necks against the blocking element, means for feeding to said station a continuous twist tie strand so that a terminal extent thereof is in the path of the advancing bag neck and is deflected thereby against said blocking element so that the strand becomes doubled about the gathered bag neck, means for severing said terminal extent of the strand, and a rotatable twister positioned between said wheels and blocking element and having a hook-like terminal at said station operable to receive and twist together the doubled portions of the strand.

11. Apparatus according to claim 10, in which said twister and blocking element are positioned so that the strand is received by and passes through said hook-like

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terminal of the twister and through an opening in the blocking element.

12. Apparatus according to claim 10, comprising means for intermittently rotating said twister in predetermined sequential relation to the strand severance by said severing means and for intermittently bodily moving said terminal into and out of the position at which it receives the strand.

13. Apparatus according to claim 10, in which said bags are positioned on their sides upon said conveyor with said strand being fed generally vertically downwardly to said station, said apparatus including means for initially moving said twister and blocking element upwardly relative to the tape to receive the tape through

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passage in the twister and element and for then moving the twister and element downwardly to their blocking and twisting positions.

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