July 19, 1966 J. D. PLATT ETAL 3,261,143

FLEXIBLE BAG CLOSING MACHINE

Filed March 15, 1963 7 Sheets-Sheet 1

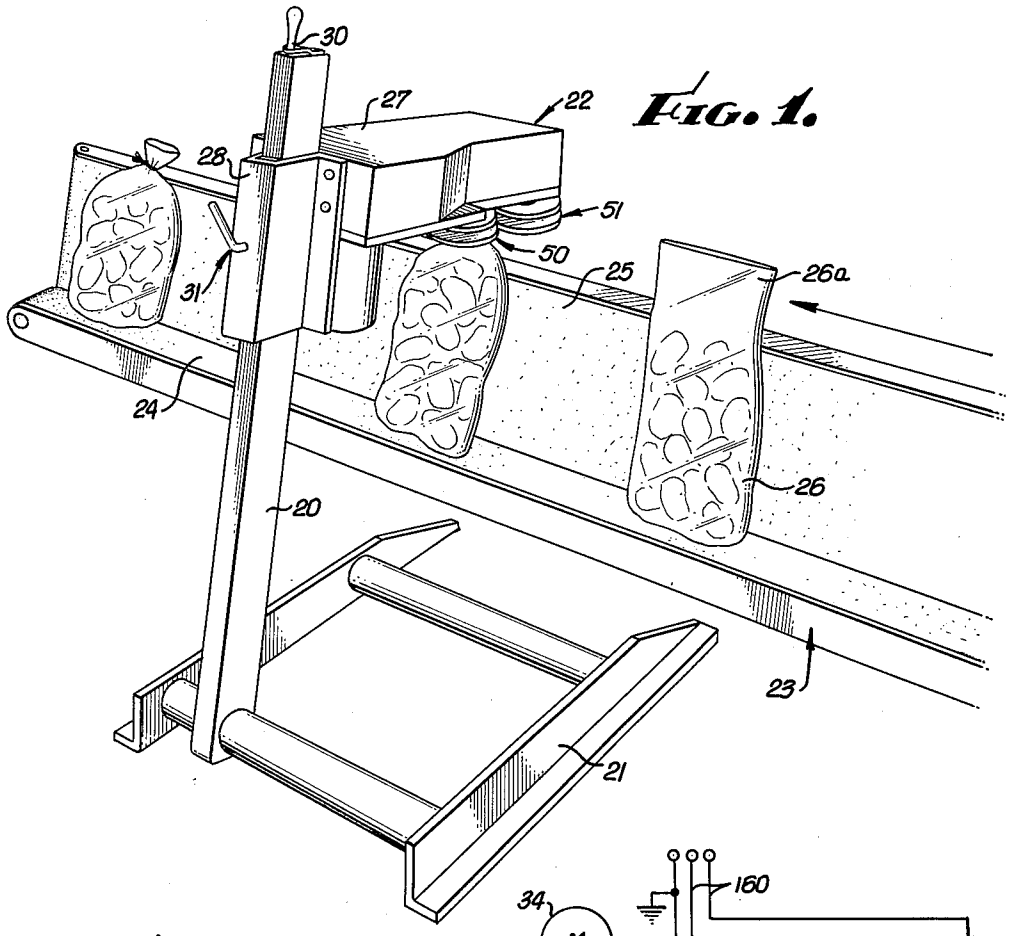


FIG. 1.

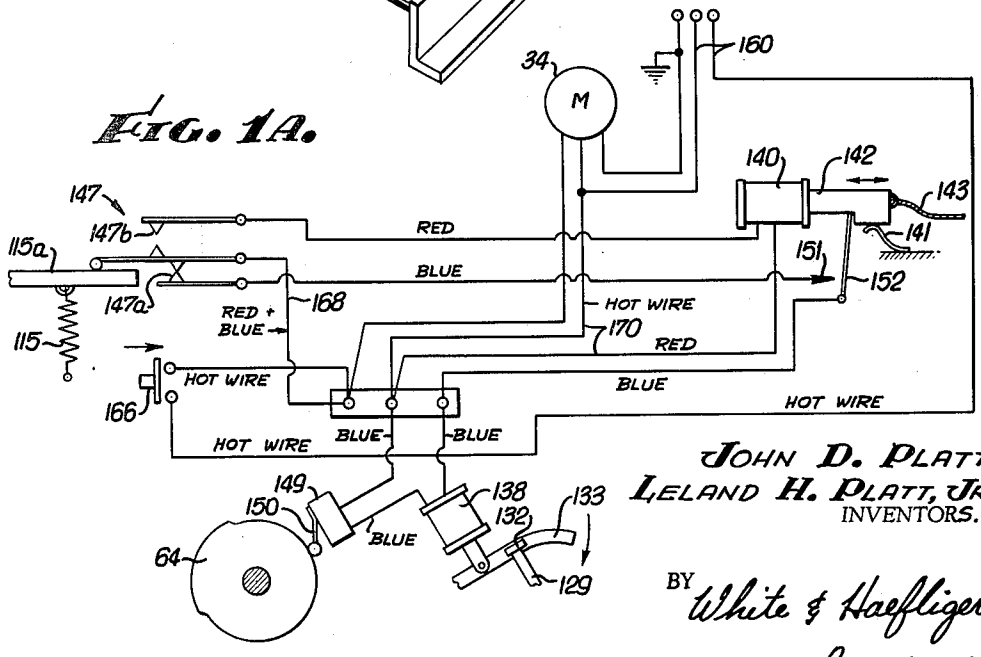


FIG. 1A.

JOHN D. PLATT
LELAND H. PLATT, JR.
INVENTORS.

BY White & Haefliger
ATTORNEYS.

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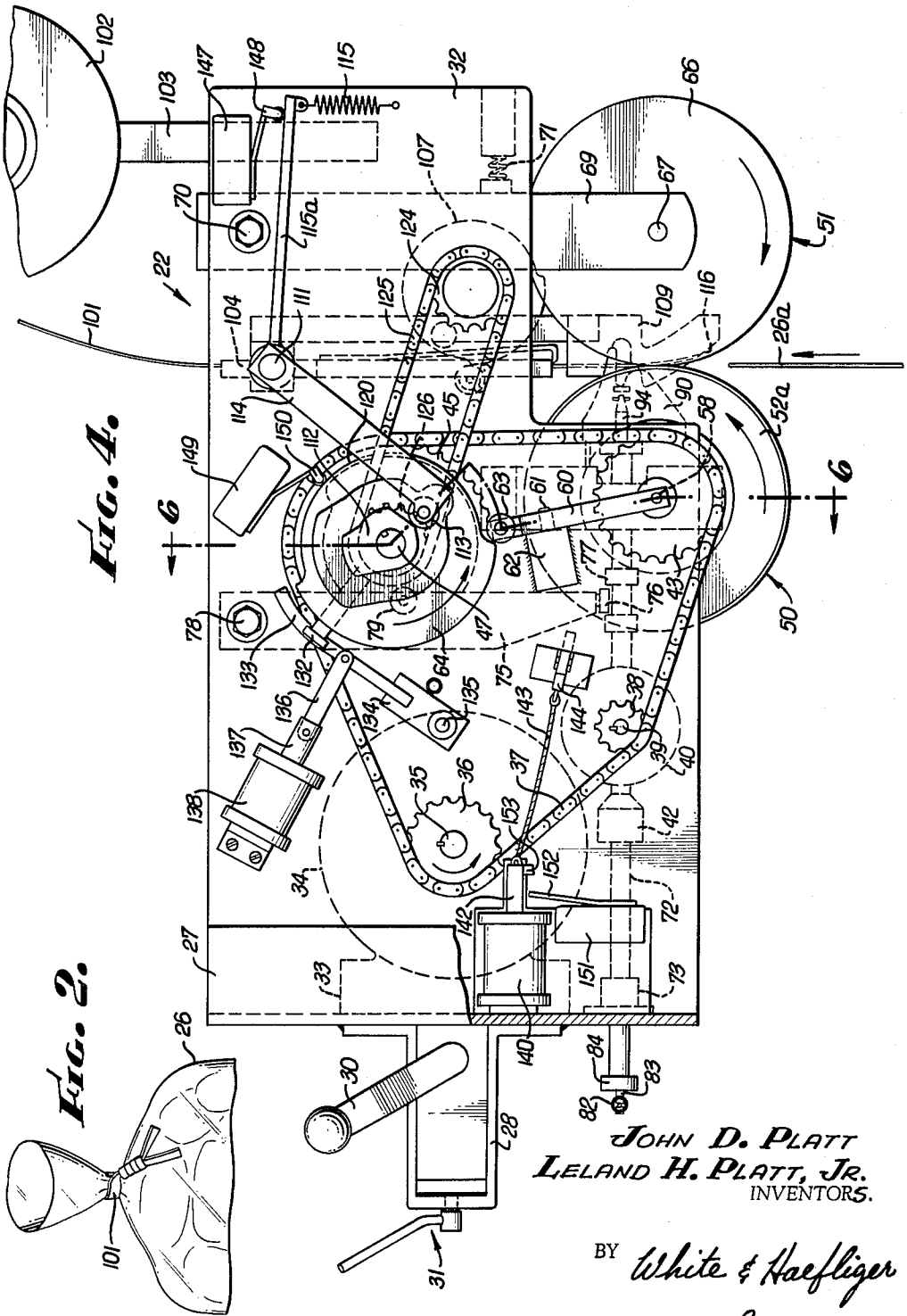


FIG. 4.

FIG. 2.

JOHN D. PLATT
LELAND H. PLATT, JR.
INVENTORS.

BY White & Haefliger
ATTORNEYS.

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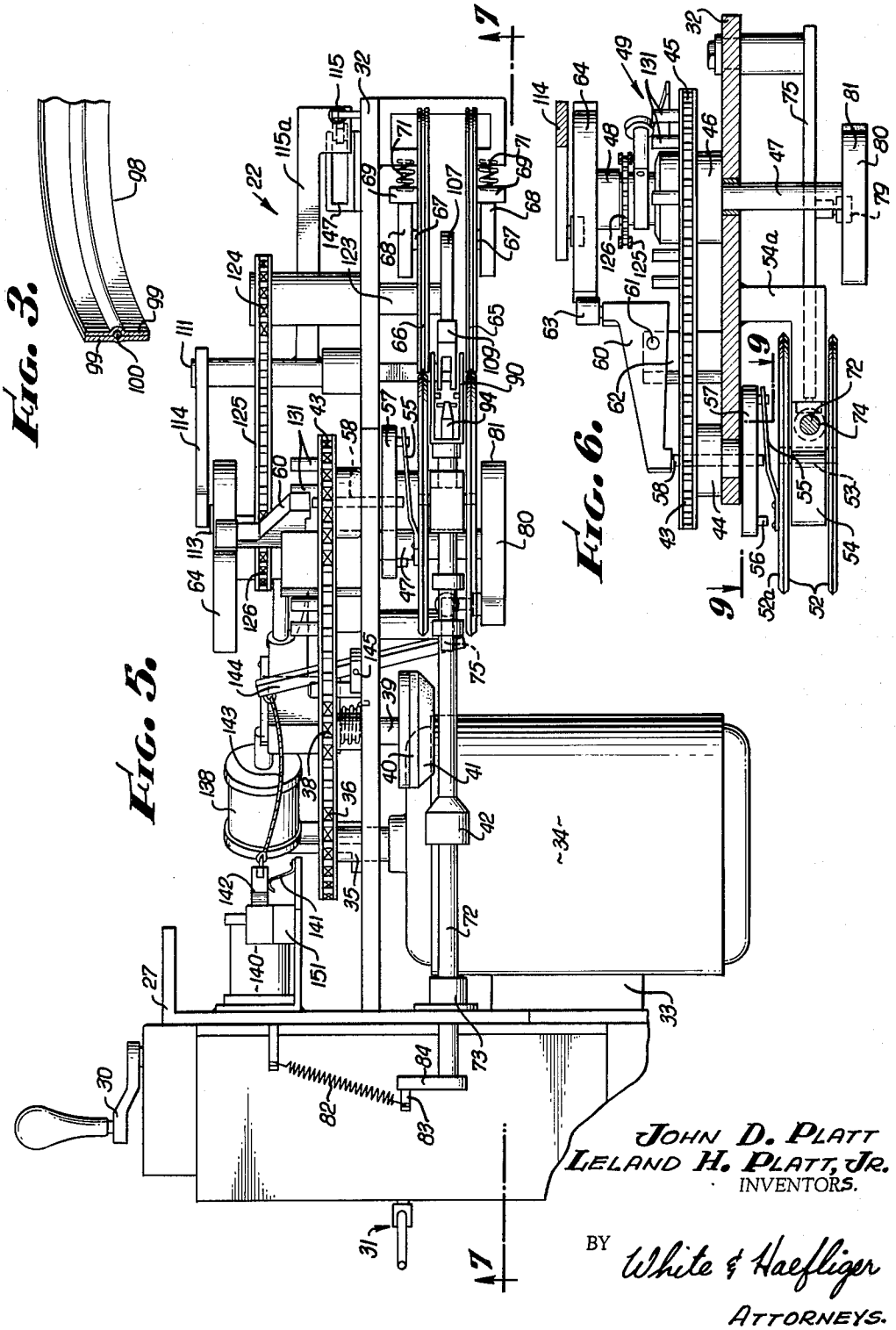


FIG. 3.

FIG. 5.

FIG. 6.

JOHN D. PLATT
LELAND H. PLATT, JR.
INVENTORS.

BY White & Haefliger
ATTORNEYS.

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FLEXIBLE BAG CLOSING MACHINE

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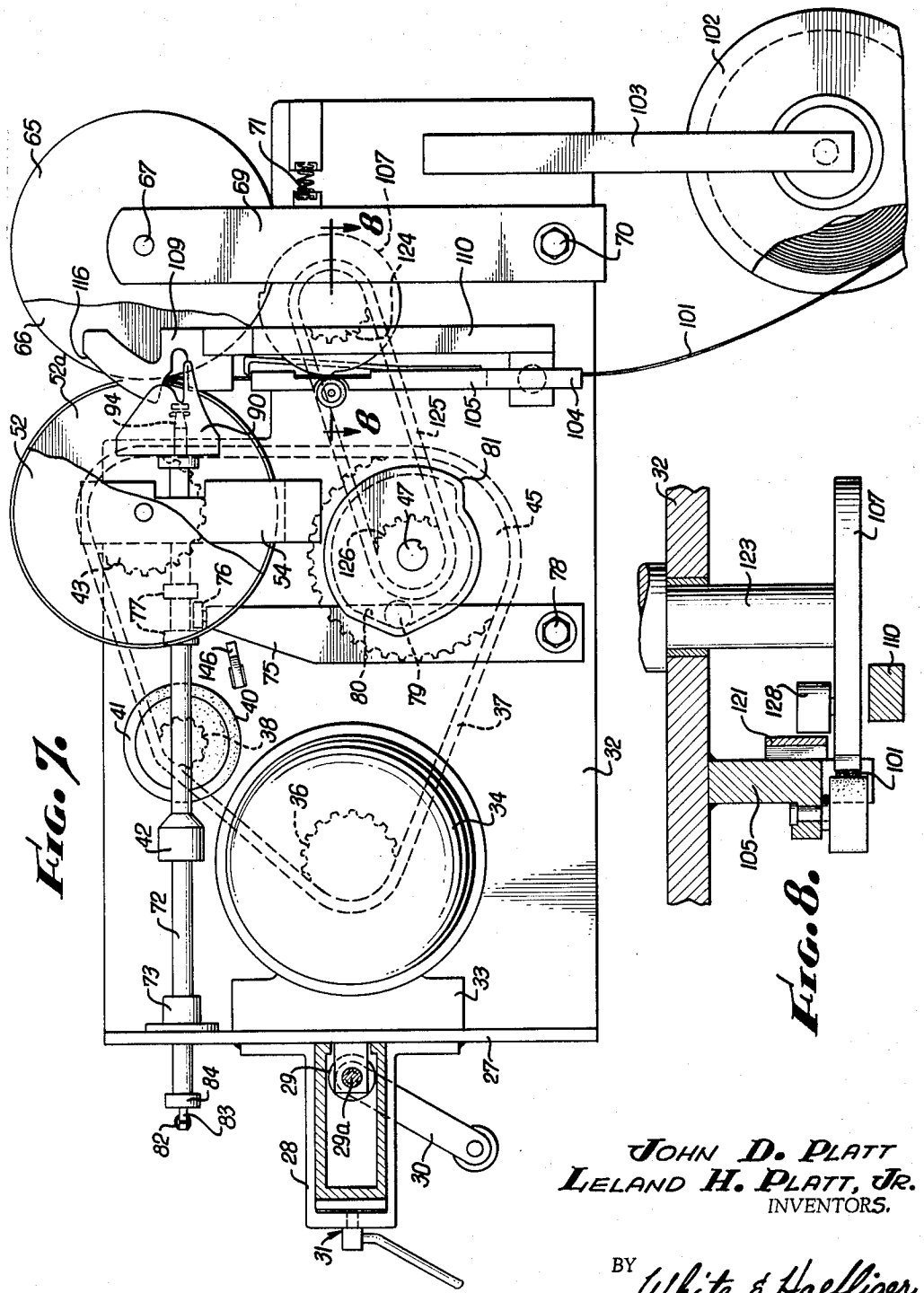


FIG. 7.

FIG. 8.

JOHN D. PLATT
LELAND H. PLATT, JR.
INVENTORS.

BY White & Haefliger
ATTORNEYS.

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FIG. 9.

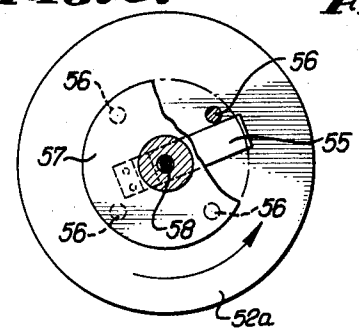
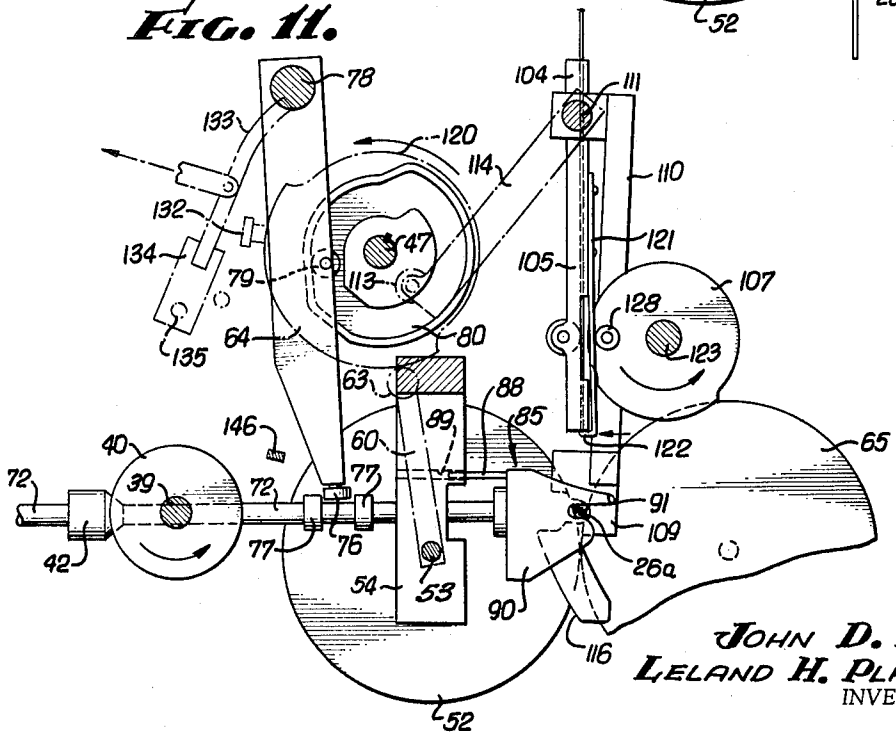


FIG. 10.

FIG. 11.



JOHN D. PLATT
LELAND H. PLATT, JR
INVENTORS.

BY White & Haefliger
ATTORNEYS.

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FIG. 12.

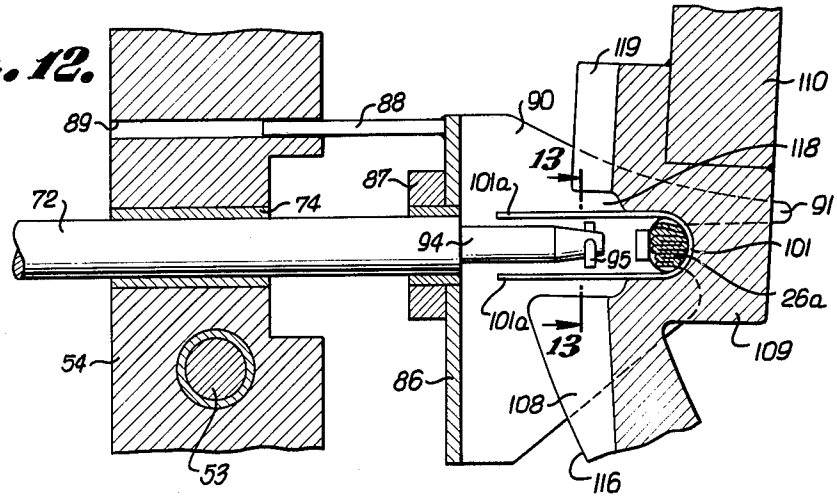


FIG. 14.

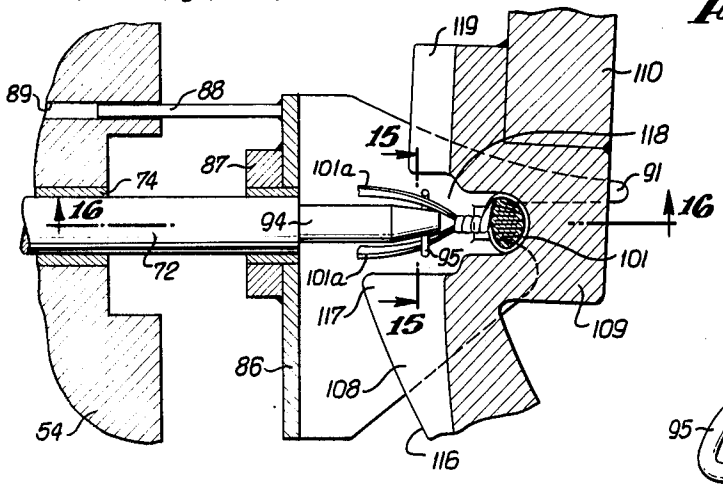


FIG. 13.

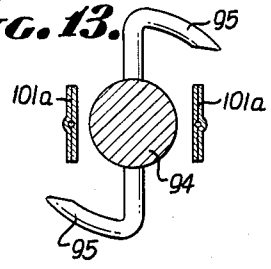


FIG. 15.

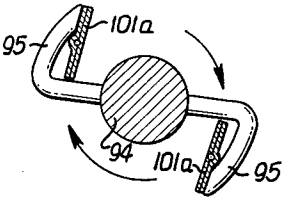
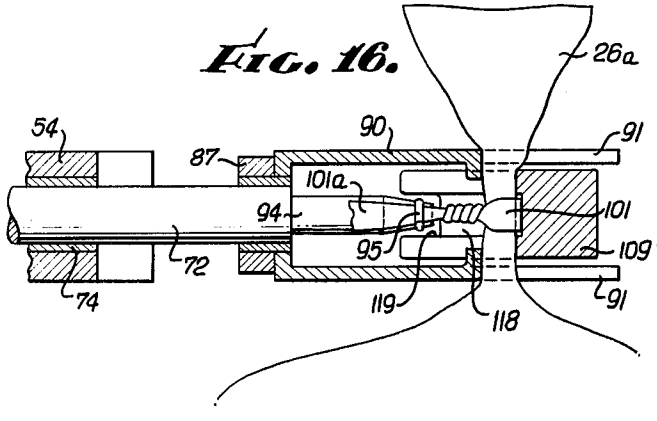


FIG. 16.



JOHN D. PLATT
LELAND H. PLATT, JR.
INVENTORS.

BY White & Haefliger
ATTORNEYS

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FIG. 17.

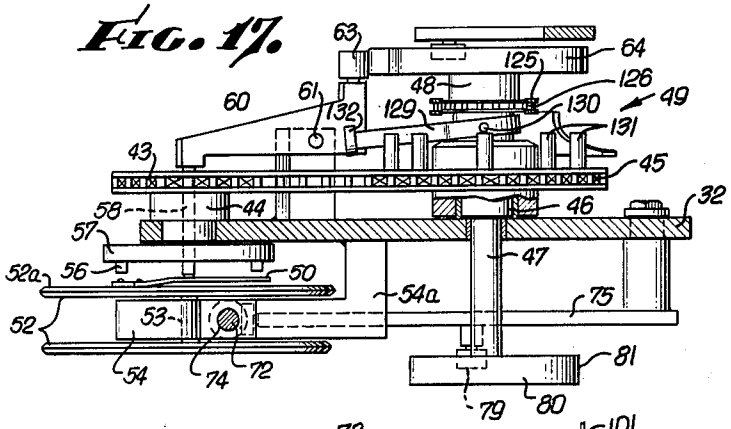


FIG. 18.

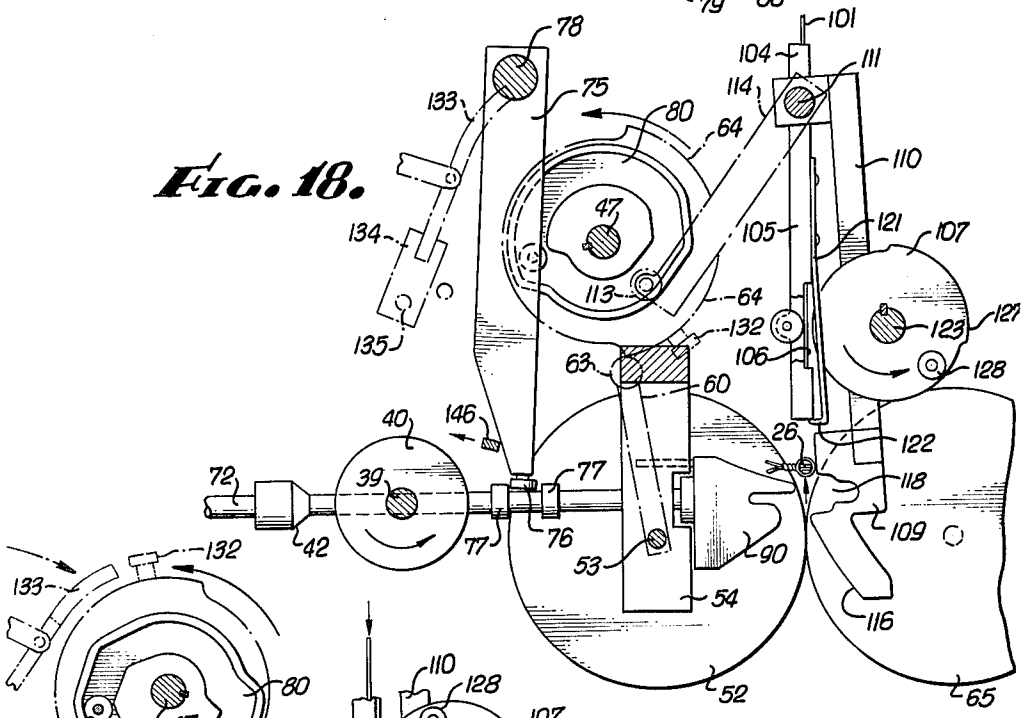
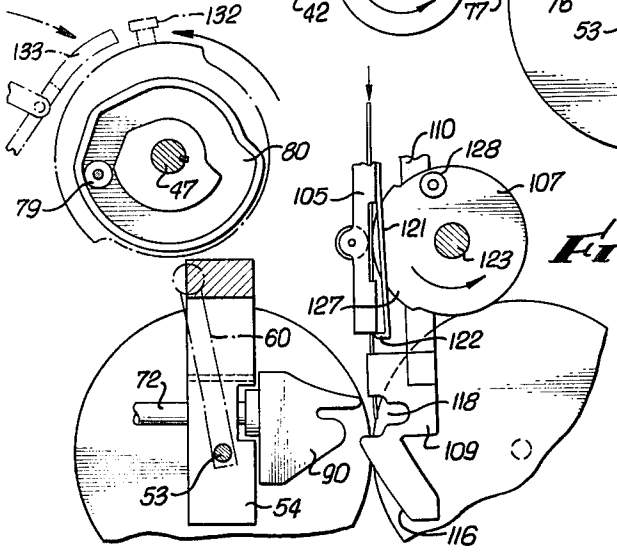


FIG. 19.



JOHN D. PLATT
LELAND H. PLATT, JR.
INVENTORS.

BY White & Haefliger
ATTORNEYS.

United States Patent Office 3,261,143 Patented July 19, 1966

3,261,143

FLEXIBLE BAG CLOSING MACHINE

John D. Platt and Leland H. Platt, Jr., Los Angeles, Calif., assignors to Doughboy Industries, Inc., New Richmond, Wis., a corporation of Wisconsin

Filed Mar. 15, 1963, Ser. No. 265,531
14 Claims. Cl. (53—135)

This invention relates to improved mechanisms for the twisted application of twist-strand material about the gathered necks of flexible bags, such as thin plastic bags used for the packaging of vegetable or fruit produce, bakery goods and the like. Particularly contemplated, though without limitation, is a machine of this character applicable to the twist-tying of somewhat larger than average size bags, e.g. of produce, and which may be used or operated in or out of association with bag conveyors, including flighted conveyors.

Machines intended to serve bag gathering and closing functions by the use of adhesive tape, as distinguished from the more easily removable and reapplicable twist strands herein contemplated, are dealt with in prior Platt Patents 2,821,055, 2,840,967, 2,867,066, 2,867,067 and in copending application Serial Number 91,831, now Patent No. 3,099,116.

In certain of its aspects, the invention aims to provide improvements in apparatus employing a bag closing assembly positionable according to one of its uses, to overlie a conveyor so that the bags are receivable at the closing station in essentially upstanding open neck condition. More specifically in this respect, the invention departs from prior practices of which we are aware, by incorporating in a compact conveyor-overlying head assembly, means for feeding to the closing station a twist-type strand (by which generally is meant a strand material so composed as to retain securely a twisted condition) which is applied and twisted about the bag neck by powered twisting mechanisms incorporated in the head assembly as to operate directly at the closing station.

Other objects of the invention have to do with the manner in which the strand initially is brought about the gathered bag neck, and the positional and operating relationships of the twister mechanisms.

According to the system employed in copending application Serial Number 262,427, the strand material is fed across the path of the bag neck being gathered so that free portions of the strand extend generally in the bag path, and the twister mechanism is located to accommodate the strand extents so positioned. Specifically, that system provides for advancement of the bag material to aid in doubling the strand about the bag neck preparatory to twisting.

The present invention provides for feeding the strand material generally alongside of the bag path approaching gathered condition and then displacing one or both of the strand and bag relatively laterally in the operation of doubling the strand terminals sufficiently for accommodation by the twisting mechanism. For such purposes it is found advantageous to employ bag blocking and strand deflecting jaws which operate sequentially to receive the gathered bag neck and undoubled strand material between them, and then to double the strand.

The invention particularly aims to provide a rotatable twister in novel and highly efficient association with the jaw parts as characterized. As will appear, we position a rotating twister shaft so that its twisting terminal has direct access to the jaw held strand, and structurally and functionally is so associated therewith as to twist the doubled strand in sequence with the bag gathering and earlier strand deflection. In this respect, the invention contemplates a novel shaft assembly and selective actuation, serving the dual functions of a jaw or blocking element mount, and a rotational drive for a terminal twister.

The invention has various additional features including the associated strand feeding and severing mechanism, as well as control systems for assuring closely timed operation of the twister in sequence with preliminary conditioning of the bag neck and applicable strand length. All these will be understood more fully from the following detailed description of an illustrative embodiment of the invention shown by the accompanying drawings, in which:

FIG. 1 is a perspective showing of the apparatus positioned over a bag conveyor;

FIG. 1A is a diagrammatic showing of the electrical control system;

FIG. 2 illustrates the twist-tied bag neck;

FIG. 3 is a view showing an illustrative form of twist-tape;

FIG. 4 is a plan view of the bag gathering and tying assembly with the FIG. 1 cover housing removed;

FIG. 5 is a front side elevation of FIG. 4;

FIG. 6 is a broken cross section taken on line **6—6** of FIG. 4;

FIG. 7 is a bottom view of FIG. 5 taken as indicated by line **7—7**;

FIG. 8 is an enlarged fragmentary section on line **8—8** of FIG. 7;

FIG. 9 is a fragmentary broken section on line **9—9** of FIG. 6;

FIG. 10 is a view illustrating the positions of the strand cutting, bag gathering and twister parts at substantially the point of bag advancement against the blocking means;

FIG. 11 is a similar view showing the positions of the same parts immediately following and at the conclusion of the bag compaction;

FIG. 12 is a fragmentary sectional enlargement of the parts at the closing station as conditioned for the strand twisting;

FIG. 13 is an enlarged fragmentary section on line **13—13** of FIG. 12;

FIG. 14 is a view similar to FIG. 12 showing the parts at the completion of the twisting operation;

FIG. 15 is a cross sectional enlargement taken on line **15—15** of FIG. 14;

FIG. 16 is a section taken on line **16—16** of FIG. 14;

FIG. 17 is a view similar to FIG. 6 showing the gathering wheel drive clutch disengaged;

FIG. 18 is a view similar to FIGS. 10 and 11 illustrative of the parts upon removal of the bag from the closing station; and

FIG. 19 is a view showing the strand feed preparatory to the successive operating cycle.

Referring first to the general showing of FIG. 1, a suitable supporting structure typified by post **20** and its base **21** mounts the bag gathering and tying assembly generally indicated at **22** in direct overlying relation to a suitable conveyor means generally indicated at **23**, where the apparatus is to be used in conjunction with a conveyor. Merely as illustrative, the conveyor is shown to comprise an endless driven belt **24** having a component correspondingly traveling upstanding guide or support **25** to assure maintenance of the bags **26** in essentially upright position as they are advanced by the conveyor to the assembly **22**. As will be observed, the bags will have been filled to an extent leaving free their upper end open neck extents **26***a* with the sides of the bag brought together more or less in alignment with the later described gathering wheels, a condition that may be maintained when necessary, by the machine operator.

The assembly **22** may be mounted for vertical adjustment to accommodate varying bag heights, as by attachment of the assembly housing **27** to a sleeve bracket

28 movable vertically on the frame post 20, and by providing the housing with a threaded lug 29 through which passes a screw shaft 29*a* rotatable by handle 30 to raise or lower the assembly. The latter may be fixed in adjusted position by the locking device at 31.

Referring to FIGS. 4 and 5, the assembly 22 is shown (with removed housing) to comprise a base plate 32 fixed to the housing end 27 which also suitably mounts as by bracket 33 a motor 34 which drives the assembly parts, as will appear. The motor shaft 35 carries above the base 32 a sprocket 36 carrying chain 37 which drives sprocket 38 on the shaft 39 of wheel 40 having a frustro conical friction surface 41 engageable with a corresponding annulus 42 on the twister shaft, all as will later appear. From sprocket 38 chain 37 extends about a sprocket 43 on the gathering wheel clutch shaft 44, see FIG. 6. Chain 37 completes its continuity about sprocket 45 rotatable in relation to the enlarged hub 46 fixed to a sectional cam shaft having a reduced extension 47 extending through and below the base 32. As will develop, rotation of sprocket 45 is transferable to the cam shaft by a clutch device generally indicated at 49. At this point it may be mentioned that throughout repeated cyclings of the machine, sprocket 36, shaft 39 with its friction element 40, sprocket 43 with its shaft 44, wheel clutch dics 57 referred to below, and sprocket 45 remain in continuous rotation. Shaft 46–47 rotates only when the clutch is engaged, and then for single revolution only.

The advancing bags are received between peripherally contactable pairs of axially spaced wheels generally indicated at 50 and 51, the former consisting of wheels 52, see FIG. 6, which may be surfaced with rubber or other material resistant to slippage against the bag necks. These wheels are keyed to a shaft 53 extending through support 54 depending by its arm 54*a* from the underside of the base plate 32. The upper wheel 52*a* carries a vertically deflectable spring arm 55 which is engageable with any of circularly spaced pins 56 projecting downwardly from disc 57 carried on shaft 44. The spring arm and pins function as a clutch which is engaged in the FIG. 6 condition and which is disengageable by downward displacement of a pin 58 to deflect the spring 55 from contact with any of the pins, as to the condition illustrated in FIG. 17. Pin 58, in turn, is actuated by an arm 60 pivoted at 61 on support 62, the arm carrying a follower 63 engaging cam 64 on the clutch driven shaft 48. Thus, in accordance with the timing later described, the cam displaces arm 60 and the pin 58 to disengage the clutch spring 55 from the FIG. 6 condition, the clutched drive from disc 57 to the wheels 52 being restorable by self-deflection of the spring arm 55 against one of the pins 56, as permitted by the contour of the cam 64.

Referring particularly to FIGS. 4 and 5, the wheel pair 51 comprises individual wheels 65 and 66 respectively opposed to the lower and upper wheels 52, having their shafts 67 carried by arms 68 projecting from arms 69 pivoted at 70 and urged by springs 71 to peripherally engage the wheel pairs in the absence of a bag between them. As the bag neck enters between the pairs, the effect of the spring pressured thrust of wheels 65 and 66 is to flatten the bag neck in the sense of bringing its sides together, and to provide for frictional advancement that will compact the bag against the later described blocking means.

A shaft 72, see FIGS. 5, 6 and 7, is journaled for rotation and also axial displacement in bearing 73 and at 74 within the driven wheel support 54. As previously indicated, shaft 72 carries a tapered friction element 42 engageable with the wheel 41 to produce rotation of the shaft as when the latter is shifted from the FIG. 5 to the FIG. 11 position. Such shifting is effected by an arm 75 carrying a terminal roller 76 received between space sleeve 77 on the shaft, arm 75 being pivoted to the base plate 32 at 78 and carrying depending roller 79 engaging the inside cam surface 80 of cam 81 keyed to shaft 47.

As will appear, the action of the cam is initially, in reference to FIG. 5, to displace shaft 72 to the right but short of engaging the drive members 41 and 42, and then to produce such engagement for actuation of the terminal twister. Following each rotative drive of the shaft 72, the latter is restored to the FIG. 5 angular position by the action of spring 82 attached to pin 83 on the shaft arm 84.

The opposite end of the shaft mounts a bifurcated blocking element generally indicated at 85, the closed end 86 of which has an integral bearing 87 within which the shaft 72 is rotatable, rotation of the blocking element itself being prevented by pins 88 which are reciprocable within openings 89 in the support 54 in accordance with reciprocations of the shaft 72. The corresponding sides 90 of the blocking member are shaped, as illustrated, to provide arms 91 which are projectable across the path of the bag neck 26*a*, as in the FIG. 10 position, at a location which is termed the closing station at 92 directly beyond the points of peripheral contact or proximity of the wheel pairs 50 and 51. Inwardly of the projections 91, the blocking element sides are recessed at 93 for accommodation of the gathered bag neck as in FIG. 11.

The shaft reduced terminal 94 projecting between the blocking element sides 90 carries a pair of oppositely turned hooks 95, see FIGS. 13 and 15, which are engageable with the later described strand extents which have become doubled about the gathered bag neck, to twist them together as appears in FIGS. 14 and 16. At this point it may be mentioned that the action of cam 79 through arm 75 initially is to project the blocking element 85 from the FIG. 4 to the FIG. 10 position, following which the cam further projects the blocking element to the point of interengageability of the friction drive members 41 and 42 to rotate the shaft through a limited number of revolutions required for twisting of the strand by the hook terminals 95.

As illustrative of a suitable strand material for twisting about the bag necks, we show in FIG. 3 a flattened ribbon-like strand 98 composed of paper or plastic laminations 99 between which is received a wire 100 serving the dual purposes of aiding in retention of the twist and also a curvature of the strand being fed past the closing station 92 in the condition illustrated by FIG. 10.

Referring to FIG. 4, the strand material 101 is fed from reel 102 carried by arm 103 through a guide channel 104 in a stationary bar 105 recessed at 106, see FIG. 18, to accommodate a roller 107 engageable by the strand. As the strand 101 is fed to the bag closing station 92, it assumes a curved configuration resulting from the tendency of the feed wheel 107 to give to the strand a degree of curvature causing it to be received within recess 108 of member 109 carried on the end of arm 110 pivoted at 111 to be swung at times by the action of cam 112, see FIG. 4, engageable by follower 113 on an arm 114 which has fixed relation to the arm 110. Also in fixed relation to these arms is a third arm 115*a* terminally connected to spring 115 which normally tends to engage follower 113 with the cam 112. Referring again to member 109, the latter is shown to present an anular face surface 116 terminating at 117, which is the innermost extent of the sides having between them the recess 108. Above, member 109 is recessed at 118 and horizontally slotted at 119. At the inwardmost position of member 109 appearing in FIGS. 4 and 11, surface 116 is disposed angularly across the path of the advancing bag neck 26*a* so that movement or thrusting of the latter against surface 116 will cause member 109 to swing outwardly to the FIG. 10 position, which passes the bag material to be compacted by the rotating wheels against blocking element projections 119. As member 109 is so displaced, the cam follower 113 is permitted to accommodate such displacement by movement into the cam recess 120.

The strand guide member 104 mounts a knife 121 which normally is sprung outwardly as in FIG. 10, allowing the

strand **101** to clear the in-turned cutting edge **122** of the knife. A wheel **107** is fixed to shaft **123** extending upwardly through the base plate **32** and carrying sprocket **124** driven by chain **125** from sprocket **126** on the upper cam shaft **48**. Wheel **107** is positioned alongside the knife **121** and has a radially extended arcuate surface **127** which when rotated against the strand **101**, operates to feed a length thereof to the closing station **92**, corresponding to the arcuate extent of surface **127**. The wheel also carries a roller **128** which engages the knife **121** deflecting it toward support **104** to cause the knife cutting edge **122** to sever the strand at the undersurface of **104**. The strand feed occurs at the last of an operating cycle, and cutting of the strand occurring at the first of an operating cycle.

Referring to FIG. 17, the upper cam shaft **48** carries arm **129** pivoted at **130** at the shaft for upward swinging, the arm in its lowered position being receivable between any of circularly spaced pins **131** carried by sprocket **45**. The arm and pins thus serve as clutch parts to engage and disengage the drive from the lower cam shaft section **46–48** and cams **64** and **112**. The arm **129** terminally carries a roller **132** adapted to travel a retractable elevating cam **133** in the form of an arm extending from mount **134** pivoted at **135** for horizontal swinging. The cam arm is connected by link **136** to the reciprocable core terminal **137** of a solenoid **138**. Actuation of the solenoid in one direction pulls the cam **133** from beneath roller **132** allowing arm **129** to drop between pins **131** and reverse actuation of the solenoid brings the cam **133** into the path of the rotating arm, allowing roller **132** to ride up the cam and elevate arm **129** to disengage the clutch.

Plate **32** also mounts a second solenoid **140**, the core reciprocation of which is frictionally resisted spring **141**, see FIG. 5, bearing against the wall extension **142**. The latter has a flexible connection **143** with a lever **144** pivoted at **145** and extending downwardly to a terminal **146**, see FIGS. 10 and 18, engageable by arm **75** as and for purposes that will appear.

A double throw switch **147** is positioned for engagement of its actuating arm **148** by arm **115***a*, see FIG. 4, and a second switch **149** serving an interrupter function is positioned so that its actuator arm terminal **150** engages and is displaced by the periphery of cam **64** which also is engaged by roller **63** on the gathering wheel clutch lever **60**. A third switch **151** has its actuator **152** positioned for engagement by the solenoid lug **153** upon its displacement to the left from the FIG. 4 position.

In considering a cyclic operation of the machine, assume first the parts to be positioned as in FIG. 4 with the bag neck **26***a* being advanced for reception between the wheel pairs **50** and **51**. Usually the operator of the machine will thrust the bag edge between the wheels and against surface **116**, although this may not be necessary in all instances. The effect of the bag engagement and advancement by the wheels against and along surface **116**, is to displace member **109** and the arm assembly **110**, **114** to the FIG. 10 position, as permitted by the accommodation given follower **113** in the cam recess **120**. FIG. 10 shows wheel **109** to have rotated to the point of strand feed completion, with roller **128** about to contact the knife arm **121** to sever the strand. By reason of the pre-established position of arm **75** as determined by cam **81**, the bifurcated blocking element extensions **91** will have been projected as in both the FIG. 4 and FIG. 10 positions, into the path of the advancing bag neck **26***a*. The wheel pairs **50** and **51** operate to repeatedly compact the bag neck by successive folds against the projections **91** while the strand **101** is positioned alongside and in contact with the bag material at least when it becomes fully gathered, as permitted by accommodation of the strand initially between the gathering projections and within recess **108**.

Upon completion of the bag gathering, member **128** strikes bar **121** causing cutter **122** to sever the strand. Concurrently, edge of cam **64** contacts follower **63** which depresses pin **58** to disengage **55** from pin **56**, causing wheel rotation to stop. Then cam **81** displaces arm **75** to shift shaft **72** to the right, thus correspondingly moving the entire blocking element **85**, while in the same sequence cam **112** displaces arms **114**, **110** and member **109** inwardly to the FIG. 11 position in which the gathered bag neck N becomes held within recesses **93** and **118** which are brought into confining relation about the bag neck by virtue of the movement together with members **85** and **109**, which thus cooperate as closable and openable jaws.

This condition is illustrated by FIG. 12 wherein it is shown that the positioning of the gathered bag neck into recess **118** resulting from the movement together of **85** and **109** doubles the strand **101** about the neck in a manner causing the free end extent **101***a* to be positioned at opposite sides of the shaft terminal **94** and in the rotative path of the twister hooks **95**. Cam **81** then further displaces shaft **72** the short distance required for engagement of friction driving members **40** and **42**, resulting in rotation of hooks **95** through sufficient turns to securely twist together the strand extents **110***a* to the condition appearing in FIGS. 14 and 16. Thereupon, shaft **72** displaces to the left and member **109** is swung oppositely away, to release the tied bag for movement by the conveyor out from the closing station as illustrated in FIG. 18. Concurrently with the opening of **109** and **72**, the raised surface portion of wheel **107** (FIG. 18 and 19) is contacting the tape and advancing it into position for the next bag, such advance being completed just as the cycle finishes.

The electrical system for controlling the described operating sequences will be understood by reference to the wiring diagram of FIG. 1A. Again assuming the entire mechanisms to be in the FIG. 4 condition, deflection of the jaw **109** and consequent swinging of arms **115***a* actuates micro-switch **147** which is shown to have two switch components **147***a* and **147***b*, the former of which is normally closed and **147***b* normally being opened, as the leading edge of the bag enters the closing station and member **116** is displaced to the right, causing **115***a* to move counterclockwise, thus closing the red (FIG. 1A) circuit through switch **147***b* to relay solenoid **140** so that its plunger moves to the left. Thus arm **152** is deflected to close the switch **151**. When compacting of the bag neck is completed, arm **115***a* will return to its initial position as indicated in FIG. 1A. The red circuit to solenoid **140** is thus opened, but **153** will continue to bear against **152** by virtue of the snubber **141**, thus keeping the circuit through **151** closed. When **114** returns it also allows contacts **147***a* to close. The circuit is now closed through the blue wiring to clutch solenoid **138** through interrupter switch **149**. Now cam **133** swings out, allowing follower **129** to drop and contact one of the revolving cam shaft pins **131**. The cam shaft now starts to rotate.

After the strand is twisted member **75** pulls back and contacts part **146** which pulls flexible connector **143** to return **142** to its original position. This opens the blue circuit to solenoid **138**, thus allowing cam **133** to return to its original position. Simultaneously with the last stated sequence, arm **114** is again displaced because cam **112** is moving member **109** to the FIG. 18 position to release the bag. This position is the same as the FIG. 10 position and thus would cause **140** to trip **138** undesirably during the cycle, except for the fact that **64** has now revolved to a position which opens the blue circuit through the interrupter switch **149**. The last described opening of the blue circuit to **138** and displacement of member **114** occur at about the halfway point in a single revolution of the cam shaft. The latter rotates until follower **132** rides up on the cam **133** and arm **129** clears the pins **131**, whereupon the cycle is completed.

We claim:

1. Bag closing apparatus comprising:

(A) structure for supporting an assemblage in which

open neck bags are movable to an essentially single location closing station,

(B) blocking means positioned at said station in the bag path,

(C) means operating to thrust and compactly gather each bag neck against said blocking means,

(D) means for feeding successive lengths of a twistable strand to said station,

(E) displacing means producing relative displacement between the strand and to cause the strand to double about the neck, and

(F) a rotatable twister positioned in direct proximity to the gathered bag neck at said station to receive the doubled extents of the strand and operating to twist them about the bag neck immediately upon said doubling of the strand.

2. Apparatus according to claim **1**, in which said strand feeding means operates to feed the strand along one side of the path taken by the bag material in being thrust against said blocking means.

3. Apparatus according to claim **2** in which said displacing means produces lateral displacement of the strand in a direction laterally of said path and against the gathered bag neck to cause doubling of the strand with the ends of the strand extending transversely of said path.

4. Apparatus according to claim **2** in which said displacing means produces lateral displacement of the strand in a direction laterally of said path and against the gathered bag neck to cause doubling of the strand with the ends of the strand extending transversely of the path,

said rotatable twister including a rotary twister shaft extending transversely of said path and to said station.

5. Apparatus according to claim **1**, in which said displacing means produces lateral displacement of the strand against the gathered bag neck to cause said doubling of the strand.

6. Apparatus according to claim **1**, including also means for shifting the blocking means into and out of the bag neck path and means for rotating said twister intermittently in timed relation with said shifting of the blocking means.

7. Apparatus according to claim **6**, in which said twister is also bodily displaced in timed relation to the shifting of the blocking means.

8. Apparatus according to claim **1**, in which said bag thrusting means comprises a pair of power driven rotating wheels receiving and passing the bag neck between them and said twister operates in direct proximity to the bag material passing from between the wheels.

9. Apparatus according to claim **8**, comprising means for interrupting the wheel drive following gathering of the bag neck.

10. Bag closing apparatus comprising:

(A) structure for supporting an assemblage in which flexible open neck bags are movable to a closing station,

(B) blocking means positioned at said station in the bag path,

(C) means operating to thrust and compactly gather each bag neck against said blocking means,

(D) means for feeding successive lengths of a twistable strand to said station so that the strand becomes doubled about the bag neck,

(E) a rotatable twister positioned at said station to receive the doubled extents of the strand and operating to twist them about the bag neck immediately upon the doubling of the strands, and

(F) means mounting and interconnecting said blocking and twister means for movement together so that the blocking means is brought into and out of the path of the bag neck.

11. Apparatus according to claim **10**, in which said blocking means and twister are connected to the same rotatable and bodily shiftable shaft.

12. Apparatus according to claim **10**, including means for initially shifting said shaft to bring the blocking means into the bag neck path and for sequentially rotating the shaft and twister.

13. Bag closing apparatus comprising:

(A) structure for supporting an assemblage in which flexible open neck bags are movable to an essentially single location closing station,

(B) blocking means positioned at said station in the bag path,

(C) means operating to thrust and compactly gather each bag neck against said blocking means,

(D) means for feeding successive lengths of a twistable strand to said station so that the strand becomes doubled about the bag neck,

(E) a rotatable twister positioned at said station to receive the doubled extents of the strand and operating to twist them about the bag neck immediately upon doubling of the strand, and

(F) a member receiving and positioning the strand at the side of the bag neck opposite the gathering means, said member and gathering means being relatively movable together to double the strand about the bag neck.

14. Apparatus according to claim **13**, in which said blocking means and member are in the form of interfitting jaws confining the bag neck between them.

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FRANK E. BAILEY, *Primary Examiner.*

L. S. BOUCHARD, *Assistant Examiner.*