

May 5, 1964

W. J. WILSON ETAL
BAG TYING MACHINES

3,131,520

Filed June 29, 1961

3 Sheets-Sheet 1

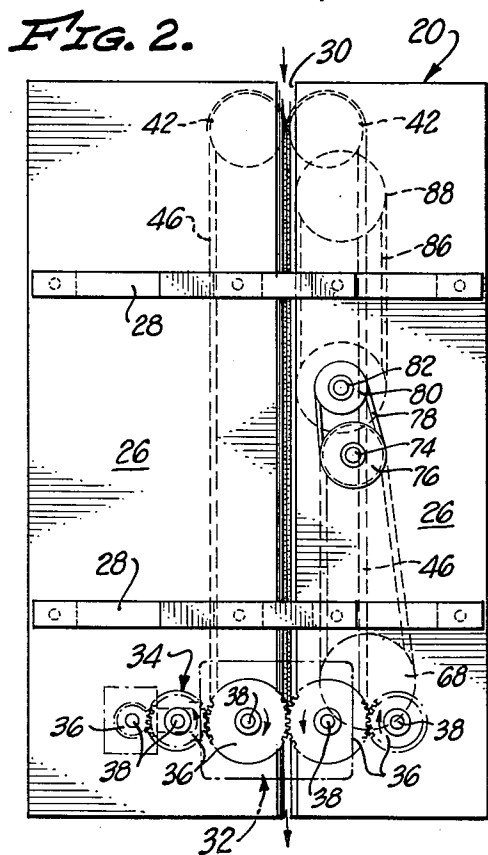
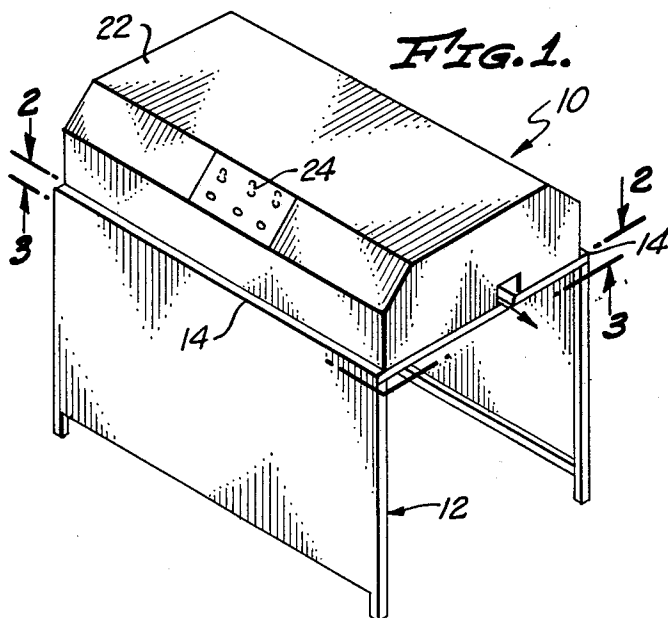


FIG. 8.

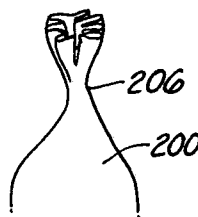


FIG. 9.

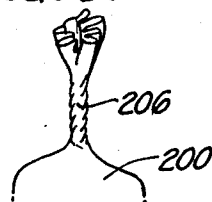


FIG. 10.

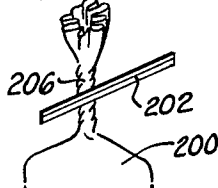


FIG. 11.

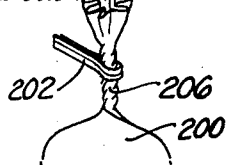
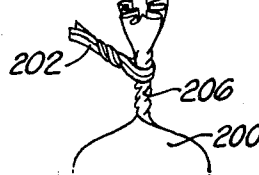


FIG. 12.



INVENTORS
CARL H. PETERSON,
WILLARD J. WILSON
BY **O'BRIAN & BLACKHAM**
ATTORNEYS

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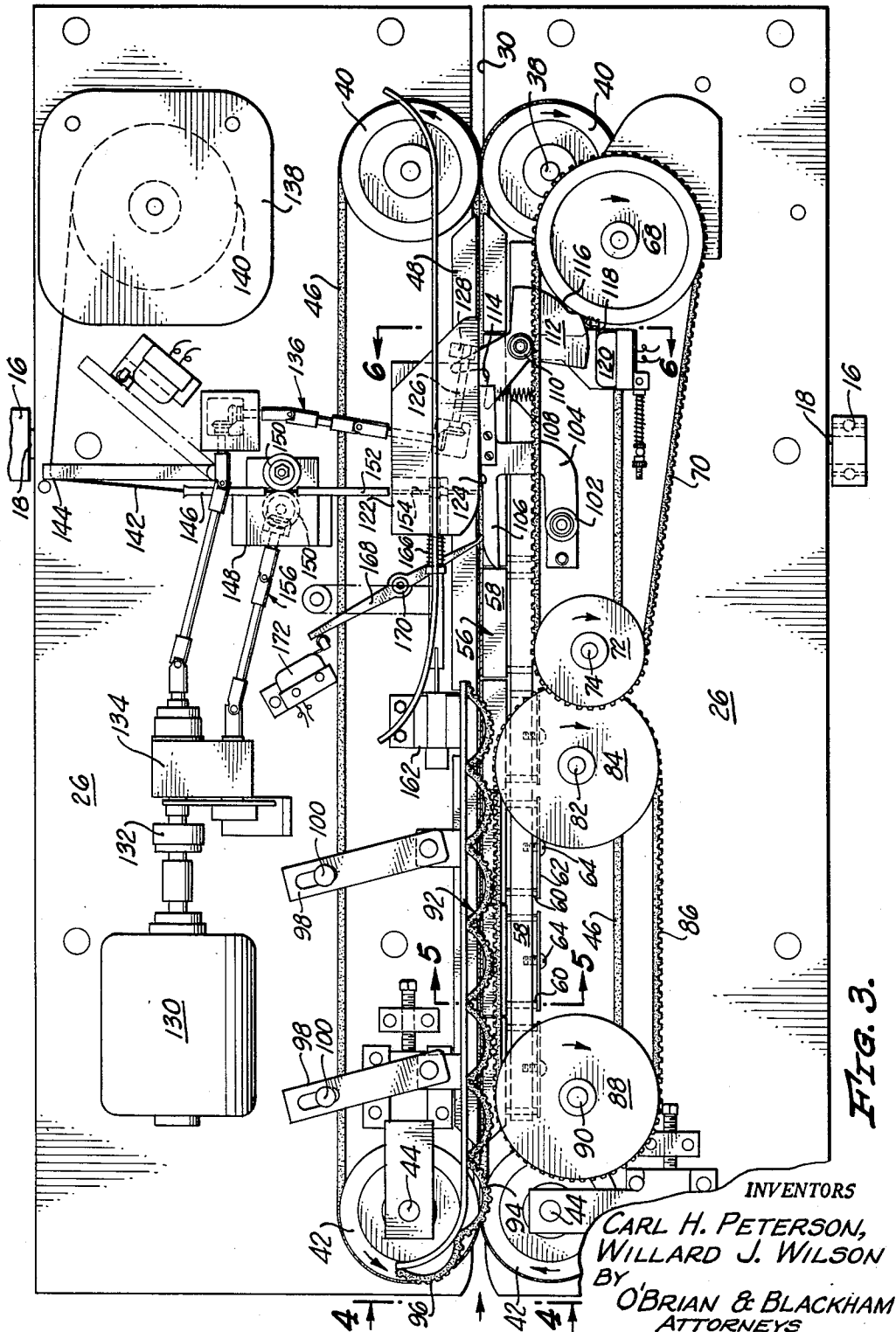
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FIG. 4.

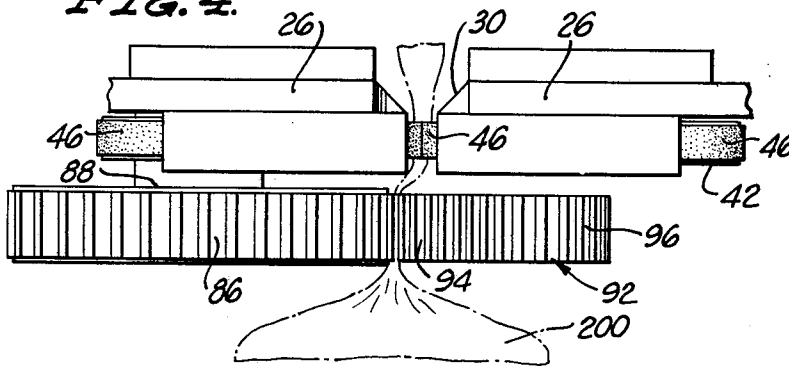


FIG. 5.

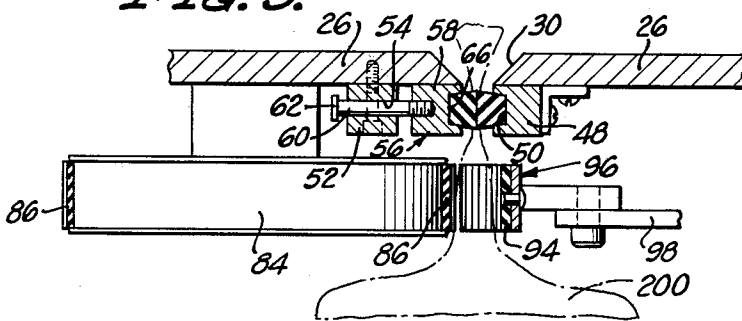


FIG. 6.

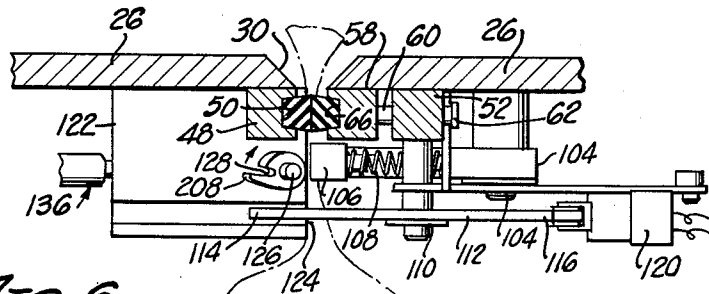
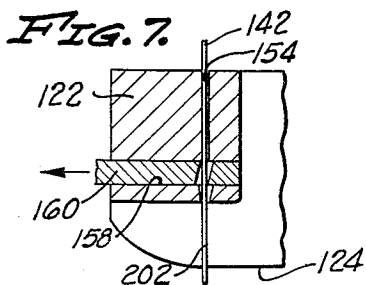


FIG. 7.



INVENTORS
CARL H. PETERSON,
WILLARD J. WILSON
BY O'BRIAN & BLACKHAM
ATTORNEYS

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BAG TYING MACHINES

Willard J. Wilson and Carl H. Peterson, both of
9739 Burke Ave., Seattle, Wash.

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7 Claims. (Cl. 53-176)

This invention pertains to new and improved bag tying machines and to a method of tying bags.

Bags or sacks are commonly used as containers for many types of different goods. Virtually whenever a bag or sack is used as a container in prepackaging various goods the top of such a bag or sack must be closed in one manner or another. A wide variety of different means have, of course, been used for this general type of purpose. Thus, for example, in the past bags have been sealed by various stitching, heat sealing and other procedures. Although methods of these generalized types are well established and although machines for carrying out these known types of sealing procedures are in common usage, there is nevertheless a need for comparatively inexpensive structures of a reliable character which can be used in closing bags containing different types of commodities and goods.

A broad object of the present invention is to provide new and improved bag tying machines meeting this need. Another object of the present invention is to provide bag tying machines which can be constructed at a comparatively nominal cost, which are capable of reliable performance and which are capable of being easily used for the intended purpose. A further object of the present invention is to provide a new simple, effective method for use in tying bags containing various commodities so that these bags are closed.

These and various other objects of this invention as well as many specific advantages of it will be apparent to those skilled in the field to which this invention pertains from a detailed consideration of the remainder of this specification including the appended claims and from a consideration of the accompanying drawings in which:

FIG. 1 is a perspective view of a tying machine of this invention;

FIG. 2 is a cross-sectional view taken at line 2-2 of FIG. 1;

FIG. 3 is a cross-sectional view taken at line 3-3 of FIG. 1;

FIG. 4 is a cross-sectional view taken at line 4-4 of FIG. 3;

FIG. 5 is a cross-sectional view taken at line 5-5 of FIG. 3;

FIG. 6 is a cross-sectional view taken at line 6-6 of FIG. 3;

FIG. 7 is an enlarged partial sectional view showing the operation of a guillotine cutter bar used with the tying machine; and

FIGS. 8, 9, 10, 11 and 12 are diagrammatic views indicating steps performed during the operation of the complete invention.

The accompanying drawings are primarily intended so as to clearly illustrate a presently preferred embodiment or form of this invention. Those skilled in the art to which this invention pertains will realize that various differently appearing machines may readily be constructed through the use or exercise of routine engineering skill so as to utilize the essential features embodied within the machine shown in the accompanying drawings. For this reason the accompanying drawings are not to be taken as limiting this invention. The appended claims forming a part of this specification set forth and define the various features embodied within the bag tying machine illustrated which are considered to constitute the present invention.

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Although the present invention is considered to be summarized in these appended claims, for the purpose of understanding the invention it can be stated in essentially summary form that it pertains to bag-tying machines, each of which includes holding means for holding the top of a bag; engaging means for twisting a bag by contact with it as its top is held by the holding means so as to provide a twisted neck in the bag; stabilizing means for preventing such a twisted neck from untwisting as its top is held by the holding means; and closure locating and closure tying means for locating a self-supporting deformable closure capable of being bent to a desired configuration around the twisted neck of a bag held by both the holding means and the engaging means and then tying this closure about this neck so as to effectively close the bag.

Apparatus

The actual details of this invention will be apparent from a careful consideration of the accompanying drawings. Here there is shown a complete bag-tying machine 10 of the present invention which includes a framework 12 used to support the entire machine 10. This framework includes side members 14 which hold bearings 16. These bearings 16 through the use of small shafts 18 rotatably hold a complete support table 20 which in turn holds the principal parts of the machine 10 as hereinafter described. With this construction the support table 20 may be rotated so that the various part mounted upon the undersurface of it as visible in FIG. 3 may be exposed for servicing and other related operations. Normally the support table 20 is covered by means of a protective cover or hood 22 which is located upon the framework 12 as indicated in FIG. 1. This hood 22 carries various controls 24 used in starting and stopping the complete machine 10.

The support table 20 consists of two elongated rectangular members 26 which are joined together by means of vertically extending braces 28 as indicated in FIG. 2 of the drawings so as to define an elongated slot 30 which extends completely from one end of the machine 10 to the other end of this machine between the members 26. Upon one of the members 26 there is mounted a conventional electric motor 32 which serves to drive a gear train 34 in order to cause the rotation of various pulleys as hereinafter described. This gear train 34 consists of a plurality of individual gears 36, each of which is mounted upon a shaft 38 held by the support table 20.

As is best seen in FIG. 3 of the drawings two of the shafts 38 are used to transmit rotation to two different pulleys 40 located on opposite sides of the slot 30. These pulleys 40 work in conjunction with other pulleys 42 which are mounted upon further shafts 44 on the members 26 adjacent to the end of the support table 20 remote from the pulleys 40. An elongated conventional V-belt 46 is mounted so as to extend around each of the pulleys 40 and one of the pulleys 42. With this construction the V-belts 46 are located so as to extend adjacent to one another generally in the vertical plane of the slot 30 immediately below this slot 30 during the operation of the entire machine 10. From the arrows indicated on the pulleys 40 and 42 in FIG. 3 of the drawings it will be seen that the belts 46 travel between the ends of the machine 10 beneath the slot 30 parallel to one another. The belts 46 also travel at the same speed.

One of the members 26 holds an elongated back-up bar 48 having a groove 50 formed therein. The groove 50 is adapted to receive the internal edge of one of the V-belts 46. A mounting bar 52 is located on the member 26 remote from the back-up bar 48. This mounting bar 52 is provided with a series of spaced holes 54 which extend through it generally toward the back-up bar 48. This mounting bar 52 is utilized in order to support a plurality

of pushers 56 which are employed in order to resiliently hold the two V-belts 46 against one another during the normal operation of the machine 10. Each of these pushers 56 includes a comparatively short bar 58 from the back of which there extends pins 60, each of which pins 60 extends through one of the holes 54. Small leaf springs 62 are mounted upon the mounting bar 52 by means of screws 64 in such a manner that the extremities of the springs 62 bear against the pins 60 so as to urge the pushers 56 toward the back-up bar 48. Each of the pushers 56 includes a groove 66 corresponding to the groove 50 previously described.

From a consideration of FIGS. 2 and 3 of the drawings it will be seen that one of the shafts 38 which is rotated by the gear train 34 serves to rotate an enlarged pulley 68; the pulley 68 is located on the undersurface of the supporting table 20 generally beneath the V-belts 46. An elastomeric belt 70 having an irregular or notched external surface is used with the pulley 68 in such a manner as to cause a rotation of another pulley 72. This other pulley 72 serves to drive a shaft 74 which in turn drives a conventional V-belt pulley 76. This pulley 76 works in conjunction with another conventional V-belt 78 so as to drive a further pulley 80. This further pulley 80 causes rotation of a shaft 82 which is attached to it so as to transmit motion to a pulley 84. This pulley 84 works in connection with a belt 86 which is similar to the belt 70 in order to cause rotation of another pulley 88 which is mounted upon a shaft 90. The shafts 74, 82 and 90 are, of course, mounted on one of the members 26.

From the foregoing it will be seen that with the machine 10 the motor 32 is utilized so as to drive a number of different separate belts; from an examination of the drawings the relative sizes of the pulleys driven by the motor 32 will be realized. Briefly, the belt 86 is operated so that the linear movement between the pulleys 84 and 88 is more rapid than the linear movement of the V-belts 46 beneath the slot 30 and that the belt 70 operates at a speed which corresponds to the linear speed of the V-belts 46. It will, of course, be realized the belts 70 and 86 are located generally beneath the support table 20 so as to be spaced further from this support table than the V-belts 46. It will also be realized that these belts 70 and 86 move between the respective pulleys holding them in paths which are parallel to the paths of the V-belts 46 and with the slot 30.

From a consideration of FIG. 4 of the drawings it will be realized that the belt 86 travels generally beneath the slot 30 so as to be offset slightly to one side of the vertical plane passing through the slot 30 and so as to be offset in the same manner with respect to the V-belts 46 in the areas where these V-belts move so as to be held against one another. From a consideration of FIG. 6 of the drawings it will be realized that the belt 70 is also located to one side of a vertical plane passing through the slot 30 and between the V-belts 46, and that this belt 70 is located further from the support table 20 than the belt 86.

In the machine 10 there is utilized an elongated engaging bar 92 having a high friction type of rubber or similar corrugated surface 94 which is generally located so as to face the belt 86. This surface 94 extends in a serpentine-like path so that the parts of it are spaced further from the belt 86 than other parts of it. An extremity 96 of the engaging bar 92 adjacent to an end of the table 20 is curved away from the slot 30 as shown in FIG. 3. This engaging bar 92 is mounted upon brackets 98 which are held with respect to one another on one of the members 26 by means of bolts 100 in such a manner that the relative position between the engaging bar 92 and the belt 86 may be easily changed during the operation of the machine 10.

A bearing 102 on one of the members 26 carries a bell-crank shaped arm 104 which in turn supports a compressing bar 106. This bar is normally biased for rota-

tion by means of a small spring 108 which is located between it and the member 26. The same member 26 which carries the bearing 102 also carries a further bearing 110 which in turn holds a neck-squeezing plate 112 having a bifurcated, fork-like end 114. This plate 112 also includes another cam shaped end 116 which is designed so as to engage an operating arm 118 extending from a micro-switch 120. This switch 120 is mounted upon the member 26.

The member 26 remote from the member 26 holding the compressing bar 106 and the plate 112 holds a back-up housing 122 which is located so as to have a surface 124 normally engaged by the compressing bar 106. This housing 122 serves as a bearing so as to carry a shaft 126 which carries a tying screw 128 having a generally helical type of shape as indicated in FIG. 6 of the drawings. Power is supplied to the shaft 126 from a motor 130 through an electro-magnetic clutch, 132, an electric brake 134 and a universal joint and gear drive 136.

The member 26 holding the housing 122 also holds another housing 138 which in turn covers a rotatable spool 140 mounted upon this particular member 26. The spool 140 is used as a supply for a flat, elongated, self-supporting, deformable tying strand 142. As shown in FIG. 3 of the drawings the strand 142 extends from the spool 140 around a corner 144 used for straightening purposes and into a tube 146 which is mounted upon a drive block 148. This block holds frictional rollers 150 having elastomeric surfaces in engagement with one another. With this structure the strand 142 passes through these rollers 150 so that when they are rotated it is advanced through another tube 152 into a hole 154 within the back-up housing 122. One of the rollers 150 is normally powered from the motor 130 by means of a drive 156 extending from the electric brake 134.

In the housing 122 the hole 154 is traversed by a passage 158 containing a guillotine type cutter bar 160 (FIG. 7). This cutter bar 160 extends out from the passage so as to be operatively connected to a solenoid 162 mounted upon the support table 20. A spring 166 is located so as to be biased by the cutter 160 and the housing 122 for the purpose of normally holding this cutter 160 so that the strand 142 can be moved past it.

Upon the undersurface of the support table 20 an elongated trip lever 168 is mounted so as to be capable of rotating about a bearing 170. This trip lever 168 is used so as to actuate a micro-switch 172 which in turn is mounted upon a member 26 as indicated in FIG. 3.

Operation

The machine 10 is utilized in tying the neck of bags such as the bag 200 indicated in FIGS. 8-12 of the drawings, through the use of a small segment or length 202 of deformable tying material obtained from the strand 142 through the operation of the cutter bar 160 in severing this strand 142. For convenience of description the operation of the tying machine 10 will be described in the following in connection with the tying of a single bag 200 although, obviously, this machine is intended to be continuously used in tying a series of bags.

During the use of the machine 10 the bag 200 enters the slot 30 as indicated by the arrows in FIGS. 2 and 3 of the drawings. As it enters this area it is engaged between the V-belts 46 so that the top of this bag 200 is held against motion by these V-belts 46. These V-belts serve as "holding means" so as to hold the top of the bag 200 as the bag is moved between the ends of the support table 20 along the length of the slot 30 by engagement of the belts 46. The pushers 56 are capable of giving sufficiently during the operation of the machine 10 so as to accommodate the bag 200 as it travels in this manner.

As soon as the bag 200 is held between belts 46 it is engaged by the engaging bar 92 a short distance below the neck 206 of this bag as indicated in FIG. 4 of the draw-

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ings. As this occurs the bag 200 tends to be rotated as it is "dragged" along the surface of the engaging bar 92. As the bag 200 moves along this engaging bar 92 it is also engaged by the belt 86 so as to be twisted to a configuration as indicated in FIG. 9 of the drawings. This twisting is considered to be important. The difference in the linear speeds of the belts 46 and 86 is, of course, a cause of this twisting action caused by the belt 86.

When the bag 200 passes from between the engaging bar 92 and the belt 86 it is "picked up" so as to "rest" against the belt 70. This belt 70 serves to prevent untwisting of the neck 206 as the entire bag is being conveyed further through the machine 10. Because of this the belt 70 may be termed a "stabilizing means." During such movement the neck 206 engages the trip lever 168 so as to actuate the micro-switch 172 in order to accomplish a function as hereinafter described. At about the point that the neck 206 engages the trip lever 168 it is forced by the compressor bar 106 against the surface of the housing 122 so as to be compressed toward a generally flat configuration. While the neck 206 is compressed in this manner it is moved past the length 202 which has been severed from the strand 142 through the operation of the guillotine cutter bar 160. In effect, the neck 206 moves against the strand 142 as indicated in FIG. 10 of the drawings and deforms the length 202 as indicated in FIG. 11 of the drawings by contact with this strand so as to be bent more or less in the configuration of a common clothespin or cotterpin extending at right angles to the twisted neck 206. From this it will be seen that the hole 154 holds the severed length 202 traverse to the path of movement of the neck 206 so as to act, in effect, as a closure-locating means which serves to locate the length 202 about the neck 206.

As the bag 200 moves past the engaging bar 92 the bag comes into engagement with the end 114 of the plate 112. This end 114 engages the neck 206 immediately below the length 202 so as to effectively squeeze this neck 206 as tightly closed as possible. As the bag 200 moves further the plate 112 rotates along with the neck 206 so as to intensify the squeezing action against the surface of the back-up housing 122. As the neck 206 is located adjacent to the tying screw 128 it is held tightly twisted and tightly closed. At this point the tying screw 128 is rotated so that the extremity 208 of it picks up the trailing edge of the length 202 and twists this length as indicated in FIG. 12 of the drawings, tying the bag 200 closed. The extremity 208 extends far enough from the axis of the rotation of the screw 128 so as to pass through a vertical plane extending through the slot 30 as this screw rotates. This twist extends along the length 202 because as it is being made the tying screw 128 continues to rotate. As the bag 200 moves past the tying screw the plate 112 turns further until finally the neck 206 is disengaged. The bag then is conveyed by engagement with the V-belts 46 out of the machine 10 as indicated by the arrows in FIGS. 1 and 2.

During this sequence of operations a control means is, of course, used in a conventional manner. The control means 24 mounted upon the hood 22 are used so as to actuate the motors 32 and 130 and to actuate various other relays and circuit components of a conventional type, not specifically described herein because of the known generalized character. It is noted, however, that these controls work in connection with the micro-switch 120 and 172 and the solenoid 162, the clutch 132 and the brake 134 in such a manner that the micro-switch 172 causes actuation of the solenoid 162 when the lever 168 is engaged by a neck 206 so as to sever the length 202 from the strand 142. As a conventional time delay mechanism forming a part of it the controls 24 actuate the brake 134 so as to turn the rollers 150 as soon as the severed length 202 is picked up by a bag so as to advance the strand 142 the correct length. Similarly the micro-switch 120 is engaged by the cam-shaped end 116 of

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the plate 112 so as to actuate the brake 134 and the clutch 132 in order to turn the tying screw 128 when a neck 206 is located in its proper position with respect to this tying screw.

From a consideration of the foregoing those skilled in the art to which this invention pertains will realize that tying machines, such as the machine 10, can be continuously operated so as to rapidly tie the necks of various types of bags or similar structures containing goods of one type or another and that these machines are comparatively simple to construct and to utilize, and because of their simplicity that these machines are comparatively extremely reliable in use. Because of the nature of this invention and the fact that many different changes of a routine engineering nature may be made in the specific structure shown without departing from the essential features of operation and construction described herein, this invention is to be limited solely by the appended claims forming a part of this disclosure.

We claim:

1. A bag tying machine which comprises, in combination:

a pair of support plates having spaced adjacent edges defining a slot between said plates;

holding means for holding the tops of bags extending through said slot and for moving the tops of said bags along said slot;

engaging means for engaging portions of bags held by said holding means located remote from said holding means and for twisting the necks of bags so held as said bag tops are moved along said slot;

stabilizing means for holding bags twisted by said engaging means and held by said holding means so that the necks of said bags remain twisted as said bags are moved along said slot;

closure locating means for locating a self supporting closure capable of being bent to a desired configuration around a twisted neck of a bag held by said holding means and by said stabilizing means;

and closure tying means for twisting closures located around the necks of bags held by said holding means and said engaging means tightly about the necks of such bags so as to tie such bags closed, all of said foregoing means being operatively associated with one another.

2. A bag tying machine as defined in claim 1 wherein said holding means include: two holding belts located adjacent to one another so as to be capable of clamping a top of a bag between said holding belts during movement of said holding belts and means for moving said holding belts.

3. A bag tying machine as defined in claim 2 wherein said means for holding also include means for resiliently holding said belts in contact with one another.

4. A bag tying machine as defined in claim 2 wherein said engaging means comprises: an elongated member having a surface designed to engage the principal portion of a bag held by said holding belts so as to cause such a portion of said bag to rotate, resulting in the neck of such a bag being twisted.

5. A bag tying machine which comprises in combination:

holding means for holding the tops of bags, said holding means including two holding belts located adjacent to one another so as to be capable of clamping a top of a bag between said holding belts during movement of said holding belts and means for moving said holding belts;

engaging means for engaging portions of bags held by said holding means located remote from said holding means and for twisting the necks of bags so held and wherein said engaging means comprises an elongated member having a surface designed to engage the principal portion of a bag held by said holding belts so as to cause such a portion of said bag to

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rotatc, resulting in the neck of such a bag being twisted;

stabilizing means for holding bags twisted by said engaging means and held by said holding means so that the necks of said bags remain twisted, and wherein said stabilizing means includes a stabilizing belt located beneath said holding belts, said stabilizing belt being capable of engaging a bag held by said holding belts to prevent the neck of such a bag from untwisting.

6. A bag tying machine as defined in claim 5 wherein said closure tying means comprises: a helical member located between said holding belts and said engaging belts and means for rotating said helical member so as to bring said helical member into contact with a closure

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located around the neck of a bag held by said holding belts and said engaging belts.

7. A bag tying machine as defined in claim 6 including means for squeezing a twisted neck of a bag having its top held by said holding belts and its principal portion held by said engaging belts as said helical member contacts a closure located around the neck of such a bag.

References Cited in the file of this patent

UNITED STATES PATENTS

1,712,454	Spencer	May 7, 1929
2,425,581	Vincent	Aug. 12, 1947
2,711,278	Gray	June 21, 1955
2,898,817	Lutz	Aug. 11, 1959
2,924,924	Jarapalo	Feb. 16, 1960