Oct. 14, 1958 P. W. JACOBSEN 2,855,995

MECHANICAL CUT-OFF FOR TEAR STRIP APPLICATOR

Filed May 12, 1954 4 Sheets-Sheet 1

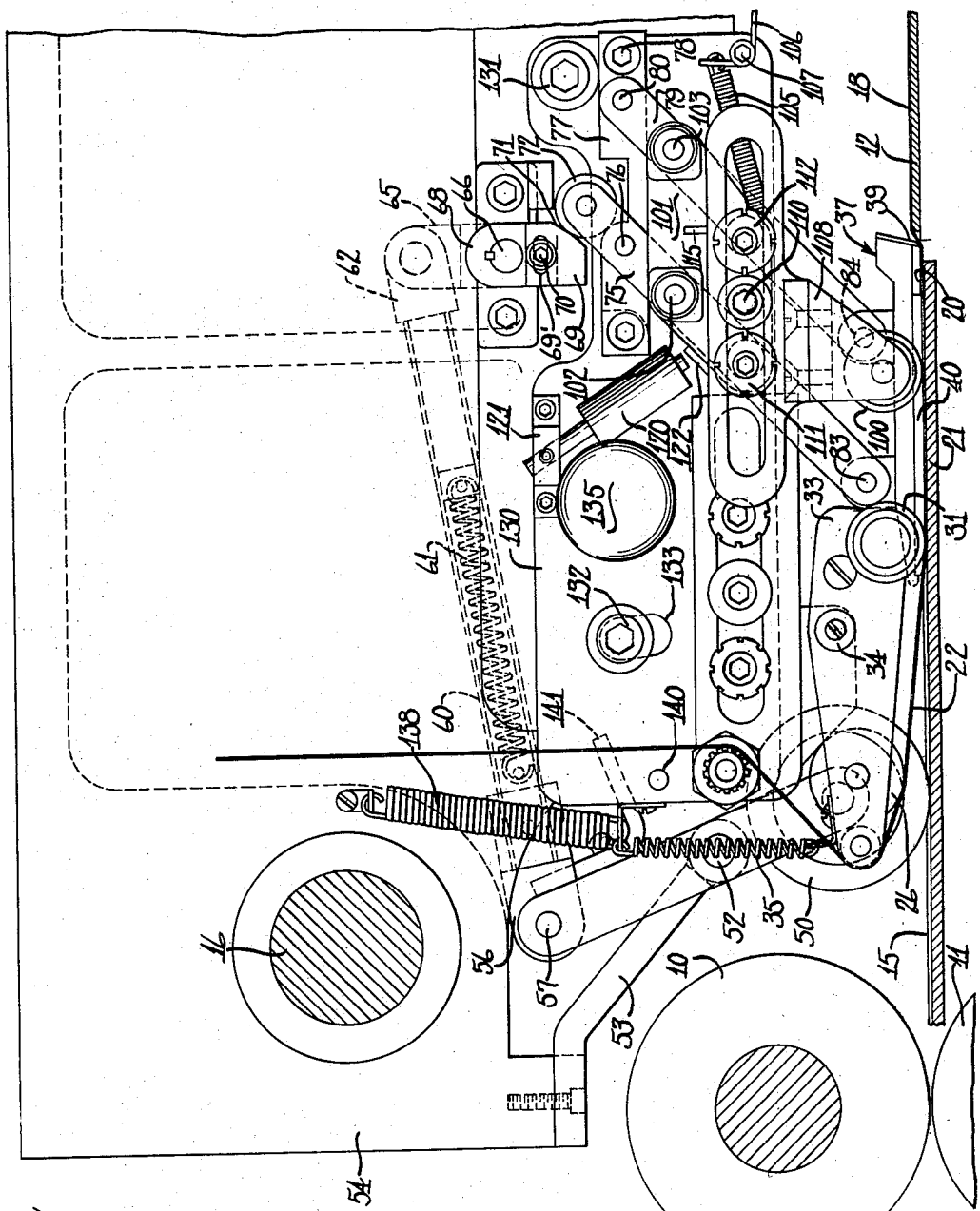


Fig. 1

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MECHANICAL CUT-OFF FOR TEAR STRIP APPLICATOR

Filed May 12, 1954 4 Sheets-Sheet 2

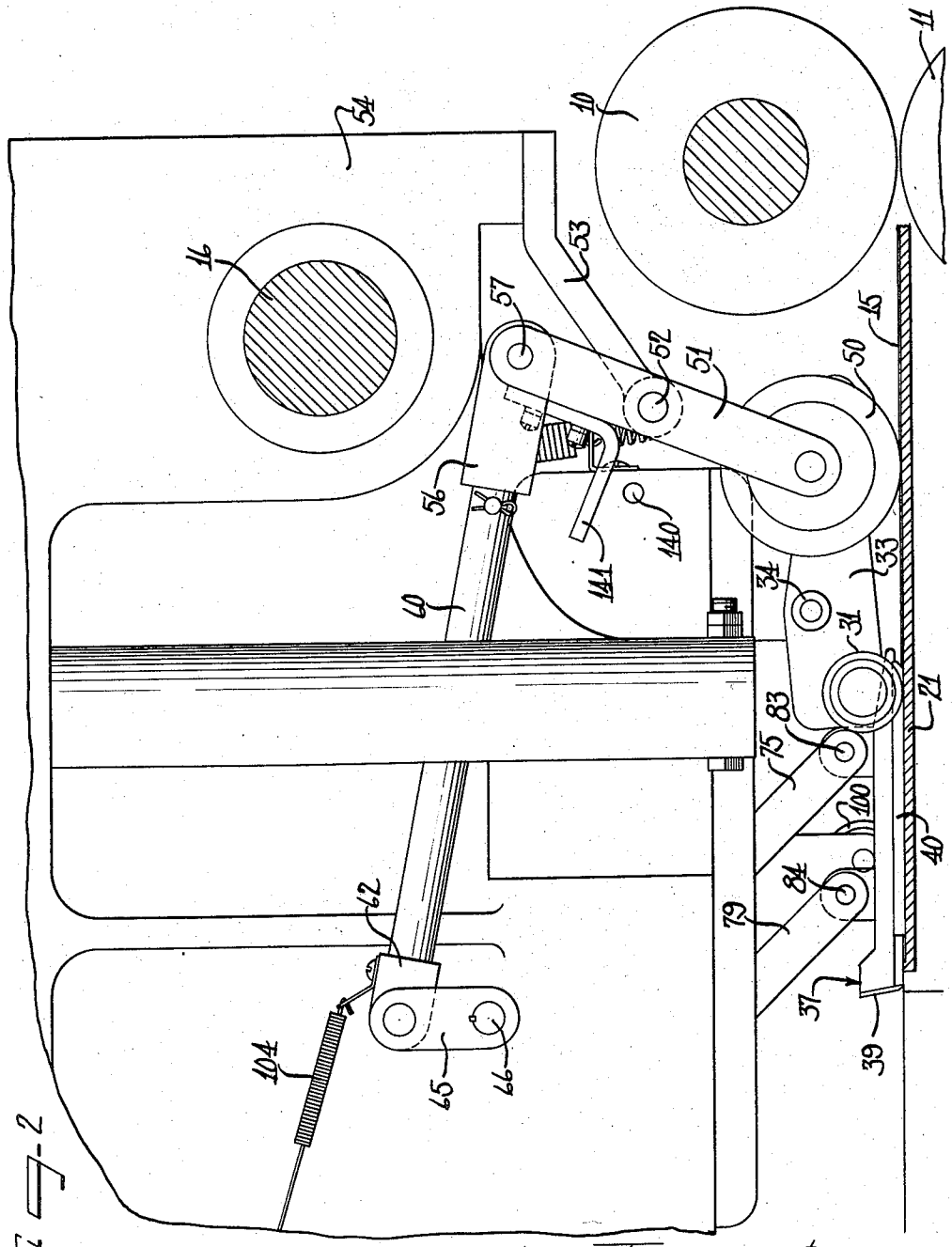


Fig. 2

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MECHANICAL CUT-OFF FOR TEAR STRIP APPLICATOR

Filed May 12, 1954 4 Sheets-Sheet 3

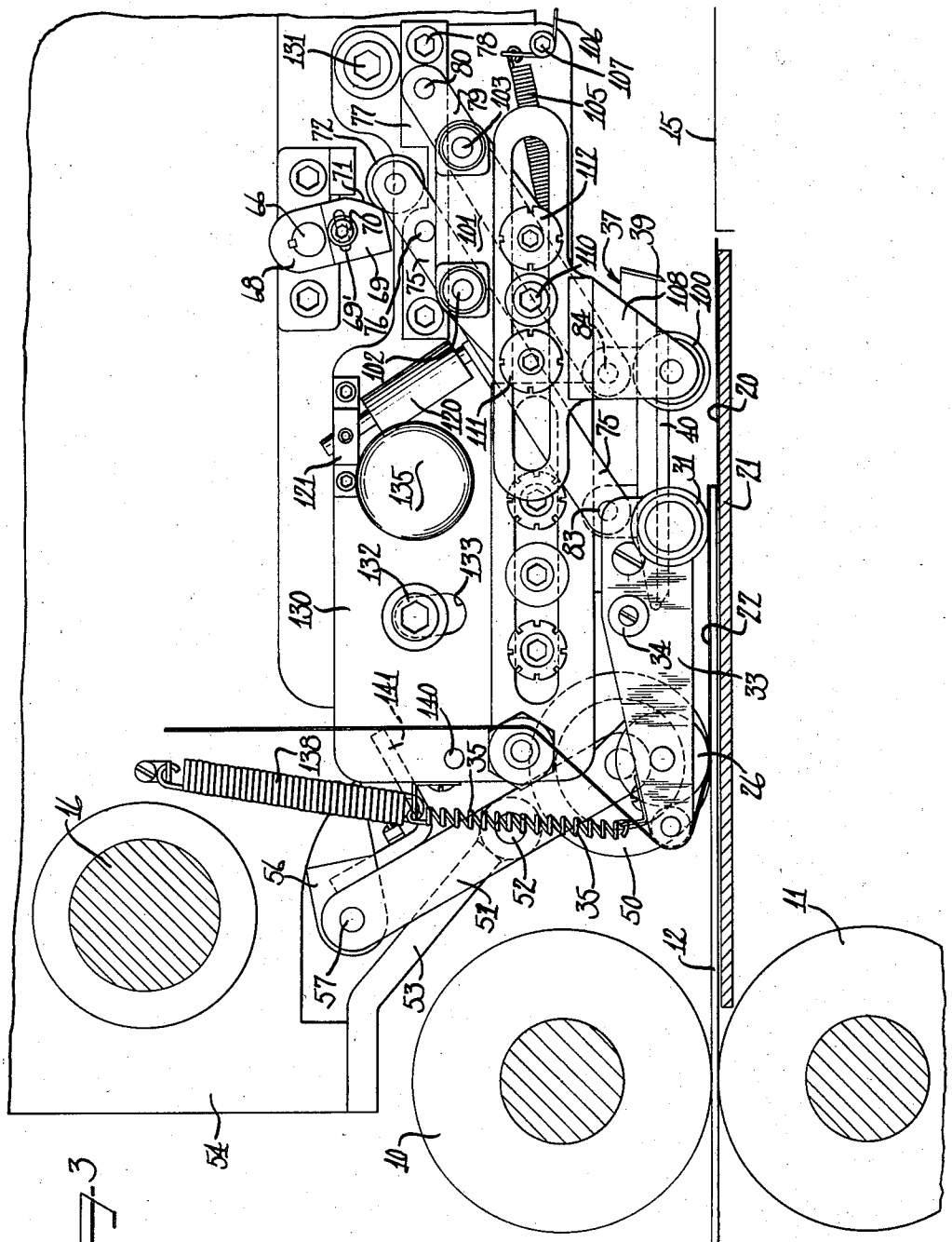


Fig. 3

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Oct. 14, 1958 P. W. JACOBSEN 2,855,995

MECHANICAL CUT-OFF FOR TEAR STRIP APPLICATOR

Filed May 12, 1954 4 Sheets-Sheet 4

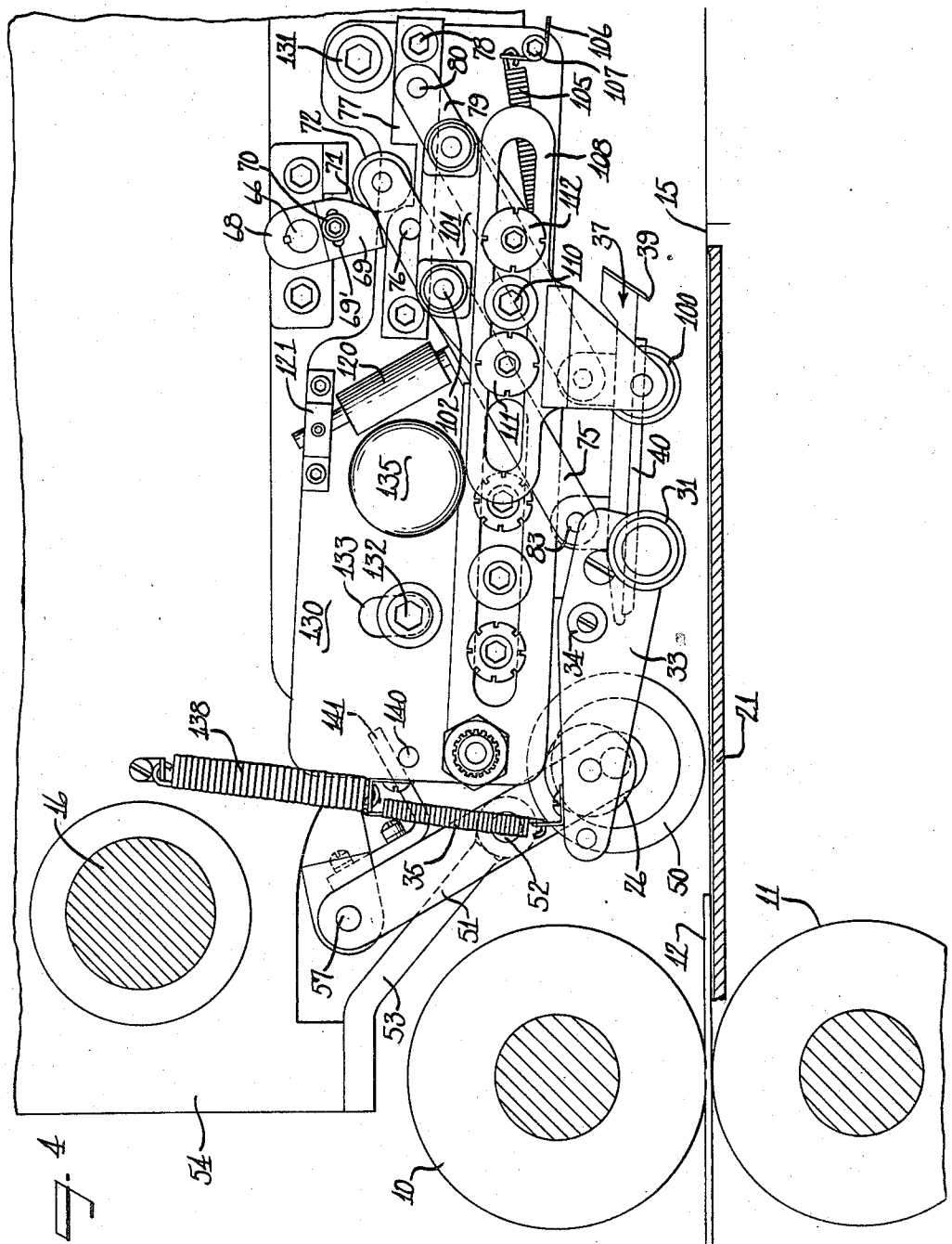


Fig. 4

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2,855,995

MECHANICAL CUT-OFF FOR TEAR STRIP APPLICATOR

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Application May 12, 1954, Serial No. 429,350

5 Claims. (Cl. 164—42)

This invention relates to means for controlling a work stroke in timed relation to movement of each of a series of articles past a work station, and particularly to apparatus for successively cutting a continuous length of tape in the application of the tape to a succession of traveling articles.

The invention has particular application to a tear strip applying machine for carton blanks. A feeding and take off mechanism suitable for delivering carton blanks to the cut-off mechanism of the present invention is illustrated in my co-pending application Serial No. 378,843, now Patent No. 2,787,467.

It is an object of the present invention to provide a cut-off mechanism for use with a tear strip applicator machine where cut-off is controlled by a mechanical system actuated automatically by travel of the carton blanks through the machine.

It is a further object of the present invention to provide a compact and rugged mechanically controlled cut-off system for use in applying tape to a succession of traveling articles.

It is another object of the present invention to provide a cut-off mechanism for a tear strip applicator which accommodates precise adjustment of the cut-off stroke in relation to the trailing edge of a carton blank traveling through the mechanism.

It is still another object of the present invention to provide a mechanical system for controlling a work operation in timed relation to a traveling article.

According to the features and objects of the present invention there is provided a cut-off system for a tape applying mechanism having means for cocking the cut-off mechanism after each cut-off and separate means cooperating with an article passing through the assembly for determining the precise timing of the cut-off stroke in relation to the trailing edge of the article.

According to other features and objects of the present invention, there is provided means for lifting the entire tape applying and cut-off mechanism away from the path of travel of the articles by means of a single control.

Other objects, features, and advantages of the present invention will be apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a fragmentary side elevational view of a cut-off system according to the present invention incorporated in a tear strip applicator mechanism with certain parts in section and showing the system in cut-off position in relation to the trailing edge of a carton blank traveling through the machine;

Figure 2 is a fragmentary side elevational view of the structure of Figure 1 looking from the side opposite that shown in Figure 1;

Figure 3 is a fragmentary side elevational view similar to Figure 1, but showing the cut-off mechanism in cocked position with a carton blank entering the tape applying section of the machine; and

Figure 4 is a fragmentary side elevational view similar

to Figure 1, but showing the mechanism raised above the path of travel of the carton blanks to provide access for threading of the tear strip or for clearing a jam-up.

As shown on the drawings:

The cut-off system of the present invention is adapted to form an integral part of a tear strip applying mechanism for use in applying tear strips to carton blanks traveling through the machine. A tear strip applicator machine including a feeding and take-off mechanism for delivering carton blanks to the tape applying mechanism is illustrated in my co-pending application Serial No. 378,843.

As illustrated in Figure 1, the tape applying section of the machine may have means including upper and lower feed rolls **10** and **11** for moving carton blanks such as indicated at **12** along an applicator deck **15**. The tape applying mechanism may be mounted on a support structure including a horizontal shaft **16** for adjustment transversely of the path of movement of the carton blanks.

The tape applying mechanism may utilize a continuous roll of normally tacky pressure-sensitive adhesive tape (not shown) from which successive strips such as **18** in Figure 1 are drawn and applied to the successive carton blanks such as **12** traveling through the tape applying section of the machine. The tape when intended as a tear strip is preferably hooked around the leading edge of the carton blank with a free end of the tape on the underside of the blank serving as a tab which will be disposed on the exterior of the assembled carton and which is pulled to tear open the carton.

In operation of the tape applying mechanism, a length of tape is drawn from the supply roll (manually in the first instance) and an end portion **20** thereof is temporarily applied to a platen **21** lying slightly below the level of the deck plate **15**. An unapplied portion of the tape indicated at **22**, extends upwardly from the platen to and around an applying roller **26** and thence upwardly to the supply roll (not shown).

When a carton blank is fed into the tape applying section by means of the feed rollers **10** and **11**, the leading end of the blank strikes a pilot roller **31**, whereby the pilot roller is raised and with it the trailing end of frame **33**, thus turning the frame counter clockwise about a pivotal shaft **34** carried by the plate **130** against the pull of spring **35**, and thereby causing the applying roller **26** at the leading end of the frame **33** to move downwardly into contact with the top surface of the blank as shown in Figure 3. The tape is thus applied by the applying roller **26** to a leading edge surface of the blank and thence along the top surface of the blank to the point of contact of the applying roller **26** with the blank. The application of this length of tape on the front edge of the blank and along the top surface thereof is accomplished by the time the blank commences to pull or withdraw fresh tape.

Continued advancement of the blank peels off the portion **20** of the tape that was initially applied to the platen **21** and thus turns the tape back on itself so that it becomes applied to the bottom of the blank until all the portion **20** has been transferred from the platen to the bottom of the blank. At the same time, the portion **22** becomes adhered to the top of the blank, since the applying roller **26** continues to bear down on the blank as long as the pilot roller **31** is held up by the blank.

After the trailing end of the blank has passed the pilot roller **31**, the spring **35** returns the applying roller frame **33** to its normal position shown in Figure 1 with the applying roller **26** above the level of the path of travel of the blanks.

A cut-off assembly indicated generally at **37** and including a cut-off knife **39** and a rubber tack down pad **40** is then actuated by the cut-off system of the present

invention to move downwardly into a cut-off position as shown in Figure 1 to sever a strip of tape such as **18** from the tape supply. A length of tape corresponding to the portion **20** in Figure 3 is drawn out along the platen **21** by movement of the carton blank **12** prior to the above described severance and is temporarily applied to the platen by the downwardly moving pad **40** to become the leading portion of the next succeeding length of tape corresponding to the length **20** in Figure 3.

The structure of the cut-off mechanism will be apparent from the following description of the sequence of operation of the parts thereof.

As a carton blank is fed through the feed rollers **10, 11** in Figure 1, the leading edge of the blank contacts a rubber roller **50** (Figures 1 and 2) which is mounted between two arms **51** which move pivotally about a shaft **52**, the shaft being mounted from a bracket **53** secured to applicator carriage **54**. The rubber surface of the roller **50** allows a slight delay in the pivotal action of the arms **51**. To provide additional delay, a block **56** (Figure 2) pivotally connected to the upper ends of the arms **51** by a shaft **57** contains needle bearings for the shaft **57** which are surrounded by rubber tire cushions. A link tube **60** contains a preloaded spring **61** (Figure 1) which is connected between the block **56** and a block **62** at the opposite end of the tube, the tube **60** limiting movement of the blocks **56** and **62** toward each other. The spring **61** serves to transmit the force exerted by the blank on roller **50** to a crank block **65** pivotally connected to the block **62**. It will be understood that forces greater than the preloading force of the spring **61** are transmitted only after an additional delay afforded by the stretching of the spring.

Due to the above delays and sequenced pickup of the separate masses of each part, the crank block **55** does not swing through its completed work stroke until the leading edge of the box blank has traversed approximately one and one half inches underneath and beyond the roller **50**. The purpose in slowing down this response is to avoid prohibitive speeds and forces on the cut-off mechanism as well as to avoid excessive resistance to the leading edge of the box blank which otherwise would be crushed between the roller **50** and the applicator deck **15**. The crank **65** causes a shaft **66** to pivot on a fixed axis to pivot the cam block **68** (Figure 1). The cam block **68** has a cam plate **69** adjustably mounted thereon by means of slot **69'** and screw **70**, and the cam plate **69** has a cam surface **71** co-acting with a cam follower **72** to cause a pair of parallel arms **75** to pivot about a shaft **76**. The shaft **76** is carried by a bracket **77** secured to a mounting plate **130** by cap screws **78**. A second pair of parallel arms **79** are pivotally secured to the bracket **77** by a shaft **80** and form a parallel linkage with the arms **75**, the lower ends of the arms **75** and **79** being pivotally connected to the cut-off assembly **37** by shafts **83** and **84** so as to raise the tack down pad **40** and cut-off knife **39** in a fixed horizontal orientation. The pressure between the cam surface **71** and the cam follower **72** thus raises the cut-off assembly **37** up and away from the applicator deck along a path at an olique angle to the applicator deck, moving all the parts into the cocked position indicated in Figure 3, with the cut-off knife **39** and tack down pad **40** spaced above the path of travel of the carton blanks through the machine.

Pivoting of the arms **75, 79** by means of the cocking roller **50** preferably also serves to raise a sensing roller **100** above the applicator deck to a cocking position in which the sensing roller is preferably spaced above the applicator deck a distance slightly less than the thickness of the carton blank. In order to raise the sensing roller **100** this relatively short distance in comparison with the distance which the cut-off assembly **37** is raised, the sensing roller **100** is secured to the linkage arms **75, 79** to move about a shorter radius than the cut-off assembly. To this end the sensing roll **100** is carried by a block **101** secured to the parallel arms **75, 79** by means of the shafts **102** and **103** which are substantially closer to the pivot axes **76** and **80** for the arms than the shafts **83** and **84** carrying the cut-off assembly **37**. The sensing roll thus rises from the applicator deck at a slower rate of speed as well as traveling a shorter total distance than the cut-off assembly. The ratio between the distance of rise of the sensing roll **100** and of the cut-off assembly is designed so that the tack down pad **40** and the tape cut-off knife **39** will be up and out of the way to clear the carton blank when the sensing roll **100** is riding on the top surface of the blank.

The sensing roll **100** in its cocked position, though small in diameter, is in a good position to receive the leading edge of the carton blank since it has already been elevated almost all of the required distance above the applicator deck. After the leading edge of the blank passes undearneath sensing roll **100**, sensing roll **100** assists cocking roll **50** in keeping the cut-off assembly in cocked position shown in Figure 3 and out of the way of the blank as it passes through the applicator.

After the trailing edge of the carton blank has passed the cocking roll **50**, cocking roll **50** and its linkage including arms **51**, blocks **56, 62** and **65**, and cam surface **71** immediately return to initial position due to the tension in spring **104** (Figure 2). As the trailing edge of the blank moves past the sensing roll, a spring **105** (Figure 1) immediately moves the sensing roll downwardly to call the cut-off assembly into action. The spring **105** is connected to the linkage arms **75, 79** at one end and to a tension adjusting crank **106** secured to plate **130** by cap screw **107** at the other end to urge the cut-off assembly to cut-off position and the sensing roll to a release position in the path of travel of the carton blanks. Since the cam surface **71** no longer constrains the motion of the arms **75, 79**, the cut-off assembly is free to move downward swiftly and with precision for accurate tape cut-off under the urging of gravity supplemented by the action of spring **105**.

The length of the tape tail portion extending from the trailing edge of the carton blank after cut-off depends upon the amount of lead of the sensing roll **100** with respect to the cut-off knife **39**. Thus as the speed of the blanks traveling through the applicator is increased, the lead between the sensing roll **100** and the cut-off knife **39** must be increased proportionately to maintain the tape cut-off point close to the trailing edge of the blanks. Lead of the sensing roll **100** is adjusted by the slotted lock-up system of a bracket **108** carried by the block **101**. Center cap screw **110** provides friction lock-up between the slotted bracket **108** and the block **101**. There is a single vertical index line on the face of block **101** as indicated at **115** and a scale graduated in one eighth inch steps on the top horizontal surface of bracket **108** for determining lead of the sensing roll **100** with respect to the cut-off knife **39**.

Members **111** and **112** are eccentric cams which provide vertical height adjustment of sensing roll **100** but do not contribute to the frictional lock-up of bracket **108** against block **101**. Eccentric cams **111** and **112** each have an inner eccentric shoulder the diameter of which is slightly less than the width of the adjustment slot in bracket **108**. The length of the eccentric shoulders on cams **111** and **112** is slightly greater than the width of bracket **108** so that when the center cap screws on cams **111** and **112** are pulled up tightly, the outer flanges of cams **111** and **112** do not contact bracket **108**. Bracket **108** may therefore be adjusted to the left or right horizontally by loosening center cap screw **110** only. Eccentric cams **111** and **112** have graduations of **1** through **4** on the face of the outer flange which indicate the positions of the eccentric shoulders in the adjustment slot of the bracket **108**. The positions of the numbers on cams **111** and **112** should be relatively the same to

keep bracket 103 in a horizontal disposition at all times, and are adjusted to provide a suitable height location for the sensing roll 101.

A dash pot 120 is adjustably mounted in a bracket 121 secured to plate 130 and has its lower end disposed in abutting relation to a strap 122 extending between the arms 75. The dash pot serves as a vibration damper to keep the cut-off assembly as near motionless as possible when in the cocked position. By employing the dash pot 120, the cut-off assembly will not respond to uneven thickness, bumps and other irregularities in the carton blanks. By keeping the cut-off knife 39 motionless, its start in the downward cut-off stroke is from precisely the same location for each successive blank, thereby permitting cut-off timing accuracy of approximately 1/500 of a second. The dash pot 120 contains a small ball check valve which opens on the downward stroke allowing hydraulic oil to by-pass very rapidly. The downward stroke of dash pot casing toward its extended position shown in Figure 1, is very rapid due to a preloaded spring which is housed within the dash pot. On an up stroke of the dash pot the ball check valve closes allowing the hydraulic oil to by-pass the piston through an orifice only. The size of the orifice controls the speed of the dash pot in the upward stroke and is designed for maximum snubbing action on the cut-off knife without disturbing the work stroke of the cut-off knife.

As mentioned previously the linkage arm mounting bracket 77 and tape applying rocker shaft 34 are carried by the mounting plate 130. The mounting plate is secured to the tape applicator carriage 54 by cap screws 131 and 132, being pivotal about the cap screw 131 and slotted vertically at 133 to accommodate movement relative to cap screw 132. Cap screws 131 and 132 are drawn up tightly enough to insure proper vertical positioning of plate 130 but do not restrain the pivotal action of the plate. The plate 130 is indexed and locked in operating position by an index lock 135 which cooperates with a spring loaded cone nosed pin (not shown). The cone nose presses constantly against the surface of the tape applicator carriage 54 seeking a cone shaped female index cavity in the surface thereof which is located to index plate 130 in the proper operating location. The index lock knob 135 is fastened to the opposite end of the cone nosed index pin so that when the knob 135 is pulled out, the cone nosed index pin is dislodged from its socket and plate 130 swings up due to the tension in spring 138, the plate 130 pivoting about cap screw 131.

In pivoting upwardly about cap screw 131, plate 130 picks up cocking roll 50 by means of a pin 140 carried by the plate 130 (Figure 2) which projects to the rear of the plate to engage an adjustable bracket 141 on one of the arms 51. As a result, cocking roll 50 pivots about shaft 52 swinging the cocking roll clear of the applicator deck. The pivoting and lifting of cocking roll 50 produces the same effect as lifting the cocking roll due to a box blank passing under it, so that it cocks the cut-off assembly 37 and sensing roll 100 lifting them clear of the applicator deck. Therefore, by pulling index lock knob 135 the entire applicator deck is cleared of all overhead mechanism.

The tape applying mechanism may include a take-up device such as disclosed in my copending application entitled "Mechanical Take-Up for Tear Strip Applicator," Serial No. 429,348, filed May 12, 1954.

Operation

The operation of the illustrated embodiment may be summarized as follows. As a carton blank 12 enters the machine, it engages the cocking roll 50 to pivot the arms 51 about the shaft 52, this movement being transmitted by means including cushioning spring 61 to raise the sensing roll 100 and the cut-off assembly 37 to the position shown in Fig. 3. After the trailing edge of the carton blank 12 has moved past the cocking roll 50, the cocking roll returns to its initial position. The cut-off assembly is then maintained in its raised position by the mechanical connection between the sensing roll 100 which rests on the top surface of the carton blank and the cut-off assembly 37. When the trailing edge of the carton blank 12 travels past the sensing roll 100, the sensing roll drops and the spring 105 energizes the cut-off assembly 37 to execute a cut-off stroke.

It will be apparent that many modifications and variations may be made in the disclosed embodiment without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. A tape cut-off system comprising a support structure, means defining a path of travel for articles past said support structure, a parallelogram linkage pivotally mounted on said support structure by means of a pivotal mounting and having a lower end depending from said pivotal mounting, a cut-off assembly including a horizontal tack down shoe and a cut-off knife carried at the lower end of said linkage and pivotally connected thereto by means of a pivotal connection for movement in a fixed generally horizontal orientation to a cocked position above the path of travel of the articles, a sensing member carried by said linkage at a point intermediate the cut-off assembly pivotal connection and the linkage pivotal mounting for movement a relatively shorter distance as compared to the corresponding movement of the cut-off assembly, cocking means operatively connected to said linkage for moving the same to a cocked position prior to travel of an article under said sensing member, said cocking means releasing said linkage prior to travel of the article past said sensing member to accommodate support of said sensing member by the upper surface of the article, said sensing member while supported by said article being operative to support said linkage in cocked position, and said sensing member being operative upon travel of the trailing edge of the article past said sensing member to move to a release position to release said linkage to initiate cutting of the tape secured to the article.

2. In combination, a support structure, means defining a path of travel for articles past said support structure, an arm movably mounted on said support structure, a work performing assembly operatively connected with said arm and movable thereby from a work to a cocked position, a sensing member operatively connected with said arm and movable thereby from a release position in the path of travel of the articles to a cocked position, and cocking means operatively connected to said arm for moving the same to cocked position to place said assembly and said sensing member in their cocked positions prior to travel of an article under said sensing member, said cocking means releasing said arm prior to travel of the article past said sensing member to accommodate support of said sensing member by the upper surface of the article, said sensing member while supported by the article being operative through said arm to retain said assembly in its cocked position, and said sensing member being operative upon travel of the trailing edge of the article past the sensing member to move to release position to initiate a work stroke of said assembly, said cocking means comprising a cocking member pivotally mounted by said support structure and pivotal from a position in the path of travel of the article to a cocking position by engagement with the leading edge of the article to move said arm to cocked position, and means urging said cocking member toward its position in the path of travel of the articles to effect release of said arm when the trailing edge of the article moves past the cocking member, and cushioning means interposed between said cocking member and said arm to afford a

delay between actuation of said cocking member by an article and movement of said arm to cocked position.

3. A tape cut-off system comprising a support structure, means defining a path of travel for an article past said support structure, a sensing member, means carried by said support structure mounting said sensing member for movement from a release position in said path of travel to a cocked position, cocking means operatively connected to said sensing member for moving said sensing member toward a cocked position prior to arrival of each article at said sensing member, said cocking means being operative to release said sensing member with the sensing member in engagement with an article after travel of the article past the cocking means, a cut-off assembly carried by said support structure and operative to cut a tape applied to the article at the trailing edge thereof, said sensing member being operative to actuate said cut-off assembly by movement to its release position, means urging said sensing member into its release position and operative to move said sensing member to release position upon travel of the article past said sensing member after release of said sensing member by said cocking means to initiate cut-off of the tape, said cocking means comprising a cocking member disposed in the path of travel of the articles and movable by the articles to a cocked position, and mechanical means operatively connecting said cocking member with said sensing member to translate movement of said cocking member to cocked position into movement of said sensing member into cocked position, said mechanical means including cushioning elements interposed between said cocking member and said sensing member to afford a delay between actuation of said cocking member by an article and movement of said sensing member to cocked position.

4. In a cut-off system, a support structure, means defining a path of travel for articles past said structure, a cocking roll disposed in the path of travel of said articles, a cocking arm carrying said cocking roll, means pivotally mounting said cocking arm for movement to a cocked position by engagement of said cocking roll with the leading edge of an article, a cam member pivotally mounted on said support structure, means operatively connected to said cocking arm and to said cam member for pivoting said cam member to a cocked position upon movement of said cocking arm to cocked position,

an arm pivotally mounted on said support structure and having a cam follower disposed for cooperation with said cam member to move said arm to a cocked position upon movement of said cam member to cocked position, a cut-off assembly carried by said arm for movement to a cocked position above the path of travel of said articles by movement of said arm to cocked position, a sensing roll carried by said arm for movement to a cocked position above the path of travel of said articles and for riding on the upper surface of an article to support said arm and said cut-off assembly in a cocked position after the article has traveled under said cocking roll, said sensing roll dropping off the trailing edge of the article to initiate a cut-off stroke of said cut-off assembly in predetermined relation to the position of the trailing edge of the article, and damping means operatively connected to said sensing roll to resist upward movement of the sensing roll above cocked position.

5. In combination, a support structure, means defining a path of travel for articles past said support structure, cocking means disposed in the path of travel of said articles, means mounting said cocking means for movement to a cocked position by engagement with an article moving along said path, a cut-off assembly, means operatively connected to said cocking means and to said cut-off assembly for moving said cut-off assembly to a cocked position displaced from the path of travel of the articles upon movement of said cocking means to cocked position, damper means acting on said cut-off assembly in cocked position thereof, and sensing means operatively connected to said cut-off assembly and engaging a surface of each successive article to hold said cut-off assembly in cocked position until the article travels past said sensing means, said damping means serving as a vibration damper to tend to maintain the cut-off assembly motionless in cocked position.

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