July 29, 1952 K. SIEG 2,604,825

BOX BLANK TAPING MACHINE

Filed April 7, 1948 2 SHEETS—SHEET 1

Fig. 1.

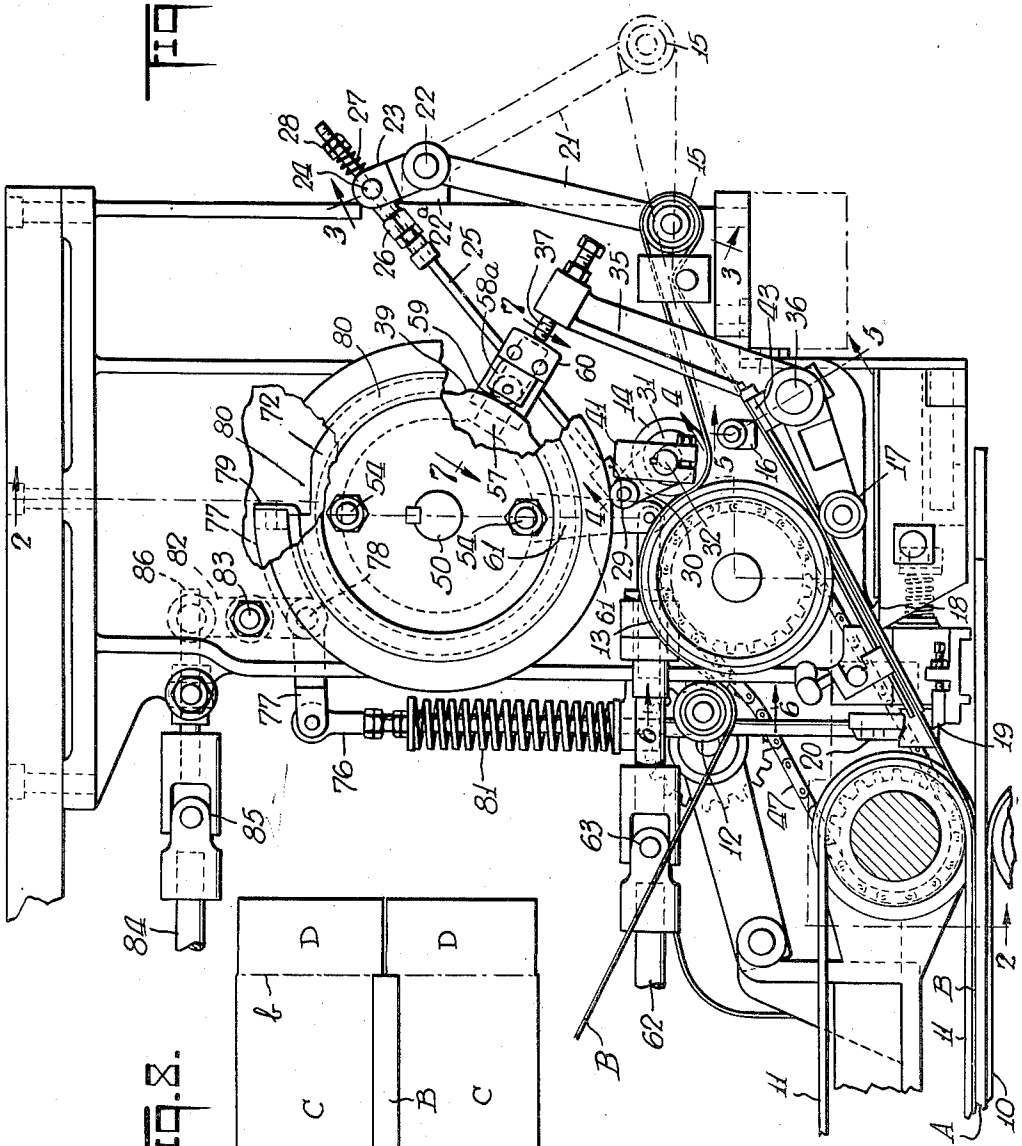


Fig. 2.

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FIG. 2.

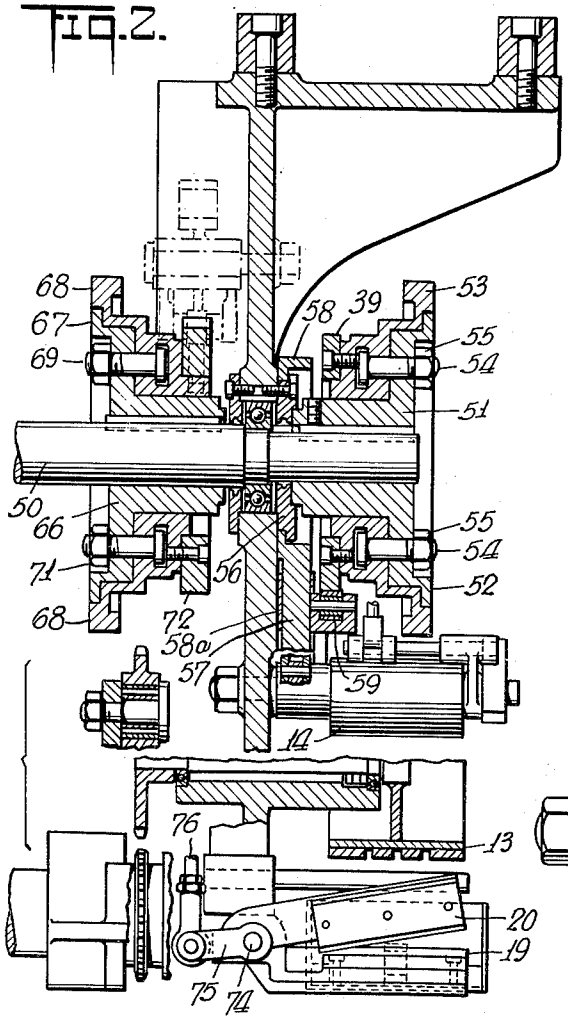


FIG. 3.

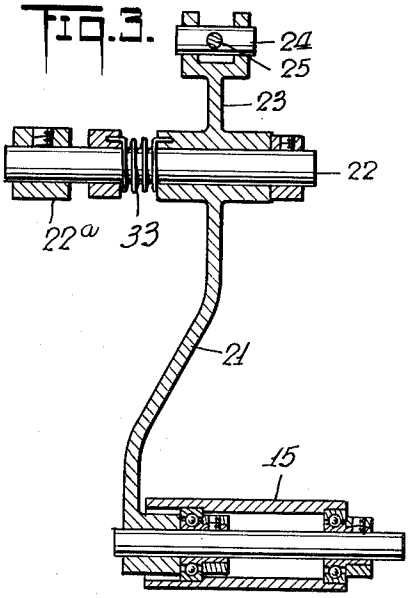


FIG. 4.

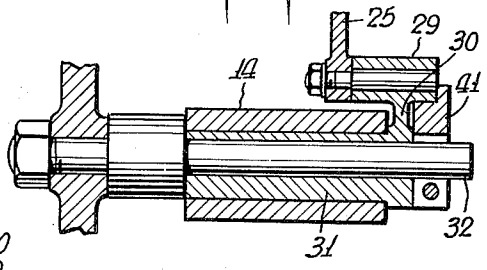


FIG. 5.

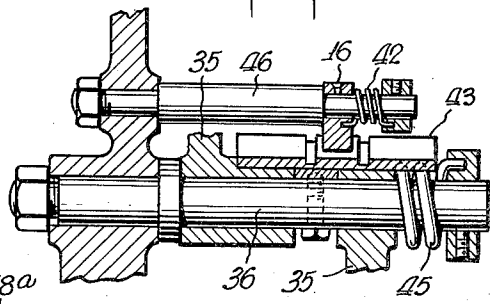


FIG. 6.

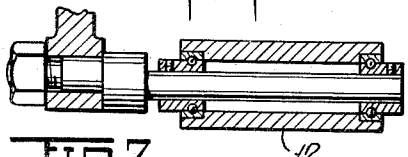
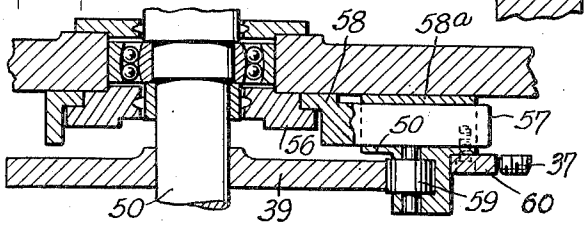


FIG. 7.



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BOX BLANK TAPING MACHINE

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6 Claims. (Cl. 93—36.9)

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This invention relates to apparatus for applying an adhesive tape to a box blank, and in its preferred form is especially adapted for use with blanks formed of double faced corrugated paper board and which include panels to form the side walls of the box and flaps or extensions which are to be folded over to form the top and bottom of the box after the blank has been taped and opened up. It is important that the tape extend along the abutting edges of the side panels and terminate at the fold lines of the closure flaps.

In a common type of such taping machines the flat blanks, folded to bring opposite edges into abutting position, are fed one at a time through the machine, and adhesive tape is supplied and cut into successive sections as it is applied over the abutting edges of the blank and lengthwise thereof. The tape is usually supplied in roll form and fed over a moistening device. One end of the tape is attached to the blank at the proper point during the advancement of the blank and the blank pulls the required amount of tape from the roll as the moistened section of the tape is pressed onto the blank. When the blank reaches a predetermined position in its travel the tape is cut off and further feeding of the tape is stopped. The strip of applied tape is much shorter than the blank as it extends only between the fold lines, and therefore even though the blanks may be fed continuously and closely juxtaposed end to end, the tape is fed only intermittently. After a section of the tape is cut off, the end of the tape remains at rest until the next blank is advanced to a predetermined position, at which time the end of the tape is attached to the blank and the tape must then travel at the speed of the blank.

In modern taping machines the blanks are fed at relatively high speed and the strain imparted to the tape when the end of the tape is attached to a fast-traveling blank and the tape is forced to instantly acquire that speed from a standing start, often causes the tape to snap or the attached end to slip back from the desired point of attachment close to the closure-flap fold line.

My invention relates particularly to the tape feeding mechanism for machines of the type referred to, and as one feature of my novel construction I provide means whereby the tape is kept under substantially uniform light tension both while at rest and while being applied.

As another feature I provide means whereby a loop of tape is maintained under tension, and as a portion of the tape forming the loop is used up the loop shortens, but during the interval between successive tape applying operations it is extended to its full length. Thus when the tape first starts moving at the speed of the blank it is drawn from the loop rather than directly from the supply roll.

As a further feature I provide positively acting feed mechanism at the supply end of the loop and at the delivery end of the loop, but so control them that the feeding mechanism supplying to

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the loop does not come into operation until a portion of the tape has been applied and the loop has been shortened to approximately a predetermined length. Thereafter the tape is positively fed to and positively drawn from the loop. Thus the strain on the tape in starting is reduced to a minimum, but the tape is kept under tension at all times.

As a further feature I provide a roller having a peripheral speed equal to the speed of travel of the blank, and which exerts a drag force on the tape supplied to the loop, so that very light tension need be exerted in extending the loop after each tape applying operation.

As a further feature I employ positively acting means for feeding tape to the shortened loop and withdrawing tape from the loop during the main portion of the tape applying operation, so that the loop remains of substantially constant length after the start of the feed means delivering tape to the loop.

As a further feature I provide a snubbing or tape gripping device for holding the free end of the tape against backward movement after a section has been cut off and during the reforming of the longer loop between successive tape applying operations.

As a further feature, I provide means for adjusting the minimum spacing of the tape feeding rollers.

As a further feature, the tape feeding and tape cutting operations may be controlled while the machine is running, and by an inspector at the delivery end of the machine.

Other features will be pointed out in connection with a description of a preferred embodiment of the invention.

In the accompanying drawings:

Fig. 1 is a side elevation of a mechanism embodying my invention.

Figs. 2 to 7 inclusive are sections on the lines 2—2 to 7—7, respectively, of Fig. 1, and

Fig. 8 is a perspective view of a box blank with the tape applied thereto.

A type of blank which may be taped by my improved machine is shown in Fig. 8. The blank A is folded so that the edges of two panels C are in abutting relationship, and the tape B is applied to secure these panels together. At each end of each panel is a closure flap D, and the tape extends merely from the fold line *a* to the fold line *b* of these flaps.

The blank A may be fed through the machine by any suitable means common in the art. As shown, the folded blank is fed between conveyor belts 10 and 11, and suitable means are provided for so controlling the feed of the tape that the feeding will start when the blank reaches a predetermined position where one end of the tape will be substantially in registry with the first fold line. The tape is cut off and the feed stopped when the blank reaches a second predetermined position, so that the other end of the tape will register with the other fold line. Means for con-

trolling the tape starting and cutting operations are well known in the art and form no novel part of my machine. Therefore I have not illustrated those portions of the machine in the accompanying drawing.

In my improved machine and in the specific form illustrated, the tape B is fed from a suitable supply roll or other source and is delivered beneath the idler roll 12 (Fig. 6); over a combined drag and feed roll 13; beneath a pressure feed roll 14 (Fig. 4); then in the form of a loop around a tension roller 15 (Fig. 3); then beneath a snubber 16 (Fig. 5); then between the roller 13 and a pressure roller 17; then over a glue moistener 18; and then between cutters 19 and 20 and onto the blank being fed along between the conveyor belts 10 and 11.

As an important feature of my invention the rollers 14 and 17 are intermittently moved toward and from roll 13 and at spaced points along the periphery thereof, so that the loop of tape around the roller 15 is formed between the rollers 14 and 17.

As a further feature means are provided for varying the length of this loop of tape, such means, in the form illustrated, including a pivoted arm 21 carrying the roller 15.

The rollers 14 and 17 are bodily movable toward and from the driven roll 13, and when in the position shown in Fig. 1, hold the tape tightly against said roll, so that the tape is positively fed to the loop, around the roller 15, and from the loop to the blank.

The position of the roller 14 is controlled by the length of the loop, and the position of the roller 17 is controlled by the operation of a driven cam.

The arm 21 and roller 15 are employed to control the position of the roller 14. As shown, the arm 21 is pivoted on a stud 22 carried by a bracket 22a on the frame, and has an extension 23 which supports a cylindrical bar 24 free to oscillate and through which a rod 25 is axially movable. The endwise movement of the rod 25 through the bar in one direction is limited by a collar or stop 26, and at the other side of the rod is a coil spring 27 acting between the bar 24 and an adjustable nut 28.

The opposite end of the rod 25 has a stud on which is pivotally mounted a sleeve 29 on the end of an arm 30 and extending outwardly from an eccentric sleeve 31 on a stud 32 supported by the main frame of the machine. The roller 14 is freely rotatable on this eccentric sleeve, as shown in Fig. 4. The extent to which the eccentric sleeve 31 may be moved, and therefore the minimum spacing of the rollers 13 and 14, when feeding the tape, may be controlled by a stop 41 adjustably clamped to the stud 32 and in the path of movement of sleeve 29.

Before the starting of each tape feeding operation, the roller 15 is in the position shown in dotted lines on Fig. 1, and is held there by the action of a coil spring 33 on the stud 22 supporting the arm 21, as shown in Fig. 3. In this position the bar 24 engages the stop 26 and holds the rod 25 to the left from the position shown in Fig. 1, and the roller 14 does not act to feed tape because this roller is away from the roll 13. In moving to the position shown in solid lines, the spring 27 is compressed, and the rod 25 is pulled to force the roller 14 toward the roller 13.

The roller 17 is rotatably mounted on an arm 35 pivoted on a stud 36 on the frame of the machine. At the upper end of the arm 35 there is

an adjustable screw 37 abutting against an actuating member 60 controlled by a cam disc 39 driven by the machine. The details of one form of this mechanism and the adjusting means therefor will be described more fully hereinafter.

As shown in Fig. 5, the snubber 16 is lightly pressed onto the tape by a spring 42 as the tape passes over a guide plate 43 supported on the stud 36 which serves as a pivotal support for the arm 35 and has a spring 45 for swinging said arm and holding the screw 37 against the cam actuated member. The snubber 16 is set at an incline to the tape and may oscillate on its supporting stud 46, so that the tape may freely pass to the blank, but when the tape is cut by the cutters 19, 20, the tape is held against return movement. The return swing of the arm 21 to the dotted line position draws tape from the supply source to reform the long loop during the interval required to advance another blank into position to be taped.

The operation of the parts so far described may be briefly summarized as follows:

With the tape at rest it terminates at the cutter, and the snubber 16 prevents any backward movement of the tape end. The roller 15 on the pivoted arm 21 is in the position shown in dotted lines in Fig. 1, and the roller 14 is spaced from the rotating roller 13. The slight drag exerted by this roller is not sufficient to advance the tape. The cam 39 is so positioned in respect to the cutter operating means and the blank advancing means that when a blank reaches a predetermined position in its path of movement to and between the conveyor belts 10 and 11, the cam 39 will cause the arm 35 to swing and force the roller 17 upwardly to press the tape tightly against the rotating roller 13. The tape will instantly start moving at the surface speed of the roller 13, which is the same as the speed of the belts 10 and 11 which convey the blanks, the shaft of the roller and that of the conveyor belt pulley being connected by a chain 47.

The timing is such that the end of the tape, after passing the moistener 18, will register with the first fold line a of the blank A. As the tape becomes attached to the blank, the latter and the upper belt 11 will pull the tape from the loop which is around the roller 15, and the arm 21 will swing to the left toward the position shown in solid lines. During this operation the tape being fed to the blank is merely that taken from the loop, and the loop rapidly shortens. The cam 39 passes the screw 37 on the arm 35 after the end of the tape has become attached to the blank, and then the roller 17 will drop slightly and cease to act in advancing the tape. As the loop further shortens by the pull exerted on the tape by the traveling blank, the arm 21 continues to swing toward and to the position shown in solid lines in Fig. 1, and in doing so will pull the rod 25 upwardly and cause the idler roller 14 to press the tape onto the driven roller 13. Then the tape will be positively fed by the roller 13 to the loop, and at the same rate that the tape is being delivered from the loop to the blank.

When the cutter operates to sever the tape the delivery of tape from the loop stops, but the free end is held against return movement by the snubber. The rollers 13 and 14 continue to feed the tape to the loop, and the loop is extended until the roller 15 is moved to such position that the roller 14 is no longer operative, and thereafter the drag on the tape by the roller 13, and

the pressure exerted by the spring 33 (Fig. 3) will continue the movement of the arm 21 and roller 15 to the dotted line position and pull in a further amount of tape to restore the loop to its full length. When this point is reached the drag by the roller 13 is not sufficient to feed further tape.

Thus the loop of the tape is at all times kept under light tension by the springs 33 and 27, and when the feeding action of the blank starts again there is but slight resistance to overcome, and this is not sufficient to cause any backward slipping of the tape in respect to the blank when the end of the tape is first attached to the blank. Due to the maintenance of light tension on the tape, the absence of slack, and the low resistance to the swinging of the arm and the shortening of the loop, there is very low resistance to the initial starting of the tape in motion and no liability of snapping the tape when the end portion suddenly starts traveling at the high speed of the blank.

To adapt the machine for use with folded blanks of various different sizes and relative proportions, either the cam 39 or the cam actuated means, or both, are relatively adjustable circumferentially, so that the feed of the tape by the rollers 13 and 17 begins at the proper time to register with the fold line of the blank being fed. Relatively adjustable cams and cam actuated means are also provided to cut off tape sections of the proper length, as will be later pointed out. After an approximately correct relative positioning of the cams and cam actuated members is effected, while the machine is at rest, an accurate adjustment may be made while the machine is running, if an examination of the taped blanks indicates the necessity therefor.

The control of the tape feeding and tape cutting is effected from a shaft 50 driven through suitable gearing and intermittently rotated to effect one revolution of the shaft for each box blank fed to the machine. Keyed to the shaft is a hub 51 having a flange 52, and adjustably mounted on the hub is a hand wheel 53 to which the cam 39 is secured. The hand wheel is secured to the flange 52, as for instance by having an undercut groove in the hand wheel for receiving the heads of bolts 54 which extend through holes in the flange 52. Thus, by loosening the nuts 55 of these bolts while the machine is at rest, the hand wheel 53 and the cam 39 may be adjusted to the approximately proper position so that the cam will actuate the lever arm 35 to press the roller 17 toward the roller 13 at the proper instant in respect to the feeding of the blanks.

To transmit motion from the cam 39 to the lever 35, a collar 56 is bolted to the frame, and on this is rotatably mounted a collar 58 having a radially extending pin 57 on which a sleeve 58a may slide radially. As shown in Fig. 7, the sleeve 58a carries a roller 59 engaging the periphery of the cam 39 and moves outwardly along the pin 57 when the cam projection passes beneath the roller 59. The sleeve 58a carries a plate 60 which engages the adjustable screw 37 on the arm 35. Thus, as the cam rotates, the cam projection will engage the roller 59 to move the sleeve 58a outwardly, and the plate 60 will swing the lever 35 to cause the roller 17 to press the tape against the driving roller 13. The roller 17 need be held in pressing engagement with the tape only until the end of the tape is fed from the cutter to the blank beneath the belt 11, and therefore the cam projection on the cam 39 may be circumferentially proportioned so as to hold the roller 17 in operative position for only the desired length of time.

The approximately correct positioning of the cam may be effected by loosening bolts 54 which secure the hand wheel and cam to the hub, and such positioning may be facilitated by having one end surface of one, for instance the hand wheel, provided with graduations or marked as a dial movable along an index mark on the adjacent surface of the hub flange.

The timing of tape feeding may be varied by circumferentially adjusting the cam 39 with the hand wheel, or circumferentially adjusting the collar 58 in respect to the frame.

To effect minor adjustment in the time of starting tape feeding to obtain the accurate timing of the operation of the cam and the roller 17, and from the delivery end of the machine where the product may be inspected, means are provided for adjusting to a limited extent the position of the roller 59 circumferentially of the cam, so that the cam will engage it earlier or later in the rotation. The collar 58 which carries the roller 59 is provided with an arm 61 pivotally connected to an adjusting rod 62 through a universal joint 63, and the rod 62 may extend to the delivery end of the machine. Thus an operator at the delivery end may note whether or not the tape end is at exactly the fold line of the blank, and by adjusting the rod 62 endwise he may oscillate the collar 58 to a limited extent so as to advance or retard the time at which the projection of the cam 39 engages the roller 59 to force the sleeve 58a outwardly, move the lever 35, and start tape feeding.

The same shaft 50 which carries the mechanism for controlling the time of application of the tape also carries means for actuating the cutter. As shown in Fig. 1, the shaft 50 has keyed thereto a hub 66 provided with a flange 67 which carries a hand wheel 68 provided with an undercut groove for the heads of bolts 69 for clamping the hand wheel to the flange 67 on the hub. Circumferential adjustment may be made by loosening nuts 71 on these bolts, and the extent of adjustment may be noted by providing calibrations or a dial on the outer face of the hand wheel, and registering with an index mark on the end surface of the flange 67. Bolted to the hand wheel 68 is the knife operating cam 72 for raising and lowering the cutter blade 20 in respect to the stationary cutter blade 19.

The blade 20 is pivoted on a stud 74, and has an arm 75 connected by a rod 76 to a lever 77 pivoted on a pin 78. The opposite end of this lever has a follower 79 riding on the knife cam 72. When the cam, rotating counterclockwise, reaches the position shown in Fig. 1, the follower drops into the recess 80 in the cam, and a spring 81 on the rod 76 suddenly forces the rod 76 upwardly, and this swings the knife blade 20 down in respect to the stationary blade 19 and cuts the tape. The follower 79 quickly moves out of the recess 80 and the knife 20 is again raised to the position shown in Figs. 1 and 2.

For effecting fine adjustment of the timing of the tape cutting operation, and by an operator at the discharge end of the machine, the pivot pin 78 is mounted on a lever 82 pivoted on a stud 83 on the frame, and connected by a rod 84 extending to the delivery end of the machine.

This rod may have a universal joint 85 connecting the main portion to a terminal portion 86 which is held against endwise movement by collars (shown in dotted lines) engaging opposite sides of the frame, and has threaded engagement with a part mounted for oscillation in the upper end of the lever 82.

Thus the operator at the discharge end of the machine may move the fulcrum stud 78 to the right or left from the position shown in Fig. 1, to advance or retard the time at which the follower 79 is actuated by the cam 72 to cut the tape; and by means of the rod 62, the operator may accurately control the starting of the tape in its delivery from the cut-off to the blank.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A machine for applying tape to successively advancing box blanks, including a movable member for forming a loop in the tape, a driven roller, a pair of rollers movable into and out of operative position in respect to said first mentioned roller, one coacting therewith to feed tape to said loop and the other coacting therewith to withdraw tape from said loop, a cam for pressing the withdrawing roller of said pair into operative position in respect to said driven roller to thereby feed tape from and shorten said loop, and means for pressing the feeding roller of said pair into operative position in respect to said driven roller to feed tape to said loop when said loop has shortened to a predetermined extent.

2. A machine for applying tape to the abutting edges of a folded box blank between its end closure flaps, including a driven roller with which the tape engages, a pair of idler rollers for pressing the tape against said first mentioned roller at two spaced points on the periphery of the latter, a movable member forming a loop in the tape under tension between said points, means for moving one of said pair of rollers into operative position in respect to the driven roller to deliver tape from said loop to the blank when the blank reaches a predetermined position in its travel, and means for moving the other of said pair into operative position in respect to said driven roller to feed tape to the loop when said loop has been reduced to a predetermined length.

3. A machine for applying tape to the abutting edges of traveling box blanks, including a roller, means for rotating said roller with a peripheral speed substantially equal to the rate of linear advancement of the blanks, a pair of spaced rollers independently movable into and out of operative position in respect to said first mentioned roller, a member movable toward and from said first mentioned roller and around which the tape is looped between said pair of rollers, means for moving one of said pair of rollers into operative position with respect to the first mentioned roller to initiate tape feeding from the loop of tape, and thereby shorten said loop, and means for moving the other of said pair of rollers into operative engagement in respect to the first mentioned roller to feed tape to said loop at the same rate it is withdrawn therefrom, when said loop has been shortened to a predetermined extent.

4. A machine for taping folded blanks for cartons, including means for advancing the blanks in succession and spaced apart, a continuously rotating driven roller, a bodily movable idler roller for forming and maintaining a loop of varying length in the tape to be applied, a second idler roller bodily movable into and out of operative position in respect to said driven roller and coacting with the latter to intermittently feed tape to said loop, a third idler roller bodily movable into and out of operative position in respect to said driven roller and coacting therewith to intermittently draw tape from said loop to the blank, and means operatively connecting said first and second mentioned idler rollers for bodily moving the second mentioned idler roller into operative position in respect to said driven roller to effect feeding of tape to said loop when the loop is shortened to a predetermined extent.

5. A machine for taping folded blanks for cartons as they are advanced in succession and in spaced relationship, including a driven tape feeding roller, a bodily movable idler roller for forming a loop of varying length in the tape to be applied, a pair of idler rollers spaced apart along the periphery of said driven roller, one movable into and out of operative position in respect to said driven roller to feed tape intermittently to said loop, and the other movable into and out of operative position with respect to said driven roller to intermittently draw tape from said loop to the blank to be taped, and means for moving the rollers of said pair in succession into operative position in respect to said driven roller.

6. A machine for taping folded blanks for cartons, including a conveyor for advancing the blanks in succession and spaced apart, a continuously rotating driven roller, a bodily movable idler roller for forming and maintaining a loop of varying length in the tape to be applied, a second idler roller bodily movable into and out of operative position in respect to said driven roller and coacting with the latter to intermittently feed tape to said loop, a third idler roller bodily movable into and out of operative position in respect to said driven roller and coacting therewith to intermittently draw tape from said loop to the blank, a cam for moving said third idler roller into and out of operative position in respect to said driven roller to draw tape from said loop to a blank to be taped, and means operatively connecting said first and second mentioned idler rollers for bodily moving the second mentioned idler roller into operative position in respect to said driven roller to effect feeding of tape to said loop when the loop is shortened to a predetermined extent.

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