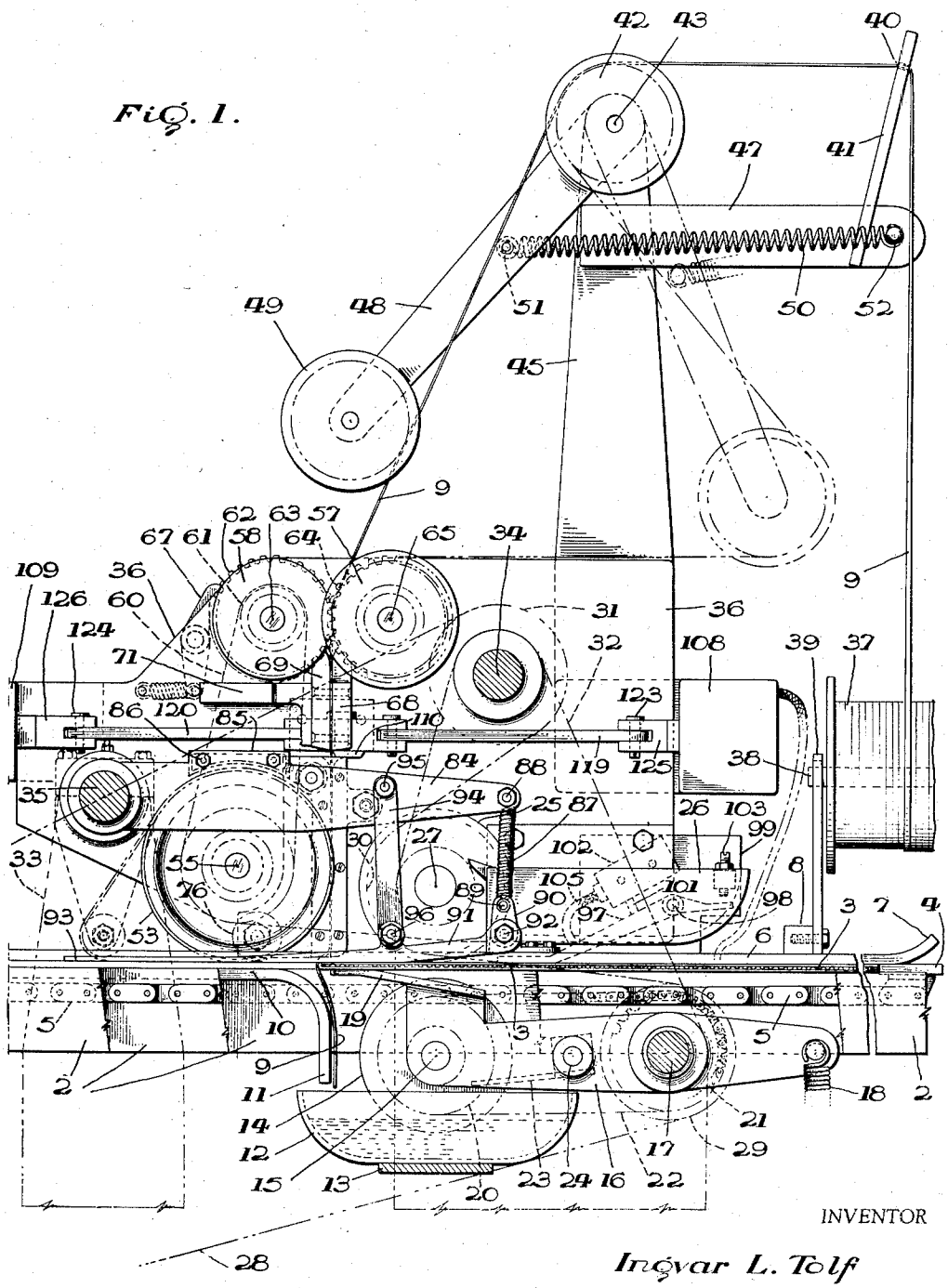
July 8, 1958 I. L. TOLF 2,842,034

MACHINE FOR APPLYING TEAR TAPE TO CARTON BLANKS

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Fig. 1.



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Fig. 2.

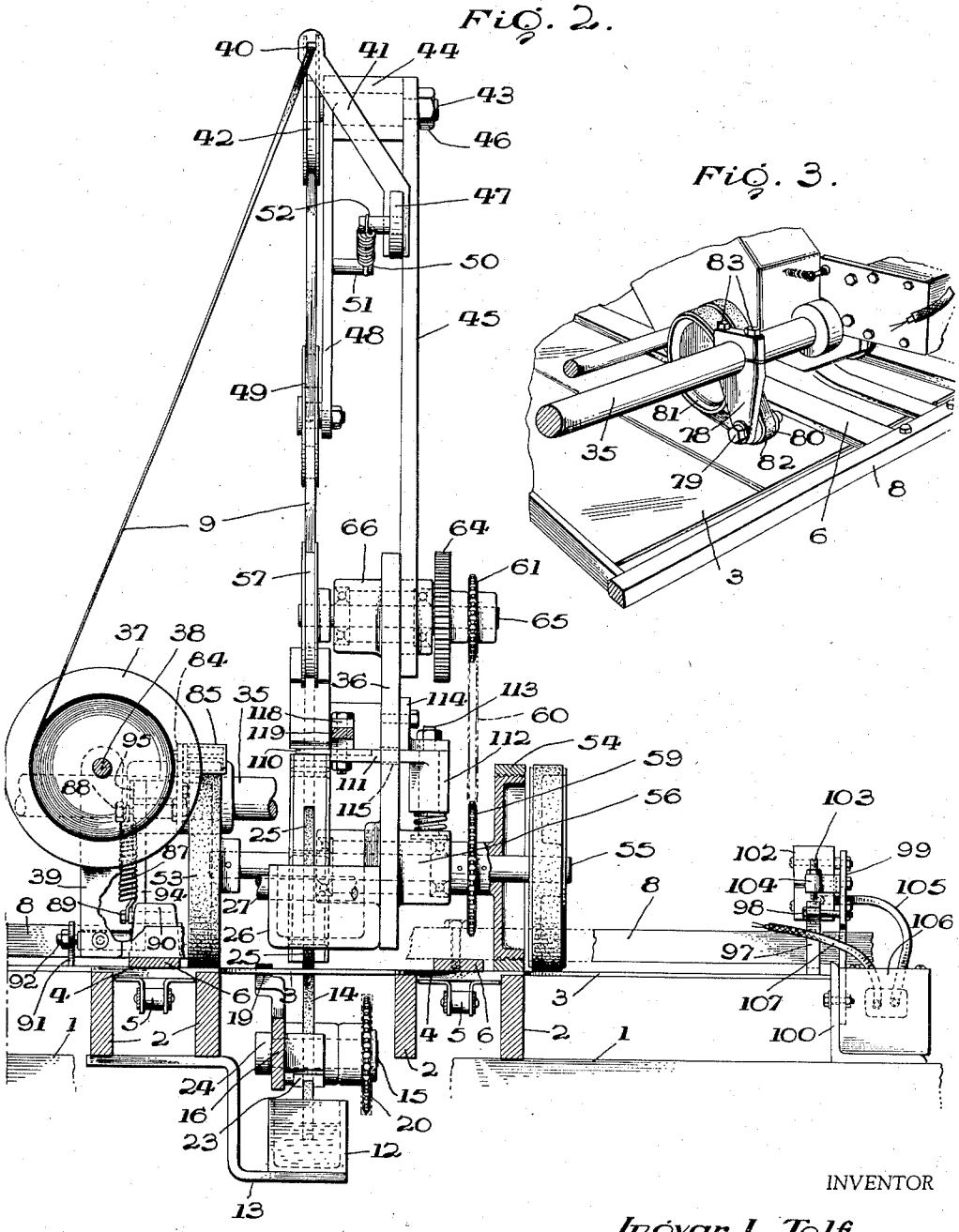


Fig. 3.

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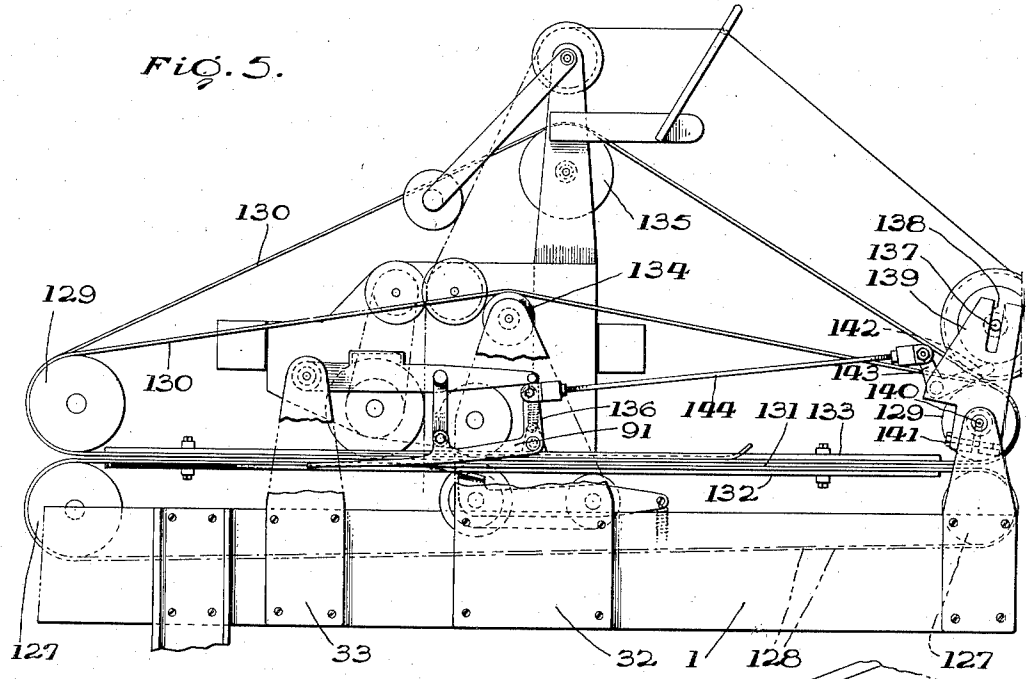
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MACHINE FOR APPLYING TEAR TAPE TO CARTON BLANKS

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Fig. 5.



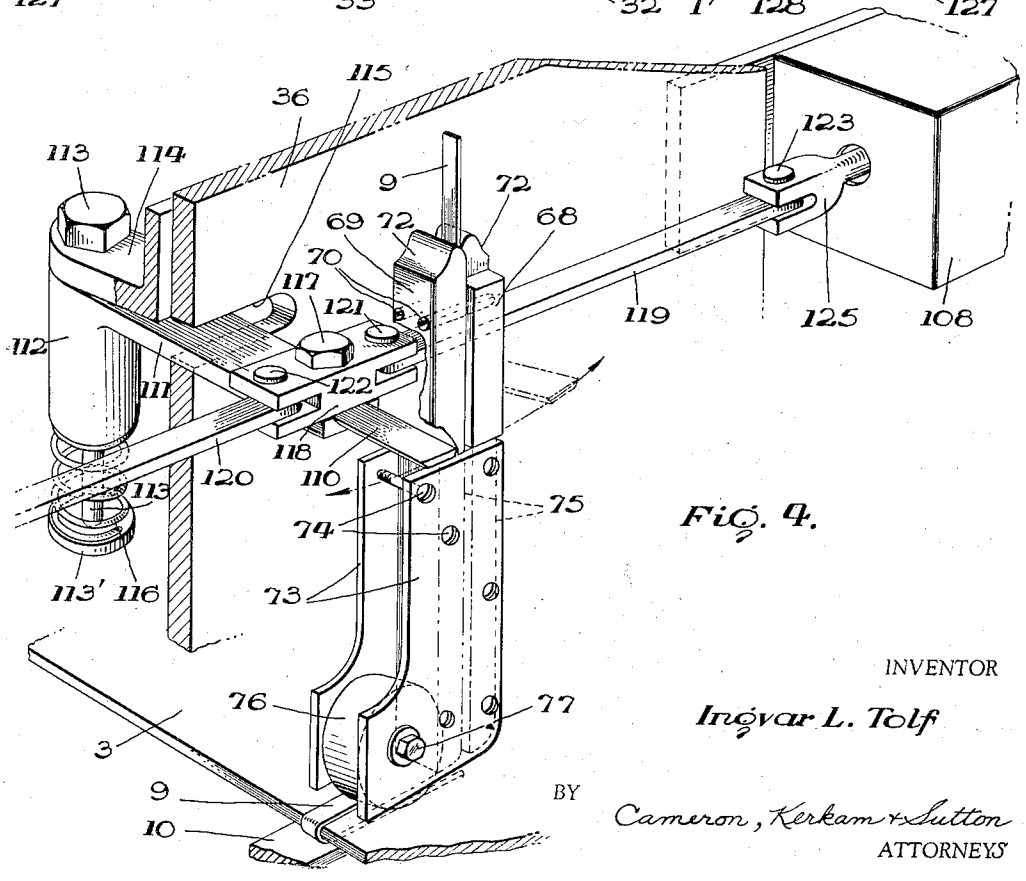


Fig. 4.

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MACHINE FOR APPLYING TEAR TAPE TO CARTON BLANKS

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Application February 27, 1953, Serial No. 339,390

12 Claims. (Cl. 93—36.9)

This invention relates to a machine for applying tear or rip tapes, strings, or the like to shipping cases such as the well known corrugated paper carton to facilitate opening the same, and more particularly to the application of such tapes to flat carton blanks passing through the machine.

The chief object of the invention is to provide a novel machine which is relatively simple and inexpensive and which operates effectively to apply the tape or string to rapidly moving, successive blanks, preferably with provision for an end or tab that will be on the outside of the carton after it is set up, filled and closed. Other more detailed objects comprise the provision of various improved mechanisms for performing the necessary operations, as will be apparent from the following description.

Two embodiments of the invention have been illustrated in the accompanying drawings, but it is to be expressly understood that said drawings are for purposes of illustration only and are not to be construed as a definition of the invention, reference being had to the appended claims for this purpose.

In the drawings:

Fig. 1 is a side view, partly in section, of a machine embodying the invention;

Fig. 2 is an end view of the machine of Fig. 1;

Fig. 3 is a detail view of part of the tape feeding mechanism of the machine;

Fig. 4 is a further detail showing part of the tape handling and applying mechanism; and

Fig. 5 is a somewhat diagrammatic side view of another embodiment of the invention.

The machine can be mounted on a suitable table or framework, parts of which are indicated generally at 1 in Figs. 2 and 5. The carton blanks are fed through the machine in the form of flat sheets, either before or after scoring, and various known types of feeding means can be employed for this purpose. For example, the blanks can be slid along supporting rails by pushers, or can be carried by traveling belts or like means. As shown in Figs. 1 and 2, four rails 2 extend throughout the length of the machine and slidably support a carton blank 3. Referring to Fig. 2, these rails are preferably arranged in pairs supporting the ends of slidable pushers 4 carried by chains 5 driven in any suitable manner (not shown). Thus blanks 3 are slid along the rails 2 by the pushers 4, meanwhile being preferably held down on the rails by suitable means such as longitudinal bars 6 having upwardly curved ends 7 and carried by bars 8 forming part of the frame. It will be understood, of course, that the blanks 3 are delivered successively to this feeding mechanism either by hand or by any desired mechanical means.

The blanks 3 pass through the machine with that side uppermost which is to form the inside surface of the completed carton, tape being applied preferably entirely across this top surface for use as a rip string or tape. In order to provide a projecting end on the outside of the carton, moreover, the tape is doubled over the leading edge of the carton blank and a short end thereof is applied to the bottom of the blank. This is accomplished by providing a predetermined length of tape 9 hanging in front of the leading edge of each advancing blank 3 as shown in Fig. 1. As the blank continues to advance, it passes over an additional supporting bar 10 having a down-turned end 11 whereby the tape end 9 is swung upwardly against the lower face of the moving blank and to which it adheres by virtue of glue or other adhesive applied to said lower face in line with the tape. The strip of adhesive should not be longer than the tape end and usually will be somewhat shorter to avoid gumming up the bar 10 and to facilitate separation of the tape end from the carton for opening.

Hence glue-applying mechanism is provided in which the applicator engages the leading portion of the carton only, the mechanism being preferably actuated by the moving blank itself to shift the applicator away from the blank and thus to stop the application of glue at the desired predetermined point. In the form shown, a glue pot 12 is carried by a frame bracket 13 below the moving blank. A glue roller 14 is rotatably mounted at 15 on a lever 16 which pivots freely around a drive shaft 17 suitably mounted in the frame (not shown). A tension spring 18 is connected to the free end of the lever 16 and normally maintains the roller 14 in a position (Fig. 2) in which it is engaged by the lower surface of the blank 3. As the leading edge of the blank advances beyond the roller 14, however, it engages an arm 19 carried by the lever 16 but offset to one side of the glue strip on the blank. The resulting depression of the arm 19 and lever 16 causes the glue roller to move out of contact with the blank as shown in Fig. 1.

The glue roller preferably rotates continuously and the glue level is maintained so that the lower portion of the roller lips into the glue in the pot 12 in either of the positions shown in Figs. 1 and 2. Rotation is conveniently provided by sprockets 20 and 21 mounted respectively on the roller shaft 15 and on the drive shaft 17 and connected by a drive chain 22. The shaft 17 may be driven as hereinafter described. Excess glue may be removed from the roller by a suitable scraper; for example, a blade 23 is secured to the lever 16 by means of a stud 24 and has a notched free end engaging the periphery of the roller 14 above the pot 12.

The section of the hanging tape 9 above the leading edge of the blank 3 is laid down on top of the moving blank simultaneously as the lower end is applied to the bottom of the blank. As movement of the blank continues, however, more and more tape is drawn from the supply until the length is sufficient to reach across the blank to the desired extent, whereupon tape cut-off means are operated as hereinafter described. This length of tape is laid on a strip of adhesive applied to the top of the blank by suitable means such as a glue roller 25 rotating partly in a slot in the side wall of a glue pot 26 which acts as a scraper to remove excess glue. The shaft 27 of the glue roller 25 is mounted in the frame in any suitable manner (not shown) and driven in any suitable manner. Preferably both glue rollers are driven in synchronism with each other and with the moving blank by a drive chain 28 passing around a drive sprocket 29 on the shaft 17, thence around a drive sprocket 30 on the shaft 27, thence around a rotatable idler sprocket 31, and thence back to a suitable source of power (not shown).

The remaining tape feeding, handling and applying mechanism is mounted on framework above the path of travel of the moving blanks. For example, pairs of vertical frame standards 32 and 33 at the sides of the machine (compare Figs. 1 and 5) are connected by cross rods 34 and 35 which serve to support various parts such as the idler sprocket 31 mentioned above and also a vertical frame plate 36.

The tape is fed from a suitable supply such as a roll

37, the spindle 38 of which is mounted in suitable brackets such as a standard 39 secured to one of the cross bars 8 mounted above. From the roll 37, the tape passes upwardly through a guiding eyelet 40 in the end of an arm 41 and thence over a grooved idler pulley 42. As shown, the pulley spindle 43 passes through a hub 44 which acts as a spacer between the pulley and the upper end of a vertical standard 45 secured to the main frame plate 36, these parts being secured by a nut 46 on the end of the pulley spindle. An arm 47 extends laterally from the standard 46 and carries the arm 41 mentioned above. The hub 44 carries a depending swinging arm 48, the end of which carries a grooved pressure roller or pulley 49 bearing on the reach of the tape 9 between the idler 42 and the feeding mechanism hereinafter described. Roller 49 maintains the tape under tension by virtue of a spring 50 having one end connected at 51 to the swinging arm 48 and the other end connected at 52 to the stationary arm 47.

The means for drawing the tape 9 from the supply roll and feeding it to the moving blank are frictionally engaged and operated by the moving blank itself, so that the rate of feed is synchronized with the speed of movement of the blank. To this end Figs. 1 and 2 show friction rollers 53 and 54 mounted on a common shaft 55 that turns in a suitable bearing hub 56 formed on the frame plate 36. As will be seen from Fig. 2, each of these friction rollers is located immediately above one of the rails 2 so that the blank 3 is gripped frictionally between these parts and the shaft 55 is driven by the movement of the blank between them. This rotation of shaft 55 is utilized to drive feeding means which preferably comprise a grooved roller 57 and a cooperating roller 58 the periphery of which turns in the groove of the roller 57. The width of the groove is sufficient to accommodate the tape 9 which is frictionally engaged between the two rollers with a sufficient grip to pull the tape from the supply roll 37 described above and to feed it to the carton blanks. When the feed rollers 57, 58 are idle, moreover, they snub and hold the tape against the pull of the tension roller 49.

Any suitable driving means can be employed to connect the feed rollers 57, 58 with the friction roller shaft 55. In the form shown, a sprocket wheel 59 on the shaft 55 is drivingly connected by a suitable chain 60 with a sprocket wheel 61 and a spur gear 62 both of which are secured to the shaft 63 of the feed roller 58. Gear 62 meshes with a similar gear 64 on the shaft 65 of the feed roller 57, so that said rollers are positively driven in opposite directions at the same speed by means of the chain 60. The shafts 63 and 65 are suitably mounted for rotation in the frame plate 36, as by means of bearing hubs one of which is shown at 66 in Fig. 2. A spring-pressed pawl 67 may be added to prevent reverse movement of the feed rollers by engagement with one of the spur gears.

Beneath the feed rollers 57, 58, the tape 9 passes downwardly through a guide channel formed by upper and lower guide units. The upper unit comprises guide elements 68, 69 (Fig. 4) which are suitably connected together by means of bolts or rivets 70 to form a single unit mounted on a bracket 71 projecting from the frame plate 36. The upper ends of the guide elements 68, 69 are preferably beveled as indicated at 72 so as to fit in between the feed rollers 57, 58. The lower guide unit comprises a pair of spaced plates 73 connected by screws or bolts 74 and mounted on the frame plate 36, tape guide members 75 being secured between these plates whereby the tape is guided down nearly to the surface of the blank 3. When no blank 3 is in the machine, the tape 9 hangs freely beneath the plates 73 as described above. As one of the carton blanks moves forwardly and engages the tape as shown in Fig. 1, however, the tape is swung forwardly and upwardly around the lower end of the forward guide member 75 to lie flat on the upper surface of the blank and is carried forward beneath a pressure roller 76 rotatable between the plates 73 on a spindle 77. As shown in Fig. 4, this pressure roller is above the bar 10 which supports the blank.

It will be seen that since the tape feed does not start until the leading edge of the blank reaches the friction rollers 53, 54, the free end of the tape 9 hanging below the plates 73 and guide elements 75 must be of sufficient length to cover the distance from the friction rollers to the guide channel between the elements 75, and also to provide the desired length of tape on the bottom side of the carton blank as described above. At this point the friction rollers commence to drive the feed rollers 57, 58 so as to draw additional tape from the supply roll and to feed it to the moving blank at a rate of feed that is synchronized with the linear speed of the blank, this action continuing until the trailing edge of the blank passes beyond the friction rollers. If the feed were to stop at this instant, and the tape were to be cut at the trailing edge (i. e., the friction rollers) and allowed to hand as shown in Fig. 1, there would be no excess length available to fold under the bottom of the next carton. For this reason it is necessary to continue the operation of the feeding devices 57, 58 for a brief period, and this can be accomplished by friction means having driving engagement with a desired length of the blank and therefore not disengaged until the trailing edge of the blank moves substantially beyond the driving rollers. In the form shown in detail in Fig. 3, the rod 35 carries a depending bracket or arm 78, the lower end of which is provided with a spindle 79 for a roller 80 close to the surface of the carton blank 3. On the end of the friction roller shaft 55 is mounted a pulley 81, and a friction belt 82 passes around the roller 80 and the pulley 81 in frictional engagement with the moving blank. The result is that after the principal drive of the feeding devices 57, 58 has terminated by virtue of the carton blank having passed beyond the friction rollers 53, 54, said feeding devices 57, 58 are nevertheless driven for an additional brief period determined by the position of the roller 80 so as to feed an excess length of tape for the purpose mentioned above. Preferably the position of roller 80 can be adjusted by varying the position of the bracket 78 on the rod 35, said bracket being clamped to the rod 35 by bolts 83.

After the trailing edge of the carton has passed beyond the roller 80 and belt 82, it is desirable to stop the feeding devices 57, 58 promptly, and for this purpose it is preferred to employ a suitable brake mechanism adapted to engage one or both of the friction rollers 53, 54. Referring again to Figs. 1 and 2, an arm 84 is rotatable on the rod or spindle 35 and carries a suitable brake member 85 secured thereto by means such as screws 86 and located so as to engage the top of the friction roller 53 when the arm 84 is swung downwardly. Suitable resilient means tend to apply the brake 85, as for example a tension spring 87 connected at 88 to the end of the arm 84 and at 89 to a stationary bracket 90 secured to the frame of the machine. Application of the brake is prevented, however, by a lever 91 pivoted at 92 on the frame and having an end 93 located just slightly in advance of the roller 80, said lever being suitably connected with the arm 84 as by means of a link 94 pivotally connected at 95 to the arm 84 and at 96 to the lever 91. The leading edge of the blank 3 engages and lifts the lever 91 shortly before or just as it moves forward into engagement with the friction rollers 53, 54 so as to lift the brake block 85 from contact with the friction roller 53. When the trailing edge of the blank passes beyond the belt 82, the friction drive to the feeding devices 57, 58 stops and immediately thereafter the trailing edge passes out from under the end 93 of the lever 91 so that the brake 85 is applied to the friction roller 53 by the spring 87.

It is necessary, of course, to sever the tape 9 between

each two carton blanks, and it will be evident that the cutting knifes may be located at any desired point between the feeding devices 57, 58 and the trailing edge of the carton blank itself. In the form shown, the knife oscillates in a horizontal plane through the space between the upper guide unit 68, 69 and the lower guide unit 73, 75, and its cutting stroke is timed with regard to the position of the trailing edge of the blank so that the cut-off length of tape will be sufficient to reach across the blank to the desired extent, preferably to its trailing edge. Thus means are provided for actuating the knife in response to movement of said trailing edge past a certain point which is located an appropriate distance in advance of the vertical guide channel through which the tape passes to the blank.

Preferably the knife is electrically operated and hence can be controlled conveniently by means of a switch arm 97 pivoted at 98 on a supporting plate 99 that is secured to a frame bracket 100. When lifted by the carton blank as shown in Fig. 1, the arm 97 cooperates with a plunger 101 of a switch mechanism 102. Its movement in the opposite direction after the trailing edge of the blank has gone by is preferably limited by means of a stop screw 103 adjustable in a bracket 104 secured to the plate 99. The switch mechanism 102 is connected by means of a cable 105 with suitable switching means 106 that in turn is connected by a cable or cables 107 with two solenoids 108 and 109 mounted at opposite ends of the frame plate 36 described above. The switching means 106 may be of any suitable type whereby the solenoids 108 and 109 are alternately energized by the passage of successive carton blank trailing edges under the switch arm 97, the knife thus severing the tape on movement in either direction.

The oscillating knife itself may suitably comprise a blade 110 secured in a grooved arm 111 projecting from a hub 112 that is mounted on a spindle 113 carried by a bracket 114 secured to the frame plate 36, the arm 111 projecting through and being oscillatable in a slot 115 in said frame plate. Preferably the hub 112 is maintained in fairly tight engagement with the bracket 114 by means such as a compression spring 116 interposed between the hub and a head 113' on the lower end of the spindle 113, lost motion and play being thus minimized. Pivotally mounted on the end of the arm 111, by suitable means such as a pivot pin 117 is a block 118 having slotted ends to receive the heads of links 119 and 120 that are pinned to the block 118 at 121 and 122 respectively, the other ends of the links being pinned at 123 and 124 respectively to the armatures 125 and 126 of the solenoids 108 and 109.

To summarize briefly the operation of the device described above, the tape 9 normally hangs freely in a position substantially as shown in Fig. 1. A carton blank 3 is moved into the machine by the pushers 4 and its leading edge first passes under and lifts the switch arm 97, and then moves forward into engagement with the hanging tape as shown in Fig. 1 while simultaneously or shortly thereafter lifting the arm 91 to release the brake 85. Meanwhile a short strip of adhesive has been applied to the bottom side of the tape by the bottom glue roller 14, after which the leading end of the carton has engaged the arm 19 and depressed this roller into an inactive position. Also a strip of adhesive has been applied to the top surface of the blank by means of the top glue roller 25 and this strip continues to be applied to the blank as it advances through the machine.

Movement of the blank beyond the position shown in Fig. 1 causes the hanging end of the tape to swing forwardly and upwardly to lie on the strip of adhesive on the top of the blank, while the excess length of tape is wiped up against the strip of glue on the bottom surface of the blank by means of the guide bar 10, 11, both tape lengths being pressed firmly against the blank as they pass between the bar 10 and the pressure roller 76.

Just as the leading edge of the blank passes beyond the pressure roller 76, and the above sequence of operations having been completed, the blank engages the friction devices and the operation of the feeding devices 57, 58 commences and thereafter continues indefinitely depending upon the length of the blank itself. Eventually the trailing edge of the blank arrives at and passes beyond the switch arm 97, allowing it to drop and actuate one or the other of the solenoids 108, 109 to sever the tape. The length of the remaining end of the tape from the cut-off point to the friction rollers 53, 54 is equal to the distance between these friction rollers and the trailing edge of the carton at the instant of cut-off, so that just enough tape is cut off to reach across the blank. Whenwhile the devices 57, 58 continue to operate, feeding out an excess length of tape which hangs down behind the trailing edge of the blank in the condition shown in Fig. 1. At this point the trailing edge of the carton passes beyond the roller 82 and the end 93 of the brake controlling lever 91 with the result that the feeding devices 57, 58 stop and the brake 85 is applied. The parts then remain stationary until the next carton blank passes into the machine.

Fig. 5 shows somewhat diagrammatically another embodiment of the invention in which the carton blanks are conveyed through the machine between endless traveling belts instead of being pushed along rails as described above. The frame 1 of the machine is provided with belt pulleys 127, one at each end, around which passes a suitable endless belt 128. Similarly belt pulleys 129 are mounted in the upper framework of the machine and an upper endless belt 130 passes around them. The carton blanks are conveyed through the machine in the space 131 between the upper reach of the lower belt 128 and the lower reach of the upper belt 130. Preferably these reaches are supported by rails 132 and 133 respectively so as to insure frictional engagement of the belts with the carton blanks sufficient to move them through the machine.

It will be understood that the belts 128 and 130 may have any suitable width, and that if desired two or more parallel belts may be employed either below or above the carton blanks or both. For example, it may be preferred to employ two narrow belts 130 above the blanks, in which event the upper reaches of the two belts may be differently arranged if necessary to avoid interference with other parts of the apparatus. In Fig. 5, for example, one of such upper reaches passes over a supporting idler pulley 134 whereas the other upper reach passes over a supporting idler pulley 135 at a substantially higher elevation.

Advantage may be taken of the use of conveying belts as described above to facilitate the feed of the tape from the supply roll by shifting the supply roll itself into frictional contact with one or the other of the upper belts at the same time that the feeding devices are brought into operation to pull the tape from the roll as described in connection with Figs. 1–4. Synchronization is automatically obtained since the belts 130 move at the speed of the blanks and turn the supply roll at a rate to feed out the tape at the same linear speed. Fig. 5 illustrates such a feeding mechanism wherein the supply roll is shifted by means connected with the brake mechanism described above. The brake lever 91 of Figs. 1–4 is provided with an upright bell crank 136 in Fig. 5. The spindle 137 of the supply roll is slidable in slots 138 formed in brackets 139 that are suitably secured on a transverse frame rod 140 by means such as clamping bolts 141. Pivoted between the brackets 139 is a bell crank lever having one end 142 adapted to engage and lift the supply roll when the bell crank lever turns in a counterclockwise direction. The other arm 143 of the bell crank lever is connected with the upright arm 136 of the brake lever 91 by a suitable link 144.

It will be seen that when the blank passes under the

brake lever 91 and lifts it to release the brake on the friction drive as described above, the link 144 will simultaneously move to the right as seen in Fig. 5 and swing the bell crank 142, 143 in a clockwise direction so as to permit the supply roll to descend until it rests on the moving belt 130. Conversely, when the trailing edge of the carton blank passes beyond the end 93 of the brake lever, the bell crank 142, 143 is turned in counterclockwise direction to elevate the supply roll and thus to stop the feeding action.

Otherwise than as described above, the machine of Fig. 5 is the same in construction and operation as the machine shown in Figs. 1–4, and the foregoing description applies to both machines and need not be repeated.

It will be understood that the invention is not restricted to the specific embodiments shown in the drawings and particularly described above, and that various changes can be made in the form, details of construction and arrangement of the parts without departing from its spirit. Reference should therefore be had to the appended claims for a definition of its limits.

What is claimed is:

1. A machine for applying tape to carton blanks comprising means for feeding carton blanks through the machine, friction roller means engaging a blank on opposite sides of the line of application of the tape and rotated by said blank during its passage through the machine, means for applying adhesive to the moving blank along said line, a tape supply means, tape feeding means driven by said friction roller means for feeding tape from said supply means to a blank as it moves through the machine, a tape cut-off knife, and knife operating means actuated by a moving blank at a predetermined point in its travel, the locations of said point and of said knife being correlated to cut off the tape at the length desired for application to the blank.

2. A machine as defined in claim 1 including brake means for at least one friction roller, and brake-applying means having an operating member engaging and actuated by the moving blank at a predetermined point in its travel.

3. A machine as defined in claim 1, said means for feeding blanks comprising upper and lower belts between which said blanks are engaged, said tape supply means comprising a movably mounted roll of tape, and means actuated by a moving blank at predetermined points in its travel for moving said roll into and out of frictional rotating engagement with one of said belts.

4. A machine for applying tape to a carton blank comprising means for feeding blanks through the machine, a friction roller engaged and rotated by a blank during its passage through the machine, a tape supply means, tape feeding means driven by said friction roller for feeding tape from said supply means to a blank as it moves through the machine, a tape cut-off knife, knife operating means actuated by a moving blank at a predetermined point in its travel, a brake for said friction roller, and a brake-operating member resiliently urged into engagement with said moving blank and actuated by the leading and trailing edges thereof respectively to release and apply said brake.

5. A machine as defined in claim 4, said means for feeding blanks comprising upper and lower belts between which said blanks are engaged, said tape supply means comprising a movably mounted roll of tape, and means connecting said brake-operating member with said supply roll for moving the same into and out of frictional driving engagement with one of said belts as said brake is respectively released and applied.

6. A machine for applying tape to a carton blank comprising means for feeding blanks through the machine, a tape supply means, tape feeding means for drawing tape from said supply means and feeding it to blanks moving through said machine, a tape cut-off knife, knife-operating means actuated by a moving blank at a predetermined point in its travel, the locations of said point and of said knife being correlated to cut off the tape at the length required to be attached to said blank, and driving means frictionally engaged and operated by said moving blank for actuating said tape feeding means, said driving means being located for disengagement by said blank a predetermined time after said cut-off knife is operated to continue the tape feed a predetermined time after cut off and thereby to advance a predetermined length of tape into the path of the leading edge of the next moving blank.

7. A machine as defined in claim 6, including glue applicator means engaged by said moving blank in advance of and in line with the application of tape thereto.

8. A machine as defined in claim 6, said advanced length of tape hanging partly below the path of the leading edge of the next moving blank, and a folding device located below said leading edge to fold the hanging end of the tape around said leading edge and underneath said next blank as it moves through the machine.

9. A machine as defined in claim 8, including a movably mounted glue applicator normally located to be engaged by the bottom of a moving blank in line with the tape to be folded under the blank, and means engaged by the leading end of the blank for moving said applicator out of contact with its bottom, said last named means being positioned to apply a strip of glue of a length not greater than that of the tape folded under the blank.

10. A machine for applying tear tape to a carton blank comprising means for feeding blanks through the machine, tape feeding means and friction driving means therefor actuated by passage of a blank through the machine, a tape cut-off knife and means actuated by passage of the trailing edge of a blank for operating the knife, the locations of said knife and actuating means being correlated to cut off the tape at the proper length for application to the trailing end of the blank, said driving means having frictional engagement with the blank throughout a substantial distance in the direction of travel whereby the length of tape passing through said feeding means on passage of a blank through the machine is greater than the length of the blank, said driving means being located at a point in the path of travel of the blank such that the operation of said feeding means continues after operation of said knife to feed the excess length of tape across said path of travel ahead of the next blank.

11. A machine as defined in claim 10, together with means for folding said excess length of tape up against the bottom surface of the moving blank.

12. A machine as defined in claim 10, including a brake member resiliently urged into engagement with said friction driving means, and a brake operating lever engageable by a blank to release said brake member, said lever having an elongated section to be engaged by a blank and extending approximately from the point where said driving means is engaged by the leading edge of a blank to the point where said driving means is disengaged by the trailing edge of a blank.

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