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J. GUIDO ETAL

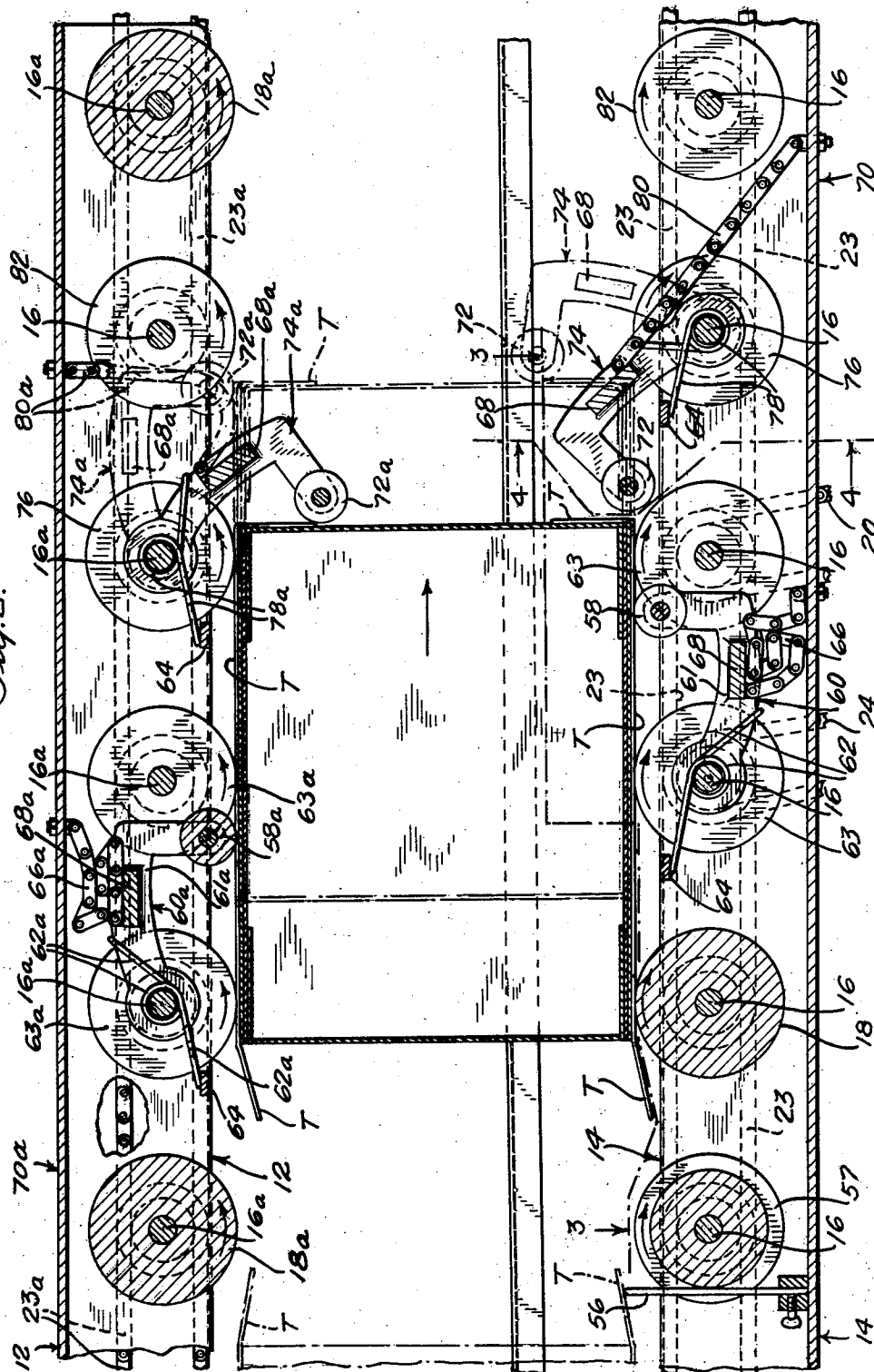
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MECHANISM FOR TAPING CARTONS

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Fig. 2.



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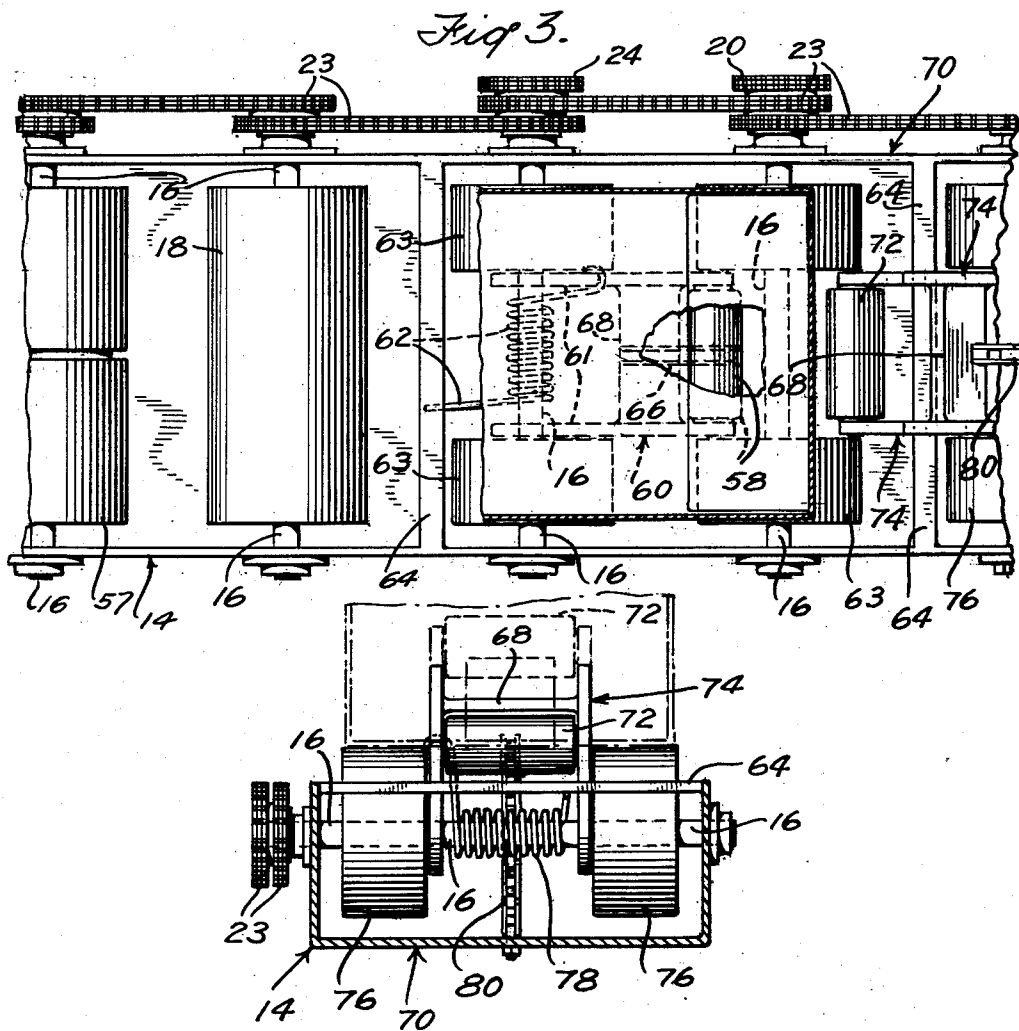
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MECHANISM FOR TAPING CARTONS

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This invention relates to carton taping machines in which a strip of sealing tape is automatically applied along the top and/or bottom of the traveling carton, with leading and trailing tape ends protruding freely beyond the carton ends, and in which the protruding tape ends are thereafter rolled and pressed in along the end faces of the carton.

Typical machines of the kind referred to are disclosed in copending applications Serial No. 811,625, filed May 7, 1959 now Pat. No. 3,052,072 for Carton Sealing Mechanism, and Serial No. 69,130, filed Nov. 14, 1960, now Pat. No. 3,045,402 for Machine for Automatically Measuring and Taping Cartons. The first of these prior machines is a machine of the U-return type, adapted to be set for carton lots of uniform heights and widths, but automatically adaptable to cartons of any length throughout an extensive range. The second of these prior machines is of the straight-through or single course type, and includes means for measuring the taping mechanism to the height and width of each individual carton and for automatically adjusting the taping mechanism to such measured height and width, this machine being also automatically adaptable to cartons of any length throughout an extensive range.

Each of the prior machines referred to feeds out tape and applies it to the top and/or bottom of the traveling carton, the tape being controlled in length by the length of the carton itself, but protruding by predetermined amounts beyond the leading and trailing ends of the carton. In each case the tape length applied to a longitudinal carton face, top or bottom as the case may be, is acted upon, as an incident of the continued travel of the carton, by a roll-over device which first rolls the tape firmly against the longitudinal face and then in against the trailing face of the carton. All this is done without arresting or slowing down the carton.

In each case, also, the carton is finally arrested at a roll-down station while a roll-down device moves in and out to fold in and press down the forwardly protruding tape length against the leading end of the carton. The roll-down device limits the rate of output of the entire machine, because it requires the carton to be stopped and to stand at rest throughout the roll-down operation.

It is the primary object of the present invention to take care of the folding in and the pressing down of the forwardly protruding tape length or lengths without arresting or slowing the carton, thereby to increase by an important amount the rate of output of the machine.

To this end it is a primary feature of the invention that a novel rock and roll device is provided which is capable of folding in the leading tape end and pressing it against the leading face of the carton, and this while the carton is being advanced at high speed.

The rock and roll device desirably includes a roller-carrying, swingable frame which is spring biased to a position in which it intercepts the forwardly protruding tape end and folds it against the leading face of the carton. As the carton continues to advance, the spring yields progressively, permitting the rockable frame to retreat. As an incident of the retreating action, the roller first rolls in along the leading carton face toward the center of such face, and then rolls out along the same face to a position clear thereof, in which position it bears against

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the adjacent longitudinal face of the carton. As soon as the carton clears the roller, the spring recovers, restoring the frame quickly to its original position.

Another feature of the invention has to do with the arrangement of upper and lower rock and roll devices in staggered relation so as to avoid interposing an objectionably high resistance to the frictional advancement of the carton by the carton feeding means.

It is a further feature of the invention that the substituting of the present rock and roll devices for the former roll-down devices materially shortens the machine thereby reducing the cost of the machine and the space which is required to accommodate it.

Other objects and advantages will hereinafter appear.

In the drawing forming part of this specification,

FIGURE 1 is a fragmentary view in sectional side elevation of an illustrative carton taping machine which embodies features of the invention;

FIGURE 2 is a fragmentary view in side elevation, partly broken away, of a portion of the structure shown in FIGURE 1, but on a larger scale than FIGURE 1, the view showing particularly the upper and lower rock and roll devices in action;

FIGURE 3 is a fragmentary, sectional plan view of the mechanism of FIGURE 2, the section being taken on the line 3—3 of FIGURE 2, looking in the direction of the arrows;

FIGURE 4 is a fragmentary sectional view taken on the line 4—4 of FIGURE 2, looking in the direction of the arrows.

For the sake of simplicity of illustration and description, the machine selected for illustration is of the straight-through or single course type, in which the overhead mechanism required to be adjusted and set to a selected fixed height appropriate to the height of the lot of cartons to be acted upon, and the side guides are similarly required to be adjusted and set.

The illustrative machine comprises a conventional frame structure 10 upon which upper and lower conveyors 12 and 14 are carried. The lower conveyor includes a number of equally spaced roller shafts 16, some of which carry solid or complete rollers 18. One of the shafts 16 is driven through chain gearing 20 from a motor 22. Except for the shaft which is directly driven by the chain gearing 20, each of the shafts 16 is driven through chain gearing 23 from a neighboring shaft of the series.

One of the shafts 16 is connected through chain gearing 24 to drive a prefeeder 26 for tape T. From the prefeeder 26 the tape passes around a guide rod 28 and between a constantly running feed roll 30 and an opposed pressure roll 32 of a feeding, cutting and moistening unit 34. The unit 34 is of well-known construction being of the type disclosed in U.S. Patent #2,721,669.

The pressure roll 32 is mounted on a rockable lever 38, which lever is normally maintained by a tension coil spring 40 in a position to hold the pressure roller 32 spaced away from the feed roller 30. A pinch cut knife 42, also carried by the lever 38 but at the opposite side of the lever fulcrum 36, is normally maintained in engagement with an anvil roller 44.

As a carton approaches the taping position, it engages and moves to switch closing position an extended switch actuator (not shown) through which a solenoid 46 is energized and held energized until after the carton has cleared the switch actuator. Energization of the solenoid 46 causes the lever 38 to be rocked clockwise, as viewed in FIGURE 1, thereby causing the cutting blade 42 to be withdrawn from the anvil 44 and the roller 32 to press through the tape T against the constantly running feed roll 30. As a consequence of this action, the rollers 30, 32 feed out, at the rate of travel of the carton, a strip of

tape which exceeds the length of the carton by a predetermined amount.

The leading end of the tape, after passing the cutter blade 42, passes a moistening couple 43 and then two constantly running feed couples 50. From the feed couples 50 the tape passes around a tape applying roller 52, against which it is held by a pressure roller 54, and by which it is applied progressively to the bottom face of the traveling carton. The timing of the feed is so arranged that the surplus tape length is divided substantially equally between forwardly protruding and rearwardly protruding tabs or tape ends.

A short distance beyond the roller 52, the leading end of the tape rides over the upper end of a vertically adjustable, upstanding, bendable finger 56, and is directed over a grooved conveyor roller 57 and into position to be intercepted by the roller 58 of a first rock and roll device 60. As the free end of the tape moves into engagement with the roller 58, the axial horizontal plane of the roller substantially coincides with the plane of engagement of the conveyor rollers with the bottom of the carton, and the tape end first becomes engaged with the front face of the carton at that level. With the continued advance of the carton, a roller carrying frame 61 which forms part of the rock and roll device 60, is forced to retreat, rocking about the axis of the shaft 16 on which it is mounted, against the increasing resistance of a torsion spring 62. The spring 62 surrounds the shaft 16 between comparatively narrow flanking rollers 63, and has one of its ends caught over an end member of the frame 61 and the other end engaged with the lower face of a fixed abutment bar 64, spanning the channel frame 70.

As the frame is moved back, the roller 58 first rises to a position directly above the shaft 16, but as the frame then continues to turn, the roller 58 descends to a level at which it bears upward against the bottom of the carton. During the first or rising phase of the roller operation, the roller runs up the leading face of the carton, pressing the free tape end progressively and smoothly against the leading face of the carton to the very end of the tape, and as the roller moves down it rolls over the leading tape end in the reverse direction, again pressing it firmly against the same area of the leading face of the carton.

The next shaft 16 is located far enough from the axis of the frame 61 to clear the frame 61 and the roller 58, but near enough to that axis to preclude the employment of a complete, solid conveyor roller on the shaft. A plurality of comparatively narrow spaced rollers 63 are therefore employed, between which the frame 61 and the roller 58 can move, as illustrated in FIGURE 2. The roller 58 holds the position in which it is shown in FIGURE 2 until it is cleared by the trailing end of the carton, so that it presses the tape evenly and smoothly from end to end of the carton bottom.

When the rear end of the carton is moved clear of the roller 58, the roller and its carrying frame 61, under the impulsion of the spring 62, quickly returns to the original condition illustrated in FIGURE 1. A link chain 66, connected at one end to a cross bar 68 which forms a rigid part of the frame 61, and anchored at the other end to the stationary channel member 70, limits the return travel of the frame 61 to the position indicated in FIGURE 1. The return movement of the frame 61 is very quickly effected, so that it is possible to cause the conveyor 14 to drive the cartons forward continuously, at high speed, and with little space intervening between them.

When the roller 58 and the frame 61 have attained the condition of FIGURE 2, in which the roller 58 bears upward against the bottom of the carton, the roller no longer opposes the frictional feeding forward of the carton by the conveyor, but instead substantially increases the pressure of the carton against the upper conveyor 12, thereby increasing the positiveness of the carton feed.

A second roller 72 and carrying frame 74, desirably identical, respectively, with the roller 58 and the frame 61

are mounted on the next shaft 16 between narrow flanking rollers 76. The roller 72 and the frame 74 have similarly associated with them a spring 78 and a chain 80. The roller 72 and the frame 74 operate exactly the same as the roller 58 and the frame 61, and clearance is provided for them between relatively narrow spaced rollers 82 which are mounted on the last of the shafts 16 shown in FIGURE 2.

Since each of the rollers 58 and 72 rolls the leading tape end against the leading carton end twice, the tape end gets rolled four times altogether and a thorough, tenacious adhesion of the leading tape end to the carton is assured.

The upper conveyor 12 is like the conveyor 14, save that it acts downward against the top of the carton rather than upward against the bottom of the carton. Two rock and roll devices of the kind already described are provided in association with the upper conveyor. Since the upper conveyor of the upper rock and roll devices are essentially identical with the corresponding structure already described, corresponding reference characters have been applied to corresponding parts with the postscript *a* added in each instance, and no further detailed description will be given. It may be noted, however, that there is no need for a finger like 56 nor a grooved roller corresponding to the roller 57 in the upper conveyor.

It is a feature of the invention that the rollers 58a, 58, 72a and 72 are arranged in staggered relation in order to avoid an objectionable opposition to advance of the carton which might be sufficient to cause the carton to slip relative to the conveyor.

At the initial engagement of the carton with the roller 58a, the thrust of the carton is applied through a comparatively short effective lever arm (the vertical projection of a line joining the axis of the roller 58a with the axis of the carrying shaft 16a) but against a comparatively low spring resistance. During the first half of the retreating stroke of the frame 61a, the spring resistance increases but the lever arm grows longer. During the second half of the retreating stroke of 61a the resistance progressively increases because the spring deformation increases and the lever arm grows shorter.

At about the beginning of the second half of the retreating stroke of the frame 61a, the roller 58a is engaged by the carton and the first half of the retreating stroke of the frame 61 progresses concurrently with the second half of the retreating stroke of the frame 61a. The first half of the retreating stroke of the frame 74a progresses concurrently with the second half of the retreating stroke of the frame 61, and finally the first half of the retreating stroke of the frame 74 progresses concurrently with the second half of the retreating stroke of the frame 74a, being followed by the second half of the retreating stroke of the frame 74. At no time are the combined resistances sufficient to cause the carton to slip relative to the conveyors. This is due in large measure to the staggered arrangement of the rock and roll devices.

A further important point in maintaining the uniform feed of the carton, resides in the fact that no gap is allowed to occur in the normal spacing of the conveyor rollers 18 and 18a. The traction area is kept as large as possible by providing pairs of spaced rollers like 63, 64, 76 and 82 in the lower conveyor and their counterparts in the upper conveyor, where clearance is required for the mounting and operation of the rock and roll devices.

After passing the rock and roll devices each carton travels between lower and upper roll-over devices 84 and 84a, which are desirably of the same construction and operate upon the same principle as the roll-over devices disclosed in our copending application Serial No. 808,253, filed April 22, 1959 for Mechanism for Applying and Pressing Adhesive Tape to Perpendicularly Related Faces of Traveling Cartons, now U.S. Patent No.

2,999,342. The roll-over device 84 comprises a pair of diametrically opposed rollers 86 which are mounted at the ends of hook-shaped arms 88 of a rotary carrier 90. The carrier 90 is constantly urged in a clockwise direction (FIG. 1) by a driving chain 92. Transmission means between the chain 92 and the carrier 90 effects a slip-drive, so that when one of the rollers comes up underneath a carton it may be arrested in carton engaging position while continuing to be urged yieldingly against the carton by the driving tendency of the chain 92.

As the trailing edge of the carton begins to move off of the roller 86 which has been riding the lower face of the carton, the roller 86 begins to move upward. The arrangement is such that the roller will always keep pace with the moving carton as the roller moves up, and will continually press the trailing tape end against the trailing face of the carton. When the active roller 86 has reached its highest position, it starts to move down, and as it moves down it again rolls the same tape end firmly against the carton to more positively assure an even and dependable cohesion of the tape end with the trailing face of the carton.

The trailing tape end is pressed only twice as compared with four times for the leading tape end. This disparity is compensated, however, by the fact that there is a greater period of delay between the moistening and pressing of the trailing tape end than between the moistening and pressing of the leading tape end. The extra delay gives the trailing end a chance to become tackier and hence enables it to adhere well with less pressing.

The lower roll-over device 84 is duplicated at the top. Since there is no difference of structure, aside from the fact that the upper roll-over device turns counterclockwise and acts on the carton from above, corresponding reference characters have been applied to corresponding parts with the subscript *a* added in each instance, and no detailed description will be given.

In a machine of the kind having a roll-down unit, which the present illustrative machine is designed to supplant, the structure up to and through the roll-over device 84 and 84a would be just as extensive as in the present machine, but after passing the roll-over devices, the leading tape ends would still extend forward beyond the leading end of the carton and would still require to be folded and pressed against the leading end face of the carton. By substituting the present rock and roll device for the former roll-down device, not only is the work of the machine expedited to an important degree, but the length of the machine is substantially reduced, with a worthwhile saving in the cost of manufacture, and a substantial reduction of floor space required.

While a certain preferred embodiment of the invention has been illustrated and described in detail, it is to be understood that changes may be made therein and the invention embodied in other structures. It is not, therefore, the intention to limit the patent to the specific construction illustrated, but to cover the invention broadly in whatever form its principles may be utilized.

We claim:

1. In a carton taping machine, the combination with a continuously running, carton driving conveyor, of means responsive to the travel of the conveyor-driven carton, automatically to feed out, moisten and cut a strip of tape controlled in length by the length of the carton while applying an intermediate portion of the tape to a longitudinally extending face of the carton with end portions of predetermined length protruding beyond the front and rear faces of the carton, respectively, a rock and roll device comprising a frame supported for rocking movement about an axis which is disposed outside the carton path, parallel to the plane of conveyance, and at right angles to the direction of conveyance, a roller

carried by the free end of the frame and disposed in parallelism with the frame axis, and spring means constantly urging the frame toward and against a stop or limit means, the same constituting a normal position in which the roller is held in the path of carton advance, across the plane of carton-conveyor engagement, and in a position well in advance of the frame axis, the construction and arrangement being such that the carton forces the roller before it, causing the roller first to fold in the tape length which protrudes beyond the leading face of the carton, then to roll in and out along the leading carton face while pressing said tape length against said face, then to bear against the adjacent longitudinal face of the carton for the full length of the carton, and finally to return the roller quickly and against said limit means upon the clearing of the roller by the carton, and a roll-over comprising a frame mounted for rotation about an axis which is disposed outside the carton path, parallel to the plane of conveyance, and at right angles to the direction of conveyance, roller means supported by the rotary frame in parallelism with the frame axis, and constantly acting slip drive means urging the frame in a direction to carry the roller means into engagement with the longitudinal face of the carton, then in along the trailing end face of the carton to fold in and roll in along the rearwardly protruding tape length, and then to roll out along the same tape length.

2. In a carton taping machine, the combination with a continuously running, carton driving conveyor, of means responsive to the travel of the conveyor-driven carton, automatically to feed out, moisten and cut a length of tape while applying an intermediate portion of the tape to a longitudinally extending face of the carton with an end portion of predetermined length protruding beyond the front face of the carton, a rock and roll device comprising a frame supported for rocking movement about an axis which is disposed outside the carton path, parallel to the plane of conveyance, and at right angles to the direction of conveyance, a roller carried by the free end of the frame and disposed in parallelism with the frame axis, and spring means constantly urging the frame toward and against a stop or limit means, the same constituting a normal position in which the roller is held in the path of carton advance, across the plane of carton-conveyor engagement, and in a position well in advance of the frame axis, the construction and arrangement being such that the carton forces the roller before it, causing the roller first to fold in the tape length which protrudes beyond the leading face of the carton, then to roll in and out along the leading carton face while pressing said tape length against said face, then to bear against the adjacent longitudinal face of the carton for the full length of the carton, and finally to return the roller quickly against said limit means upon the clearing of the roller by the carton, the conveyor including a multiplicity of evenly spaced, constantly driven roller shafts, one of said shafts serving to support the frame with freedom for rocking movement, rollers drivably mounted on said shaft at opposite sides of said frame, and driven rollers fixed on the next following conveyor shaft and spaced from one another to provide clearance for said frame as it rocks forward.

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