

Sept. 12, 1961

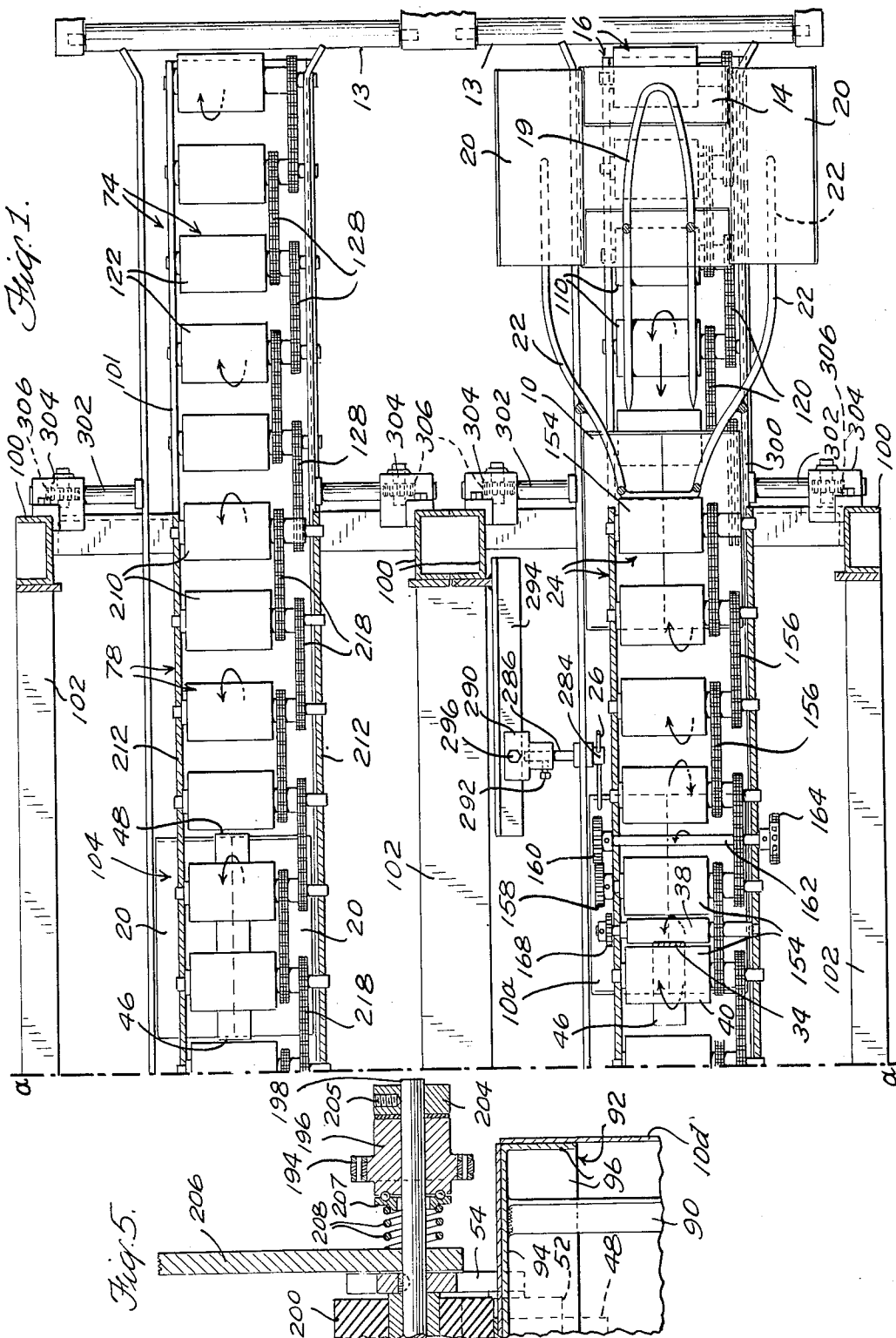
C. D. KEELY ET AL

2,999,342

MECHANISM FOR APPLYING AND PRESSING ADHESIVE TAPE TO
PERPENDICULARLY RELATED FACES OF TRAVELING CARTONS

Filed April 22, 1959

6 Sheets-Sheet 1



Sept. 12, 1961 C. D. KEELY ET AL 2,999,342
MECHANISM FOR APPLYING AND PRESSING ADHESIVE TAPE TO
PERPENDICULARLY RELATED FACES OF TRAVELING CARTONS
Filed April 22, 1959 6 Sheets-Sheet 2

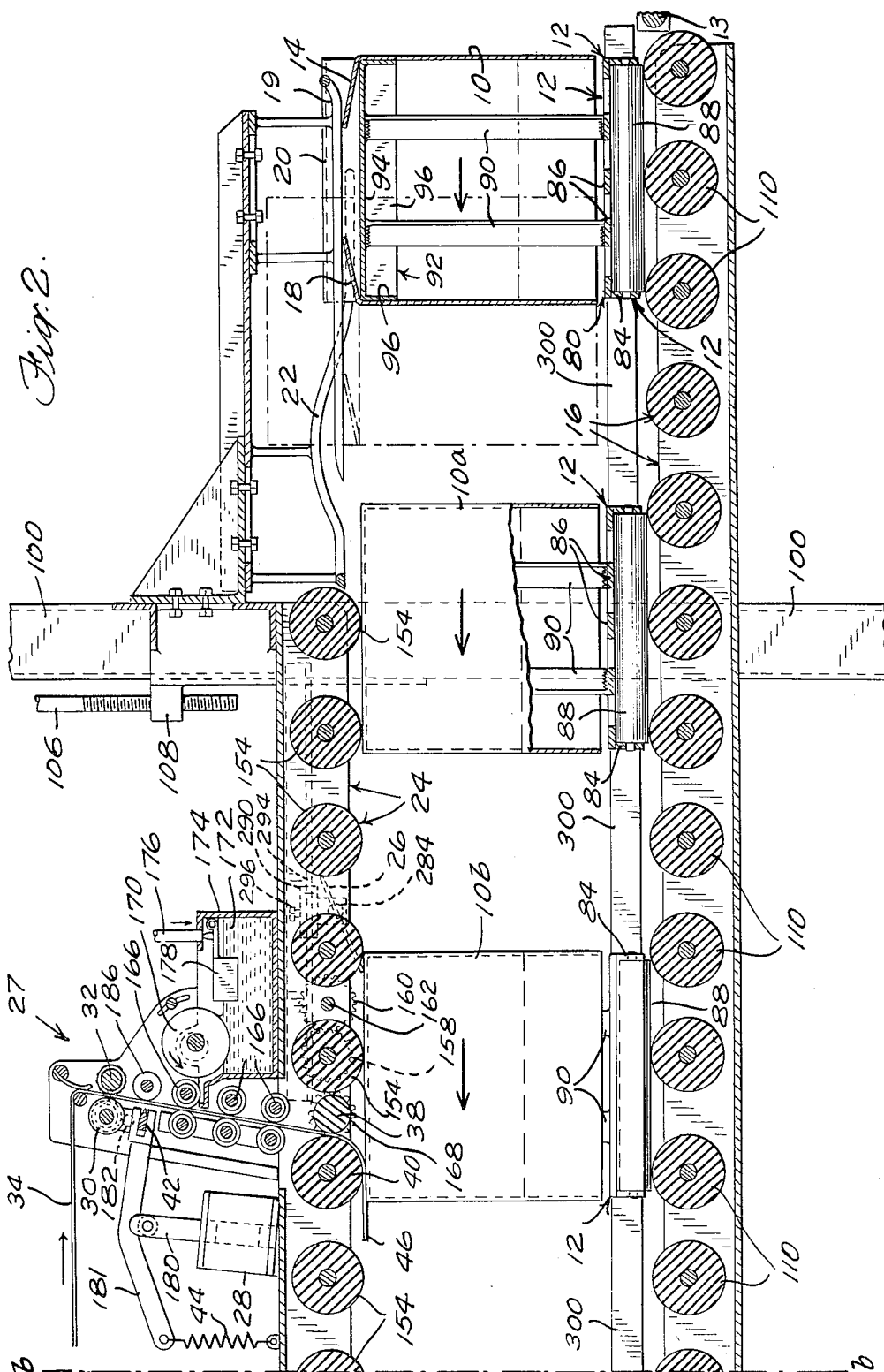
C. D. KEELY ET AL

2,999,342

MECHANISM FOR APPLYING AND PRESSING ADHESIVE TAPE TO
PERPENDICULARLY RELATED FACES OF TRAVELING CARTONS

Filed April 22, 1959

6 Sheets-Sheet 2



Sept. 12, 1961

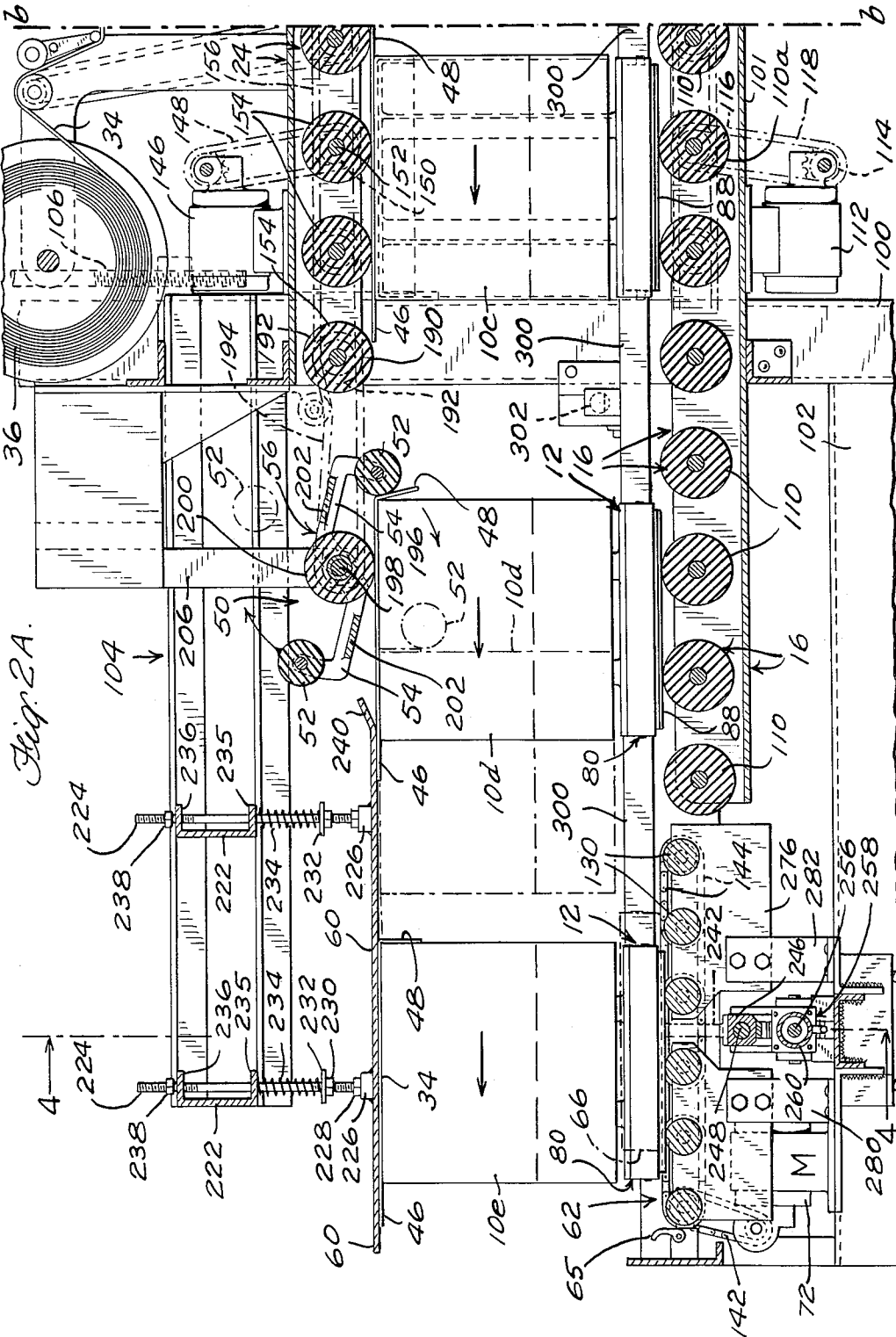
C. D. KEELY ET AL

2,999,342

MECHANISM FOR APPLYING AND PRESSING ADHESIVE TAPE TO
PERPENDICULARLY RELATED FACES OF TRAVELING CARTONS

Filed April 22, 1959

6 Sheets-Sheet 3



Sept. 12, 1961

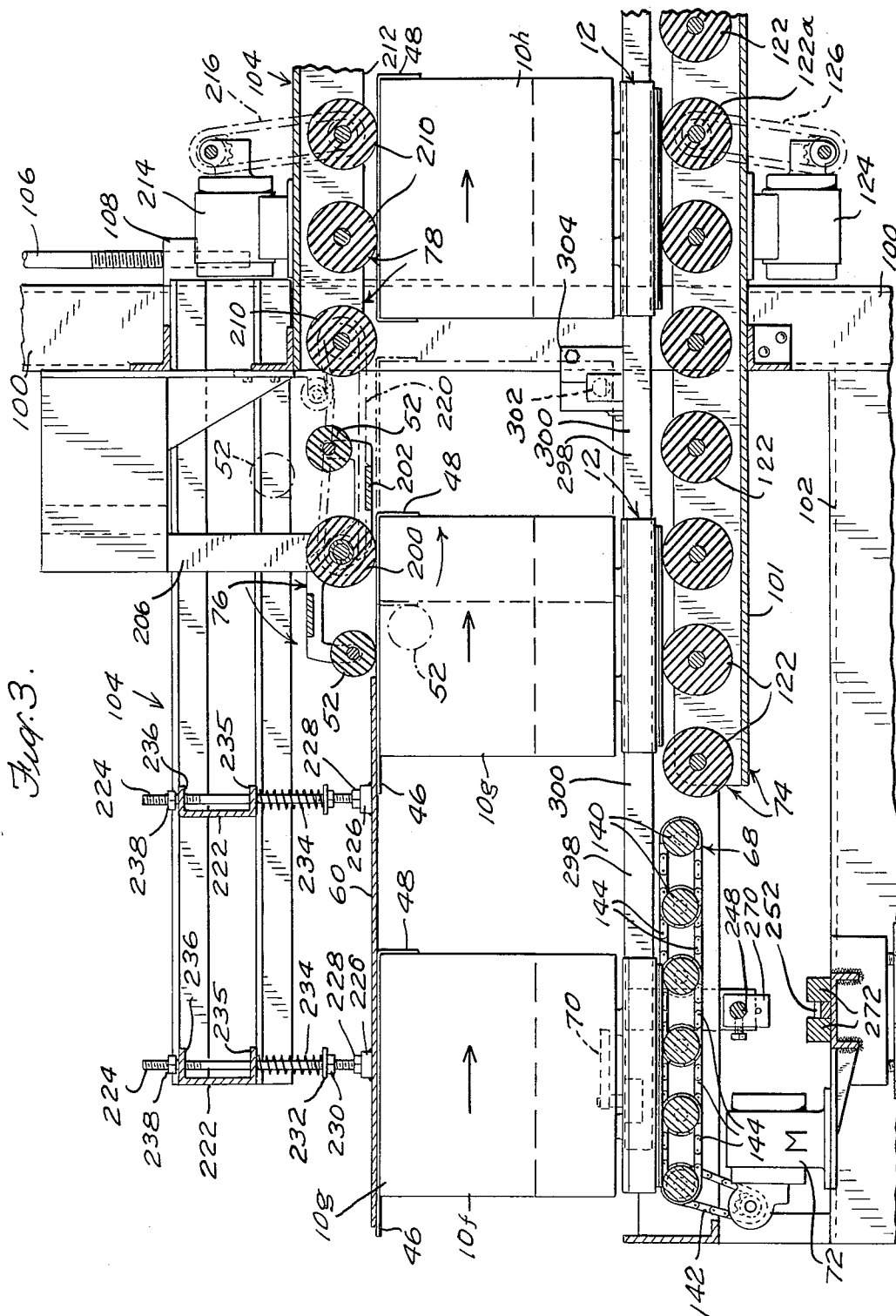
C. D. KEELY ET AL

2,999,342

MECHANISM FOR APPLYING AND PRESSING ADHESIVE TAPE TO
PERPENDICULARLY RELATED FACES OF TRAVELING CARTONS

Filed April 22, 1959

6 Sheets-Sheet 4



Sept. 12, 1961

C. D. KEELY ET AL

2,999,342

MECHANISM FOR APPLYING AND PRESSING ADHESIVE TAPE TO
PERPENDICULARLY RELATED FACES OF TRAVELING CARTONS

Filed April 22, 1959

6 Sheets-Sheet 5

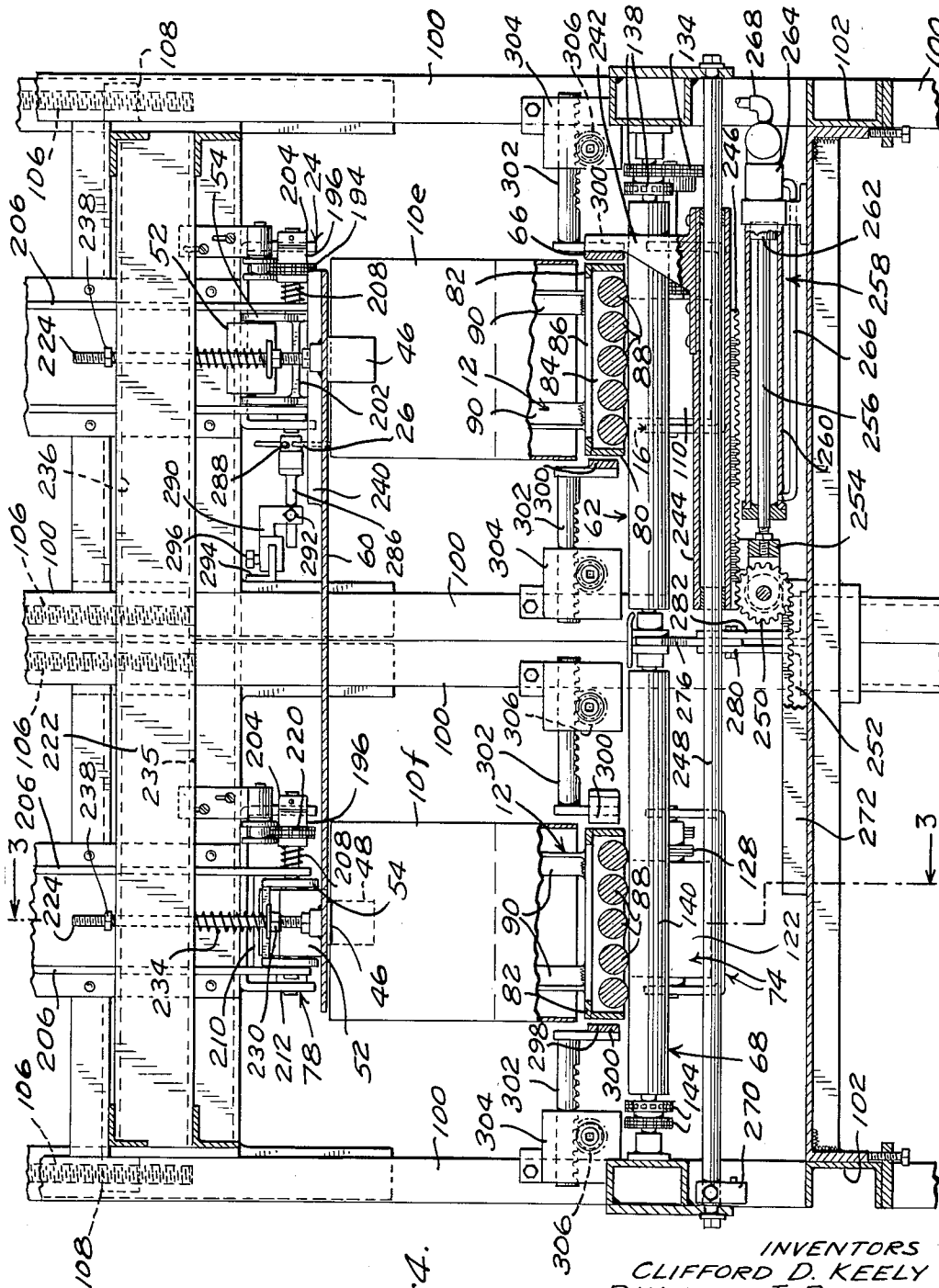


Fig. 4.

INVENTORS
CLIFFORD D. KEELY
RAYMOND J. BAISLEY

BY

Berry & Crews
ATTORNEYS

Sept. 12, 1961

C. D. KEELY ET AL

2,999,342

MECHANISM FOR APPLYING AND PRESSING ADHESIVE TAPE TO
PERPENDICULARLY RELATED FACES OF TRAVELING CARTONS

Filed April 22, 1959

6 Sheets-Sheet 6

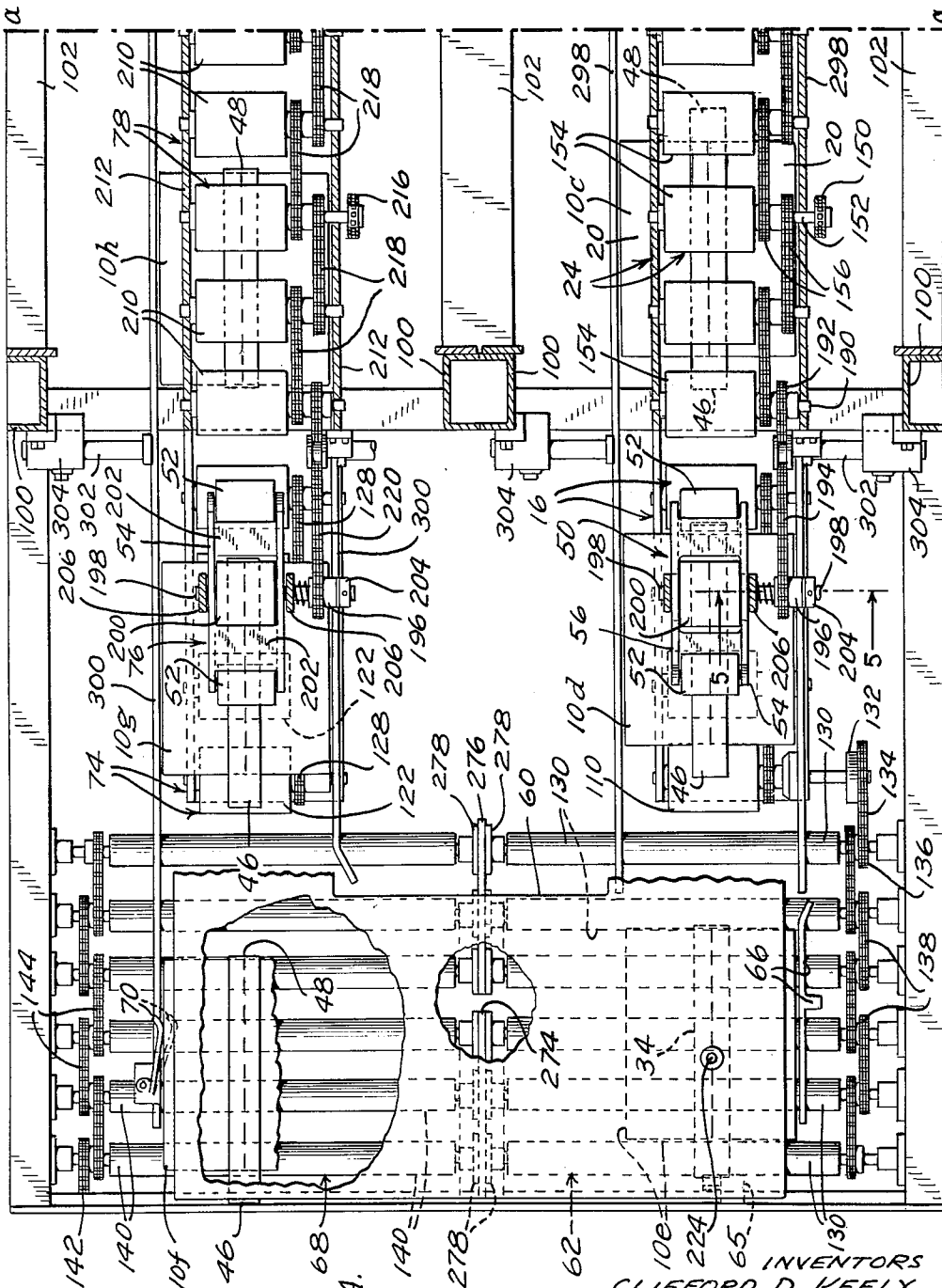


Fig. 1A.

INVENTORS
CLIFFORD D. KEELY
RAYMOND J. BAISLEY
BY *Berry & Crews*
ATTORNEYS

1

2,999,342

MECHANISM FOR APPLYING AND PRESSING ADHESIVE TAPE TO PERPENDICULARLY RELATED FACES OF TRAVELING CARTONS

Clifford D. Keely, West Englewood, N.J., and Raymond J. Baisley, Hempstead, N.Y., assignors to General Corrugated Machinery Company, Inc., Palisades Park, N.J., a corporation of New Jersey

Filed Apr. 22, 1959, Ser. No. 808,253

12 Claims. (Cl. 53—66)

This invention relates to automatic carton taping mechanism adapted particularly for use in the shipping or packing department of a manufacturing or merchandising concern.

It is common practice to provide carton taping machines which include tape moistening and feeding mechanism responsive to a traveling carton for feeding out strips of moistened tape to the upper and/or bottom ends of cartons (in upright or inverted position) which strips are automatically fed and cut of varied lengths according to the length of the carton, to exceed by a predetermined amount the length of the carton. The moistened tape, as delivered, is automatically applied to the carton with end portions protruding substantially equally beyond the leading and trailing edges of the carton, and with the intervening length of tape continuously adhered to the carton for single strip sealing. Such machines, however, bring the carton to rest at an automatic end taping station where the protruding tape ends at the front and rear are rolled or brushed over and down and pressed firmly against the leading and trailing faces of the carton.

In known machines of the kind referred to, a roll-down mechanism for acting against the leading face of the carton and a roll-down mechanism for acting against the trailing face of the carton are arranged to act in unison. They must necessarily be adjusted to varied distances from one another to adapt them for acting upon cartons of varied lengths. For each change of carton length, it is necessary to readjust one or both of the roll-down devices and to make other incidental changes in the machine set-up in order to adapt the machine for the new work requirements. The loss of this "make-ready" time is costly, since it cuts down materially the average daily output of a machine. It also calls for additional knowledge and skill on the part of the machine attendant.

It is a primary object of the present invention to provide means for pressing tape ends against the end faces of moving cartons, capable automatically, without any "make-ready" adjustments, to act properly on cartons of widely varied lengths, and this without the need for timing the feeding of cartons to the machine.

To this end, it is a feature that a roll-over device is provided having diametrically opposed, orbitally movable rollers, either of which is capable of engaging the top of a carton and arresting rotation of the roll-over device as the carton travels along beneath the engaged roller. Then, as the carton top clears the roller, the roll-over device is partially freed to rotate further. As the device is allowed to rotate again, the roller rolls the over-hanging tape end down against the trailing face of the carton and then rolls up to press the tape end once more against the carton. In order that the rollers may act in this fashion, slip drive means are provided for the roller carrying arms. The arrangement is such that the rollers when unimpeded, travel bodily at a considerably greater speed than the cartons, but are adapted to be arrested or limited in bodily speed when obstructed by the top or the trailing face of a carton to allow the respective roller to follow the box surface.

Since the roller carrying arms are uniformly but yieldingly urged at all times about a fixed axis of rotation, they simply turn at uniform rotary speed whenever there

2

is no obstruction by a carton. The direction of rotation is such that a roller first lands on top of a carton and is detained in the top engaging position until the carton top begins to move clear of the roller. As the carton top begins to move out from under the roller, the carrying arms begin to turn again, so that the arm carried, carton engaging roller moves over the edge and downward causing a tight rub-down pull and roll-in of tape against the trailing face of the carton while also seeking yieldingly to move forward relative to said face. The effect is to prevent over the end looseness. This causes the overhanging, trailing end of the tape to be folded down and rolled smoothly against the leading face. As the roller moves through its lowermost position, it begins to move upward, and during this upward movement it again rolls over the same length of down-folded tape, roller-pressing it once more against the trailing face.

Once the engaged carton is cleared, the roll-over arms are caused to resume their free or normal rotation by the action of the slip clutch drive, until one or the other of the rollers lands on top of the next following carton. If there is a sufficient gap between cartons, both rollers will continue rotatively past the normal carton top engaging position until a carton comes along. There is no necessary timing of the cartons, and the uniform forward motion of the carton is never interrupted and never interfered with. The roll-over device acts properly and impartially upon each carton regardless of the carton spacing and regardless of the carton length. The cartons must, however, be separated by a minimum distance sufficient to assure that the tape cutting switch arm will function between cartons. This presents no problem.

As thus far outlined, nothing has been done about the protruding tape end which extends beyond the leading face of the carton. In accordance with a further important feature of the invention, the machine is of the familiar U-return type, in which the carton is introduced at the beginning of an outgoing course, is transferred without reorientation along a transverse course, and is finally fed, still without reorientation, along a return course parallel to the outgoing course, to the operative's end of the machine. The tape end which protruded at the leading end of the carton in the outgoing course, trails in the return course. A second roll-over device, like the one already referred to, is provided in the return course for acting upon this now trailing tape end. The second roll-over device may be a duplicate of the first, and may act in precisely the manner of the first as already described.

While the roll-over mechanisms are illustratively shown and described herein as acting on the upper ends of cartons, it will be understood, of course, that they could be provided for operating instead on the lower ends of cartons, or that they could be provided for acting concurrently on the upper and lower ends. These arrangements are particularly advantageous in single course or straight-away machines.

Other objects and advantages will hereinafter appear;

In the drawing forming part of this specification,

FIGURES 1 and 1A are complementary views, which, when placed end to end along the lines *a—*a** jointly form a sectional plan view of the complete machine, with the exception of an auxiliary roller table which is provided at the operator's end of the machine;

FIGURES 2 and 2A are complementary views which, when placed end to end along the lines *b—*b** jointly form a view in sectional side elevation of the outgoing run of the machine;

FIGURE 3 is a fragmentary view in sectional side elevation showing roll-over and adjacent operations of the return run, the section being taken upon line 3—3 of FIGURE 4 looking in the direction of the arrows;

FIGURE 4 is a fragmentary sectional view taken upon the line 4—4 of FIGURE 2A looking in the direction of the arrows;

FIGURE 5 is a fragmentary sectional view taken on the line 5—5 of FIGURE 1A looking in the direction of the arrows, but on a larger scale than FIGURE 1A.

For the purpose of affording a clear comprehension of the general principle of operation of the machine, a concise general description will first be given by reference only to the principal parts, and without attention to detail. A carton 10, having front and rear faces and four longitudinal faces, i.e., a top face, a bottom face, and two side faces, is illustratively shown. The carton 10 mounted upon a dummy 12, is introduced into the machine from a roller table 13 at the right hand end (FIG. 2), with its trailing or rear flap 14 manually folded down. The carton carrying dummy 12 is fed onto a constantly driven roller conveyor 16 which carries the carton supporting dummy 12 toward the left at constant speed through the first or out-going course.

The forward inner flap 18 of the carton immediately encounters an overhead folding bar 19 which turns the flap down and back against the upper end of the dummy 12. The rear inner flap 14, manually folded inward, follows the flap 18 under the bar 19 and is held down by the bar. The upstanding side flaps 20 are engaged and folded in and down over the flaps 14 and 18, and into substantially meeting relation with one another by overhead plows 22. The flaps 20 are held down by the plows 22 and are guided by the plows beneath hold-down means in the form of a roller conveyor 24. The conveyor 24 consists of a multiplicity of overhead rollers which are constantly driven at equal and uniform speeds.

As the carton continues along the outgoing course it engages a control arm 26 of a normally open switch. Movement of the switch arm 26 to switch closing position causes a solenoid 28 to be energized, and the solenoid forces an idler roller 30 against a constantly driven tape feeding roller 32, causing tape 34 to be fed out from a supply reel 36 onto the top of the carton, as partially illustrated with regard to the carton shown in position 10b in FIG. 2. The tape passes to the carton between opposed constantly driven rollers 38 and 40.

When the carton clears the switch arm 26, the arm drops down, the solenoid 28 is de-energized, the idler roller 30 moves away from the driven roller 32, and the tape is severed by the pinch cutting knife 42 under the impelling force of a spring 44. The switch arm 26 is so situated that the tape is delivered to the carton with an overhanging end 46 of predetermined length protruding beyond the forward face of the carton. The switch arm 26 is of such length and has a range of movement such that the length of tape fed exceeds the length of the carton by a predetermined amount, causing an overhanging end 48, substantially equal in length to the overhanging length 46, to protrude beyond the rear face of the carton.

After the application of the tape, the carton continues along the outgoing course between the overhead conveyor 24 and the supporting conveyor 16, past a tape end rolling station at which a roll-over device 50 acts to fold down the tape end 48 and to roll the tape end smoothly and firmly against the trailing face of the carton. The roll-over device 50 comprises a pair of diametrically opposed rollers 52 which are mounted at the outer ends of hook-shaped arms 54 of a rotary carrier 56. The carrier 56 is constantly urged in a clockwise direction (FIG. 2A) by a driving chain 194. The transmission means between the chain 194 and the carrier 56 effects a slip drive, so that when one of the rollers comes down on top of a carton it may be arrested in carton riding position while continuing to be urged yieldingly against the carton by the driving tendency of the chain 194.

As the latter edge of the carton begins to move out from under the roller 52 which has been riding the carton, the roller 52 begins to move down. The arrangement is

such that the roller will always keep pace with the moving carton as the roller moves down, and will continuously press the tape end 48 against the trailing face of the carton. When the active roller 52 has reached its lowermost position, it starts to move up, and as it moves up it again rolls the same tape end firmly down against the carton to more positively assure an even and dependable cohesion of the tape end with the carton face.

After passing the roll-over device, the carton is fed beneath a hold-down plate 60 and onto a roller table 62, the rollers of which are constantly driven by a relatively large sprocket 132 for continuing the advance of the carton at the same uniform speed to the end of the outgoing course.

At the end of the outgoing course, the carton engages and moves a switch actuating arm 65, causing the pusher 66 (FIG. 4) to push the carton sidewise from the position 10e to the position 10f. In transferring the carton from 10e to 10f the pusher 66 pushes the carton off the constantly running roller table 62 and onto a normally idle roller table 68. As the carton arrives at the 10f position it moves a switch actuating arm 70 to energize a motor 72, causing the motor 72 to drive the rollers of table 68 at the same peripheral speed as the rollers of roller table 62, but in the opposite direction.

Table 68 delivers the carton onto a constantly running return conveyor 74. As the carton moves clear of the switch arms 70, the arm returns to its normal dotted line position, permitting the switch to open, and thereby causing the motor 72 and the rollers of table 63 to come to rest. Before the clearance of the arm 70 by the carton, the control of the carton feeding has been taken over by the conveyor 74. The conveyor 74 runs constantly at the same speed as the other conveyors which have been referred to.

The conveyor 74 continues the advance of the carton at uniform speed to a second roll-over device 76 which is desirably in all respects the same as the roll-over device 50. The roll-over device 76 acts upon the protruding tape end 46 in the same manner, already described, that the roll-over device 50 acts upon the protruding tape end 48. Following the roll-over device 76, the carton is advanced beneath a hold-down roller conveyor 78 for a short distance only, and it is then continued by the conveyor 74 to a point of discharge, directly alongside the station at which the carton was introduced into the machine.

The carton which has been thus put through the machine on a dummy in an inverted position to have its bottom taped, is now removed from the dummy, and filled. When filled the cartons are set on carriers of appropriate height, and put through the machine the same as before for a repetition of the same sequence of operations on the carton tops as has been described for the carton bottom sealing before filling. The filled carton, when sealed in the same machine, is supported at a proper level by the carrier to cause the overhead operating instrumentalities, including the overhead folding bar 19, the plows 22, the tape applier 27, the overhead conveyors 24 and 78, the hold-down plate 60 and the roll-over devices 50 and 76, to act upon the erected and filled carton as they are shown acting on the inverted carton in the drawing.

It is possible after the tape has been applied to the carton to keep under pressure the tape so applied, and the carton flaps to which it is applied, at all times until the carton is ready for discharge. This is desirable because the tape is necessarily applied to the carton top directly after it has been moistened and before the moisture has had full time to soak into the adhesive and make it thoroughly tacky.

The roll-over device 50, however, is placed some distance away from the tape applying station in order to give the adhesive on the tape end 48 time to become tacky before it is stuck down. This is advantageous be-

cause there is no extraneous means for holding the tape end 48 in place after the effective roller 52 of the device 50 has rolled downward and then upward along the tape end. The extra tackiness gained by the delay contributes importantly to the evenness and the effectiveness of the adhesive joint formed between the trailing carton face and the tacky tape end. There is a still longer delay in rolling the tape end 46 against the opposite end of the carton, and this also serves to bring about dependable and even adhesion.

Before proceeding with the detailed description of the machine, attention will be given briefly to the means for carrying the cartons through the machine. Referring particularly to FIGURES 2 and 4, the carton 10 is shown in an inverted position on the dummy 12. The dummy 12 comprises a lower frame 80 which consists of longitudinal members 82, transverse bearing members 84, transverse slats 86, and longitudinally extending rollers 88. Standards 90, carried by slats 86, support at their upper ends an inverted pan 92, whose base 94 provides solid support for the carton flaps which jointly form the bottom of the inverted carton, and whose skirt portion 96 fits within the carton and engages the side and end walls of the carton to hold the carton steady and to retain it firmly in place.

The overhead parts of the machine are all adjustable vertically, but it is generally desirable in order to avoid accumulation of unfilled cartons at the attendant's end of the machine to put only a few of the inverted blanks through for first or bottom taping operation, then to fill and perform the second, or top tape sealing operation upon the filled cartons so that they can be disposed of before another group is similarly dealt with. By alternating the operations, traffic management is greatly simplified. When this mode of procedure is followed it is not convenient nor economical to be continually readjusting the level of the overhead mechanism.

For any popular size carton, therefore, it is desirable to leave the overhead mechanism in a fixed setting and to provide appropriate carriers for the bottom sealed and filled cartons which will carry the carton tops through at the same level at which the bottoms of the inverted cartons were carried through. The carriers used for this purpose are exactly like the dummies illustrated with the following exceptions.

(1) The standards 90 and the pans 92 are removable and are sized in relation to the base unit for interchangeability.

(2) The pans 92 are mounted in upright rather than inverted position, and

(3) The skirt portions of the pans are made large enough to embrace the carton bottoms and hold them steadily and securely on the carriers.

It is quite normal, however, because of production quantities, to use another machine for straight line sealing after filling of mixed sizes. In such machines the roll-over unit may be advantageously included in order to eliminate the need for make-ready down time.

The machine comprises upright frame members 100 on which all the other frame members are supported. A lower frame structure which comprises longitudinal members 102 is supported from the upright members 100 in fixed position, while an upper frame structure 104 for carrying the overhead mechanism is supported from the upright members 100 with provision for vertical adjustment. Numerous screws 106 supported from the uprights 100 with freedom for rotation, but without capacity for axial movement, are threaded through ears 108 of the upper frame 104. The screws are desirably operated simultaneously from a single operating source through suitable gearing (not shown), in accordance with conventional practice. Other details of the frame structure will be referred to incidentally as the description proceeds.

The rollers 110 of conveyors 16 are mounted in a

pair of parallel lower frame members 101. A motor 112 (FIG. 2A), suspended from these frame members 101, drives all the rollers 110 in unison and at constant speed through suitable gearing. The motor is illustrated as connected through sprockets 114 and 116 and a chain 118 to drive one of these rollers 110 which, for the purpose of differentiation, is designated 110a. In the whole series of rollers 110, the roller 110a drives its neighbors, and each of the other rollers is driven from its neighbor roller nearer to 110a through a drive chain 120.

This type of drive is used also in connection with the rollers 122 and 122a of lower conveyor 74, these rollers being mounted in a further pair of parallel frame members 101, and the roller 122a being driven from a motor 124 through a chain 126, and the drive being transmitted from roller to roller through chain gearing 128.

The rollers 130 of constantly operating roller table 62 are driven at the same peripheral speed as the rollers 110 and 110a of conveyor 16. A relatively large sprocket 132 fast on the shaft of the final roller 110, is connected through a chain 134 to drive a smaller sprocket 136 fast on the shaft of the first table roller 130. Chain gearing 138 transfers the drive from roller shaft to roller shaft of the table 62.

The rollers 140 of intermittently operated roller table 68 are driven from a motor 72, as previously noted. The motor drives one of the rollers 140 through chain gearing 142, and the drive is transmitted thence to the other rollers 140 through chain gearing 144.

A constantly running motor 146, mounted on the upper frame 104, serves to drive the upper conveyor 24, the feeding means of the tape supplier 27 and the roll-over device 50. The motor is connected through chain gearing 148 to drive a sprocket 150 which is fast on an extended horizontal shaft 152 of one of the rollers 154 of the upper conveyor 24. The rollers 154 of the upper conveyor 24 are connected through chain gearing 156 which causes all the rollers of the conveyor to turn at one peripheral speed, the same as that of the rollers 110 of the lower conveyor 16.

One of the rollers 154 has an extended shaft upon which a gear 158 for driving the tape feeding means is made fast. The gear 158 drives a meshing gear 160 which is fast upon a shaft 162. The shaft 162 has fast upon it a sprocket 164 which, through a chain and other gearing, not shown, constantly drives the roller 32, the rolls 166 and the roller 38. The input gear 168 of roller 38 is shown as fast on the shaft of the roller in FIGURE 1. The tape feed drive gearing is not illustrated in detail, the construction and arrangement being well-known and being as shown and described in U.S. Letters Patent #2,721,669, granted to me on October 25, 1955.

The tape moistening means and the means for causing the tape to be alternately fed and cut are also like the corresponding parts of Patent #2,721,669. The uppermost one of the rollers 166 is a tape moistening roller. It runs in contact with a water pick-up roller 170. The roller 170 runs in water 172 which is supplied to a tank 174 from a supply pipe 176 and maintained automatically at a desired level by a float valve 178.

The armature 180 of solenoid 28 is arranged, when the solenoid is energized, to thrust upward on lever 181. The lever 181 is pivotally mounted on a fulcrum pin 182. It carries on one arm the roller 30 which is moved toward and from the roller 32 as the solenoid is energized and de-energized respectively, and on the other arm a pinch cutting blade 42 which is moved toward and from a non-driven anvil roller 186 as the solenoid is de-energized and energized, respectively. As the solenoid circuit is broken, causing the solenoid to be de-energized, the roller 30 is pulled away from the driven roller 32 and the blade 42 is snapped into engagement with the anvil roller 186 to cut the tape. The cut length of tape continues to be fed until it has all been delivered

to the carton, but the uncut tape above the knife remains at rest until another carton comes along to energize the solenoid 28.

The shaft 190 of the final roller 154 of the conveyor 24 has fast upon it a sprocket 192. The sprocket 192, through a chain 194, drives a sprocket 196 which is mounted on a shaft 198 of the roll-over device 50, with freedom to turn and to slide axially thereon. (See FIGS. 1A and 5). An idler roller 200, of the same diameter as the rollers 154, is mounted on the shaft 198. The carrier 54 of the rollers 52, which is keyed on the shaft 198 for rotation in unison therewith, comprises arms 54 which are located at opposite sides of the roller 200 on the shaft 198, the arms being connected to one another by webs 202 to form a rigid carrier frame. A friction clutch collar 204 is mounted on the shaft 198 alongside the sprocket 196, being in fixed relation to the shaft by a set screw 205 and being frictionally driven by the sprocket 196. A compression coil spring 208 surrounds the shaft 198 and bears at one end against a frame member 206 and at its opposite end against the sprocket 196 through a thrust ball bearing 207, constantly urging the sprocket 196 against the collar 204 for effecting a yielding or slip drive.

The rollers 210 of upper return conveyor 78 are mounted in parallel bearing members 212 of the upper frame 104. One of the rollers 210 is driven from a constantly running motor 214, the motor being mounted on the upper frame, by chain gearing 216. The drive is transmitted from roller to roller of the conveyor 78 through chain gearing 218 of the kind already described in connection with the other conveyors. The return roll-over device 76 is desirably in all respects exactly like the roll-over device 50, and it is similarly driven from an end roller 210 of the conveyor 78 through a chain 220. Since the structures are duplicates, no detailed description will be given. Corresponding reference characters have been applied to corresponding parts of the two roll-over devices.

The plate 60, which holds down the tape and the carton flaps from the time the carton leaves the roll-over device 50 until it reaches the roll-over device 76, is supported from fixed channel members 222 of the upper frame through carrier rods 224. Each carrier rod is threaded at its ends, and each is screwed at its lower end into a nut 226 which is affixed to the upper face of the plate, as by soldering. The adjusted relation of each rod and nut is fixed by a lock-nut 228. A further nut 230 threaded on the rod 224, supports a washer 232 and sustains through the washer the downward thrust of a compression coil spring 234 which is interposed on the rod between the washer 232 and a lower flange 235 of the associated, fixed upper frame member 222. Above the upper flange 236 of frame member 222, a stop-nut 238 is threaded on the rod 224. The arrangement as shown and described causes the plate 60 to bear down evenly and yieldingly against the upper ends of the cartons but prevents depression of the plate, when no carton is present, down into a position where it could intercept a carton or interfere with the orderly advance thereof. In order that a carton may be fed under the plate 60, mounted as described, the plate is provided with an upturned camming lip 240 at the point of entry of the carton beneath the plate.

The mechanism for pushing the carton along the second or transverse course from position 10e to position 10f is illustrated in FIGURES 1A, 2A, 3 and 4, but chiefly in FIGURES 2A and 4. The broad pusher 66, itself, is provided midway of its length with a vertically extending supporting arm 242. The arm 242 extends between two of the rollers 130 of the roller table 62. The lower end of the arm 242 is rigidly secured upon a carrier sleeve 244 which is formed as a toothed rack 246 at its lower side. The sleeve 244 is mounted slidably upon a hori-

zontal rod 248 which extends completely across the machine.

The sleeve 244 is driven by a pinion 250 which meshes overhead with the rack teeth of the sleeve 244, and which meshes below with a stationary rack 252. As the pinion 250 rolls along the rack 252, it advances or retracts the sleeve 244, according to the direction of operation, at twice its own linear rate of movement and through twice its own distance of movement. The pinion 250 is carried in a fork 254 which is affixed to the outer end of a piston rod 256. The piston rod 256 forms part of a pneumatic device 258 of well-known construction, which is sold commercially by the Lehigh Manufacturers and Engineers Inc., under the name of "Air-Motor."

The device 258 includes a cylinder 260, having working chambers at its opposite ends and a piston 262 which divides the working chambers from one another and which carries the piston rod 256. A chest 264 is formed with passages which communicate constantly with opposite ends of the cylinder 260, a pipe 266 serving to connect a passage of the chest with the left end of the cylinder. A slide valve (not shown), which is operable crosswise of the cylinder, is moved to a position to connect the right hand cylinder chamber (as viewed in FIGURE 4) to a source of compressed air through a conduit 268 and simultaneously to connect the left hand cylinder chamber to atmosphere, when a carton engages the switch arm 65 to close the switch controlled thereby. The closing of the normally open switch controlled by the arm 65 causes energization of a first solenoid which shifts the valve into position to cause the piston rod 256 to be thrust toward the left (as viewed in FIG. 4). The solenoid is de-energized as soon as the carton is thrust clear of the arm 65, but the valve remains in the position to which it was operated in response to the movement of the arm 65 to switch closing position.

At the left hand limit of movement of the sleeve 244, the sleeve engages a switch actuator 270 which is mounted with capacity for adjustment along the rod 248. Engagement of the actuator by the sleeve 244 closes a normally open switch (not shown) and this, in turn, causes a second solenoid to be energized for reversing the position of the valve. This reverses the connections to the cylinder chambers, and causes the pusher to return to its original, at rest position. The circuit of the second solenoid is opened as soon as the sleeve 244 leaves engagement with the actuator 270, but again the valve remains in the position which it was caused to assume in response to closing of the switch controlled by the actuator 270. The mechanism is mechanically obstructed and arrested upon arrival of the pusher at its original (FIG. 4) position, but continues to be urged toward the right, as viewed in FIGURE 4, until the switch arm 65 is engaged and operated by another carton. It will be noted that the stroke of the pusher can be adjusted as desired by adjusting the setting of the switch actuator 270 along the rod 248.

The teeth of the rack 252 are formed in the base of a channel bar 272 which forms a track. The fork 254 which is secured on the piston rod 256 and which has the pinion 250 supported by and between its arms has its arms disposed to ride along the flanges of the bar 272 which flank the rack teeth 252.

It is necessary for the pusher supporting arm 242 to pass back and forth between the tables 62 and 68 in executing its operative movements. To enable this to be done, bearing plates 274 and 276 are provided which are spaced from one another to provide clearance between them for the arm 242. The plate 274 supports the first three rollers of both the roller tables 62 and 68, counting from the left in FIGURE 1A, while the plate 276 supports the last three rollers of both roller tables 62 and 68, counting from the left in FIGURE 1A. Three bearing members 278 are provided at each side of each of the plates 274 and 276. The plates 274 and 276 are carried respectively upon fixed brackets 280 and 282.

A point which should not be overlooked is the fact that provision is made for varying the length of tape automatically fed to a carton and for varying the timing of the tape feed to adjust the relative lengths of the tape ends which protrude front and rear. The length of the carton itself principally determines and controls the length of tape fed. The surplus length is determined by the effective length of the rod 26. The rod 26 passes through a hub member 284 on the end of a horizontal rod 286 and is secured in adjusted position by a set-screw 288. The rod 286 is secured in a bracket 290 by a set-screw 292. The bracket 290 engages longitudinally extending, horizontally disposed frame web 294, being secured in adjusted position therealong by means of a set-screw 296.

Adjustable side guides 298 are provided at both sides of the conveyor 16 and at both sides of the conveyor 74. Each guide takes the form of a longitudinally extending guide plate 300. Each guide 300 is supported at its opposite ends by carrying brackets in the form of racks 302. Each rack is supported for adjustment transversely of the machine in a fixed bracket 304. Pinions 306, mounted in the respective brackets 304, mesh with the respective racks 302, and may be turned to and fro against frictional resistance for adjusting the racks in and out.

While certain preferred embodiments of the invention have 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. A carton taping machine of the U-return type comprising, in combination, means for feeding a carton through an outgoing course, then through a transverse course and finally through a return course to the end of the machine at which it was introduced, all while maintaining the original orientation of the carton, means responsive to the carton for automatically feeding and cutting a length of tape determined by the length of the carton itself but exceeding the carton in length by a predetermined amount, means for applying the length of tape to the top of the carton as it travels along the outgoing course, with overhanging tape ends of substantially predetermined lengths protruding beyond the front and rear faces of the carton, means automatically effective to press down the rearwardly protruding tape end against the rear face of the moving carton as the carton travels along the first course, and means automatically effective to press the originally leading, but now trailing, tape end against the originally leading, but now trailing, face of the moving carton as the carton travels along the return course.

2. A carton taping machine of the U-return type comprising, in combination, means for feeding a carton through an outgoing course, then through a transverse course and finally through a return course to the end of the machine at which it was introduced, all while maintaining the original orientation of the carton, means responsive to the carton for automatically feeding and cutting a length of tape determined by the length of the carton itself but exceeding the carton in length by a predetermined amount, means for applying the length of tape to the top of the moving carton as it travels along the outgoing course, with overhanging tape ends of substantially predetermined lengths protruding beyond the front and rear faces of the carton, means automatically effective to roll down the rearwardly protruding tape end against the rear face of the moving carton as the carton travels along the first course, and means automatically effective to roll down the originally leading, but now trailing, tape end against the originally leading, but now trailing, face of the moving carton as the carton travels along the return course.

3. A carton taping machine of the U-return type comprising, in combination, means for feeding a carton through an outgoing course, then through a transverse course and finally through a return course to the end of the machine at which it was introduced, all while maintaining the original orientation of the carton, means responsive to the carton for automatically feeding and cutting a length of tape determined by the length of the carton itself but exceeding the carton in length by a predetermined amount, means for applying the tape length to the top of the carton as it travels along the outgoing course, with overhanging tape ends of substantially predetermined lengths protruding beyond the front and rear faces of the carton, means automatically effective during travel of the carton along the outgoing course to roll along the tape applied to the carton top, thereafter to roll the rearwardly protruding tape end down against the trailing face of the moving carton, and finally to travel upward along the same tape end to press it once more against the trailing face of the moving carton, and means automatically effective during travel of the carton along the return course to roll along the tape applied to the carton top, thereafter to roll the originally leading, but now trailing, tape end down against the originally leading, but now trailing, face of the moving carton, and finally to travel upward along the same tape end to press it once more against the same face of the moving carton.

4. A carton taping machine of the U-return type comprising, in combination, means for feeding a carton through an outgoing course, then through a transverse course and finally through a return course to the end of the machine at which it was introduced. All while maintaining the original orientation of the carton, means responsive to the carton for automatically feeding and cutting a length of tape determined by the length of the carton itself but exceeding the carton in length by a predetermined amount, means for applying the length of tape to the top of the carton as it travels along the outgoing course, with overhanging tape ends of substantially predetermined lengths protruding beyond the front and rear faces of the carton, an untimed, roll-over device adapted during travel of a carton through the outgoing course to roll a rearwardly protruding tape end of each carton down against the trailing face of the moving carton regardless of the length of the carton and of any irregularity of spacing with respect to the other cartons in excess of a predetermined minimum, said roll-over device comprising a pair of diametrically opposed rollers, a carrier for the rollers, and constantly running yieldable driving means for the carrier constantly urging the carrier in a direction of rotation to press either roller successively against the top and rear faces of the moving carton, and a similar untimed, roll-over device adapted during travel of the carton through the return course to roll the originally leading, but now trailing, protruding tape end down against the originally leading, but now trailing, face of the carton.

5. A carton taping machine comprising, in combination, a carton conveyor, means for advancing the conveyor at uniform speed, means automatically responsive to the length of any carton for feeding and cutting a piece of tape of a required length as measured and determined by the length of the individual carton itself, to exceed the carton in length by a predetermined amount, means for applying the tape to a longitudinal face of the carton with a tape end of substantially predetermined length protruding beyond the trailing face of the carton, and untimed, automatically acting roll-over mechanism comprising a tape pressing member mounted for planetary movement and unidirectional slip driving means therefor constructed and arranged constantly to urge the pressing member in a single direction of planetary movement suitable to cause the pressing member first to move into and maintain bearing engagement with the

adhered tape on the longitudinal face of the moving carton, then to press in and forward the rearwardly protruding tape end against the trailing end of the carton as an incident of the travel of the carton past such roll-over mechanism, and then to continue idly in the same direction of planetary movement.

6. A carton taping machine comprising, in combination, means for advancing a carton at uniform speeds, means automatically responsive to the length of any carton for feeding and cutting a piece of tape of a required length as measured and determined by the length of the individual carton itself and applying it to a horizontal face of the carton, with a substantial length of the tape protruding beyond the rear face of the carton, and untimed, automatically acting roll-over mechanism comprising a tape pressing member mounted for planetary movement and unidirectional slip driving means therefor constructed and arranged constantly to urge the pressing member in a single direction of planetary movement suitable to cause the pressing member first to move into and maintain bearing engagement with the adhered tape on the moving carton, then to press in and forward the rearwardly protruding tape end against the trailing end of the carton as an incident of the travel of the carton past such roll-over mechanism, and then to continue idly in the same direction of planetary movement.

7. A carton taping machine comprising, in combination, means for advancing a carton, means automatically responsive to the length of any carton for feeding and cutting a piece of tape of a required length as measured and determined by the length of the individual carton itself, to exceed the carton in length by a predetermined amount, means for applying the tape to a horizontal face of the carton with a tape end of substantially predetermined length protruding beyond the trailing face of the carton, untimed, automatically acting, roll-over mechanism comprising a tape pressing member mounted for planetary movement and unidirectional slip driving means therefor constructed and arranged constantly to urge the pressing member in a single direction of planetary movement suitable to cause the pressing member first to move into and maintain bearing engagement with the adhered tape on the moving carton, then to press in and forward the rearwardly protruding tape end against the trailing end of the carton, and then, while continuing in the same direction of rotation, to travel in the opposite direction along the same tape end for pressing it once more against the trailing face of the moving carton, all as an incident of the travel of the carton past the roll-over mechanism, and then to continue idly in the same direction of planetary movement.

8. A carton taping machine comprising, in combination, means for advancing a carton at uniform speed, means automatically responsive to the length of any carton for feeding and cutting a piece of tape of a required length as measured and determined by the length of the individual carton itself, to exceed the carton in length by a predetermined amount, means for applying the tape to a horizontal face of the carton with a tape end of substantially predetermined length protruding beyond the trailing face of the carton, and an untimed roll-over device adapted to roll the protruding tape end of each carton against the trailing face of the moving carton regardless of the length of the carton and its timing with respect to other cartons, said roll-over device comprising a pair of diametrically opposed idler rolls, a rotary carrier for the rolls, and constantly running, rotary, slip driving means for the carrier, constantly urging the carrier in a direction of rotation to cause one of the rolls to press first against the tape on the carton face to which the tape has been applied, and then along the rear face of the carton, and then to cause both rolls to continue idly in the same direction of rotation.

9. A carton taping machine comprising, in combina-

tion, conveyor means for advancing a carton, means automatically responsive to the length of any carton for feeding and cutting a piece of tape of a required length as measured and determined by the length of the individual carton itself, to exceed the carton in length by a predetermined amount, means for progressively applying the tape to a horizontal face of the carton as the tape is fed out with a tape end of substantially predetermined length protruding beyond the trailing face of the carton, and an untimed roll-over device adapted to roll the rearwardly protruding tape end of each carton in against the trailing face of the moving carton, regardless of the length of the carton and its timing with respect to other cartons, said roll-over device comprising a pair of diametrically opposed rollers, a rotary carrier for the rollers, and constantly running, rotary, slip driving means for the carrier, constantly urging the carrier in a direction of rotation to cause either roller to be pressed first against the horizontal carton face to which the tape has been applied and then against the rear face of the carton, and then to cause both rollers to continue idly in the same direction of rotation, the roll-over device having its axis disposed horizontally and at right angles to the direction of carton travel, and spaced vertically from the path along which the tape receiving carton face is put through the machine.

10. A carton taping machine comprising, in combination, conveyor means for advancing a carton, means automatically responsive to the length of any carton for feeding and cutting a piece of tape of a required length as measured and determined by the length of the individual carton itself, to exceed the carton in length by a predetermined amount, means for progressively applying the tape to a horizontal face of the carton as the tape is fed out with a tape end of substantially predetermined length protruding beyond the trailing face of the carton, and an untimed roll-over device adapted to roll the protruding tape end of each carton in against the trailing face of the moving carton, regardless of the length of the carton and its timing with respect to other cartons, said roll-over device comprising a pair of diametrically opposed rollers, a rotary carrier for the rollers, and constantly running, rotary, slip driving means for the carrier, constantly urging the carrier in a direction of rotation to cause either roller to be pressed first against the tape receiving carton face and then against the rear face of the carton, and then to cause both rollers to continue idly in the same direction of rotation, the roll-over device having its axis disposed horizontally and at right angles to the direction of carton travel and spaced vertically from the path along which the tape receiving carton face is put through the machine; the distance of the carrier axis from said path, the distance of the rollers from the axis of rotation of the carrier, and the normal driving speed of the carrier, being so related that a roller will be caused continually to keep pace with a carton in the direction of carton travel as it moves behind the carton.

11. A carton taping machine comprising, in combination, conveyor means for advancing a carton, means automatically responsive to the length of any carton for feeding and cutting a piece of tape of a required length as measured and determined by the length of the carton itself, to exceed the carton in length by a predetermined amount, means for progressively applying the tape to a horizontal face of the carton as the tape is fed out with a tape end of substantially predetermined length protruding beyond the trailing face of the carton, and an untimed roll-over device adapted to roll the protruding tape end of each carton in against the trailing face of the moving carton, regardless of the length of the carton and its timing with respect to other cartons, said roll-over device comprising a pair of diametrically opposed rollers, a rotary carrier for the rollers, and constantly running, rotary slip driving means for the carrier, constantly urging the carrier in a direction of rotation to cause either roller to be

13

pressed first against the tape receiving carton face and then against the rear face of the carton, and then to cause the rollers to continue idly in the same direction of rotation, the roll-over device having its axis disposed horizontally and at right angles to the direction of the carton travel, and spaced vertically from the path along which the tape receiving carton face is put through the machine, the carrier comprising carrying arms for the respective rollers which are hook shaped, the construction and arrangement being such that engagement of the arms themselves with a carton is at all times avoided.

12. A carton taping machine comprising, in combination, means for advancing a carton, means for automatically cutting and applying to a longitudinal face of the carton a measured length of tape which protrudes rearwardly for a substantial distance beyond the trailing face of the carton, and untimed, automatically acting roll-over mechanism comprising a tape pressing member mounted

14

for planetary movement and unidirectional slip driving means therefor constructed and arranged constantly to urge the pressing member in a single direction of planetary movement suitable to cause the pressing member first to move into and maintain bearing engagement with the adhered tape on the longitudinal face of the moving carton, then to press in and forward the rearwardly protruding tape end against the trailing end of the carton as an incident of the travel of the carton past such roll-over mechanism, and then to continue idly in the same direction of planetary movement.

References Cited in the file of this patent

UNITED STATES PATENTS

15 1,626,379 Armstrong ----- Apr. 26, 1927

FOREIGN PATENTS

746,624 Great Britain ----- Mar. 14, 1956