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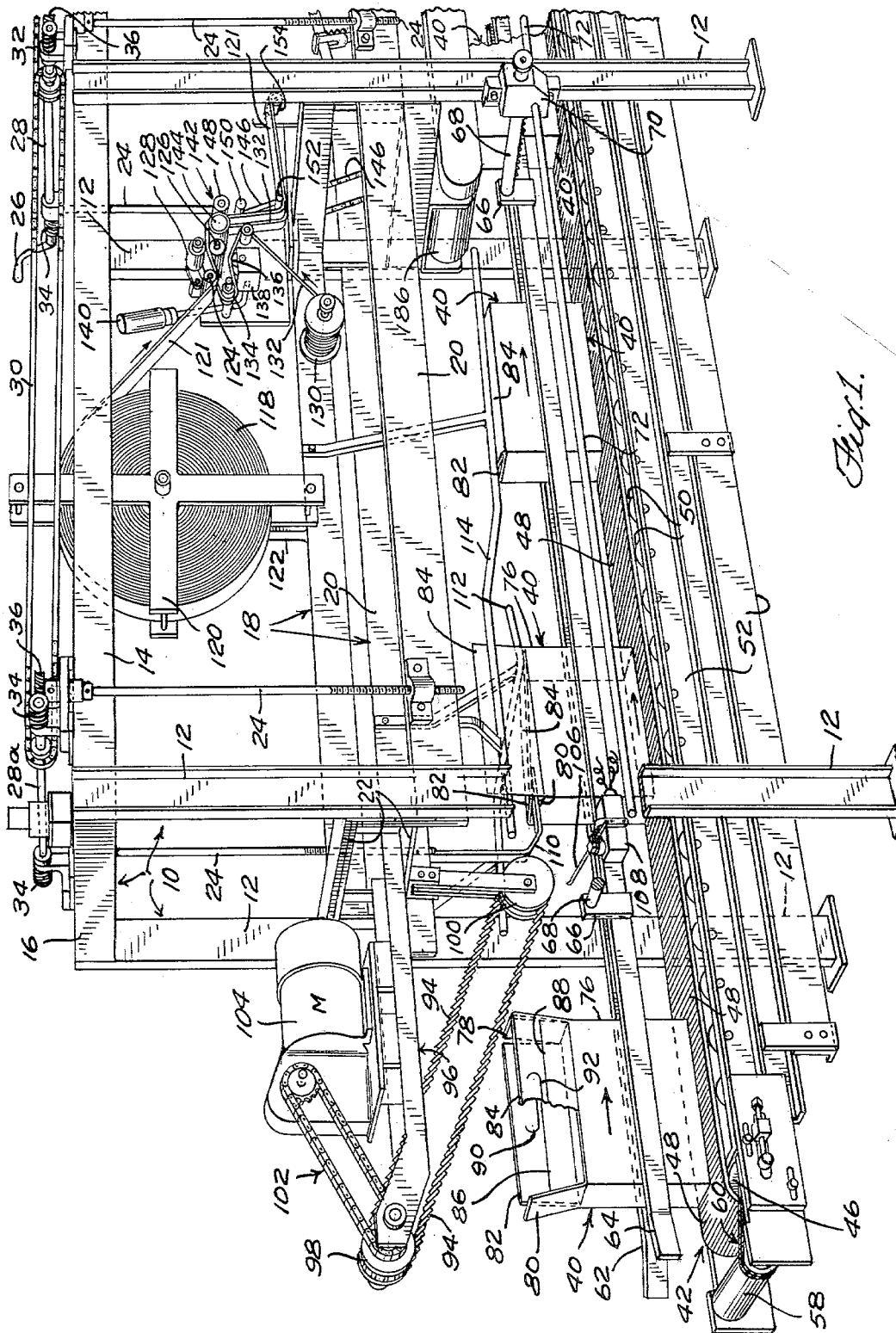
J. A. MILLER ETAL

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CARTON TAPING MACHINE

Filed Nov. 24, 1961

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Aug. 10, 1965

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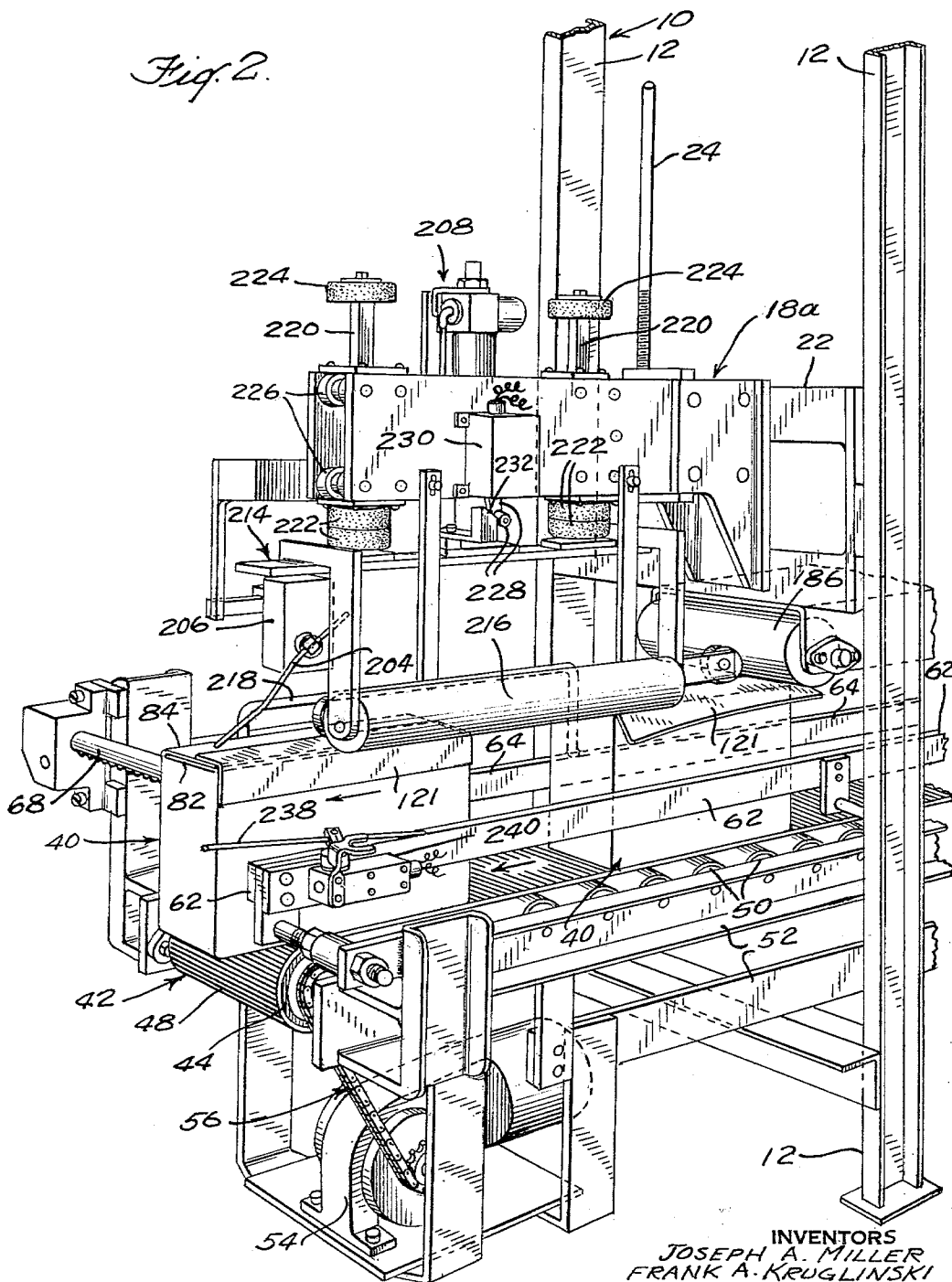
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Filed Nov. 24, 1961

5 Sheets-Sheet 2

Fig. 2.



INVENTORS
JOSEPH A. MILLER
FRANK A. KRUGLINSKI
BY *Berry & Brews*
ATTORNEYS

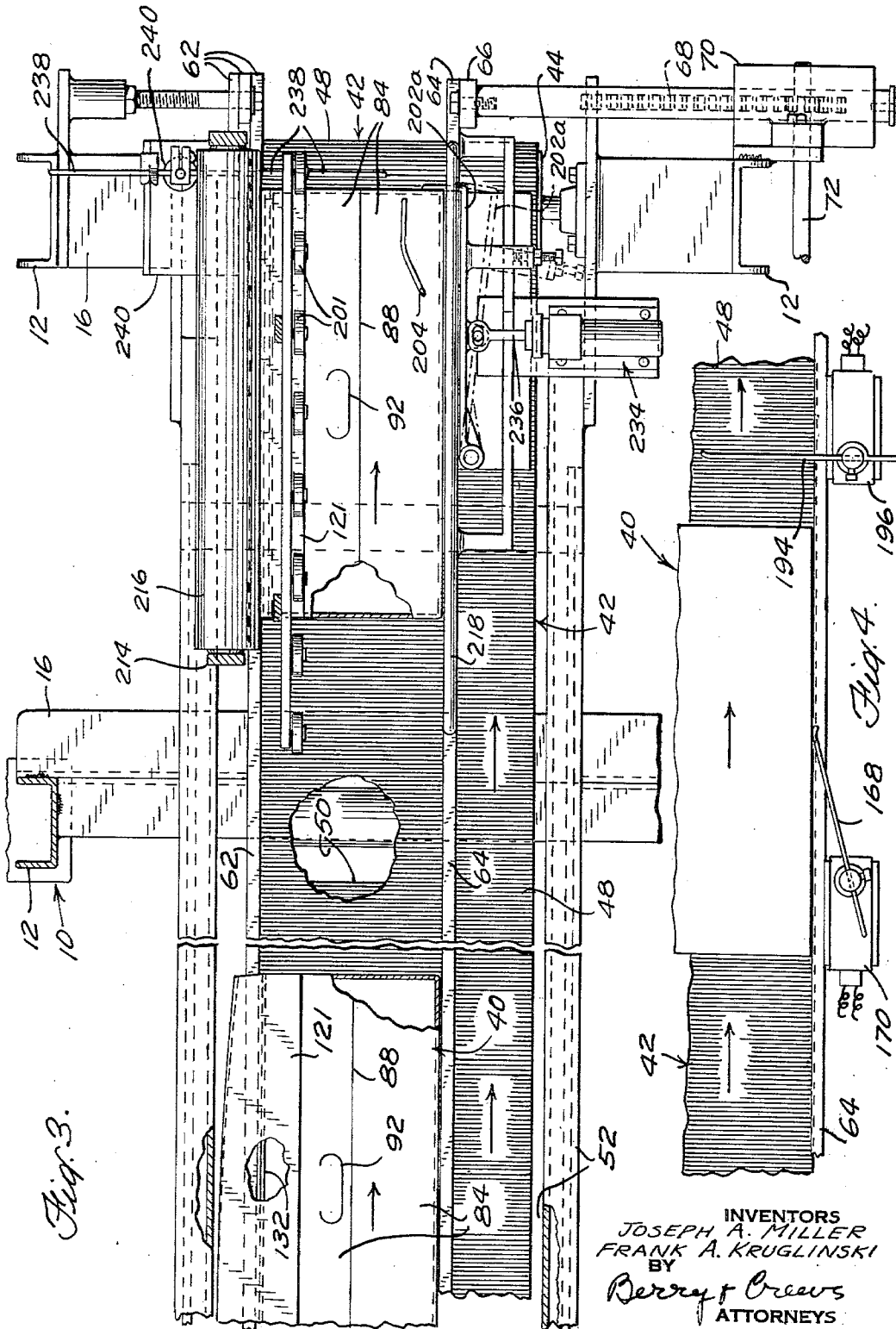
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3,199,262

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5 Sheets-Sheet 3



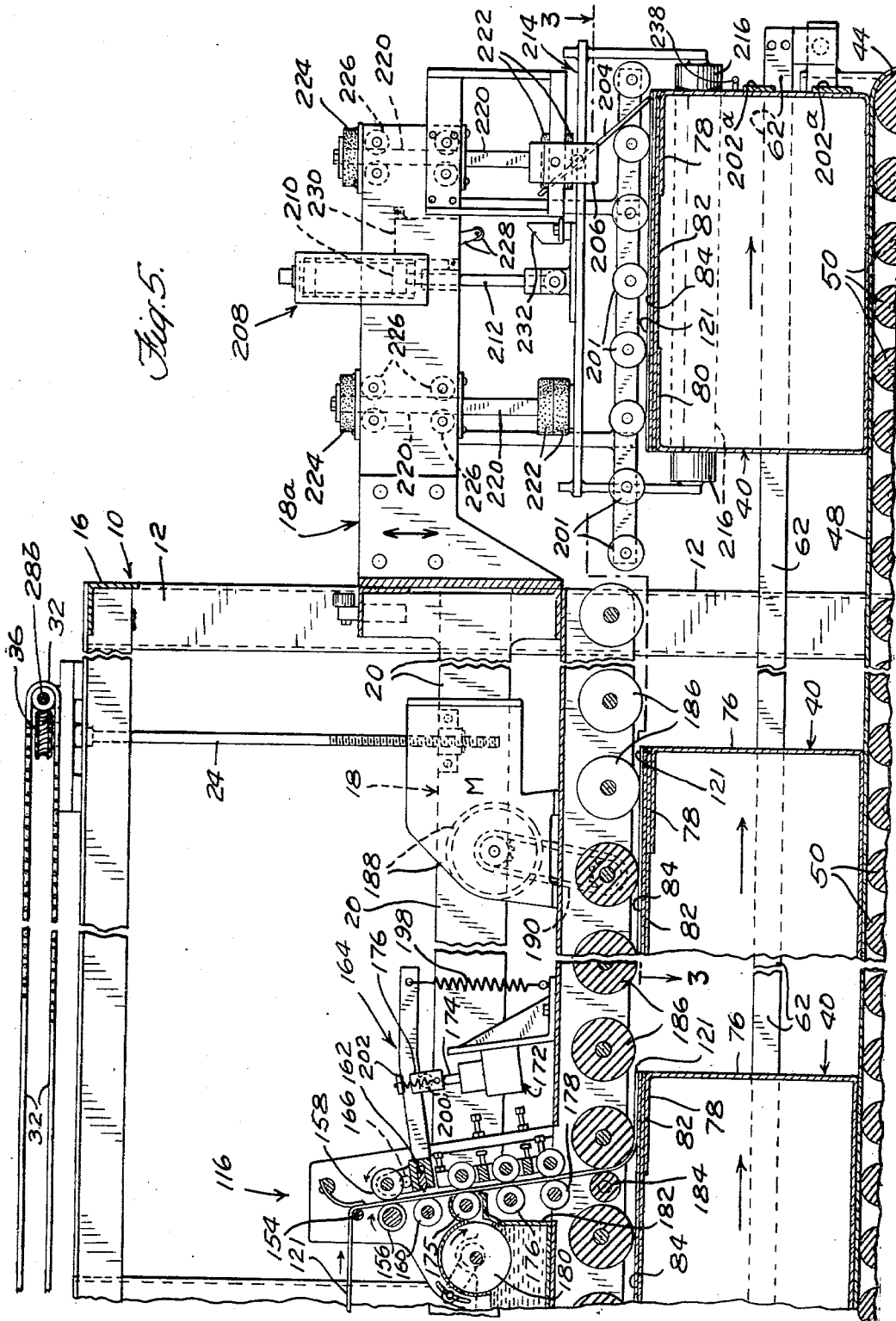
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J. A. MILLER ETAL
CARTON TAPING MACHINE

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INVENTORS
JOSEPH A. MILLER
FRANK A. KRUGLINSKI
BY *Berry & Ows*
ATTORNEYS

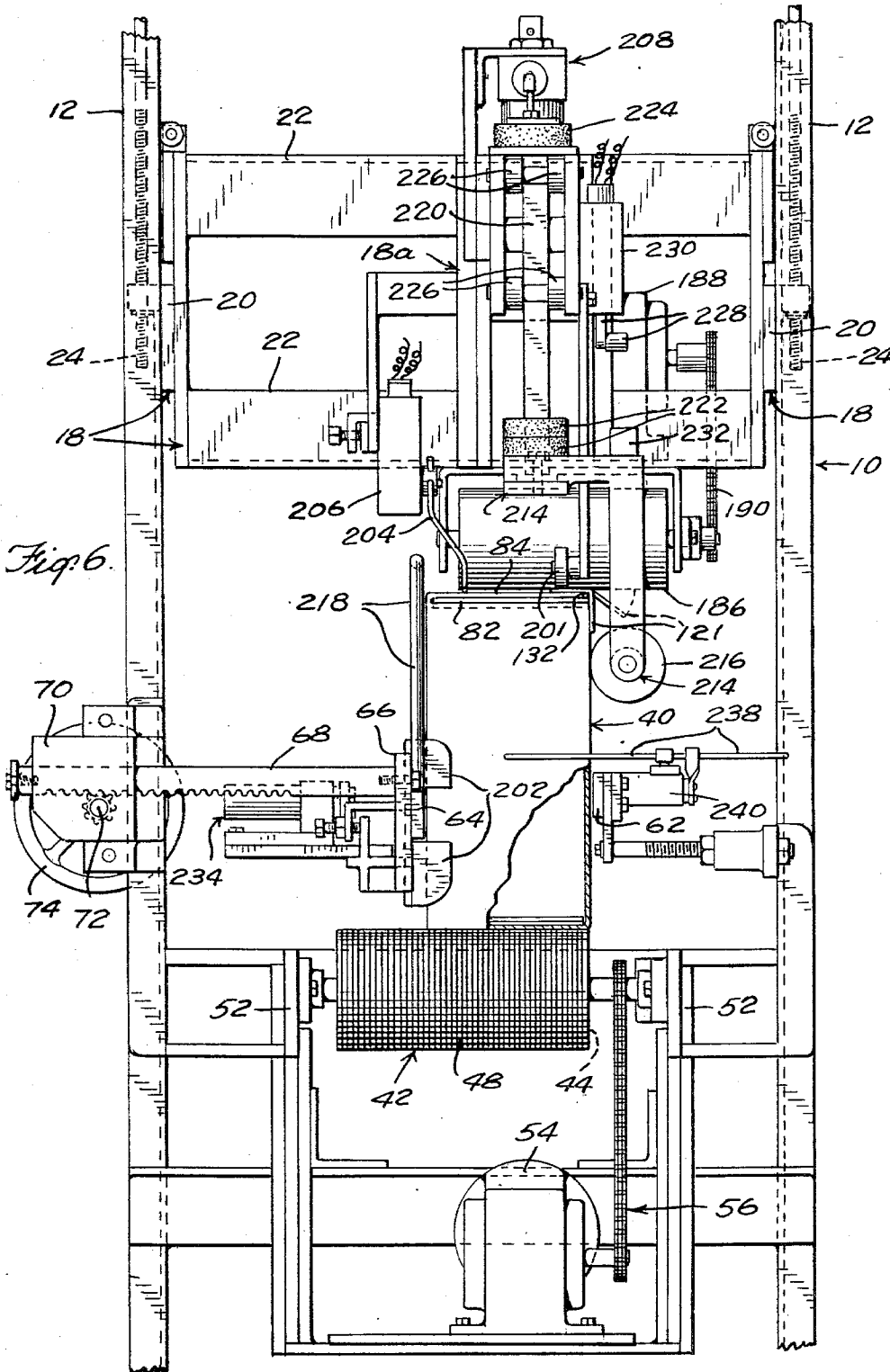
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Filed Nov. 24, 1961

5 Sheets-Sheet 5



INVENTORS
JOSEPH A. MILLER & FRANK A. KRUGLINSKI
BY *Berry & Brews*
ATTORNEYS

1

3,199,262

CARTON TAPING MACHINE

Joseph A. Miller, Englewood, and Frank A. Kruglinski, North Bergen, N.J., assignors to General Corrugated Machinery Company, Inc., Palisades Park, N.J., a corporation of New Jersey

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4 Claims. (Cl. 53-66)

This invention relates to mechanism for automatically tape sealing cartons. The problem with which the invention is particularly concerned is that of tape sealing a carton joint which extends along an upper longitudinal edge of the carton, rather than along the center of the top as is more customary.

Although the invention lies solely in the mechanism, the problem and its solution will be best understood in relation to the carton illustratively shown herein, this carton being of a type which is popularly used for the shipping and dispensing of boxes of cookies. The carton body may be of conventional construction.

At the top of the body, front and rear flaps are provided which are destined to be the inner flaps when the carton has been filled and sealed. Side flaps are provided which are as wide as the carton body, the result being, when these flaps are folded in, that the first flap completely covers the mouth of the carton and the second flap completely covers the first.

Through partial perforation and scoring the side flaps of the shipped and opened carton are adapted to be refolded to form a carrying handle, the carton being thereby converted into a carrying satchel for use by the recipient when selling and/or delivering the cookies from door to door.

The illustrative machine is characterized by the fact that it automatically folds in first the front flap, then the rear flap, then the inner side flap, and finally the outer side flap in a fully automatic manner, all while advancing the carton uninterruptedly.

As an incident of the continued advance of the carton, the machine automatically measures a strip of tape of substantially the same length as the carton and applies about one-half of the tape width, from end to end, along the outer face of the free margin of the outer side flap.

The carton is then briefly arrested at a roll-down station while a longitudinally extending sealing roller is caused to run down and then up, folding and rolling the unadhered half of the tape down and pressing it in against the side of the carton during the downward travel and again pressing it against the side of the carton during the upward travel.

Other objects and advantages will hereinafter appear.

In the drawing forming part of this specification,

FIG. 1 is a fragmentary perspective view of a substantial portion of the length of an illustrative machine which embodies features of the invention, as seen from a point on the operator's side of the machine near the introductory end thereof;

FIG. 2 is a fragmentary perspective view of the delivery end of the machine as viewed from the opposite side and the opposite end;

FIG. 3 is a fragmentary sectional plan view, partly broken away, of a portion of the delivery end of the machine, the section being taken on the line 3-3 of FIG. 5, looking in the direction of the arrows, but being on a larger scale than FIG. 5;

FIG. 4 is a fragmentary detail plan view showing particularly the carton controlled switches through which the feeding, cutting and applying of the tape are timed and controlled;

FIG. 5 is a fragmentary view in sectional side elevation of the delivery end of the machine, the section being

2

taken on the line 5-5 of FIG. 3, looking in the direction of the arrows, but being on a smaller scale than FIG. 3; and

FIG. 6 is a fragmentary view in end elevation of the delivery end of the machine.

The machine is in many respects of conventional construction, and as to the conventional features the description will be comparatively brief. A rigid stationary frame 10, consisting chiefly of upright members 12, longitudinal members 14 and transverse members 16, is provided.

A vertically adjustable frame 18 for carrying various overhead operating instrumentalities to be described, and consisting chiefly of longitudinal side members 20 and transverse members 22, is supported from the top of the frame 10 by threaded rods 24 which pass vertically downward through threaded brackets on the adjustable frame members 20. A manually operable crank 26 can be operated to drive a transverse shaft 28 which, through chains 30 and 32 drives similar transverse shafts 28a and 28b. Each of the shafts 28, 28a and 28b has worms 34 fast upon its opposite ends, each worm 34 being drivingly engaged with a wormwheel 36 fast on the upper end of one of the threaded rods 24. Through operation of the crank 26, all the rods are turned in unison and, because of the low pitch of the worms 34 and/or the low pitch of the threads on the rods 24, the frame 18 is automatically retained in any position to which it may have been adjusted by operation of the crank 26. Most of the significant operating mechanisms are carried upon, and are adjustable by and with, the frame 18, and will be described a little farther on.

Cartons 40 are advanced through the machine at regularly spaced intervals on a conveyor 42, which conveyor comprises end rollers 44 and 46 at the delivery and introductory ends of the machine, respectively, an endless conveyor belt 48, and a multiplicity of intermediate rollers 50 for supporting the active run of the belt in a horizontal plane. The conveyor is carried by longitudinally extending frame supported bars 52. A motor 54 disposed beneath the delivery end of the conveyor is connected through chain gearing 56 to operate the drive roller 44 of the conveyor. The cartons are supplied to the machine by a gravity conveyor, not shown, and the spacing of the cartons is brought about by a slow running roller 58 which the cartons must cross as they near the conveyor. The roller 58 is driven from the roller 46 through chain gearing 60 at a peripheral speed which is substantially less than the speed of the conveyor belt 48.

Since it is desired to apply the tape with the tear string extending precisely along the edge of the carton, and since the carton must be supported laterally during the rolling down of the tape against the side of the carton, provision is made of rigid, relatively adjustable, continuous side guides 62 and 64. The side guide 62, above which the tape is applied, is desirably adjustably fixed in position, while the side guide 64 is adjustable toward and from the side guide 62 to conform to the width of the cartons of each run.

The guide 64 is carried by plates 66 which are fixed on the ends of racks 68. Each rack extends through a gear box 70, affixed to one of the upright frame members 12, and has driving engagement within the box with a drive gear shown in dotted lines in FIGS. 3 and 6. The several drive gears are fast upon a longitudinally extending shaft 72, which shaft has fast upon it an operating hand wheel 74 (FIG. 6).

A typical carton 40, with one side flap partly broken away, is shown entering the machine in FIG. 1, while several preceding cartons, appropriately spaced, are shown progressing through the machine. On the entering carton, the body is designated 76, the front and rear

flaps 78 and 80, and the left and right side flaps 82 and 84. The flaps 82 and 84 are provided, respectively, with longitudinal score lines 86 and 88 to divide the flaps into relatively foldable panels, and the outer panels are cut through along C-shaped lines 90 and 92 to provide registered hand-grip portions when the shipped and opened carton has been folded into satchel form.

As will be observed in FIG. 1, the carton enters the machine with all four of the top flaps upstanding. The first thing required is that the machine shall fold in the front and rear flaps 78 and 80 successively, and then the left and right side flaps 82 and 84 successively. For acting upon the front and rear flaps 78 and 80, a normally idle, inclined endless chain or belt 94 is provided. An extension 96 of the vertically adjustable frame 18 supports pulleys 98 and 100 upon which the upper rear portion and the lower front portion, respectively, of the chain 94 are trained. The pulley 98 is adapted to be driven counterclockwise (as viewed in FIG. 1) by chain gearing 102 from a motor 104, which motor is also carried on the extension 96 of the vertically adjustable frame 18.

It is important that the chain 94 stand idle while in engagement with the leading flap 78, but that it travel forward at a rate considerably exceeding that of the carton while in engagement with the trailing flap 80. In this way the leading flap 78 is caused to be folded rearward and downward by the idle chain 94, and the trailing flap 80 is caused to be folded forward and downward by the traveling chain.

A rockable actuating arm 106 of a normally open switch 108 stands normally across the carton path, the switch being mounted on the side guide 64 with the pivot of the actuating arm 106 substantially abreast of the sprocket 100. The carton, therefore, engages the arm 106 and swings it forward to switch closing position after the leading flap has been fully folded. The motor is thereby energized, causing the active run of the chain to travel rapidly in a downward and forward direction. The motor continues to be driven and the chain continues to run until after the rear end of the carton clears the arm 106. The chain 94 is of stepped or toothed formation, being composed of an endless series of connected pads or plates so that it will catch behind the free edge of the trailing flap 80 and swing it forward. In order to avoid buckling of the trailing flap and possible damage thereto, the chain is maintained normally in a sufficiently slack condition to enable it to yield upward rather freely as it first engages the trailing flap. The free edge of the trailing flap is thus able to swing forward through an arc which intersects the normal or free path of the active run of the chain.

As the leading flap 78 moves beyond the chain 94, it passes beneath a holddown shoe 110 which is carried by the frame 18, and the same thing is true of the trailing flap 80. As soon as the folding down of the trailing flap 80 is complete, a first plow 112, supported by the frame 18, starts folding in the side flap 82, and this action is continued until the flap 82 has been folded down over the flaps 78 and 80 and a portion at least of the shoe 110. A second plow 114, also carried by the frame 18, then folds in side flap 84 over the side flap 82 as an incident of the continued advance of the carton, as shown in FIG. 1.

The carton is now ready for taping, and it passes beneath a taping head 116 which is carried by the frame 18. A reel 118 carried in a holder 120, which is supported by an arm 122 from the frame 18, pays out tape 121 to the taping head 116 as required. The tape may be initially provided with a tear string in the form of a ribbon of tough paper, cord or fabric, disposed along the center of the gummed face of the tape. As illustrated, however, the tear string is applied in a moist condition to the gummed face of plain, moisture sensitive, gummed tape, while the tape is enroute from the reel 118 to the taping head 116.

The tape passes from the reel 118 beneath an idler guide roller 124 and thence through a fixed lower roller 126 and an opposed pressure roller 128. A spool 130, rotatively mounted on the frame 18, pays out string 132 as required. The string passes around a narrow waisted, V-grooved, guide pulley 134, thence over a moistening roller 136 which runs in a water container 138, then into contact with the center line of the gummed tape, and with the tape through the roller couple 126, 128. The water in the container 138 is maintained at a substantially uniform level by a conventional barometric feed device 140.

After having the tear string 132 applied, the tape 121 passes through a prefeeder 142 of the type disclosed in U.S. Patent No. 2,721,669. The prefeeder comprises a roller 144 which is constantly driven by chain gearing 146. A pressure roller 148 normally exerts no pressure on the tape, but is caused by a web riding rod 150 to press the tape against the roller 144 whenever the tape which has already traveled beyond the roller 144 becomes taut. The tape continues beneath a guide rod 152 and over a guide rod 154 to the taping head, which head is also of the type disclosed in Patent No. 2,721,669.

The tape is directed downward between a constantly driven feed roller 156 and an automatically operated pressure roller 158. The roller 158 is normally retracted, and the leading end of the tape normally stands at rest between an anvil roller 160 and an opposed cutting blade 162. The roller 158 and the blade 162 are carried on a feed-cut lever 164 at opposite sides of the lever pivot 166.

At an appropriate point in its travel, the carton engages an actuator 168 of a switch 170. The switch 170 is of the type which is closed momentarily by its actuator but promptly reopens independently of the actuator, and which cannot be reclosed until after its actuator has been returned to normal position and then operated again in a forward direction. The momentary closing of the switch 170 energizes an electromagnetic, valve operating winding (not shown) of a familiar pneumatic actuator 172, setting the valve in a position to cause the piston rod 174 to be thrust upward. The piston rod 174 carries a clevis 176 which partially embraces the lever 164 and which transmits the upward motion of the piston rod to the lever 164, thereby swinging the cutter blade 162 away from the anvil roller 160 and the pressure roller 158 in a direction to press the tape against the constantly driven feed roller 156. This causes the tape to be fed forward at the speed at which the conveyor belt 48 travels.

The tape is fed through successive feed couples which includes, respectively, driving rollers 175, 177 and 178. The roller 175 is a moistening roller which cooperates with a water pick-up roller 180 to transfer water from a container 182 to the gummed face of the tape. The tape is finally fed out between a driven roller 184 and one of a series of driven rollers 186, which run at carton top level and serve to press the applied tape against the overlying side flap 84. One of the rollers 186 is driven directly from a constantly running drive motor 188 through chain gearing 190, while each of the remaining rollers of the series is driven from a neighboring roller through chain gearing, not shown. The rollers 156, 175, 177, 178 and 184 are all driven from the shaft of one of the rollers 186 through chain gearing, not shown.

The feeding out of the tape continues until the carton engages and displaces a switch actuator 194 of a second switch 196 which is like the switch 170. Momentary closing of the switch 196 of the actuator 194 energizes a second winding of the pneumatic device to return the valve of the device to its initial position. This causes the piston rod 174 to be pulled downward leaving the lever 164 free to be pulled downward by a tension coil spring 198. Tension coil springs 200 (one shown) connect the clevis 176 with a rider 202 on the lever 164, so that the lever 164 can lag relative to the piston rod 174 if an obstruction is encountered. The switches 170 and 196

are adjustably supported on side guide 64, being disposed at exactly a carton length interval from one another and being so located that the length of tape fed out and cut will be extend from end to end of the carton with no protruding end.

Only a predetermined portion of the width of the tape, say one-half, is applied to the closure flap, the remaining portion being caused to assume an overhanging position. The carton continues its advance beneath a set of idler holddown rollers 201, which are carried by an extension 18a of the frame 18, until it is arrested at a tape folding and pressing, or roll-down station by a carton obstructing gate 202a. Coincidentally with the arrival of the carton at the gate 202a, the carton causes a switch actuator 204 to close a switch 206 momentarily. The switch 206 energizes a valve operating winding of a pneumatic device 208. The device 208 is generally like the device 172, save that it includes in its own structure means for automatically returning the valve to its original position at the conclusion of the downward stroke, and thereby returning the piston 210 to its raised position.

The piston rod 212 of the piston 210 is connected at its lower end to a movable frame 214 whereby a side pressing roller 216 is supported with freedom for rotation. As the roller is carried downward by the frame 214 it folds the overhanging portion of the tape downward and presses it firmly and progressively in against the side of the carton, the carton being supported laterally during this action by the side guide 64 and by a heavy C-shaped auxiliary support 218 welded to the side guide 64 which extends upward in carton engaging position far enough to support the carton at its very top. As the roller is automatically returned upward it again rolls the tape smoothly and progressively against the side of the carton. The roller is made long enough to extend the full length of the longest carton for which the machine is designed.

The frame 214 has affixed to it a pair of rigid, upwardly extending guide rods 220. The guide rods 220 carry cushions 222 at their lower ends and cushions 224 at their upper ends for suppressing noise and absorbing shock at the ends of the upstroke and downstroke, respectively. The cushions are desirably formed of soft resilient rubber. Each of the rods 220 travels between upper and lower pairs of guide rollers 226, which rollers are carried by a frame extension 18a.

It is necessary that the pivotally mounted gate 202a be withdrawn at the conclusion of the upward or return stroke of the frame 214 in order to permit further advance of the carton. An actuator 228 of a switch 230, which is of the same type as the switches 170, 194 and 206, is carried by the frame 18a. It is normally maintained in a displaced position by a sloping abutment 232 on the frame 214. As the frame 214 starts downward, the actuator 228 is allowed to move to a free position, but this is an idle movement and is without effect. At the conclusion of the upward stroke of the frame 214, however, the actuator 228 re-engages the abutment 232 and is returned to the position in which it is illustrated in FIG. 2. This causes the switch 230 to be closed momentarily.

Momentary closing of the switch 230 causes an electromagnetic winding of a further pneumatic device 234 (FIG. 3), like 172, to be energized, and thereby to set the valve of the device 234 in position to cause the piston rod 236 to be retracted. The piston rod 236 is connected to the gate 202a and as the rod is retracted it withdraws the gate to the dotted line position indicated as 202a in FIG. 3. The advance of the carton is immediately resumed, the interruption of advance having been so brief that the following carton has not been allowed completely to close the gap between the cartons.

As the carton moves forward it engages and displaces an actuator 238 of a switch 240, causing the switch to be closed momentarily. Momentary closing of the switch 240 energizes a second winding of the device 234, and this restores the valve of the device to gate closing position.

The gate 202a cannot close until it has been cleared by the carton, but closing pressure is yieldingly maintained upon the gate and serves to close the gate as soon as the carton has cleared the gate.

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 principle may be utilized.

We claim:

1. A carton taping machine for forming a tape joint between a side and the adjacent outer free margin of a flap which forms a substantially complete closure of an erected carton comprising, in combination, a carton conveyor, a taping head disposed above the conveyor and including means automatically responsive to the carton for feeding out, moistening and cutting a strip of tape substantially equal in length to the carton length, and applying it in substantially coterminous relation to the carton, means guiding the carton and tape relative to one another before and during application of the tape so that the tape is caused throughout its length to be applied to the closure flap along a predetermined substantial portion of the tape width and to protrude beyond the adjacent side of the carton throughout another predetermined substantial portion of the tape width, means for temporarily arresting the carton at a folding and pressing station, automatic folding and pressing means at such station, responsive to the carton, for folding in the entire length of the protruding tape portion and pressing the same against the carton side at a single operation, and a tape holder for paying out tape to said taping head, and means for feeding out a tear string, moistening it and then conveying it in a moist condition and in a predetermined position against the gummed face of the tape enroute to the taping head whereby the tape will be located precisely in position completely to open the tape-sealed joint when operated to tear through the tape.

2. A carton taping machine for forming a tape joint between a side and the adjacent outer free margin of a flap which forms a substantially complete closure of an erected carton comprising, in combination, a carton conveyor, a taping head disposed above the conveyor and including means automatically responsive to the carton for feeding out, moistening and cutting a strip of tape substantially equal in length to the carton length and applying it in substantially coterminous relation to the carton, means guiding the carton and tape relative to one another before and during application of the tape so that the tape is caused throughout its length to be applied to the closure flap along a predetermined substantial portion of the tape width and to protrude beyond the adjacent side of the carton throughout another predetermined substantial portion of the tape width, means for temporarily arresting the carton at a folding and pressing station, and automatic roll-down means at such station reciprocable in a direction parallel to the direction of the conveyor travel but at right angles to the plane of the conveyor and responsive to the carton, and including a roller not substantially shorter than the carton for rolling in and then out over the protruding tape portion and pressing the same against the carton side as it moves inward and again as it moves outward.

3. A carton taping machine for forming a tape joint between a side and the adjacent outer free margin of a flap which forms a substantially complete closure of an erected carton comprising, in combination, a carton conveyor, a taping head disposed above the conveyor and including means automatically responsive to the carton for feeding out, moistening and cutting a strip of tape substantially equal in length to the carton length, and applying it in substantially coterminous relation to the carton, means guiding the carton and tape relative to one an-

7

other before and during application of the tape so that the tape is caused throughout its length to be applied to the closure flap along a predetermined substantial portion of the tape width and to protrude beyond the adjacent side of the carton throughout another predetermined substantial portion of the tape width, means for temporarily arresting the carton at a folding and pressing station, and automatic roll-down means at such station, responsive to the carton, for folding down the entire length of the protruding tape portion and pressing the same against the carton side at a single operation, the carton arresting means comprising a carton intercepting gate, means responsive to the arrival of a carton at the roll-down station to initiate a single complete operative reciprocation of the roll-down means, mechanism responsive to a final portion of the return stroke of the roll-down means to open the gate and permit further advance of the carton, and means responsive to such further advance to return the gate to carton intercepting position.

4. A carton taping machine for forming a tape joint between a side and the adjacent outer free margin of a flap which forms a substantially complete closure of an erected carton comprising, in combination, a carton conveyor, a spacing roller located just ahead of the conveyor, means driving the conveyor at constant speed and the roller at a substantially lower constant peripheral speed, a taping head disposed above the conveyor and including means automatically responsive to the carton for feeding out, moistening and cutting a strip of tape substantially equal in length to the carton length, and applying it in substantially coterminous relation to the carton, means guiding the carton and tape relative to one another before and during application of the tape so that the tape is caused throughout its length to be applied to the clo-

8

sure flap along a predetermined substantial portion of the tape width and to protrude beyond the adjacent side of the carton throughout another predetermined substantial portion of the tape width, means for temporarily arresting the carton at a folding and pressing station, and automatic folding and pressing means at such station, responsive to the carton, for folding down the entire length of the protruding tape portion and pressing the same against the carton side at a single operation, the arresting and folding and pressing means being so timed in relation to the space provided between successive cartons by the spacing roller that their action is complete and the carton is freed to resume its travel before it can be overtaken by the next following carton.

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FRANK E. BAILEY, *Primary Examiner.*

EARL M. BERGERT, TRAVIS S. McGEHEE,
Examiners.