

June 20, 1967

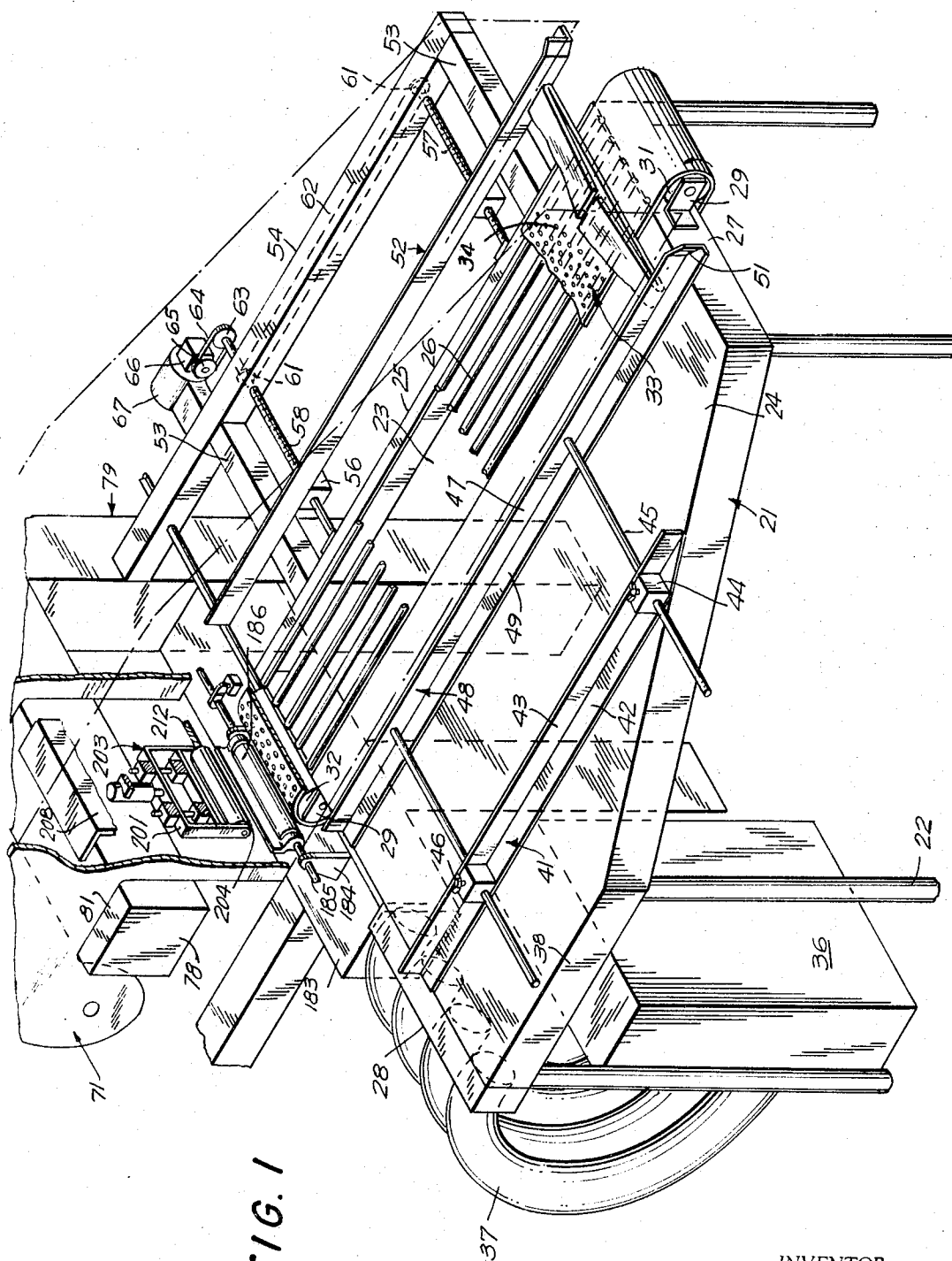
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3,326,095

SQUARING EQUIPMENT FOR FOLDED BOX BLANKS

Filed April 17, 1964

7 Sheets-Sheet 1



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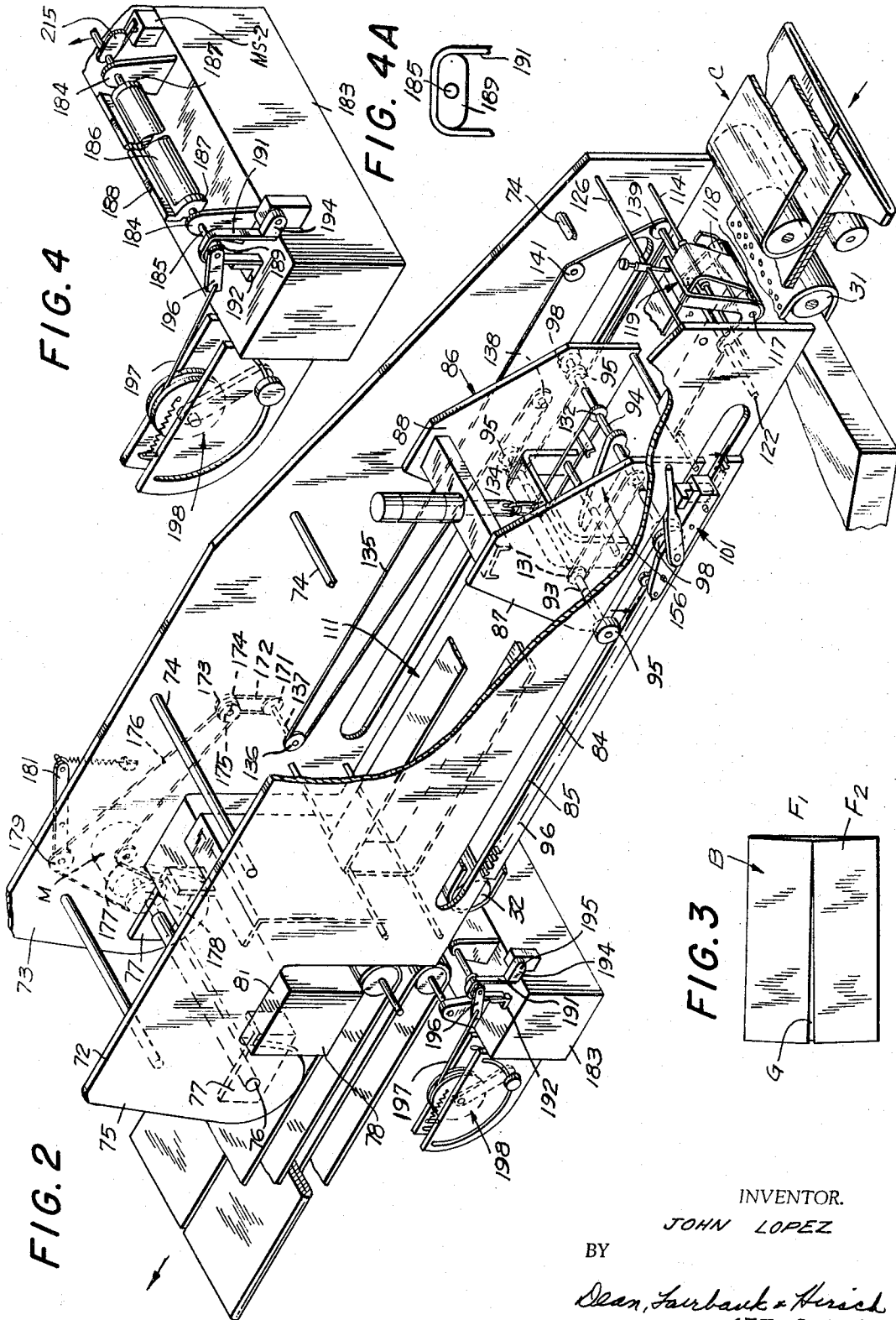
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3,326,095

SQUARING EQUIPMENT FOR FOLDED BOX BLANKS

Filed April 17, 1964

7 Sheets-Sheet 2



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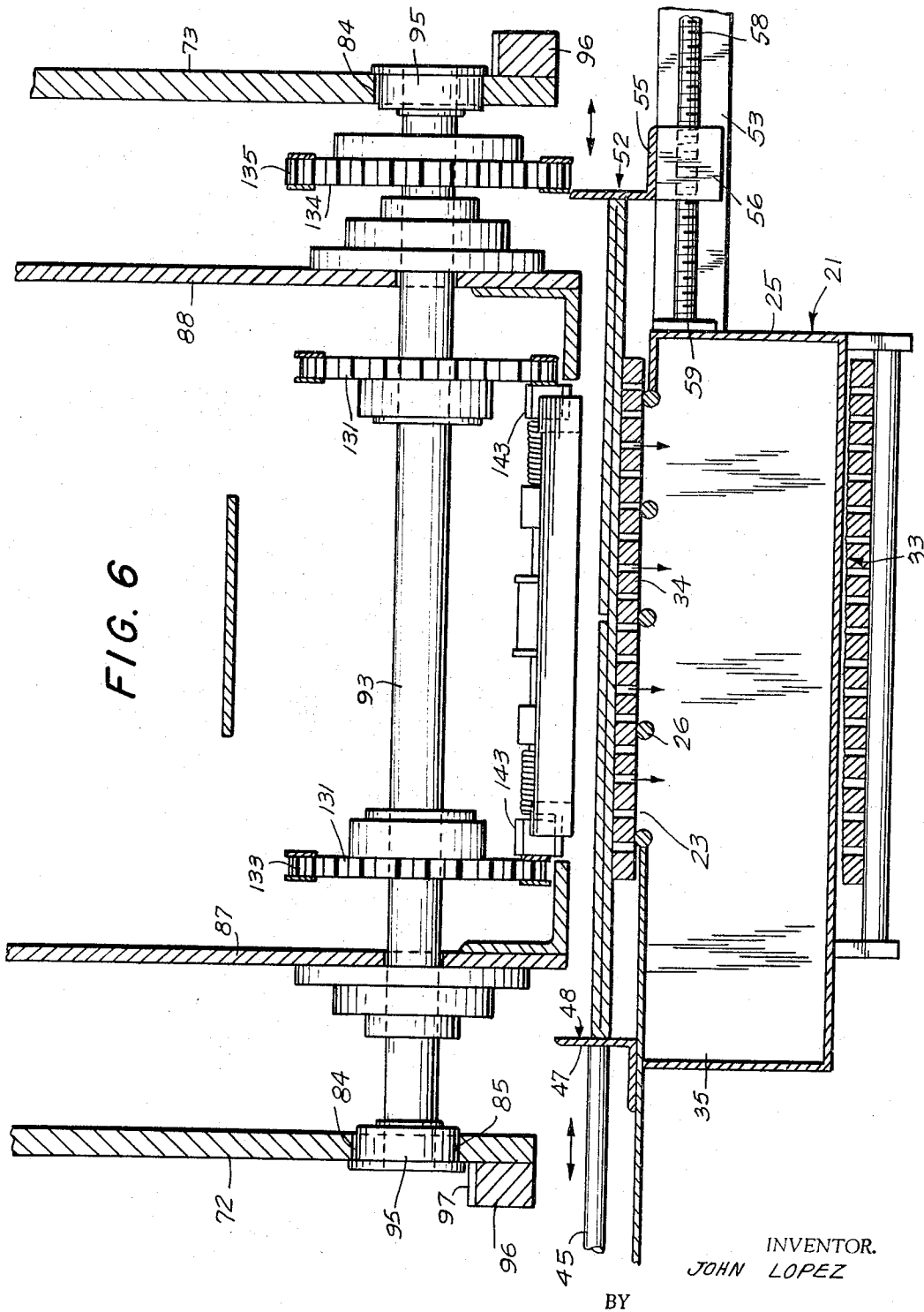
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3,326,095

SQUARING EQUIPMENT FOR FOLDED BOX BLANKS

Filed April 17, 1964

7 Sheets-Sheet 4



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SQUARING EQUIPMENT FOR FOLDED BOX BLANKS

Filed April 17, 1964

7 Sheets-Sheet 5

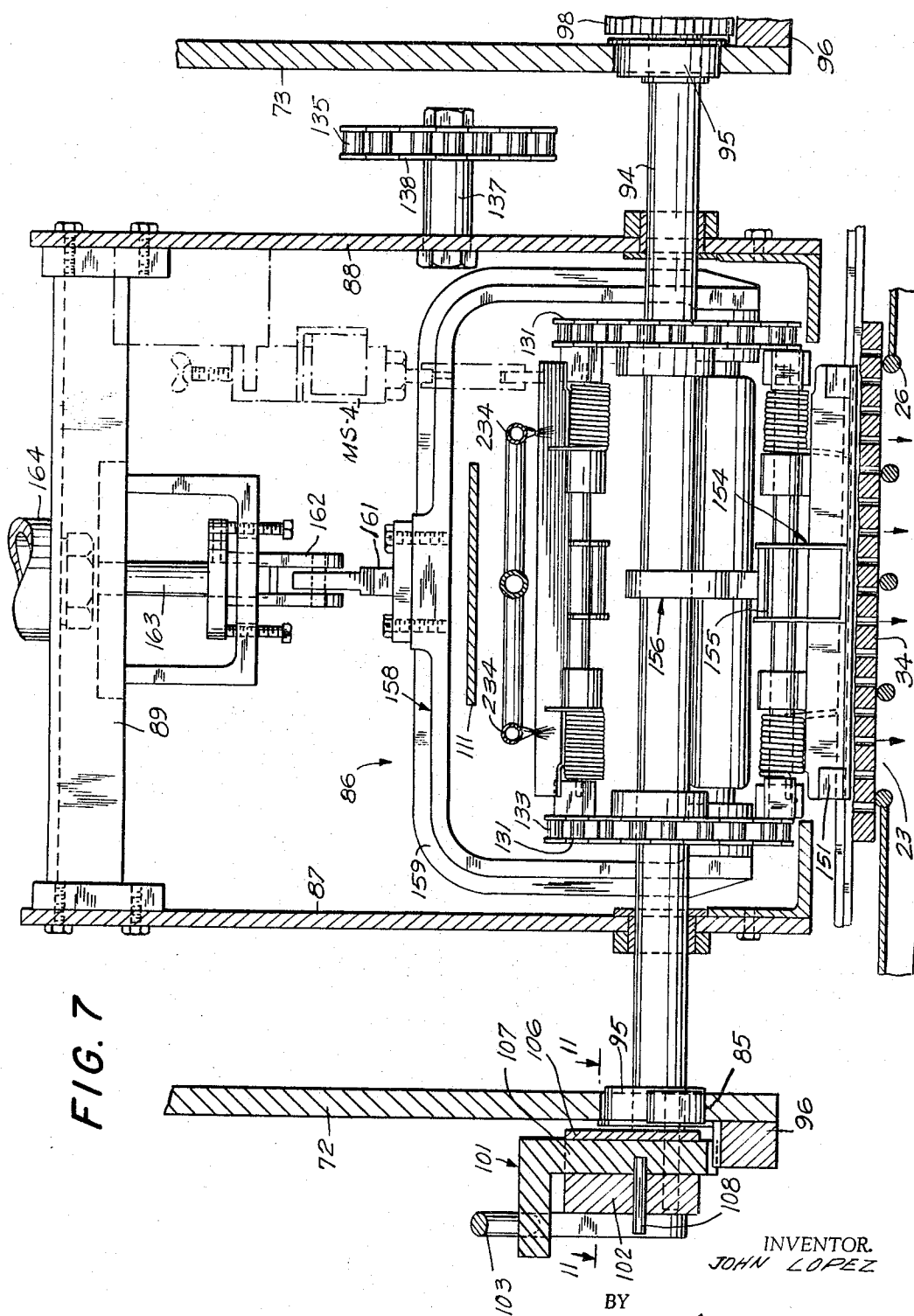


FIG. 7

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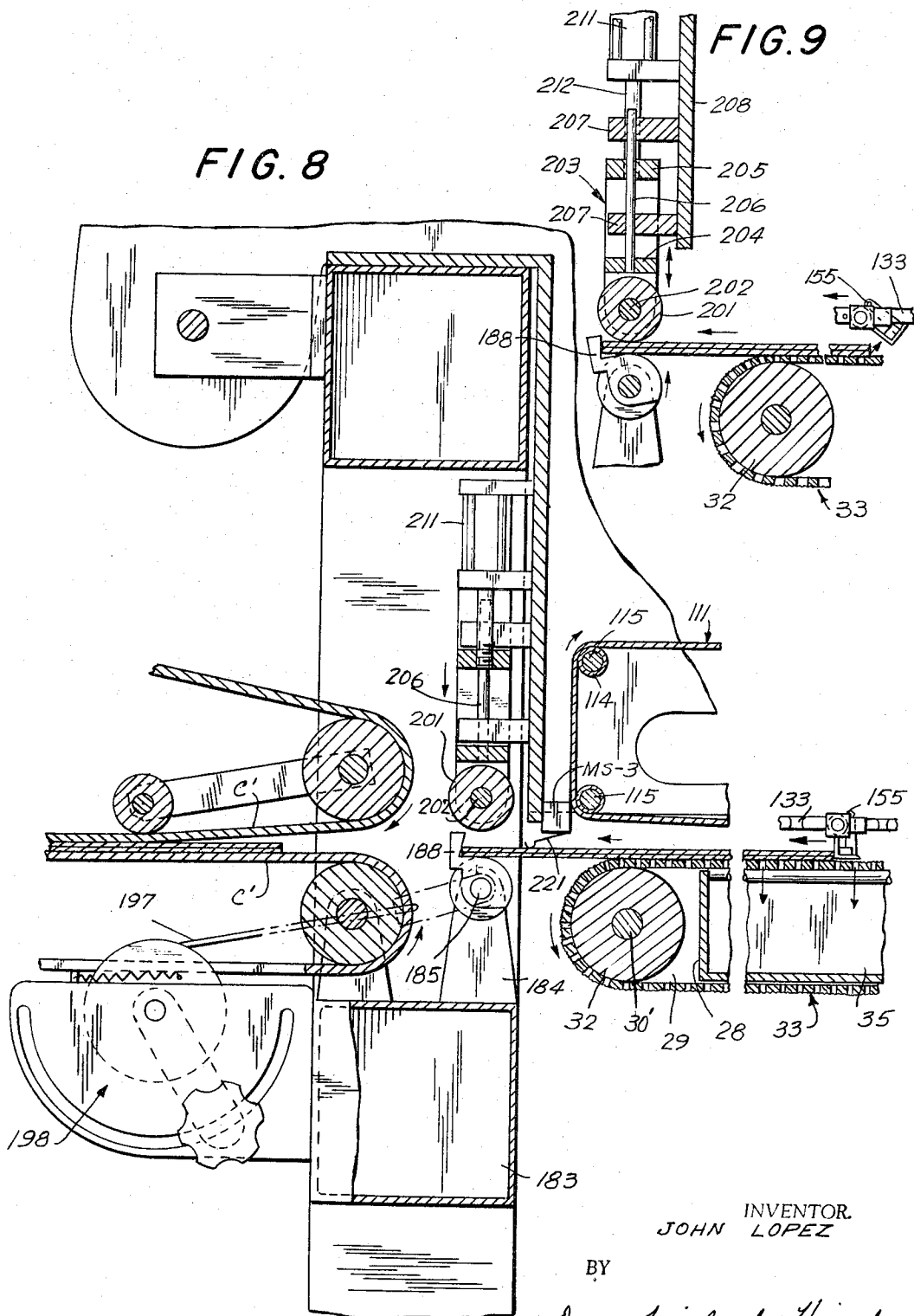
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3,326,095

SQUARING EQUIPMENT FOR FOLDED BOX BLANKS

Filed April 17, 1964

7 Sheets-Sheet 6



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SQUARING EQUIPMENT FOR FOLDED BOX BLANKS

Filed April 17, 1964

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FIG. 10.

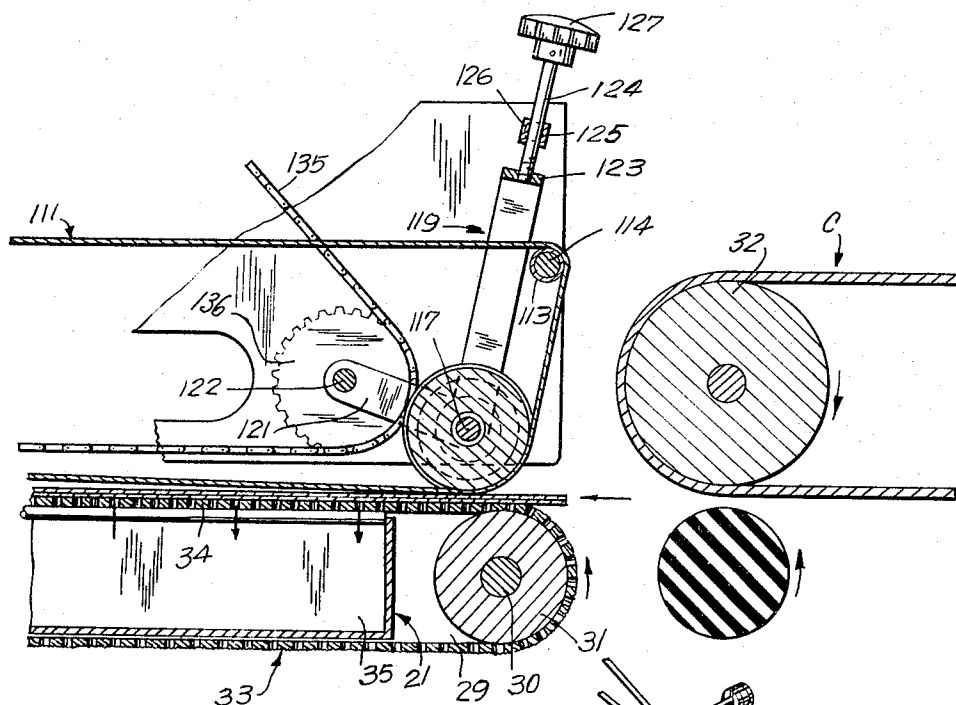


FIG. 13

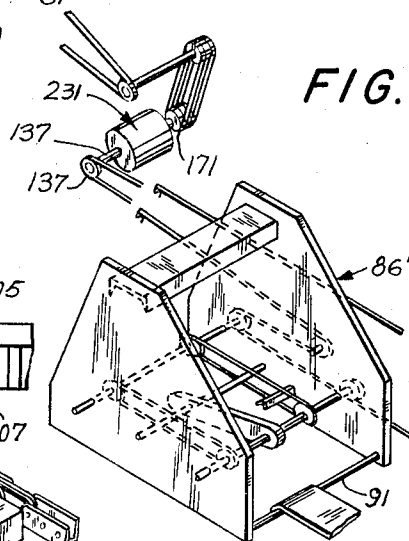


FIG. 11

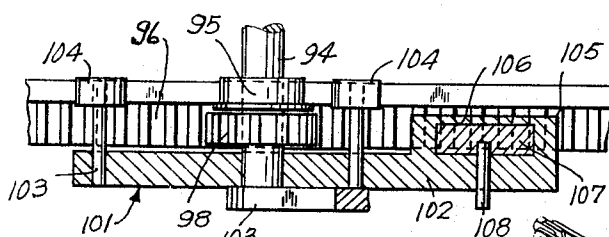
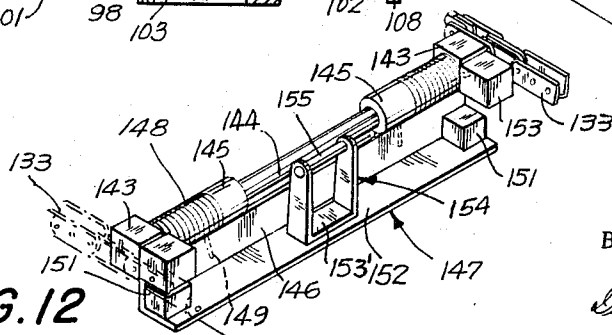


FIG. 12



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3,326,095 SQUARING EQUIPMENT FOR FOLDED BOX BLANKS

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Filed Apr. 17, 1964, Ser. No. 360,602

15 Claims. (Cl. 93—36)

This invention relates to the art of squaring equipment for folded boxes of the type that comprise four panels in side by side relation that have been pre-scored to facilitate folding of the two outer panels into substantially edge to edge juxtaposition.

As conducive to an understanding of the invention, it is noted that during the normal automatic folding by belt folders of corrugated box blanks of the type shown in application Ser. No. 745,979, filed July 1, 1958, now U.S. Patent No. 3,122,069, since the folding belts of the folder are spiralled 180 degrees to effect corresponding progressive folding of the outer panels of the blanks, the outer panels will be in the spiral portion of the folding belts while the other panels will be advanced by the horizontal conveyer associated with the folding belts.

Since the outer panels will take a longer time to reach the outlet of the folding equipment than the other panels moved by the horizontal conveyer, due to the delay imparted by the spiral portion of the folding belts, it is apparent that the outer panels may not be aligned with the other panels.

As a result of such lack of alignment, the resultant box will not be square and hence cannot be opened properly for filling, without breaking of the corners of the box so that such improperly formed box must be discarded with resultant waste.

Furthermore, where the folded box blanks are opened by automatic equipment, if they are not truly square, such automatic equipment will not function properly.

It is accordingly among the objects of the invention to provide a squaring equipment which will dependably advance folded box blanks in sequence at a relatively high rate of speed and will automatically align the panels of the folded box blank, thereby providing a folded box that is square and which may be opened without breakage of the corners thereof.

According to the invention, a conveyor is provided which successively advances folded box blanks in sequence and means are provided as the blanks are advanced to force the leading and trailing edges of successive folded box blanks between aligning bars which will effect squaring of such box blank.

More particularly, the alignment bar engaging the trailing edge of the box blank forces the leading edge thereof against an alignment bar which will move out of the path of such box after it has been squared to retain such folded box blank in square condition as it moves past the displaced forward alignment bar.

In the accompanying drawings in which is shown one or more of various possible embodiments of the several features of the invention,

FIG. 1 is a perspective view of the squaring equipment with parts broken away,

FIG. 2 is a view similar to FIG. 1 showing the upper mount of the squaring equipment,

FIG. 3 is a plan view of a typical folded box blank before it is squared,

FIG. 4 is a detail perspective view on an enlarged scale showing the front alignment bar,

FIG. 4a is a detail view of the brake block,

FIG. 5 is a longitudinal sectional view on an enlarged scale of the squaring carriage,

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FIG. 6 is a sectional view taken along line 6—6 of FIG.

5, FIG. 7 is a sectional view taken along line 7—7 of FIG.

5, FIG. 8 is a detail longitudinal sectional view of the discharge end of the squaring equipment,

FIG. 9 is a detail longitudinal sectional view illustrating the operation of the front alignment bar,

FIG. 10 is a detail longitudinal sectional view of the inlet end of the squaring equipment.

FIG. 11 is a detail sectional view of the carriage locking mechanism taken along line 11—11 of FIG. 7,

FIG. 12 is a detail perspective view of one of the carriage alignment bars, and

FIG. 13 is a diagrammatic perspective view of another embodiment of the invention.

Referring now to the drawings, as shown in FIGS. 1 and 4, the equipment comprises a hollow casing 21 which is supported in a horizontal plane by suitable standards 22. The casing 21 has an elongated rectangular opening 23 in its top wall 24 adjacent the side wall 25 thereof and a plurality of spaced parallel support rods 26 extend the length of said opening.

Extending outwardly from the ends 27, 28 of the casing adjacent side edge 25 thereof and aligned with said opening 23 (FIGS. 1, 8 and 10) are a pair of spaced parallel brackets 29 each pair of which mounts a pulley 31, 32 on an associated shaft 30, 30'. A perforated conveyor belt 33 encompasses said pulleys 31, 32 as well as the portion of said casing 21 with said opening 23 so that the upper run 34 of said conveyor belt extends over said opening 23 supported by the parallel support rods 26 as is clearly shown in FIG. 1.

The interior of said casing 21 defines a suction chamber 35 and a conventional suction blower 36 is provided driven in any suitable manner and having its suction lines 37 connected to the end wall 28 of the casing as shown in FIG. 1 adjacent the side wall 38 thereof.

Means are provided to guide a box blank B positioned on the conveyor belt 33.

To this end, as shown in FIG. 1, an L-shaped angle bar 41 is provided having its horizontal leg 42 secured as by welding to the top wall 24 of the casing 21 on the side of opening 23 adjacent the wall 38 thereof and extending parallel to the adjacent edge of elongated opening 23.

Secured to the vertical leg 43 of the bar 41 and spaced along the length thereof are blocks 44 each of which has a horizontal bore through which extends an associated rod 45, the position of said rods being set by means of a set screw 46 extending vertically through each block.

The free inner end of each of the rods 45 is secured to the vertical wall 47 of an L-shaped angle bar 48, the horizontal leg 49 of which rests on the top wall 24 and directed outwardly toward angle bar 41.

As shown in FIG. 1, the vertical leg 47 of angle bar 48 presents a guide surface and the outer end thereof is curved outwardly as shown at 51.

Thus, the angle bar 49 and the associated support therefor serves as one side of the guide means for the box blanks B.

The other side of the guide means comprises an L-shaped angle bar 52 similar to angle bar 48 and which in conjunction therewith serves to form the guide channel for the box blanks B.

The angle bar 52 is mounted so that it may automatically be moved toward and away from angle bar 48 to adjust the spacing therebetween, depending upon the width of the box blank B to be accommodated.

To this end, as is shown in FIGS. 1 and 6, a pair of spaced parallel support bars 53 are secured at one end as by welding to the side wall 25 of the casing 21 and extend outwardly therefrom, the outer ends of bars 53

being joined by a bar 54 which extends parallel to side wall 25.

The horizontal leg 55 of angle bar 52 mounts a pair of blocks 56 secured to the undersurface thereof and spaced along the length thereof, each of said blocks having a horizontal threaded bore through which extends an associated threaded rod or screw 57, 58.

One end of each screw 57, 58 is rotatably mounted in a suitable bearing 59 secured to side wall 25. The other end of each screw is rotatably mounted in a suitable bearing carried by the bar 54 and each of said outer ends mounts a sprocket wheel 61 connected by a sprocket chain 62.

The screw 58 also mounts a pulley 63 at its outer end which is connected by a belt 64 for example, to a pulley 65 driven through gear box 66 by a reversible motor 67 mounted on bar 54.

Thus, depending upon the direction of rotation of motor 67, the screws can be rotated in a corresponding direction to cause the angle bar 52 to move toward and away from angle bar 48 to adjust the spacing therebetween.

Associated with the casing 21 and the mechanism associated therewith, above described, is an upper mount 71 (FIGS. 1, 2).

The upper mount 71 comprises a pair of parallel side plates 72, 73 (FIGS. 1, 2, 6 and 7) mounted in spaced relation by means of transverse struts 74.

The upper mount 71 is illustratively pivotally supported at its inner end 75 on a shaft 76 which extends through transversely aligned openings in the ends 75 of plates 72, 73. The shaft 76 is supported by brackets 77 secured to a horizontal beam 78 of a vertical standard 79 and the lower edges of plates 72, 73 have cutouts 81, designed to receive the beam 78 which thus limits the downward pivotal movement of the upper mount 71.

The purpose of such pivotal support for upper mount 71 is to permit the latter to be pivoted in a counter-clockwise direction from the position shown in FIGS. 1 and 2 when access is desired to the conveyor belt 33 therebeneath.

As is clearly shown in FIGS. 2, 6 and 7, each of the side plates 72, 73 has a longitudinal slot 84, near the lower edge thereof, the lower edge 85 of each slot 84 serving as a track for a carriage 86 (FIGS. 2, 5 and 7).

As shown in FIGS. 2, 5 and 7, the carriage 86 comprises a pair of spaced parallel side plates 87, 88 connected by upper transverse strut 89 and lower transverse bars 91, 92 at the respective ends of the carriage.

Extending transversely through the side plates 87, 88 of the carriage near their lower edges, are parallel shafts 93, 94 which also extend through the longitudinal slots 84 in the plates 72, 73 of the upper mount 71, each of said shafts idly mounting a flanged roller 95 at its outer end which rides on the lower edge 85 of the associated slot 84.

Means are provided to move the carriage 86 to any desired position along the length of the slots 84 and also to lock the carriage in set position.

To this end as shown in FIGS. 2, 6 and 7, a rack bar 96 is secured to the lower edge of each of the side plates 72, 73 so that the teeth 97 of the rack bars are substantially aligned with the lower edges 85 of slots 84 in said side plates 72, 73, said rack extending substantially the length of said slots 84. The shaft 94 in addition to rollers 95 also carries pinions 98 which are rigidly secured to said shaft 94 and which ride on the associated rack bar 96.

Associated with shaft 94 is a brake mount 101 (FIGS. 2 and 11) which comprises a plate 102 through which shaft 94 extends, a ratchet arm 103 being secured to the end of shaft 94 protruding from plate 102. The plate 102 has inwardly extending studs 103 which mount rollers 104 at their free ends that ride on the lower

edge 85 of slot 84 in plate 72 and straddle the roller 95 as shown in FIG. 11.

In addition, the plate 102 has an inwardly extending boss 105 with a vertical rectangular slot 106 to receive a rectangular detent 107, the lower edge of which has teeth that engage the teeth on the rack bar 96 therebelow. The removable locking pin 108 extends through plate 102 into the detent 107 to retain the latter in position.

Thus when the detent is removed the ratchet arm 103, which is of the conventional reversible type, may be rocked back and forth, to rotate shaft 94 and the pinions 98 thereon thereby to move the carriage to desired position. Thereupon, the detent may be positioned in slot 106 to engage the teeth of rack 96 to lock the carriage in set position, the locking pin preventing inadvertent release of detent 107.

As shown in FIGS. 2 and 5, the carriage 86 has a transverse bar 91 near the lower portion of its front end. Secured to said bar 91 is one end of an elongated belt 111 which extends forwardly and rides around a pulley 112, then upwardly around a roller 113 mounted on a bar 114 extending transversely between plates 72, 73 at the outer end thereof. The belt 111, then extends rearwardly toward the back of the mount 71 and as shown in FIGS. 2 and 8, rides around rollers 114 mounted on vertically aligned transverse bars 115 extending between plates 72, 73 and the belt then is secured as shown in FIG. 5 to transverse bar 92 at the rear of the carriage. Tension on the belt 111 may be adjusted by a suitable turnbuckle 116 shown in FIG. 5.

The purpose of the belt 111 is to retain the flaps F of the box blank B in closed position as the box blank B is advanced and to this end the roller 112 shown in FIG. 10 has its vertical position adjustable.

More particularly, as shown in FIGS. 2 and 10, the shaft 117 carrying the pulley 112 also carries two soft rubber rollers 118 which straddle the pulley 112 and are designed to press on the sides of the folded flaps F of the box blank B adjacent the gap G therebetween.

The shaft 117 is supported at the ends of a U-shaped yoke 119 and arms 121 extend rearwardly from such ends and are rotatably mounted at their free ends on shaft 122 extending between plates 72, 73. The cross piece 123 of the yoke 119 rotatably mounts one end of a screw 124 which is threaded through a block 125 pivoted on a bar 126 so that when the screw 124 is rotated by knob 127, the roller 112 can be raised or lowered as desired.

Referring now to FIGS. 5, 6 and 7, each of the shafts 93, 94 of the carriage 86 mounts a pair of spaced sprocket wheels 131, 132 inwardly of the walls 87, 88. The sprocket wheels 131 are keyed to shaft 93 to rotate therewith and the sprocket wheels 132 are idly mounted on shaft 94 so as to rotate independently thereof. The respective pairs of sprocket wheels 131, 132 are connected by sprocket chains 133 so as to rotate in unison.

The shaft 93, as shown in FIG. 6, has a sprocket wheel 134 rigidly secured thereto between plates 88 and 73 and a drive sprocket chain 135 is provided to rotate sprocket wheel 134 and hence the sprocket chains 133.

As shown in FIG. 2, the drive sprocket chain 135 rides around a sprocket wheel 136 mounted on a shaft 137 rotatably mounted in a suitable bearing on side plate 73 near the rear thereof, the sprocket wheel 136 being positioned on the inner side of plate 73. The chain 135 then extends forwardly around an idler sprocket wheel 138 (FIGS. 2 and 7) mounted on a stud shaft carried by plate 88 of carriage 86. The chain then extends rearwardly around sprocket wheel 134 then forwardly around idler sprocket wheel 139, mounted on shaft 122 between plates 72, 73 at the front end thereof, then upwardly and rearwardly over idler sprocket wheel 141 and around sprocket wheel 136.

With the arrangement above described, it is apparent that as the position of the carriage is adjusted, the sprocket

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wheels will remain in engagement with sprocket chain 135 so that drive may be imparted to sprocket chains 133 carried by the carriage 86.

Secured to the sprocket chains 133 (FIGS. 5, 12) and transversely aligned thereacross are a plurality of pairs of blocks 143, four pairs being illustratively shown equidistantly spaced along said chains, each pair of blocks carrying a rod 144. Idly mounted on each of said rods 144 is a pair of spaced hubs 145 to each of which is secured the upper edge of the pusher leg 146 of an L-shaped angle bar 147, the latter extending transversely between the sprocket chains 133.

As is clearly shown in FIG. 12, a pair of coil springs 148 encompass the rod 144 at each end, one end of the coil spring being secured to the associated block 143 and the other end 149 reacting against the pusher leg 146 normally to urge the angle bar in counterclockwise direction (referring to the lower run of sprocket chains 133 in FIG. 5). The pivotal movement of the angle bars 147 is limited by the abutment of resilient blocks 151 secured to the ends of the other leg 152 thereof against abutments 153 carried by the sprocket chains 133.

The abutments 153 are so positioned that normally the pusher legs 146 are at an angle as shown in three positions in FIG. 5 so that if in such position they would not abut against the box blank B.

Means are provided to actuate the angle bars 147 so that the pusher leg 146 thereof is in vertical position.

As shown in FIGS. 7 and 12, each of the legs 152 of each angle bar has secured thereto the cross piece 153' of a U-shaped yoke 154, the free ends of the upstanding legs of which mount a transverse rod 155.

Associated with the rod 155 is a cam 156 which, as shown in FIGS. 2, 5 and 7, is aligned with said rods 155 and is rotatably mounted at one end on shaft 94. The cam 156 near its other end has a rod 157 extending there-through which is carried at its end by the legs of a yoke 158 which straddle the chains 133 as shown in FIG. 7.

The cross piece 159 of yoke 158 mounts a link 161 pivotally connected to and straddled by a yoke 162 which is operatively connected to the plunger 163 of an air cylinder 164 supported on the strut 89.

Thus, when the cam 156 is in its lowermost or operative position, shown in FIG. 5, as the sprocket chains 133 advance, the rods 155 of each angle bar will successively ride along the inclined portion 165 of cam 156 thereby to rotate the angle bar in a clockwise direction against the tension of spring 148, so that the pusher leg 146 thereof will be in vertical position as shown in FIG. 5. Thereupon with continued advance of the sprocket chains 133, the rod 155 will ride along the straight bottom edge 166 of the cam, maintaining the pusher leg 146 in such vertical position.

When the rod 155 moves past the end 167 of cam 156, the coil springs 148 will quickly rotate the angle bars in a counterclockwise direction.

Although the pusher bars may be advanced in any suitable manner, as illustratively shown, the shaft 137 (FIG. 2) has a sprocket wheel 171 secured thereto around which rides a sprocket chain 172 that also rides around sprocket wheel 173 mounted on stud shaft 174 along with sprocket wheel 175. A sprocket chain 176 rides around sprocket wheel 175 as well as idler sprocket wheel 177, drive sprocket wheel 178 driven by motor M and idler sprocket wheel 179. The sprocket wheel 179 is mounted at the end of a spring urged lever 181, which maintains tension on sprocket chain 176.

Thus, in the embodiment shown in FIG. 2 the sprocket chains 133 of the carriage 86 are constantly driven, and it is the actuation of the air cylinder that causes the pusher bars to move into operative position.

Associated with the pulley 32 at the outlet end of conveyer 33 is a rotatable stop mechanism which, in conjunction with the pusher bars 147 produces the squaring action.

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As shown in FIGS. 1, 2, 4 and 8, a support beam 183 also extends outwardly from standard 79 beneath beam 78. Secured to the top surface of beam 183 are upstanding parallel brackets 184 which rotatably mount a shaft 185. Idly mounted on said shaft 185 is a roller 186 which is straddled by hubs 187 through which shaft 185 extends, said hubs being secured to said shaft. The hubs 187 form the legs of a yoke, the cross piece 188 of which comprises a stop bar having a beveled inner surface which is normally aligned with the top surface of conveyer belt 33 as is shown in FIG. 8.

Mounted on the end of shaft 185 is an elongated block 189 with rounded ends. Riding over said block 189 is a leather strap 191 one end of which is secured as at 192 to the top of beam 183 and the other end of which is secured to one end of a weighted lever 194 pivoted at its other end as at 195. A lever 196 is secured to the shaft 185 and is urged in a clockwise direction by a cable 197 maintained under tension by a spring urged adjustable takeup mechanism 198.

Thus, due to the coaction of the strap 191 with block 189, rotation of lever 196 in a clockwise direction will be restrained and the stop bar 188 will be in the vertical position shown.

As shown in FIGS. 1, 8 and 9, there is associated with roller 186 and positioned above the latter parallel thereto, a vertically reciprocable roller 201 which is secured to a shaft 202 extending between the legs of a yoke 203. The yoke 203 has a cross piece 204 beneath the cross piece 205 thereof which cross piece 204 carries upright guide rods 206 which extend through suitable openings in blocks 207 extending outward from a mounting plate 208 which supports the roller 201 and associated mechanism, the plate 208 being mounted on beam 78.

The plate 208 also carries an air cylinder 211, the plunger 212 of which is secured to the cross piece 205 of the yoke 203 as shown in FIG. 9 to raise and lower the roller 201 when the air cylinder is actuated.

As is shown in FIG. 1, a flexible shaft 212 is connected to roller 201 to rotate the latter illustratively at a speed greater than the rate of advance of the conveyer belt 33.

Operation

In the operation of the equipment above described, folded box blanks B are to be advanced one by one by feed conveyor C (FIGS. 2 and 10) into the nip between rollers 118, 112, 118 and suction conveyor belt 33.

As the top flaps F-1, F-2, FIG. 3 may not be in alignment, as shown, the equipment is designed to square such flaps.

As the box blank is advanced by the suction conveyer belt 33, the rollers 118 which ride on the flaps F-1, F-2, will urge the latter downwardly. At this time, the cam 156 (FIG. 5) is in its uppermost position and hence the continuously moving pusher bars are advancing but with the pusher leg 146 at an incline so that it is not in operative position and will not engage the box blank therebeneath.

When the trailing edge of the folded box blank B moves past the control arm 214 of microswitch MS-1 (FIG. 5), it will actuate the latter and through conventional control circuits the air cylinder 164 will be actuated. As a result, the cam 156 will be pivoted downwardly to the position shown in FIG. 5 and hence the rod 155 of yoke 154 of the next pusher bar will ride along the cam surfaces 165, 166 thereby moving the pusher leg 146 to vertical position.

As the speed of movement of the sprocket belts 133 carrying the pusher bars is greater than the speed of movement of the conveyer belt 33, it is apparent that the pusher bar will quickly catch up with such trailing edge and abut thereagainst as shown in FIG. 5, moving the box blank forwardly at a speed greater than that of the conveyer belt 33.

It is apparent, referring to FIGS. 5 and 8, that the spacing between the carriage 86 and stop bar 188 is adjusted, so that depending upon the length of the box blank (i.e., the distance from the leading edge to the trailing edge) the pusher bar will have forced the leading edge of the box blank against the stop bar 188 before the rod 155 of yoke 154 has moved past the cam portion 166.

As a result of the force exerted by the pusher bar against the trailing edge of the box blank, the front edges of the top flaps F1-F2 will be forced against the pusher bar and hence the top flaps will be moved backwardly slightly thereby squaring the flaps. Continued forward motion of the box blank will cause the stop bar 188 to be pivoted in a counterclockwise direction from the position shown in FIG. 8 against the tension of cable 197.

As this occurs, a control arm 215 (FIG. 4) mounted on the end of shaft 185 will release the plunger of micro-switch MS-2 and through conventional control circuits actuate air cylinder 211 to move the yoke 203 downwardly so that the driven roller 201 will clamp the squared box blank against roller 186 and move the box blank forwardly.

As is clearly shown in FIG. 9, at this time the stop bar 188 will have been pivoted out of the path of movement of driven roller 201 and the rod 155 of the pusher bar 147 that has advanced the box blank will have moved past the end 167 of cam 156 so that it is now in its retracted position.

The driven roller 201 will rapidly advance the squared folded box blank between the conveyer belts C' of the subsequent processing equipment which may be a taping machine of conventional type such as that put out by Universal Corrugated Box Machinery Corporation and this machine will thereupon apply tape to the juxtaposed edges of the squared folded box blank.

As soon as the trailing edge of the box blank which has just been squared passes by the control arm 221 of micro-switch MS-3 (FIG. 8) it will de-energize the circuit to cylinder 211 and the latter will immediately be retracted ready for the next cycle. A slight delay is provided to insure that the trailing edge of the blank will have passed the stop bar 188 before the roller 201 is retracted.

It is to be noted, referring to FIG. 5, that the next box blank B-1 is immediately following the first box blank B and the leading edge thereof will abut against control arm 214 which will cause the air cylinder 164 to be actuated to raise the cam ready for the next cycle. The spacing between successive box blanks is such that the leading edge of the next box blank will not actuate the control arm 214 until the pusher bar has moved the previous box blank sufficiently for the squaring action to occur.

If desired, according to another embodiment of the invention, in which the pusher bars 147 are advanced intermittently, not continuously, the cam 156 may be maintained in its downward position at all times and the air cylinder and associated mechanism to pivot the cam may be eliminated.

In such case, referring to FIG. 13, a suitable brake and clutch unit 231 of conventional type such as that put out by Eaton Mfg. Co. of Kenosha, Wisconsin is interposed in shaft 137 between sprocket wheels 136 and 171.

As the embodiment of FIG. 13 is substantially identical to that of FIGS. 1 to 12 except for the elimination of air solenoid 164 and the associated mechanism, it will be described with respect thereto and for ease of explanation, only two pusher bars designated P-1 and P-2 will be employed and the micro-switch MS-4, shown in broken lines in FIGS. 5 and 7, added.

In operation, the sprocket wheel 171, FIG. 13, is continuously driven but the sprocket wheel 136 will be driven or not depending upon whether the brake and clutch unit is energized. Thus, with the pusher bars P-1, P-2, in the position shown in FIG. 5, when the trailing edge of the

box blank passes the control arm 214 of MS-1, it will energize the unit 231 so that the brake will be released and the clutch energized. As a result, the pusher bar P-1 will advance to abut against the trailing edge of the box blank to effect the squaring action as previously described.

As the pusher bar P-1 advances the pusher bar P-2 will also advance and abut against the control arm 233 of MS-4. As a result, this will energize the unit 231, to engage the brake and release the clutch so that the pusher bars P-1, P-2 will no longer advance.

It is to be noted that MS-4 is actuated just as the pusher bar passes cam 156 and a slight coasting will occur. When the trailing edge of the next box blank passes control arm 214 the cycle will be repeated.

By reason of the micro-switch MS-4, the pusher bar will always be stopped at the proper position ready to pick up the trailing edge of the box blank.

It is to be noted that the belt 111 will retain the flaps F-1, F-2 in downward position as the box blank is advanced. However, in the case of a small box blank, since there is no belt 111 between the ends of the carriage 86, the flaps might open.

To prevent this, a source of air under pressure is provided which is forced through a pair of air tubes 234, FIG. 7, extending parallel to each other, each of said tubes having one end closed and the other end connected to the pressure source. The tubes each have suitable air nozzles directed downwardly and designed to direct streams of air under pressure against the flaps F1-F2 to retain them in closed position as they pass beneath the carriage 86.

As many changes could be made in the above construction, and many apparently widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. Equipment for squaring the panels of a folded box blank comprising a perforated conveyer belt having a horizontal run to carry such box blanks with the gap between the folded top panels thereof extending longitudinally of the conveyer belt, means to create suction through said perforations to retain the box blank thereagainst, means to advance said conveyer belt, said conveyer belt having an outlet end, a shaft extending transversely with respect to said conveyer belt at the outlet end thereof, a stop member comprising an elongated strip rigid with said shaft and extending parallel thereto, means pivotally mounting said shaft, a lever secured at one end to said shaft, resilient means reacting against the other end of said shaft normally pivoting the latter to retain the strip in the path of movement of the leading edge of such box blank, pusher means movable against the trailing edge of such box blank as it is advanced by the conveyer belt to force the leading edge against said stop member thereby squaring the panels of such blank and pivoting the stop member out of the path of movement of the leading edge of the box blank for discharge of the latter from the outlet of said conveyer belt, and brake means to limit the pivotal movement of said stop member by said resilient means, said brake means comprising a substantially rectangular block secured between its ends to one end of said shaft, a strap riding on the top surface of said block and depending from both ends thereof, means rigidly securing one end of the strap in fixed position on one side of said shaft, a lever pivotally mounted at one end on the other side of said shaft on an axis parallel to the axis of said shaft and weighted at its outer end normally to rotate in the opposite direction to said stop member under the urging of said resilient means, said other end of said strap being secured to the free end of said lever, whereby the strap will restore said stop member to its

stop position after it has been pivoted out of the path of movement of said box blank.

2. Equipment for squaring the panels of a folded box blank comprising a perforated conveyor belt having a horizontal run to carry such box blanks with the gap between the folded top panels thereof extending longitudinally of the conveyor belt, means to create suction through said perforations to retain the box blank there-against, means to advance said conveyor belt, said conveyor belt having an outlet end, a pivoted stop member at the outlet end of said conveyor belt, resilient means normally retaining said stop member in the path of movement of the leading edge of such box blank and pusher means movable against the trailing edge of such box blank as it is advanced by the conveyor belt to force the leading edge against said stop member thereby squaring the panels of such blank and pivoting the stop member out of the path of movement of the leading edge of the box blank for discharge of the latter from the outlet of said conveyor belt, said pusher means comprising an elongated strip positioned over said horizontal run of said conveyor belt and extending transversely thereof, and means to advance said strip in the direction of movement of said horizontal run of said conveyor belt at a speed greater than the speed of movement of the latter to abut against the trailing edge of the box blank.

3. Equipment for squaring the panels of a folded box blank comprising a perforated conveyor belt having a horizontal run to carry such box blanks with the gap between the folded top panels thereof extending longitudinally of the conveyor belt, means to create suction through said perforations to retain the box blank there-against, means to advance said conveyor belt, said conveyor belt having an outlet end, a pivoted stop member at the outlet end of said conveyor belt, resilient means normally retaining said stop member in the path of movement of the leading edge of such box blank and pusher means movable against the trailing edge of such box blank as it is advanced by the conveyor belt to force the leading edge against said stop member thereby squaring the panels of such blank and pivoting the stop member out of the path of movement of the leading edge of the box blank for discharge of the latter from the outlet of said conveyor belt, said pusher means comprising an elongated strip positioned over said horizontal run of said conveyor belt and extending transversely thereof, a second conveyor carries said elongated strip, means to actuate said second conveyor to advance said strip in the direction of movement of said horizontal run of said conveyor belt at a speed greater than the speed of movement of the latter to abut against the trailing edge of the box blank.

4. The combination set forth in claim 3 in which said pusher strip is pivotally mounted on said second conveyor and movable between retracted and extended position, resilient means normally retaining said pusher strip in retracted position and means to pivot said pusher strip to extended position with the lower edge thereof in juxtaposition to the horizontal run of said first conveyor belt to engage the trailing edge of such box blank.

5. The combination set forth in claim 4 in which the means to pivot said pusher strip comprises an actuating arm carried by said pusher strip and a cam in the path of movement of said actuating arm whereby when the arm engages the cam the pusher strip will be pivoted to extended position against the tension of said resilient means.

6. The combination set forth in claim 5 in which said second conveyor is continuously driven and means are provided to move said cam into and out of the path of movement of said arm.

7. The combination set forth in claim 5 in which a brake and clutch unit is associated with the drive means intermittently to effect advance of said second conveyor.

8. Equipment for squaring the panels of a folded box blank comprising a perforated conveyor belt having a horizontal run to carry such box blanks with the gap be-

tween the folded top panels thereof extending longitudinally of the conveyor belt, means to create suction through said perforations to retain the box blank there-against, means to advance said conveyor belt, said conveyor belt having an outlet end, a pivoted stop member at the outlet end of said conveyor belt, resilient means normally retaining said stop member in the path of movement of the leading edge of such box blank, pusher means movable against the trailing edge of such box blank as it is advanced by the conveyor belt to force the leading edge against said stop member thereby squaring the panels of such blank and pivoting the stop member out of the path of movement of the leading edge of the box blank for discharge of the latter from the outlet of said conveyor belt, and a second conveyor positioned over the horizontal run of said first conveyor, said second conveyor comprising a carriage, a pair of spaced parallel shafts carried by said carriage and extending transversely of said conveyor belt, a pulley at each end of each shaft, a belt riding around each pair of longitudinally aligned pulleys, means to drive said belts, said pusher means comprising an elongated strip extending between said pair of belts and pivotally mounted with respect thereto, resilient means reacting against said strip to retain the latter in retracted position, an actuating arm carried by said strip, a cam carried by said carriage and movable into and out of the path of movement of said arm, whereby when said arm engages said cam, said strip will be pivoted to extended position when in engagement with said cam, with the lower edge of said pusher strip in juxtaposition to the horizontal run of said first conveyor belt to engage the trailing edge of such box blank.

9. The combination set forth in claim 8 in which means are provided to rotate one of said shafts to drive said belts to move said pusher strip in the direction of movement of said conveyor belt and at a greater speed than the latter.

10. The combination set forth in claim 8 in which a guide frame is provided comprising a pair of spaced parallel guide plates extending longitudinally of said conveyor belt over the latter, said carriage is mounted on said frame and movable longitudinally thereof to adjust the position at which the pusher strip will abut against the trailing edge of said box blank.

11. The combination set forth in claim 8 in which air jets are provided carried by said carriage and positioned to direct jets of air downwardly to abut against the top flaps of said folded box blank.

12. The combination set forth in claim 8 in which a guide frame is provided comprising a pair of spaced parallel guide plates extending longitudinally of said conveyor belt over the latter, each of said plates having an elongated longitudinal slot therethrough, the lower edge of which defines a track, said conveyor comprises a carriage having a pair of spaced side plates between which said shafts are mounted, a rack is secured to each of the guide plates aligned with the lower edge of each track, and said shafts having rollers and pinions thereon riding on said tracks and said racks and means to rotate at least one of said pinions to move said carriage to a desired position along said tracks, and means to rotate said belts to move said pusher strip in the direction of movement of said conveyor belt and at a speed greater than the latter.

13. The combination set forth in claim 12 in which means are provided to lock said carriage in set position along said track.

14. The combination set forth in claim 12 in which an elongated belt is provided having its ends secured to the opposed ends of the carriage, and extending longitudinally of said conveyor belt adjacent the surface thereof, said belt extending to the front and rear of said guide frame and being movably mounted whereby regardless of the position of said carriage, said belt will have portions adjacent said conveyor belt to retain the top flaps of the box blank therebeneath in folded position.

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15. The combination set forth in claim 12 in which an elongated block is provided through which one of said shafts extends, said block being positioned directly over one of said racks, a ratchet arm secured to the extending end of said shaft, said block having a vertical slot, a detent slidable in said slot, said detent having a locking conformation at its lower end to engage said rack to lock the carriage with respect thereto.

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