May 13, 1958 J. P. LOPEZ 2,834,168

BOX FLAP TAPING AND END SEALING EQUIPMENT

Filed March 3, 1954 6 Sheets-Sheet 1

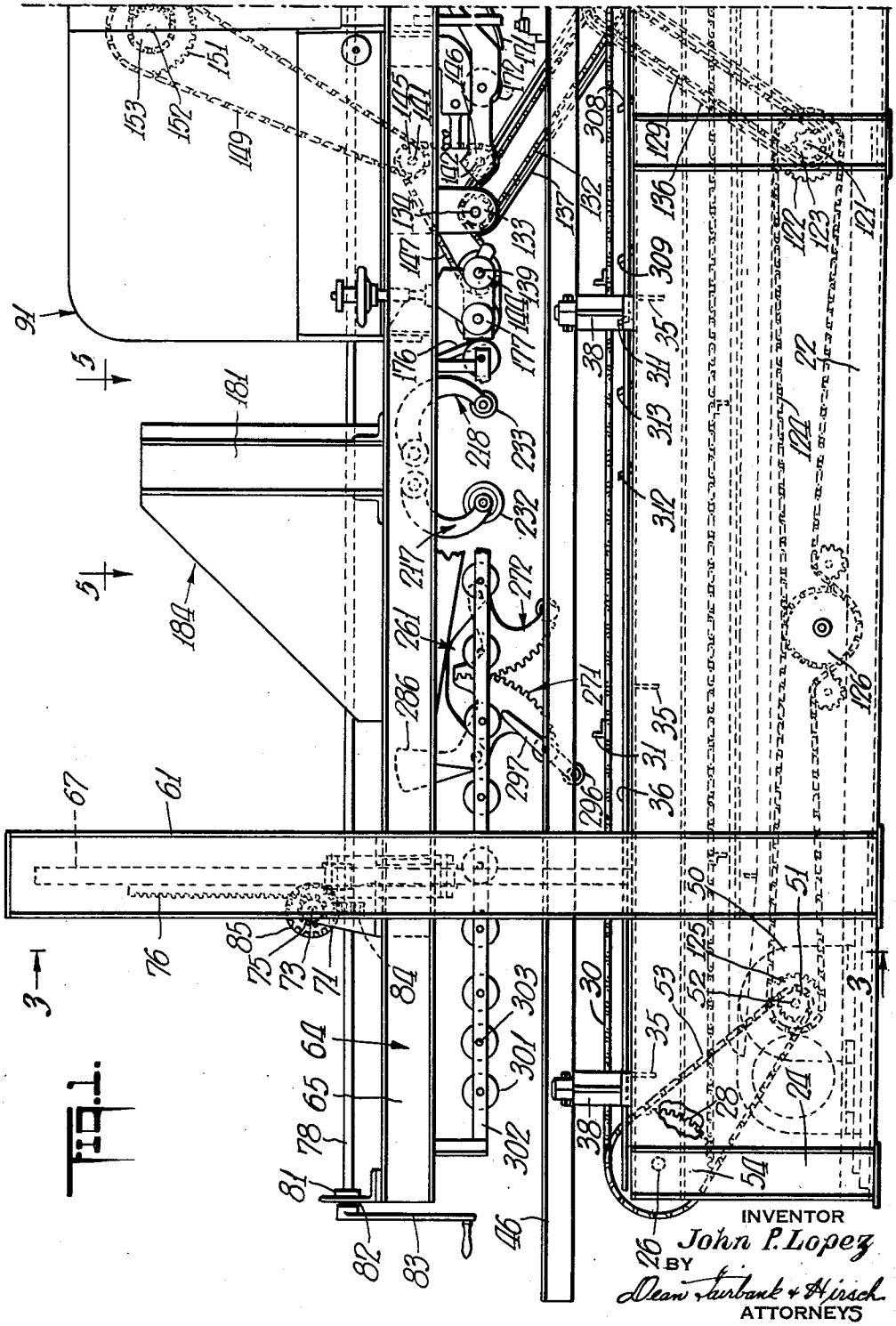


Fig. 1.

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FIG. 8.

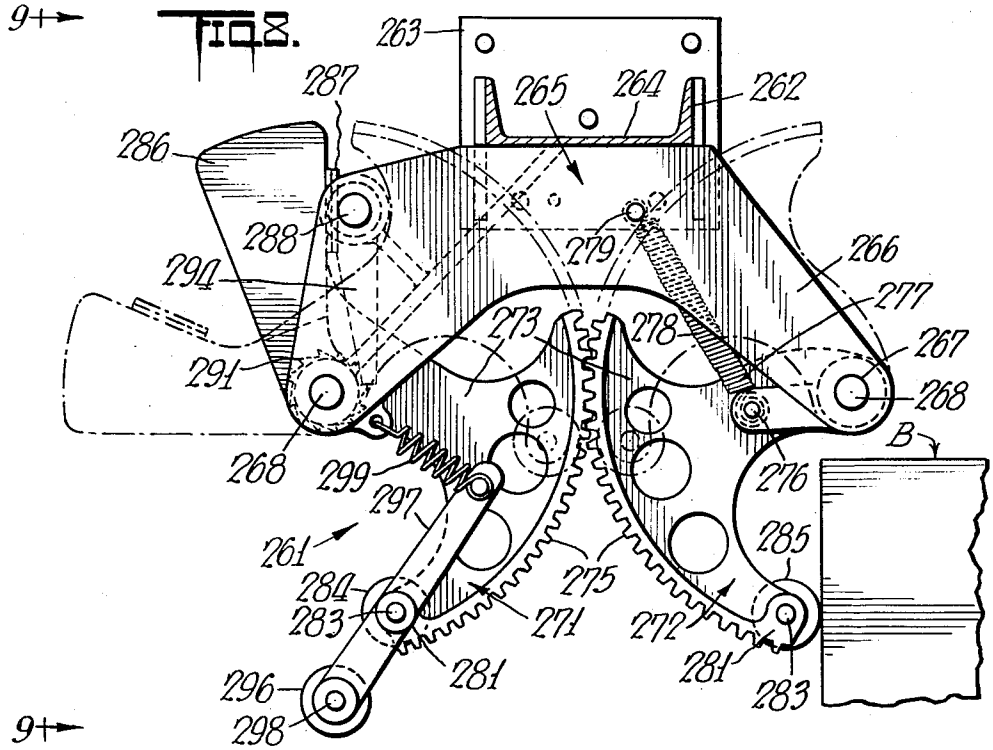
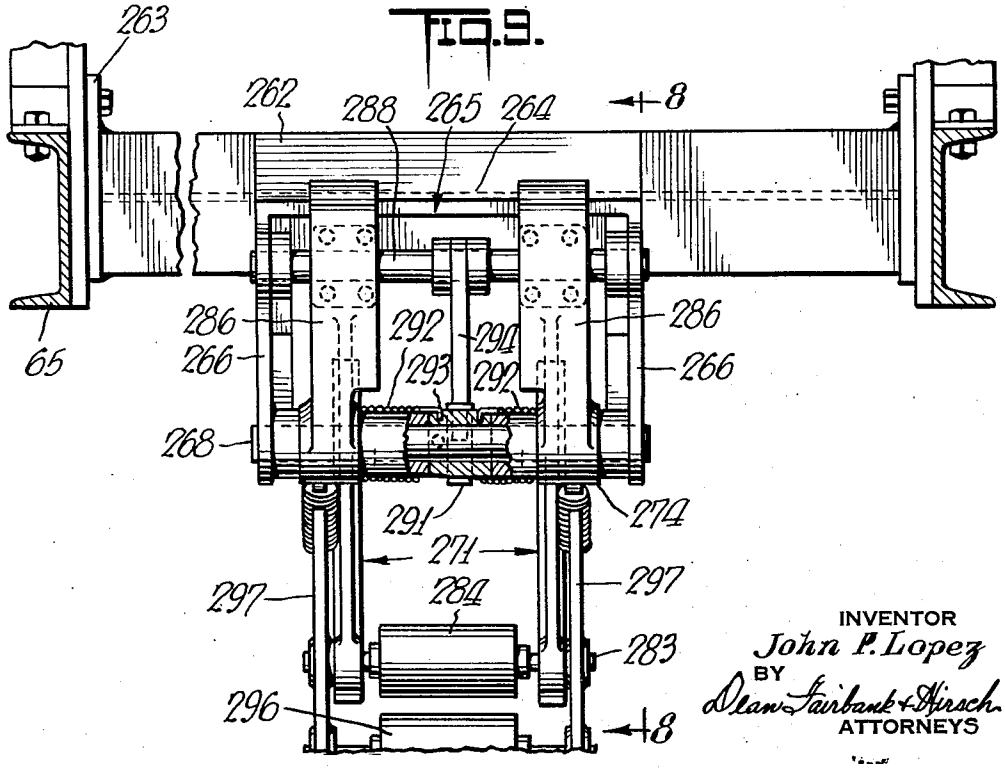


FIG. 9.



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Fig. 5.

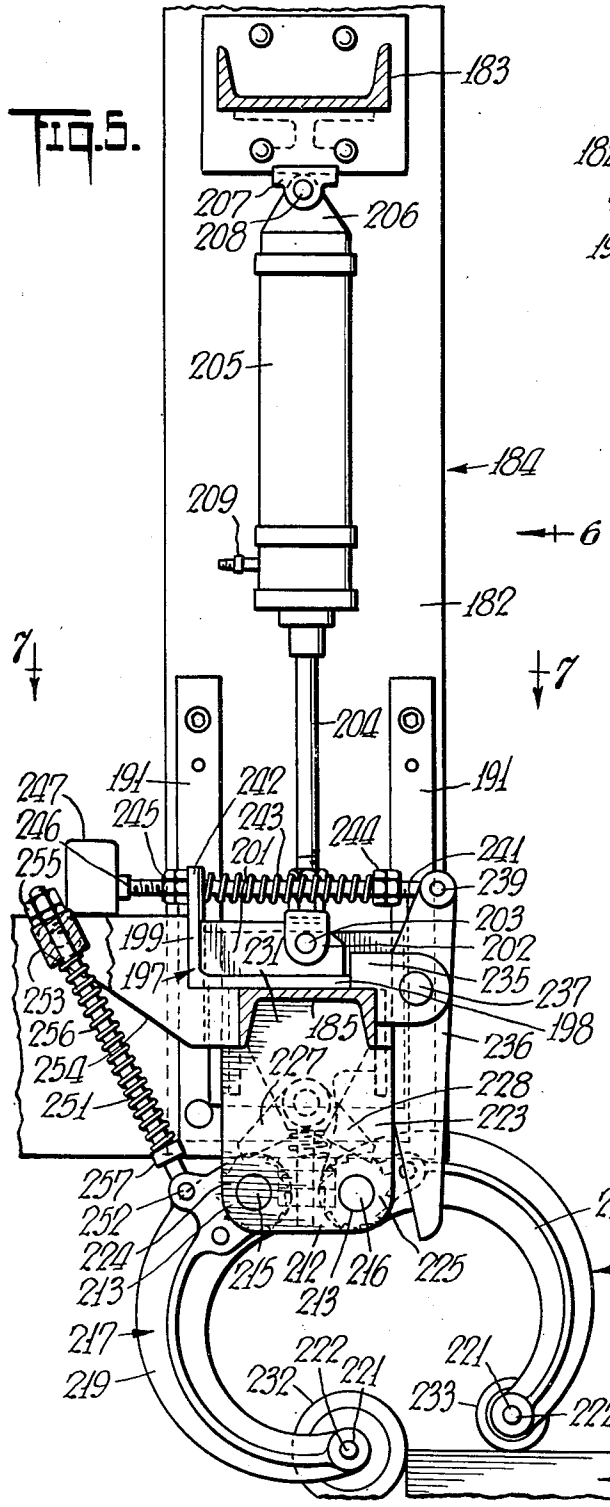
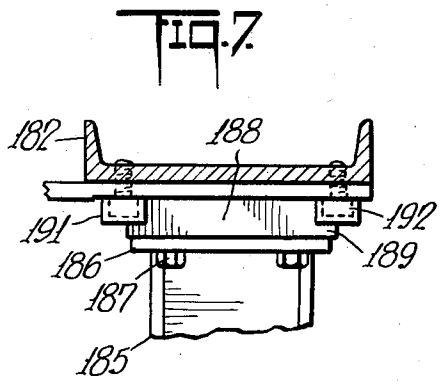


Fig. 7.



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BOX FLAP TAPING AND END SEALING EQUIPMENT

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FIG. 3.

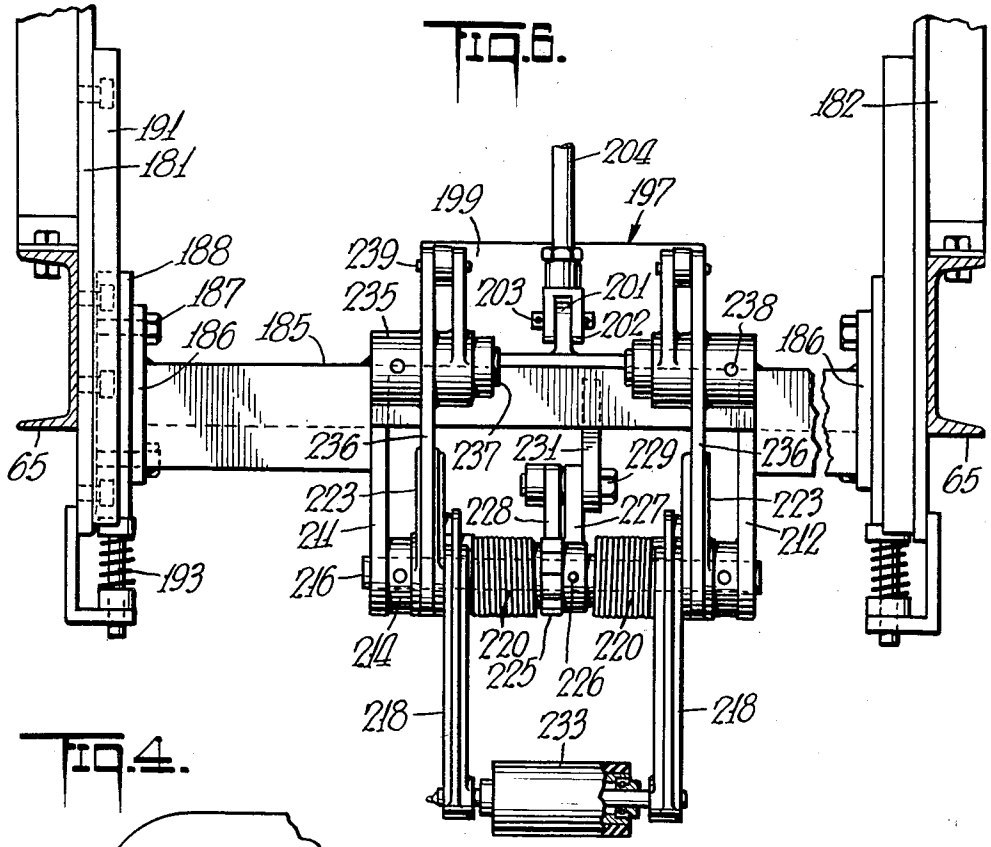
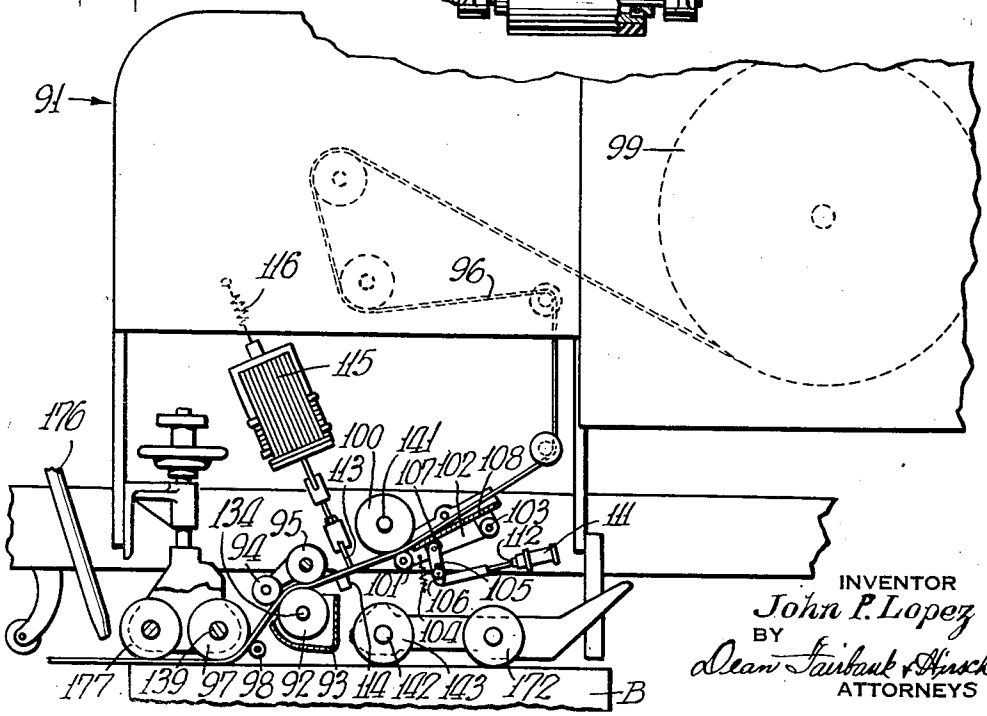


FIG. 4.



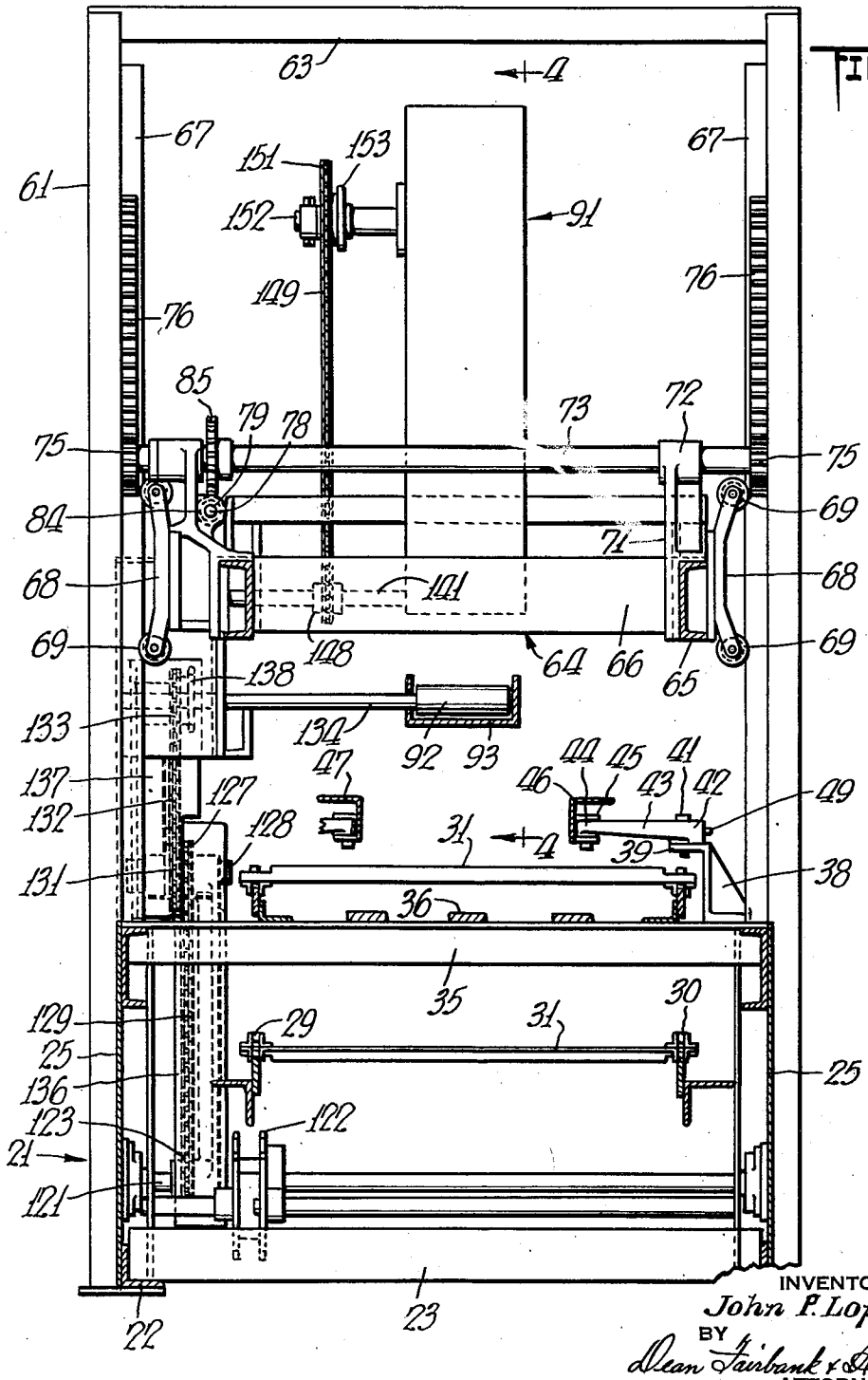
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BOX FLAP TAPING AND END SEALING EQUIPMENT

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Fig. 3.



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BOX FLAP TAPING AND END SEALING EQUIPMENT

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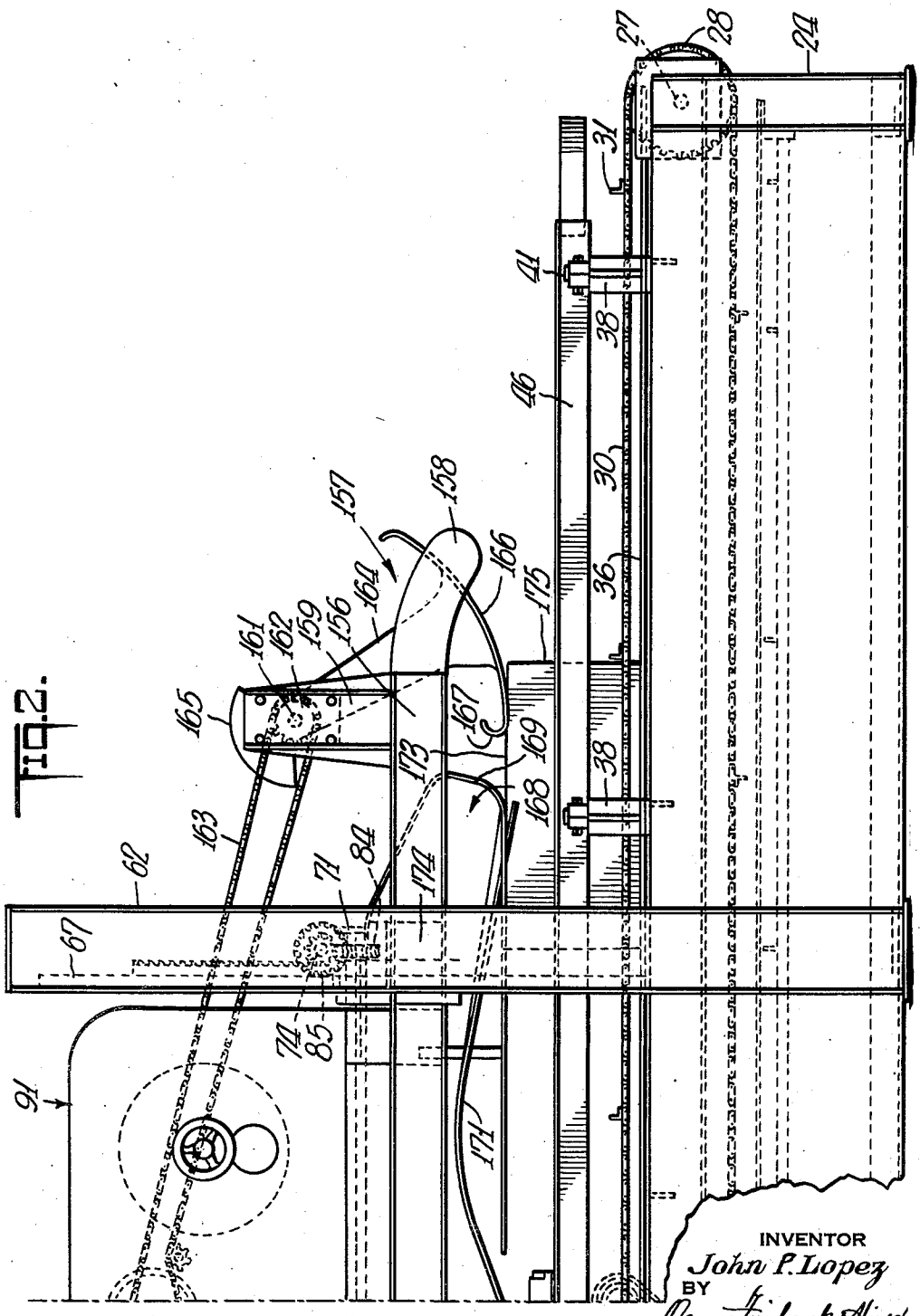


Fig. 2.

United States Patent Office 2,834,168 Patented May 13, 1958

2,834,168

BOX FLAP TAPING AND END SEALING EQUIPMENT

John P. Lopez, New York, N. Y., assignor to Universal Corrugated Box Machinery Corporation, a corporation of New York

Application March 3, 1954, Serial No. 413,935

13 Claims. (Cl. 53—137)

This invention relates to the art of taping equipment for the flaps of a box and more particularly to equipment for retaining the ends of the tape in place.

As conducive to an understanding of the invention, it is noted that where, for example, a partially assembled paper box has been filled and the end and side flaps must be folded downwardly and sealed by applying a tape thereon, in order for the box to be securely sealed, the tape, in addition to being applied to the top of the box over the adjacent edges of the folded side flaps, must also be bent downwardly and secured against the front and rear ends of such box.

Where the taping is done manually, the operation is extremely time-consuming and requires considerable personnel. Where the tape is applied automatically to the box, unless the ends of the tape can be folded over the ends of the box and pressed thereagainst so as to securely adhere thereto, the folded ends of the tape may peel away causing an ineffective seal.

It is accordingly among the objects of the invention to provide a box taping equipment that will operate at a relatively high rate of speed without need for supervision and which will dependably apply tape to the top of the box to seal the adjacent edges of the side flaps and will also apply such tape to the ends of the box and securely retain such tape against such ends, which equipment is not likely to become deranged even with long use and may readily be maintained.

According to the invention, from its broader aspect, means are provided to apply a length of tape to the top of a box over the adjacent edges of the side flaps with the front and rear ends of the tape protruding beyond the adjacent ends of such box. The box thus taped is advanced by a suitable conveyer and means are provided in the path of movement of such box to press the protruding front end of the tape against the front of the box and to press the protruding rear end of the tape against the rear of the box.

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

Figs. 1 and 2 are side elevational views of the machine,

Fig. 3 is a transverse sectional view taken along lines 3—3 of Fig. 1,

Fig. 4 is a side elevational view of the taping unit taken along line 4—4 of Fig. 3,

Fig. 5 is a side elevational view of the first end sealer taken along line 5—5 of Fig. 1,

Fig. 6 is a front elevational view of said first end sealer, 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 side elevational view of the second end sealer taken along line 8—8 of Fig. 9, and

Fig. 9 is a rear elevational view of the second end sealer taken along line 9—9 of Fig. 8.

Referring now to Figs. 1 to 3 of the drawings, the taping machine desirably comprises a substantially rectangular frame 21 having parallel, longitudinally extending angle bars 22 securely retained in spaced relationship by transversely extending angle bars 23. The frame also includes a plurality of upright standards 24 spaced along each side thereof which mount elongated substantially rectangular rigid panels 25.

Extending transversely across the frame at each end thereof respectively and rotatably mounted in suitable bearings at the upper end of the associated standards 24 are shafts 26 and 27, each having affixed near each end, a sprocket wheel 28. Each longitudinally aligned pair of wheels 28 mounts a continuous length of sprocket chain 29, 30, a plurality of spaced pusher bars 31 extending transversely between the pairs of chains 29, 30 and being affixed thereto at each end, the chains and bars forming a conveyer.

Affixed at each end to the upper edges of the parallel panels 25 and extending transversely across the frame are a plurality of supporting beams 35 which mount a plurality of spaced longitudinal bars 36 which form a track lying in a horizontal plane below that of the pusher bars 31.

A plurality of the supporting beams 35 near each end thereof mount an upright bracket 38 (Fig. 3) having an arm 39 extending inwardly above the horizontal plane of the pusher bars 31. Each arm has a stud 41 affixed thereto and rising vertically therefrom which extends through one end 42 of a horizontal arm 43, the other end 44 of which is pinned to an associated bracket 45 affixed to the wall of angle bars 46, 47 extending substantially the length of the frame along each side thereof.

The ends 42 of each of the arms 43 has a set screw 49 which, when tightened, engages stud 41 securely to retain the angle bars 46, 47 in fixed position. Thus, the angle bars 46, 47 may be adjusted to the width of the box B to be taped, to prevent transverse displacement thereof on the track formed by bars 36.

To drive the sprocket chains 29, 30, a motor 50 is desirably securely mounted on the frame near one end thereof as shown in Fig. 1 and has a sprocket wheel 51 mounted on its drive shaft 52 which is connected by means of a sprocket chain 53 to a sprocket wheel 54 desirably mounted on shaft 26.

Means are desirably provided to close the flaps of the box to be sealed, to apply tape thereto and securely to press the tape in place. To this end, as shown in Figs. 1 to 3, two pairs of upright, transversely aligned standards 61, 62 are affixed at their lower ends to the panels 25 and rise substantially above the latter, the upper ends of each pair of standards being connected by cross beam 63. Mounted on the standards 61, 62 and desirably straddled thereby is a vertically movable substantially rectangular frame 64 which has spaced longitudinally extending side beams 65 connected by transverse beams 66.

Each of the standards 61, 62 desirably has a substantially rectangular bar 67 affixed to the inner surface thereof which forms a track along which the frame 64 is movable. Each of the side beams 65 near each end thereof desirably has a vertical arm 68 affixed thereto desirably mounting a grooved roller 69 at each end which rides on the associated track 67 as is clearly shown in Fig. 3.

In order to move the frame 64 to any desired position and to retain the frame in such position, an upstanding arm 71 (Fig. 3) is affixed to the frame near each corner thereof. The pairs of arms 71 at each end of the frame have transversely aligned bearing openings 72 at their upper ends through which extend shafts 73, 74, the ends of each of said shafts having a gear 75 affixed thereon

and meshing with a rack 76 affixed to the outer surface of each of the tracks 67.

To rotate the shafts 73, 74 in unison to effect vertical movement of the frame 64, an adjustment shaft 78 is provided, which extends longitudinally of the frame 64 near one of the side beams 65. The shaft 78 is rotatably mounted in suitable bearings 79 adjacent shafts 73, 74 and also in a bearing 81 in a bracket 82 affixed to one end of the frame, the shaft extending through bearing 81 and having a handle 83 affixed thereon for rotation thereof.

The shaft 78 desirably has a pair of worms 84 affixed thereon which mesh with worm gears 85 affixed to each of the shafts 73, 74 so that upon rotation of shaft 78, through the worm drive 84, 85, the shafts 73, 74 and gears 75 thereon will be rotated to raise or lower the frame.

Centrally located on the frame 64 and extending longitudinally thereof is a tape applying machine 91 desirably of the type put out by Universal Corrugated Machine Company of Linden, New Jersey.

As the tape applying machine 91 per se forms no part of this invention, it will only be described sufficiently to illustrate the invention herein.

The tape applying machine 91 which has a substantially rectangular casing, is desirably mounted in upright position as shown, on suitable cross beams affixed to the side beams 65 of the frame 64. The machine 91 (Fig. 4) desirably has a roller 92 positioned in a liquid reservoir 93 and extending transversely with respect to the frame 64. A pair of idly mounted gripping rollers 94 and 95 normally resiliently urge the tape 96 against roller 92 so that it may be advanced thereby. The undersurface of tape 96, which desirably has adhesive material thereon, is moistened by the roller 92 as such tape is advanced by the roller 97 and idler roller 98 to be affixed to the juxtaposed edges of the flaps of the box B in the manner hereinafter to be described.

Tape feed mechanism serves to draw the tape 96 from the supply roll 99 and advance it to the reservoir 93 and may comprise a roller 100 with an associated idler roller 101 rotatably mounted at one end of an arm 102 pivotally mounted at its other end as at 103 to the casing of the taping machine. Roller 101 is normally spaced from roller 100 by means of a coil spring 104 which normally urges arm 102 downwardly. Thus, the tape 96 positioned between spaced rollers 100 and 101, but not operatively engaged thereby, will not be drawn from supply roll 99.

Means are provided to move roller 101 to press the tape against the roller 100 so that it may be advanced. To this end, a cam arm 105 is pivoted near its lower end as at 106, and desirably has a cam roller 107 at the upper end thereof which rides against a flange 108 extending laterally from arm 102. In order to rotate cam arm 105 about its pivot 106 to lift arm 102 thereby to move roller 101 toward roller 100, a solenoid 111 is desirably provided, the armature 112 of which is normally in extended position and is desirably connected through suitable linkage to the lower end of cam arm 105.

In order to sever the tape 96 after a predetermined length thereof has been fed, a pair of knife blades 113 and 114 are provided, one of which, illustratively blade 113, is movable and the other of which, i. e., blade 114 is fixed. Although blade 113 may be actuated in any suitable manner, a solenoid 115 is shown for the purpose, the armature of which is connected to blade 113 by a suitable linkage and is normally in retracted position, being so retained as by spring 116 so that blade 113 is spaced from blade 114.

Although the tape feeding mechanism may be driven in any suitable manner, in the illustrative embodiment herein the same motor 50 which drives the sprocket chain 29 and 30 is used for this purpose.

As shown in Figs. 1 and 3, an inwardly extending stud shaft 121 is rotatably mounted on frame 21 and mounts a pair of sprocket wheels 122 and 123. The sprocket wheel 122 is connected by sprocket chain 124 to sprocket wheel 125 affixed on motor shaft 52, a conventional sprocket chain takeup 126 being provided between the ends of the chain 124. The sprocket wheel 123 on shaft 121 is connected to a sprocket wheel 127 on a second stud shaft 128, by means of a sprocket chain 129, said stud shaft 128 having a second sprocket wheel 131 affixed thereon, connected by sprocket chain 132 to sprocket wheel 133 affixed on a shaft 134 on which the roller 92 in reservoir 93 is mounted.

Pivotally connected to the frame of the machine and encompassing sprocket wheels 123 and 127 and sprocket chain 129, is an elongated rigid casing 136, the stud shaft 128 extending through the upper end of said casing with the sprocket wheel 131 being mounted on such extending end. A second elongated casing 137 is pivotally mounted at one end on stud shaft 128 encompassing the sprocket wheel 131, sprocket chain 132 and sprocket wheel 133. Thus, with the assembly above described, regardless of the vertical position of the frame 64, drive will be imparted to shaft 134 at the same rate of speed.

The shaft 134 has an additional sprocket wheel 138 thereon and the shafts 139, 141 and 142 mounting rollers 97, 100 and 143 respectively, each has a sprocket wheel 144, 145 and 146 which are connected by a sprocket chain 147 so that upon rotation of the shaft 134, the rollers 92, 97, 100 and 143 will rotate in unison. The shaft 141 mounting roller 100 has an additional sprocket wheel 148 thereon which is connected by sprocket chain 149 to a sprocket wheel 151 mounted on a stud shaft 152 extending laterally from the taping machine. The stud shaft 152 has an additional sprocket wheel 153 thereon which serves to drive the rear box flap closing mechanism 157 in the manner now to be described.

As shown in Fig. 2, each of the side beams 65 of the frame 64 has an extension beam 156 affixed thereto and extending longitudinally therefrom toward the inlet of the box taping machine, the end of each of the extension beams having an outwardly curved arm 158. Rising from the end of each extension beam is an upstanding arm 159 between which is rotatably mounted a shaft 161. The shaft 161 has a sprocket wheel 162 thereon connected by sprocket chain 163 to sprocket wheel 153 on stud shaft 152. Affixed to shaft 161 preferably midway between its ends and extending at right angles thereto is an arm 164 having at one end a counter weight 165 and at its other end an arcuate strip 166 of rigid material with a rounded leading end 167.

Extending longitudinally of the frame 64 midway between extension beams 156 is a front flap closing member 168 which desirably comprises a panel suitably affixed in a vertical plane to the frame 64 and desirably having a slightly inclined front edge 169 rounded at its bottom against which the leading flap of the box may abut. Also affixed to the side bars of the frame are two rods 171 which converge outwardly from adjacent the roller 172 and which serve to move the side flaps of the box inwardly as the box is advanced by the sprocket chains 29, 30.

Means are desirably provided to insure that the tape applied to the box B will be securely retained on the upper surface 173 and against the front and rear end walls 174, 175 thereof. To this end an air nozzle 176 is provided immediately to the left of the roller 177 associated with roller 97 and centrally located so that it will be aligned with the tape applied to the box. The nozzle is connected through suitable conduits (not shown) to a source of compressed air actuated by means of a suitable switch 311 positioned on the frame of the machine and adapted to be engaged by the leading edge of the box as it is advanced in the manner hereinafter to be described.

Rising vertically from each of the side beams 65 on the frame 64 to the left of the tape applying mechanism

91 are posts 181 and 182 (Figs. 1, 5 and 6) connected at their upper ends by a cross beam 183 to serve as the support for the first tape sealing assembly 184.

As is clearly shown in Figs. 5 and 6, the tape sealing assembly 184 desirably comprises a substantially U-shaped cross beam 185 which extends transversely between the posts 181 and 182. Affixed to the ends of each of the cross beams 185 as by welding, is a substantially rectangular plate 186. Secured to each of the plates 186 as by bolts 187 is a slide member 188 desirably comprising a substantially rectangular plate having lateral flanges 189 on its side edges which ride on a pair of spaced vertical guide rails 191 affixed as by bolts 192 to the inner surface of posts 181 and 182. Thus, as shown in Fig. 7, the slide members 188 will be straddled by the guide rails 191 thereby preventing substantially any transverse displacement of the cross beam 185, yet permitting free vertical movement thereof.

Mounted on each side of the frame 64 in the path of movement of the bottom surface of the slide members 188 is a resilient member 193, desirably a coil spring, which serves to take up the impact of the sealing assembly 184 at the bottom of its stroke.

Mounted on the top surface of cross beam 185 (Fig. 5) is a substantially L-shaped bracket 197, the horizontal leg 198 of which is affixed as by welding to such top surface and extends beyond the rear edge thereof and the vertical leg 199 of which extends longitudinally of said cross beam. Integral with bracket 197 and rising from the horizontal leg 198 thereof at its center, is a flange 201 which has a transverse bore therethrough aligned with the center line of said beam 185. Straddling the flange 201 are the legs of a yoke 202 pivotally connected to said flange by means of a pin 203 extending through said bore.

Affixed to the cross piece of the yoke 202 is one end of a piston rod 204, the other end of which is connected to a piston (not shown) slidably mounted in an air cylinder 205. The upper end of the cylinder 205 desirably has a plate 206 affixed thereto having an opening at one end, positioned between the legs of a yoke 207 affixed to the cross beam 183, said plate being pivotally connected to said yoke by means of a pin 208. The air cylinder is desirably operated by means of a source of compressed air (not shown) connected to an inlet port 209 in the cylinder so that upon flow of air into such port, the piston rod will be raised and upon cessation of such air under pressure, the weight of the sealing unit 184 will cause the piston rod to move downwardly.

Affixed to the cross beam 185 are two parallel plates 211 and 212, the upper ends of which extend between the side walls of the cross beam, preferably being welded thereto. Each of the plates 211 and 212 which are substantially rectangular, has a pair of openings 213 therethrough at the lower end thereof, a bushing 214 being associated with each of said openings 213 and being affixed to the inner surface of said plates as by welding. Extending through each of the transversely aligned pairs of openings 213 is a rod 215, 216 which mounts the upper ends of pairs of roller arms 217 and 218 respectively. Each of the roller arms desirably comprises a substantially arcuate portion 219 having a bearing opening 221 at its lower end, through which a rod 222 extends. Rising from each of the upper ends of arms 218 and preferably formed integral therewith is a cam arm 223, the function of which will be hereinafter described.

Mounted on each of the rods 215, 216 near the center thereof is a ratchet wheel 224, 225 affixed to the associated rod by set screw 226 so as to rotate therewith. Encompassing each rod between the ratchet wheel and each of the pairs of arms 217 and 218 is a coil spring 220, one end of each of which is affixed to the associated ratchet wheel and the other end of each of which is affixed to the upper end of the associated arm which is free to turn on the associated rod. The ratchet wheels 224, 225 are desirably controlled by pawl arms 227, 228 respectively, the free ends of which engage the associated ratchet wheel and the other ends of which are pivotally connected by means of a bolt 229 to the free end of a plate 231 depending from the cross beam 185 and affixed thereto as by welding.

Rotatably mounted on each of the rods 222 is a pressing member, preferably an elongated roller 232, 233, the peripheries of which are desirably covered with resilient material such as rubber. As shown, the roller 232 desirably has a larger diameter than roller 233. The cross beam 185 desirably has two bushings 235 affixed thereto as by welding and extending outwardly therefrom, said bushings having transversely aligned bearing openings therethrough. An elongated cam arm or lever 236 is pivotally mounted between its ends to each of said bushings by means of a headed stud 237 the end of which is held in place in the bushing by a set screw 238. Each cam arm is positioned so that it will be engaged by the associated cam 223 actuated by the roller carrying arms 218 as is clearly shown in Figs. 5 and 6. The upper end of each cam arm, desirably has a transverse opening with a pin 239 extending therethrough and through an opening in the end of an elongated threaded rod 241. The other end of each of said rods 241 extends through an opening 242 in the vertical wall 199 of bracket 197, said openings being of diameter considerably greater than that of the rod 241 which extends therethrough. Each of the rods is encompassed by a coil spring 243 compressed between the vertical wall 199 of bracket 197 and a nut 244 threaded on said rod. The end of each of the rods extending beyond the panel also has a nut 245 threaded thereon, adjustment of such nuts permitting variation of the tension of said coil springs 243. Associated with the free end 246 of at least one of said rods is a micro-switch 247 which is actuated by said rod upon movement thereof to break the circuit to the drive motor of the taping machine as will hereinafter be described.

Each of the arms 217 near its upper end desirably has one end of a rod 251 pivotally connected thereto as at 252. The other end of each of the rods 251 desirably extends through an associated bushing 253 having a lateral stud affixed thereto at one end and rotatably mounted in an opening in a rearwardly extending arm 254 rigidly affixed to the rear of wall 199. The end of each of the rods 251 extending through the associated bushing 253 desirably has a nut 255 threaded thereon to limit the downward movement of the rod. Each of the rods is desirably encompassed by a coil spring 256 compressed between the bushing 253 and a nut 257 threaded on said rod adjacent its pivot 252. The pivot 252 is so positioned with respect to shaft 215, that when the arms 217 are displaced sufficiently in a clockwise direction from the position shown in Fig. 5, the coil springs 256 will tend to counteract the effect of the coil springs 220 to limit the pressure against the box B.

Positioned to the left of the first end sealer 184 is a second or auxiliary end sealer 261 which serves to insure that the tape will be securely retained in position. As shown in Figs. 8 and 9, the second end sealer 261 is desirably mounted on a cross beam 262 which may have a rectangular plate 263 affixed as by welding to each end and secured to the side beams 65 of the frame 64. Affixed as by welding to the undersurface 264 of the cross beam adjacent its center is a substantially U-shaped bracket 265 desirably having side walls 266 extending longitudinally of the frame. The lower end of each of the side walls 266 has an opening 267 therethrough, a rod 268 extending through each pair of transversely aligned openings, and desirably being rigidly mounted so that it cannot rotate. Mounted on each of the rods is a pair of arcuate gear segments 271 and 272, each having an arm 273 with a bushing 274 preferably formed integral therewith, through which the associated rod extends. The segments are so positioned that the teeth 275 thereon will be in

engagement, so that movement of one of the segments will cause corresponding movement of the other.

Each of the segments **272** has an inwardly extending pin **276** affixed thereto at one end to which one end **277** of a coil spring **278** is affixed, the other end of each of the coil springs being affixed to a retaining pin **279** affixed to the side walls **266**. As shown in Fig. 8, the ends **277** of the coil springs **278** are normally positioned to the left of the associated rod **268** and in normal position, the coil springs **278** are slightly extended so that they may readily be compressed.

The end **281** of each of the segments **271, 272** has an opening therethrough with a rod **283** extending through each pair of transversely aligned openings. Each of the rods **283** mounts a roller **284** and **285** thereon respectively, said rollers desirably having their surfaces covered with resilient material such as rubber.

As is clearly shown in Fig. 8 of the drawings, the diameter of the rollers **284, 285** is such that they extend beyond the end of the associated segment. Each of the segments **271** has a counterweight **286** which rises upwardly therefrom and is preferably formed integral therewith, and being of such weight that under normal conditions the segments will hang downwardly as shown with springs **278** slightly extended. The inner surface of each of the counterweights **286** has affixed thereon a pad **287** of resilient material designed to abut against a rod **288** extending transversely between the walls **266** and serving as a stop for the segments **271, 272** to limit their downward movement.

Means are provided to afford adjustable downward tension on the segments. To this end, a ratchet wheel **291** is rotatably mounted on the rod **268** associated with segments **271** between the latter. A coil spring **292** is positioned on each side of the ratchet wheel **291** having one end **293** connected to the ratchet wheel **291** and the other end connected to the bushing **274** of the associated segment **271**. A pawl **294** pivotally mounted on the rod **288** has its free end designed to engage the ratchet wheel **291**. Thus, the ratchet wheel may be turned to wind up the springs **292** to exert desired downward tension on the segments, the pawl **294** retaining the ratchet wheel in adjusted position.

The rod **283** of segments **271** mounts an additional roller **296** which extends parallel to roller **284**. To mount roller **296** an arm **297** is pivotally mounted between its ends at each end of the rod **283**. The lower ends of the arms **297** carry a cross rod **298** on which the roller **296** is mounted and the upper ends of each of the rods has one end of a coil spring **299** connected thereto, the other end of said coil springs **299** being connected to the walls **266** adjacent rod **268** of segments **271**. Thus, the arms **297** will be normally positioned to retain the roller **296** in a plane below that of the roller **284**.

To apply pressure on the top of the box B as it is advanced by the conveyer, a plurality of rollers **301** (Fig. 1) are provided. To support the rollers, a pair of parallel bars **302** are suspended from the frame **64** extending longitudinally thereof and straddling the segments **271** and **272** and the curved arms **217** and **218**. Extending transversely between the bars are a plurality of spaced rods **303** on which the rollers **301** are mounted, the bottom surfaces of the rollers **301** being substantially aligned with the rollers **97** and **177**, for example, of the tape applying machine **91**.

In order to control the operation of the machine in timed sequence, a plurality of switches are provided, mounted on the frame of the machine between the longitudinal bars **36** and adapted to be engaged by the box as it is advanced by the conveyer. The switches **308** and **309** control the tape feed and cut off, the switch **311** controls the air jet through nozzle **176** and the switches **312** and **313** control the first end sealer all in the manner hereinafter to be described.

Operation

To operate the equipment, the drive motor **50** is first energized and, through sprocket chain **53** (Fig. 1), sprocket wheel **54** will be rotated to turn shaft **26**. As a result, the sprocket chains **29** and **30** will be advanced to effect movement of the pusher bars **31** carried thereon. Through sprocket chains **124, 129** and **132** (Figs. 1 and 3), the sprocket wheel **133** will be rotated to turn shaft **134** and roller **92** (Fig. 4) of the taping machine **91**. Through sprocket wheel **138** on shaft **134** and sprocket chain **147** the sprocket wheels **144, 145** and **146**, the associated shafts **139, 141** and **142** and the rollers **97, 100** and **143** thereon will also be rotated. In addition, through sprocket wheel **148** (Fig. 3) the sprocket chain **149**, the sprocket wheels **151** and **153** will be rotated to rotate arm **164** in a clockwise direction (Fig. 2) through the drive imparted to its sprocket wheel **162** from sprocket chain **163**.

Depending upon the width of the box B to be sealed, the appropriate spacing between the guide bars **46** and **47** is set by the adjustment of set screws **49**. By rotation of handle **83** (Fig. 1) the vertically movable frame **64** is then positioned so that the rollers **143, 97** and **177** of the taping unit and the rollers **301** on the frame **64** may ride on top of the box.

At this time a box B, preferably rectangular, which has been previously filled, is positioned between two adjacent pusher bars **31** on the longitudinal bars **36** which define the track. When the box is thus positioned its end and side flaps will extend substantially upward in open position. As the pusher bar **31** to the rear of the box is advanced by the sprocket chains **29** and **30**, it will abut against the rear edge of such box to thereupon effect forward movement of the latter. As the box is advanced, the upstanding front flap thereof will abut against the front flap closing member **169** and as the box is further advanced the front flap will be moved downwardly by such closing member.

At this time also the front curved edge **167** of the curved rear flap closing member **166** will have been rotated to abut against the upstanding rear flap of the box to move the latter forward to closed position. And such rear flap will thereupon pass under the front flap closing member **168** to be retained in closed position.

As the box is further advanced, the upstanding side flaps thereof (not shown) will abut against the converging bars **171** to be moved inwardly and downwardly to closed position on top of the front and rear flaps respectively. Thus, all the flaps on the box will be moved to closed position just prior to entry of the box beneath the rollers **172, 143** as shown in Fig. 4. These rollers will thereupon retain the flaps of the box in closed position until the tape is applied.

Referring to Figs. 1 and 4, as the box continues to advance, the leading edge of the box will abut against switch **308** to actuate solenoid **111**. As a rsult, the cam arm **105** will be pivoted to move its roller **107** against frame **102** to move roller **101** to bring the tape **96** against driven roller **100**. The tape **96** will thereupon be advanced between idler rollers **95** and **94** and driven roller **92** and between rollers **97** and **98**, to be applied against the top of the box immediately over the inturned edges of the side flaps. It is noted that the advance of the tape **96** is started sufficiently in advance of the moving box so that a portion of the leading edge of the tape will extend beyond the front or leading edge of the box, as clearly shown in Fig. 4. When the box B has advanced sufficiently so that the protruding end of the tape is aligned with the outlet of nozzle **176**, the switch **311** will be engaged by the leading lower edge of the box, momentarily to actuate the compressor (not shown) connected to such nozzle, so that a jet of air will be directed against such protruding end of the tape to force the latter downward against the front wall of the box adjacent its top

edge. As the undersurface of the tape has been moistened by the action of driven roller 92 which rotates in water reservoir 93, the protruding end of the tape will adhere to the front of the box.

As the advance of the box B continues, the leading edge thereof will pass beneath roller 233 (Figs. 1 and 5) of the first end sealing unit 184 and when the upper leading edge of the box substantially abuts against roller 232, the lower leading edge of the box will engage switch 312. When switch 312 is actuated, the air supplied to air cylinder 205 through inlet 209 will be cut off so that the piston and piston rod 204 thereof will drop downwardly under the weight of the unit connected thereto. As a result, the roller 233 will press against the tape on the top of the box and by reason of the pivotal mount of arms 218 it will move along the length of the tape on the top of the box toward the rear thereof to press such tape downwardly into sealing engagement with the top of the box. At the same time the roller 232 will move downwardly along the front of the box, pressing the leading edge of the tape thereagaint so that it is tightly sealed, and as the box continues to advance the arms 217 will be pivoted in a clockwise direction so that roller 232 will ride up the front face of the box again pressing the tape thereagainst.

At this time, the rear lower edge of the box will pass over switch 311 so that the latter will thereupon actuate solenoids 111 and 115. As the result, roller 101 will move away from the tape so that no further drive will be imparted by the driven roller 100. The actuation of the solenoid 115 will cause the knife 113 to sever the tape 36. The switch 311 is so positioned that a portion of the tape will protrude beyond the rear edge of the box.

Referring to Fig. 5, with further advance of the box, the roller 233 will move along the top surface of the box pressing the tape into sealing engagement therewith and when such roller reaches the rear of the box it will move downwardly bending the rear protruding end of the tape and moving the latter in engagement with the rear of the box to effect sealing of such tape thereagainst. The roller 232 will also move along the top of the box insuring sealing engagement of the tape thereagainst. When the rear edge of the box passes by switch 313, the power to the air compressor supplying air solenoid 205 will again be started so that the air solenoid 205 will be actuated to raise its piston rod 204 to move the sealing unit upwardly away from the box ready for the next box to be sealed.

The tension of the associated coil springs 220 on arms 217, 218 may readily be adjusted by turning of the associated ratchet wheel. Thus the pressure of the rollers against the box may be set for maximum sealing action without deformation of the box.

If due to improper adjustment of the position of roller 233 set by the positioning of frame 64, the leading edge or front of the box should abut against arms 218 and pivot the latter in a clockwise direction as shown in Fig. 5, the member 223 will pivot lever 236 so that link 241 will move to the left against the tension of coil spring 243 to actuate switch 247 thereby cutting off power to the main drive motor 50 with resultant stoppage of the equipment thereby preventing jamming.

By reason of the rod 251, when the arms 217 have been rotated in a clockwise direction about their pivot rod 215 to a position such that pivot 252 moves past the vertical projection of rod 215, the spring 256 will thereupon counteract the force of springs 220 so that no undue pressure will be exerted against the top of the box.

In order to insure that the tape is dependably sealed to the front, rear and top of the box, a second end sealer 261 (Figs. 1, 8 and 9) is desirably provided. Referring to Fig. 8, as the box is advanced by the pusher bars 31, the front of the box will abut against roller 285 on arcuate arms 272. With further advance of the box, the arcuate arms 272 will be pivoted upwardly and the roller 285 will ride up the front of the box pressing the tape against such box. By reason of the engaging teeth 275, the movement of arms 272 will effect corresponding movement of arms 271.

As the box advances, arms 272 will be pivoted upwardly sufficiently so that the roller 285 carried thereon will then press on the top of the box and roller 285 will press the tape on the top of the box into sealing engagement with the side flaps. Further advance of the box will move it beneath roller 284 carried on arms 271. When the leading front end of the box abuts against roller 296 which is carried on arms 297, such arms will be pivoted in a clockwise direction. This will again press the tape against the front of the box to provide further sealing action. When the rear of the box passes by roller 285, inasmuch as roller 284 is resting against the top of the box, by reason of the coaction of gear teeth 275, the arms 272 will remain in position with roller 285 above the horizontal plane of the top of the box. When the rear edge of the box passes by roller 284, such roller will ride down the rear of the box pressing the tape thereagainst. Thereupon, both of the segments 271 and 272 will move downwardly balanced by counterweights 286 with such downward movement being limited by coil spring 278, and the roller 296 will move along the top of the box and thereupon move down the rear edge thereof again pressing the rearmost portion of the bent tape against the rear of the box. As the box moves away from the roller 296, the latter will be restored to its original position as shown in Fig. 8, by the coil spring 299 and the second sealing unit 261 will be ready for the next box to be sealed.

When the sealed box reaches the end of the tracks 36, it may thereupon be removed therefrom by discharge onto a suitable conveyer belt for further processing.

With the equipment above described, there is assurance that the tape applied to the box will be dependably sealed and retained thereagainst without likelihood of unloosening of the tape at the ends of the box. The rollers 301 which press along the top of the box as it is moved after it leaves the tape applying machine 91 further insure that the tape along such top will be retained in place until the glue has dried for adherence of such tape to the box.

By reason of the vertical adjustability of frame 64 and the considerable space between adjacent pusher bars 31, boxes of a great range of sizes can be handled by the equipment with each setting thereof and as the equipment is automatic and relatively rapid in operation, a large number of boxes may be dependably sealed in a relatively short space of time.

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 sealing boxes having side and end flaps, comprising means to apply a length of tape to the top of such box over the adjacent edges of said side flaps with the front and rear ends of such tape protruding beyond the adjacent ends of such box, means to advance such box, a pair of pressing members in the path of movement of such box, supporting means for each of said pressing members, respectively pivotally mounted on axes extending at right angles to the path of movement of such box, resilient means associated with the supporting means for each of said pressing members normally urging said supporting means in opposite direction toward each other, vertically movable mounting means for said supporting means, and means operative in timed relation with the movement of such box to effect vertical

downward movement of said mounting means to bring one of said pressing members in front of such box and the other of said pressing members against the top of the tape of such box, whereby with continued forward movement of such box, the first pressing member will ride up the front of the box to press the tape thereagainst and the second pressing member will ride along the top of the box and down the rear thereof to press the rear end of the tape thereagainst.

2. The combination set forth in claim 1 in which the supporting means for each pressing member comprises a pair of arms, each pressing member extending transversely between the lower ends of the associated pair of arms, the pivotal mount for each of said pair of arms comprises a rod extending through the upper ends of the associated pair of arms, a ratchet wheel is rotatably mounted on each of said rods, a pawl coacts with each of said ratchet wheels and the resilient means normally urging said supporting means toward each other comprises a pair of coil springs encompassing each of said rods respectively and connected at their ends respectively to the associated ratchet wheel and to one of the associated pair of arms, said ratchet wheel and associated pawl permitting adjustment of the tension of the associated spring.

3. Equipment for sealing boxes having side and end flaps, comprising means to apply a length of tape to the top of such box over the adjacent edges of said side flaps with the front and rear ends of such tape protruding beyond the adjacent ends of such box, means to advance such box, a pair of spaced parallel rods extending at right angles to the path of movement of such box, two pairs of spaced arms pivotally mounted respectively at their upper ends on an associated rod and depending therefrom, a pressing member mounted between each pair of arms respectively at their lower ends and extending transversely thereacross, resilient means associated with each pair of arms normally urging said pressing members towards each other, a frame mounting said rods, vertical guide means for said frame, actuating means operatively connected to said frame to effect vertical movement thereof and means operative in timed relation with the movement of such box to operate said actuating means to effect vertical downward movement of said frame to bring one of said pressing members in front of such box and the other pressing member against the top of the tape on such box, whereby with continued forward movement of such box the first pressing member will ride up the front of the box to press the tape thereagainst and the second pressing member will ride along the top of the box and down the rear thereof to press the rear end of the tape thereagainst.

4. The combination set forth in claim 3 in which each of said arms is curved, the opposed inner edges of the arms of each pair being concave.

5. The combination set forth in claim 3 in which drive means are associated with said taping means and said box advancing means, a switch is controleld by one of the arms of the pair associated with said second pressing member and actuated to de-energize said drive means upon pivotal movement of said arm on its associated rod in the direction of the path of movement of the box beyond a predetermined position.

6. The combination set forth in claim 3 in which drive means are associated with said taping means and said box advancing means, the upper end of one of the arms of the pair associated with the second pressing member has an extending portion, a lever is pivotally mounted between its ends to said frame, said extending portion normally engaging the lower end of said lever and a switch controlling said drive means is operatively connected to the upper end of said lever and is actuated to de-energize said drive means upon movement of said lever by said arm when the latter has pivoted beyond a predetermined position on its associated rod.

7. The combination set forth in claim 3 in which drive means are associated with said taping means and said box advancing means, the upper end of one of the arms of the pair associated with the second pressing member has an extending portion, a lever is pivotally mounted between its ends to said frame, a slidably mounted link on said frame is pivotally connected at one end to the upper end of said lever, resilient means reacting against said lever normally urges the lower end of said lever against said extending portion and a switch controlling said drive means is operatively connected to the other end of said link, said switch being actuated to de-energize said drive means upon movement of said lever by said arm when the latter has pivoted beyond a predetermined position on its associated rod.

8. The combination recited in claim 3 in which means are associated with the pair of arms mounting said first pressing member to counteract the force of the resilient means associated with said pair of arms after said arms have pivoted a predetermined amount.

9. The combination recited in claim 3 in which means are associated with the pair of arms mounting said first pressing means to counteract the force of the resilient means associated with said pair of arms after said arms have pivoted a predetermined amount, said means comprising a link pivoted at its lower end to one of said arms at its upper end adjacent to and laterally displaced from the associated rod, a stud pivotally mounted on said frame above said rod and laterally displaced therefrom in the same direction as the lower end of said link, said stud having a transverse bore through which said link extends, means at the end of the link to limit its downward movement through said bore and a coil spring reacting against the link and the stud, whereby when after said arm has pivoted such predetermined amount the lower end of the link will move past the rod and the compressed coil spring will counteract the effect of the resilient means.

10. Equipment for sealing boxes having side and end flaps, comprising means to apply a length of tape to the top of such box over the adjacent edges of said side flaps with the front and rear ends of such tape protruding beyond the adjacent ends of such box, conveyer means to advance such box, sealing means to press the protruding front and rear ends of such tape against the front and rear of such box, means normally supporting said sealing means out of the path of movement of such box, means to actuate said supporting means to move the sealing means into the path of movement of such box, a second sealing means longitudinally displaced from said first sealing means normally in the path of movement of such box to press the front and rear ends of the tape against the front and rear of the box, said second sealing means comprising a pair of spaced parallel rods extending at right angles to the path of movement of such box, two pairs of parallel arcuate gear segments pivotally mounted on said rods respectively with the teeth of longitudinally aligned segments being in mesh, a pair of pressing members mounted respectively at the lower ends of each pair of segments and extending transversely thereacross adapted to be successively engaged by such box and means to limit the downward movement of said segments.

11. The combination set forth in claim 10 in which one of said rods has a ratchet wheel rotatably mounted thereon, and a coil spring encompasses said rod being affixed at its respective ends to said ratchet wheel and to one of the gear segments on said rod, and a pawl coacting with said ratchet wheel to retain the latter in fixed position on its associated rod.

12. The combination set forth in claim 10 in which said pressing members are rollers, a pair of arms are pivotally mounted respectively between their ends on the end of the rod carrying the second roller to be engaged and a third roller is pivotally mounted between the lower

ends of said pair of arms and extends transversely thereacross and resilient means associated with the arms mounting said third roller to limit their movement.

13. The combination set forth in claim 10 in which one of said rods has a ratchet wheel rotatably mounted thereon, a coil spring encompasses said rod being affixed at its respective ends to said ratchet wheel and to one of the gear segments on said rod, a pawl coacting with said ratchet wheel retains the latter in fixed position on its associated rod and counterweights are associated with

one of said pairs of gear segments to counterbalance said coil spring.

References Cited in the file of this patent

UNITED STATES PATENTS

1,877,042	Pearce	Sept. 13, 1932
2,050,268	Bronander	Aug. 11, 1936
2,095,258	Kimball	Oct. 12, 1937
2,596,158	Lindsey	May 13, 1952
2,649,221	Wagner et al.	Aug. 18, 1953