AUTOMATIC LID STRAPPING MACHINE

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Our invention relates to the art of securing lids on boxes and particularly to the application of a strap of round, flat or other cross section across the middle of a lid of a box so that the ends of said strap extend part way down the sides of the box and are then secured to the box sides. While our invention has wide utility, it is particularly useful in thus strapping lids on shipping boxes overfilled with fresh citrus fruit and similar farm products, and an embodiment of the invention particularly adapted for this purpose will be disclosed in this application.

This is a divisional application, the subject matter disclosed herein being divided from our copending application for United States Letters Patent, Serial No. 688,104, filed September 5, 1933, on an Automatic lid nailing and strapping machine, said application having since issued on June 15, 1937, as United States Letters Patent No. 2,084,048.

Among other objects, this invention is directed towards producing a simpler, more compact, and stronger machine for strapping covers on boxes, one which is less expensive to build and operate, one which is easier to service and repair, one which is more dependable in operation, and a strapping machine which is relatively easier on the fresh farm products being packaged.

It is a further object of our invention to produce such a strapping machine which is automatically caused to apply a strap to an object to be strapped as a result of relative movement between such object and the means for supporting the strapper.

In a certain type of lidding machine, such as that disclosed in our copending application aforesaid, the box to be lidded is elevated into engagement with nail chucks disposed over the ends of the lid to be applied to the box and these lid ends are thus forced downwardly onto the ends of the box. This upward movement of the box is then continued to elevate the nail chucks, the nail drivers being held stationary thereafter on the frame. This causes the nails to be held stationary by the drivers while the chucks are lifted and the work is impaled upon the nails so that the latter are, in effect, driven through the lid ends and into the box ends to complete the lidding of the box.

It is an object of our invention to provide a strapping machine which is adapted to be mounted in such a lidded and to be actuated to strap the middle portion of a lid onto a box while the ends of said lid are being nailed to the ends of said box in said lidded.

It is a still further object of our invention to provide such a strapper which will perform the strapping operation last mentioned hereinabove in response to relative vertical movement between the overhead structure and the box.

Yet another object of our invention is to provide a strapping machine which, during a strapping operation, applies a substantially constant pressure to the object being strapped thereby.

The manner of accomplishing the foregoing objects, as well as further objects and advantages, will be made manifest in the following description taken in connection with accompanying drawings, in which:

Fig. 1 is a plan view of a box lidded incorporating a preferred embodiment of our invention.

Fig. 2 is an enlarged sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary diagrammatic perspective view illustrating a detail of the mechanism of the aforesaid lidded for actuating the sloping table thereof.

Fig. 4 is a front elevational view of the lidded shown in Fig. 1.

Fig. 5 is a fragmentary view similar to Fig. 4 and illustrating the lidding machine just after a lid has been nailed and strapped to a box and the operator's foot released from the control pedal.

Fig. 6 is a diagrammatic view of the control switch of said box lidded.

Fig. 7 is a vertical transverse sectional view taken on the line 7—7 of Fig. 4.

Fig. 8 is an enlarged transverse sectional view taken on the line 8—8 of Fig. 4.

Fig. 9 is a fragmentary detail view of the nailing mechanism of the aforesaid lidded, said view being taken on the line 9—9 of Fig. 8 and illustrating the step in the operation of said lidded where a box of fruit is rising into contact with a lid in the process of lidding said box.

Fig. 10 is a view similar to Fig. 9 and illustrating the position of the parts thereof at the instant when the driving of nails through the lid ends into the box ends is completed.

Fig. 11 is an enlarged transverse vertical sectional view taken on the line 11—11 of Fig. 4 and showing the strapping machine of our invention with its parts positioned as at the beginning of a strapping operation and showing a box of fruit elevated to substantially the same position in which such a box is shown in Fig. 9.

Fig. 12 is a view similar to Fig. 11 and illustrates the strapping machine of our invention.
just after the first step in the strapping operation which results in preforming the strap.

Fig. 13 is a view similar to Fig. 12 and illustrating the strapping machine of our invention after the next step in the strapping operation which results in the shaping of the box cover and the confining of the driver actuating springs. Fig. 14 is a view similar to Fig. 13 and illustrating a strapping machine just after the final step takes place in the strapping operation which results in the release of the drivers permitting these to make the strap securing movement in a relative to the strap positioning jaws which movement, in the present embodiment, drives the strap ends into the sides of the box.

Referring specifically to the drawings, we have shown therein a box lifter 35, including a frame 36, an elevator 37, a nailing mechanism 38, a strapper 39 comprising a preferred embodiment of our invention, and a control mechanism 40.

The frame 36

The frame 36 includes a rectangular base 41 having a heavy transverse channel iron 42 shown in Figs. 4, 6 and 7 and four posts 43 which are rigidly secured to the corners of the base 41 and extend vertically upward therefrom. As seen in Fig. 5, end pairs of the posts 43 are connected by bars 44 and by spacers 45.

Upper ends of side pairs of the posts 43 (Fig. 5) are connected together by relatively heavy side plates 48 which perform an important function of the frame 36 which will be explained hereinafter. While the side plates 48 might be formed integral with the corner posts 43, they are preferably bolted to said posts.

Retained in a suitable aperture in the forward side plates 48 is a push pin 55 (Figs. 1, 4 and 5) having a knob on its outer end. This pin is free to play in and out through said aperture but its inner end is upset to prevent its being removed therefrom. Also provided on the posts 43 are cam tracks 56, as shown in Fig. 7, and stop lugs 57, the latter being preferably welded in place on these posts.

The frame 36 also includes a channel iron 58 shown in Figs. 4 and 7, said channel iron being preferably welded at its ends to the frame bars 46. The channel iron 58 has an aperture formed vertically therethrough at its middle through which a hollow standard 59 extends, the lower end of this standard resting on the channel iron 42 and is preferably welded to these channel irons. Also extending between and secured at their ends to the channel irons 42 and 58 are angle-iron motor struts 60.

The elevator 37

The elevator 37 and associated devices will now be described. This elevator includes an electric motor 65 bolted onto the motor struts 60, as clearly shown in Fig. 7, this motor having a drive pinion 66 which is preferably formed of fiber.

The pinion 66 meshes with a jack gear 67 having a nut 68 formed within the hub thereof, this gear being rotatably mounted on a bearing 69 inserted in the upper end of the hollow standard, as clearly shown in Fig. 7.

Covering the pinion 66 and gear 67 is a gear housing brake 70 having a brake lining 71 of the flat ring type, this lining being disposed just above the outer rim of the gear 67, as clearly shown in Fig. 7. The brake 70 is positioned in a horizontal plane and has its vertical move-

2,177,075 ment upward limited by cap screws 72, compression springs 73 coiled about these screws constantly urging the brake 70 into disengaged position, as shown in Fig. 7.

Screwed downwardly through the nut 68 is a jack screw 74 which is preferably double pitched as shown, this screw having a cap plate 75, as clearly shown in Fig. 7. Provided on the lower end of the screw 74 is a guide spindle 76.

Resting on and rigidly secured to the cap plate 75 is a central cross-beam 79 of a nailing table 80. This table 80 includes longitudinal side beams 81 and 82 which are welded to opposite ends of the cross-beam 79 and have their opposite ends connected by end cross-bars 85 and 86 (see Fig. 1). The opposite ends of these cross-bars extend into the angles produced by adjacent flanges of the angle iron posts 43, as clearly shown in Figs. 3 and 7, so that said posts are adapted to guide any vertical movement of the table 80.

Provided on the beam 79, as by welding, so as to be integral therewith are hollow cylinders 87 (Fig. 7) having integrated flanges at their lower ends which limit the downward movement of plungers 85 solderable in these cylinders. Confined in the cylinders 87 above the plungers 85 are compression springs 88 which tend to force the plungers 85 downwardly to their lowest positions in the cylinders 87. In the normal downward position of the table 80, as shown in Fig. 7, plungers 85 bear against gear housing brake 70 forcing the brake lining 71 against the jack gear 67.

The table 80 (Figs. 4, 5 and 7) also has provided thereon a pair of side flushers 110. Each of these flushers has a shaft 111, opposite ends of which are journaled in suitable apertures in the table end cross-bars 85 and 86, and each of these shafts is provided at its opposite end with upwardly disposed cam arms 112 carrying rollers 113 adapted to travel on the cam tracks 56 and downwardly extending arms 114, end pairs of the arms 114 being connected by springs 115 which yieldably hold the cam rollers 113 against the cam tracks 56. Secured, preferably as by welding, to each shaft 111 and extending upwardly therefrom, as clearly shown in Figs. 4, 5 and 7, are pairs of spring flusher arms 116. Just below their upper ends these arms 116 are bent outwardly to form recesses 117 (Fig. 11). Secured to the upper ends of each pair of spring arms 116 is a main flusher blade 118. Each of the blades 118 has an upwardly extending lid centralizing finger 119. Extending downwardly and outwardly from opposite ends of each flusher blade 118 are brackets 120 through which screws 121 extend, inner ends of these screws screwing into auxiliary flusher blades 122. Compression springs 123 between the blades 122 and the brackets 120 constantly urge each auxiliary blade inwardly into the same plane as its main flusher blade 118.

As will be noted in Figs. 4 and 5, the flusher blades 118 by the use of a slot and bolt connection are mounted on the spring arms 116 in such a manner as to permit a limited degree of vertical adjustment thereon.

Fixed on spring arms 116 on each of the side flushers 110 is a box guide rail 128, opposite ends 129 of this rail being adapted to engage sides of a box on the table 80 so as to centralize this box laterally when the flushers 110 are swung inwardly.
Mounted on the endmost spring arms 116, as clearly shown in Figs. 4, 5, 6 and 7, are box locating cams 130, the function of which is to centralize said box longitudinally, when said flushers are swung in, by engaging the ends of the box in a longitudinally strapping relation therewith. Extending through opposite end portions of the front and rear beams 81 and 82 of the table 80 are bolts 132 and 133 on which rollers 134 are notably mounted. Pivotally mounted on the bolt 132 is a tilting roller conveyor 140, this conveyor including side members 141 and an end member 142 (Fig. 3), the latter being at the receiving end of the table 80. Pivotally mounted on the end bar 85 of the table 80, as clearly shown in Fig. 3, is a bell crank 143 having a roller on one arm thereof engaging the lower surface of the member 142 and having the other arm thereof connected by a link 144 to one of the downwardly extending flusher arms 114. The operation of the bell crank 143 and link 144 is such that when the table 80 is in its lowest position, as shown in Fig. 4, conveyor 140 is tilted. Provided on the conveyor 140 in between the rollers 134 is a set of idle rollers 145. The roller 145 at the middle of the table 80 is shorter than the balance of these rollers, as clearly shown in Fig. 7, and is pivotally mounted at its ends on U-shaped brackets 147 which extend around the cylinders 87 and permit access to these cylinders from above the table 80.

At the left-hand end of Fig. 4 is diagrammatically illustrated a box stop 153 which is mounted on the table 80 and which is adapted to engage the forward end of a box fed onto the table and properly position this box for feeding into the machine 35. Provided on the front table beam 81, as clearly shown in Figs. 3 and 4, is a downwardly extending shut-off cam 155 and a safety rod guide and shut-off finger 166, the purpose of these being made evident hereinafter. As shown diagrammatically at the right-hand edge of Figs. 4 and 5 the machine 35 is provided with a novel box feeding mechanism 167. This apparatus includes a box feeder conveyor 168 mounted on the table cross bar 86 and pivotally engaged in a catch 169 having a release finger 170 and urged into upright position by a spring 171. This apparatus also includes a box feed conveyor 173, being equipped with a roller stop 175 which is spring pressed upwardly into box stopping position in which it is shown in Fig. 5. The stop 175 has a hook finger 176 which lies in the path of the catch 169 as the latter moves vertically with the table 80 during the operation of the machine 35. It is thus seen that each time the table 80 ascends at the completion of a feeding and dropping operation, the catch 169 engages the finger 176 and depresses the stop roller 175 thus permitting a box to be fed from the conveyor 173 onto the conveyor 140 on the table 80. As the box passes into the machine it engages the release finger 170 thereby releasing the stop 175 permitting it again to rise into position to prevent the discharge of the next box from the conveyor 173 until the lifting and strapping of the box just fed into the machine has been completed.

Disposed at the discharge end of the machine 35 is a discharge conveyor 183, one end of which may be supported upon an adjacent pair of the corner posts 43.

The nailing mechanism 38 consists primarily of two nailing units 188 and 189 (Fig. 4), these being substantially identical so that a description of one with an explanation of the differences will suffice for both. The nailing unit 189 (Figs. 8 and 9) has side slide bars 190 having pins 191 by which the unit may be supported upon the side plates 48 of the frame, these units normally being rigidly mounted upon the side plates 48 by cap screws 193 extending through holes in the side plates 48 and being threadedly received in suitable holes provided in the side slide bars 190. Secured to the lower ends of the side slide bars 190 are chuck beam stops 194, the front stop 194 having a lid guiding hook 195 secured thereon. Extending between and preferably rigidly connected at its opposite ends to the upper ends of the side slide bars 190 is a cross-bar 196, this bar having stripper supporting ears 197 (Figs. 1, 8 and 9), a bearing 198 provided by a rearwardly extending end thereof, an upwardly extending spring hanger 199 pivoted thereon, and a picker operating cam lever 200 pivotally mounted thereon. The spring hanger 199 is connected to the cross bar 196 by a single cap screw 201. Formed in the lower face of the cross-bar 196 is a groove 205, and square nail drivers 206 have their upper ends held in place in the groove 205 by a key 207 which extends into suitable notches provided in the drivers 206, the key 207 being secured in any suitable manner to the lower face of the cross-bar 196. Disposed between the side slide bars 190 (Figs. 8, 9 and 10) is a chuck beam 208 having guide shoes 209 provided on its opposite ends, these guide shoes embracing the side slide bars 190 so as to guide the chuck beam vertically thereafter. Chuck beam 208 has mounted thereon, just beneath the nail picker cam 200, a cam actuating roller 213 (see Fig. 8). Secured to the guide shoe 208 at the front of the machine and on nailing unit 189 alone is a control rod guide and release finger 216 (Fig. 4). Provided on the upper edge of the chuck beam 208 at the middle of the beam is a lid centralizer spring lug 219. As shown in Figs. 8, 9 and 10 a stripper limit bar lug 220 extends inwardly from the central portion of the chuck beam 208. Pivotally mounted at their opposite ends on the spring hanger 199 and on opposite ends of the chuck beam 208 are telescopic spring spindles 221 on which heavy compression springs 222 are mounted under constant tension. Provided on the lower edge of the chuck beam 208 and extending inwardly is a pair of crown sheet attaching eyes 223.

Formed on the chuck beam 208 (Figs. 8, 9 and 10) and extending inwardly across its entire length is a chuck spring supporting boss 224, chuck springs 225 being secured by screws to an inclined lower face of this boss and extending through suitable notches in the lower edge of the chuck beam 208 and downwardly on the opposite side of the chuck beam. The lower ends of the chuck springs 225 are bent to extend vertically downward and pockets 226 are formed in these springs, preferably by expressing the material thereof outwardly.

Yieldably held against the chuck beam 208 by suitable springs (not shown) is a compound spring chuck block 231 shown in Fig. 9. This block 231 has a plurality of driver guideways 232 provided therein and a rearwardly extending boss 233 opposite each of these guideways, this boss providing a nail feeding duct 234 leading into the channel 232 and inwardly inclined faces against which chuck springs 235 are secured by 76.
screws. These springs are substantially identical with springs 225 and extend inwardly and downwardly to cooperate with the springs 225 in a manner which will be made manifest hereinafter.

Removably supported in each of the ducts 234 and connecting therewith is a funnel 237. Mounted on the chuck beam 208 are brackets 242, these pivotally carrying opposite ends of an end tucker 243 and a lid depressor and centralizer 244. The end tucker 243 comprises two substantially cylindrical bodies, one of which is disposed on the axis of rotation of the tucker and the other of which is disposed parallel with the first body and radially therewith, the two being connected by a substantially continuous web of metal. After extending the rearmost bracket 242 the tucker 243 provides an arm 245 which extends outwardly therefrom, as shown in Fig. 8. The tucker 243 normally extends downwardly at an angle as clearly shown in Fig. 9 so that it is adapted to support an end of a box lid as shown in this figure. Secured on the tucker 243 to provide a stop for the rear edge of such a lid is a cam member 246. Also formed in the tucker 243, as clearly shown in Figs. 8 and 9, is a pair of slots 247.

The lid depressor and centralizer 244 has a cross-section as shown in Figs. 9 and 10 and includes a body 248 having arcuate guards 249 extending downwardly into the grooves 247 in the tucker 243, and a lip 250 which extends inwardly from the body 248 at the upper edge thereof and is provided with suitable notches 250a opposite each of the nail guide way members 232. The lid depressor and centralizer 244 has an upwardly extending hummer 251 (Figs. 9 and 10) to which is pivotally secured a clevis 252 carrying a rod 253 which extends through a suitable aperture in the lug 219, a compression spring 264 being colleted about the rod 253, said spring constantly urging said lid depressor and centralizer 244 to rotate downwardly into the position in which it is shown in Figs. 8 and 9.

Referring now particularly to Figs. 1, 3, 4, 8, 9 and 10, it will be seen that the nailing unit 189 also includes a nail hopper 260 having a floor 261, a rear wall 262, and side walls 263, the inner ends of the latter being pivotally connected to the upper mounting lugs 267. The hopper side walls are also connected by links 264 to the reinforcing block 211 of the chuck beam 208. Extending from the upper edge of the rear wall 262 to spaced points in the floor 261 are nail agitating rods 266, there being nail advancing slots 268 extending outwardly from these rods to a front edge 267 of the floor 261. Formed in the edge 267 adjacent each of the slots 266 is a relatively small notch 268. The hopper 260 has a fixed baffle wall 269 extending between the walls 263 and rigidly secured thereto, there being clearance between the lower edge of the wall 269 and the floor 261 adjacent the slots 266 to permit nail heads to pass underneath the baffle wall 269 as the stems of the nails extend through the slots 268. Pivotedly mounted between the walls 263 is a pivoted baffle 270, this baffle having a flange 271 at its upper end and a set screw 272 for limiting its downward swing. When the hopper 260 is extended upwardly, as shown in Figs. 5 and 10. Also extending between the walls 263 is a rod 273 on which are pivotally mounted a series of traps 274, these being held in spaced relation by spacers 278. Each of the traps 274 is disposed over one of the slots 266, as clearly shown in Fig. 1.

As shown in Figs. 1, 8, 9 and 10, two brackets 280 are connected to the lower surface of the hopper floor 261 and extend forwardly beyond the front edge 267 of said floor. Slidably mounted on these brackets is a picker bar 281 having a pair of slots 282 through which cap screws 283 extend, these screws then screwing into suitable apertures in the brackets 280. Fixed on the 10 picker bar 281 is an actuating arm 285, the extremity of which is bent as shown in Fig. 8 to extend into the upper bifurcated end of the cam lever 200 by which the picker bar 281 is adapted to be actuated. As shown in Figs. 1, 8, and 9, one spring 286 attaches to one of the brackets 280 and to the picker bar 281 so as to constantly urge this picker bar into the position in which it is shown in Fig. 8.

The picker bar 281 has its lower edge both parallel and close to the front edge 267 of the hopper floor 261, and this edge of the picker bar is provided with a series of pairs of notches, one pair for each of the slots 266 of the hopper floor. Each of these pairs of notches comprises a small notch 287 and a large notch 288, the notch 287 of each of these pairs being opposite one of the notches 268 when the picker bar is positioned as shown in Fig. 9, while the large notch 288 of that pair is on the opposite side of that notch 268 from the slot 266 adjacent that notch 287. The notches 287 and 288 are spaced apart the same distance from their centers as is each of the slots 266 and adjacent notch 268.

In the operation of the machine, a considerable quantity of nails are carried in the hopper 260, which apply a considerable pressure to the pivotal connection between the links 264 and the inner portions of the hopper walls 263. Owing to the fact that these links and inner portions of the walls 263 form toggle joints and the weight of the nails thus applied to the intermediate pivots of these joints tends to maintain the links of these toggle joints in extended relation, the weight of these nails is thus effective in strongly restricting the elevation of the chuck beam 208. The weight of these nails on these toggle joints, however, is yieldable and as will be pointed out hereinafter, is overcome in the operation of the machine by the upward pressure agains the chuck beams 208, so that the links 264 in lift, swinging the hopper pans and the loads of nails carried thereby upwardly and collapsing said toggle joints formed by the links 264 and the hopper walls 263.

We have now completed the description of the nailing unit 189. The nailing unit 189 is an exact duplicate of nailing unit 188 excepting that in stead of a hook 195 being formed on the forward chuck beam stop 194, the corresponding chuck beam stop 224, the operating chuck beam stop 194, the operating chuck beam stop 189 merely has a shallow V-shaped lid end guide 293, as shown in Fig. 4. Connecting the hogs 220 of the nailing units 188 and 189 is a strapper height limit bar 290.

The strapper 39

The strapper 39 of our invention is best shown in Figs. 1, 2, 4, 7, 11, 12, 13 and 14. This strapper includes a pair of bridge bars 292 mounted on blocks 293 securing two opposite side plates 48 of our invention. Rotatably mounted between the bridge bars 292 are rollers 294 and spring heads 295 and 296, the spring heads 295 being directly beneath the rollers 294. Each bridge bar 292 has a driver release cam 291 rigidly secured thereon...
and depending therefrom. The lower end of each of these cams 291 has an oblique cam face 298.

Slidably vertically between the bridge bars 292 and the rollers 294 and spring heads 295 is a strapper stem 299, this stem consisting of two plates 300 having a roller 301 rotatably mounted between these plates on a suitable spacer. The lower ends of the plates 300 extend on opposite sides of and are rigidly secured to a saddle bar 302, the stem and saddle bar having a vertically elongated opening 303 through which the strapper height limit bar 309 extends.

The saddle bar 302 has an arched conformation corresponding approximately with the transverse shape which it is desired that this bar transmit to the middle portion of a lid to be strapped. The lower face of this bar is provided with a recess 307 which connects at its opposite ends to vertical strap jaw guideways 308 through which extend pins 309 mounted on opposite ends of said saddle bar. Pivoted mounted on the pins 309 in the recesses 308 are strapper jaws 310, each jaw comprising a pair of plates 311 which are spaced at their lower ends by a strap end stop 312. The lower extremities of the plates 311 are bent outwardly to form strap end guides for assisting in feeding a strap into the strapper 35.

Disposed between the plates 311 and also pivotally mounted on the pins 309 of each jaw 310 is a spring 313, the function of which is to secure an end of a strap to a side of a box. An upper end of each driver 313 is connected by a clevis 314 to a rod 315 which extends through a spring head 295. A coil compression spring 316 surrounds the rod 316 and is maintained under tension by a head 317 on the end of the rod 315. The upper end of each driver 313 also pivotally connects to a link 322 of a toggle 323, the other link 324 of this toggle being pivotally connected to the jaw 310 by a pin 325. The links 322 and 324 are connected together by a pin 326, this pin having a spring 327 attached to one of its extending ends, the other end of the spring being attached to the saddle bar 302. The opposite end of the pin 326 carries a roller 328 which is disposed directly beneath the oblique cam face 298 of one of the cams 291.

Whenever the links 322 and 324 are free to respond to the tension of the springs 325 pulling on the pins 326, the toggles 323 are pulled in by these springs with the pins 326 resting against the strap drivers 313. Thus disposed the toggles 323 lock the drivers 313 to the jaws 311 so as to impart rotary movement from the drivers to the jaws as will be made clear hereinafter in describing the operation of the strapper. This locked condition of the toggles 323 is illustrated in Figs. 11, 12 and 13. The collapse of these toggles in which their locked condition is temporarily destroyed, together with the effect thereof above described, is shown in Fig. 14.

Journalled in the bearings 198 of the cross-bars 196 of the two nailing units 188 and 189 is a shaft 200 having arms 333 at its opposite ends, as shown in Figs. 1 and 8, these arms being connected by links 334 with the arms 245 (Fig. 12) on the end tuckers 243 (Fig. 9). As shown in Figs. 11 to 14 inclusive, the shaft 332 carries an arm 335 opposite the strapper 39, this arm having a clevis 336 pivoted thereon, a rod 337 on this clevis extending through the spring head 295 and carrying a coil compression spring 338 which constantly tends to rotate the shaft 332 and maintain the end tuckers 243 rotated into their downwardmost position in which extending ends of these tuckers engage the brackets 242 as shown in Fig. 9.

Pivoted connected to the upper end of the arm 335 is a wedge 339 which overlies one of the rollers 294 and extends beneath the strapper stem roller 301, as shown in Fig. 11.

Pivoted connected at their outer ends to crown sheet ears 323 and loosely connected at their inner ends to the strapper saddle bar 302 by bolts 302' provided on said bar, as shown in Figs. 1, 4, 8, 9 and 10, are halves 340 (Fig. 2) of a crown sheet 341. Lugs 340' provided on the crown sheet halves 340 slide horizontally on the bolts 302' whenever there is relative vertical movement between the saddle bar 302 and the chuck beams 340. Pivoted mounted on the crown sheet halves 340 along their edges as shown in Fig. 1 are cover slat spreader jaws 342, the inner ends of which are lifted by suitable springs, disposed thereunder so as to permit the outer ends of said jaws to swing upwardly and outwardly and brought into vertical engagement with the side slats of a lid, said jaws thus being separated to spread said side slats laterally.

The control mechanism 40

The control mechanism 40 of our invention includes a switch 343 which is preferably mounted on a suitable bracket 344 fixed upon the frame member 42, as shown in Fig. 7. The switch 343 is diagrammatically shown in Fig. 6 and is an ordinary reversing switch interposed between the main line conductors a, b, and c and the three terminals of the motor 65. The switch 343 includes a stem 345 having two sets of contact makers X and Y. Whenever the stem 345 is positioned as shown in Fig. 6, the motor 65 is shut off and no contact is made by either of the contact makers X or Y. When the stem 345 is moved upwardly the electrodes a, b, and c are connected with the motor 65 through a circuit X to cause the motor to run in a direction so as to elevate the table 80. When the stem 345 is moved downwardly from the position in which it is shown in Fig. 6, the electrodes a, b, and c are connected through a circuit Y with the motor 65 to cause the motor to run in the opposite direction or so as to lower the table 80. Connecting with the lower end of the stem 345 is a spring 346 which maintains the stem 345 in the position in which it is shown in Fig. 6 unless a lifting or depressing force is applied to this stem. Extending upwardly from the stem 345 is a rod 347 having collars 348 and 349.

Pivoted mounted at its opposite ends in the cross-bar 46 (Fig. 5) of the frame 38 is a control rock shaft 360 having two arms 361 and 362 extending forwardly therefrom, an arm 363 extending upwardly therefrom, and one arm 365 extending rearwardly therefrom. The arm 365 is pivotally connected to a link 366 which extends downwardly, as shown in Fig. 7, and is provided with a horizontal loop 367 which encircles the rod 347 between the collars 348 and 349. The arm 365 engages the downwardly extending shutter cam 109 when the table 80 is in its lowermost position, as shown in Figs. 4 and 7, so as to rock the shaft 360 and relieve the switch stem 345 of all pressure from the eye 361 and permit this switch to assume the position shown in Fig. 6 in which it shuts off the motor 65.

Pivoted connected with the arm 361 (Fig. 7) is a rod 370 which extends downward through a guide bracket 371 mounted on the frame base 41 and connects at its lower end to a foot pedal 372.
which is pivotally mounted on the base 41. The rod 370 has a collar 373, a compression spring 374 between this collar and the bracket 371, and a pair of lock nuts 375 beneath the bracket 371 to arrest the action of the spring 374 on the rod 370 when the pedal 372 is relaxed from all manual pressure.

Connected by a clevis to the arm 362 (Figs. 4 and 5) and extending upwardly is a safety shut-off rod 376, this rod extending upwardly through suitable holes in the safety shut-off fingers 365 and 218. Mounted on the upper end of this rod is a head 377, this head having a suitable opening therein having a channeled edge and adapted to receive the push pin 55 so as to adjust the rod 376 vertically in such a position that the switch 345 will shut off the motor 66.

Normally pin 55 is pulled forwardly until its rear end is flush with the rear face of the plate 48 so as not to interfere with the free vertical movement of the rod 376 and the head 377 on its upper end. Whenever it becomes necessary to de-energize the motor indefinitely, when the table 148 is in an elevated position, the operator pushes the pin 55 inwardly so that it extends into a tapered hole in the head 377 and neutralizes the position of the rod 376, thus causing electricity to the motor 66 to be shut off. Whenever the operator desires to return to normal operation of the machine, he merely pulls the pin 55 forwardly and resumes control of the machine through the foot pedal 372.

Operation

In commencing the operation of our machine 35, the parts that are positioned as shown in Figs. 1, 3, 4, 7, 8, 9 and 11. The balance of the views are views illustrating the machine during its operation. To begin with, a series of boxes are delivered toward the machine on the conveyer 173. Also the conductors a, b, and c are connected to a suitable source of three phase current capable of driving the motor 65 in opposite directions when these conductors are connected with this motor through the circuits X and Y.

As will be noted in Figs. 4, 6 and 7, the control eye 367 of the switch 340 is now disposed out of contact with the rocking of the collars 343 or 349, thus permitting the spring 346 of the switch 343 to neutralize the switch stem 345 and shut off the motor 65. As before mentioned, this position of the eye 367 results from engagement between the table shut-off arm 363 and the shut-off cam 165 when the table 80 is in its lowermost position, as shown in Figs. 4 and 7.

It is also desired to point out that at this time the plungers 85 yieldably hold the gear housing brake 70 downwardly with the lining 71 pressed against the gear 61, as shown in Fig. 7. It is also noted that the side flushers 110 are swung outwardly as shown in Fig. 7, and that the receiving end of the tiltable conveyor 140 is as shown in Figs. 3 and 4. At this time also the stop 175 is held downwardly by the catch 169. A box B is thus fed from the conveyor section 173. Owing to the inclination of the conveyor section 173 in the direction of the machine 35, the box B now rolls by gravity onto the tilting conveyor 140 where its foremost end engages the stop 183, as shown in Fig. 4. The box B is shown as overfilled with oranges, a superposed layer of which extends above the upper edges of the box.

Either before the box B enters the machine 35 or after it has come to a stop, as shown in Fig. 4, the operator takes a strap 55 which is preferably in the form of a straight wire having nail-like pointed driving ends B bent from its ends, and inserts this strap in the strapper 39. When strap S is thus inserted, the strap ends rest against the stops 312 (Fig. 11) and the body of the strap is arched upwardly so as to extend into the notch 301 along the lower side of the side bar 303. The space between the plates 311 of the jaws 310, as shown in Fig. 2, is just sufficient to slidably receive the strap ends E.

The operator now inserts a lid L in the machine, as clearly shown in Figs. 4, 9 and 11, so that ends of the lid rest upon the end tuckers 248, the rear edge of the lid engaging the stops 249 provided on these tuckers. The lid L is a "unitized" lid formed of a plurality of spaced parallel longitudinal slats of relatively thin material, such as plywood, wood, connected at their opposite ends by relatively thin transverse end cleats stapled or nailed to the slats.

The machine 35 is now ready for initiating a power cycle of operation for nailing and strapping the lid L to the box B. The entire operation is brought about by the operator stepping on the foot pedal 372 and the progress of the operation is retained under control of the operator by his manipulating this pedal.

When this pedal is depressed, the eye 367 engages the collar 344, and lifts this to cause the switch 343 to complete the circuit X and Y to the conductors a, b, and c in the motor 65. This causes the motor to rotate the gear 67 and the nut 68, thereby lifting the jack screw 74 and the table 80 mounted thereon. The braking action of the lining 71 against the gear 67 is insufficient to overload the motor in starting. A quarter revolution of the gear 67 lifts the plungers 85 clear of housing 70 thereby entirely releasing the brake.

As the nailing table 80, carrying the box B, starts upwardly the flusher cam rollers 113 (Fig. 7) are shifted inwardly by the corner post flusher cams 55, thus rocking the shafts 111, swinging the side flushers 110 inwardly into flushing position, and swinging the lower arms 114 on the shafts 111 outwardly. The outward swinging of the arms 114, to one of which is attached the link 164, results in rocking the bell crank 148 to lower the tilting conveyor 140 into horizontal position, as it is shown in Fig. 5.

As will be noted in Fig. 7, the upper edges of the sides of the box B are of such a height as to permit the auxiliary flusher blades 122 of the flushers 110 to pass inwardly over these sides as shown in this view. This moves in side rows of the superposed layer of oranges, these oranges being engaged by both the main flusher blades 118 and the auxiliary blades 122. In case a higher box than the box B were to be used, the auxiliary blades 122 engage the outer surface of the sides of the box so as to compress the springs 123 and permit the main blades 118 to extend inwardly over the upper edges of the box sides and shift the side rows of the oranges inwardly over the sides.

The swinging in of the side flushers 110 also brings the box centralizers 128 into engagement with sides of the box B thus centralizing this box laterally on the nailing table 80 while the springs and longitudinal box centralizing cam 120 engages the ends of the box and centralizes the box longitudinally in proper position on the nailing table 80 for performing a lidding and strapping operation on the box.

The flushing movement of the side flushers 110 is timed with the elevation of the table 80 by 38.
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Cam tracks 56 so that the lid positioning fingers 118 are brought inwardly as they come opposite the lid L and positively position the lid L laterally for application to the box B (see Fig. 11). At the moment the side flushers 110 come into flushing position, as shown in Fig. 11, the box B has been elevated practically to the position in which it is shown fragmentarily in Fig. 9. As box B continues thereafter to rise the end tuckers 243 contact the ends of the box B and engage the lips 250 of the box B. As Fig. 11 shows a cross-section of a chuck beam 208 in the position in which this remains until the box B has risen to press the ends of the lid L onto the ends of the box B, forcing the lid ends upwardly against the lips 250 which have been raised, as the sides of the box B have been raised, as the sides of the box B have been raised. As O.

The upward swinging of the end tuckers 243 causes the lid ends to engage the lip 250 and swing the centralizers 244 upward.

Fig. 9 shows a cross-section of a chuck beam 208 in the position in which this remains until the box B has risen to press the ends of the lid L onto the ends of the box B, forcing the lid ends upwardly against the lips 250 which have been raised, as the sides of the box B have been raised, as the sides of the box B have been raised. As O.

The upward swinging of the end tuckers 243 causes the lid ends to engage the lip 250 and swing the centralizers 244 upward.

This releasing the box from the longitudinal positioning cams 130 and swinging the downward extending arms 114 inwardly to lift the receiving end of the tiltable conveyor 140 into its elevated position, as shown in Fig. 3. The stop 184 may be manually or automatically disengaged in any desired manner such as shown in our aforesaid coping application.

Owing to the inclination of the conveyor 140 on the table 80, the box B is now automatically discharged from this table by gravity onto the discharge conveyor 163. With the descent of the box B from its upwardmost position shown in Figs. 5 and 10, the chuck beam 208 descends to the positions indicated in Figs. 8 and 9, then being forced downwardly by the springs 222 to closely follow the box until the guide shoes 209 come into engagement with the chuck beam stops 194 provided on the lower ends of the side slide bars 190. This reciprocation of the chuck beam 208 in each nailing operation accomplishes through the links 264 the oscillation of the nail hoppers 265 between downwardly inclined positions as shown in Figs. 4, 8 and 9 and upwardly inclined positions as shown in Figs. 5 and 10.

A quantity of nails N are maintained in the hoppers 260 so that these are gravity fed into the slots 266 owing to the oscillating motion of the hoppers. The nails thus fed into the slots 266 slide downwardly in the slots beneath the transverse baffle walls 269 and 270 and the traps 274. Thus, when the hoppers 260 rock downwardly, as shown in Fig. 9, the traps 274 retain the nails which have passed under these traps from returning back into the hoppers. A supply of nails is thus always maintained in the slots 266 adjacent to the mouths thereof.

When the chuck beam 208 moves upwardly in each nailing operation, it not only lifts the hoppers 260 upwardly, as shown in Fig. 10, but the roller 213 shown in Fig. 8 engages the picker operating cam 220 so as to shift the picker bar 281 rearwardly. This causes a nail to be fed from the mouth of each of the slots 266 into the small picker bar notch 287 now disposed opposite this slot. As the hoppers 260 start to swing downwardly the roller 213 releases the lever 200 permitting the spring 266 to shift the picker bar 281 to its other position as shown in Fig. 8.

This brings the notches 287 and 288 to their upwardmost position, as shown in Fig. 9. The operation of the strapper 39 occurs simultaneously and automatically during the operation of the nailing mechanism 38. When the ends of box B engage the end tuckers 243 so as to...
to lift these upwardly from the positions indicated in Fig. 9 to the positions indicated in Fig. 10, the arms 245 on these end tuckers are swung downwardly, thus pulling down on the links 324 (Fig. 11) and the arms 333 of the shaft 332 so as to rock this shaft and move the wedge 339 from the position in which it is shown in Fig. 11 to the position in which it is shown in Fig. 12. In this action the wedge 339 engages the roller 301 and the strapper stem 299 and saddle bar 302 so that the springs 316 swing the drivers 313 about the pins 309. This movement is transmitted through the toggles 323 to the jaws 310 so that the latter are swung into substantially vertical positions as shown in Fig. 12. This action of the wedge 339 is thus seen to shape the ends of the strap S inwardly and bring the inner faces of the jaws 310 into parallel relationship and spaced apart a distance approximately equal to the width of the box B. This inward swinging of the jaws 310 places them just as the upper edges 30 of the sides of the box come opposite the lower portions of these jaws (Fig. 12), so that with further elevation of the box the jaws slide vertically on the sides of the box. Owing to the box B being positioned between the jaws 310, these jaws cannot swing any further inwardly towards each other and the saddle bar 302 accordingly is not lifted by contact of the lid L therewith until the pressure between the lid and the saddle bar is sufficient to compress the springs 316. When the latter is accomplished, however, the cover has been shaped laterally to conform to the saddle bar 302, as shown in Fig. 13.

The final elevation of the box B to lift the chuck beams 205 and complete the nailing operation of the ends of the lid to the ends of the box lifts the saddle bar 302 to bring the rollers 328 on the toggles 323 into engagement with the oblique faces 297 of the driver release cams 297, as shown in Fig. 13, and this contact throws the rollers 328 outwardly over dead center, thus releasing the drivers 313 from being locked to the jaws 310 by the toggles 323 and permitting the springs 316 to swing the drivers 313 suddenly inward, thus driving the pointed strap ends E into the sides of the box B and securing the ends of the strap S to the sides of the box, as shown in Fig. 14.

As the strapper saddle bar 302 rises after being engaged by the rising box B the springs 316 are compressed from the condition in which these are shown in Fig. 12 to the condition in which they are shown in Fig. 13. As this compression progresses the angles at which these springs lie change so that at the height of the compression of these springs a lesser portion of the total forces exerted by these springs along their axes is applied to pressing the saddle bar 302 downwardly against the lid L of the box B. As shown in Figs. 12 and 13, the angles at which the springs 316 lie with respect to the horizontal are substantially the same as the angles to the horizontal of the springs 222 of the nailing units 168 and 189. These angles are purposely designed to cause these springs during their compression to exert a substantially constant downward pressure against the lid L. This provision is especially useful in the strapper 39 where the shoe 302 is supported only by the middle of the relatively light lid L and the fruit thereon.

With the lowering of the box B, the box B merely drops away from the strapper 39 and the strapper resumes the condition in which it is shown in Fig. 11 excepting for the fact that it is emptied of its strap.

It is noted that the crown sheet 341 is expansible vertically owing to the fact that its halves 340 are loosely connected to the strapper 39 (see Fig. 2) and the strapper 39 is yieldable vertically independently of the chuck beams 208 (see Figs. 11, 12, 13 and 14) to which the outer ends of the crown sheet are pivotally connected. It is preferable to limit this vertical expansibility of the crown sheet 341 and this is accomplished by the strapper limit bar 290 which connects the chuck beams 208. In the drawings box B is shown as having a pack of medium height. The height limit bar 290 is thus shown in Figs. 13 and 14 as disposed a considerable distance above the bottom of the slot 303 in the strapper 39 through which this bar extends. In the event a box with a pack of maximum height were to be strapper in the machine 35, the strapper 39 would be lifted so that the bottom of the slot 303 would engage the bar 290, thus limiting the upward extremity to which the center of the crown sheet could be lifted. This is for the purpose of preventing the arching of the lid L to the extent of drawing the ends of the lid inwardly from their proper positions over the ends of the box.

In the operation of the machine 35 the end tuckers and side flushers guard the edge rows of fruit in the superposed layer of oranges and make special care by the operator for guarding these oranges almost unnecessary. However, the operator has complete control over the vertical movement of the table 80 at all times and is able by manipulation of the foot pedal 372 to either stop vertical movement of this table or neutralize this pedal or by pressing the pedal down or entirely releasing it move the table 80 either upwardly or downwardly respectively.

What we claim:

1. In a lid nailing and strapping machine the combination of: a frame; a nailing table for receiving a packed box with a lid disposed thereon; nail chucks supported on said frame over opposite ends of said box and shiftable vertically; nail drivers on said frame disposed over and in vertical alignment with said chucks; means for elevating said table to lift said box and lid to bring ends of said lid into contact with said chucks and lift said chucks to drive nails therewith from the ends of said lid into the ends of said box; a strapper mounted on said frame between said nail chucks; said strapper being vertically movable on said frame; and means for operating said strapper coordinately with said nailing operation to apply a strap transversely across the lid of said box and secure its opposite ends to the opposite sides of said box.

2. In a lid nailing and strapping machine the combination of: a frame; a nailing table for receiving a packed box with a lid disposed thereon; nail chucks supported on said frame over opposite ends of said box and shiftable vertically; nail drivers on said frame disposed over and in vertical alignment with said chucks; means for elevating said table to lift said box and lid to bring ends of said lid into contact with said chucks and lift said chucks to drive nails therewith from the ends of said lid into the ends of said box; a strapper mounted on said frame between said nail chucks; said strapper being vertically movable on said frame; means for operating said strapper coordinately with said nailing operation to apply a strap transversely across the lid of said box and secure its opposite ends to the opposite sides of said box.
across the lid of said box and secure its opposite ends to the opposite sides of said box; and a bar connected to said chucks and engaging said strapper to limit vertical movement of said straprelative to said chucks.

3. In a lid fastening and strapping machine the combination of: a frame; a nailing table for receiving a packed box with a lid disposed thereon; nail chucks supported on said frame over said box ends disposed of said box and shiftable vertically; nail drivers on said frame disposed over and in vertical alignment with said chucks; means for elevating said table to lift said box and lid to bring ends of said lid into contact with said chucks and lift said chucks to drive nails therethrough the ends of said lid into the ends of said box; a strapper mounted on said frame in between said nail chucks, said strapper being vertically movable on said frame; end tuckers extending into the path of said box ends during said lidding operation to tuck superposed on said box ends as said box is applied to said box; the upward movement of said box moving said end tuckers upwardly and outwardly; mechanism actuated by said movement of said box and operating on said strapper to preshape a strap thereby applying said strap to said box; and means actuated by movement of said strapper when lifted by said box for causing said strapper to secure opposite ends of said strap to opposite sides of said box.

4. In a strapping machine the combination of: a table for receiving an overfilled box with a cover disposed over said box; a strapper unit including a bar disposed above and extending transversely across said cover, jaws movably mounted on opposite ends of said bar to place ends of a strap in position to be secured to sides of said box, and strap end securing drivers provided on said unit; a frame on which said table and said unit are mounted; mechanism provided on said frame for causing relative vertical movement between said table and said unit to cause said unit to engage said cover; elements connected to said strapper securing drivers for actuating both said jaws and said drivers; positive locking means between said jaws and said strapper unit to substantially prevent strap securing movements of said drivers relative to said jaws; and means for unlocking said locking means to permit strap securing movements by said strappers; and means for applying yieldable pressure to said drivers before the unlocking of said locking means to cause strap securing movements of said drivers to immediately follow said unlocking.

5. In a strapping machine the combination of: a table for receiving an overfilled box with a cover disposed over said box; a strapper unit including a bar disposed above and extending transversely across said cover, jaws movably mounted on opposite ends of said bar to place ends of a strap in position to be secured to sides of said box, and strap end securing drivers provided on said unit; a frame on which said table and said unit are mounted, said unit being shiftable vertically on said frame; mechanism provided on said frame for lifting said table to cause the cover of said box to engage and lift said unit relative to said frame; yieldable pressure links connected to said drivers and said frame; locking means between said drivers and said jaws, and causing movement of said drivers to be transmitted to said jaws, the initial lifting of said unit causing said links to shift said jaws to place ends of the strap in positions to be secured to sides of said box; and means for unlocking said locking means after a further lifting of said unit relative to said frame, said unlocking permitting a yieldable pressure to be exerted by said links on said drivers to effect strap securing movements by said drivers relative to said jaws.

6. A combination as in claim 6 in which said unlocking means is provided on said frame and performs its function as the result of said locking means being brought into contact therewith incidental to the lifting of said unit on said frame.

7. A combination as in claim 6 in which said cross-bar engages and shapes transversely said cover, and said yieldable links exert a substantially greater pressure on said cover.

8. In a strapping machine the combination of: a table for receiving an overfilled box with a cover disposed over said box; a strapper unit including a bar disposed above and extending transversely across said cover, jaws movably mounted on opposite ends of said bar to place ends of a strap adjacent opposite sides of said box for securing said ends to said sides, strap end securing drivers provided on said unit, spring means, means for applying the force of said spring means both to said drivers and to said jaws for shifting said drivers and jaws to place said strap ends as aforesaid, said applying means having locks for suspending movement of said drivers when said jaws and said drivers reach said strap end placing positions; and means for actuating said strapper unit to compress said spring means to press said bar against said cover, to position said strapper and then to release said locks to permit said spring means to actuate said drivers to secure said strap ends to opposite sides of said box.

9. In a strapping machine the combination of: a table for receiving a packed box with a lid disposed thereon; a strapper unit including means for positioning a strap across said cover with its ends adjacent opposite sides of said box and means for securing said strap ends to said box; a frame for supporting said table and said unit in spaced relation; and mechanism on said frame for causing relative movement between said table and said unit to bring said box with its lid into pressural contact with said unit,
said contact substantially halting said relative movement, continued operation of said mechanism now actuating said strapper unit to position and secure said strap ends as aforesaid.

11. In a strapping machine the combination of: a frame; a strapper unit including means for positioning a strap across a face of an object with the ends of said strap opposite adjacent faces of said object, and strap end securing means; nail chucks supported in alignment with said drivers and slidably related to the latter; shift said unit towards said frame, said shifting actuating said operating means and causing said unit to position the ends of said strap and secure said ends to said adjacent faces as aforesaid.

12. In a lid nailing and strapping machine the combination of: a frame; a nailing table on said frame for receiving a packed box with a lid disposed thereover; an overhead structure provided on said frame; nail drivers provided on said overhead structure over opposite ends of said box; nail chucks supported in alignment with said drivers and slidably related to the latter; means for causing relative vertical movement between said overhead structure and said table to bring the ends of said lid into pressurizable contact with said chucks, press the ends of the lid against the ends of said box and cause said drivers to drive nails from said chucks through the ends of said lid and into the ends of said box; a strapper mounted on said overhead structure and being vertically movable thereto; and means for operating said strapper co-ordinately with said nailing operation to apply a strap transversely across the lid of said box and secure its opposite ends to the opposite sides of said box.

13. In a lid nailing and strapping machine the combination of: a frame; a nailing table on said frame for receiving a packed box with a lid disposed thereover; an overhead structure provided on said frame; nail drivers provided on said overhead structure over opposite ends of said box; nail chucks supported in alignment with said drivers and slidably related to the latter; means for causing relative vertical movement between said overhead structure and said table to bring the ends of said lid into pressurizable contact with said chucks, press the ends of the lid against the ends of said box and cause said drivers to drive nails from said chucks through the ends of said lid and into the ends of said box; a strapper mounted on and vertically movable relative to said overhead structure, said relative vertical movement between said table and said overhead structure causing contact between said strapper and said lid to cause relative vertical movement between said strapper and said overhead structure; and means operated by said last-mentioned relative vertical movement to actuate said strapper to secure opposite ends of a strap carried by said strapper to the opposite sides of said box.

14. In a lid nailing and strapping machine the combination of: a frame; a nailing table on said frame for receiving a packed box with a lid disposed thereover; an overhead structure provided on said frame; nail drivers provided on said overhead structure over opposite ends of said box; nail chucks supported in alignment with said drivers and slidably related to the latter; means for causing relative vertical movement between said overhead structure and said table to bring the ends of said lid into pressurizable contact with said chucks, press the ends of the lid against the ends of said box; drivers to drive nails from said chucks through the ends of said lid and into the ends of said box; and strapper means operated by said relative vertical movement to apply a strap transversely across the lid of said box and to secure the opposite ends of said strap to the opposite sides of said box.

15. In a strapper the combination of: a head frame adapted to be held in spaced relation with an object to be strapped to permit relative movement between said object and said head frame; a strapper unit on said head frame including means adapted to be brought into contact with a given face of said object by said relative movement for positioning a strap across said face of said object with the ends of said strap opposite two other faces of said object adjacent said first mentioned face, and strap end securing means; and yieldable means between said strapper unit and said head frame for operating said unit, said yieldable means being actuated to cause said strap end securing means to secure the ends of said strap to said adjacent faces, as aforesaid, by relative movement between said head frame and said object.

16. In a strapper the combination of: a head frame adapted to be held in spaced relation with an object to be strapped to permit relative movement between said object and said head frame; a strapper unit on said head frame including means adapted to be brought into contact with a given face of said object by said relative movement for positioning a strap having driving ends integral therewith across said face of said object with said driving ends of said strap opposite other faces of said object adjacent said first mentioned face, and strap end driving means; yieldable means between said strapper unit and said head frame for operating said unit, said yieldable means being actuated to cause said strap end driving means to drive said strap ends into said adjacent faces of said object, by relative movement between said head frame and said object after said relative movement has caused contact of said strap positioning means and said first mentioned face of said object.

17. In a lid nailing and strapping machine the combination of: a frame; a nailing table on said frame for receiving a packed box with a lid disposed thereover; an overhead structure provided on said frame; nail drivers provided on said overhead structure over opposite ends of said box; nail chucks supported in alignment with said drivers and slidably related to the latter; means for causing relative vertical movement between said overhead structure and said table to bring the ends of said lid into pressurizable contact with said chucks, press the ends of the lid against the ends of said box and cause said drivers to drive nails from said chucks through the ends of said lid and into the ends of said box; means for applying a strap across the lid of said box; means for securing end portions of said strap to the sides of said box; energy storage means adapted to be actuated by said relative vertical movement to store energy therein; and means for providing by said relative vertical movement to cause said energy storage means to actuate said strap end securing means to secure the ends of said strap to the sides of said box.
18. In a lid nailing and strapping machine the combination of: a frame; a nailing table on said frame for receiving a packed box with a lid disposed thereover; an overhead structure provided on said frame; nail drivers provided on said overhead structure over opposite ends of said box; nail chucks supported in alignment with said drivers and slidably related to the latter; means for causing relative vertical movement between said overhead structure and said table to bring the ends of said lid into pressurizable contact with said chucks, press the ends of the lid against the ends of said box and cause said drivers to drive nails from said chucks through the ends of said lid and into the ends of said box; means for applying a strap across the lid of said box; means for securing end portions of said strap to the sides of said box; energy storage means adapted to be actuated by said relative vertical movement to store energy therein; and means for automatically releasing said energy to cause said energy storage means to secure the ends of said strap to said adjacent faces of said box.

19. In a lid nailing and strapping machine the combination of: a frame; a nailing table on said frame for receiving a packed box with a lid disposed thereover; an overhead structure provided on said frame; nail drivers provided on said overhead structure over opposite ends of said box; nail chucks supported in alignment with said drivers and slidably related to the latter; means for causing relative vertical movement between said overhead structure and said table to bring the ends of said lid into pressurizable contact with said chucks, press the ends of the lid against the ends of said box and cause said drivers to drive nails from said chucks through the ends of said lid and into the ends of said box; means for applying a strap across the lid of said box; means for securing end portions of said strap to the sides of said box; spring means adapted to be actuated by said relative vertical movement to store energy therein; and means for automatically releasing said energy and cause said spring means to secure the ends of said strap to said adjacent faces of said box.

20. In a lid nailing and strapping machine the combination of: a frame; a nailing table on said frame for receiving a packed box with a lid disposed thereover; an overhead structure provided on said frame; nail drivers provided on said overhead structure over opposite ends of said box; nail chucks supported in alignment with said drivers and slidably related to the latter; means for causing relative vertical movement between said overhead structure and said table to bring the ends of said lid into pressurizable contact with said chucks, press the ends of the lid against the ends of said box and cause said drivers to drive nails from said chucks through the ends of said lid and into the ends of said box; spring means adapted to be actuated by said relative vertical movement to store energy therein; and means for automatically releasing said energy and cause said spring means to secure the ends of said strap to said adjacent faces of said box.

21. In a strapper the combination of: a head frame adapted to be held in spaced relation with an object to be strapped to permit relative movement between said object and said head frame; a strapper unit on said head frame including means adapted to be brought into contact with a given face of said object by said relative movement for positioning a strap across said face of said object with the ends of said strap opposite two other faces of said object adjacent said first mentioned face and strap end securing means; energy storage means between said strap unit and said head frame for operating the securing means of said unit, said relative movement storing energy in said energy storage means; and means operated by said relative movement to release said energy to cause said energy storage means to actuate said strap end securing means to secure the ends of said strap to said adjacent faces of said object.

22. In a strapper the combination of: a head frame adapted to be held in spaced relation with an object to be strapped to permit relative movement between said object and said head frame; a strapper unit on said head frame including means adapted to be brought into contact with said object by said relative movement for positioning a strap against said object, and strap end securing means; energy storage means adapted to be actuated to store energy therein by said relative movement; and means for automatically releasing said energy to cause said energy storage means to actuate said strap end securing means to secure the ends of said strap to said object.

23. In a strapper the combination of: a head frame adapted to be held in spaced relation with an object to be strapped to permit relative movement between said object and said head frame; a strapper unit on said head frame including means adapted to be brought into contact with said object by said relative movement for positioning a strap against said object, and strap end securing means; energy storage means adapted to be actuated to store energy therein by said relative movement; and means for automatically releasing said energy storage means to cause the latter to actuate said strap end driving means to drive the ends of said strap into said object.

24. In a lid nailing and strapping machine the combination of: a nailing mechanism; a strapping mechanism; a table for supporting a box to be lidded and strapped; and means for causing relative vertical movement between said table and said nailing and strapping mechanisms; said relative vertical movement means actuating said nailing mechanism to nail a lid onto said box and to apply a strap across said box and secure the ends of the strap thereto.

25. In a strapper the combination of: a frame adapted to be held in spaced relation with an object to be strapped to permit relative movement between said object and said frame; a press shoe supported on said frame; mechanism for causing relative movement between said object and said frame; means for performing a strapping operation on said object during said pressurizable con-
tact between said shoe and said object; and means for exerting a force of substantially constant value between said frame and said shoe throughout said relative movement between said shoe and said frame, said force urging said shoe against said object.

26. In a strapper the combination of: a frame adapted to be held in spaced relation with an object to be strapped to permit relative movement between said object and said frame; a press shoe supported on said frame; mechanism for causing relative movement between said object and said frame to cause pressurable contact between said object and said shoe and cause relative movement between said shoe and said frame; means actuated by said relative movement between said shoe and said frame for performing a strapping operation on said object during said pressurable contact between said shoe and said object; and means for exerting a force of substantially constant value between said frame and said shoe throughout said relative movement between said shoe and said frame, said force urging said shoe against said object.

27. In a strapping machine for applying straps to overfilled boxes, the combination of: a frame adapted to be held in spaced relation with an overfilled box to be strapped to permit relative vertical movement between said box and said frame; a press shoe supported on said frame; mechanism for causing relative vertical movement between said box and said frame to cause pressurable contact between the cover of said box and said shoe and cause relative movement between said shoe and said frame; means actuated by said relative movement between said shoe and said frame for applying a strap across said lid and securing the ends of said strap to the sides of said box; and means for exerting a force of substantially constant value between said frame and said shoe throughout said relative movement between said shoe and said frame, said force urging said shoe against said cover.

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