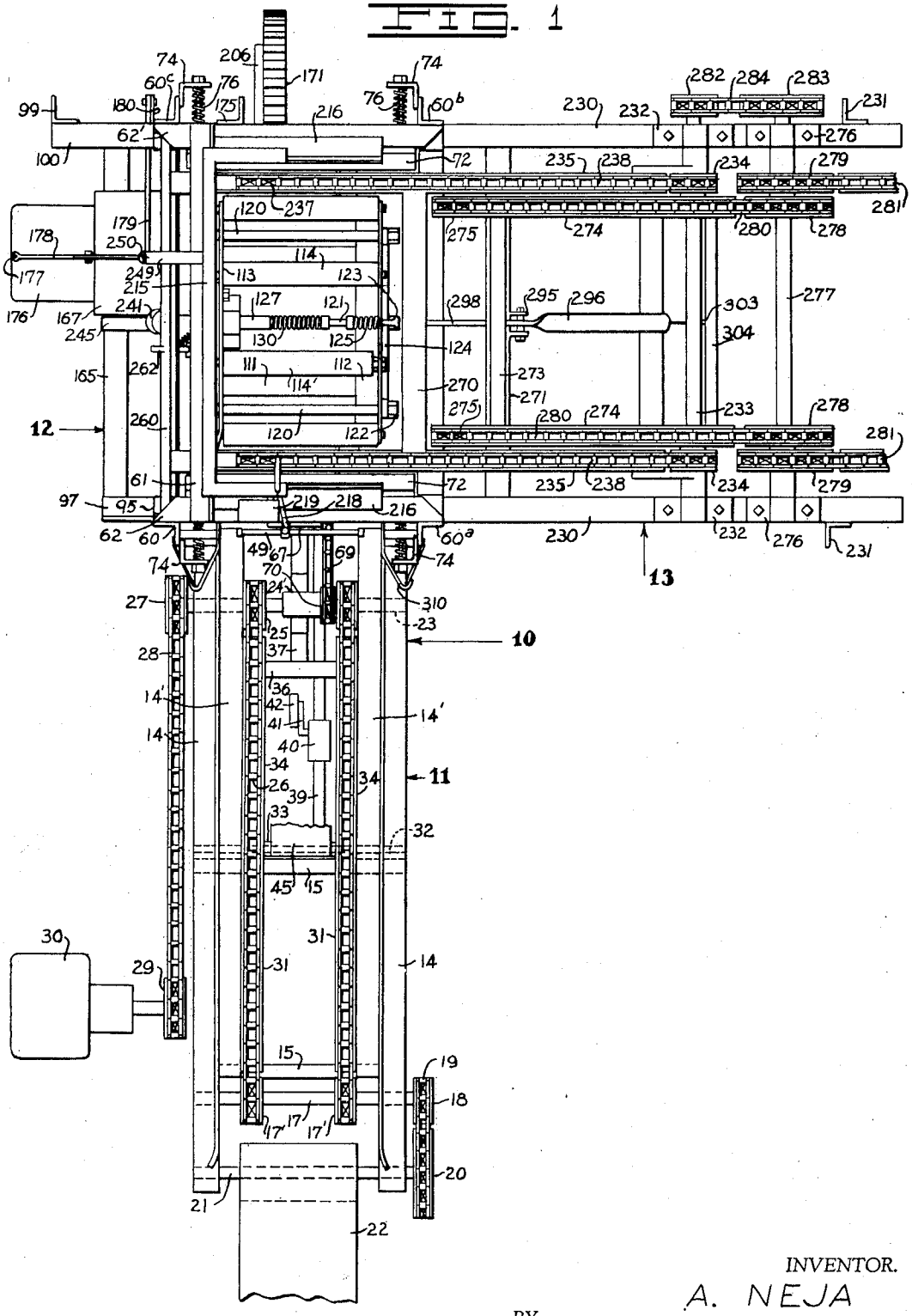
Sept. 14, 1943. A. NEJA 2,329,413

BOX HANDLING APPARATUS

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FIG. 1



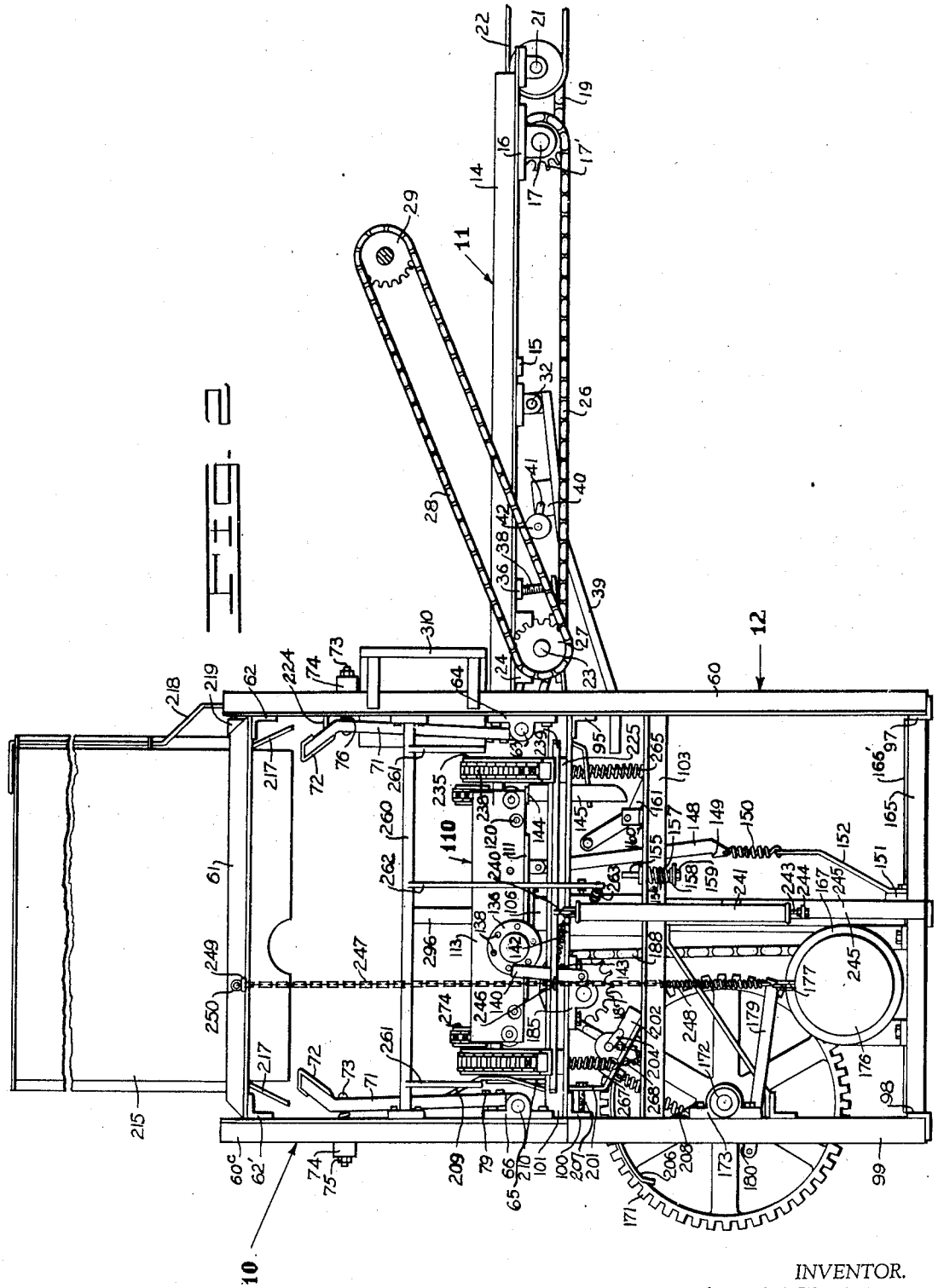
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FIG. 2



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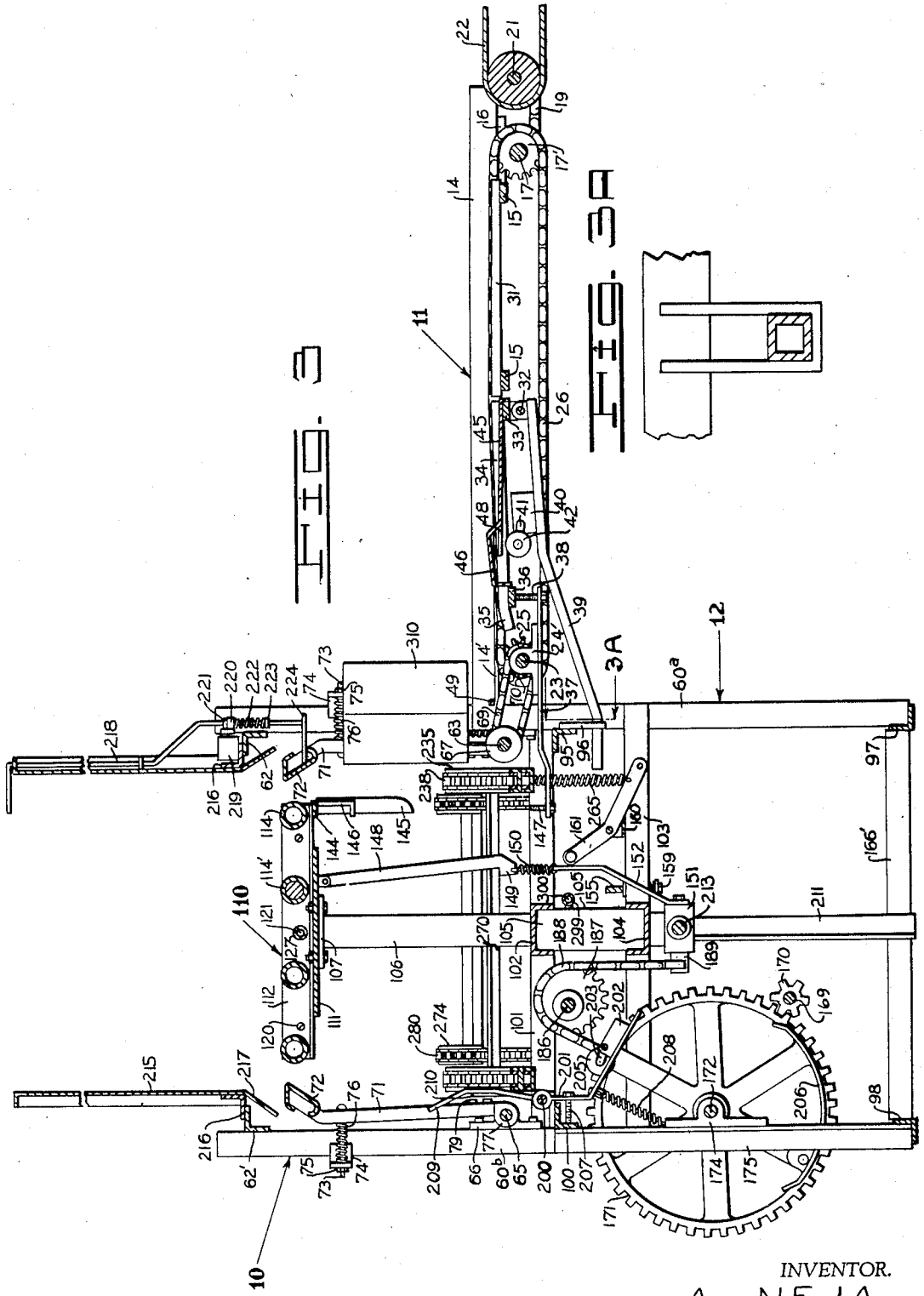


FIG. 3

FIG. 3A

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FIG. 10

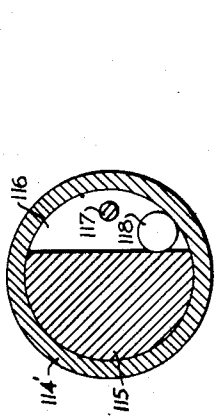


FIG. 4

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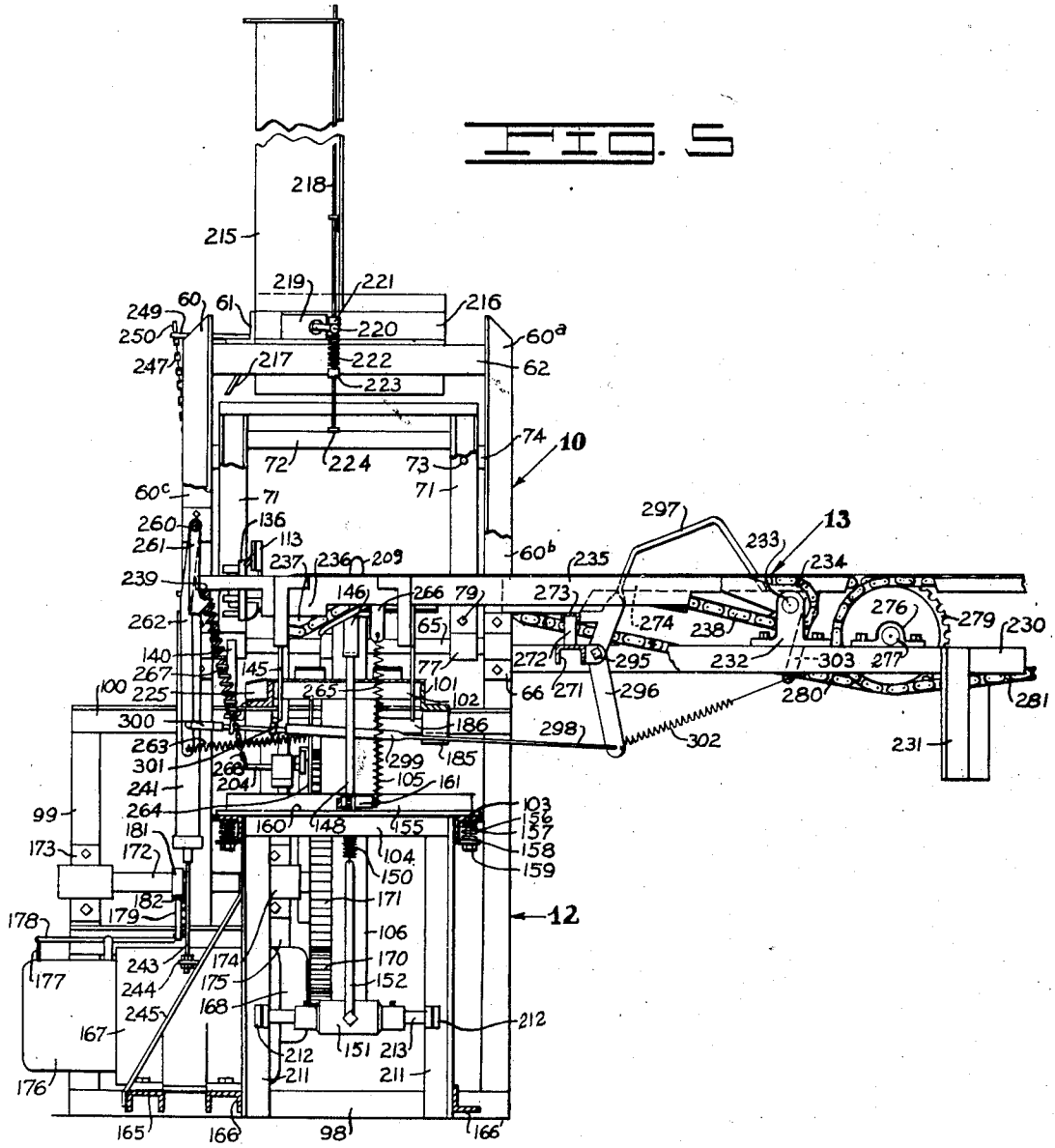
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BOX HANDLING APPARATUS

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FIG. 5



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FIG. 6

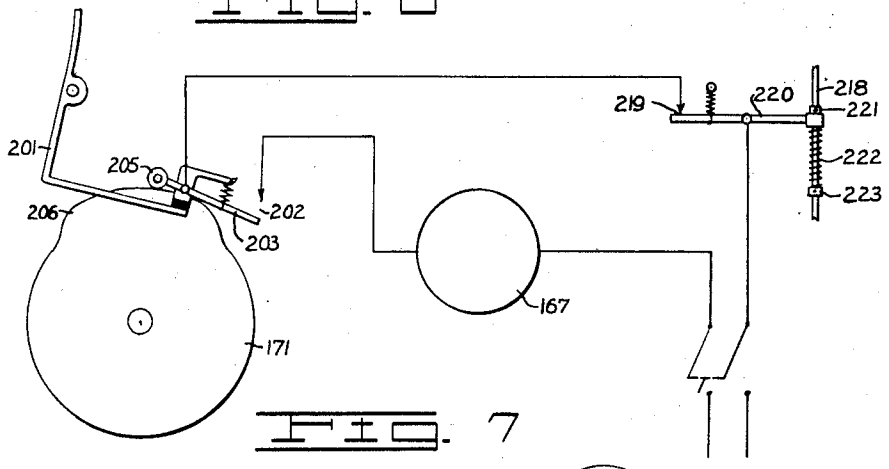


FIG. 7

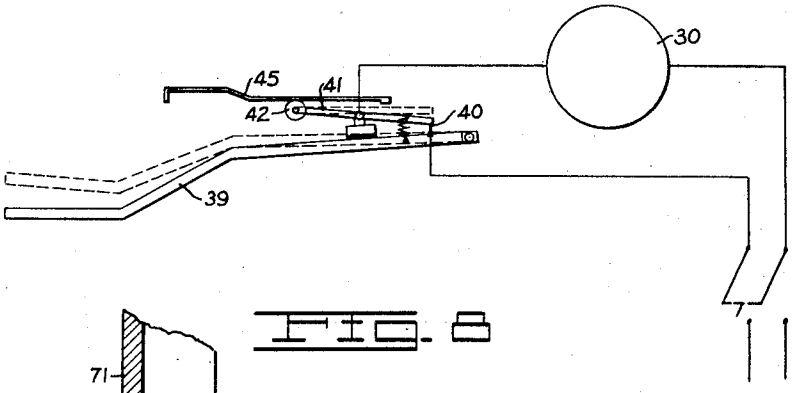


FIG. 8

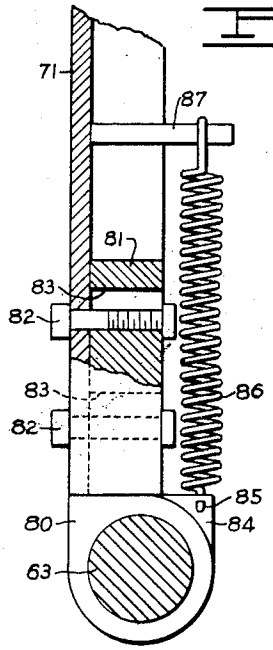
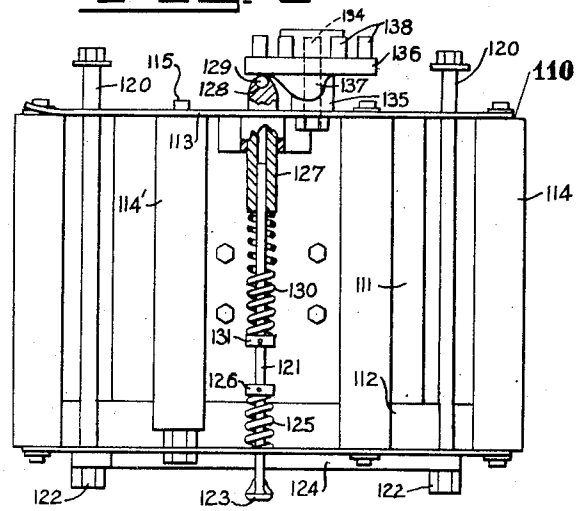


FIG. 9



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Patented Sept. 14, 1943

2,329,413

UNITED STATES PATENT OFFICE

2,329,413

BOX-HANDLING APPARATUS

Ambrose Neja, Anaheim, Calif.

Application March 17, 1942, Serial No. 435,013

13 Claims. (Cl. 214—6)

This invention relates to box handling apparatus.

The general object of the invention is to provide an improved box handling apparatus whereby boxes fed along a conveyor may be stacked and the stack moved to a desired location.

A more specific object of the invention is to provide an improved apparatus for stacking boxes one upon the other.

Another object of the invention is to provide a novel means for lifting the elevator of a box stacking apparatus.

Another object of the invention is to provide a novel support arm construction for use in a box stacking apparatus.

Another object of the invention is to provide a novel means for controlling the lifting operation of a box stacking apparatus.

A further object of the invention is to provide a novel discharge conveyor, a novel means for operating the discharge conveyor of a box stacking apparatus.

A further object of the invention is to provide a novel means for controlling the movement of a box stacking apparatus wherein the control is effected by a box moved by the apparatus.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings, wherein

Fig. 1 is a plan view of my improved stacking and conveying mechanism;

Fig. 2 is a rear elevation;

Fig. 3 is a view similar to Fig. 2 with parts in section and with parts in different position;

Fig. 3A is a sectional detail taken on line 3A—3A, Fig. 3;

Fig. 4 is a view similar to Fig. 3 with other parts in section and with parts in different positions from that shown in Figs. 2 and 3;

Fig. 5 is a side elevation partly in section;

Fig. 6 is a wiring diagram for controlling motor operation of the box stacking mechanism;

Fig. 7 is a wiring diagram for controlling motor operation for the box conveying mechanism;

Fig. 8 is a sectional detail with parts broken away showing one of the extensible swing arms;

Fig. 9 is a sectional detail with parts broken away showing the elevator platform; and

Fig. 10 is a sectional detail with parts broken away showing the roller brake mechanism.

Referring to the drawings by reference characters, I have shown my invention as embodied in a box handling apparatus which is indicated generally at 10. As shown the apparatus includes a feed conveyor 11, a stacking mechanism 12 and a discharge conveyor 13.

As shown the feed conveyor includes frame members 14 shown as made of angle iron with cross pieces 15 connecting the members 14. The frame members 14 each includes an inwardly extending leg 14' secured thereto as by welding. Secured to the frame members 14 at the end thereof remote from the stacking mechanism 12 I show bearing blocks 16 which support a shaft 17 having a pair of sprockets 17' secured thereto and arranged between the frame members 14. As shown the shaft 17 extends on one side beyond the adjacent frame member 14 and has a sprocket 18 secured thereto. The sprocket 18 by means of continuous chain 19 drives a sprocket 20 on a shaft 21 of a belt conveyor 22 which may extend to any desired location and is adapted to transport boxes to the feed conveyor 11.

The frame members 14 at the end thereof adjacent the stacking mechanism 12 support a shaft 23 journaled in bearing blocks 24 secured to the frame members 14. The shaft 23 has a pair of sprockets 25 secured thereto and arranged between the frame members 14. The sprockets 25 and the sprockets 17' support a pair of substantially parallel continuous chains 26.

The shaft 23 extends beyond one of the frame members 14 and has a sprocket 27 thereon which supports one end of a continuous chain 28 which is driven by a sprocket 29 on a motor 30.

Thus it is seen that the motor 30 by means of the chain 28 drives the shaft 23 which drives the chains 26 and by means of the chain 19 drives the belt conveyor 22.

A pair of channel guides 31 supported by the cross pieces 15 serve to support the rear portion of the upper reaches of the chains 26. The frame members 14 intermediate the lengths thereof pivotally support a shaft 32 which supports a transverse bar 33 to which one end of channel guides 34 are secured.

The forward ends of the channel guides 34 are downwardly inclined as at 35 and have a cross piece 36 secured therebetween adjacent the inclined portions 35. A lever 37 is provided with a bearing block 24' which is pivotally mounted on the shaft 23 between the brackets 25. The rear end of the lever includes an upwardly extending adjustable rod 38 adapted to engage the cross piece 36. Pivotally mounted on the shaft 32 I provide a downwardly inclined, forwardly extending rocker arm 39 which has a switch 40 mounted thereon. The switch 40 has an operating arm 41 with a roller 42 thereon, the roller 42 being posi-

tioned between the channel guides 34. The switch 40 controls the motor 30.

Secured to the transverse bar 33 I provide a forwardly extending spring plate 45 disposed between the channel guides 34. The spring plate 45 includes an upwardly, then forwardly, and then downwardly extending portion 46. A slot 47 cut in the plate 45 forms a tongue 48 which extends above and is adapted to engage the switch roller 42.

Thus it will be seen that the forward end of the chains 26 may be raised and lowered by rocking the lever 37 and the construction is such that when in the raised position, the chains 26 are slightly above the inwardly extending legs 14' of the frame members 14 and when in the lowered position the chains 26 are slightly below the inwardly extending legs 14'. It will also be seen that the switch 40 may be raised and lowered by rocking the rocker arm 39 and the construction is such that when the chains 26 are in raised position and the switch 40 is in raised position (see Fig. 4) a box being conveyed by the chains will engage and depress the spring plate 45 thus forcing the tongue 48 down upon the switch roller 42 to thus actuate the switch 40 and shut off the motor 30 and stop the operation of the entire feed conveyor.

When the switch 40 is in lowered position and the chains 26 are in lowered position (see Fig. 3), a box being conveyed by the chains will be urged to rest upon the inwardly extending legs 14' and will engage and depress the spring plate 45 forcing the tongue 48 upon the roller 42 and thus actuate the switch 40 to shut off the motor 30 and stop operation of the entire feed conveyor. Thus boxes are prevented from bunching up adjacent the stacking mechanism.

When the switch 40 is in raised position and the chains 26 are in lowered position, a box being urged onto the inwardly extending legs 14' will force the tongue 48 to engage the roller 42 and actuate the switch 40.

When the switch 40 is in lowered position and the chains 26 are in raised position, a box being conveyed by the chains will not depress the spring plate 45 far enough for the tongue 48 to actuate the switch 40.

A stop member 49 at the forward ends of the inwardly extending legs 14' is positioned so as to engage the forward end of a conveyed box when the chains 26 are in lowered position, but when the chains 26 are in raised position, the box will be above and will pass over the stop member 49.

As shown the stacking mechanism 12 includes a plurality of upright frame members 60, 60*a*, 60*b* and 60*c*. The frame members 14 are secured to the members 60 and 60*a*. At the upper ends thereof, the upright members 60, and 60*c* are joined by a longitudinal cross member 61 while the members 60 and 60*a* are joined by transverse member 62 and members 60*b* and 60*c* are joined by a transverse member 62'.

A shaft 63 is supported on the upright members 60 and 60*a* being journaled in bearing blocks 64 and a shaft 65 is journaled in bearing blocks 66 on the upright members 60*b* and 60*c*. The shaft 63 has a cylinder 67 secured thereto. The cylinder 67 has a sprocket 68 at one end thereof which is driven by one end of a chain 69, the other end of the chain being supported and driven by a sprocket 70 secured to the shaft 23.

On each of the shafts 63 and 65 I pivot a pair of spaced box engaging arms 71. The arms 71 extend upwardly and at the upper ends thereof are bent inwardly and joined by cross channels 72. Adjacent the upper bent portions, each arm has an elongated bolt 73 extending outwardly therefrom and through an aperture in a boss 74 on the upright member 60. A nut 75 threadedly engages the bolt 73 and the outer face of the boss 74. A compression spring 76 is disposed about the bolt 73 between the arms 71 and the boss 74.

The lower portions of the arms 71 are supported on the shaft 65 by bearing portions 77, the arms being secured to the bearing portions by bolts 79. The lower portions of the arms 71 (see Fig. 8) on the shaft 63 each include a bearing portion 80 having an upwardly extending bar portion 81 thereon to which the lower portion of the associated arm 71 is secured by bolts 82. The bar portion 81 has slots 83 therein through which the bolts 82 extend to thus permit relative vertical movement of the upper portion of the arm 71 and the bar portion 81. The bearing portion 80 has an outwardly extending boss 84 thereon having an aperture 85 therein in which one end of a tension spring 86 is secured. The other end of the spring 86 is secured to an outwardly extending boss 87 secured to the upper portion of the arm 71.

Adjacent the feed conveyor, a transverse angle member 95 extends between and is secured to the uprights 60 and 60*a*. The member 95 has a loop member 96 secured thereto and depending therefrom. The loop member 96 supports the rocker arm 39 and permits limited vertical movement thereof. At the bottom of the frame, a transverse angle member 97 is secured to the lower ends of the uprights 60 and 60*a* and a transverse angle member 98 is secured to the lower ends of the uprights 60*b* and 60*c*. As shown, members 97 and 98 extend beyond the uprights 60 and 60*c* and at its outer end member 98 is secured to a vertical angle member 99. Opposite the transverse member 95 is a transverse member 100 secured to the uprights 60*b* and 60*c* and at one end thereof extends beyond the upright 60*c* and is secured at its outer end to the upper end of the vertical member 99. Secured to the transverse members 95 and 100 are a pair of longitudinal angle members 101, each of which has one end of a transverse channel member 102 secured thereto. A pair of longitudinal angle members 103 are secured to the uprights 60 and 60*c*, and 60*a* and 60*b*, and each has one end of a transverse channel member 104 secured thereto. To the channels 102 and 104 are secured opposite ends of a cylindrical collar 105 through which an elongated tube 106 slides.

The top of the tube 106 includes a rectangular head member 107 thereon to which an elevator platform 110 is secured. The elevator platform 110 includes a plate member 111 which is bolted to the head member 107 and has an angle bar 112 secured at one end thereof and a vertical plate 113 secured at the other end thereof. A plurality of rollers 114 are mounted on the vertical leg of the angle bar 112 and the vertical plate 113 and extend therebetween. The tops of the rollers extend slightly above the vertical leg of the angle bar 112.

Within one of the rollers 114' is a shaft 115 (Fig. 10) which is non-rotatably secured to the angle bar 112 and the vertical plate 113. The shaft 115 has a slot 116 cut therein (see Fig. 10) with a pin 117 extending across said slot and a free resilient ball 118 in the slot. Thus it is seen that as the roller rotates in one direction the

ball 118 is urged toward the center of the slot 116 where it is engaged by the pin 117. As the roller rotates in the reverse direction, the ball 118 is urged toward the end of the slot where it engages and binds against the roller and thus prevents rotation thereof.

Two outer rods 120 and a central rod 121 slidably extend through the angle bar 112 and the vertical plate 113, (see Fig. 9). On the outside of the angle bar 112 the rods 120 each have a hexagonal lifting head 122 on the end thereof and the rod 121 has a downwardly and inwardly extending handle 123 thereon. A bar 124 connects the rods 120 and 121 adjacent the hexagonal heads 122 and the handle 123. Disposed about the rod 121 I arrange a compression spring 125, one end of which bears against the angle bar 112 and the other end of which bears against a collar 126 secured on the rod 121. A tube 127 slidably fits over the rear end of the rod 121 and slidably extends through the vertical plate 113. The rear end of the tube 127 is closed and includes a socket 128 in which a ball 129 is positioned. A compression spring 130 is disposed about the rod 121 and at one end engages the end of the tube 127 and at the other end engages a collar 131 secured to the rod 121.

A shaft 134 (Fig. 9) extends outwardly from the vertical plate 113. The shaft supports a but 135 and the but 135 supports a disc 136. The inner face of the disc 136 is spaced from the vertical plate 113 and includes a cam 137 adapted to engage the ball 129 in the tube 127. The disc is adapted to shift into a number of positions in one of which the cam 137 will engage the ball 129 and force the tube 127 and the rod 121 forwardly and by means of the bar 124 also force the rods 120 forwardly. The outer face of the disc 136 has a plurality of pegs 138 thereon, one peg for each position into which the disc 136 may be shifted.

The pegs 138 are adapted to be engaged by the top of an arm 140, (see Fig. 2) pivotally mounted on one of the angle members 101. A tension spring 142 normally urges the arm 140 toward the center of the disc 136 and a stop member 143 secured to the angle member 101 limits the movement of the arm 140 toward the disc 136. The construction is such that as the elevator descends, the top of the arm 140 engages one of the pegs 138 and rotates the disc 136 to the next shifted position.

A cross bar 144 extends between, and is secured to, the angle bar 112 and the vertical plate 113 at the ends thereof adjacent the feed conveyor 11. A pair of stop bars 145 are secured to the cross bar 144 and extend downwardly therefrom. Between the stop bars 145 is a bar 146 which extends downwardly and then inwardly and is adapted to engage the top of an adjustable rod 147 in the lever 37.

Pivotally secured to the bottom of the plate 111 is a swing arm 148 having a laterally extending portion 149 at the bottom thereof and which secures one end of a tension spring 150. The lower end of the tube 106 includes a collar 151 to which an upwardly inclined bar 152 is secured. The upper end of the bar is secured to the other end of the tension spring 150.

A bar 155 extends transversally between the longitudinal angle members 103 and has depending leg portions 156 at each end thereof. The leg portion 156 slidably extends through the horizontal legs of the angle members 103 and each is surrounded by a compression spring 157, the top of which engages the angle member 103 and the bottom of which engages a washer 158 held in place by a nut 159 threadedly engaging the lower end of the leg 156.

A bar 160 is secured to and extends between the angle members 103 and has a lever 161 pivotally mounted thereon. One end of the lever 161 is adapted to engage the swing arm 148 and urge it inwardly and the other end is adapted to engage and raise the rocker arm 39 (see Fig. 4). When the swing arm 148 is thus urged inwardly, the laterally extending portion 149 thereon is in position to engage the bar 155 as the elevator rises for a purpose to be hereinafter described.

A channel member 165 extends between the extended portions of angle members 97 and 98 (see Figs. 1 and 5) and a channel member 166 extends between the members 97 and 98 adjacent the uprights 60 and 60c. An angle member 166' extends between the members 97 and 98 adjacent the uprights 60a and 60b. An electric motor 167 is mounted on the channel members 165 and 166. The motor 167 by means of a reduction gear 168 drives a shaft 169 on which a gear 170 is mounted. The gear 170 is adapted to drive a large gear wheel 171 mounted on a shaft 172 which is journaled in a bearing bracket 173 on the vertical angle member 99 and in a bearing bracket 174 on a vertical angle member 175 extending between the members 98 and 100 and disposed between the uprights 60. In Figs. 2, 3 and 4 the gear 170 drives the gear wheel 171 in a counterclockwise direction.

The motor 167 includes a brake mechanism 176 which normally prevents the shaft 169 from rotating backwards. The brake mechanism includes an operating rod 177 which is adapted to release the brake and allow the shaft 169 to rotate backwards. A lever arm 178 is pivotally mounted on the motor 167 and is pivotally secured to the operating rod 177 at one end thereof. At the other end thereof the lever 178 is pivotally secured to a rocker arm 179 pivoted to a boss 180 extending from the upright 60c. A cam wheel 181 mounted on the shaft 172 has a cam 182 thereon which is adapted to engage the rocker arm 179 when the elevator is in lowered position. When the cam 182 engages the rocker arm 179 the brake mechanism 176 is forced into operative position and when the cam does not engage the rocker arm the brake mechanism may be urged into inoperative position by means to be hereinafter described.

Bearing blocks 185 are secured to the longitudinal angle members 101 and support a shaft 186 on which a sprocket 187 is eccentrically mounted. One end of a chain 188 is secured to the gear wheel 171 near the outer periphery thereof. The chain 188 passes over the sprocket 187 and extends downwardly and is mounted at its other end on a boss 189 on the collar 151 on the tube 106.

It will thus be seen that as the gear wheel 171 rotates the elevator 110 will be raised and lowered by means of the chain 188. The eccentric sprocket 187 is so set as to provide means to control the movement of the elevator so that the elevator starts to rise slowly, travels faster during the middle of its motion, and then goes slowly as it reaches the top of its stroke. The movement is similar as the elevator descends.

A shaft 200 (see Figs. 2 and 3) is pivotally mounted between the longitudinal angle mem-

bers 101 and has an arm 201 secured thereto. The arm 201 extends downwardly and then inwardly and has a switch 202 mounted thereon. The switch 202 includes two operating arms 203 and 204. The operating arm 203 has a roller 205 rotatably mounted thereon which is adapted to engage an arcuate cam 206 on the rim of the gear wheel 171. The switch 202 controls the motor 167 and the construction is such that when the wheel 205 engages the cam 206 the switch 202 shuts off the motor 167.

As shown the wheel engages the cam when the elevator is in lowered position. The downwardly extending portion of the supporting arm 201 has a threaded adjustable rod 207 extending therefrom and engaging the member 100 to thus limit the swinging movement of the arm 201. A tension spring 208 has one end thereof secured to the supporting arm 201 and the other end thereof secured to the bearing bracket 174 and thus normally urges the supporting arm downwardly.

Also mounted on the shaft 200 I provide an upwardly extending trigger member 209 which is adapted to be rocked by engagement with a box delivered upon the elevator platform, thus rotating the shaft 200 and rocking the supporting arm 201 and lifting the switch 202 to release the wheel 205 from engagement with the cam 206 and thus turn on the motor 167. A stop member 210 is secured to the transverse angle member 100 and is positioned slightly behind the trigger member 209 and is adapted to be engaged by a box delivered to the elevator to thus limit the movement of the trigger member 209.

Angle members 211 which extend upwardly from the channel member 166 and the angle member 166' have inwardly extending legs adapted to be engaged by rollers 212 on opposed ends of an arm 213 which extends through the collar 151. Thus any tendency for the tube 106 to bind in the collar 105 as the elevator is raised is eliminated.

A stacking trough 215 is secured to the cross member 61 and by means of angle members 216 is secured to transverse members 62 and 62'. The lower end of the trough 215 is outwardly flared as at 217 to act as guides for a box being raised by the elevator. A rod 218 extends downwardly along one side of the trough 215 and at the top thereof extends inwardly over the trough. A switch 219 is mounted on one of the angle members 216 and includes an operating arm 220 through which the rod 218 slidably extends. A collar 221 on the rod 218 engages the top of the operating arm 220 and a compression spring 222 engages the bottom of the operating arm 220 and is held in place by a collar 223 on the rod 218. The rod 218 extends downwardly and engages a tongue 224 secured to the cross channel 72. The switch 219 controls the motor 167.

A pair of frame members 230 are secured to the uprights 60*a* and 60*b* and extend therefrom at substantially right angles to the frame members 14. The frame members 230 are supported at their outer ends by legs 231. Mounted on each frame member 230 is a bearing bracket 232. The bearing brackets 232 support a shaft 233 on which are mounted a pair of sprockets 234 and one end of a pair of channel guides 235. The channel guides 235 extend between the uprights 60*a* and 60*b* and are positioned adjacent opposed sides of the elevator platform 110. Each channel guide 235 includes downwardly extending side portions 236 which pivotally support therebetween a sprocket 237. The channel guides support the upper and lower reaches of continuous chains 238, the ends of which are supported by the sprockets 234 and 237 (see Fig. 5). The channel guides extend beyond the sprockets 237 and at the ends thereof are joined by a rod 239 (see Fig. 2). When in lowered position, the channel guides 235 are adapted to rest on blocks 225 mounted on one of the members 101 (see Figs. 2 and 5).

The rod 239 has a boss 240 thereon to which an air cylinder 241 (Fig. 2) is pivoted and from which a piston rod 243 extends and is secured to a boss 244 on an inclined member 245 (Fig. 5) secured at one end thereof to the channel member 165 and at the other end thereof to the angle member 211 (see Fig. 5). The cylinder 241 includes an air outlet (not shown) so that air may be allowed to enter the cylinder above the piston as the cylinder rises and to slowly escape therefrom as the cylinder descends.

The rod 239 has an apertured boss 246 through which a chain 247 extends. The lower end of the chain 247 engages one end of a tension spring 248 and the other end of the spring engages the rocker arm 179. A pin (not shown) may be inserted through any link in the chain 247 to thus prevent said link from passing through the apertured boss 246. The chain 247 extends upwardly and through an apertured tongue 249 secured to the member 61. The upper end of the chain is prevented from sliding through the apertured tongue by means of an enlarged ring 250 arranged on the uppermost link in the chain. The chain 247 is so adjusted in the boss 246 that when the channel guides 235 are in lowered position, as shown in Fig. 2, the spring 248 does not act upon the rocker arm 179, but when the channel guides are in raised position the spring 248 tends to urge the rocker arm 179 upwardly and to thus release the brake mechanism 176.

A rod 260 extending between the uprights 60 and 60*c* and is pivotally secured thereto. The rod 260 has two depending notched arms 261 thereon and a further depending actuating arm 262 to the lower end of which one end of a tension spring 263 is secured. The other end of the spring being secured to a rod 264 extending between the channel members 102 and 104. The notched portions of the arms 261 are adapted to receive the ends of the rod 239 when the channel guides are in raised position.

One end of a tension spring 265 is secured to a boss 266 on one of the channel guides 235 and the other end is secured to the lever 161 to thus actuate said lever when the channel guides are raised. The other channel guide has one end of a spring 267 secured thereto. The other end of the spring 267 is secured to a chain 268, the chain being in turn secured to the operating arm 204 of the switch 202 to thus actuate said switch when the channel guides 235 are in raised position and thus shut off the motor 167.

A cross bar 270 extends between the channel guides 235 and is adapted to be engaged by the hexagonal heads 122 on the elevator platform rods 120 and the handle 123 on the rod 121 when said rods are urged forwardly by the cam 137. When the rods 120 and 121 are thus extended and the elevator rises, the hexagonal heads 122 and the handle 123 engage the cross bar 270 and thus lift the channel guides 235. As the channel guides are lifted, the switch 202 is actuated by means of spring 267 and chain 268 to shut off

the motor 167 and thus stop the elevator platform from being urged further upwardly.

As the channel guides are moved upwardly, the spring 265 actuates the lever 161 so that it moves the swing arm 148 into position to engage the bar 155 and thus prevent further upward motion of the elevator due to its inertia. As the channel guides move upwardly, the chain 247 and the spring 248 actuate the rocker arm 179 which rocks the lever 178 to move the operating rod 177 and thus release the brake mechanism 176 and allow the gear wheel 171 to turn backwardly and thus let the elevator down. As the elevator reaches its lowest position the cam 182 engages the rocker arm 179 and thus moves the brake mechanism into operative position to stop the backward motion of the gear wheel 171 and thus prevent the elevator from rising again due to the inertia of the backwardly rotating gear wheel.

Extending between the frame members 230 is a channel member 271 (Fig. 5) on which upwardly extending legs 272 are mounted, the legs 272 supporting a channel beam 273 upon the tops thereof. On the beam 273 rests one end of a pair of channel guides 274, the other ends of which are mounted on the shaft 233. The channel guides 274 each include downwardly extending side portions between which a sprocket 275 is supported.

Bearing brackets 276 are also mounted on the frame members 230 and support a shaft 277 on which an inner pair of sprockets 278 and an outer pair of sprockets 279 are mounted. The sprockets 278 and the sprockets 275 support opposed ends of a pair of continuous chains 280, the upper reaches of which are supported by channel guides 274. The sprockets 279 support one end of a pair of continuous chains 281 which may extend to any desired location and which may be driven by any suitable means.

The shafts 233 and 277 each extend on one side beyond the frame members 230. Mounted on the shaft 233 is a sprocket 282 and mounted on the shaft 277 is a sprocket 283. The sprockets 282 and 283 support opposed ends of a continuous chain 284. Thus the chains 281 by means of the shaft 277 drive the chains 280 and by means of chain 284 drive the chains 238.

Pivotally mounted to a boss 295 on the channel member 271 is a trip release member 296 which has an upwardly and then downwardly extending portion 297 adapted to be engaged and rocked by a stack of boxes being discharged from the stacking mechanism. The trip release extends downwardly and has one end of a rod 298 pivotally connected thereto. The rod extends rearwardly and has a tube 299 at the other end thereof into which a rod 300 pivotally connected to the actuating arm 262 extends. The rod 300 has a collar 301 thereon to limit the movement of the rod into the tube 299. One end of a tension spring 302 is secured to the trip release 296 and the other end of the spring is secured to a depending arm 303 secured to a cross piece 304 between the channel guides 274.

A box being conveyed by the belt conveyor is delivered thereby onto the chains 26 which carry it towards the elevator platform 110. Assuming that the elevator and discharge conveyor are both in lowered position, as shown in Fig. 2, the box passes over the spring plate 45 without actuating the switch 40, as previously described, passes over the stop member 49 and onto the cylinder 67. A guide member 310 is secured to each of the uprights 60 and 60a. The guide members serve to guide the box as it is delivered onto the cylinder 67. The cylinder 67 urges the box onto the elevator rollers 114 and against the trigger member 209. As previously described, any tendency of the box to bounce back from the trigger member is eliminated by the brake mechanism in the roller 114'.

When the box engages the trigger member 209, the shaft 200 rotates, thus raising the arm 201 and thereby raising the switch roller 205 from engagement with the cam 206. This actuates the switch 202 and turns on the motor 167. The motor 167 drives the gear 169 which rotates the gear wheel 171 which by means of the chain 188 raises the elevator with the box thereon. As the box is raised from engagement with the trigger member 209, the switch 202 is lowered by means of the spring 208. At this time the cam 206 has rotated away from the switch wheel 205 and the motor 167 continues to drive the gear wheel 171 until the cam again engages the switch wheel 205.

As the box is raised by the elevator, the box engages the cross channels 72 and forces the arms 71 outwardly. The elevator raises the box slightly above the cross channels 72 at which time the arms 71 resume their original position (see Fig. 3) and support the box thereon. If the box should be too long or should extend too far under the cross channel 72 adjacent the feed conveyor, the box would raise the extensible arms and tongue 224 would actuate the switch 219 and thus shut off the motor 167.

When the elevator rises, the lever 37 is rocked and thus lowers the chains 26. A further box being conveyed by the chains 26 will press the spring plate 45 and actuate the switch 40, as previously described, and will be urged against the stop member 49. When the elevator descends, the chains 26 are raised and the switch 40 is released and the further box is delivered to the elevator.

For every descent of the elevator, the disc 136 is advanced one position by the arm 140 as previously described. Once during each revolution of the disc 136, the cam 137 forces the rods 120 and 121 forwardly so that the lifting heads 122 are in position to engage the cross bar 270. This occurs when the lowermost box of a stack is on the elevator platform. As the elevator rises the heads 122 raise the cross bar 270 and the latter raises the channel guides 235. When the channel guides 235 are raised the notched portions of the arms 261 engage the ends of the rod 239 on the channel guides 235.

As the channel guides are lifted the switch 202 is actuated to stop the motor 167 so that the elevator only rises high enough to allow the notched portion of the arms 261 to engage the rod 239. As the channel guides are moved upwardly, spring 265 moves the lever 161 and the latter moves arm 148 to cause the latter to engage bar 155 and stop upward movement of elevator due to its inertia. As the channel guides move upwardly chain 247 and spring 248 operate rod 177 to release brake 176 and allow wheel 171 to lower the elevator. At the lowest elevator position cam 182 rocks arm 179 to cause the brake mechanism to stop backward movement of wheel 171 and prevent movement of elevator due to inertia of wheel 171.

The elevator has thus descended and has left the channel guides supported in raised position by engagement with the notched portions of

arms 261. The downward movement of the elevator causes the lowermost box to engage the chains 239. The arms 271 are held apart, as shown in Fig. 4, by engagement with the last box while the chains 238 convey the stack away from the elevator. The stack being thus discharged engages and rocks the trip release member 296 which moves the rods 298 and 300 and thus rocks the rod 260 and releases the rod 239 from the notched arms 261 and allows the channel guides to resume their lowered position.

If the boxes within the trough should be raised too high, the uppermost box would engage and raise the rod 218 and actuate the switch 219 to thus shut off the motor 167.

Having thus described my invention, I claim:

1. In a box handling apparatus, an elevator, a stacking trough positioned in the path of movement of a box on said elevator, means to feed boxes to said elevator, means actuated by the delivery of a box onto said elevator to operate said elevator, opposed arms alongside the elevator and mounted to move to and from the path of a box on the elevator, the arms on one side of the elevator being extensible, resilient means to normally hold the extensible arms in non-extended position, and means actuated by the extension of said extensible arms to shut off said elevator operating means.

2. In a box handling apparatus, an elevator, a stacking trough positioned in the path of movement of a box on said elevator, means to feed boxes to said elevator, means actuated by the delivery of a box onto said elevator to operate said elevator, opposed arms alongside the elevator and mounted to move to and from the path of a box on the elevator, the arms of one side of the elevator being extensible, resilient means to normally hold the arms in non-extended position, means actuated by the extension of said extensible arms to shut off said elevator operating means, and means operated by a box moving above a predetermined height in said stacking trough for shutting off the elevator operating means.

3. In a box handling apparatus, an elevator, a chain secured at one end thereof to said elevator, a wheel, means to rotate said wheel, the other end of said chain being secured to said wheel at a point spaced from the axis of said wheel, an eccentrically mounted sprocket, said chain passing over said eccentric sprocket, said sprocket being so adjusted that as the wheel rotates, the elevator is raised and lowered, the eccentricity of the sprocket being such that the elevator travels slowly at the end portions of its path and faster at the central portion of its path.

4. In a box handling apparatus, an elevator, means to operate said elevator, a stacking trough positioned in the path of movement of a box on said elevator, a feed conveyor adapted to deliver boxes to said elevator, means to support boxes raised by said elevator in said trough to form a stack, a discharge conveyor operable to discharge a stack of boxes from said trough, said discharge conveyor being arranged adjacent to the lower end of the stacking trough and including an end portion disposed in the path of movement of the lower one of the stack of boxes descending in the stacking trough, said discharge conveyor being mounted to move from a lower inoperative position below the position occupied by the elevator when in its lowermost position to an upper operative position above the position occupied by the elevator when in its lowermost position, means actuated by the delivery of a box onto said elevator to actuate said elevator operating means and to thereby raise and lower said elevator, means to shut off said elevator operating means upon the descent of said elevator, means to move said discharge conveyor from operative to inoperative position and vice versa and means to shut off said elevator operating means when said discharge conveyor is in operative position.

5. In a box handling apparatus, an elevator, means to operate said elevator, a stacking trough positioned in the path of movement of a box on said elevator, a feed conveyor adapted to deliver boxes to said elevator, means to support boxes raised by said elevator in said trough to form a stack, a discharge conveyor operable to discharge a stack of boxes from said trough, said discharge conveyor being arranged adjacent to the lower end of the stacking trough and including an end portion disposed in the path of movement of the lower one of a stack of boxes descending in the stacking trough, said discharge conveyor being mounted to move from a lower inoperative position below the position occupied by the elevator when in its lowermost position to an upper operative position above the position occupied by the elevator when in its lowermost position, means actuated by the delivery of a box onto said elevator to actuate said elevator operating means and to thereby raise and lower said elevator, means to shut off said elevator operating means upon the descent of said elevator, means to move said discharge conveyor from operative to inoperative position and vice versa and means to shut off said elevator operating means when said discharge conveyor is in raised operative position.

6. In a box handling apparatus, an elevator, a motor having a driven shaft with a gear wheel thereon, means whereby said gear wheel raises and lowers said elevator, a brake on said shaft, said brake being adapted to prevent said shaft from rotating in a reverse direction to that in which it is driven, means to feed boxes to said elevator, a stacking trough, means to support boxes in said trough to form a stack, a discharge conveyor, said discharge conveyor being arranged adjacent to the lower end of the stacking trough and including an end portion disposed in the path of movement of the lower one of a stack of boxes descending in the stacking trough, said discharge conveyor being mounted to move from a lower inoperative position below the position occupied by the elevator when in its lowermost position to an upper operative position above the position occupied by the elevator when in its lowermost position, means to move the discharge conveyor to operative position when the stack reaches a predetermined height to thereby discharge a stack of boxes from said trough, means to shut off said motor when said discharge conveyor is in operative position, means to release said brake when said discharge conveyor is in operative position to thus allow the elevator to descend, and means to reengage said brake when said elevator has reached its lowermost position.

7. In a box handling apparatus, an elevator, a chain secured at one end thereof to said elevator, a wheel, a motor, means whereby said motor rotates said wheel, the other end of said chain being secured to said wheel, a sprocket,

said chain passing over said sprocket, a stacking trough positioned in the path of movement of a box on said elevator, means to deliver boxes to said elevator, opposed arms mounted to move to and from the path of a box on the elevator, means operated by a box moving above a predetermined height in said stacking trough for shutting off the motor, a discharge conveyor operable to discharge a stack of boxes from said trough, said discharge conveyor being arranged adjacent to the lower end of the stacking trough and including an end portion disposed in the path of movement of the lower one of a stack of boxes descending in the stacking trough, said discharge conveyor being mounted to move from a lower position below the position occupied by the elevator when in its lowermost position to an upper position above the position occupied by the elevator when in its lowermost position, lifting means movably mounted on the elevator and movable to a position to engage and lift the discharge elevator to its upper position when the elevator ascends, means to move the lifting means to elevator engaging position, means to hold the discharge conveyor in elevated position while the elevator descends, means to release the discharge conveyor holding means, and means to shut off said elevator operating means upon the descent of said elevator.

8. In a box handling apparatus, an elevator, a chain secured at one end thereof to said elevator, a wheel, a motor, a shaft driven by said motor, means whereby said shaft rotates said wheel, a brake on said shaft, said brake being adapted to prevent said shaft from rotating in a direction reverse to that in which it is driven, the other end of said chain being secured to said wheel, a sprocket, said chain passing over said sprocket, a stacking trough positioned in the path of movement of a box on said elevator, means to deliver boxes to said elevator, opposed arms mounted to move to and from the path of a box on the elevator, a discharge conveyor operable to discharge a stack of boxes from said trough, said discharge conveyor being arranged adjacent to the lower end of the stacking trough and including an end portion disposed in the path of movement of the lower one of a stack of boxes descending in the stacking trough, said discharge conveyor being mounted to move from a lower position below the position occupied by the elevator when in its lowermost position to an upper position above the position occupied by the elevator when in its lowermost position, lifting means movably mounted on the elevator and movable to a position to engage and lift the discharge elevator to its upper position when the elevator ascends, means to move the lifting means to elevator engaging position, means to hold the discharge conveyor in elevated position while the elevator descends, means to release the discharge conveyor holding means, and means to release said brake when said discharge conveyor is in operative position.

9. In a box handling apparatus, an elevator, a chain secured at one end thereof to said elevator, a wheel, a motor, means whereby said motor rotates said wheel, the other end of said chain being secured to said wheel, an eccentrically mounted sprocket, said chain passing over said eccentric sprocket, the eccentricity of the sprocket being such that the elevator travels slowly at the end portions of its path and faster at the central portion of its path, a stacking trough positioned in the path of movement of a box on said elevator, means to deliver boxes to said elevator, opposed arms mounted to move to and from the path of a box on the elevator, a discharge conveyor operable to discharge a stack of boxes from said trough, said discharge conveyor being arranged adjacent to the lower end of the stacking trough and including an end portion disposed in the path of movement of the lower one of a stack of boxes descending in the stacking trough, said discharge conveyor being mounted to move from a lower position below the position occupied by the elevator when in its lowermost position to an upper position above the position occupied by the elevator when in its lowermost position, lifting means movably mounted on the elevator and movable to a position to engage and lift the discharge elevator to its upper position when the elevator ascends, means to move the lifting means to elevator engaging position, means to hold the discharge conveyor in elevated position while the elevator descends, means to release the discharge conveyor holding means, and means to shut off said elevator operating means upon the descent of said elevator.

10. In a box handling apparatus, an elevator, a chain secured at one end thereof to said elevator, a wheel, a motor, means whereby said motor rotates said wheel, the other end of said chain being secured to said wheel, an eccentrically mounted sprocket, said chain passing over said eccentric sprocket, the eccentricity of the sprocket being such that the elevator travels slowly at the end portions of its path and faster at the central portion of its path, a stacking trough positioned in the path of movement of a box on said elevator, means to deliver boxes to said elevator, opposed arms mounted to move to and from the path of a box on the elevator, the arms of one side of the elevator being extensible, means to normally hold the arms in non-extended position, means actuated by the extension of said extensible arms to shut off said motor, a discharge conveyor operable to discharge a stack of boxes from said trough, said discharge conveyor being arranged adjacent to the lower end of the stacking trough and including an end portion disposed in the path of movement of the lower one of a stack of boxes descending in the stacking trough, said discharge conveyor being mounted to move from a lower position below the position occupied by the elevator when in its lowermost position to an upper position above the position occupied by the elevator when in its lowermost position, lifting means movably mounted on the elevator and movable to a position to engage and lift the discharge elevator to its upper position when the elevator ascends, means to move the lifting means to elevator engaging position, means to hold the discharge conveyor in elevated position while the elevator descends, said lifting means including a step by step mechanism operable one step each time the elevator descends, and means to shut off said elevator operating means upon the descent of said elevator.

11. In a box handling apparatus, an elevator, a chain secured at one end thereof to said elevator, a wheel, a motor, means whereby said motor rotates said wheel, the other end of said chain being secured to said wheel, a sprocket, said chain passing over said sprocket, a stacking trough positioned in the path of movement of a box on said elevator, means to deliver boxes to said elevator, opposed arms mounted to move to and from the path of a box on the elevator, the arms

of one side of the elevator being extensible, means to normally hold the arms in non-extended position, means actuated by the extension of said extensible arms to shut off said motor, means operated by a box moving above a predetermined height in said stacking trough for shutting off the motor, a discharge conveyor operable to discharge a stack of boxes from said trough, said discharge conveyor being arranged adjacent to the lower end of the stacking trough and including an end portion disposed in the path of movement of the lower one of a stack of boxes descending in the stacking trough, said discharge conveyor being mounted to move from a lower inoperative position below the position occupied by the elevator when in its lowermost position to an upper operative position above the position occupied by the elevator when in its lowermost position, means actuated by the delivery of a box onto said elevator to actuate said elevator operating means, means to shut off said elevator operating means upon the descent of said elevator, a disc on said elevator adapted to be rotated step-by-step into a predetermined number of positions, means to advance said disc one step upon each descent of said elevator, a plurality of movable rods on said elevator, means connecting said rods and operable to shift said discharge conveyor, a cam on said disc, means whereby said cam moves said rods and the connecting means, when said disc is in one position, to thereby cause said discharge conveyor to move to operative position by the next ascent of the elevator.

12. In a box handling apparatus, an elevator, a chain secured at one end thereof to said elevator, a wheel, a motor, means whereby said motor rotates said wheel, the other end of said chain being secured to said wheel, a stacking trough positioned in the path of movement of a box on said elevator, means to deliver boxes to said elevator, opposed arms mounted to move to and from the path of a box on the elevator, the arms of one side of the elevator being extensible, means to normally hold the arms in non-extended position, means actuated by the extension of said extensible arms to shut off said motor, a discharge conveyor operable to discharge a stack of boxes from said trough, said discharge conveyor being arranged adjacent to the lower end of the stacking trough and including an end portion disposed in the path of movement of the lower one of a stack of boxes descending in the stacking trough, said discharge conveyor being mounted to move from a lower inoperative position below the position occupied by the elevator when in its lowermost position to an upper operative position above the position occupied by the elevator when in its lowermost position, means to shut off said elevator operating means upon the descent of said elevator, a disc on said elevator adapted to be rotated step-by-step into a predetermined number of positions, means to advance said disc one step upon each descent of said elevator, a plurality of movable rods on said elevator, means connecting said rods and operable to shift said discharge conveyor, a cam on said disc, means whereby said cam moves said rods and the connecting means, when said disc is in one position, to thereby cause said discharge conveyor to move to operative position by the next ascent of the elevator.

13. In a box handling apparatus, an elevator, a chain having one end secured to said elevator, a wheel, a motor, means whereby said motor rotates said wheel, the other end of said chain being secured to said wheel, an eccentrically mounted sprocket receiving said chain, said sprocket being so adjusted that as the wheel rotates the elevator is raised and lowered, the eccentricity of the sprocket being such that the elevator travels slowly at the end portions of its path and faster at the intermediate portion of its path, a stacking trough in the path of movement of a box on said elevator, means to deliver boxes to said elevator, opposed arms alongside the elevator and mounted to move to and from the path of a box on the elevator, the arm of one side of the elevator being extensible, resilient means to normally hold said one arm in non-extended position, means actuated by the extension of said extensible arm to shut off said motor, means operated by a box moving above a predetermined height in said stacking trough for shutting off the motor, a discharge conveyor operable to discharge a stack of boxes from said trough, said discharge conveyor being arranged adjacent to the lower end of the stacking trough and including an end portion disposed in the path of movement of the lower one of a stack of boxes descending in the stacking trough, said discharge conveyor being mounted to move from a lower inoperative position below the position occupied by the elevator when in its lowermost position to an upper operative position above the position occupied by the elevator when in its lowermost position, means actuated by the delivery of a box onto said elevator to actuate said elevator operating means and to thereby raise and lower said elevator, means to shut off said elevator operating means upon the descent of said elevator, a disc on said elevator adapted to be rotated step-by-step, means to advance said disc one step upon each descent of said elevator, a plurality of movable rods on said elevator, means connecting said rods and operable to shift said discharge conveyor, a cam on said disc, and means whereby said cam moves said rods and the connecting means when said disc is in one position, to thereby cause said discharge conveyor to move to operative position upon the next ascent of the elevator.

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