ABSTRACT

A machine for stacking and bundling flat articles. An upright stack of articles is formed on an elevator arm with the articles extending horizontally. A horizontal compressor foot is lowered to compress the stack. The stack is pushed into a generally U-shaped basket having open ends and parallel spaced sides. The basket is swung to a lay-over position in which the sides of the basket are upright to swing the stack to a position in which articles in the stack are upright. A basket clearing pusher assembly discharges the stack from the basket.
MACHINE FOR STACKING AND BUNDLING FLAT ARTICLES

This invention relates to a machine for handling cartons and the like. More particularly, this invention relates to a machine for counting and assembling cartons in bundles.

An object of this invention is to provide a machine of this type in which flat articles such as flat cartons or the like are counted, assembled in a stack after being counted, and in which the stack is compressed into a bundle which is transferred from the assembly portion of the machine into a basket in which the compressed stack is held until discharged from the machine.

A further object of this invention is to provide such a machine in which protective pads are disposed at opposite ends of the stack.

A further object of this invention is to provide such a machine in which the flat cartons are assembled in a vertical stack that is advanced into the basket while the stack remains vertical, and in which the basket is turned 90 degrees with the stack thereinside before the stack is discharged with the stack extending horizontally as it is discharged.

Briefly, this invention provides a carton assembling and bundling machine in which flat cartons are delivered to a counting device in shingled fashion in the manner generally shown in Lloyd and Beckman U.S. Pat. No. 3,678,525. The counting device is generally of the type shown in Lloyd U.S. Pat. application Ser. No. 213,333 filed Dec. 29, 1971. From the counting device, the cartons are delivered onto an elevator in which a first portion of a stack is accumulated. When the first portion of the stack has been accumulated, the stack is transferred to a second elevator on which the remainder of the stack is accumulated. Pads are positioned at opposite ends of the stack. The first elevator is provided with readily releasable turnable flange members which support the first portion of the stack as it is being accumulated and which can be swung quickly out of position to release the first portion of the stack onto the second elevator when the elevators are aligned. When a full stack has been accumulated, a stack compressing device compresses the stack on the second elevator. The stack compressing device has presser feet which are parallel to arms of the second elevator. The compressed stack is discharged lengthwise of the elevator arms and the presser feet into a basket which holds the compressed stack while the basket is laid over to align the axis of the stack to a horizontal position at which the stack is discharged. The stack is discharged from the basket by a basket clearing pusher assembly which advances the stack transversely of the direction the stack is advanced into the basket.

The above and other objects and features of the invention will be apparent to those skilled in the art to which this invention pertains from the following detailed description and the drawings in which:

FIG. 1 is a somewhat schematic view in side elevation of a carton handling machine constructed in accordance with an embodiment of this invention;

FIG. 2 is a fragmentary view in upright section on an enlarged scale of a pad transfer section of the machine;

FIG. 3 is a fragmentary view in upright section showing belt conveyors of the machine;

FIG. 4 is a fragmentary view in upright section of a counter portion of the machine;

FIG. 5 is a fragmentary plan view looking in the direction of the arrows 5—5 in FIG. 4;

FIG. 6 is a fragmentary plan view of the counter portion of the machine;

FIG. 7 is a view in side elevation of a pad delivery section of the machine, parts being broken away for clarity;

FIG. 8 is a view in section taken on the line 8—8 in FIG. 7;

FIG. 9 is a view in section taken generally on the line 9—9 in FIG. 8;

FIG. 10 is a view in transverse section of the machine showing a roll raising apparatus, other structure being omitted for clarity;

FIG. 11 is a fragmentary plan view of the roll raising apparatus shown in FIG. 10;

FIG. 12 is a view in section taken on the line 12—12 in FIG. 11;

FIG. 13 is a view in transverse section of the machine showing a control valve and valve operating mechanism;

FIG. 14 is a view in section taken on the line 14—14 in FIG. 13, nip rolls of the machine being shown in association therewith;

FIG. 15 is a view in section taken on the line 15—15 in FIG. 14;

FIG. 16 is a view in side elevation of a control valve operating member of the machine;

FIG. 17 is a view in section taken on the line 17—17 in FIG. 13;

FIG. 18 is a view in side elevation of a first elevator assembly of the machine, parts being broken away for clarity;

FIG. 19 is a view in section taken on the line 19—19 in FIG. 18, parts being broken away for clarity;

FIG. 20 is a view in section taken on the line 20—20 in FIG. 19;

FIG. 21 is a view in section taken on the line 21—21 in FIG. 20;

FIG. 22 is a fragmentary view taken in the direction of the arrows 22—22 in FIG. 20;

FIG. 23 is a view in transverse section of the machine showing a fragmentary portion of the first elevator assembly together with limit switches operated thereby;

FIG. 24 is a view in side elevation of a second elevator assembly of the machine;

FIG. 25 is a view in section taken on the line 25—25 in FIG. 24;

FIG. 26 is a view in section taken on the line 26—26 in FIG. 24, limit switches being shown in position, fragmentary portions of the first elevator assembly in lowered position being shown in association therewith;

FIG. 27 is a view in side elevation of a stack compressing assembly of the machine, fragmentary portions of the second elevator assembly and of a first horizontal pusher assembly being shown in association therewith, presser feet thereof being shown in advanced position overlying a stack of cartons, the presser feet being shown in lowered position in dot-dash lines, the stack in compressed position being shown in dot-dash lines;

FIG. 28 is a view in section taken on the line 28—28 in FIG. 27, limit switches being omitted for clarity;
FIG. 29 is a fragmentary view in side elevation of the stack compressing assembly in raised and retracted position;

FIG. 30 is a fragmentary view in cross section taken on the same line as FIG. 28 but showing limit switches;

FIG. 31 is a view in side elevation of the first horizontal pusher assembly, parts being broken away to reveal structural detail;

FIG. 32 is a view in section taken on the line 32—32 in FIG. 31;

FIG. 33 is a view in section taken on the line 33—33 in FIG. 31;

FIG. 34 is a view in side elevation of a layover basket assembly of the machine in lowered position, a stack of cartons being shown therein in dot-dash lines;

FIG. 35 is a view in end elevation of the layover basket assembly in lowered position;

FIG. 36 is a fragmentary view in side elevation of the layover basket assembly in raised position, presser feet of the stack compressing assembly and a portion of the first horizontal pusher assembly being shown in association therewith;

FIG. 37 is a view in section taken on the line 37—37 in FIG. 34;

FIG. 38 is a view in end elevation of a basket clearing pusher assembly of the machine in retracted position, a fragmentary portion of the layover basket assembly being shown in association therewith;

FIG. 39 is a view looking in the direction of the arrows 39—39 in FIG. 38;

FIG. 40 is a plan view of the basket clearing pusher assembly in retracted position and the layover basket assembly in lowered position, a discharge table and a fragmentary portion of a stack receiving machine being shown in association therewith;

FIG. 41 is a view in side elevation of a fence of the machine;

FIG. 42 is a view in section taken on the line 42—42 in FIG. 41, fragmentary portions of pusher bars of the basket clearing pusher assembly being shown in association therewith;

FIG. 43 is a fragmentary plan view of an end portion of one of the pusher bars shown in FIG. 42, part being broken away to reveal structural details;

FIG. 44 is a view in section taken on the line 44—44 in FIG. 40;

FIG. 45 is a schematic view of belt and chain drives of the machine;

FIG. 46 is a schematic electrical wiring diagram of a portion of the machine;

FIG. 47 is a schematic electrical wiring diagram of other portions of the machine;

FIG. 48 is a schematic view of hydraulic connections of the machine; and

FIG. 49 is a schematic view of pneumatic connections of the machine;

In the following detailed description and the drawings, like reference characters indicate like parts.

In FIG. 1 is shown a carton handling and bundling machine 40 constructed in accordance with an embodiment of this invention. The machine 40 includes a frame 41 on which rolls 42, 43 and 44 are rotatably mounted.

CARTON ADVANCING BELT ASSEMBLY

The rolls 42, 43 and 44 support a belt 46. Flat cartons are fed onto the upper reach of the belt 46 adjacent the roll 42 and travel in overlapping shingle fashion under a carton restraining arm or discriminator 47 which restrains the cartons so that the cartons flow under the discriminator 47 and from the belt 46 to a belt 49 in a smooth shingle fashion. This discriminator structure can be similar in construction and operation to what is shown in Lloyd and Beckman U.S. Pat. No. 3,678,525. As shown in FIG. 45, the roll 44 is carried by a shaft 49 on which is mounted a sprocket 51. A motor 52 drives gearing (not shown) in a gear box 53 to drive a shaft 54 which carries a sprocket 56. A chain 57 runs on the sprockets 51 and 56, and the motor 52 drives the roll 44 to drives the belt 46.

The belt 48 runs on an idle roll 59 (FIG. 1) at the right hand end thereof as shown in FIG. 1 and runs over idle rolls 61, 62 and 63 (FIG. 3) and therefrom runs upwardly opposite idle rolls 64, 65, 66, 67 and 68 on which a belt 69 runs. From the idle roll 68 the belt 48 runs over idle rolls 70, 71, 72, 73 and 74, a driven roll 76, and idle rolls 77 and 78. The idle rolls 64, 65, 66, 67 and 68 are rotatably mounted between frame plates 79 (FIG. 1) and 81 (FIGS. 1 and 3) mounted on cross frames 82 and 83. The rolls 70, 71, 72, 73, 74, 76 and 77 are rotatably mounted between upper frame plates 84 (FIG. 1) and 86 (FIGS. 1 and 3). The idle rolls 61, 62 and 63 are mounted on frames 87 (FIG. 1) and 88 (FIG. 3) supported on main lengthwise frames 89 (FIG. 1) and 91. The roll 78 is rotatably mounted between plates 92 and 93 carried by the lengthwise main frames 89 and 91. The driven roll 76 is carried by a shaft 92 (FIG. 45) which carries a sprocket 93 on which a drive chain 94 runs.

The chain 94 is driven by a motor 96 which drives gearing (not shown) in a gear box 97 to drive a shaft 98 on which is mounted a sprocket 99. The sprocket 99 drives the chain 94. The chain 94 also runs on an idle sprocket 101 and on a sprocket 102 carried by a shaft 103 which drives a driven roll 104 to drive the belt 69.

From the drive roll 104, the belt 69 travels on idle rolls 106, 107 (FIG. 3) and 108, an adjustable idle roll 109 and an idle roll 111, the idle rolls 64, 65, 66, 67 and 68, then opposite the idle rolls 70, 71 and 72 on which the belt 48 runs in face-to-face relation from the idle roll 64 to the idle roll 112 and carry the cartons upwardly and to the left as shown in FIG. 3 to be discharged onto the portion of the belt 48 between the idle rolls 73 and 74 and beneath a pair of belts 113–114 which run on pairs of rolls or pulleys 116–117 (FIG. 6) and 118–119. As shown in FIG. 3, the roll 109 is mounted on an adjustable shaft 121 which can be drawn to the left as shown in FIG. 3 to tighten the belt 69 by tightening nuts 122 on adjustment belts 123. Similarly, the roll 77 is mounted on an adjustable shaft 124 which can be advanced upwardly and to the left as shown in FIG. 3 to tighten the belt 48. The idle roll 107 is mounted on a shaft 126 which can be pivoted or swung by turning of a threaded member 127 to advance a lug 128 attached to the shaft 126 to the left or right to adjust the direction of the axis of the shaft 126.

The roll 106 is mounted on a shaft 129 which spans the plates 84 (FIG. 1) and 86 (FIGS. 1, 3 and 6). Swinging bars 131 (FIGS. 3 and 6) and 132 (FIG. 6)
are pivotally mounted on the shaft 129. The swinging bars 131 and 132 are urged downwardly by leaf springs 133 and 134 respectively. The springs 133 and 134 are carried by brackets 136 and 137, respectively, which are mounted on a cross shaft 138. The cross shaft 138, in turn, is mounted on and spans the frame plates 84 and 86. A shaft 139 spans the swinging bars 131 and 132. The idle roll 112 is rotatably mounted on the shaft 139, and the idle roll 112 is urged downwardly to hold the upper end portion of the belt 69 (FIG. 3) against the belt 48, but the roll 112 can swing upwardly to accommodate cartons between the belts.

From the idle roll 112, the cartons pass to a counting assembly shown in FIGS. 4 and 6. The counting assembly includes a counting switch 141, which can be of the type described and claimed in the copending application of Allen H. Lloyd, U.S. Pat. Ser. No. 213,333 filed Dec. 29, 1971. The switch 141 includes a plunger 142 which is released as a trailing edge 143 (FIG. 4) of a carton 144 passes over the plunger. The plunger 142 is then depressed by the succeeding carton 144A passes over the plunger. The switch 141 is mounted on a block 146 which, in turn, is mounted on a channel-shaped bracket 147. The channel-shaped bracket 147 is adjustably mounted on a mounting bracket 148 which is carried by a cross frame 149. On opposite sides of the switch 141, the cartons are supported by rolls 151, 152, 153 and 154 (FIG. 6). The rolls 151 and 153 are mounted on shafts 1511 and 1531, respectively, that are journaled in a bearing block 156 attached to the frame plate 86. The rolls 152 and 154 are mounted on shafts 1521 and 1541, respectively, which are journaled in a bearing block 157 mounted on the frame plate 84. The lower course of the belt 113 overlies the rolls 151 and 153, and the lower course of the belt 114 overlies the rolls 152 and 154 to hold the cartons against the rolls 151, 152, 153 and 154 as the cartons pass over the switch 141 in engagement with the plunger 142.

As shown in FIG. 45, the shaft 92 carries a sprocket 159 which drives a chain 161. The chain 161 drives a sprocket 162 on a shaft 163. Sprockets 164 and 166 on the shaft 163 drive chains 167 and 168, respectively. The chain 167 runs on sprockets 169 and 171 carried by the shafts 1521 and 1541 to drive the rolls 152 and 154. The chain 168 runs on sprockets 172 and 173 carried by the shafts 1511 and 1531 to drive the rolls 151 and 153.

The pulleys 116 and 117 (FIG. 6) are carried by a shaft 176 which is rotatably mounted in bearings 177 and 178 mounted on swinging bars 179 and 181. The pulleys 118 and 119 are mounted on a shaft 182 rotatably mounted in bearings 183 and 184 mounted on the swinging bars 179 and 181, respectively. The bars 179 and 181 are rotatably mounted on the cross shaft 138. Adjustment bolts 186 (one of which is shown in FIG. 4) limit downward movement of the swinging bars 179 and 181. The adjustment bolt 186 is threaded in a lug 188 mounted on the plate 86.

The swinging bars 179 and 181 are spaced by a cross plate 189 (FIGS. 4 and 6) and by a cross shaft 191. As shown in FIGS. 4 and 5, bars 192 and 193 are pivotally mounted on the cross shaft 191. A roller 194 is rotatably mounted on a shaft 195, which spans the bars 192 and 193.

The bars 192 and 193 are linked by a plate 196. As shown in FIG. 4, the roller 194 overlies the switch 141 just ahead of the plunger 142. The roller 194 is centered on the plunger 142 as shown in FIG. 5 and urges the cartons 144 into engagement with the plunger 142. A compression spring 197 (FIG. 4) mounted between a boss 198 on the plate 196 and a spring cap 199 urges the bars 192 and 193 and the roller 194 downwardly. The spring cap 199 is mounted on an adjustable bolt 201 carried by the plate 189. A chain 202 linking the plates 189 and 196 limits downward swinging of the roller 194.

As shown in FIG. 45, the shaft 176 carries a sprocket 203. A chain 204 runs on the sprocket 203 and on a sprocket 205 carried by the shaft 103 to drive the pulleys 116, 117, 118 and 119. As these pulleys are driven, the belts 113 and 114 grip the cartons against the rolls 151, 152, 153 and 154 (FIG. 6) as the cartons advance so that the cartons are driven past the switch 141.

From the rolls 151 and 152, the cartons are discharged onto a belt 206 (FIGS. 4 and 9). The belt 206 runs on a pulley 207 which is rotatably mounted on a shaft 208. The shaft 208 spans the plates 84 and 86. The belt 206 also runs on a pulley 209 (FIGS. 9 and 10). The pulley 209 is mounted on a shaft 211 rotatably mounted between bearings 212 and 213 supported on frame plates 214 (FIG. 10) and 216 respectively.

An adjustable idle roll 217 underlies the lower course of the belt 206. The idle roll 217 is mounted on a shaft 218 carried by upright bolts 219-220. The bolts 219-220 are carried by a cross frame 221. As shown in FIG. 45, the shaft 211 carries a sprocket 222 on which a chain 223 runs. The chain 223 is driven by a sprocket 224 mounted on a shaft 226. The shaft 226 is driven by a motor 227 and gearing (not shown) in a gear box 228.

The belt 206 discharges the cartons between pairs of nip rolls 231-232 and 233-234 (FIGS. 8 and 9). The lower nip rolls 231 and 232 are mounted on a shaft 236 rotatably mounted in bearings 237 and 238 (FIG. 8) carried by the frame plates 214 and 216, respectively. The upper nip rolls 233 and 234 are mounted on a shaft 239 (FIG. 7) rotatably mounted between swinging bars 241 and 242. The swinging bars 241 and 242 are rotatably mounted on a shaft 234 which, in turn, is rotatably mounted in bearings 244 and 246 (FIG. 8) carried by frame plate extensions 247 and 248, respectively. A timing belt 249 runs on pulleys 251 and 252 carried by the shafts 243 and 239, respectively, so that the upper nip rolls 233 and 234 are driven in timed relation to the shaft 243. The swinging bars 241 and 242 are urged downwardly to urge the upper nip rolls toward the lower nip rolls by leaf springs 253 and 254. The springs 253 and 254 are carried by brackets 256 and 257, respectively, which are mounted on a cross bar 258. Opposite ends of the cross bar 258 are supported by uprights 259 and 261 which are supported by brackets 262 and 263, respectively. The brackets 262 and 263 are supported by auxiliary frame members 264 and 266 mounted on the frame plate extensions 247 and 248, respectively.

As shown in FIG. 45, the shaft 236, which carries the lower nip rolls 231 and 232, carries a sprocket 267 on which the chain 223 runs to drive the lower nip rolls 231 and 232. The shaft 236 also carries a sprocket 268 on which a chain 269 runs. The chain 269 drives a sprocket 271 mounted on the shaft 243 to drive the timing belt 249 and the upper nip rolls 233 and 234.
PAD ADVANCING ASSEMBLY

The shaft 243 also carries pad nip rolls 272 and 273. The pad nip rolls 272 and 273 (FIGS. 8 and 9) can cooperate with a pad inserting nip roll 274 to draw a pad member 276 (FIG. 9) from a pad carrying assembly 277. The pad member 276 can be formed of corrugated cardboard and is of the same shape and size as one of the folded cartons. The machine is constructed to place a pad member at each end of each stack of cartons. When a pad is required, the pad inserting nip roll 274 is raised to the FIG. 9 position to grip an outwardly extending end portion of a pad member 276 to withdraw the pad member from the pad carrying assembly 277 and eject the pad member downwardly to the right as shown in FIG. 9 to be received between the pairs of nip rolls 231-232 and 233-234.

The pad inserting nip roll 274 is rotatably mounted on a shaft 279 (FIGS. 10 and 11) between positioning collars 281 and 282. Ends of the shaft 279 are carried by crank arms 283 and 284. The crank arm 284 is pivotally mounted on the frame plate extension 248. The crank arm 283 is pivotally mounted on the frame plate extension 247. The crank arm 283 carries outwardly extending arms 286 and 287 on which a cross member 288 is mounted. A rocker member 289 is pivotally mounted between the crank arm 283 and the cross member 288. A tubular spring retainer 290 (FIG. 12) having a flange 291 is mounted in a central bore 292 of the rocker member 289 with the flange 291 engaging the underside of the rocker member 289. The pad inserting nip roll 274 is raised by operation of an hydraulic cylinder 293 (FIGS. 9 and 10) which is pivotally mounted on a bracket 294 mounted on the cross frame 221. A piston rod 296 of the cylinder 293 carries a spring stud 297 having an upper portion which extends through the tubular spring retainer 290. A compression spring 298 mounted on the spring stud 297 urges the crank arm 283 and the pad inserting nip roll 274 upwardly. Nuts 299-301 mounted on the spring stud prevent release of the spring stud 297. The spring 298 causes the pad inserting nip roll 274 to resiliently grip the pads as the pad is drawn from the pad carrying assembly 277.

The pad members 276 are advanced to the pad carrying assembly on a conveyor belt 303 (FIGS. 1 and 2) which runs on a pulley 304 carried by a frame 306 and on a second pulley 307 (FIG. 45) (details of which have been omitted). The pad members 276 are mounted on the belt 303 in single fashion as shown in FIG. 2 and advance to the right as shown in FIG. 2 to fall onto a pad incline conveyor belt 308 which is a portion of the pad carrying assembly 277, as indicated at 276A. As pads 176 are advanced by the belt 303 while the belt 308 is stationary, the pads can build up to engage a switch operator 3081 of a limit switch 3082, which controls advance of the belt 303, as will be described in greater detail hereinafter. The pad members advance up the belt 308 beneath a brush 309 (FIG. 1) which limits the pads on the belt 308 to a single layer of pads. The belt 308 passes over rollers 311, 312, 313, 314, 316, 317, 318, 319, and 320. A curved plate 321 overlaps the belt 308 above these rollers to hold the pad members in engagement with the belt 308. The belt 308 advances the pad members until the leading edge of the first pad 276B engages switch operating arms 322 (FIG. 9) which operate a limit switch 323 (FIG. 10) mounted on the bracket 262. As shown in FIG. 45, a motor 324 drives gearing (not shown in detail) in gear boxes 326 and 327 to drive shafts 328 and 329, respectively. The shaft 328 carries a sprocket 331, which drives a chain 332. The chain 332 drives a sprocket 333 carried by a shaft 334 on which the pulley 304 is mounted to drive the belt 303. The shaft 329 carries a sprocket 336 on which a chain 337 runs. The chain 337 also runs on a sprocket 338 carried by a shaft 339 which also carries a roller 341 which drives the belt 308. From the drive roll 341, the belt 308 passes over an idle roll 342 to the roll 311. From the roll 320, the belt 308 passes over a small pad discharge roll 343 and idle rolls 344, 346 and 347 to the drive roll 341.

STACK CONTROL substantially

From the nip rolls 231-232-233-234 (FIG. 14) the cartons and pads are projected beneath a stack sensing arm 351 which is part of a stack sensing assembly 352. The assembly 352 is supported on an upright frame 353 which is mounted on a lengthwise frame 354 (FIGS. 1 and 13). A plate 355 (FIG. 13) attaches the upright frame 353 to the lengthwise frame 354. Plates 356 and 357 are mounted on opposite sides of the upright frame 353 and are adjustable up and down the upright frame 353. The plates 356 and 357 are linked by bolts 358. A mounting plate 359 is mounted on the plate 357. The mounting plate 359 carries a control valve 360 having a shaft 361 on which a crank arm 362 (FIG. 17) is mounted. An adjustable link 363 links the crank arm 362 and a second crank arm 364. The second crank arm 364 is mounted on a shaft 366 rotatably mounted in bearing openings in lugs 368, 3681 and 3682 (FIG. 13). The lugs 368, 3681 and 3682 are carried by an angle-shaped frame 369 which is mounted on the mounting plate 359.

A third crank arm 371 is mounted on the shaft 366 and carries an adjustable link 372 which links the crank 371 with a rocker member 373. Details of construction of the rocker member 373 are shown in FIG. 16. The rocker member 373 includes a central block 374 having a bore 376 for receiving a pivot pin 377 (FIGS. 14 and 15). The stack sensing arm 351 is attached to the block 374 by fasteners 378 (FIG. 16). A bracket 379 provided with an upstanding lug 381 is attached to the block 374 by fasteners 382. The adjustable link 372 is connected to the lug 381 as shown in FIG. 14. The pivot pin 377 is pivotally mounted in side plates 383 and 384. The side plates 383 and 384 are supported on hanger bars 386 and 387 which are attached to the angle-shaped frame 369. An adjustable carton and pad stop assembly 3811 is mounted on the side plates 383 and 384. Stop arms 3821 and 3831 of the stop assembly 3811 hang downwardly on opposite sides of the stack sensing arm 351, as shown in FIG. 13.

A compression spring 389 (FIGS. 14 and 15) resists upward swinging of the rocker member 373. The spring 389 is mounted on a bolt 391. The head of the bolt 391 is carried by a bracket 392 (FIG. 15) pivotally mounted on a pin 393 which spans the side plates 383 and 384. As cartons projected by the nip rolls 231-232-233-234 build up in a stack 394 (FIG. 14), the rocker member 373 is swung upwardly to swing the crank arm 362 (FIG. 17) upwardly to actuate the control valve 360.

FIRST ELEVATOR

The stack 394 first builds up on elevator plates 396
and 397 (FIG. 19), which are part of an elevator assembly 398. The elevator assembly 398 moves up and down on upright rods 399 and 401. Upper ends of rods 399 and 401 are carried by mounting brackets 402 and 403, respectively, supported on a cross plate 404 which spans the upright frame 353 and an upright frame 406. The upright frame 406 is supported on a lengthwise frame 407. As already indicated, the upright frame 353 is mounted on the lengthwise frame 354. The lower end of the upright rod 399 is mounted on an angle-shaped bracket 408, of which the plate 355 is a part. The lower end of the upright rod 401 is mounted on an angle-shaped bracket 409 mounted on the lengthwise frame 407.

The elevator assembly 398 includes sliding blocks 411 and 412 which are slidably mounted on the upright rods 399 and 401, respectively. Extension plates 413 and 414 mounted on the blocks 411 and 412, respectively, are connected by a cross member 416 so that the blocks 411 and 412 move up and down together. An angle-shaped bracket 417 (FIG. 18) is mounted on the slide block 412. A bracket 418 mounted on a horizontal flange of the bracket 417 carries a head of a piston rod 419. An upper end of a cylinder 421, in which a piston 421A (FIG. 48) carried by the piston rod 419 works, is supported by a bracket 422 (FIG. 18) mounted on the upright frame 406. The cylinder 421 serves to raise and lower the elevator assembly 398, as will be explained in more detail hereinafter.

The elevator plate 396 is carried by an elevator sub-assembly 423 (FIG. 19) carried by the slide block 411, and the elevator plate 397 is carried by an elevator sub-assembly 424 supported on slide block 412. The elevator sub-assemblies are similar in construction, and only the sub-assembly 424 will be described in detail. The sub-assembly 424 includes a frame plate 426 (FIGS. 18 and 19) mounted on the slide block 412. A screw fitting 428 is threaded in a nut 429 (FIG. 22) mounted on the frame plate 426. An inner end portion of the screw fitting 428 is rotatably mounted in an opening 430 in a bar 4301. Nut members 4311-4321 pinned on the screw fitting 428 hold the bar 4301 in position rotatably mounted on the screw fitting 428. As shown in FIG. 20, the bar 4301 is attached to and supports bar frames 431 and 432 which in turn are attached to a plate 433. Additional bar frames 434 and 436 are also attached to the plate 433. The plate 433 additionally supports a guide plate 437. The guide plate 437 cooperates with a similar guide plate 4371 (FIGS. 14 and 18) to guide the cartons with the stack 394 (FIG. 14).

The plate 433 (FIG. 20) is steadied by rod members 438 and 439 attached to the plate 433. The rod members 438 and 439 are slidably mounted in tubular guides 441 and 442, respectively, which are attached to the frame plate 426 in the manner that the guide 442 is shown in FIG. 22. A shaft 444 (FIG. 20) is rotatably mounted in bearing openings in the bar frames 431, 432, 434 and 436. Brackets 446, 447 and 448 mounted on the shaft 444 support the elevator plate 397. The bracket 447 includes an extension 449 (FIG. 21) to which a head of a piston rod 451 is pivotally connected. The head of the piston 451 carries a piston 451A (FIG. 49), which works in a cylinder 452 (FIG. 19). The upper end of the cylinder 452 is pivotally supported by a bracket 453 mounted on the frame bars 436 and 432 as shown in FIG. 20. The shaft 444, the brackets 446, 447 and 448 and the elevator plate 397 (FIG. 19) can be swung from the full line stack supporting position of FIG. 21 to the position in which the elevator plate is indicated in dot-dash lines at 397A at which a stack carried thereon is released. The elevator sub-assembly 423 (FIG. 19) includes a cylinder 454 which can operate to swing the elevator plate 396 in a similar fashion. The stack 394 (FIG. 14) builds up on the elevator plates and the elevator assembly 398 is lowered by operation of the cylinder 421 (FIG. 18) to lower the stack as it forms to keep the upper level of the stack at a constant height, as will be explained in more detail hereinafter, until the stack reaches a predetermined height, whereupon the elevator plates 396 and 397 (FIG. 19) can be swung to stack released position to release the stack.

The stack is released on elevator arms 456 and 457 (FIGS. 1 and 25) of a second elevator assembly 458.

In FIG. 23 are shown limit switches 4581, 4582 and 4583 which are operated by the first elevator assembly 458. The limit switches 4581 and 4582 are mounted on the upright frame 406. The limit switch 4583 is mounted on the upright frame 353. When the elevator assembly 398 is in the raised position shown in FIGS. 18, 19 and 23, a switch actuator 459 (FIG. 23) of the limit switch 4581 is engaged by an L-shaped actuator arm 461 which is mounted on the extension plate 414. When the elevator assembly is in its lowermost position, at which that extension plate is shown at 414A in dot-dash lines in FIG. 23, a switch actuator 462 of the limit switch 4582 is engaged by that actuator arm, the actuator arm in that position being shown at 461A. A switch actuator 463 of the limit switch 4583 is engaged by an L-shaped actuator arm 464 attached to the extension plate 413 when the elevator assembly 398 is in an intermediate position spaced a predetermined distance above the lowermost position.

SECOND ELEVATOR ASSEMBLY

As shown in FIG. 25, the arms 456 and 457 of the second elevator assembly 458 are carried by a plate 466, which is mounted on a sliding block 467. The block 467 slides up and down on an upright rod 468. The rod 468 is mounted between a plate 469, which spans the frames 491 and 407 (FIG. 25), and a plate 471 which spans upright frames 472 and 473 and is mounted on a cross frame 4731. Rocking arms 474 and 476 are pivotally attached to opposite sides of the sliding block 467. Right hand ends of the rocking arms 474 and 476, as shown in FIGS. 24 and 25, are supported on a link 477 which is pivotally mounted on a pivot pin 478 carried by a bracket 479 (FIG. 24) attached to a cross frame 481. A bracket 482, having an extension arm 483, is attached to and swings with the link 477. A transverse plate 486 carried by the bracket 482 supports one end of a compression spring 487. The spring 487 is mounted on a rod 488 pivotally connected between the rocking arms 474 and 476. A nut 489 threaded on the rod 488 maintains compression in the spring 487. The spring 487 serves to counterbalance the weight of the second elevator assembly and of a stack of cartons supported on the arms 456 and 457 thereof. The rocking arms 474 and 476, the sliding block 467, and the arms 456 and 457 are raised and lowered by operation of an hydraulic cylinder 491, which is pivotally mounted on an upright frame 492. A head of a piston rod 493, having a piston (not shown) which works in the cylinder 491, is pivotally connected to the rocking arms 474 and 476.
The second elevator assembly 458 moves between a raised position at which the arms 456 and 457 are shown in FIG. 26 (indicated in dot-dash lines at 456A in FIG. 1) and a lowered position shown in full lines in FIG. 1. When the second elevator assembly 458 is in the raised position, a switch operating arm 496 (FIG. 26) carried by the sliding block 467 engages a switch actuator 497 of a limit switch 498. At this position, the elevator arms 456 and 457 can be slightly below the lowermost position of the elevator plates 396 and 397 as shown in FIG. 26. When the elevator plates 396 and 397 swing to stack released position, as described hereinabove, the stack carried by the plates 396 and 397 is released onto the elevator arms 456 and 457 of the second elevator assembly 458. The second elevator assembly 458 descends through operation of the cylinder 491 (FIGS. 1 and 24) as cartons continue to be added to the stack. Flow of hydraulic fluid to and from the cylinder 491 is controlled by the control valve 360 (FIG. 1) during the descent of the second elevator assembly as will be described more fully hereinafter. As the second elevator assembly 458 descends, the switch operating arm 496 engages a switch operator 499 (FIG. 26) of a limit switch 501. As the switch actuator 499 starts to swing downwardly, first contacts of the switch 501 are actuated to indicate that the stack is approaching proper height and to permit discharge of the stack when a full count of cartons is reached, as will be explained hereinafter in more detail. When the full count is reached, the cylinder 491 rapidly lowers the second elevator assembly 458 to the lowered position shown in full lines in FIG. 1. At the fully lowered position, the switch operating arm 496 (FIG. 26) engages a switch actuator 502 of a limit switch 503 to indicate that the second elevator assembly is at fully lowered position. If for some reason, a full count is not reached during normal descent of the second elevator assembly 458, a second set of contacts of the limit switch 501 are actuated when a stack has been accumulated which is of a maximum permissible height to energize circuity to be described hereinafter to lower the second elevator assembly to lowered position even though a full count has not been registered.

STACK COMPRESSION ASSEMBLY

When the second elevator has been lowered with a stack 3941 (FIG. 27) on the elevator arms 456 and 457 thereof, a stack compressing assembly 506 (FIGS. 27, 28, 29 and 30) compresses the stack 3941 as indicated in dot-dash lines in FIG. 27.

The stack compressing assembly 506 includes upright frames 507 and 508 (FIG. 28) mounted on the lengthwise frames 354 and 407, respectively. A cross bar 509 links upper ends of the upright frames 507 and 508. Upright guide rods 511 and 512 are mounted on the cross bar 509 and extend downwardly to brackets 513 and 514 mounted on the lengthwise frames 354 and 407, respectively. Sliding blocks 515 and 5151 slide up and down on the guide rods 511 and 512, respectively. An inverted generally channel-shaped frame 516 is attached to and spans the sliding blocks 513 and 514. A piston rod 517 is attached to the inverted channel-shaped frame 516. A piston 517A (FIG. 49) mounted on the piston rod 517 works in an upright cylinder 518 so that the cylinder 518 serves for raising and lowering the inverted channel-shaped frame 516 (FIG. 28) and the sliding blocks 515 and 5151. Inwardly extending frames 519 and 521 mounted on the inverted channel-shaped frame 516 carry elongated plates 522 and 523, respectively. Cross frame bars 524 and 526 (FIG. 27) span the elongated plates 522 and 523. A horizontal cylinder 527 is mounted on the cross frame bars 524 and 526. A piston rod 528 carries a piston 528A (FIG. 49) which works in the cylinder 527. A rod mount bracket 529 (FIG. 28) is mounted on the piston rod 528. The bracket 529 carries a sliding plate 531, (FIG. 27) which is slidable mounted between angled shaped guides 532 and 533 (FIG. 28) carried by the frame bars 524 and 526. A bar 534 attached to the sliding plate 531 supports a frame 536 (FIG. 29) on which generally angle-shaped presser feet members 537 and 538 are mounted. Horizontal flanges 539 and 541 (FIG. 27) of the presser feet members 537 and 538, respectively, can engage the stack 3941 as shown at 539A and 541A in FIG. 27 to compress the stack 3941 against the elevator arms 456 and 457 of the second or main elevator.

The stack compressing assembly can move from the FIG. 29 position at which the presser feet 539 and 541 are retracted through an intermediate position shown in full lines in FIG. 27 at which the presser feet overlie the stack 3941 to a lowered position at which the presser feet are shown in dot-dash lines in FIG. 27 at 539A and 541A and the stack 3941 is compressed against the elevator arms 456 and 457.

When the stack compressing assembly moves from the FIG. 29 position to the full line position of FIG. 27, a switch actuator 543 of a limit switch 544 is engaged by the rod mount bracket 529 to indicate that the presser feet overlie the stack. As the presser feet move downwardly, an angle-shaped switch operating member 546 (FIGS. 27 and 30) attached to the sliding block 5151 moves downwardly into engagement with a switch actuator 547 of a limit switch 548 to indicate that the presser feet are in lowered position. When the lowermost limit of downward movement is reached, the switch operating member 546 engages a push button 549 of a switch 551 which controls delivery of a pad, as will be explained in more detail hereinafter.

FIRST HORIZONTAL PUSHER ASSEMBLY

When the stack 3941 (FIG. 27) has been compressed between the presser feet 539 and 541 and the elevator arms 456 and 457, the stack is pulled to the left as shown in FIG. 27 by vertical pusher arms 551 and 552 of a first horizontal pusher assembly 553. Details of construction of the first horizontal pusher assembly 553 are shown in FIGS. 31, 32 and 33.

The vertical pusher arms 551 and 552 are attached to fillet plates 554 and 556, respectively. The fillet plates 554 and 556 are mounted on a plate 557. The plate 557, in turn, is mounted on a block 558, which slides on an elongated horizontal rod 559. The block 558 is connected to a second sliding block 561 (FIGS. 31 and 33) by a plate 562. The second sliding block 561 slides on a horizontal rod 563 which is parallel to and spaced from the rod 559. A piston rod 564 (FIG. 33) is attached to the plate 562. A piston 564A (FIG. 48) mounted on the piston rod 564 works in a horizontal cylinder 566, and the cylinder 566 serves to drive the vertical pusher arms 551 and 552 to the left and right as shown in FIGS. 27, 31 and 33. As shown in FIG. 27, the presser feet 539 and 541 and the elevator arms 456 and 457 are parallel and horizontal, and, as
the pusher arms 551 and 552 are moved to the left, the stack 3941 is advanced from between the presser feet and the elevator arms.

The cylinder 566 (FIG. 33) is mounted on a plate 569. The plate 569 is carried by a post 570 (FIGS. 31 and 32) mounted on a cross frame 571 (FIG. 32) and an upright support 572 (FIG. 31) carried by a cross arm 573 mounted on the upright frame 472. The rods 559 and 563 are mounted on U-shaped frame plates 574 and 576. The frame plate 574 is mounted on a frame 577, and the frame plate 576 is mounted on a frame 578. The frames 578 and 577 are mounted on a lengthwise main frame 579 (FIG. 33) and a cross frame 580, respectively.

When the vertical pusher arms 551 and 552 are in their retracted position, as shown in FIGS. 27 and 31, a switch operator 581 (FIG. 33) of a limit switch 582 is engaged by the sliding block 561 to actuate the limit switch 582. The limit switch 582 is mounted on a plate 583 engaged by an arm 584 of the frame 578. When the vertical pusher arms 551 and 552 reach their extended position, an actuator 586 of a limit switch 587 is engaged by the plate 562 to actuate the limit switch 587. The limit switch 587 is mounted on a plate 588 supported on an arm 589 of the frame 577.

LAY-OVER BASKET

The pusher arms 551 and 552 push the stack 3941 to the left as shown in FIG. 36 into a lay-over basket 592. When the pusher arms 551 and 552 reach the extended position indicated in dot-dash lines at 551A and 552A, the stack is disposed in the basket 592.

The basket 592 includes a plate 593 on which pairs of posts 594–596, 597–598 (FIG. 40) and 599–601 are mounted. The post 594 is provided with notches 602, 603, and 604 as shown in FIG. 36. In similar fashion, the post 596 is provided with notches 606, 607, and 608 (FIG. 34), which are aligned with notches of the post 594. A curved plate 609 spans the post 594 and 596. In addition, curved plates 611, 612, and 613 are mounted on the posts 594 and 596. The plates 611, 612, and 613 span the plate 593, as the plate 611 is shown in FIG. 40. The posts 597 and 598 (FIG. 34) are provided with notches 614 aligned with the notches of the opposed posts 596 and 594. A curved plate 616 spans the posts 597 and 598. The posts 599 and 601 are edge posts and are provided with notches 617 (FIG. 37) aligned with the notches of the other posts. Curved plates 618, 619 and 621 span the posts 597, 598, 599, and 601.

Plates 622 and 623 (FIG. 40) are attached to the posts 599 and 601, respectively, and are mounted on a shaft 624. The shaft 624 is rotatably mounted in bearings 626 and 627 supporting on mounting plates 628 and 629 carried by posts 631 and 632, respectively. The posts 631 and 632 are mounted on a cross frame 633. A fitting 634 is also mounted on the shaft 624 and attached to the plate 622 so that the basket 592 can be swung by means of the fitting 634. As shown in FIG. 34, the fitting 634 is pivotally connected to a head 636 of a piston rod 637. A piston 637A (FIG. 48) mounted on the piston rod 637, works in a cylinder 638, and the cylinder 638 serves to swing the basket 592 between the raised position of FIG. 36 and the lowered position of FIGS. 34 and 35. When in the lowered position, the basket 592 rests on a bumper 639 (FIGS. 35 and 36) mounted on a cross frame 640. When the basket 592 is in the lowered position, a cross frame 641 of the basket 592 engages a switch operator 642 (FIG. 35) of a limit switch 643. When the basket 592 is in the raised position of FIG. 36, a cross member 644 (FIG. 40), which links the plates 622 and 623, engages a switch operator 646 (FIG. 34) of a limit switch 647.

BASKET CLEARING PUSHER ASSEMBLY

As the basket 592 swings from the FIG. 36 position to the FIG. 34 position, the stack 3941 is swung from the upright position shown in FIG. 36 to a horizontally extending position indicated at 3941A in FIG. 34. The basket 592 has open sides. The stack 3941A is pushed horizontally and cross-wise of the machine to discharge the stack from the basket 592 by a basket clearing pusher assembly 651, details of construction of which are shown in FIGS. 38 and 39. The basket clearing pusher assembly 651 includes a horizontal guide rod 652 extending transversely of the basket 592 at one side thereof. The guide rod 652 is mounted on upright plates 653 and 654 (FIGS. 38 and 40) mounted on the main framework of the machine. A sliding block 656 slides on the guide rod 652. An elongated plate 657 is attached to the sliding block 656 and carries an upright member 658 on which pusher bars 659, 660, and 661 are mounted. When the sliding block 656 is moved to the right as shown in FIGS. 38 and 40, the pusher bars 659, 660, and 661 advance through the basket 592 and between rail fence assemblies 672 and 673 (FIG. 40). Outwardly extending guide lugs 674 are mounted on opposite ends of the pusher bars 659, 660, and 661 and can enter the notches 606, 607, 608, and 614 (FIG. 34) of the basket 592 to support the pusher bars as they move through the basket 592. The guide lugs 674 of the pusher bars 660 and 661 are also relieved between pairs of rails 676 and 676A of the fences 672 and 673, respectively, to support the pusher bars as they move between the fences 672 and 673. As shown in FIGS. 42 and 43, each guide lug 674 is received in a slot 6741 between bifurcations 6742 and 6743 of one of the pusher bars and is held therebetween. The pusher bars 659, 660, and 661 move from the retracted position shown in FIGS. 38 and 40 in full lines to an extended position shown in dot-dash lines in FIG. 40 at 659A. When the pusher bars 659, 660, and 661 are in retracted position, they are supported by short rail fences 677 (FIG. 40) and 6771 (FIGS. 39 and 40). As shown in FIGS. 41 and 42, the short rail fence 677 includes first angle-shaped supports 678 and 679 attached to the main frame 640 and second angle-shaped supports 681 and 682 mounted in the first angle-shaped supports. Horizontal rails 683 are mounted on the supports 681 and 682. The lugs 674 of the pusher bars 660 and 661 are received between pairs of rails 683 (FIGS. 41 and 42). The short fence 6771 includes similar rails 6841 (FIG. 39) which are mounted on an angle-shaped frame 686. The frame 686 is mounted on the cross frame 633.

The fence 672 includes angle-shaped frames 6821 and 6823 (FIGS. 40 and 44) mounted on a plate 684 carried by the main framework. The rails 676 are mounted on the angle-shaped frame 686 and 687 mounted on the plate 684 with the rails 676A supported thereon.

The sliding block 656 and the pusher bars 659, 660, and 661 (FIGS. 38 and 39) are advanced and retracted by action of a cylinder 691 (FIG. 38) pivotally.
mounted on a bracket 692 supported on the transverse frame 640. A piston rod 693 (FIG. 38), which is carried by a piston 693A (FIG. 48), which operates in the cylinder 691, is pivotally connected to a frame 694 (FIG. 38) centrally thereof. The frame 694 includes elongated bars 696 and 697. Upper end portions of the bars 696 and 697 are pivotally attached to the sliding block 656. Lower end portions of the bars 696 and 697 are pivotally attached to one end of a link 698. The opposite end of the link 698 is pivotally supported on a bracket 699 mounted on a cross frame 701.

When the sliding block 656 and the pusher bars 659, 660, and 661 are in the retracted position shown in FIG. 38, a switch actuator 702 of a limit switch 703 is engaged by the bar 697 to activate the limit switch 703. When the pusher bars are in the advanced position indicated at 659A in FIG. 40, an angle-shaped switch operating member 704 mounted on the sliding block 656 engages a switch actuator 706 of a limit switch 707 to activate the limit switch 707. When the pusher bars are in a nearly advanced position, a switch actuator 708 (FIG. 38) of a limit switch 709 is engaged by the bar 697 to activate the limit switch 709. This limit switch 709 remains actuated until the pusher bars 659, 660, and 661 have been retracted a predetermined distance.

The pusher bars deliver the stack of cartons to between fence members 710 and 711 (FIG. 40) of a machine 712 which can wrap the cartons or do further operations thereon, details of which are not shown. The limit switch 709 remains actuated until the pusher bars have been retracted sufficiently that there is no possibility of interference between the machine 712 and the pusher bars.

When the stack has been delivered between the fence members 710 and 711, the stack engages a switch actuator 714 of a limit switch 716 mounted on a wall 717 which spans the fence members 710 and 711. The switch actuator 716 extends through an opening 7171 in the wall 717. A limit switch 718 having an actuator 719 engageable with the fence member 710 is also actuated as shown in FIG. 40 when the fence members 710 and 711 are in proper position to receive the stack.

OPERATION

The operation of the machine will now be described with particular reference to FIGS. 46 and 47 which show electrical connections of the machine, FIG. 48 which shows hydraulic connections, and FIG. 49, which shows pneumatic connections.

Air under pressure is supplied by a suitable pump 797 (FIG. 49) to an air pressure line 798. A pressure operated switch 799 (FIGS. 46 and 49) is actuated by the air pressure. Electric power is supplied by main leads 800 and 803 (FIG. 46). When the machine is to be operated, spring returned push button switches 802 and 803 are moved from the positions shown to their other position. The switch 802 energizes a motor 804 which powers a pump 806 (FIG. 48) to supply hydraulic fluid under pressure to a line 8061. When the motor 804 is energized, a lamp 805 (FIG. 46) is lighted. Fluid returns through a discharge or return line 8062 (FIG. 48) to a fluid storage tank 8063. Motor relay contacts 804A (FIG. 48) of the motor 804 close to provide a hold-in circuit, and the motor 804 runs continuously until contacts of a hydraulic stop switch 8062 are opened. Contacts 803A and 803B of the switch 803 energize a control relay 807 to close contacts 807A and 807B thereof energizing power leads 808 and 809. The control relay 807 remains energized until one of a pair of relay release switches 8091 and 8092 is opened or until the pressure operated switch 799 opens. A lamp 8093 is lighted when the control relay 807 is energized. Contacts 803C of the switch 803 energize a control relay 811. Contacts 811A of the control relay 811 close when the relay 811 is energized to form a hold-in circuit. During ordinary operation of the machine, the control relay 811 remains energized. However, if instantaneously operating contacts 812A of a time delay relay 812 open at a time when contacts 801A of the limit switch 501 (FIGS. 26 and 46) are open, the control relay 811 is deenergized. The control relay 811 can also be de-energized when contacts 813A of a spring returned reject switch 813 are opened. As will be explained in greater detail hereinafter, the control relay 811 is de-energized when there is an improper stack. When the control relay 811 is de-energized, contacts 811B thereof close to energize an alarm 813. Contacts 803D of the switch 803 energize a control relay 814 and a solenoid 8141 (FIGS. 46 and 49). Contacts 814A of the control relay 814 operate a hold-in circuit therefor. The solenoid 8141 moves an air valve 8142 (FIG. 79) from the position shown to the alternate position to supply air under pressure to the flap operating cylinders 452 and 454 (FIG. 19) to swing the elevator plates 396 and 397 to lowered position, as will be explained in greater detail hereinafter. The reject switch 813 (FIG. 46) is momentarily moved to its other position to initiate a reject cycle, as will be explained in more detail thereinafter, in which limit switch contacts 548B of the limit switch 548 (FIGS. 30 and 46) are opened de-energizing the control relay 814 (FIG. 46) and the solenoid 8141. De-energizing of the solenoid 8141 permits the valve 8142 (FIG. 49) to return to the position shown at which the first elevator plates are in position to receive cartons. Closing of contacts 814B (FIG. 46) of the control relay 814 energizes the solenoids 834A and 836A to move the valve 834 and 836 (FIG. 48) to their alternate positions. In addition, selective on-off switches 816 (FIG. 47) and 817 are turned from the positions shown to their other positions. The switch 816 supplies power to a lead 819 which energizes the motor 227 (FIG. 45), which drives the nip rolls 231–232 and 233–234. The lead 819 (FIG. 47) also is connected through the switch 817 and contacts 821A of a control relay 821 to energize the motors 52 and 56 (FIGS. 45 and 46) which drive the cartons toward the nip rolls. The control relay 821 is energized by a circuit which will be described in more detail hereinafter. A selective on-off switch 822 is moved from the position shown to its other position to close contacts 822A (FIG. 46), 822B (FIG. 47) and 822C (FIG. 46) and to open contacts 822D (FIG. 47) thereof. The on-off switch 822 controls pad inserting circuits to be described hereinafter. A cycle reset spring returned push button switch 8221 (FIG. 46) is instantaneously moved to its other position to close contacts 8221A thereby energizing a solenoid 141C which sets the counting mechanism for the start of a count and to open contacts 8221B thereof to de-energize a manual discharge control relay 8741.

Closing of contacts 822A of the switch 822 energizes the motor 324 (FIGS. 45 and 46) which advances pads.
of the control relay 814. The line 833 (FIG. 48) is connected through the valve 834 to a line 837 which directs fluid to the upper end of the cylinder 421 (FIGS. 18 and 48) to lower the first elevator assembly 398 under the control of the control valve 360. Fluid returns from the cylinder 421 through a line 838 (FIG. 48), the valve 836, a line 839, and the control valve 360 to the discharge line 8062. Control units 840 and 841 are provided in the lines 837 and 838, respectively. Each of these control units includes a check valve and a throttle valve in parallel for controlling the maximum rate of movement of the first elevator assembly. A pressure controlled check valve 842 is mounted in the line 838 and is controlled by pressure in the line 837 to permit lowering of the first elevator assembly only when there is a positive pressure in the line 837.

When the first elevator assembly 398 (FIG. 23) is lowered part of its travel, contacts of the limit switch 45883 (FIGS. 23 and 47) open to prevent energizing of the control relay 821 unless the first horizontal pusher assembly is retracted to close contacts 582A (FIG. 47) of the limit switch 582 (FIG. 33), so that the first elevator assembly and cartons thereon do not interfere with the first horizontal pusher assembly. As will be explained in more detail hereinafter, de-energizing of the control relay 821 opens contacts 821A thereof to stop advance of the carton feed motors 52 and 96. When the first elevator assembly reaches its lowest position at which cartons are discharged to the second elevator assembly, the limit switch 4582 (FIG. 23) is actuated to open contacts 4582A (FIG. 47) thereof and close contacts 4582B (FIG. 46) thereof. Opening of the contacts 4582A prevents energizing of the control relay 821 except when the contacts 498A of the limit switch 498 (FIGS. 26 and 46) are closed to indicate that the second elevator assembly is in fully raised position. Closing of the contacts 4582B (FIG. 46) energizes the control relay 814 when contacts 498B of the limit switch 498 are closed to indicate that the second elevator assembly is in fully raised position, and contacts 582B of the limit switch 582 are closed indicating that the first horizontal pusher assembly is fully retracted.

When the control relay 814 (FIG. 46) is energized the hold-in contacts 814A thereof close. The solenoid 8141, which is connected in parallel with the control relay 814, is energized to move the valve 8142 (FIG. 49) from the position shown to its other position at which air under pressure is directed from the air pressure line 798 to lower ends of the cylinders 452 and 454 (FIG. 19) to swing the elevator plates 396 and 397 to open position to deposit the partial stack of cartons onto the elevator arms 456 and 457 (FIGS. 24 and 27) of the second elevator assembly 458. The control relay 814 remains energized through the contacts 814A thereof until contacts 548B of the limit switch 548 (FIG. 30) open to indicate that a stack is fully compressed and the contacts (FIG. 46) of the limit switch 4581 (FIGS. 23 and 46) open to indicate the first elevator assembly 398 is fully raised.

Energizing of the control relay 814 (FIG. 46) opens contacts 814B thereof to de-energize the solenoids 834A and 836A permitting the valves 834 and 836 to return to the position shown in FIG. 48. As cartons continue to build up on the stack to raise the crank 362 and swing the control valve 360 counterclockwise as shown in FIG. 48, pressure is supplied from the pres-
ensure line 8061 through the control valve 360, the line 833, and the valve 834 to a line 846 connected to the upper end of the cylinder 491 (FIGS. 24 and 48) to cause lowering of the second elevator under control of the control valve 360. Fluid returns from the cylinder 491 through a line 847 (FIG. 48), the valve 836, the line 839, and the control valve 360 to the return line 8062. Throttle-check valve units 848 and 849 in the lines 846 and 847, respectively, permit control of the maximum rate of advance of the second elevator in either direction. A pressure controlled check valve 851 in the line 847 and controlled by pressure in the line 846 prevents lowering of the second elevator except when there is a positive pressure in the line 846.

When the stack on the second elevator arms has reached a predetermined height, the second elevator assembly is lowered to engage the switch actuator 499 (FIG. 26) of the limit switch 501 to actuate first contacts 501B (FIG. 46) thereof. The first contacts 501B are closed when the stack contains slightly less than a full count of cartons. The cartons continue to accumulate to a full count, whereupon counter mechanism, not shown in detail, causes switch contacts 141A to close and switch contacts 141B to open. Closing of the contacts 141A energizes the time delay relay 812. Instantaneous contacts 812A of the time delay relay 812 close to permit de-energizing of the relay 811 when the limit switch contacts 501A open. Instantaneous contacts 812B of the time delay relay 812 close to supply a circuit which keeps the time delay relay 812 energized until opening of the limit switch 4581 (FIGS. 23 and 46) to indicate that the first elevator assembly is fully raised. Instantaneous contacts 812C (FIG. 47) of the time delay relay 812 open to de-energize the control relay 821 permitting the contacts 821A thereof to open stopping the motors 52 and 96, which advance cartons to the counter switch 141 (FIG. 4) as explained hereinabove. However, the motor 227 continues to run. The motor 227 drives the belt 206 (FIGS. 4 and 45) to deliver cartons which have passed the counter switch 141 to the nip rolls 231-232-233-234 (FIG. 45). Thus, all cartons which have passed the counter switch are delivered to the stack. After there has been a sufficient time for clearing of cartons which have passed the counter switch, time delay contacts 812D (FIG. 46) of the time delay relay 812 close to energize a control relay 853. At this time, the contacts 852B of the limit switch 582 (FIGS. 33 and 46) are closed to indicate that the first horizontal pusher assembly 553 is fully retracted. Energizing of the control relay 853 causes closing of contacts 853A thereof to form a hold-in circuit for the control relay 853 and closing of contacts 853B thereof to energize the solenoids 834A and 836A to move the valves 834 and 836 (FIG. 48) to their alternate positions. Energizing of the control relay 853 also causes closing of contacts 853C thereof to energize a solenoid 854A of an air valve 854 (FIG. 49) to move the valve 854 from the position shown to its other position and direct air from the air pressure line 798 through a line 8541 into the left hand end of the cylinder 527 (FIGS. 27 and 49) causing advance of the presser feet 539 and 541 to a position overlying the stack 3941. Air is discharged from the cylinder 527 through a line 875 and the valve 854. A throttle-choke valve assembly 8542 in the line 8541 permits control of the speed of return of the presser feet horizontally. When the control relay 853 (FIG. 46) is energized, a solenoid 856A (FIGS. 46 and 48) is also energized to move a three position valve 856 (FIG. 48) to the right from the position shown. Energizing of the control relay 853 (FIG. 46) also opens contacts 853D thereof to prevent energizing of a solenoid 856B of the valve 856 (FIG. 48). Fluid under pressure from the pressure line 8061 passes through the valve 856, a line 858, the valve 834, and the line 846 to the cylinder 491 causing rapid lowering of the second elevator. Fluid returns from the cylinder 491 through the line 847, the valve 836, a line 859, and the valve 856 to the return line 8062.

The counter controlled contacts 141B are connected in series with contacts 811C of the reject control relay 811, instantaneous contacts 826A of the time delay relay 826, and the relay 826. The relay 826 is energized when a pad is being advanced to delivery position as contacts 323D of the limit switch 323 (FIGS. 10 and 46) close during advance of a pad. When the pad is in delivery position, the contacts 323D (FIG. 46) are open, and instantaneous opening of the counter contacts 141B de-energizes the time delay relay 826 to permit opening of time delay contacts 826B thereof after a sufficient time delay to permit delivery onto the stack of the last of the cartons which has been counted. Opening of the contacts 826B de-energizes the time delay relay 825.

De-energizing of the control relay 825 causes closing of the contacts 825A thereof energizing the solenoid 831A to move the valve 831 (FIG. 49) to its alternate position to supply air under pressure from the air pressure line 798 through the line 7981 to the lower end of the cylinder 293 to raise the roll 274 (FIG. 9) to cause delivery of a pad onto the top of the stack of cartons. When the time delay relay 826 (FIG. 46) is de-energized, time delay contacts 826C thereof close to prevent de-energizing of the reject relay 811 when contacts 501A of the limit switch 501 (FIG. 26) open.

As the second elevator descends further, the contacts 501A (FIG. 46) of the limit switch 501 (FIG. 26) open. These contacts are set to open to cause discharge of a stack if the stack becomes significantly higher than it should without being discharged in the normal manner, as will be explained more fully hereinafter. In the normal operation of the machine, nothing occurs when the contacts 501A are opened because the contacts 812A of the control relay 812 are in parallel with the contacts 501A and are closed.

When the second elevator reaches the limit of its downward movement, the limit switch 503 (FIG. 26) is actuated closing contacts 503A (FIG. 46) and 503B thereof and opening contacts 503C thereof. Closing of the contacts 503A energizes the reject relay 811 if it has become deenergized. Closing of the contacts 503B energizes a control relay 861 if the contacts 852B of the limit switch 852 are closed to indicate that the first horizontal pusher assembly is fully retracted and contacts 647A of the limit switch 647 (FIGS. 34, 36 and 46) are closed to indicate the basket 592 is in position for receiving a stack of cartons. Energizing of the control relay 861 (FIG. 46) causes closing of contacts 861A and 861B thereof and opening of contacts 861C thereof. Closing of the contacts 861B sets up a hold-in circuit for the relay 861. Closing of the contacts 861A energizes a solenoid 862A of an air valve 862 (FIG. 49) to move the valve 862 to its al-
ternate position supplying air under pressure from the air pressure line 798 through the valve 862 and a line 8631 to the upper end of the cylinder 518 (FIGS. 27 and 49) to cause lowering of the presser feet 539 and 541 to compress the stack 3941 against the elevator arms 456 and 457. Air is discharged from the cylinder 518 through a line 877 (FIG. 49) and the valve 862. A pressure controlled check valve 8621 in the line 877 and controlled by pressure in the line 8631 prevents lowering of the presser feet except when there is a positive pressure in the line 8631. Throttle check valve assemblies 8622 and 8623 in the lines 8631 and 877, respectively, make possible control of the rate of descent and ascent of the presser feet.

The solenoid 862A (FIG. 46) is energized by a circuit including the relay contacts 861A and the contacts of the limit switch 544 (FIGS. 27 and 29), which are closed when the presser feet are over the stack 3941 (FIG. 27).

When the presser feet have been lowered, contacts 548A (FIG. 46) of the limit switch 548 (FIG. 30) close to energize a solenoid 863A (FIG. 46) of a valve 863 (FIG. 48) to move the valve 863 (FIG. 48) to its alternate position to supply fluid under pressure from the pressure line 8061 through the valve 863 and a line 864 to the cylinder 566 (FIG. 33) to cause advance of the first horizontal pusher assembly in a direction to advance the stack from the second elevator arms 456 and 457 (FIG. 36) into the basket 592. The presser feet 539 and 541 are parallel to the elevator arms 456 and 457 and are horizontal so that the stack can be pushed horizontally from between the presser feet 539 and 541 and the elevator arms 456 and 457. When the basket 592 is in the FIG. 36 position, side plate assemblies 592A and 592B thereof also are horizontal and are displaced sufficiently from the presser feet 539–541 and the arms 456–457 that the stack can pass readily between the side assemblies 592A and 592B. Fluid returns from the cylinder 566 (FIG. 48) through a line 866 and the valve 863 to the return line 8061. Throttle-check valve units 867 and 868 in the lines 864 and 866, respectively, permit control of the rate of advance of the first horizontal pusher assembly in both directions. The solenoid 863A (FIG. 46) is energized by a circuit including normally closed contacts 587A of the limit switch 587 (FIG. 33) which open when the stack has been fully advanced by the first horizontal pusher assembly, the relay contacts 861B, contacts 647B of the limit switch 647, which indicates the basket 592 (FIG. 36) is in raised position, and the contacts 548A of the limit switch 548 (FIG. 30) which is actuated when the stack is fully compressed.

Opening of the contacts 861C of the control relay 861 permits de-energizing of the time delay relay 825 upon opening of the contacts of the push button switch 551 (FIGS. 30 and 46), which is actuated at the end of downward movement of the stack compressing assembly.

When the stack has been fully compressed and the limit switch 548 (FIG. 30) has been actuated, contacts 548B thereof open to de-energize the control relay 814 and the solenoid 8141. De-energizing of the solenoid 8141 permits return of the valve 8142 (FIG. 49) to the position shown at which air under pressure from the air pressure line 798 is introduced through the valve 8142 and a line 871 into the upper ends of the cylinders 452 and 454 (FIGS. 19 and 49) to restore the plates 396 and 397 (FIG. 19) to stack holding position. Deenergizing of the control relay 814 (FIG. 46) opens the hold-in contacts 814A thereof and closes the contacts 814B thereof to energize the solenoids 834A and 836A to move the valves 834 (FIG. 48) and 836 to their alternate positions. Since there is no stack at the control valve 360, the crank arm 362 is in lowered position and the control valve 360 is displaced clockwise to connect the pressure line 8061 through the line 389, the valve 836 and the line 838 to the lower end of the first elevator cylinder 421 to raise the first elevator, fluid returning from the cylinder 421 through the line 837, the valve 834, the line 833 and the control valve 360 to the return line 8062.

As the stack compressing assembly reaches its lowermost position, the push button switch 551 (FIG. 30) is actuated. The contacts (FIG. 46) of the switch 551 open instantaneously to de-energize the time delay relay 825 causing delivery of a pad onto the elevator plates 396 and 397 (FIG. 19) to start a new stack.

When the first stack has been pushed fully into the basket 592 (FIG. 36) the limit switch 587 (FIG. 33) is actuated to open contacts 587A and 587B (FIG. 46) thereof and to close contacts 587C thereof. Openings of the contacts 587A de-energizes the control relay 861 and the solenoid 863A. The contacts 587B are connected in parallel with contacts 503C of the limit switch 503 (FIG. 26), which open when the second elevator assembly is fully lowered, and opening of the contacts 587B de-energizes the control relay 853 and the solenoid 856A. Closing of the contacts 587C energizes a solenoid 873A and a control relay 879. The solenoid 873A and the control relay 879 are energized by a circuit including contacts 874A of a spring returned push button switch 874, contacts 703A of the limit switch 703 (FIG. 38), which are closed to indicate that the basket clearing pusher assembly 651 is fully retracted, the contacts 587C (FIG. 46) and contacts 8741A of the manual discharge control relay 8741. When the solenoid 873A is energized, a valve 873 (FIG. 48) is moved to its alternate position and fluid under pressure from the fluid pressure line 8061 is introduced through the valve 873 and a line 8743 into the cylinder 638 to swing the basket 592 from the FIG. 36 position to the FIG. 34 position, fluid returning from the cylinder 638 through a line 8744 and the valve 873 to the return line 8062. Throttle-check valve units 8745 and 8746 in the lines 8744 and 8743, respectively, make possible control of the speed of turning of the basket 592. A pressure operated pilot valve 8747 in the line 8743 and controlled by pressure in the line 8744 prevents return movement of the basket except when there is a positive pressure in the line 8744. Energizing of the relay 879 (FIG. 46) closes contacts 879A and 879B (FIG. 47) thereof and opens contacts 879C thereof. The contacts 879A form a hold-in circuit for the relay 879.

De-energizing of the solenoid 863A permits return of the valve 863 (FIG. 48) to the position shown at which fluid from the pressure line 798 is introduced through the valve 863 and the line 866 into the cylinder 566 to retract the first horizontal pusher assembly, fluid returning from the cylinder 566 through the line 864 and the valve 863 to the return line 8062. De-energizing of the solenoid 856A releases the valve 856. De-energizing of the control relay 853 (FIG. 46) permits closing of the contacts 853D thereof to energize the...
solenoid 856B to move the valve 856 (FIG. 48) to the left so that fluid under pressure from the line 8061 is introduced through the valve 856, the line 859, the valve 836, and the line 847 into the lower end of the cylinder 491 to raise the second elevator rapidly, fluid returning through the line 846, the valve 834, the line 858 and the valve 856 to the return line 8062. Deenergizing of the control relay 853 also opens contacts 853B and 853C thereof. Opening of the contacts 853C de-energizes the solenoid 854A permitting the valve 854 (FIG. 49) to return to the position shown to introduce air under pressure from the air pressure line 798 through the valve 854 and a line 875 into the cylinder 527 to move the stack compressing assembly 506 (FIG. 27) horizontally toward its retracted position.

De-energizing of the control relay 861 opens the contacts 861A thereof de-energizing the solenoid 862A permitting the valve 862 (FIG. 49) to return to the position shown at which air under pressure from the air pressure line 798 is introduced through the valve 862 and a line 877 into the lower end of the cylinder 518 to raise the stack compressing assembly 506 toward the raised and retracted position shown in FIG. 29. De-energizing of the control relay 861 (FIG. 46) also permits the contacts 861C thereof to close by-pass the push button switch 551 so that operation of the push button switch 551 is ineffective to de-energize the control relay 825 until the control relay 861 is again energized.

When the first elevator assembly reaches its fully raised position, the contacts of the limit switch 4581 (FIGS. 46 and 23) open to de-energize the time delay relay 812. De-energizing of the time delay relay 812 permits contacts 812A (FIG. 46) thereof to open and contacts 812C (FIG. 47) thereof to close to energize the control relay 821 and a time delay relay 878. De-energizing of the control relay 821 closes the contacts 821A thereof to energize the motors 52 and 96 (FIGS. 45 and 47) which advance cartons. De-energizing of the time delay relay 812 (FIG. 46) also permits opening of the contacts 812D thereof.

When the second elevator assembly 458 (FIG. 26) reaches fully raised position, the limit switch 498 is actuated to close the contacts 498B (FIG. 46) and 498A (FIG. 47) thereof and to open contacts 498C thereof to deenergize the solenoid 856B permitting the valve 856 (FIG. 48) to return to the position shown.

When the first horizontal pusher assembly 553 (FIG. 33) is fully retracted, the limit switch 582 is actuated to close the contacts 582A (FIG. 47) and 582B (FIG. 46) thereof.

When the basket 592 reaches the FIG. 34 position, the contacts of the limit switch 643 (FIGS. 43 and 47) are closed to energize a solenoid 881A. The limit switch 718 (FIGS. 40 and 47) prevents energizing of the solenoid 881A when the fences 710 and 711 are away from the position shown in FIG. 40. Energizing of the solenoid 881A (FIG. 47) advances a detent valve 881 (FIG. 48) to the position shown at which fluid under pressure from the fluid pressure line 8061 is introduced through the valve 881 and a line 883 into the cylinder 691 (FIGS. 38 and 48) to advance the basket clearing pusher assembly 651 through the basket 592 and between the fences 672 and 673 (FIG. 40) to deliberate the stack between the fence members 710 and 711. Fluid returns from the cylinder 691 through a line 884 and the valve 881 to the return line 8062. A through-check valve assembly 8841 in the line 884 permits control of the rate of advance of the basket clearing pusher assembly. When the stack has been retrieved between the fence members 710 and 711 (FIG. 40), the limit switch 716 is actuated to open contacts 716A (FIG. 47) thereof de-energizing the solenoid 881A and to close contacts 716B.

When the basket clearing pusher assembly 651 (FIG. 46) is fully extended, the limit switch 707 (FIG. 40) is actuated to close contacts 707A (FIG. 47) thereof and to open contacts 707B (FIG. 46). Opening of the contacts 707B de-energizes the control relay 789 to open the contacts 879B (FIG. 47) thereof and to close the contacts 879C thereof. Closing of the limit switch 707A energizes a solenoid 881B to move the valve 881 (FIG. 48) to its other position at which fluid under pressure from the line 8061 is introduced through the valve 881 and the line 884 into the cylinder 691 to return the basket clearing pusher assembly 651 (FIG. 38) to retracted position, fluid returning through the line 883 (FIG. 48) and the valve 881 to the return line 8062.

When the basket clearing pusher assembly is partially retracted sufficiently to clear the fences 710 and 711 (FIG. 40), contacts of the limit switch 709 (FIGS. 38 and 47) close to energize a control relay 885 (FIG. 47). The control relay 885 can be used to operate controls (not shown) of the machine 712 (FIG. 40), details of which are not shown.

When the basket clearing pusher assembly 651 has been fully retracted, the limit switch 703 (FIG. 38) is actuated to close the contacts 703A (FIG. 46) and 703B (FIG. 47) thereof. Closing of the contacts 703B energizes a solenoid 873B to return the valve 873 (FIG. 48) to the position shown at which fluid under pressure from the pressure line 8061 is introduced through the valve 873 and the line 8744 to the cylinder 638 to swing the basket 592 from the FIG. 34 position to the FIG. 36 position, fluid returning from the cylinder 638 through the line 8743 (FIG. 48) and the valve 873 to the return line 8062.

If there is a stack in the basket 592 (FIG. 34) which must be discharged to clear the basket, as when the machine is being started, the push button switch 874 (FIG. 46) is moved to its other position opening the contacts 874A thereof and closing contacts 874B and 874C thereof to energize the solenoid 873A and the control relay 879 to initiate the swinging of the basket and discharge of the stack from the basket in the manner already described.

If there is an improperly formed stack or a stack to be rejected for some other reason, the stack reject spring returned push button switch 813 is instantaneously moved to its other position to initiate a reject cycle to open the contacts 813A thereof and to close contacts 813B and 813C thereof. Opening of the contacts 813A de-energizes the control relay 811. Closing of the contacts 813B energizes the control relay 814 and the solenoid 8141. As already pointed out, energizing of the solenoid 8141 moves the valve 8142 (FIG. 49) to its alternate position directing air under pressure to the cylinders 452 and 454 to swing the elevator plates 396 and 397 (FIG. 19) of the first elevator assembly to lowered position. Energizing of the control relay 814 (FIG. 46) closes the hold-in contacts 814A thereof and opens the
contacts 814B de-energizing the solenoids 834A and 836A allowing the valves 834 and 836 (FIG. 48) to return to the position shown causing raising of the first elevator assembly under control of the control valve 360. Energizing of the control relay 8741 causes closing of hold-in contacts 8741B thereof and lights a warning lamp 891, which is in parallel with the control relay 8741. Energizing of the control relay 8741 also opens contacts 8741A, 8741C (FIG. 47), and 8741D thereof. Opening of the contacts 8741A (FIG. 46) de-energizes the solenoid 873A and the control relay 879 to prevent swinging of the basket from stack receiving position, as already described. Opening of the contacts 8741C (FIG. 47) de-energizes the solenoid 881A to prevent advance of the basket clearing pusher assembly as already described. Opening of the contacts 8741D de-energizes the control relay 821 to prevent energizing of the carton conveyor motors 52 and 96.

De-energizing of the control relay 811 opens the hold-in contacts 811A thereof and also opens the contacts 811C to de-energize the time delay relay 826 to cause discharge of a pad after a short interval. De-energizing of the time delay relay 826 also permits closing of the contacts 826C thereof after a time delay to re-energize the control relay 811. De-energizing of the control relay 811 also causes closing of the contacts 811B thereof to energize the alarm 8131, closing of the contacts 811D thereof to energize the counter resetting solenoid 141C and closing of contacts 811E thereof to energize the time delay relay 812. Energizing of the time delay relay 812 causes closing of contacts 812D thereof after a time delay to energize the control relay 853 and the solenoid 856A to cause rapid downward advance of the second elevator as already described and discharge of the rejected stack as heretofore described. When the second elevator has descended and the first horizontal pusher assembly has advanced the rejected stack into the basket, the push button switch 874 (FIG. 46) is advanced to its other position to cause clearing of the basket as already described.

When the rejected stack has been discharged, normal operation can be restored by moving the switch 8221 to its other position to de-energize the control relay 8741.

If, during operation of the machine, the counting mechanism registers a full count before the stack on the second elevator is sufficiently high to cause operation of the limit switch contacts 501B of the limit switch 501 (FIG. 26), instantaneous closing of the counter contacts 141A is ineffective to energize the time delay relay 812, and the stack continues to build up on the second elevator. Then, when the stack is sufficiently high to cause the contacts 501A of the limit switch 501 to open, the control relay 811 is de-energized and contacts 811B thereof energize the alarm 8131 while the contacts 811E thereof energize the time delay relay 812 initiating a discharge operation as explained hereinafter.

If, during operation of the machine, the counting mechanism does not register a full count between the time that the contacts 501B close and the time the contacts 501A open, opening of the contacts 501A de-energizes the control relay 811 to energize the alarm 8131 and to initiate a discharge operation as described above. If it is desired to produce and discharge a stack of a given height at each cycle of the machine without regard for the count, a switch 902 can be opened to prevent energizing the relay 812 when the counter contacts 141A close. A switch 903 in a bypass line 904 can be closed to bypass the counter contacts 141B. Then, the machine operates to deliver a stack of a height measured by the limit switch contacts 501A.

The carton drive motors 52 and 96 (FIGS. 45 and 47) are controlled by the contacts 821A (FIG. 47) of the control relay 821. The relay 821 in turn is controlled by a circuit which permits energizing of the control relay 821 to advance cartons only when cartons can be received. The control relay 821 can be energized to cause carton advance only when the manual reject control relay 8741 and the packing cycle time delay relay 812 are de-energized so that contacts 8741D and 812C are closed. Furthermore, if the switch contacts 822D are open, as in normal operation, the control relay 821 cannot be energized until there has been a time delay following energizing of the pad delivery relay 825 (FIG. 46) to cause closing of the contacts 825C (FIG. 47) thereof. Furthermore, if the first elevator is at the position at which it transfers cartons to the second elevator and limit switch contacts 4582A are open, the control relay 821 is not energized unless the second elevator is fully up to close limit switch contacts 498A. Finally, the control relay 821 is not energized if the first elevator is in the lower portion of its travel to open the limit switch contacts 4583 unless limit switch contacts 4582A are closed to indicate that the first horizontal pusher assembly is fully retracted. The time delay relay 878 is energized in parallel with the control relay 821. Time delay contacts 878A thereof close after a time delay following de-energizing of the time delay relay 878 to light a warning lamp 895 in the event that there is an undue delay in the re-energizing of the control relay 821.

If, during operation of the machine, delivery of a pad is required which is not automatically delivered, a pad delivery switch 901 (FIG. 46) can be operated to de-energize the relay 825 causing delivery of a pad. Further, if it is desired to insert a pad or pads in the stack at a selected position or positions along the stack, the pad delivery switch 901 can be opened instantaneously at such a time as delivery of a pad is desired. The switch 901 can be operated manually or, if desired, automatic means, not shown in detail, can be associated with the second elevator assembly for instantaneously opening the pad delivery switch 901 when the stack is at a predetermined height.

The machine counts cartons, assembles the cartons in an upright stack with a protective pad at each end of the stack, compresses the stack, pushes the stack into a basket having open ends and side plate assemblies which hold the stack, turns the basket to hold the stack of cartons to horizontal position, and discharges the stack from the basket in a direction parallel to the cartons in the stack.

The compressing of the stack before it is advanced into the basket renders the machine suitable for handling stacks of articles such as cartons which are springy, and the compression renders the stack of springy articles stable.

The carton stacking and bundling machine illustrated in the drawings and described above is subject to modification without departing from the spirit and scope of the appended claims.

Having described our invention, what we claim as new and desire to secure by letters patent is:
1. A machine for stacking and bundling flat articles which comprises a horizontal stack receiving arm, means for forming a compressible upright stack of articles on the stack receiving arm with the articles extending horizontally, a horizontal presser foot, means for lowering the presser foot over the stack to compress the stack, a generally U-shaped basket having parallel spaced sides, means for mounting the basket for swinging between an upright position in which the sides are horizontal and substantially aligned with the stack receiving arm and the presser foot in stack compressed position and a lay-over position in which the sides of the basket are upright, means for pushing the stack from between the presser foot and the stack receiving arm into the basket when the basket is in upright position with ends of the stack bearing on the sides of the basket and the stack being compressed between the sides of the basket, and means for swinging the basket to lay-over position when the stack has been received therein to turn the stack to a position in which the articles in the stack are upright.

2. A machine as in claim 1 wherein the means for forming a stack of articles on the stack receiving arm includes an elevator, the elevator including spaced plates for supporting edges of articles, the plates being on opposite sides of the stack receiving arm, means for advancing the articles to a position overlying the plates of the elevator and the stack receiving arm, means for moving the elevator between a raised position at which a stack starts to form and a lowered position, the elevator moving means lowering the elevator to the lowered position as the articles build up thereon, means for moving the stack receiving arm between a raised position at which the stack receiving arm is adjacent the plates of the elevator and a lowered position at which the stack is held when being compressed, means for withdrawing the plates of the elevator from below the articles when the elevator is at its lower position and the stack receiving arm is at its raised position, means for lowering the stack receiving arm as the stack builds up thereon until a stack of desired height has been formed on the stack receiving arm whereupon the presser foot is lowered to compress the stack, means for raising the elevator to raised position when the stack is compressed, and means for stopping advance of articles while the presser foot is being lowered, the advance of articles being resumed when the presser foot has been lowered to advance articles for another stack to the elevator while the first stack is being pushed into the basket.

3. A machine as in claim 1 wherein the means for forming an upright stack of articles on the stack receiving arm includes means for counting the articles as the articles are delivered to the stack and means for lowering the presser foot when a predetermined number of articles has been accumulated on the stack.

4. A machine as in claim 1 wherein the means for forming an upright stack of articles on the stack receiving arm includes means for measuring the height of the stack and means for lowering the presser foot when a stack of a predetermined height has been accumulated on the stack receiving arm.

5. A machine as in claim 1 wherein ends of the basket are open and there is a basket clearing pusher assembly and means for advancing the basket clearing pusher assembly crosswise of the basket at lay-over position to discharge the stack from the basket through one of the open ends in a direction lengthwise of the articles.

6. A machine for stacking and bundling flat articles which comprises a horizontal stack receiving arm, means for forming a compressible upright stack of articles on the stack receiving arm with the articles extending horizontally, a horizontal presser foot, means for lowering the presser foot over the stack to compress the stack, a generally U-shaped basket having parallel spaced sides and open ends, means for mounting the basket for swinging between an upright position in which the sides are horizontal and substantially aligned with the stack receiving arm and the presser foot in stack compressed position and a lay-over position in which the sides of the basket are upright, means for pushing the stack from between the presser foot and the stack receiving arm into the basket when the basket is in upright position, and means for swinging the basket to lay-over position when the stack has been received therein to turn the stack to a position in which the articles in the stack are upright, a basket clearing pusher assembly, means for advancing the basket clearing pusher assembly crosswise of the basket at lay-over position to discharge the stack from the basket through one of the open ends in a direction lengthwise of the articles, and track means on the sides of the basket, the basket clearing pusher assembly including a pusher member which passes through the basket as the basket clearing pusher assembly is advanced, the pusher member including guide means for riding on the track means to support the pusher member as the pusher member advances through the basket.

7. A machine as in claim 6 wherein there is second track means mounted on the machine and the guide means rides on the second track means when the basket clearing pusher assembly is in a retracted position clear of the basket.

8. A machine for stacking and bundling flat articles which comprises a horizontal stack receiving arm, means for forming a compressible upright stack of articles on the stack receiving arm with the articles extending horizontally, a horizontal presser foot, means for lowering the presser foot over the stack to compress the stack, a generally U-shaped basket having parallel spaced sides and open ends, means for mounting the basket for swinging between an upright position in which the sides are horizontal and substantially aligned with the stack receiving arm and the presser foot in stack compressed position and a lay-over position in which the sides of the basket are upright, means for pushing the stack from between the presser foot and the stack receiving arm into the basket when the basket is in upright position, and means for swinging the basket to lay-over position when the stack has been received therein to turn the stack to a position in which the articles in the stack are upright, a basket clearing pusher assembly, means for advancing the basket clearing pusher assembly crosswise of the basket at lay-over position to discharge the stack from the basket through one of the open ends in a direction lengthwise of the articles, and spaced fences mounted on the machine opposite the lay-over position of the basket, the fences being substantially aligned with the sides of the basket in lay-over position, the fences receiving the stack therebetween when the stack is discharged from the basket.
9. A machine as in claim 6 wherein there are spaced fences mounted on the machine opposite the lay-over position of the basket, the fences being substantially aligned with the sides of the basket in lay-over position, the fences receiving the stack therebetween when the stack is discharged from the basket, and the fences are provided with rail means engageable by the guide means for supporting the pusher member in extended position.

10. A machine as in claim 1 wherein the means for lowering the presser foot over the stack includes means for withdrawing the presser foot from above the stack as the stack accumulates and for advancing the presser foot to a position overlying the stack when advance of articles to the stack is stopped, and means for lowering the presser foot from the position overlying the stack to compress the stack.

11. A machine as in claim 1 wherein the means for forming a stack of articles on the stack receiving arm includes means for delivering articles onto a stack on the stack receiving arm, means for measuring the height of the upper level of the stack, means for lowering the stack receiving arm as the stack builds up to maintain the upper level of the stack at a predetermined height, means for stopping advance of articles onto the stack when the stack has reached a predetermined height, and means for lowering the stack receiving arm to a position substantially aligned with the lower one of the sides of the basket in upright position before the presser foot is lowered.

12. A machine as in claim 1 wherein the means for forming a stack of articles on the stack receiving arm includes means for delivering articles onto a stack on the stack receiving arm, means for measuring the height of the upper level of the stack, means for lowering the stack receiving arm as the stack builds up to maintain the upper level of the stack at a predetermined height, means for stopping advance of articles onto the stack when the number of articles in the stack has reached a predetermined number, and means for lowering the stack receiving arm to a position substantially aligned with the lower one of the sides of the basket in upright position before the presser foot is lowered.

13. In a machine for bundling a stack of articles, the combination of means for compressing the stack in upright position between parallel compressor members, a generally U-shaped basket having open ends and parallel spaced sides, means for mounting the basket for swinging between an upright position in which the sides are substantially aligned with the compressor members in stack compressed position and a lay-over position in which the sides of the basket are upright, means for pushing the stack from between the compressor members into the basket when the basket is in upright position with ends of the stack bearing on the sides of the basket and the stack being compressed between the sides of the basket, means for swinging the basket to lay-over position when the stack has been received therein, a basket clearing pusher assembly, and means for advancing the basket clearing pusher assembly crosswise of the basket at lay-over position to discharge the stack from the basket through one of the open ends, there being track means on the sides of the basket and guide means on the pusher assembly for riding on the track means as the pusher assembly advances through the basket.

14. A machine for stacking and bundling flat articles which comprises a horizontal stack receiving arm, means for forming a compressible upright stack of articles on the stack receiving arm with the articles extending horizontally, a horizontal presser foot, means for lowering the presser foot over the stack to compress the stack, a generally U-shaped basket having parallel spaced sides, the basket being mounted for swinging between an upright position in which the sides are horizontal and substantially aligned with the stack receiving arm and the presser foot in stack compressed position and a lay-over position, means for pushing the stack from between the presser foot and the stack receiving arm into the basket when the basket is in upright position with ends of the stack bearing on the sides of the basket and the stack being compressed between the sides of the basket, and means for swinging the basket to lay-over position when the stack has been received therein.
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,832,938 Dated September 3, 1974

Inventor(s) Willis J. Stapp, Norman P. Crowe and Edwin A. Molitor

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 28, Claim 8, line adjacent marginal reference number 65, "algined" should be -- aligned --;

Column 29, Claim 12, line 41, "substna-" should be -- substan- --.

Signed and sealed this 26th day of November 1974.

(SEAL)
Attest:

McCoy M. Gibson Jr.
Attesting Officer

C. Marshall Dann
Commissioner of Patents