Jan. 11, 1966 C. E. CORY 3,228,171

PACKAGING MACHINE

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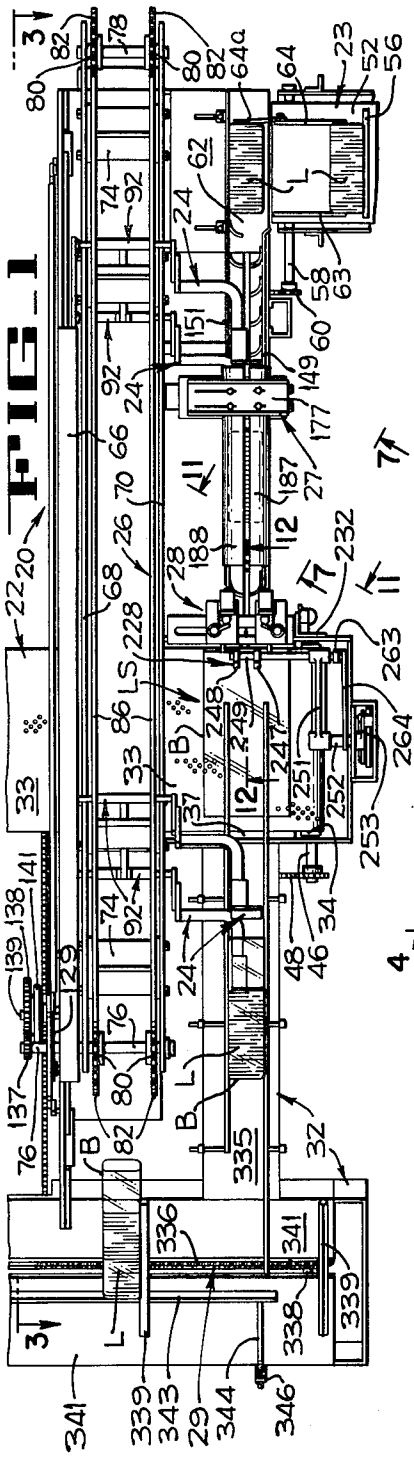


FIG. 1

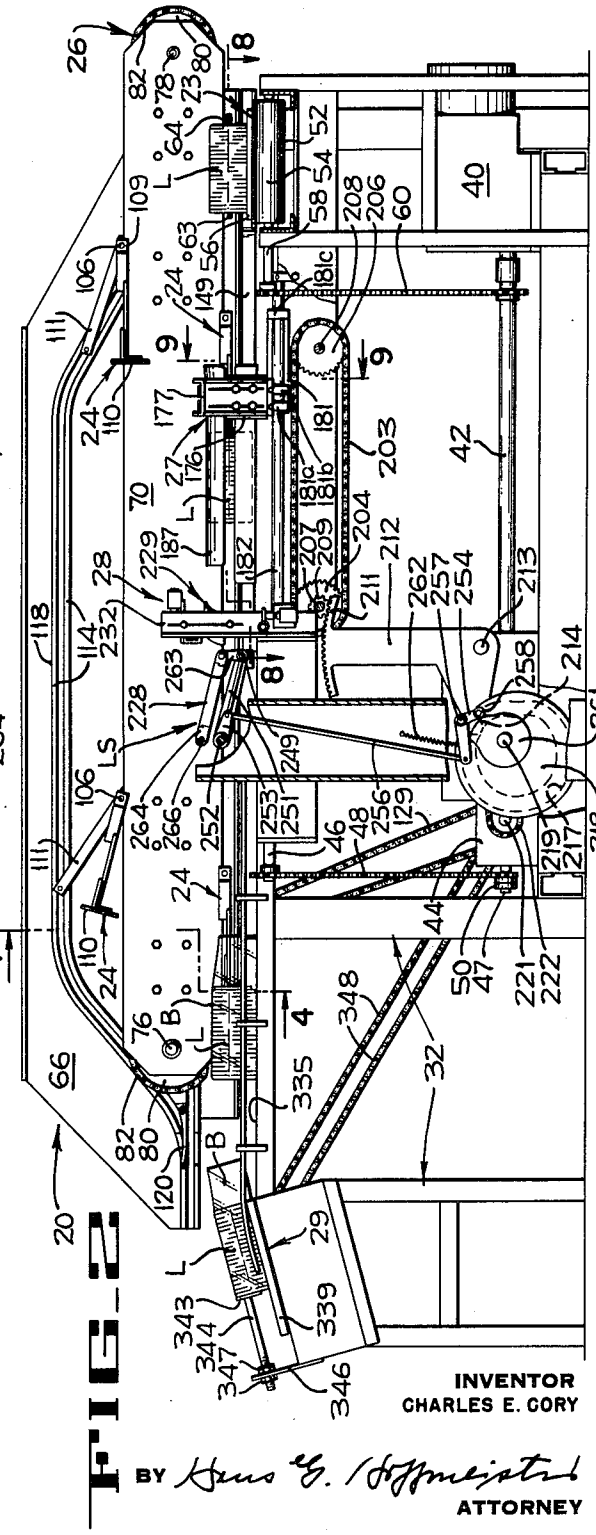


FIG. 2

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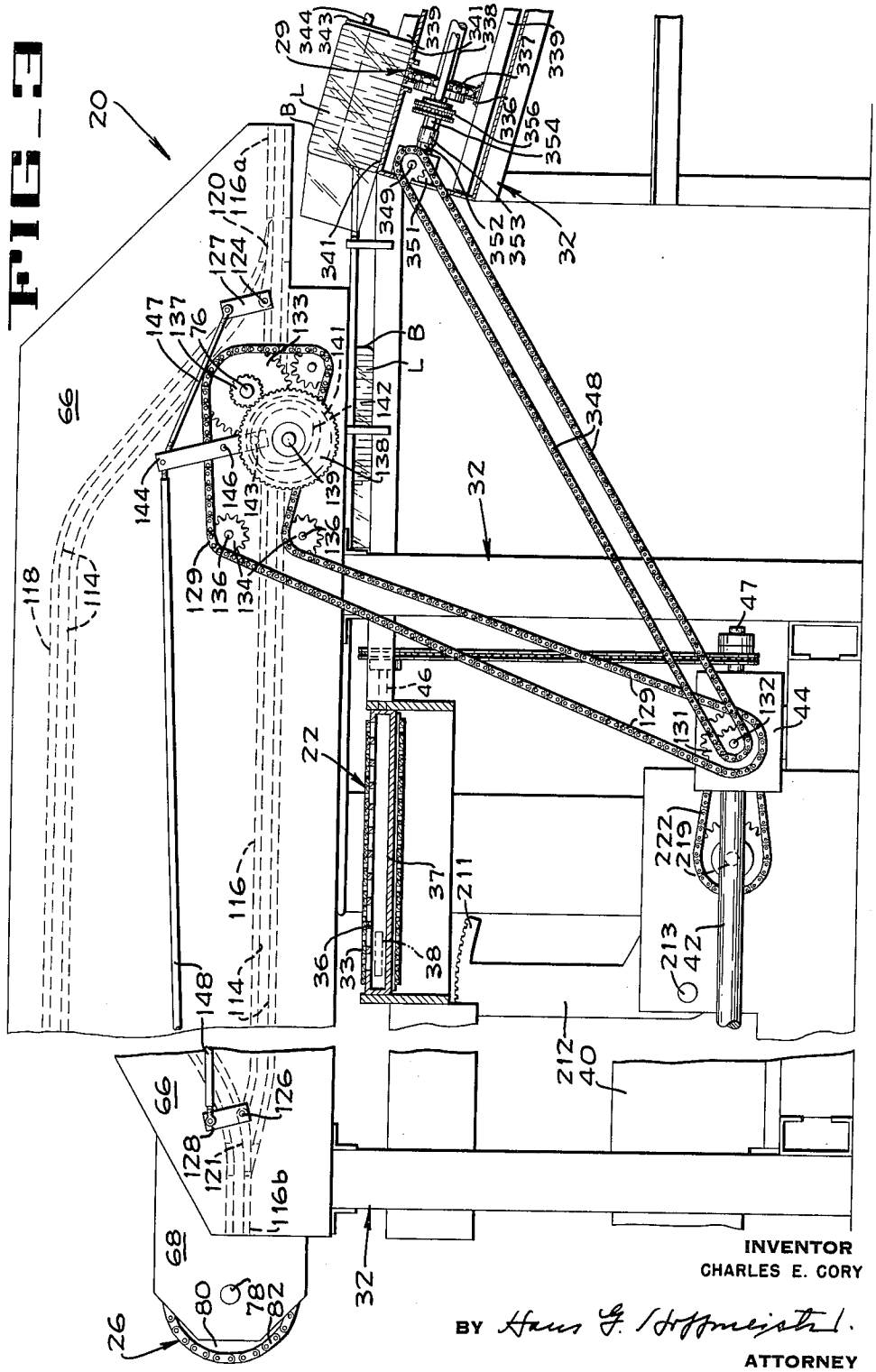
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FIG. 3



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FIG_5

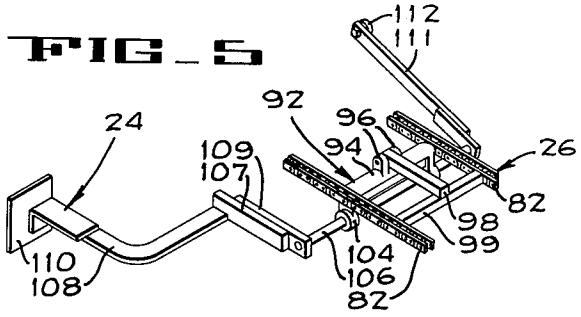


FIG_4

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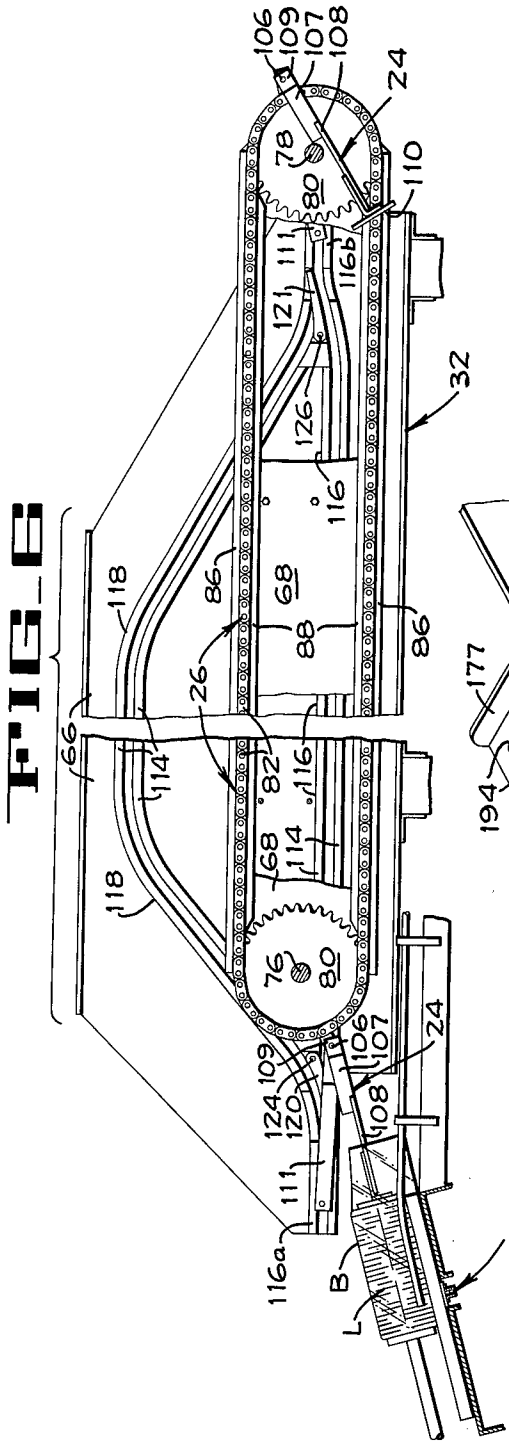


FIG. 6

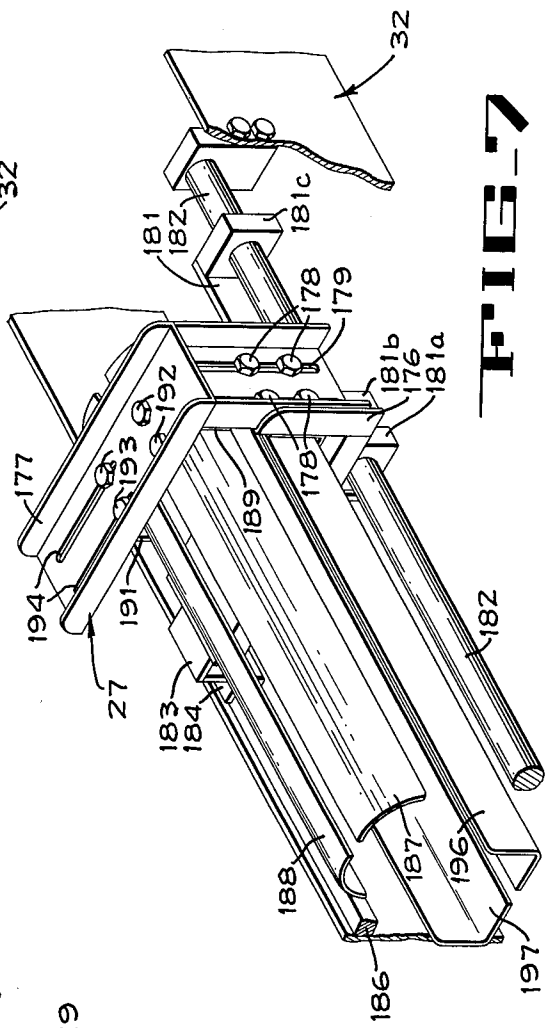


FIG. 7

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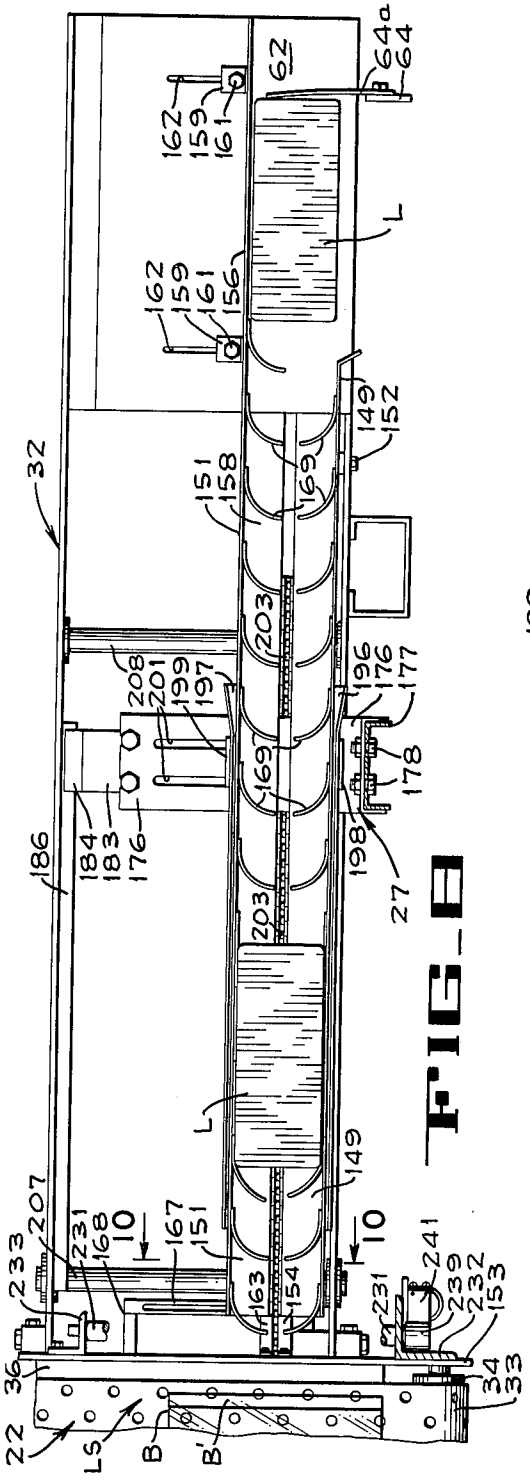


FIG. 8

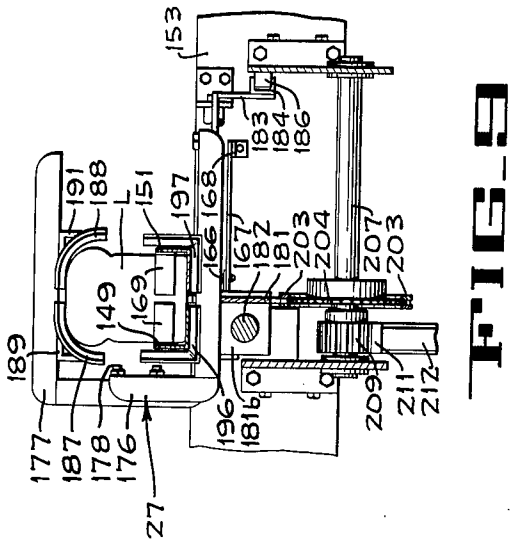


FIG. 9

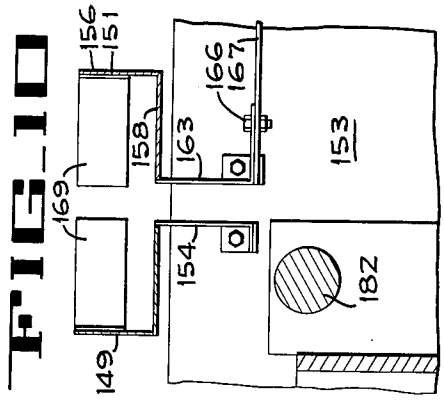


FIG. 10

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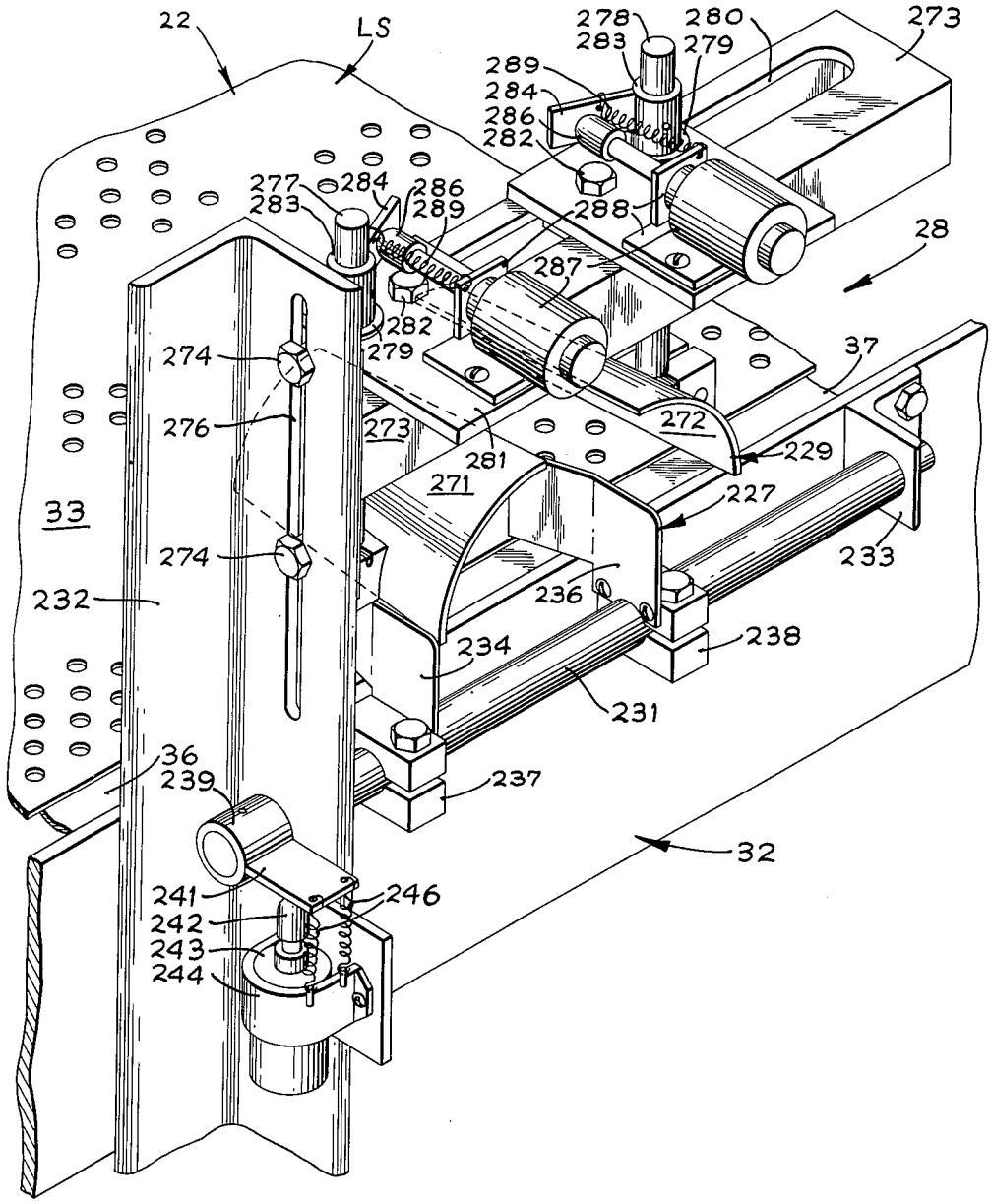
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FIG_11



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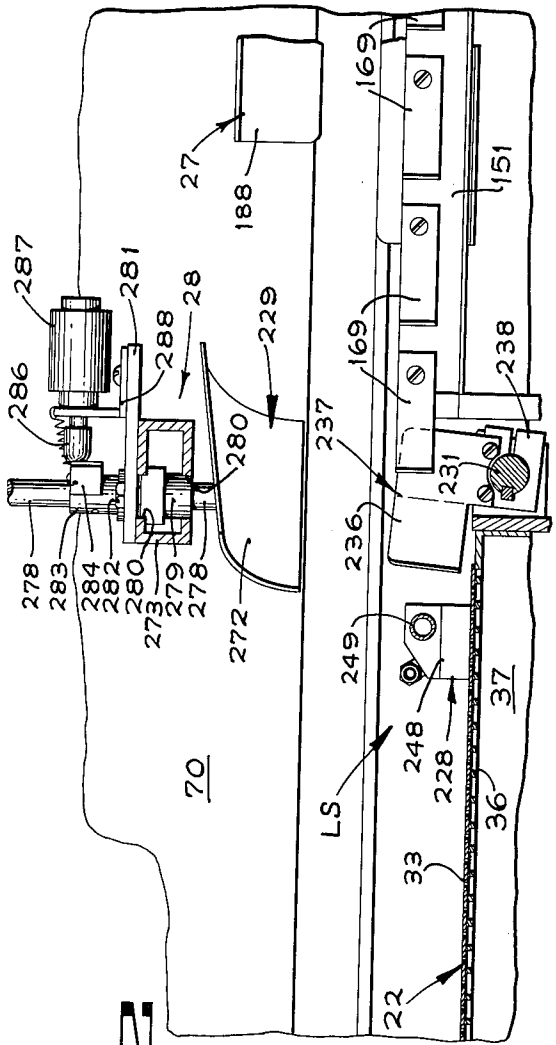


FIG_12

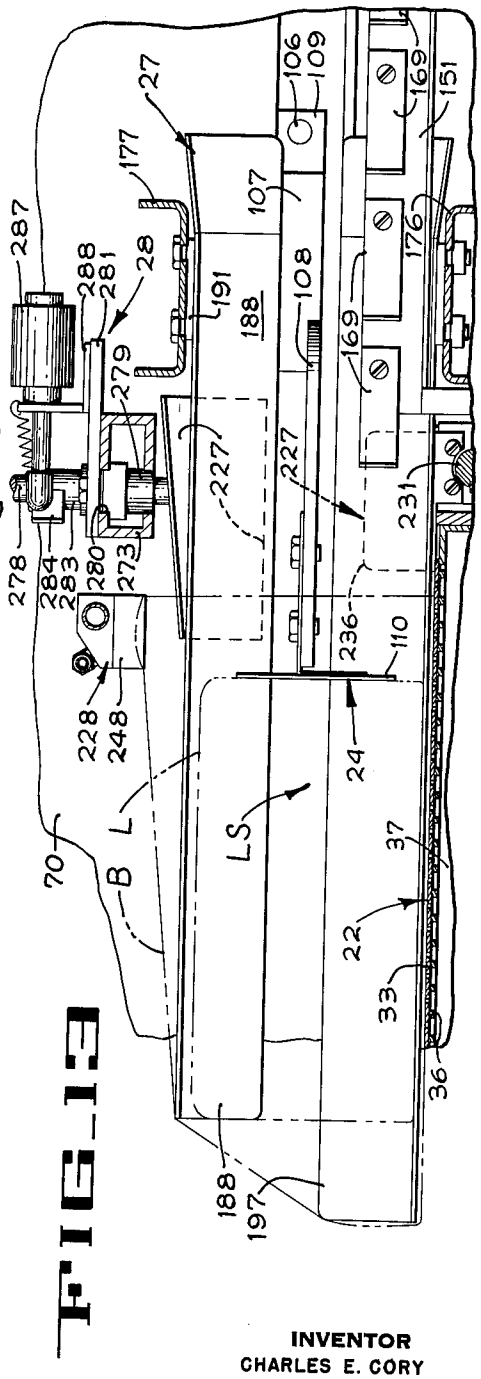


FIG_13

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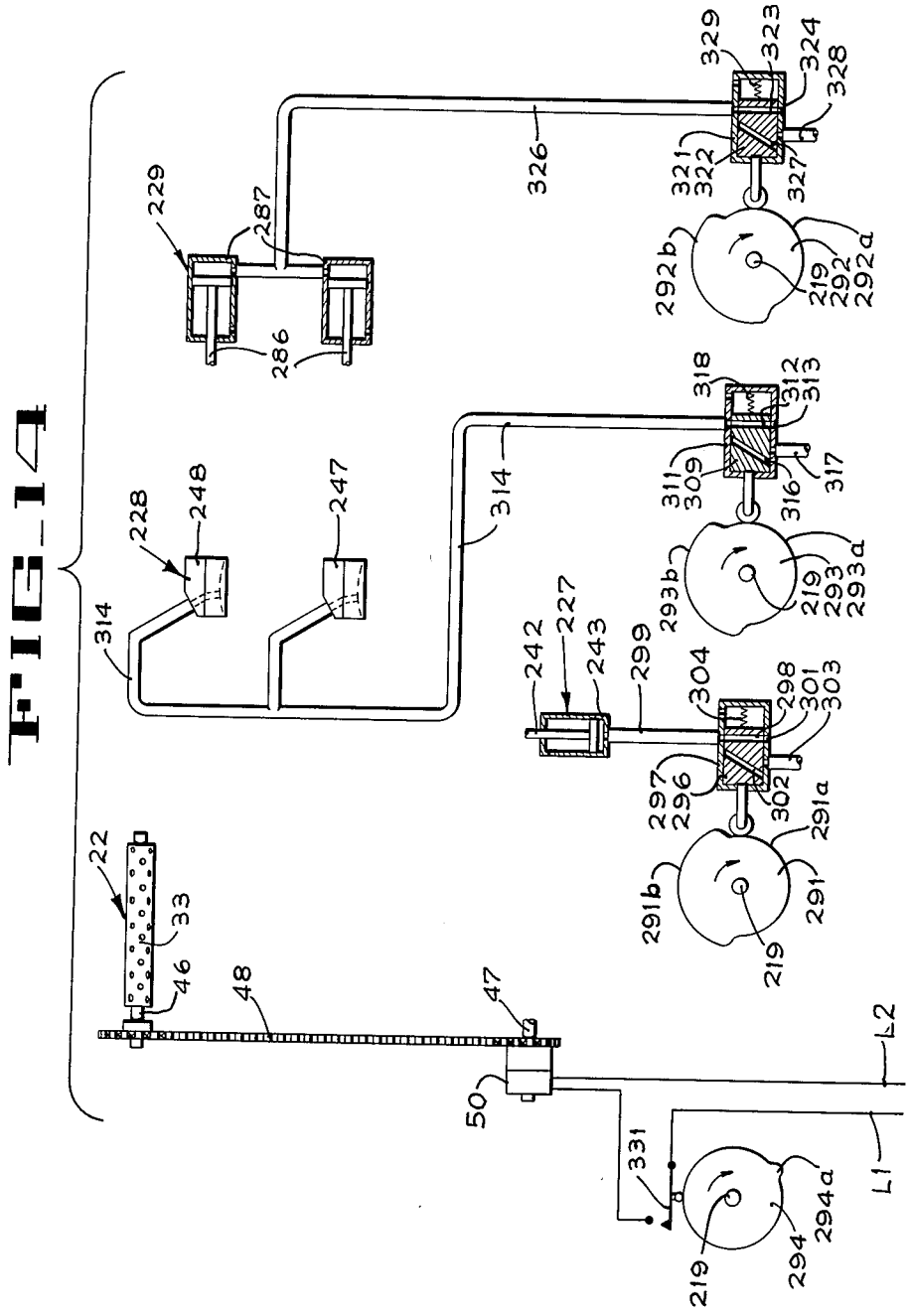
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PACKAGING MACHINE

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FIG. 14



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United States Patent Office 3,228,171
Patented Jan. 11, 1966

3,228,171

PACKAGING MACHINE

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Filed Oct. 5, 1962, Ser. No. 228,687
15 Claims. (Cl. 53—187)

The present invention pertains to packaging machines and more particularly relates to an apparatus for loading articles, such as sliced loaves of bread, individually into resealable plastic containers.

Heretofore, sliced loaves of bread and other bakery products, such as rolls and buns, were automatically packaged in rather stiff, waxed or plastic material tightly wrapped around the commodity and firmly sealed in place. Once a container of this type is opened and a part of its contents removed, the quality of the remaining contents is impaired because such a package cannot be satisfactorily resealed. This difficulty is caused by the stiffness of the packaging material and also because if only a small part of the contents is removed, say one or two slices, insufficient excess material is available to permit folding of the open end of the container in such a manner as to provide an air tight seal.

The apparatus of the present invention uses preformed polyethylene containers, which are in the form of bags that are open at one end. Each bag includes sufficient excess material to permit its open end to be easily pursed and sealed with a wire tie after being filled. Also, the preformed bags are highly resistant to being punctured or torn, in spite of the fact that the polyethylene sheet material of which they are formed is extremely thin and consequently relatively inexpensive. Additionally, after the bread or other bakery product has been removed, the bag affords convenience as a container for other commodities which are beneficially stored in a flexible, substantially airtight container.

It has been discovered that the crust fragments of certain types of sliced breads are quite sharp and will tear the polyethylene film from which the bags are made if the bags are allowed to slide in contact with the sharp crust fragments.

Accordingly, it is one object of the present invention to provide an apparatus for loading articles into bags.

Another object is to provide an apparatus for automatically loading loaves of bread into preformed open-ended bags.

Another object is to provide an apparatus for automatically loading a sliced loaf of bread into a preformed bag and for shielding the bag from the bread until the operation of moving the loaf all the way to the bottom of the bag is substantially completed.

Another object is to provide an improved device for maintaining the slices of a sliced loaf of bread upright and together while loading the loaf into a bag.

Another object is to provide an improved mechanism for pushing the bread into a bag and for withdrawing the pusher from the filled bag in a manner leaving the bag top in the most advantageous condition for subsequent handling in an automatic bag closing and tying machine.

Another object is to provide an improved mechanism for opening a bag and for supporting the open bag in bread receiving position.

These and other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings, in which:

FIGURE 1 is a plan of a portion of the packaging machine of the present invention, illustrating a collapsed bag in position for loading and a bread carrier in retracted position.

FIGURE 2 is a side elevation of the apparatus of FIGURE 1, parts being broken away and other parts being shown in section.

FIGURE 3 is an enlarged section taken along lines 3—3 of FIGURE 1, illustrating drive mechanisms for the loading conveyor, certain parts being broken away.

FIGURE 4 is an enlarged vertical section taken along lines 4—4 of FIGURE 2 showing details of the loading conveyor, certain parts being broken away.

FIGURE 5 is an enlarged perspective showing the structure for pivotally mounting the pushers of the loading conveyor on the chains of the conveyor.

FIGURE 6 is an enlarged fragmentary, longitudinal section of the loading conveyor showing the parts in a different operative position from that illustrated in FIGURE 2, certain parts being broken away.

FIGURE 7 is an enlarged fragmentary perspective of the bread carrier viewed as indicated by the line 7—7 in FIGURE 1.

FIGURE 8 is an enlarged horizontal section taken along lines 8—8 of FIGURE 2 showing the device for maintaining the slices of bread in each loaf in an upright position as the loaf is moved toward the loading station.

FIGURE 9 is a vertical section taken along lines 9—9 of FIGURE 2 showing the structure for mounting the bread carrier and showing the position of the bread supporting guide rails relative to the carrier.

FIGURE 10 is a vertical section taken along lines 10—10 of FIGURE 8, showing the structure for mounting one end of the bread guide rails.

FIGURE 11 is an enlarged perspective of the bag opening mechanism viewed as indicated by the line 11—11 of FIGURE 1.

FIGURE 12 is an enlarged fragmentary section taken along lines 12—12 of FIGURE 1, showing the bag opening mechanism in an inactive position and the bread carrier in a retracted position.

FIGURE 13 is a fragmentary section similar to FIGURE 12, showing the bag opening mechanism in an active position and the bread carrier in its advanced position.

FIGURE 14 is a schematic diagram illustrating the control mechanism of the packaging machine.

The article loading apparatus **20** (FIGS. 1, 2 and 3) of the present invention comprises an intermittently driven bag conveyor **22** which advances preformed, open-end, polyethylene bags B one at a time to a loading station LS. Loaves L of sliced bread are fed to the apparatus **20** by a continuously moving feed conveyor **23** of a bread slicing machine (not shown). Pushers **24** of a continuously driven loading conveyor **26** then advance the loaves individually along a linear path into a reciprocating carrier **27**. The carrier **27** cooperates with a pusher **24** to move a loaf of bread into a bag, which is opened by a bag opening mechanism **28**. Thereafter the pusher continues movement of the filled bag B along the path onto an inclined discharge conveyor **29**. The inclination of the discharge conveyor **29** is sufficient to prevent the slices of each loaf from separating. The discharge conveyor **29** advances the filled bags into a bag tying machine (not shown) which closes the open end of each bag and applies a wire tie thereto to provide a substantially air tight container.

More particularly, the article loading apparatus or machine **20** comprises a frame **32** (FIGS. 1, 2 and 3) upon which the several components of the machine are mounted. The intermittently driven bag conveyor **22** includes an endless perforated belt **33** which is trained around the usual rollers **34** (only one being shown in FIG. 1). The upper run of the belt **33** slides over the perforated upper wall **36** (FIG. 3) of a vacuum chamber **37** which is maintained at a sub-atmospheric pressure by a high volume, low pressure blower (not shown) which

draws air from the chamber 37 through a conduit 38 (FIG. 3).

The preformed polyethylene bags B are individually placed in collapsed condition on the upper run of the perforated conveyor belt 33 at spaced intervals therealong, and are held in place on the belt 33 by the low pressure atmosphere in the vacuum chamber 37.

The bag conveyor 22 is intermittently driven by a gear motor 40 (FIGS. 2 and 3) which is coupled to a main drive shaft 42 that is connected to a gear box 44. An output shaft 47 of the gear box is connected to the conveyor drive shaft 46 (FIG. 3), which is journalled in the frame 32 and to which one of the rollers 34 is keyed, by a chain drive 48 which includes a one revolution clutch 50 to thereby achieve the intermittent drive of the conveyor 22 from the continuously driven shaft 47. The one revolution clutch 50 is of well known design and is activated by mechanism to be described hereinafter.

The continuously driven feed conveyor 23 (FIGS. 1 and 2) of the bread slicing machine is of a well known type and is provided to feed sliced loaves of bread to the machine 20 in timed relation with the other operating components of the machine. The feed conveyor 23 includes an endless belt 52, a drive roller 54 and a driven roller (not shown). A plurality of evenly spaced pusher bars 56 secured to the outer surface of the belt 52 assures positive movement of the loaves into the machine 20. The drive roller 54 is secured to a shaft 58 which is connected to the constantly driven main drive shaft 42 by a chain drive 60.

Rails 63 and 64 mounted on the frame 32 guide the sliced loaves of bread on the conveyor 23 onto a table 62 and into the path of movement of the pushers 24. The rail 64 includes a flexible end portion 64*a* (FIGS. 1 and 8) which deflects to permit the pushers 24 to move therepast. It will be apparent that the individual slices of the loaves of bread are held together and in an upright position by the spaced guide rails 63 and 64 while the loaves are on the feed conveyor 23.

Each of the pushers 24 (FIGS. 2, 4 and 6) is cam controlled and with the cooperation of the carrier 27, as will presently be explained, moves a loaf of bread into a bag and then positively moves the bread and the bag as a unit onto the discharge conveyor 29. Thereafter, the pusher 24 is withdrawn from the bag in a particular manner which leaves the bag top in the most advantageous condition for handling in an automatic bag closing and tying machine.

The loading conveyor 26 (FIGS. 1, 2, 4 and 6) is carried by a longitudinally extending auxiliary frame member 66 of generally L-shaped vertical section which is rigidly secured to the frame 32 of the machine. As is best shown in FIG. 4, a pair of conveyor support plates 68 and 70 are held in parallel vertical planes by a plurality of spacers 74 bolted therebetween. The plate 68 is bolted to spacer blocks 75 one shown in FIGURE 4 and the blocks 75 are bolted to the auxiliary frame member 66.

A drive shaft 76 and an idler shaft 78 extend between and are journalled on the conveyor support plates 68 and 70. Each of the shafts 76 and 78 has a pair of spaced sprockets 80 keyed thereon, which sprockets have a pair of endless chains 82 trained therearound. The upper and lower runs of the chains 82 are guided along linear paths by rails 86 and 88 respectively (FIGS. 4 and 6), which are secured to and held in spaced relation to the adjacent conveyor support plates 68 or 70 by spacers 90.

A plurality of pusher support members 92 (FIGS. 1, 4 and 5) are secured to and are evenly spaced along the chains 82. Each pusher support member 92 provides pivotal support for one of the pushers 24. Each pusher support member 92 comprises a yoke 94 secured at its ends to the chains 82 and having upturned ears 96 to which one end of a link 98 is pivotally connected. The other end of the link 98 is secured to a stabilizing bar 99 which extends between and is pivotally connected to both chains 82 at points spaced from the yoke 94. A pair of ears 104 project downward from the yoke 94 and pivotally support a pusher control shaft 106 which projects laterally of the loading conveyor 26.

An L-shaped pusher support arm 108 is connected by a mounting flange 107 to an arm 109 which is secured to one end of the shaft 106, and a loaf engaging pusher plate 110 is secured to the free end of the arm 108. A cam follower arm 111 is secured to the other end of the shaft 106 and has a cam follower 112 secured to its free end which is disposed adjacent the auxiliary frame member.

As has already been mentioned, each pusher 24 is controlled so as to move a bag having a loaf of bread therein onto the discharge conveyor 29 and then withdraw from the bag in a manner leaving the open end thereof undisturbed. A cam track 114 provided for accomplishing this action, cooperates with the cam followers 112 to guide the pushers in the desired manner.

The cam track 114 (FIGS. 3 and 6) includes a substantially linear lower track section 116, a bowed upper track section 118, and a pair of movable gates 120 and 121 disposed at the points of intersection of the two track sections. End portions 116*a* and 116*b* of the lower track sections 116 extend beyond the gates 120 and 121, respectively. The gates 120 and 121 are rigidly secured to shafts 124 and 126 which are journalled in the frame member 66, and crank arms 127 and 128 (FIG. 3) are rigidly secured to the shafts 124 and 126, respectively. The parts are so proportioned and arranged that the continuously moving loading conveyor 26 moves each pusher 24 in turn toward the discharge end of the conveyor 26 with the associated cam follower 112 riding in the lower cam track 116. After the roller 112 has moved past the gate 120 into the end portion 116*a*, the gate 120 is shifted to its lower position, shown in FIGURE 6, so that shortly after the pusher commences its return movement caused by continued movement of the conveyor 26, the cam follower 112 rides over the gate 120 and into the upper track section 118. Therefore, as the pusher 24 returns toward the receiving end of the loading conveyor 26, it is raised to an elevated position, so that during its return stroke it will clear succeeding loaves being propelled by following pushers, as well as a loaf on the table 62 awaiting its turn to be pushed into the carriage 27. As the pusher approaches the end of its return stroke, its associated cam follower 112 rides over the upper surface of the gate 121, positioned as shown at the left end of FIGURE 3, and enters the end portion 116*b* of the lower track section 116. This effects lowering of the pusher, so that when it arrives at the end of its return stroke, it will be in a position behind a loaf L which has just arrived on the table 62. The gate 121 is then shifted to its upper position, shown at the right hand end of FIGURE 6, permitting the cam follower 112 to move forward along the lower track section 116 and hold the associated pusher 24 in its lowered position to engage a loaf of bread and move the same toward the bag B at the loading station LS.

The mechanism for continuously driving the loading conveyor 26 and for operating the gates 120 and 121 in timed relation therewith is best shown in FIGURE 3. A drive sprocket 131 keyed to a second output shaft 132 of the gear box 44 is connected by a chain 129 to a driven sprocket 133 that is keyed to the conveyor drive shaft 76. The chain 129 is additionally trained around idler sprockets 134 that are journalled on shafts 136 which are secured to the frame member 66.

The gates 120 and 121 are driven from the conveyor drive shaft 76 by means of a pinion 137 keyed thereto and enmeshed with a large diameter gear 138 which is journalled on a stub shaft 139 secured to and project-

ing from the frame member 66. A cam 141 rigidly secured to the gear 138 has a cam groove 142 therein. A cam follower 143 journalled on one end of an arm 144 is disposed within the cam groove 142 and causes the arm 144 to turn a few degrees in each direction about a pivot pin 146 upon which the arm 144 is mounted. The other end of the arm 144 is pivotally connected to the crank arms 127 and 128 by links 147 and 148, respectively.

Thus, the loading conveyor 26 is driven continuously and the cam 141 causes actuation of the gates 120 and 121 in timed relation with the movement of the conveyor 26. The timing is such that the gates 120 and 121 remain in the positions shown in FIGURE 3 until the cam followers 112 (FIG. 4) of associated ones of the pushers 24 are moved to the opposite end portions 116*a* and 116*b* of the lower track sections 116 at which time both gates shift to the positions shown in FIGURE 6, i.e., the gate 120 moves to its lower position permitting the associated cam follower 112 to move into the upper track section, and the gate 121 moves to its upper position permitting the adjacent cam follower to enter the lower track section. It will be apparent that the cam 141 effects return of the gates to the positions shown in FIGURE 3 before the next cam followers reach the gates 120 and 121 so that the above described operating cycle will be repeated for these cam followers and their associated pushers 24.

The continuously moving pushers 24 of the loading conveyor 26 are timed with the movement of the conveyor 23 so as to engage the loaves of sliced bread shortly after the loaves have been fed onto the table 62 (FIG. 1). Each pusher 24 deflects the guide rail 64*a* and engages the associated loaf of bread to move the loaf off the table 62 and toward the loading station LS. After each loaf is discharged from the table 62 it is supported and guided along a linear path by a pair of elongated angle guide rails 149 and 151 (FIGS. 8, 9 and 10) which extend from the table 62 to a point closely adjacent the loading station LS. The rail 149 is stationary and has its inlet or right end (FIG. 8) connected to the frame 32 by a cap screw 152, and its other end connected to a vertical frame member 153 by a bracket 154 (FIGS. 8 and 10) which is welded to the rail 149 and is bolted to the frame member 153.

The guide rail 151 is laterally adjustable in order to handle loaves of different widths. As shown in FIGURE 8, the vertical leg 156 of the rail 151 extends across the table 62 and acts as an abutment which terminates movement of the loaves received from the feed conveyor 23. The horizontal leg 158 of the rail 151 is cut away adjacent the table 62 so that the upper surface of the horizontal leg 158 and the table lie in a common horizontal plane. The receiving end of the rail 151 has angle tabs 159 welded thereto which tabs are connected to the table by bolts 161 which extend through transverse slots 162 in the table. The discharge end of the rail 151 is welded to a downwardly extending L-shaped tab 163 (FIG. 10). The tab 163 is connected by a bolt 166 to a slotted laterally extending section 167 of a U-shaped bracket 168 that is bolted to the frame member 153.

In order to maintain the slices of each loaf of bread upright as the loaf is moved toward the loading station LS by a pusher 24, a plurality of flexible deflecting fingers 169 are mounted on each rail 149 and 151 and project into the path of movement of the loaves of bread. As the bread is moved along its linear path it is contacted by the fingers 169 which may be constructed of nylon or of a light spring steel. The fingers 169 apply sufficient resistance to the movement of the bread to maintain the slices in an upright position.

The reciprocating carrier 27 is provided to receive each loaf of bread after the loaf has been delivered by the feed conveyor 23 onto the table 62 and by the loading conveyor 26 onto the rails 149 and 151. The carrier then moves into a bag B while the loaf is contained therein, thus to shield the bag from the relatively rough crust, which frequently presents hard protrusions so sharp and jagged that, in the absence of such shielding, would puncture and tear the bag material if the loaf were permitted to move relatively to the bag while in contact therewith.

The carrier 27 (FIGS. 2, 7 and 9) comprises a lower L-shaped support member 176 and an upper L-shaped support member 177 whose vertical legs are connected in telescoping relation by bolts 178 which extend through slots 179 in the member 177 and holes in the lower support member 176. This enables the carrier to handle loaves of different heights, as is apparent from observation of FIG. 9. A slide block 181, which includes three apertured ears 181*a*, 181*b* and 181*c* (FIG. 2), is secured to the under surface of the lower carrier member 176 and is slidably received on a longitudinally extending rod 182 which is rigidly secured to the frame 32 of the machine. An L-shaped stabilizing arm 183 (FIG. 9) is bolted to the lower carrier member 176 and has a channel slide 184 welded to its free end. The channel slide 184 slidably engages a longitudinally extending rail 186 which is rigidly secured to the frame of the machine.

A pair of longitudinally extending, transversely curved bag supporting shields 187 and 188 are welded to angle brackets 189 and 191, respectively. The angle bracket 189 is rigidly connected to the upper support member 177 in fixed position by cap screws 192. The angle bracket 191 and its shield 188, are adjustably secured to the upper L-shaped support member 177 by cap screws 193 which are screwed into the angle bracket 191 and extend through slots 194 in the member 177, thus making the shield 188 laterally adjustable relatively to the shield 187 to accommodate loaves of different widths.

A pair of lower rectangular bread supporting shoes 196 and 197, likewise, have angle brackets 198 and 199 (FIG. 8), respectively, welded thereto. The angle bracket 198 is mounted in fixed position on the horizontal leg of the lower support member 176 by cap screws (not shown). The angle bracket 199 and its bread supporting shoe 197 is connected to the lower L-shaped support member 176 by cap screws (but shown) which are screwed into the angle bracket 199 and extend through slots 201 (FIG. 8) in the horizontal leg of the lower support member 176, so that the lower supporting shoe 197 is laterally adjustable similarly to the shield 188, and for the same purpose.

As best shown in FIGURE 9, the rails 149 and 151 are positioned within the bread supporting shoes 196 and 197 so that the carrier 27 may be reciprocated longitudinally without interference with the guide rails 149 and 151. It will also be noted that the right side of the carrier 27 (as viewed in FIG. 9) is open and that the bag supporting shield 188 and the bread supporting shoe 197 are spaced from each other thereby permitting the pushers 24 to extend into and to move relatively to the carrier 27 without interference.

In order that there will be substantially no relative movement between the bread and the bag when the bread is in contact with the bag, the bread supporting shoes 196 and 197 are somewhat longer than the bag supporting shields 187 and 188, as is best shown in FIG. 13. Thus, as the carrier 27 completes its forward motion and starts to return to receive another loaf of bread, the associated pusher 24 moves the bread off the shoes 196 and 197 in such a way that the forward end of the loaf contacts the nearly vertical closed end of the bag. Thus, very little relative movement will occur between the loaf and the bag.

In order to reciprocate the carrier 27 in timed relation with movement of each pusher 24, the block 181 (FIGS. 2 and 9), is connected to an endless chain 203. The chain 203 is trained around sprockets 204 and 206 which are secured to shafts 207 and 208, respectively, which are journalled on the frame 32 of the machine. A pinion 209 is keyed to the shaft 207 and meshes with a gear segment 211 formed on one end of a bell crank 212. The bell

crank 212 is pivotally mounted on a stub shaft 213 which is rigidly secured to the frame 32. A cam follower 214 is journalled on the other end of the bell crank 212 and is received within a cam groove 217 in a cam 218. The cam 218 is keyed to a cam shaft 219 (FIGS. 2 and 3) which is driven from a third output shaft 221 of the gear box 44 by a sprocket and chain drive 222.

The timing between the carrier 27 and the loading conveyor 26 is such that one of the pushers 24 propels a loaf of bread from the table 62 and into the carrier 27 while the carrier is in its retracted position. The carrier 27 and pusher 24 then move toward the bag B at substantially the same linear speed. Prior to reaching the bag, the bag opening mechanism 28 opens the bag, permitting the carrier 27 and the loaf of bread therein to enter the bag. The carrier 27 then reverses its direction of movement while the pusher 24 continues its forward movement to propel the filled bag out of the loading station LS and onto the discharge conveyor 29.

The bag opening mechanism 28 (FIGS. 1, 2, 11, 12 and 13) cooperates with the bag conveyor 22 which advances collapsed bags one at a time into the loading station LS. As is shown at the left end of FIGURE 8, the lower panel of each collapsed bag has a short lip B' projecting a short distance beyond the upper panel. The bag opening mechanism 28 comprises a bag gripping assembly 227 for gripping the lip B' and for determining the width of the lower portion of the open end of the bag B. The mechanism 28 also includes a suction cup assembly 228 for separating the upper panel of the bag from the lower panel, and a bag top spreading assembly 229 for maintaining the bag top open widely enough to permit the carrier 27 with a loaf of bread therewithin to enter the bag.

The bag gripping assembly 227 (FIGS. 11 and 12) comprises a transversely extending rock shaft 231 having one end journalled in vertical angle member 232 of the frame 32 and having its other end journalled in an ear 233 which is bolted to the frame 32. A pair of bag clamping wings 234 and 236 are shaped in the form of a chute which aids in opening the bag and holding it open for entry of the carriage. The wings 234 and 236 are bolted to split blocks 237 and 238, respectively, which may be slid along the shaft 231 and clamped in desired position thereon to adapt the gripping assembly 227 to handle bags of different widths. A collar 239 having a tongue 241 projecting outwardly therefrom is pinned to one end of the shaft with the tongue 241 being in contact with the actuating element 242 of an air cylinder 243. The air cylinder 243 is secured to the angle member 232 by a bracket 244. The bag clamping wings 234 and 236 are normally held in the inactive position spaced from the conveyor belt 33 of the bag conveyor 22, as shown in FIGURE 12, by springs 246 which are connected between the tongue 241 and the bracket 244.

The suction cup assembly 228 (FIGS. 1 and 2) comprises a pair of suction heads 247 and 248 which are rigidly secured to a rod 249 journalled in one end of an arm 251. The other end of the arm 251 is secured to a rock shaft 252 which is journalled in the frame 32. A crank arm 253 secured to the rock shaft 252 is connected by a push rod or link 256 to one end of a bell crank 254 journalled on a stud shaft 257 which is secured to the frame 32. A cam follower 258 on the other end of the bell crank 254 rides along the periphery of a cam 261 which is keyed to the cam shaft 219. A spring 262 holds the follower 258 against the periphery of the cam 261 which is so shaped as to cause the suction heads 247 and 248 to move down and grip the upper panel of a collapsed bag B at the loading station LS immediately prior to the arrival of the carrier 27. Upon gripping the upper panel of the bag, the cam 261 effects the immediate raising of this upper panel.

In order to maintain the gripping surfaces of the suction heads 247 and 248 in a substantially horizontal plane, an arm 263 (FIG. 2) is rigidly secured to the rod 249. The free end of the arm 263 is pivotally connected to one end of a link 264 which is pivoted to the frame at its other end by a pin 266. It will be noted that the arms 251 and 263 and the link 264 cooperate to define a parallelogram linkage. The suction heads 247 and 248 are connected to a vacuum pump (not shown) through a control circuit soon to be described.

As best shown in FIGURES 11, 12 and 13 the bag spreading assembly 229 includes a pair of curved horns 271 and 272. These are mounted for pivotal movement between the retracted position illustrated in FIGURE 12 and the extended position within the bag B illustrated in FIGURE 13. The horns 271 and 272 are moved to the extended position immediately after the upper panel of the bag has been elevated to aid in opening the bag. A box bracket 273 which is mounted on the angle member 232 for vertical adjustment by means of cap screws 274 which are threaded into the bracket 273 and extend through a vertical slot 276 in the angle member 232. The horns 271 and 278 are welded to the lower ends of vertically extending shafts 277 and 278, respectively, which project upward through vertically aligned, transversely extending slots 280 in the bracket 273. Each shaft 277 and 278 is journalled in a bushing 279 having flats formed thereon, which are received in the upper horizontal slots 280 of the bracket 273 to prevent rotation of the bushing. An apertured plate 281 is fitted over each shaft 277, 278 and is connected to the associated bushing 279 by cap screws 282. The position of the shafts 277 and 278 may easily be laterally adjusted by merely loosening the cap screws 282 and moving the shafts to the desired position after which the parts may be locked in their adjusted positions by tightening the cap screws 282.

The actuating mechanism for each of the horns 271 and 272, includes a collar 283 having a tongue 284 projecting therefrom and positioned to engage the actuating element 286 of an air cylinder 287. Each collar 283 is pinned to the associated shaft 277 or 278 so as to prevent axial movement of the shaft relative to the bracket 273, and so as to prevent rotary movement of the shaft relative to the associated collar 283. Each air cylinder 287 is mounted on the associated plate 281 by a bracket 288. A spring 289 is connected between each tongue 284 and the associated bracket 288 to hold the tongue 284 against the actuating element 286 of the air cylinder 287, and to normally hold the associated horn in its retracted position.

As illustrated in FIGURE 14, the actuation of the bag gripping assembly 227 and the bag spreading horns 271 and 272, the evacuation of the suction heads 247 and 248, and the energization of the one-revolution clutch 50 of the bag conveyor 22 are controlled by cams 291, 292, 293 and 294, respectively, keyed on the cam shaft 219. The angular position of the shaft 219 as shown in FIGURE 14 is the same as that shown in FIGURE 2 wherein the carrier 27 is in its retracted position and wherein the suction cup assembly 228 has been lowered to the bag pickup position. At this time, the bag conveyor 22 is stationary and a collapsed bag B is held in the loading station LS by suction which is continuously applied to the bag through the perforations in the belt 33 of the bag conveyor 22.

At this time, which may be considered as the beginning of a cycle of operation, a small diameter portion 291*a* (FIG. 14) of the cam 291 maintains the core 296 of an air valve 297 in a position wherein one end of a vent passage 298 communicates with the lower end of the air cylinder 243 through a conduit 299 and the other end of the vent passage communicates with a port 301 in the valve 297 that is open to the atmosphere. Shortly after the beginning of the cycle of operation, a large diameter portion 291*b* of the cam 291 shifts the core 296 so that an inclined passage 302 therein established communication between the conduit 299 and a conduit 303 connected to a source of air under pressure. Thus, pres-

surized air enters the air cylinder 243 and moves the actuating element 242 thereof to its extended position thereby moving the bag clamping wings 234 and 236 (FIG. 11) into firm clamping engagement with the lip B' of the bag B at the loading station LS. The wings 234 and 236 are maintained in the clamped position by the large diameter portion 291*b* of the cam 291 until the forward end of the carrier 27 is moved into the bag B and to a position closely adjacent the closed end, or bottom of the bag B. At this time the cam shaft 219 has turned far enough for the small diameter part 291*a* of the cam to be presented to the actuator of the valve core 296, permitting a spring 304 to return the core 296 to the position wherein pressure within the cylinder is relieved. Thus, the wings 234 and 236 release the bag, permitting the associated pusher to move the bag, with a loaf of bread therewithin, out of the loading station L.S.

Shortly after the bag clamping wings 234 and 236 have clamped the lip B' of the bag B against the conveyor belt 33, a vacuum is introduced into the suction heads 247 and 248 and the heads are raised to lift the upper panel of the bag away from the lower panel and thus open the top, or mouth, of the bag. The cam 293 (FIG. 14) controls the introduction of vacuum into the vacuum heads.

At the beginning of the cycle the core 309 of a valve 311 is held in a venting position by a small diameter portion 293*a* of the cam 293. When in this position, a vent passage 312 in the core 309 establishes communication between a vent port 313, which is open to the atmosphere, and the suction heads 247 and 248 which are connected to the valve 311 by a conduit 314. Upon rotation of the cam shaft 219, the valve core 309 is shifted by a large diameter portion 293*b* of the cam 293 to a position wherein an inclined passage 316 establishes communication between the conduit 314 and a conduit 317 that is connected to a source of vacuum, thereby actuating the suction heads 247 and 248 to grip the upper panel of the bag. After the vacuum has been applied by the suction heads 247 and 248 the suction heads are moved to their elevated position by the cam 261 (FIG. 2) as hereinabove explained. The large diameter portion 293*b* of the cam 293 maintains the core 309 in the active position until the bread is pushed into the bag to fill the bag. At this time a spring 318 cooperates with the small diameter portion 293*a* of the cam 293 to shift the core 309 to the venting position thereby permitting the suction heads 247 and 248 to release their grip on the upper panel of the bag before the filled bag is pushed out of the loading station LS.

The horns 271 and 272 (FIG. 11) are moved into the active bag supporting position shown in FIGURES 11 and 13 shortly after the upper panel of the bag B has been elevated by the suction heads 247 and 248. The horns 271 and 272 are actuated by an air valve 321 which is controlled by the cam 292.

At the start of the cycle, the core 322 of the valve 321 is in a venting position wherein a vent passage 323 in the core 322 establishes communication between a vent port 324, which is open to the atmosphere, and a conduit 326 which is connected to the air cylinders 287. Upon rotation of the cam shaft 219, a large diameter portion 292*b* of the cam 292 shifts the valve core 322 to an active position wherein an inclined passage 327 in the core 322 establishes communication between a conduit 328 connected to a source of air under pressure and the conduit 326 which directs pressurized air into the air cylinders 287 thereby moving the actuating elements 286 to the extended positions. The actuating elements 286 remain in the extended position, and accordingly the horns 271 and 272 remain in the bag opening or supporting position, until the carrier 27 has moved into the bag to carry a loaf of bread thereinto and the carrier 27 has been withdrawn. Thereafter, a spring 329 cooperates with a small diameter portion 292*a* of the cam 292 to move the valve core 322 to the venting position. With the air cylinders 287 vented, the actuating elements 286 return to the retracted position and the horns 271 and 272 are likewise returned to the retracted position as illustrated in FIGURE 12.

As previously mentioned, the bag conveyor 22 is intermittently driven from the main drive shaft 42 (FIG. 3) under the control of the one-revolution clutch 50. The clutch 50 is controlled by the cam 294 (FIG. 14). After a pusher 24 of the loading conveyor 26 has moved a filled bag from the loading station LS, a lobe 294*a* of the cam 294 momentarily closes a switch 331, which completes an electrical circuit from main lines L1 and L2, thereby activating the one-revolution clutch 50. The drive shaft 46 of the bag conveyor 22 is thereby rotated one revolution to advance another collapsed bag B into the loading station, thereby preparing the machine for another cycle of operation.

After the bag B is filled it is moved by the associated pusher 24 of the loading conveyor 26 over a slide plate 335 and onto the discharge conveyor 29 (FIGS. 1, 2 and 3). The pusher 24 positively forces the packaged loaf of bread onto the discharge conveyor 29 and then reverses its direction of movement so that it is withdrawn from the open end of the bag B.

An important feature of the present invention is the manner of withdrawal of the pushers 24 from the bag. The pusher is supported by the cooperative action of the chains 82 and the cam tracks 116 and 118. Moreover, the length of the arm 108, and the diameter and relative position of the sprocket 80 at the discharge end of the conveyor 26 are so related that the pusher plate follows a substantially rectilinear path as it moves out of the bag. Consequently the pusher plate does not drag along the lower panel of the bag—in fact, it substantially avoids contact with any part of the bag top, with the result that after the pusher plate is fully withdrawn, the bag top remains fully open, or substantially so, with all four sides thereof nearly, if not quite, flat and projecting straight from the body part of the bag which contains the loaf. The importance of this feature is that this is the optimum condition of the bag top for subsequent handling in an automatic bag closing and tying machine such as that disclosed in my copending application Serial No. 228,696 filed October 5, 1962.

The discharge conveyor 29 comprises an endless chain 336 (FIG. 1) which is trained around a drive sprocket 337 (FIG. 3) and around a driven sprocket (not shown). The drive sprocket 337 is keyed to a drive shaft 338 which is journalled on the frame 32 of the machine. A plurality of pusher slats 339 are secured at evenly spaced intervals on the chain and move along the upper surface of a two-piece inclined slide plate 341 upon which the packaged loaves of bread being discharged are supported. The slide plate 341 forms part of the frame of the discharge conveyor 29.

As best shown in FIGURES 1 and 2, the discharge conveyor is adapted to handle loaves of bread of different lengths. In this regard an end support rail 343 is welded to a plurality of spaced threaded studs 344 (one of which is shown) bolted in adjusted position to brackets 346 welded to the frame. The conveyor can, therefore, be adapted to handle loaves of bread of different lengths by merely readjusting the position of the end support rail 343 by means of the threaded studs 344 and the associated nuts 347.

The discharge conveyor 29 is continuously driven from the output shaft 132 (FIG. 3) of the gear box 44 by means of a chain drive 348 which connects the output shaft 132 to an input shaft 349 of a gear box 351. The output shaft 352 of the gear box 351 is connected by coupling 353 to a shaft 354 which is journalled in the frame 32 and is connected to the drive shaft 338 of the discharge conveyor 29 by a chain drive 356.

In the operation of the apparatus of the present inven-

tion collapsed bags B (FIG. 1) are advanced one at a time into the loading station LS by the intermittently driven bag conveyor 22. At the same time, sliced loaves L of bread are advanced one at a time onto the table 62 by the continuously driven feed conveyor 23. During the forward stroke of each pusher 24 it engages one of the loaves L, and advances it along the guide rails 149 and 151 toward the loading station LS. While moving along the rails 149 and 151, the flexible deflector fingers 169 maintain the slices of bread upright. As the loaf is moved along the guide rails the carrier 27 moves first to its retracted position, i.e., in a direction opposite the movement of the pusher, and receives the advancing loaf. The carrier then moves forward, i.e., in the same direction as the advancing loaf, and substantially at the same speed. At this time the loaf is supported on the rails 149 and 151 but is disposed within the carrier.

Before the loaf of bread and carrier reach the loading station LS, the loaf leaves the rails 149 and 151 and is supported by the shoes 196 and 197 of the carrier 27. The bag B is opened, as hereinabove described, as the carrier approaches the loading station so that the carrier with the loaf of bread therein, moves into the bag B. Entry into the bag is continued until the shoes 196 and 197 closely approach or actually reach the closed end of the bag. The carrier then reverses its direction of movement while the pusher 24 continues its forward motion, moving the bread to the closed end of the bag.

The pusher 24 then advances the filled bag out of the loading station LS and onto the discharge conveyor 29. It is to be particularly noted that the loaf of bread, which may have jagged, sharp crust fragments apt to puncture or cut the material of the bag, does not move relatively to the bag while the bag is in contact with the loaf. Thus, the bag is effectively shielded from damage which otherwise would occur when the loaf is loaded into the bag.

It should also be mentioned that since the loaves of bread are packaged at a high rate (seventy-two loaves per minute has been found to be a satisfactory rate) the loaves move so rapidly while entering the bags that they create a back pressure of air therein. The individual slices of each loaf are thus maintained in an upright position by air pressure within the bag after the loaf moves past the fingers 169.

Upon continued movement of the conveyor, the pusher 24 moves the loaf of bread over the plate 335 and onto the conveyor 29 and then is withdrawn from the bag B without disturbing the open bag top, as hereinabove explained.

The discharge conveyor 29 then moves the filled bag to a wire tying machine (not shown) which closes the bag to provide an air tight container. After the bag is closed, the discharge conveyor 29 discharges the filled and closed bag from the machine.

From the foregoing description it is apparent that the article loading apparatus 20 provides a carrier for supporting the loaf of bread as the bread is moved into the bag thereby eliminating the possibility of the sharp crust fragments from puncturing or ripping the material from which the bag is made. Also, flexible deflector fingers 169 are provided along the path of the sliced loaves of bread so as to maintain the individual slices of bread in an upright position as the loaves are moved toward the loading station. The pushers 24 of the loading conveyor 26 are arranged to positively move the filled bags onto the discharge conveyor and thereafter reverse their direction of movement so as to withdraw from the open end of the bag without disrupting the material therearound.

While one embodiment of the present invention has been shown and described, it will be understood that various changes and modifications may be made without departing from the spirit of the invention or the scope of the appended claims.

Having thus described the present invention and the manner in which the same is to be used, what is claimed as new and desired to be protected by Letters Patent is:

1. A packaging machine for loading an article into a bag, comprising means for pushing the article along a predetermined path, a carrier independent of said pushing means mounted for reciprocatory movement along said path, means for supporting a bag in position to receive the carrier and the article, said carrier including a bag supporting shield disposed above the article and an article supporting shoe disposed below the article for shielding the bag from sliding engagement with the article, and drive means for moving said carrier and said pushing means in timed relation wherein said article is first moved onto said carrier by said pusher means and then both said carrier and said pusher means move into the bag while the article is supported by said carrier, said drive means thereafter reversing the direction of movement of said carrier while said pushing means continues in its original direction of movement.

2. A packaging machine for loading a leaf of sliced bread into a bag, comprising means for pushing a loaf of sliced bread along a certain path, resilient means spaced along said path for engaging the loaf and for holding the slices thereof upright, a carrier mounted for reciprocation along said path, means for supporting a bag in position to receive the carrier and loaf of bread, and means for moving said carrier and said pusher means in timed relation wherein said loaf is first moved onto said carrier by said pusher means and then both said carrier and said pusher means move at substantially the same speed into the bag while the loaf of bread is supported by said carrier.

3. A packaging machine for loading an article into a bag, comprising means for pushing the article along a predetermined path, a carrier mounted independent of said pushing means for reciprocation along said path, means for moving a collapsed bag into said path, means for opening said bag while in said path, said carrier including a bag supporting shield disposed above the article and an article supporting shoe disposed below the article for shielding the bag from sliding engagement with the article, and drive means for moving said carrier and said pushing means in timed relation wherein said article is first moved onto said carrier by said pushing means and then said carrier and said pushing means move at substantially the same speed to move the carrier into the bag with the article supported thereon, said drive means thereafter reversing the direction of movement of said carrier while said pushing means continues in its original direction of movement.

4. A packaging machine for loading a sliced loaf of bread into a bag, comprising means for pushing a sliced loaf of bread along a predetermined path, a carrier mounted for movement along said path, means for moving a collapsed bag into said path, means for opening said bag while in said path, resilient means disposed in the path of movement of the sliced loaf of bread for engaging the loaf and maintaining the slices thereof upright, and means for moving said carrier and said pushing means in timed relation wherein said sliced loaf of bread is first moved onto said carrier by said pushing means and then said carrier and said pushing means move at substantially the same speed into the bag while the loaf of bread is supported by said carrier.

5. A packaging machine for loading an article into a bag, comprising a continuously driven endless loading conveyor, a pusher on said loading conveyor for moving the article along a predetermined path, an intermittently driven bag conveyor for moving a collapsed bag into said path, a feed conveyor for moving the article into said path, means for opening the bag, a carrier movable along said path and arranged to receive the article while the article is being moved into the bag to shield the bag from the article, said carrier including a bag supporting shield disposed above said article and an article supporting shoe

disposed below said article, a discharge conveyor in said path for receiving the filled bag and moving the same out of said path, and means for operating said bag opening means, said carrier and said conveyors in timed relation.

6. A packaging machine for loading an article into a bag, comprising a continuously driven endless loading conveyor, a pusher pivotally mounted on said conveyor and arranged to move an article along a linear path, means for placing the article in the path of movement of said pusher, means independent of said pusher for supporting the article as said pusher moves the article along a portion of said path, releasable means for supporting an open bag in position to receive the article, means for releasing the bag supporting means when the pusher enters the bag and the bag is filled, inclined discharge means for receiving the filled bag from said linear path, and means operatively connected to said pusher for effecting reversal of movement of said pusher after said pusher has advanced the bag onto said discharge means for withdrawing said pusher from within the bag in a path inclined similarly to the inclination of said discharge means.

7. A packaging machine for loading an article into a bag, comprising a continuously driven endless loading conveyor, a pusher pivotally mounted on said conveyor and arranged to move an article along a linear path, in a predetermined direction, means for supporting the article as the pusher moves the article along said path, an open ended carrier included in said article supporting means and mounted for movement in said path independent of said pusher, means for opening a bag and for holding the open bag in said path to receive the article, means on said carrier for supporting the article and for holding all surfaces of the bag spaced from the article as the article enters the bag, means for advancing said carrier along said path in the same direction and substantially at the same speed as the pusher to enter the carrier with the article therein into the bag and for thereafter reversing the direction of movement of said carrier while said pusher continues to move in said predetermined direction, said bag opening means being adapted to release the bag for movement with said article when the bag is filled, and an inclined discharge conveyor for receiving the filled bag from said linear path, said loading conveyor including means operatively connected to said pusher for withdrawing the pusher from said bag in a direction substantially parallel to the inclined discharge conveyor.

8. A packaging machine for loading sliced loaves of bread into bags comprising a continuously driven loading conveyor, a pusher pivotally mounted on said conveyor and arranged to move a loaf of bread along a predetermined path, means for supporting the loaf of bread as said pusher moves the loaf along said path, means for opening a bag and supporting the bag in an open position in said predetermined path for receiving the loaf of bread, said bag opening and supporting means being arranged to release the bag for movement with the loaf when the bag is filled, resilient fingers extending into the path of movement of said loaf for holding the slices of bread in the loaf upright, inclined discharge means for receiving the filled bag from said path, and means operatively connected to said pusher for withdrawing the pusher from said bag in a direction substantially parallel to the inclined surface of said discharge means.

9. A packaging machine for loading loaves of sliced bread into bags comprising a continuously driven endless loading conveyor, a plurailty of pushers with each pusher pivotally mounted on said conveyor for moving a loaf of bread along a linear path in a predetermined direction, means for supporting the loaf of bread as one of said pusher moves the loaf along said path, means for opening and for holding a bag in an open position in said path for entry of the loaf of bread into the bag, means for effecting release of the bag from the bag holding means for movement of said bag with the sliced loaf of bread therein along said linear path, an open ended movable carrier included in said loaf supporting means, means on said carrier for supporting the bread and for shielding all surfaces of the bag from the bread as the bread enters the bag, means for moving said carrier into the bag in the same direction and substantially at the same speed as said one pusher and for thereafter reversing the direction of movement of said carrier to receive another loaf of bread advanced by another pusher while said one pusher continues to move in said predetermined direction, a discharge conveyor for receiving the filled bag from said linear path, and means operatively connected to each of said pushers for withdrawing said pushers from the associated bags after said pushers have advanced the filled bags onto said discharge conveyor.

10. In a packaging machine for loading articles into an open bag, the combination of a pusher movable along a predetermined path, support means for supporting an article in said predetermined path, an open ended carrier independent of said pusher and mounted for reciprocatory movement along said path, means for positioning an open bag in said path, said carrier including a bag supporting shield disposed above the article and an article supporting shoe disposed below the article for shielding the bag from sliding engagement with the article, and drive means connected to said pusher and to said carrier for driving the pusher and the carrier along said path in one direction at substantially the same speed to move the pusher, the carrier and the article simultaneously into the bag and for reversing the direction of movement of said carrier to withdraw the carrier from the bag while said pusher continues its movement in said one direction for moving the article and bag along said predetermined path and for thereafter withdrawing the pusher from the bag to leave the article within the bag.

11. In a packaging machine for loading articles into a bag, the combination of a pusher movable along a predetermined path in a predetermined direction, means for supporting an article in the path of movement of the pusher, means for supporting an open bag at a loading station in said path, an open ended carrier mounted independent of said pusher for reciprocatory movement along said predetermined path and having both ends considered transversely of the movement of the carrier being open, and means connected to said pusher and to said carrier for driving them in said direction to move the article into the carrier and the carrier with the article therein into the bag, said driving means being arranged to reverse the direction of movement of said carrier after the carrier has been moved into the bag while continuing movement of said pusher in said direction to withdraw the carrier from the article and leave the article within the bag and to move the bag with the article therein from the loading station, said carrier including shields for shielding the upper portion of the bag from the article during movement of the article relative to the bag.

12. In a packaging machine for loading articles into bags, the combination of a pusher movable along a predetermined path in a predetermined direction, means for supporting an article in said path, an open ended carrier mounted for movement along said path and including two horizontally aligned article supporting members, two horizontally spaced bag supporting members mounted in a loading station and spaced above said article supporting members a sufficient distance for movement of an article therebetween, means for adjusting said bag supporting members vertically relatively to said article supporting members, means for adjusting one of said article supporting members horizontally relatively to the other article supporting member, means for adjusting one of said bag supporting members horizontally relatively to the other bag supporting member, and drive means connected to said pusher and to said carrier for first driving the pusher toward the carrier to push the article into the carrier and for then pushing the carrier with the article therein into the bag, said drive means being arranged to reverse the direction of movement of said carrier after said carrier

has been moved into the bag while continued movement of said pusher in said predetermined direction transfers the article from the carrier to the bag and moves the bag with the article therein away from said loading station.

13. In a packaging machine for loading bread or the like into an open bag the combination of a continuously moving conveyor, a pusher pivotally mounted on said conveyor and arranged to be moved along a predetermined path, means for supporting a loaf of bread in a bag in the path of movement of said pusher, said bag including side walls with end portions which extend a substantial distance beyond the open end of the bag, inclined discharge means disposed at one end of said path for receiving the bag of bread, a cam follower connected to said pusher, a cam track disposed adjacent said conveyor for receiving said cam follower, said cam track including a substantially linear lower section and a bowed upper section which intersects with the lower section at a point intermediate the ends thereof, a pivotal gate disposed at the point of intersection of said upper and lower track section, and means for actuating said gates in timed relation with the movement of said conveyor whereby said cam follower first moves along said lower section past said gate causing said pusher to move a loaf of bread onto said inclined discharge means and thereafter reverses its direction of movement and is deflected by said gate to said upper section to cause said pusher to withdraw from the bag in a direction substantially parallel to the inclination of said discharge means without disturbing the end portion of the bag.

14. A packaging machine for loading sliced loaves of bread into bags comprising a pusher mounted for movement along a predetermined path, means for placing a sliced loaf of bread into said path, means for guiding the loaf along said path, means disposed along said path for maintaining the slices of bread upright, an open ended carrier mounted for reciprocatory movement independent of said pusher along said path and including means for enclosing said loaf therein, an intermittently driven bag conveyor for advancing into said path a collapsed bag having a protruding lower lip, clamp means for clamping the bag lip against said bag conveyor, vertically movable means for gripping the upper panel of the bag and for elevating the same, laterally movable means for engaging the sides of said bag for spreading them apart, said lower lip clamping means, said upper panel gripping means and said side separating means cooperating to open the bag to receive the carrier therein, means for driving the pusher to move said loaf into the carrier, drive means timed with the movement of said pusher for first moving said carrier with the loaf of bread and the pusher therein into the bag so that the carrier shields the sides of the bag from the loaf, and control means for effecting release of the bag from the clamp means and the gripping means after the carrier and loaf have entered the bag whereby continued movement of said pusher moves the bag with the loaf therein away from said carrier and said separating means.

15. A packaging machine for loading articles into a bag, comprising an endless, continuously running pusher conveyor having a substantially linear loading reach, and a return reach, article supporting means to one side of and parallel to said conveyor loading reach, a plurality of spaced article pushers pivotally mounted on said pusher conveyor, said pushers having arms extending from said pusher conveyor with pusher plates on said arms overlying said article supporting means, a bag holder intermediate the length of said article supporting means, a reciprocating article carrier upstream of said bag holder, drive means for reciprocating said carrier along said article supporting means, said carrier having a through slot for receiving said pusher arms, said carrier drive means causing said carrier to first advance at rate slower than that of said pusher conveyor for loading articles into the carrier, said carrier drive means then advancing along said article supporting means, at the same rate as that of said pusher conveyor for introducing the carrier and the article therein into a bag at said bag holder, said carrier drive means thereafter retracting said carrier with the slot in the carrier clearing the pusher arm, said pusher conveyor then continuing its advance for moving bagged articles downstream of said bag holder and to a bagged article discharge station, and means for causing said pusher conveyor to withdraw from the bag while the latter is at said discharge station.

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