

Fig. 1

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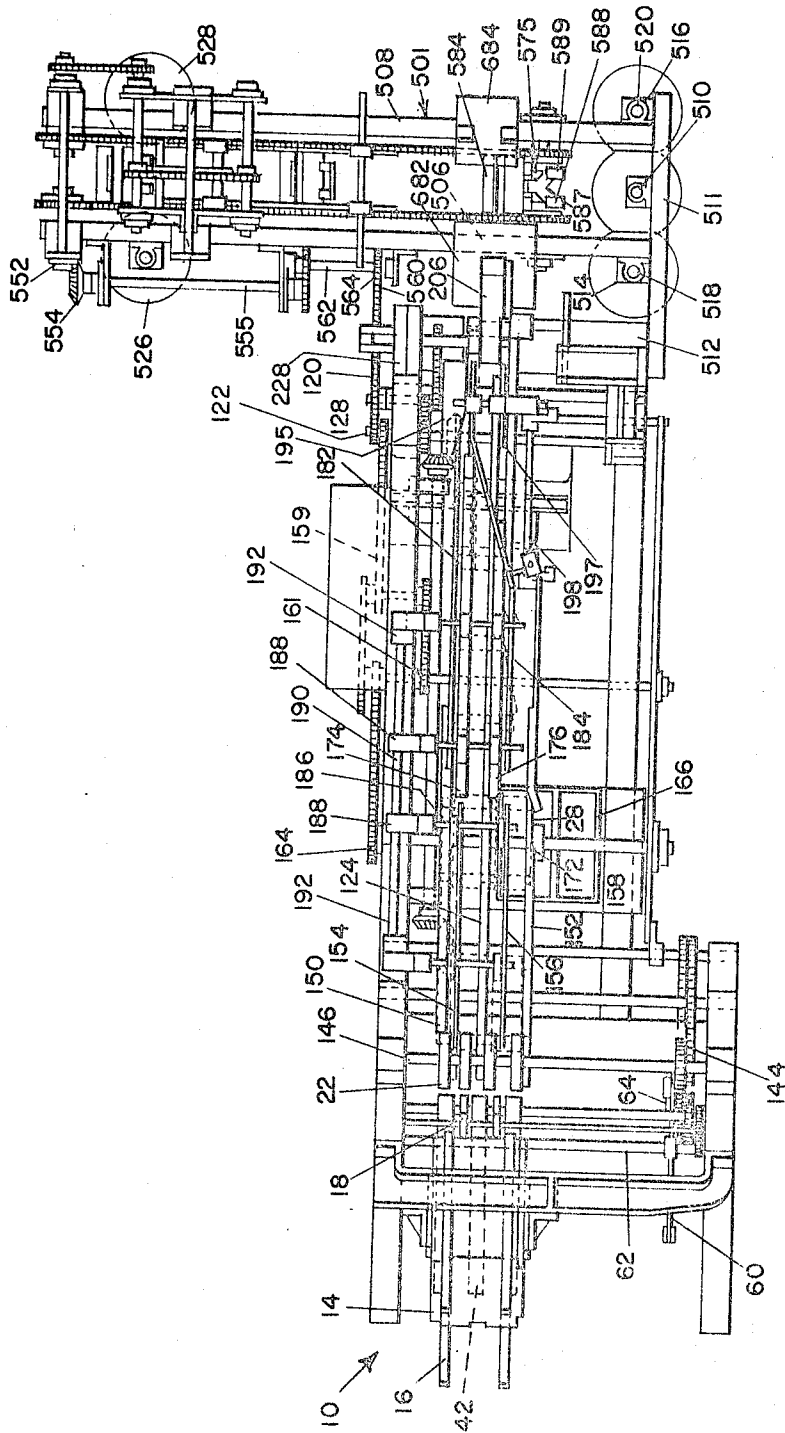


Fig. 2

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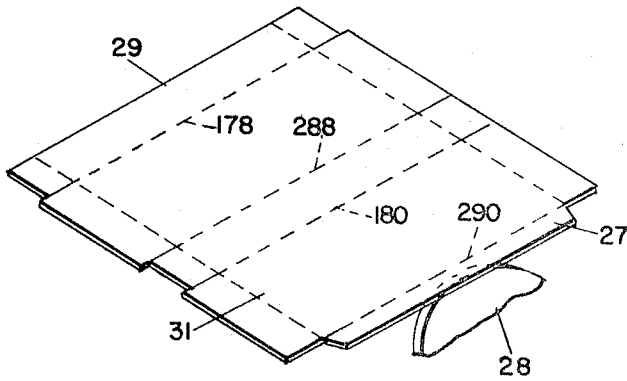


Fig. 3

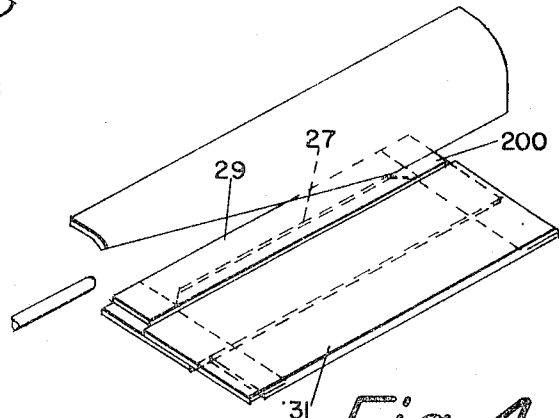


Fig. 4

Fig. 7

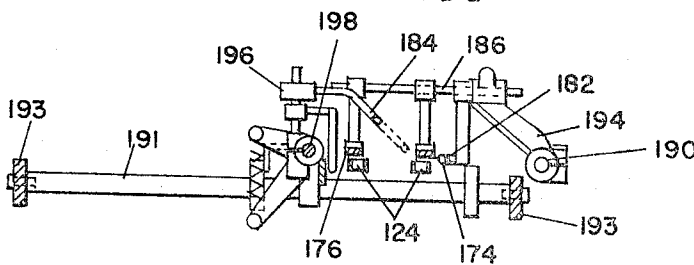
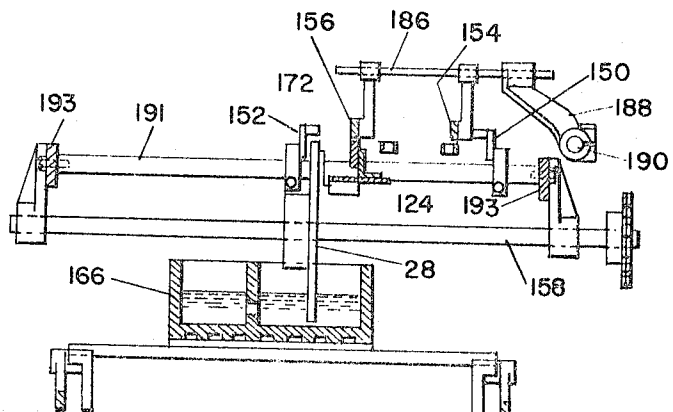


Fig. 8

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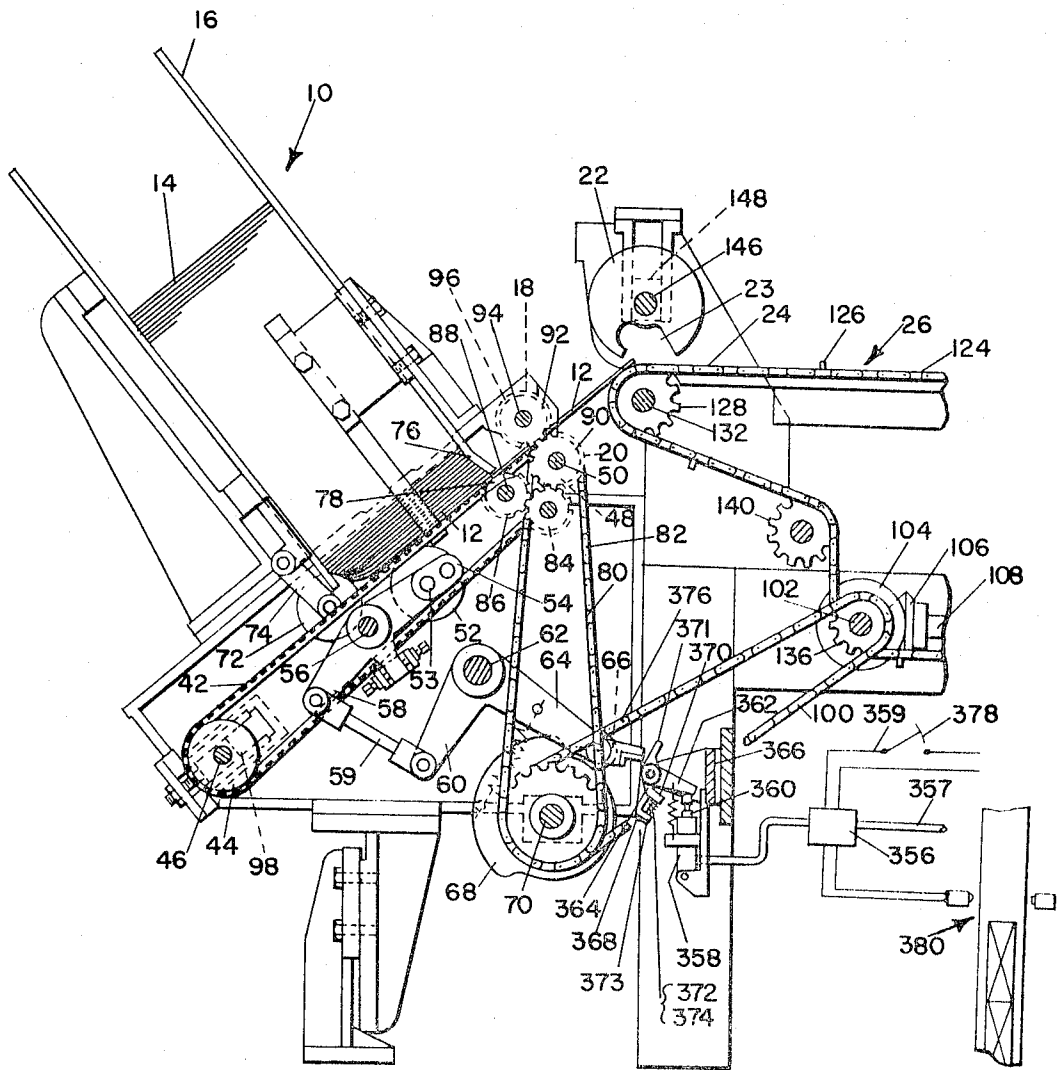
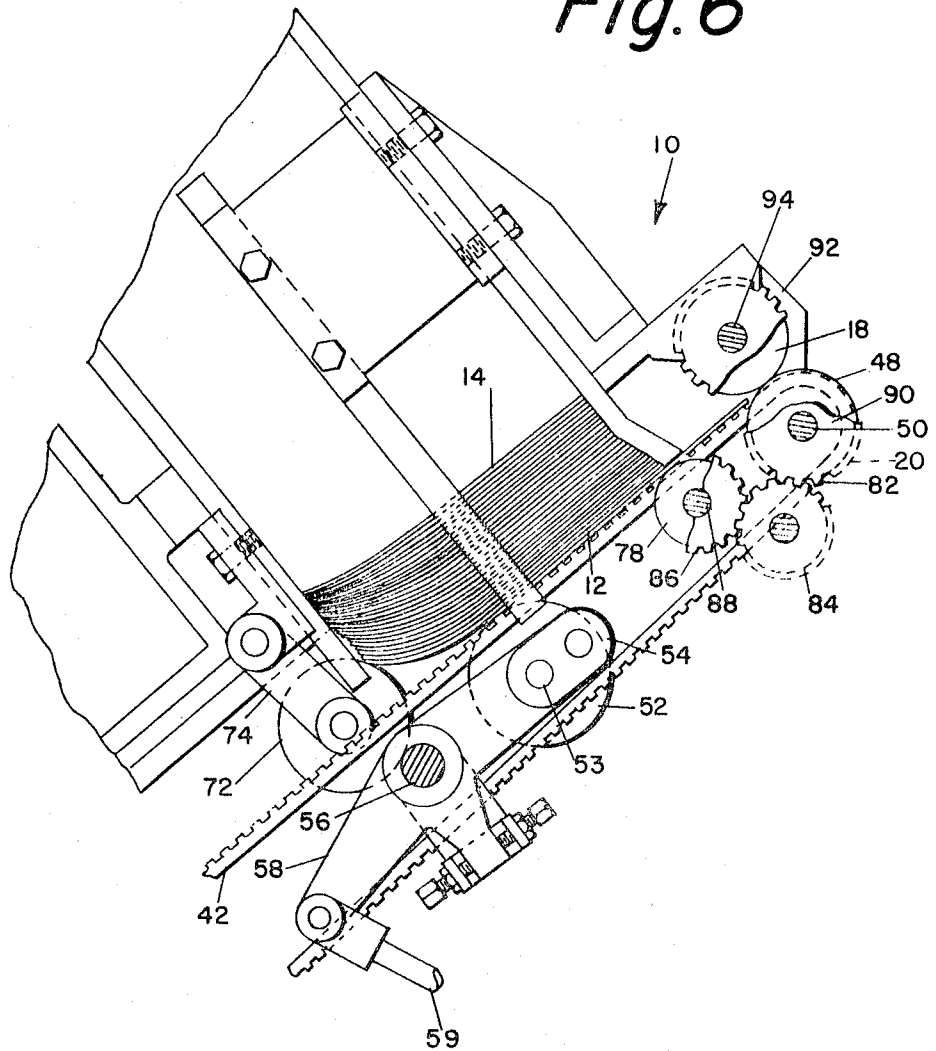


Fig. 5

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Fig. 6



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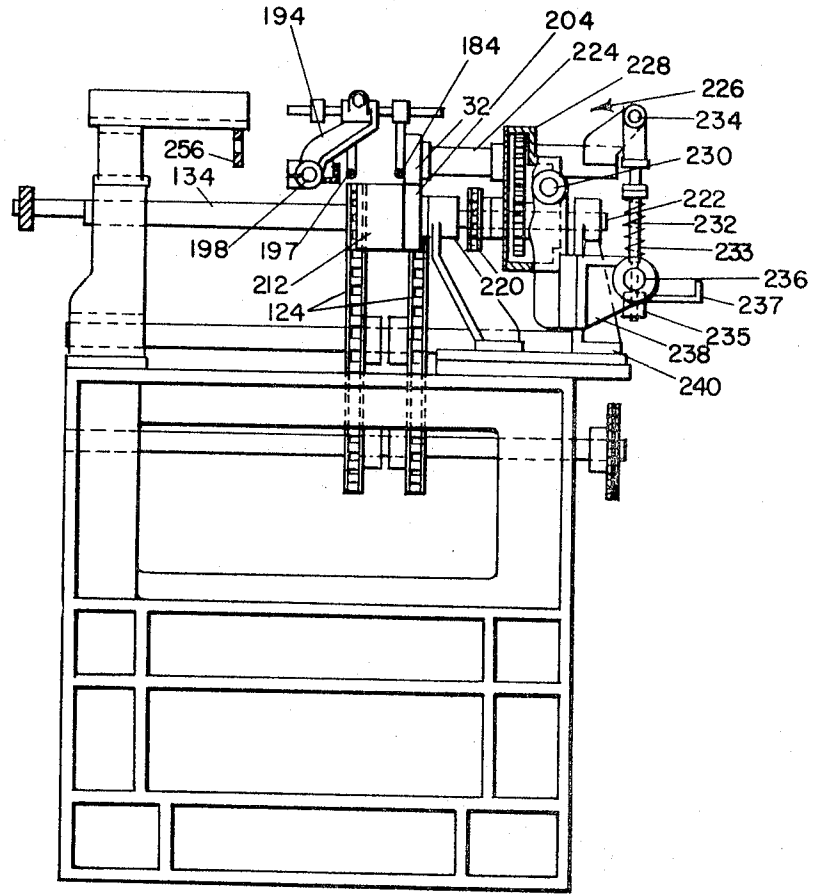


Fig. 9

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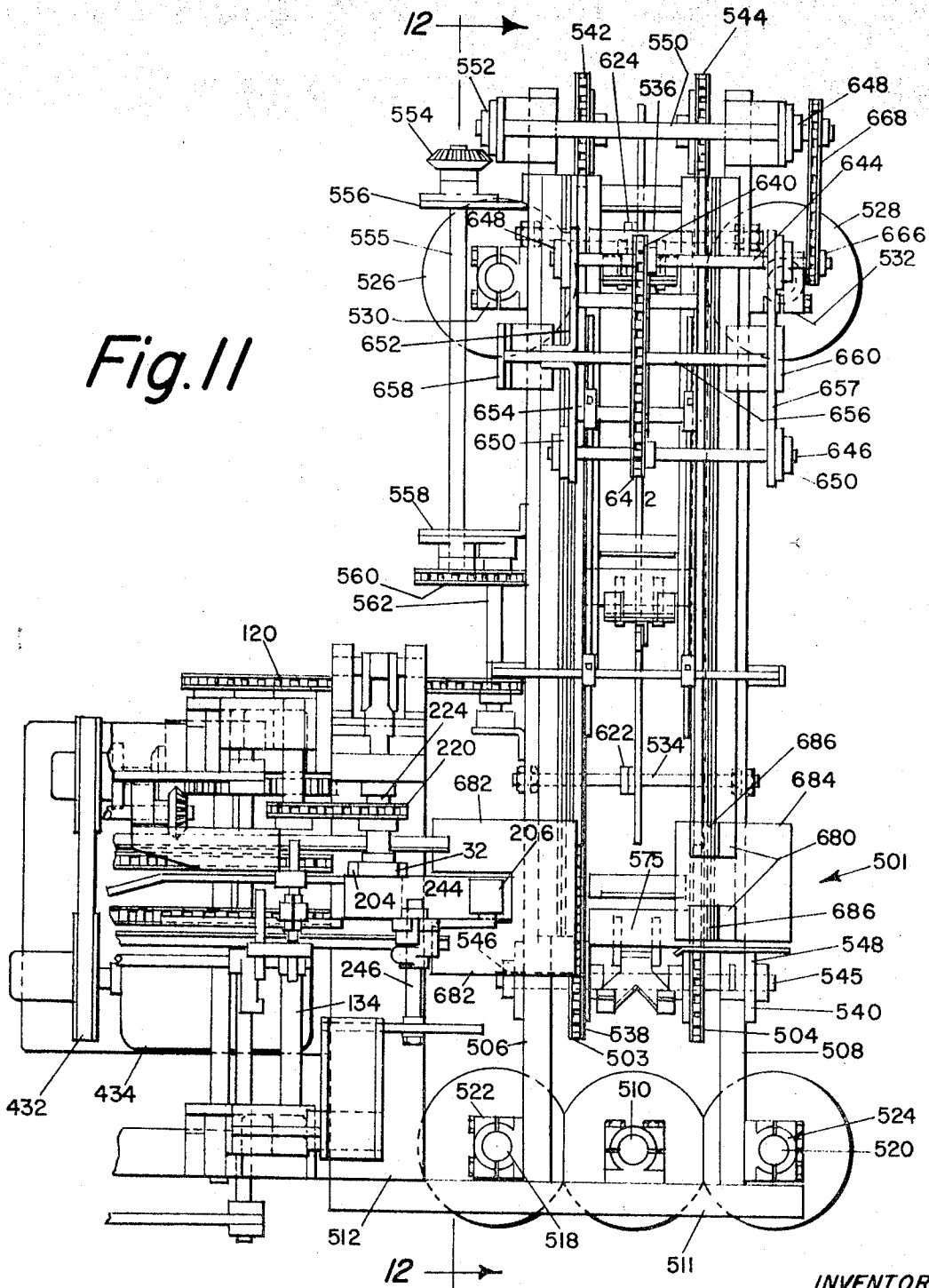


Fig. 11

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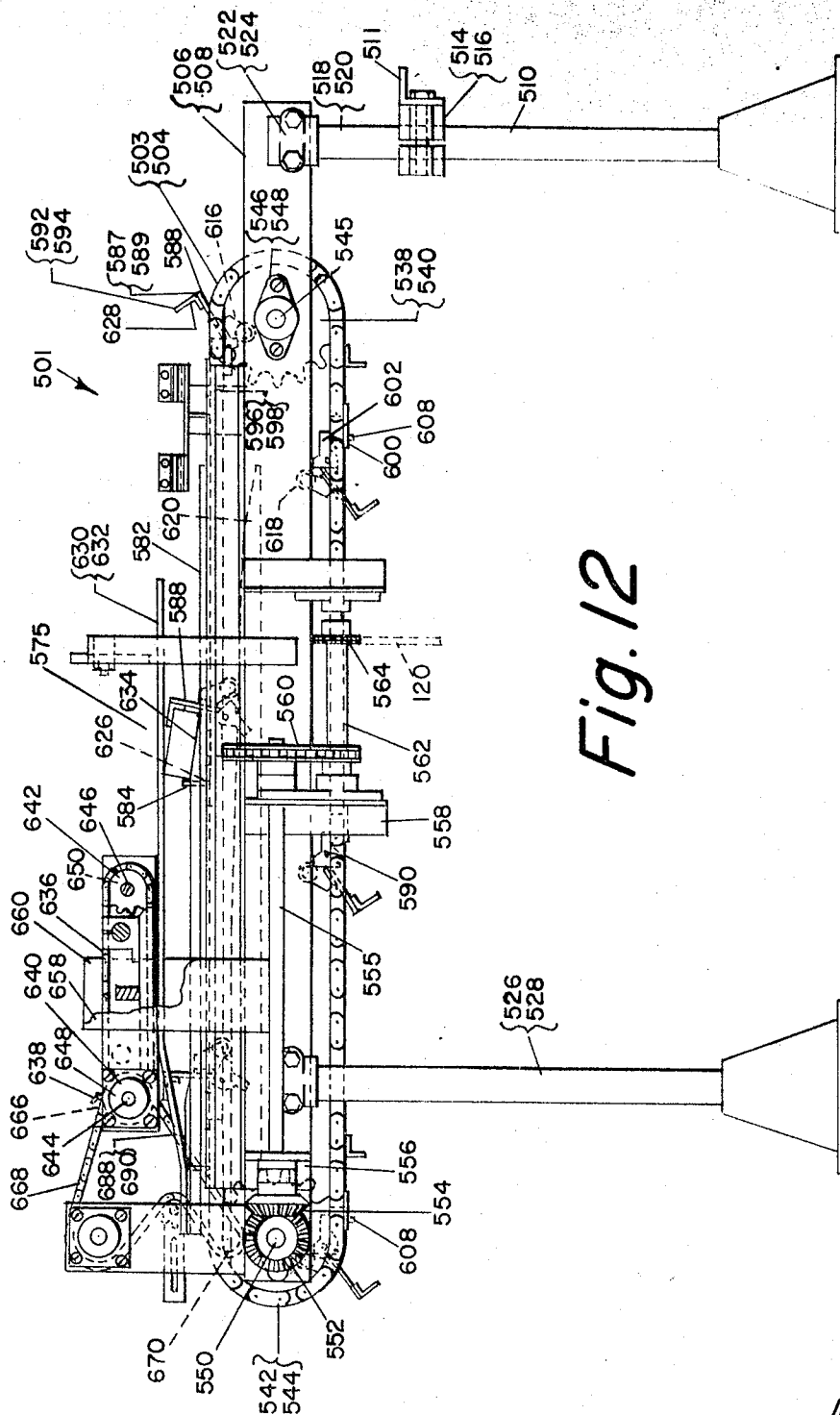


Fig. 12

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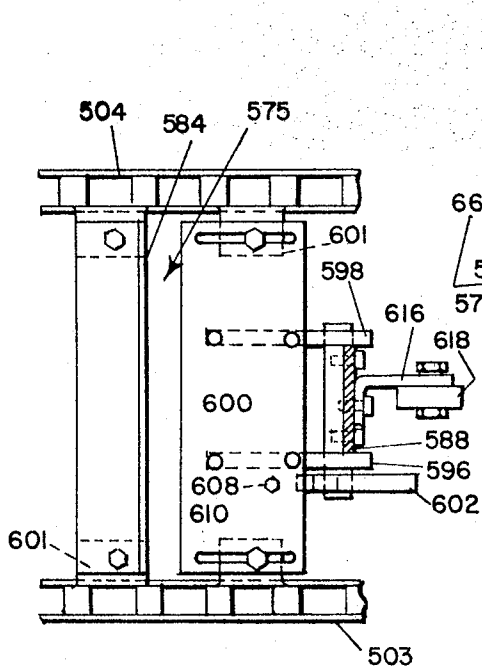


Fig. 15

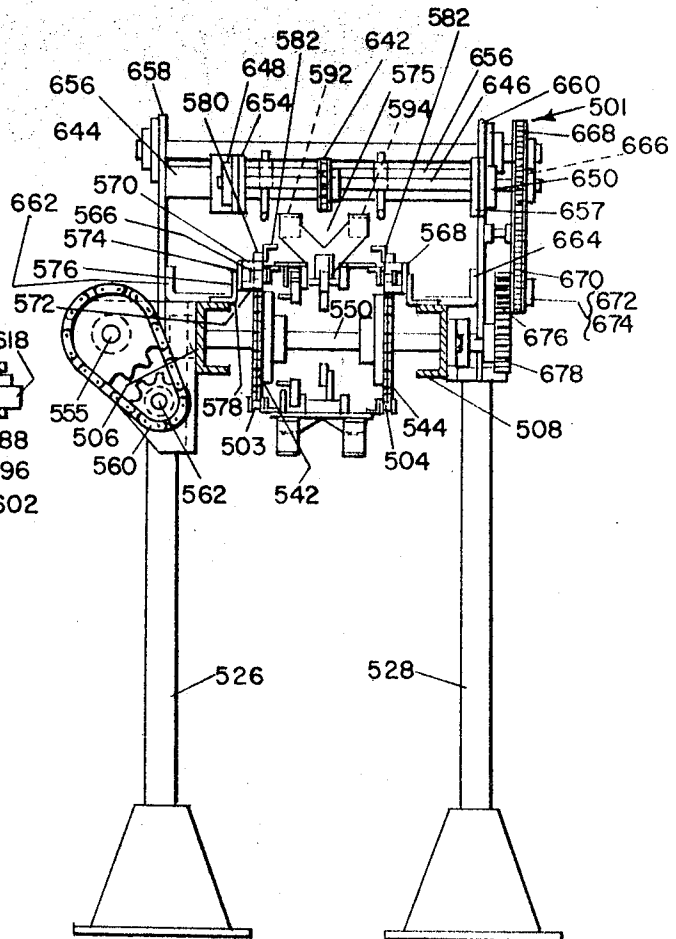


Fig. 13

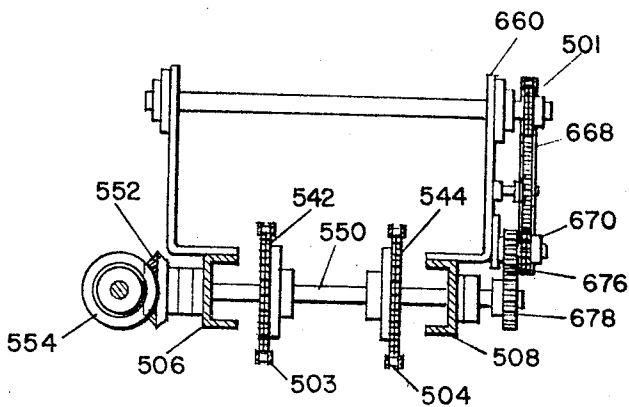


Fig. 14

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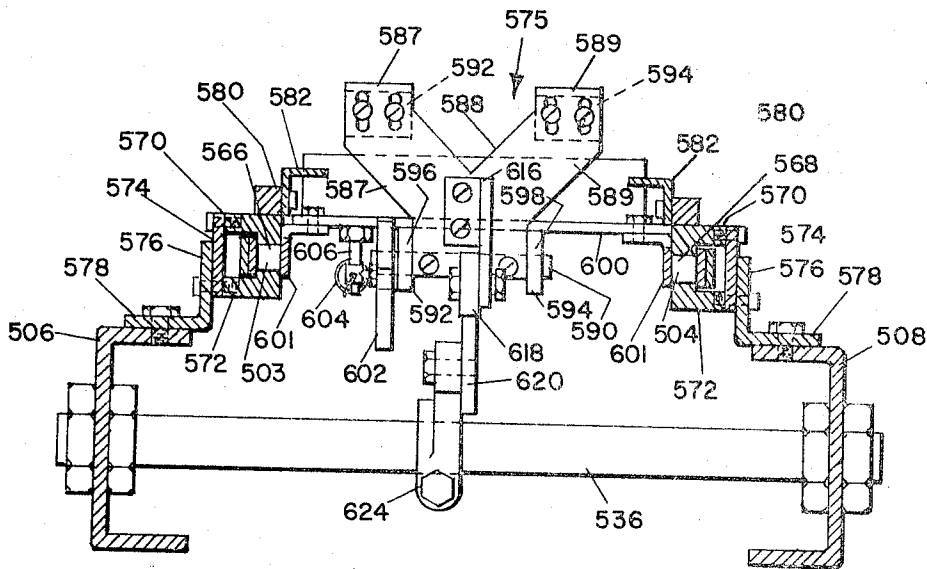


Fig. 16

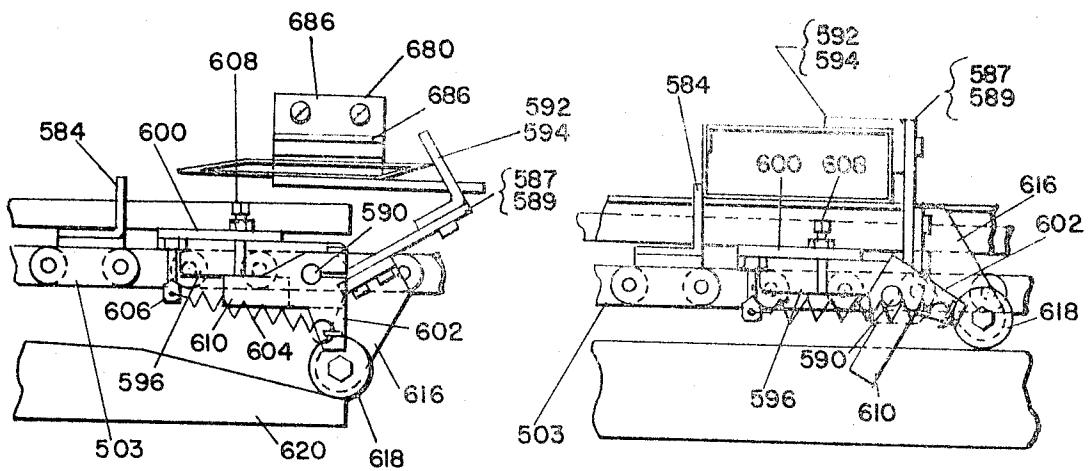


Fig. 17

Fig. 18

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APPARATUS FOR PRODUCING CARTONS

SUMMARY OF THE INVENTION

This invention relates to the packaging art and contemplates novel apparatus for feeding, folding, side seaming and reverse bending flat tubular cartons, known in the art as "knockdown" cartons, prepared from prescored carton blanks. The feeding mechanism is arranged to withdraw successive lowermost carton blanks from a stack thereof and to present successive blanks to a continuously moving conveyor where the blanks are first provided with a strip of adhesive along a seam-forming portion. The prescored panels on either side of the blank are then folded inwardly to join the marginal edges and to form a tube provided with a side seam. The side seam is then pressed to firmly set the adhesive.

In the illustrated embodiment of the invention provision is made for transferring successive flat tubular cartons from the tube forming conveyor to a reverse-folding or bending device arranged to open the flat folded cartons and to refold the same **180** in the opposite direction along the score lines which were previously unfolded. In operation, the cartons thus reverse folded may be transferred to a bottom-sealing machine, not shown, where each carton is squared up and applied to a mandrel or forming block whereupon the bottom flaps are closed and adhesively secured to provide a bottom closure. Alternatively, the flat tubular cartons may be stacked and stored for future use.

Prior to the present invention it has been the practice for those in the packaging trade to purchase the flat tubular cartons from a carton manufacturer, and in practice such cartons are transferred from a magazine into the pocket of a bottom-sealing machine where the carton is squared up and applied to a forming block to be bottom sealed. One transfer mechanism widely used in the packaging industry comprises a reciprocating bladefike device which is inserted within a flat knockdown carton in a magazine and then moved to open the carton and to present the same between rollers which deliver the carton to the squaring pocket of the bottom-sealing machine. The prior art apparatus for feeding the side-seamed cartons to a bottom-sealing machine is exemplified generally in the patent issued to S. R. Howard, U.S. Pat. No. 1,916,425, July 4, 1933. While such prior devices have operated successfully over a long period of time, it was found that in practice if the cartons supplied by the manufacturer were not of uniform shape and size, or were slightly displaced in the magazine, there would be times where the bladefike device would fail to transfer a carton to the bottom sealer. The expedient of side seaming the cartons and reverse bending the same, in accordance with the present invention, gives the user better control of the product. Furthermore, the expedient of forming the side seam in the packaging plant rather than purchasing the side-seamed cartons resulted in a saving in the initial cost of the cartons.

Accordingly, the invention has for an object to provide novel and improved apparatus for producing side-seamed cartons from prescored carton blanks and which embodies novel structure for opening and reverse folding side-seamed cartons in a rapid, efficient and economical manner.

With this general object in view and such others as may hereinafter appear, the invention consists in the apparatus for producing cartons and in the various structures, arrangements and combinations of parts hereinafter described and particularly defined in the claims at the end of this specification.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings illustrating the preferred embodiment of the invention:

FIG. 1 is a side elevation of apparatus for producing cartons embodying the present invention;

FIG. 2 is a plan view of the apparatus shown in FIG. 1;

FIG. 3 is a perspective view of a prescored carton blank;

FIG. 4 is a perspective view of the blank folded and provided with a side seam to form a flat tubular carton;

FIG. 5 is a view in side elevation of the carton blank feeding device;

FIG. 6 is a cross-sectional view at a larger scale of the lower end of the magazine showing a blank partially withdrawn;

FIG. 7 is a cross-sectional view taken on the line 7-7 of FIG. 1;

FIG. 8 is a cross-sectional view taken on the line 8-8 of FIG. 1;

FIG. 9 is a front elevation partly in cross section of the side seam pressing mechanism as taken on the line 9-9 of FIG. 1;

FIG. 10 is a detail view showing in side elevation the discharge end of the side-seaming conveyor and the receiving end of the reverse-folding conveyor;

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

FIG. 12 is a view in side elevation as seen from the line 12-12 of FIG. 11 of the reverse-folding conveyor;

FIG. 13 is a cross-sectional view taken on the line 13-13 of FIG. 11;

FIG. 14 is a cross-sectional view taken on the line 14-14 of FIG. 11;

FIG. 15 is a plan view detail of a pocket carried by the reverse-folding conveyor shown at a larger scale;

FIG. 16 is an end view cross section of the reverse-folding conveyor at a larger scale;

FIG. 17 is a detail view in side elevation of pocket shown in its carton-receiving position; and

FIG. 18 is a view similar to FIG. 17 showing the pocket with its carton in a squared-up condition.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and particularly to FIG. 1, in general the present apparatus includes carton blank feeding mechanism **10** adapted to withdraw successive lowermost carton blanks **12** from a stack **14** thereof supported in a magazine **16**. The upright stack is arranged at an angle of about 40° from the vertical for convenience in loading the magazine and also to reduce the height of the unit.

The carton blanks **12** are prescored and, in operation, successive blanks withdrawn from the stack are advanced longitudinally to present the leading ends thereof first between advancing rolls **18, 20** and then between the transfer rolls **22, 24**, the latter being arranged to present the cartons to a horizontal conveyor indicated generally at **26** wherein a marginal edge, comprising the side seam flap **27**, of the blank is provided with adhesive by a glue-applying roller **28** during the advance of the carton blank. The sidewall panels along the outer edges of the carton, including a narrow panel **29** on one side and a wider panel **31** on the other side, are then folded inwardly by folding rails indicated generally at **30** to present the longitudinal marginal edges in overlapping and adhesive engagement. The carton is thus folded along two score lines and provided with a side seam, the latter being firmly pressed to set the seal by a presser roll **32** during the continuous advance of the blank.

In the illustrated embodiment of the invention, the blanks thus folded and sealed to form a flat tube are transferred to successive pockets **575** of a continuously moving reverse-folding conveyor indicated generally at **501** which serves to open the cartons and refold the same along the two remaining longitudinal score lines.

Referring now to FIG. 5 for a more detailed description of the carton blank feeding mechanism **10**, it will be seen that successive lowermost carton blanks **12** in the stack are arranged to be withdrawn by engagement with a plurality of laterally spaced friction belts **42** arranged to run over spaced idler pulleys **44** fast on a shaft **46** and spaced drive pulleys **48** fast on a shaft **50**. The friction belts **42** are run continuously and each belt comprises a rubber belt having a plurality of small upstanding resilient projections thereon.

In order to control the withdrawal of successive blanks in timed relation to the operation of the machine, a plurality of laterally spaced lifting rolls **52**, which extend between the spaced belts **42**, are arranged to alternately elevate the stack **14** to lift the lowermost blank **12** away from the belts and to lower the stack to present the lowermost blank in frictional

engagement with the belts to effect withdrawal of a blank. The rolls 52 are mounted on a rod 53 carried by spaced arms 54 which are mounted on a shaft 56. A second arm 58 carried by the shaft 56 is connected by a link 59 to one arm 60 of a bell-crank mounted to rock on a shaft 62. The second arm 64 of the bell crank carries a roller 66 for cooperation with a cam 68 fast on a camshaft 70.

As herein shown, the rear edge of the lower end of the stack 14 engages a roller 72 carried by an arm 74 which is adjustably mounted in the magazine 16. The roller 72 carries some of the weight of the stack and is extended slightly forwardly of the rear edge of the stack so as to cause the leading edges of the lowermost group of blanks to feather out forwardly as shown. The forward end of the stack carries a plurality of angular guides 76 against which the feathered edges of the lowermost group of blanks rests. The guides 76 are vertically adjustable and are arranged to cooperate with driven rolls 78 to assist in freeing the lowermost blank from the stack. In operation, the spacing between the lower ends of the guides 76 and the periphery of the rolls 78 is about $1\frac{1}{2}$ times the thickness of the carton blank. When the lifting rolls 52 are rocked to their elevated positions, the blanks are raised above the friction belts 42 and, conversely, when the stack is lowered by the rolls 52, as shown in FIG. 5, the lowermost blank is engaged by the belts and carried under the guides 76 into the grip of the driven feed rolls 18, 20 spaced a short distance forwardly of the front end of the magazine. In practice, the friction belts are operative to feed the forward end of the blank for a short distance only before the feed rolls 18, 20 take over the blank-advancing operation, the rolls being driven at a surface speed equal to the linear speed of the belts 42. As shown in FIG. 6, the spacing between the guides 76 and the rolls 78 permits only one blank at a time to be withdrawn from the underside of the stack. In operation, the lifting rolls 52 must be actuated to elevate the stack before the trailing end of the blank being withdrawn leaves the magazine whereby to prevent release of a succeeding carton immediately following the first. In operation, the cam-operated lifting rolls thus serve to control the spacing of the carton blanks in timed relation to the operation of the machine.

The leading ends of successive cartons blanks 12 advanced by the feed rolls 18, 20 are received between the continuously driven transfer rolls 22, 24 to be delivered to the horizontal conveyor 26. As herein shown, the upper transfer rolls 22 are provided with cutouts 23 to receive the leading ends of the blanks and to ease their transition from an inclined position to a horizontal position on the conveyor 26.

The drives to the carton blank feeding device 10 include a chain and sprocket drive 80 from the camshaft 70 to the shaft 50 on which the pulleys 48 are mounted. The shaft 50 is connected by spur gears 82, 84, 86 to a shaft 88 on which the rolls 78 are mounted for cooperation with the guides 76. The shaft 50 is also connected by spur gears 90, 92 to a shaft 94 which carries the upper feed rolls 18. The shaft 94 is carried by spring-pressed block bearings 96 slidably mounted in the side frames and the shaft 46 on which the pulleys 44 are mounted is also carried by block bearings 98 adjustably mounted in the frames to serve as a belt tightener.

The camshaft 70 is driven by a chain and sprocket connection 100 to a shaft 102 which latter is connected by bevel gears 104, 106 to a longitudinally extended shaft 108. The latter shaft is connected by bevel gears 110, 112 to a driven shaft 114. The shaft 114 is connected by spur gears 116 to a shaft 118 which in turn is connected by a chain and sprocket drive 120 to a main drive shaft 122. The drive shaft 122 comprises the output shaft of a speed-reducing unit 430, the input shaft being connected by a belt and pulley drive 432 to a motor 434. The chain and sprocket drive 120 further includes a sprocket 564 which drives an intermediate shaft 562 to be described.

As illustrated in FIGS. 1 and 2, the horizontal conveyor 26 includes a pair of laterally spaced chains 124 provided with longitudinally spaced lugs or flights 126 arranged to engage the rear or trailing edges of a blank 12 delivered to the con-

veyor by the transfer rolls 22, 24. The chains 124 are continuously driven and are arranged to run over upper sprockets 128, 130 mounted on shafts 132, 134, respectively, at each end of the conveyor; lower sprockets 136, 138 mounted on shafts 102, 114; and intermediate guide sprockets 140, 142. The sprockets 138 are fast on the shaft 114 to effect driving of the chains 124. The shaft 132 is connected by spur gears 144 to the shaft 146 on which the upper rolls 22 are mounted. The upper rolls are supported in block bearings 148 slidably mounted in the supporting frame.

In operation, the surface speed of the transfer rolls 22, 24 is faster than the linear speed of the chains 124 of the conveyor 26 so that a carton blank 12 deposited on the conveyor comes to rest momentarily after leaving the transfer rolls until the chain lugs 126 engage the trailing end to start the blank forward to carry it through the machine. As shown in FIG. 1, the drive to the shaft 132 on which the lower roll 24 is mounted comprises a chain and sprocket drive 145 from the shaft 102. It will be understood that the sprockets 128 on shaft 102 over which the carrier chains 124 run comprise idlers and that the chain and sprocket drive 145 is designed to effect rotation of the shaft 132 at a rate such that the carton blank 12 will be deposited on the conveyor 26 prior to arrival of the lugs 126. As herein shown, the blank is guided between side guides 150, 152 and under hold down rails 154, 156. The blank is first carried past the adhesive-applying roller 28 where the underside of the side seam flap 27 is provided with a coating of adhesive.

As shown in FIG. 1, the adhesive-applying roller 28 is relatively narrow and is mounted for adjustment on a shaft 158 arranged to be rotated in timed relation to the advance of the carton by chain and sprocket connections from the shaft 114 including a connection 159 to a shaft 160, a second connection 161 to a shaft 162 and a final connection 164 to the shaft 158. In practice, the roller 28 is rotated at a surface speed slightly less than the linear speed of the conveyor chains 124 so that the trailing end of the carton side seam flap will not receive a surplus of adhesive such as would occur if the applying roller were traveling faster than the blank. The applying roller 28 is arranged to run in a gluepot 166 provided with a quick-setting hot melt adhesive. As herein shown, the gluepot is carried by parallel arms 168 arranged to be lowered by a handle 170 to permit convenient cleaning and servicing of the same. One of the guide rails, 152, is provided with a short rail 172 overlying a portion of the applying roller and under which the side seam flap 27 extends, the rail 172 serving to retain the flap in operative engagement with the applying roller during the adhesive-applying operation.

The carton blank is then guided under shoes 174, 176 whose outer edges are aligned with score lines 178, 180, respectively, of the carton blank and past stationary folding rails 182, 184 shaped and bent to effect inward folding of the sidewall panels 29 and 31 through 180° . As herein shown, the holddown rails 154, 156 and the shoes 174, 176 are mounted for lateral adjustment on rods 186 carried by arms 188. The arms 188 are clamped to a longitudinally extended rocker shaft 190 journaled in bearing brackets 192 attached to the frame. The folding rails 182 on one side of the conveyor 26 are likewise carried by and adjustably mounted on arms 194 clamped to the rocker shaft 190. The folding rails 184 on the other side of the conveyor are carried by and adjustably mounted on arms 196 clamped to a rocker shaft 198. The side guides 150, 152 are adjustable on tie rods 191 extending between side rails 193. With this construction it will be seen that the operating elements of the side-seaming conveyor are adjustable for different sizes of cartons within predetermined minimum and maximum limits. As shown in FIG. 1, the side-seamed carton passes under a guide plate 195 on one side and under a rod 197 on the other side which serve to complete the creased fold along the score lines 178, 180.

In practice, the holddown and folding elements are spring urged downwardly to a predetermined and adjustable stop position as indicated in FIG. 8 and are capable of rocking upwardly in the event of a jam. Suitable controls, not shown, may

be provided for stopping the machine when such a jam occurs. It will be understood that the wider sidewall panel 31 comprises the first folded panel whereby to present the adhesive-coated flap 27 face up whereupon the narrower panel 29 is folded down on top of the flap 27 to provide the side seam indicated at 200. Immediately thereafter, during the continued advance of the carton, the side seam 200 is subjected to a pressing operation by driven pressure rolls including the roll 32 previously referred to and a cooperating roll 204 arranged to spread and set the adhesive.

During the pressing operation, the carton is supported on a continuously moving belt 206 which is coextensive with the chain conveyor 26. The belt 206 and the driven rolls 32 and 204 are arranged to travel faster than the carrier chains 124 in order to pull the carton ahead of the lugs 126 during the transfer from the chains to the belt. Thus, in practice, the pressure rolls not only press the glue seam but also accelerate the carton away from the chain lugs. As herein shown, the belt 206 runs over a drive pulley 212 fast on a drive shaft 222 and over a driven pulley 214 mounted to rotate on a stud 216 fast in a bracket 218. The drive shaft 222 is rotated by a chain and sprocket drive 220 from the carrier chain sprocket shaft 134 and is designed to effect a linear speed of the belt 206 at a faster rate than the linear speed of the carrier chains 124. The lower pressure roll 204 is also mounted on the pulley shaft 222. The upper roll 32 is mounted on a shaft 224 and is connected to rotate with the lower roll by spur gears 226. As herein shown, the upper roll shaft 224 is journaled in a bracket 228 pivotally mounted at 230 and is rocked in a direction to urge the roll 32 into cooperating engagement with the lower roll 204 by a compression spring 232 coiled about a rod 233 and interposed between a yoke 234 forming a part of the bracket 228 and a shaft 236 journaled in spaced arms 238 extended from a bracket 240 attached to the machine frame. In practice, the rod 233 may extend through the shaft 236 and connections to the lower end of the rod may be made to effect manual rocking of the bracket 228 to an inoperative position when desired. As herein shown, the lower end of the rod 233 may be provided with a hub 235 having a cam surface at its upper end engaging the handle 237 and rocking of the handle will effect rocking of the pressure roll 32 upwardly.

In operation, it may be desired to limit the pressing operation to the side seam area 200 only as defined by the flap 27 of the carton blank 12, that is, to maintain the roll 32 elevated until the closing flap area at one end has passed again lifting the roll before it engages the closing flaps at the other end of the carton so as to avoid squeezing glue out of the ends of the seam onto the closing flaps. This may be accomplished by rocking the upper roll 32 into and out of cooperating engagement with the lower roll 204 through cam-operated linkage, not shown, connected to the rod 233. Another expedient employed to effect pressing along the side seam area only and not along the extended end closing flaps is to provide a cutout in the lower roll 204 to avoid cooperation with the upper roll except during that portion of each cycle when the side seam portion 200 passes between the rolls. In any event, the passage of the carton between the rolls 32, 204 also serves to advance the carton to the carton-opening, reverse-folding and transferring device 501.

In order to further assist in advancing the carton into a pocket 575 of the reverse folding device 501, a roller 242 carried by an arm 244 is arranged to cooperate with the discharge end of the belt 206 adjacent the pulley 214. The arm 244 is mounted to pivot on a stud 246 and is pressed downwardly by a coil spring 248 carried between an extension 250 from the arm 244 and a second arm 252 clamped to the stud 246. The stud 246 is adjustably mounted in an elongated slot 254 forming in a bracket 256.

As herein illustrated, the carton-opening and reverse-folding conveyor 501, which includes two spaced carrier chains 503, 504, is supported between two opposed channel iron side frames 506, 508. The side frames 506, 508 are supported by floor stands including a stand 510 at the receiving end of the

conveyor and which is connected by a horizontal bar 511 to a frame 512 of the apparatus. The bar 511 has two spaced clamp collars 514, 516, respectively, attached thereto which support upstanding rods 518, 520. The upper ends of the rods 518, 520 are also provided with clamp collars 522, 524 to which the adjacent ends of the side frames 506, 508 are attached. The further ends of the side frames are each provided with a separate floor stand 526, 528 and clamp collars 530, 532 as shown. The intermediate portions of the conveyor are connected together by tie rods 534, 536 extended between the side frames 506, 508.

The carrier chains 503, 504 are arranged to run over sprockets 538, 540 at the receiving end of the conveyor, and over sprockets 542, 544 at the discharge end thereof. The sprockets 538, 540 are mounted on a shaft 545 which is journaled in bearings 546, 548 secured to the side frame members 506, 508, respectively. The sprockets 542, 544 which comprise the drive sprockets are mounted on a shaft 550, also journaled in bearings attached to the side frames. The shaft 550 is connected by bevel gears 552, 554 to a shaft 555 journaled in bearings attached to brackets 556, 558. The brackets 556, 558 are secured to and extend from the side frame 506. The shaft 555 is connected by a chain and sprocket drive 560 to an intermediate shaft 562 also journaled in bearings secured to the machine frame. The shaft 562 is provided with a sprocket 564 connected by the chain and sprocket drive 120 which also drives the shaft 118 comprising the drive to the side seamer 26 as above described.

The carrier chains 503, 504 are arranged to run in tracks 566, 568 defined by like structures on both sides including upper and lower extensions 570, 572 from a rail 574 attached to one leg 576 of an elongated angle member, the other leg 578 of each angle member being attached to its respective side frame 506, 508. Secured to the upper extension 570 on both sides in an elongated rail 580 which supports angle members 582. The cartons presented to the conveyor 501 are supported by and slide along the upper surface of the angle members 582. The spaced carrier chains 503, 504 support between them the pockets 575, each pocket being defined at its leading end by an angle member 584 secured to opposed chain links, and at its trailing end by a carton-pushing member 588. The carton-pushing member is Y-shaped in front elevation providing spread-apart arms 587, 589 to which angle members 592, 594 are adjustably secured. In practice, when the carton is in its fully opened position in the pocket 575, the angle members engage the rear and top walls of the carton. The member 588 is secured to and mounted to rock with a shaft 590 journaled in bearings formed in spaced arms 596, 598 attached to a transversely extended plate 600. The plate 600 is connected to angle members 601 attached to or formed integrally with opposed links of the carrier chains as shown. An arm 602 clamped to one end of the shaft 590 is connected by a spring 604 to a stud 606 depending from the underside of the plate 600. The spring 604 urges the trailing member 588 of the pocket into a rearwardly rocked or open position. When the member 588 is disposed in a rearwardly rocked position, an adjusting screw 608 carried by the plate 600 engages an extension 610 from the arm 602 which is clamped to the shaft 590, thus limiting the rearward rocking movement of the trailing member 588.

In order to control the rocking movement of the trailing member 588 of the pocket, the trailing member has attached thereto a bracket 616 which carries a roller 618 for cooperation with a stationary cam 620. The cam 620 is supported by clamp collars 622, 624 secured to the tie rods 534, 536, respectively. In operation, the trailing member 588 of each pocket 575 is urged into a rearwardly rocked or open position by virtue of the spring 604, and the stationary cam 620 operates to rock the trailing member forwardly into an upright position.

As herein shown, a carton propelled from the side seam conveyor comes to rest against a stop 680 and is supported on spaced platforms 682, 684 attached to the side frames 506,

508. A curved guide plate 686 supported above the further platform 684 serves to deflect downwardly the leading edge of the carton propelled from the side seam conveyor so that the leading edge enters a slotted area defined by the platform 684, stop 680 and deflector plate 686. The carton thus transferred from the side seam conveyor 26 to the reverse-folding conveyor 501 is timed to come to rest on the platforms 682, 684 immediately before the arrival of an open pocket 575 of the reverse-folding conveyor, and the folding trailing edge of the carton is first engaged by the inside edge or corner 628 formed by the intersection of the legs of the angle members 592, 594. Continued forward movement of the pocket moves the carton off the platforms 682, 684 and the leading folded edge of the carton drops down to engage the upper surface of the angle members 582 and the leading member 584 of the pocket 575. In other words, the leading edge of the carton engages the inside edge or corner 626 formed by the intersection of the vertical leg of the angle member 584 and the horizontal surface of the angle members 582.

The side-seamed carton thus engaged in the pocket 575 inherently assumes a slightly open position because of the resiliency of the carton board and thus facilitates subsequent opening or squaring up of the carton. During the continued movement of the carton in its pocket, the stationary cam 620 effects forward rocking of the trailing member 588 of the pocket. Simultaneously therewith, the carton moves up an inclined portion 634 of the angle members 582 and under a pair of spaced rails 630, 632. Elevation of the carton relative to the pocket reduces the height of the vertical leg of the angle member 584 relative to the leading edge of the carton so as to facilitate subsequent release from the pocket. When the trailing member 588 reaches a vertical position, the carton is fully squared up and the top wall of the fully squared-up carton is in engagement with the underside of the spaced rails 630, 632. At this time, the carton and its pocket is also disposed under a continuously moving chain 636 supported above the carton. The chain 636 carries a folding member 638 which serves to strike the rear or trailing end wall of the squared up carton a forwardly directed blow as it passes by to effect forward bending of the carton along the two remaining longitudinal score lines 288, 290 of the carton. Forward bending of the squared-up carton frees the front edge of the carton from the lip of the leading member 584 of the pocket while the back or lower trailing edge of the carton remains engaged by the member 588 of the pocket to continue the forward movement of the carton.

As herein illustrated, immediately after the carton is bent forwardly, it passes under downwardly inclined extensions 688, 690 of the spaced rails 630, 632 to effect continued folding of the carton along the score lines 288, 290. Continued movement of the pocket 575 effects discharge of the carton from the pocket and from the conveyor. The discharged carton thus prebroken along all 4 longitudinal score lines may be distributed to packaging machines, such as bottom-sealing machines, arranged to fold and seal the end-closing flaps to provide a bottom closure for the carton, or the cartons may be stacked and packed in containers preparatory to shipment or for storage for future use.

As illustrated in FIG. 12, the chain 636 runs over sprockets 640, 642 mounted on shafts 644, 646 which are journaled in bearings 648, 650 respectively. The bearings on one side are supported in angle brackets 652, 654 attached to a tie piece 656. The tie piece 656 also carries a plate 657 which the bearings on the other side are supported. The tie piece 656 is secured to upright bars 658, 660 which are vertically adjustable in angle pieces 662, 664 attached to the side frames 506, 508, respectively. The shaft 644 is provided with a sprocket 666 connected by a chain 668 to a sprocket 670 mounted to rotate on a stud 672 attached to a bracket 674. The sprocket 670 is formed with a spur gear 676 which is in mesh with a spur gear 678 fast on the conveyor drive shaft 550 as shown in FIG. 11.

Referring again to FIG. 5, provision is made for latching the cam lever 64 in an upraised position to maintain the stack 14 in an elevated position when it is desired to discontinue feeding of the carton blanks. This may be done by a manual control or by an automatic control of any usual or preferred construction. In either event, a normally closed solenoid valve 356, see FIG. 5, which is connected to a source of air from a pipe 357 to an air cylinder 358 is actuated to open the valve 356 upon closing of the circuit 359. Opening of the valve effects extension of the stem 360 which engages one arm 362 of a bellcrank pivotally mounted on a stud 364 carried by a bracket 366. The arm 362 is spring urged in a clockwise direction and the second arm 368 of the bellcrank is connected to one arm 370 of the latch 371 by a rod 372 fixed in the arm 370 and slidingly mounted in the arm 368. The rod 372 is provided with a nut 373 to limit the sliding movement and to effect positive disengagement of the latch. A compression spring 374 coiled about the rod 372 is arranged to rock the latch in a counterclockwise direction on the stud 364 to present the latch 371 in the path of an extension 376 of the cam lever 64. This type of control is of advantage when it is desired to automatically discontinue the feed of the cartons in the event that a jam occurs in the side-seaming device such as to cause elevation of the folding elements wherein a microswitch 378 may be placed to close the circuit 359 to the solenoid valve 356 in such event, or a manually operated switch may be provided in the circuit. Another form of control for discontinuing the feed of carton blanks, as illustrated in FIG. 5, may comprise a photoelectric scanning unit indicated at 380 which is arranged to detect an oversupply of completed cartons at a forward point in the packaging line, and to actuate the solenoid valve 356 whereby to effect latching of the cam lever 64.

From the above description it will be seen that the present apparatus is capable of producing flat tubular or side-seamed cartons from prescored carton blanks in a rapid, efficient and economical manner. It will also be observed that the present apparatus provides novel reverse-folding mechanism arranged at right angles to the side-seaming device whereby to provide side-seamed carton prebroken along all four score lines. While the blanks herein illustrated and described comprise unlined carton blanks, the present apparatus may be used with advantage for handling cartons provided with a lining material affixed thereto to produce lined cartons.

While the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:

1. Apparatus for opening and refolding a prescored and side-seamed carton initially folded along two longitudinal score lines, comprising, in combination, a conveyor including a pair of spaced chains provided with a pocket, said pocket comprising a leading member and rockingly mounted trailing member carried by and movable with said chains, means including a platform for supporting a side-seamed carton in the path of a pocket to be engaged and moved thereby, a pair of spaced rails along which the carton is moved by said pocket, and means operative during movement of the pocket for opening and refolding the carton along the two remaining longitudinal score lines, said last-named means including means for rocking said trailing member to an upright position to effect opening of the carton to a squared-up condition, and means for continuing folding the squared-up carton forwardly along said two remaining longitudinal score lines.

2. Apparatus for opening and refolding a prescored and side-seamed carton initially folded along two longitudinal score lines comprising, in combination, a conveyor provided with a pocket, means for supporting a side-seamed carton in the path of a pocket to be received thereby, means operative during movement of the pocket for opening and refolding the carton along the two remaining longitudinal score lines, said pocket comprising a leading member supporting one folded

edge of the carton and a trailing member supporting the other folded edge of the carton, said trailing member being movable relative to the leading member whereby to effect opening of the carton to a squared-up condition, guide means engaging the top of the carton in its squared-up condition, and means for continuing folding the squared-up carton forwardly along said two remaining longitudinal score lines.

3. Apparatus for opening and refolding a prescored and side-seamed carton initially folded along two longitudinal score lines comprising, in combination a conveyor provided with a pocket, means for supporting a side-seamed carton in the path of a pocket to be received thereby, means operative during movement of the pocket for opening and refolding the carton along the two remaining longitudinal score lines, said pocket comprising a leading member supporting one folded edge of the carton and a trailing member supporting the other folded edge of the carton, said trailing member being movable relative to the leading member whereby to effect opening of the carton to a squared-up condition guide means engaging the top of the carton in its squared-up condition, and means for continuing folding the squared-up carton forwardly along said two remaining longitudinal score lines, said guide means being bent downwardly to complete the folding operation along said remaining score lines.

4. Apparatus for opening and refolding a prescored and side-seamed carton initially folded along two longitudinal score lines comprising, in combination, a continuously movable conveyor provided with a plurality of pockets, each pocket having a leading member and a rockingly mounted trailing member, means including a platform for supporting successive side-seamed cartons in the path of successive pockets to be engaged and moved thereby, a pair of spaced rails along which the carton is moved by said pocket, said leading and trailing members supporting a carton along the initially folded edges with the carton in a slightly open position, means for moving said trailing member to effect squaring up of the carton in cooperation with said leading member, and means engageable with the squared-up carton for folding the same forwardly along the two remaining longitudinal score lines.

5. Apparatus for opening and refolding a prescored and side-seamed carton initially folded along two longitudinal score lines comprising, in combination, a continuously movable conveyor provided with a plurality of pockets, each pocket having a leading and a trailing member, means for supporting successive side-seamed cartons in the path of successive pockets to be received thereby, said leading and trailing members supporting a carton along the initially folded edges with the carton in a slightly open position, means for moving said trailing member to effect squaring up of the carton in cooperation with said leading member means engageable with the squared-up carton for folding the same forwardly along the two remaining longitudinal score lines, and stationary rails on which the leading edge of the carton is supported in cooperation with said leading member of the pocket, said rails having an upwardly inclined portion arranged to elevate said leading edge relative to said leading member whereby to facilitate release of the carton upon initiation of the forward-folding operation.

6. In apparatus for handling side-seamed cartons prepared from prescored carton blanks and folded along two longitudinal score lines, in combination, means for reverse folding the cartons along the two remaining score lines to provide a side-seamed carton prebroken along all four longitudinal score lines, said means comprising a continuously moving chain conveyor having a plurality of spaced pockets carried by said chain conveyor, each pocket provided with leading and trailing members engageable with the leading and trailing folded edges of the carton, a pair of spaced rails along which the cartons are moved by said pockets, the trailing member of each pocket being movable relative to the leading member whereby to effect opening and squaring up of the carton along said two remaining score lines, and means mounted above said conveyor engageable with the trailing sidewall of the carton

for bending the carton forwardly to effect continued folding of the carton along the two remaining longitudinal score lines.

7. In apparatus for handling side-seamed cartons prepared from prescored carton blanks and folded along two longitudinal score lines, in combination, means for reverse folding the cartons along the two remaining score lines to provide a side-seamed carton prebroken along all four longitudinal score lines, and means comprising a continuously moving conveyor having a plurality of spaced pockets, each pocket provided with leading and trailing members engageable with the leading and trailing folded edges of the carton, the trailing member of each pocket being movable relative to the leading member whereby to effect opening and squaring up of the carton along said two remaining score lines, and means engageable with the trailing sidewall of the carton for bending the carton forwardly to effect continued folding of the carton along the two remaining longitudinal score lines, said folding means further including downwardly inclined guide means under which the forwardly bent cartons are passed.

8. In apparatus for handling side-seamed cartons prepared from prescored carton blanks and folded along two longitudinal score lines, means for reverse folding the cartons along the two remaining score lines to provide a side-seamed carton prebroken along all four longitudinal score lines, said reverse-folding means comprising a conveyor having a plurality of spaced pockets, each pocket having a relatively stationary leading member and a pivotally mounted trailing member, a pair of spaced rails along which the cartons are moved by said pocket, means including a platform for supporting successive side-seamed cartons in the path of successive pockets to be received thereby, means for transferring successive cartons onto said supporting means, said pockets effecting transfer of the carton from the platform to the rails, means operative during the continued movement of the pocket for rocking and trailing member to effect opening of the carton, and means for refolding the carton along said two remaining score lines, said refolding means including means supported above the conveyor for bending the squared-up carton forwardly, and stationary guide means for continuing the bending operation during continued movement of said pocket.

9. In apparatus of the character described, in combination, means for producing side-seamed cartons from prescored carton blanks having sidewall panels defined by score lines comprising a conveyor, means on said conveyor for folding the blanks along two score lines and for adhesively securing the side seam, a second conveyor arranged at right angles to said first conveyor and provided with pockets, means including a platform on the second conveyor arranged to receive and support a carton discharged from said first conveyor in the path of a pocket to be received thereby, a pair of spaced rails along which the cartons are moved by said pockets, each of said pockets having a leading and a trailing member, the trailing member of said pocket being movable relative to the leading member whereby to effect opening and squaring up of the carton by bending along the two remaining score lines, and means supported above the conveyor for bending the squared-up carton forwardly, and guide rails arranged to continue the folds along said remaining score lines whereby to provide a side-seamed carton precreased on all four longitudinal lines.

10. In apparatus of the character described, in combination, means for reverse folding side-seamed cartons prepared from prescored carton blanks and folded along two longitudinal score lines, said means comprising a continuously moving conveyor having a plurality of pockets provided with leading and trailing members, said members adapted to support the leading and trailing folded edges of the carton therebetween, means including a platform for presenting successive cartons in the path of successive pockets to be received thereby, a pair of spaced rails along which the cartons are moved by said pocket, the trailing member of each pocket being movable relative to the leading member whereby to effect squaring up of the carton by bending along the two remaining score lines, means disposed above the conveyor and engageable with the

trailing sidewall of the squared-up carton for continuing the bending forwardly along said remaining score lines, and stationary guide means for continuing the bending operation during continued movement of said pockets whereby to provide a side-seamed carton precreased along all four longitudinal 5 score lines.

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