

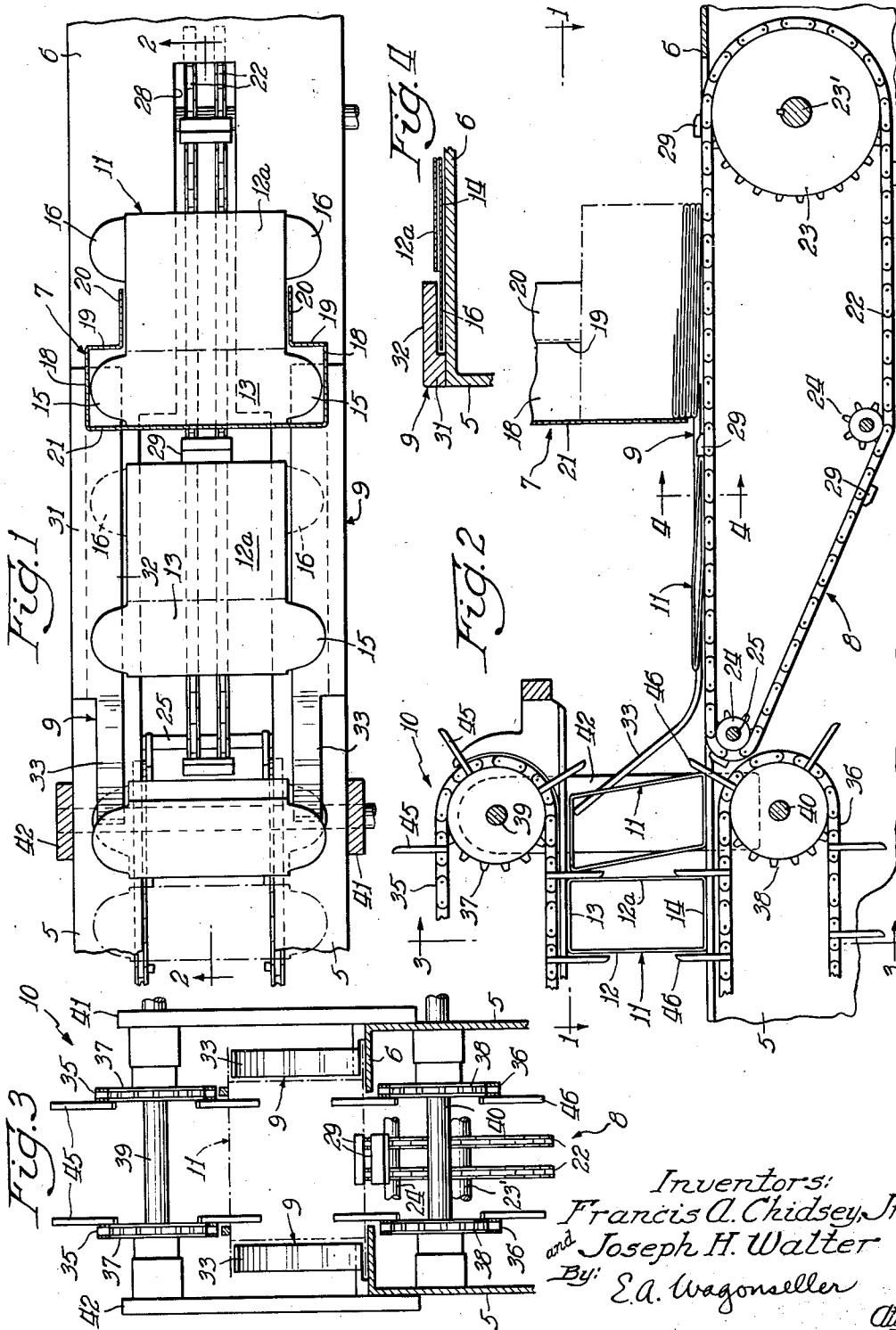
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MECHANISM FOR OPENING COLLAPSED TUBULAR CARTONS

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MECHANISM FOR OPENING COLLAPSED TUBULAR CARTONS

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The present invention relates to mechanism for opening collapsed tubular cartons of the type which have externally projecting portions on oppositely disposed walls.

One object of the present invention is to provide simple and effective mechanism which will receive a group of superimposed collapsed tubular cartons having open ends and which will remove one carton at a time from the group and cause it to be expanded to its normal open condition preparatory to receiving articles, such as filled cans, which are inserted into one or both open ends of the cartons.

Another object of the invention is to provide carton opening mechanism, particularly adapted to open cartons of the type having externally projecting portions on two opposite walls, such, for example, as cartons which have can flange engaging and retaining tabs projecting outwardly from the upper and lower walls of the carton.

Other objects of the invention will become apparent as the description proceeds.

In the drawings, illustrating a preferred embodiment of the invention,

Fig. 1 is a plan view of a carton opening mechanism showing cartons in several positions thereon;

Fig. 2 is a vertical sectional view of the carton opening mechanism, taken substantially along line 2—2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a vertical sectional view taken along line 3—3 of Fig. 2, looking in the direction of the arrows, and

Fig. 4 is an enlarged fragmentary, sectional view taken along line 4—4 of Fig. 2.

The mechanism of the present invention constitutes a portion of a complete carton opening and loading machine, but the invention to be described is limited substantially to the carton feeding and expanding features, and hence certain of the parts are illustrated in fragmentary form.

The mechanism comprises essentially a magazine or hopper for receiving a plurality of stacked, collapsed, tubular containers having outwardly extending portions such as retaining tabs for engagement with the top and bottom flanges on beverage cans of the type used for beer and soft drinks. The cartons are removed from the lower portion of the magazine by a conveyor having one or more upstanding flight or pusher elements thereon. A guide bar is arranged at the discharge side of the carton magazine with one end of the guide bar extending part way under the magazine to lie beneath the extended portions which are carried by the top wall of the carton. When the lowermost carton is ejected from the magazine, the forwardly positioned, extended portion will slide along the upper surface of the guide bar, and the rearwardly positioned extending portion will move beneath the guide bar. Thus, when the forward extended portions reach an upwardly inclined part of the guide bar with the rear edge of the carton being propelled by the pusher element on the conveyor, the carton will be forced into expanded condition. The carton, after being brought to expanded condition is then engaged by additional conveying mechanism,

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formed as upper and lower endless chain conveyers provided with downwardly projecting and upwardly projecting pusher elements respectively which carry the expanded carton along to a subsequent operating section such as a can loading station while maintaining the carton in an expanded condition.

Referring more particularly to the drawings, frame members 5, 5 are provided secured on a suitable base, not shown. The frame members terminate at their upper ends in a horizontal table portion 6. Suitably located on the frame are the collapsed carton magazine 7, the carton feeding conveyor 8, the carton expanding bars 9, 9, and the expanded carton conveying means, indicated as a whole at 10.

The form of carton for which the mechanism of the present invention is particularly designed is designated as a whole at 11 and is adapted to retain a single row of recessed end cans. The carton comprises a pair of side walls 12 and 12a, top and bottom walls 13 and 14, with extended portions 15, 15 on the top walls and similar portions 16, 16 on the bottom walls. These extended portions are adapted to be folded interiorly of the tubular cartons to be closely adjacent their attached walls in position to engage the chimes of cans enclosed by the tubular carton and retain the cans from outward movement.

The collapsed-carton magazine 7 preferably comprises side wall portions 18, 18 suitably anchored to the table 6. These side wall portions are in the present instance spaced sufficiently to accommodate the width of the carton measured from the outer extremities of the extended portions 15, 15 on opposite edges of the top wall 13. See Fig. 1. Additional portions 19 and 20 extend from the vertical edges of walls 18, the portion 19 being directed inwardly and the portion 20 being disposed at right angle to portion 19 to bring portions 20 in position to guide the edges of the collapsed cartons which lie intermediate the forward extended portions 15 on the top wall and the rearward extended portion 16 on the bottom wall.

The front wall 21 is secured to the vertical edges of the side walls in any desired manner. The lower edge of the wall 21 is spaced above the table 6 a sufficient distance to permit the delivery of the lowermost carton from the magazine. Conveyor 8 is employed to eject cartons from the magazine. This conveyor is preferably formed of endless chain members 22, 22 running over sprocket wheels 23 keyed to a suitably driven shaft 23' journaled in the frame members 5, 5. The chain members pass over idler sprockets 24, 24 mounted on shaft 25, journaled in supplemental frame members 26, 26, carried by frame members 5, 5.

The upper run of the conveyor chains is preferably flush with the upper surface of table 6 which is formed with an elongated opening 28 to accommodate the conveyor. Flights or pusher elements 29, 29 are secured to the conveyor chains at suitable intervals. When the conveyor 8 is driven the pusher elements 29 pass beneath the pile of collapsed cartons and eject the lowermost carton. This allows the pile to lower each time a carton is ejected and thus each pusher element passing beneath the magazine will eject one carton.

After a carton is delivered from the magazine it is then ready for the setting up or expanding operation. For this purpose the carton expanding or guide bars 9, 9 are employed. These bars, as shown in Figs. 1, 2 and 4 are secured adjacent the opposite edges of the table 6 in position to contact both the projecting portions on the forward or top wall and on the rearward, or bottom wall. The forward portions ride on the upper surfaces of the bars 9 and the rearward portions move along beneath the guide bars. In order to space the bars from

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the upper surface of the table 6, their outer edge portions are each formed with a flange 31 extending along that portion of the bar which lies close to the face of the table. These flanges are on the under side of the bar and rest upon the table face so that the inwardly extending portion 32 of the bar is somewhat spaced from the table top to accommodate the rearward, or bottom wall, projecting portion 16 of the carton.

Expansion of the collapsed cartons is effected by moving the carton along, after it is ejected from the magazine, and applying a pushing force to its trailing edge, which is the edge formed by the junction of bottom wall 14 and side wall 12a, guiding the rearward extended portions 16, 16 in fixed paths between the table top and the bars 9, 9, guiding the forward extended portions 15, 15 along a path spaced progressively farther from the path of the rear portions until the carton has been brought substantially to its expanded form. The preferred arrangement for effecting this result is to form the bars 9, 9 with upwardly inclined sections 33, 33 at their end portions remote from the carton magazine so that, as the cartons are advanced, their top wall panels and extended portions will be forced to move along an upwardly inclined path. This causes the side walls to swing with respect to the top and bottom walls until the side walls reach a position approximately perpendicular to the top and bottom walls.

After the carton has been brought to a partially expanded condition it is engaged by the conveying means, indicated as a whole at 10, which may conveniently be termed an off-bearing conveyor. This conveyor is designed to carry the cartons past other treating and loading stations, not shown. The off-bearing conveying means 10 preferably comprises upper and lower sets of endless chain conveyers 35, 35 and 36, 36. The chains pass over sprockets 37 and 33 fixed on shafts 39 and 40, suitably journaled in vertical frame members 41 and 42, carried by the frame members 5, 5. As shown in Fig. 3, each of the conveyor chains carries a series of pusher fingers, indicated at 45, 45 on the chains 35 and at 46, 46 on the chains 36. The upper and lower conveyers are operated by suitable driving means, not shown, to run at the same speed. Thus the pusher fingers 45 will move in synchronism with the pusher fingers 46, as shown in Fig. 2. The spacing of the adjacent pusher fingers is slightly greater than the overall width of the cartons between the outer surfaces of the side walls. By this construction the upper and lower sets of pusher fingers form in effect upwardly and downwardly directed pockets which receive the expanded cartons and retain them in expanded form as they are conveyed.

By reference to Figs. 1 and 2, it will be seen that the conveyor 8 is relatively narrow and its discharge end extends into the path described by the spaced pusher fingers 46, 46 on the off-bearing conveyor chains 36, 36. Since the spacing of these pusher fingers is greater than the width of the pushers 29 the two conveyers can be operated without interference. It is also to be noted that the pusher fingers 45, 45 and 46, 46 operate within the space defined by the upwardly inclined portions 33, 33 of the guide bars.

For cartons of the proportions illustrated, conveyor 8 is preferably driven at a linear speed which is approximately four times the speed of the conveyers 35 and 36, and the synchronization is preferably such that when pairs of vertically registering pusher fingers 45 and 46 have completed the turn around their respective sprockets and are substantially aligned vertically with the shafts 39 and 40, the upper edge of leading side wall 12 of the carton will be brought into contact with the rear surface of upper pusher fingers 45, 45. Following such contact the pusher element 29 will continue in contact with the lower edge of the trailing side wall 12a for a very short distance and will then begin to pass down around the sprocket 24 and will slip out of contact with wall 12a.

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The following set of pusher fingers 45 and 46 will move in behind the partially expanded carton and as pusher fingers 46, 46 move up around their sprockets 38, 38, approaching a vertical position, such fingers will engage the lower edge of side wall 12a. This engagement between fingers 46 and the side wall is approximately simultaneous with the disengagement of pusher 29 from the side wall 12a. It is to be understood that changes in height and width of cartons to be run on the equipment herein disclosed will require suitable changes in the relative speeds of the conveyers.

The upper ends of the inclined sections 33, 33 of the guide bars terminate preferably at points vertically aligned below the center line of shaft 39 carrying sprockets 37, 37. Thus, as the projecting portions 15, 15 on the upper wall 13 of the carton move to the end portions 33, 33 of the guide bars and slip over the free ends of such bars, the upper edge of wall 12 will at approximately this time come into contact with the downwardly projecting fingers 45, 45.

As the registering fingers 45 and 46 continue to advance, the fingers 46, bearing against the lower rear corner of the carton, that is, against the edge where side wall 12a is joined with bottom wall 14, will cause the carton to be brought substantially to squared up condition. The carton is then carried forward to a further treating station while it is held in a pocket formed by two forward and two rearward sets of finger 45 and 46.

Each succeeding carton delivered from the magazine will be carried forward, partially expanded, and delivered to the conveying fingers 45 and 46 in continuous sequence.

From the foregoing it is apparent that the present invention provides an effective mechanism for expanding open end collapsed, tubular cartons having top and bottom wall portions projecting from the ends of such walls. The invention is particularly advantageous in setting up tubular paperboard, sleeve-form cartons having can chime engaging tabs projecting outwardly from the ends of the walls which are to be in contact with the can ends.

In normal use of the machine the operator will place the collapsed cartons in the carton magazine so that the top wall flaps are aligned above the end of the guide bars 9, 9 that project under the magazine. As the collapsed cartons are withdrawn by the pushers 29, the forward flaps will ride on the top surfaces of the guide bars and the rearward or bottom wall flaps will move along the under sides of the guide bars. As the top wall flaps begin to move along the inclined portion of the guide bars the carton will begin to be forced open with the opposite walls moving in parallelism. The top wall flaps will continue upward along the inclined part of the guide bars and at about the time the flaps pass over the free ends of the bars the top edge of the advancing side wall will contact the downwardly disposed fingers on the expanded carton conveyor which moves at a speed about one-fourth as fast as the collapsed carton conveyor. At about the time the expanded carton contacts the downwardly extending fingers the pusher member on the collapsed carton conveyor will slip from contact with the lower trailing corner of the carton and the succeeding upwardly extending fingers on the expanded carton conveyor will engage such lower trailing carton corner serving to advance the carton and at the same time further force it into more nearly fully expanded condition. The four sets of fingers—two upper sets and two lower sets—form a pocket which will carry the expanded carton to a subsequent carton treating station, such as mechanism for interiorly folding the outwardly projecting flaps and mechanism for loading cans into the carton.

While the present description sets forth a preferred embodiment of the invention, numerous changes may be made in the construction without departing from the spirit of the invention, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being had to the

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appended claims rather than to the foregoing description to indicate the scope of the invention.

We claim:

1. Mechanism for opening or expanding collapsed, tubular cartons of the type having interconnected top, bottom and side walls in which the top and bottom walls have outwardly projecting portions, such mechanism comprising in combination, a conveyer member including an element adapted to engage and advance a collapsed carton and move it along a predetermined path, and spaced guide bars disposed along the conveyer, the spacing of the guide bars being such that the outwardly projecting portions on the top wall of a collapsed carton can be supported upon and move along the respective spaced guide bars, the inner portions of the guide bars being spaced somewhat above and substantially parallel to the conveyer whereby projecting portions on the bottom wall of a collapsed carton may move along said path below such guide bars, such guide bars each having symmetrically formed, upwardly inclined sections joined with the portions that are spaced from and parallel with the conveyer, whereby, when a collapsed carton is advanced with its top wall forwardly disposed and in an overlying position with respect to a side wall and its bottom wall rearwardly disposed and in an underlying position with respect to the other side wall, and with the outwardly projecting portions on the top wall coming into engagement with the upper surface of the upwardly inclined guide bar sections, while the rearwardly disposed, outwardly projecting bottom wall portions are moving between the lower surfaces of the guide bars and the conveyer, the carton will move toward expanded condition.

2. Mechanism for opening or expanding collapsed, tubular cartons of the type having interconnected top, bottom and side walls in which the top and bottom walls have outwardly projecting portions, such mechanism comprising in combination, a conveyer member including a supporting table, a pusher element adapted to engage the edge of a collapsed carton placed thereon and move it along the supporting table, and spaced guide bars disposed along the conveyer, the spacing of the guide bars being such that the outwardly projecting portions on one wall of a collapsed carton can be supported upon and move along the respective spaced guide bars, the inner portions of the guide bars being spaced somewhat above and substantially parallel to the table surface whereby projecting portions on another wall of a collapsed carton may move along the table surface below such guide bars, such guide bars each having symmetrically formed, upwardly inclined sections joined with the portions that are spaced from and parallel with the table surface, whereby, when a collapsed carton is advanced with its top wall forwardly disposed and in an overlying position with respect to a side wall and its bottom wall rearwardly disposed and in an underlying position with respect to the other side wall, and with the outwardly projecting portions on the top wall coming into engagement with the upper surface of the upwardly inclined guide bar sections while the rearwardly disposed, outwardly projecting portions on the bottom wall are moving between the lower surfaces of the guide bars and the table surface, the carton will progressively be expanded.

3. Mechanism for opening or expanding collapsed, tubular cartons of the type having interconnected top, bottom and side walls in which the top and bottom walls have outwardly projecting portions, such mechanism comprising in combination, a conveyer member including a supporting table and a pusher element for engaging and advancing one collapsed carton at a time along the supporting table, a vertically disposed collapsed-carton magazine having front and rear walls supported above the path of the conveyer pusher element to permit one collapsed carton at a time to be removed from the lower end of the magazine by the conveyer pusher element, and

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a guide bar supported above the table surface at the discharge side of the magazine and having an end projecting beneath a portion of the magazine at the discharge end, such guide bar being in a position to be engaged by and to support from below the projecting portion on the upper and forward carton panel, the end of the guide bar beneath the discharge portion of the magazine terminating intermediate the front and rear walls of the magazine and being spaced above the table surface so that the rearwardly positioned, extended portion on the carton will pass beneath the end of the guide bar, the end portion of the guide bar remote from the magazine being inclined upwardly and terminating at a point above the conveying level substantially equal to the height of the carton to be expanded, whereby, when a collapsed carton is discharged from the magazine with its top wall forwardly disposed and in an overlying position with respect to a side wall and its bottom wall rearwardly disposed and in an underlying position with respect to the other side wall, and with the outwardly projecting portions on the top wall coming into engagement with the upper surface of the upwardly inclined guide bar sections, while the rearwardly disposed, outwardly projecting bottom wall portions are moving between the lower surfaces of the guide bars and the table surface, the carton will progressively be expanded.

4. Mechanism for opening or expanding collapsed tubular cartons of the type having interconnected top, bottom and side walls in which the top and bottom walls have outwardly projecting portions, such mechanism comprising in combination, a conveyer member including a supporting table and a pusher element for engaging and advancing one collapsed carton at a time along the supporting table, spaced guide bars disposed along the sides of the conveyer and supported above the table surface, such guide bars being in positions to be engaged by and to support from below the respective projecting portions on the upper and forwardly disposed carton panel, portions of each of the guide bars being spaced above the table surface so that the rearwardly disposed, extended portions on the carton will pass beneath the end of the guide bars, adjoining portions of each of the guide bars, located beyond the first mentioned portions in the direction of movement of the conveyer, being inclined upwardly and terminating at points above the conveying level substantially equal to the height of the carton to be expanded, a second conveyer having a plurality of downwardly extended, spaced pushers thereon disposed at the end of the guide bars such spaced pushers being adapted to engage the upper portion of an expanded carton to convey it past the ends of the guide bars, and a third conveyer disposed below the second conveyer and having similar but upwardly extended, spaced pushers thereon adapted to engage the lower portion of an expanded carton, such spaced pushers on the upper and lower conveyers being operable in synchronism, whereby to engage the trailing, vertically disposed wall of an expanded carton and advance such expanded carton beyond the ends of the guide bars toward a subsequent operating station.

5. Mechanism for opening or expanding collapsed tubular cartons of the type having interconnected top, bottom and side walls in which the top and bottom walls have outwardly projecting portions, such mechanism comprising in combination, a conveyer member including a supporting table and a pusher element for engaging and advancing one collapsed carton at a time along the supporting table, a vertically disposed collapsed-carton magazine having front and rear walls supported above the path of the conveyer pusher element to permit one collapsed carton at a time to be removed from the lower end of the magazine by the conveyer pusher element, spaced guide bars supported above the table surface at the discharge side of the magazine and having their ends projecting beneath a portion of the magazine at the discharge end, such guide bars being respectively in posi-

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tions to be engaged by and to support from below the respective projecting portions on the upper and forwardly disposed carton panel, the ends of the guide bars beneath the discharge portion of the magazine terminating intermediate the front and rear walls of the magazine and being spaced above the table surface so that the rearwardly disposed, extended portions on the carton bottom wall will pass beneath the ends of the guide bars, the end portions of the guide bars remote from the magazine being inclined upwardly and terminating at points above the conveying level substantially equal to the height of the carton to be expanded, a first off-bearing conveyer member having a plurality of downwardly extended, spaced pushers thereon disposed between the upwardly inclined end portions of the guide bars, such spaced pushers being adapted to engage the upper portion of an expanded carton to convey it past such upwardly inclined end portions of the guide bars, and a second off-bearing conveyer member disposed below the first off-bearing conveyer and having similar, but upwardly extended, spaced pushers thereon adapted to engage the lower portion of an expanded carton, such spaced pushers on the upper and lower conveyers being operable in synchronism, whereby to engage the trailing, vertically disposed wall of an expanded carton and advance such expanded carton beyond the ends of the guide bars toward a subsequent operating station.

6. Mechanism for opening or expanding collapsed tubular cartons of the type having interconnected top, bottom and side walls in which the top and bottom walls have outwardly projecting portions, such mechanism comprising in combination, a conveyer member including a supporting table and a pusher element for engaging and advancing one collapsed carton at a time along the supporting table, a vertically disposed collapsed-carton magazine having front and rear walls supported above the path of the conveyer pusher element to permit one collapsed carton at a time to be removed from the lower end of the magazine by the conveyer pusher element, spaced guide bars supported above the table surface at the discharge side of the magazine and having their ends projecting beneath a portion of the magazine at the discharge end, such guide bars being respectively in positions to be engaged by and to support from below the respective projecting portions on the upper and forwardly disposed carton panel, the ends of the guide bars beneath the discharge portion of the magazine terminating intermediate the front and rear walls of the magazine and being spaced above the table surface so that the rearwardly disposed, extended portions on the carton bottom wall will pass beneath the ends of the guide bars, the end portions of the guide bars remote from the magazine being inclined upwardly and terminating at points above the conveying level substantially equal to the height of the carton to be expanded, a first off-bearing conveyer member having a plurality of downwardly extended, spaced pushers thereon movable in paths located between the upwardly inclined end portions of the guide bars, and in paths outside the path of the first mentioned pusher member, such spaced pushers on the off-bearing conveyer being adapted to engage the upper portion of an expanded carton to convey it past such upwardly inclined end portions of the guide bars, and a second off-bearing conveyer member disposed below the first off-bearing conveyer and having similar, but upwardly extended, spaced pushers thereon movable in paths disposed vertically below the pushers on the first off-bearing conveyer and adapted to engage the lower portion of an expanded carton, such spaced pushers on the upper and lower off-bearing conveyers being operable in synchronism, whereby to engage the trailing, vertically disposed wall of an expanded carton and advance such expanded carton beyond the ends of the guide bars toward a subsequent operating station.

7. In combination, a conveying mechanism adapted to convey a plurality of articles such as expanded cartons,

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such mechanism being in the form of upper and lower conveyer members, and comprising a frame, a pair of vertically spaced parallel shafts journaled thereon, a pair of sprockets on the upper shaft, a pair of sprockets on the lower shaft respectively aligned in the same vertical plane with the sprockets on the upper shaft, an endless sprocket chain passing over each sprocket, each extending laterally in the same direction, a plurality of longitudinally spaced pusher fingers on the upper sprocket chains extending downward on the reach of such conveyer member which is adjacent to the lower conveyer member, a plurality of longitudinally spaced pusher fingers on the lower pair of sprocket chains extending upward on the reach of such conveyer member which is adjacent to the upper conveyer member, the spacing of the pusher fingers on the upper and lower conveyer members being substantially the same, whereby individual pusher fingers on the upper conveyer may be moved in synchronous, vertical alignment with individual pusher fingers on the lower conveyer to form a plurality of separate pockets of uniform size, each adapted to carry a carton, and a feeder conveyer for delivering a carton to an individual pocket formed by a set of four downwardly directed pusher fingers on the upper conveyer member and four aligned, upwardly directed pusher fingers on the lower conveyer member, such feeder conveyer comprising an endless chain having a width less than the lateral spacing between the fingers on the sprocket chains, the discharge end of the feeder conveyer extending into the space between the laterally spaced pusher fingers as they pass around the sprockets.

8. In combination, a conveying mechanism adapted to convey a plurality of articles such as expanded cartons, such mechanism being in the form of upper and lower conveyer members, and comprising a frame, vertically spaced parallel shafts journaled thereon, a pair of laterally spaced sprockets on the lower shaft, sprocket chains passing over such sprockets and extending in the same direction, a plurality of longitudinally spaced pusher fingers on the lower sprocket chain extending upward on the reach of such chains which is adjacent the upper conveyer, a set of two longitudinally spaced pusher fingers on one sprocket chain and an aligned set of two longitudinally spaced pusher fingers on the adjacent sprocket chain, the four pusher fingers in the two sets forming an upwardly directed pocket adapted to embrace the lower portions of the leading and trailing walls of an expanded carton and convey the same, a sprocket on the upper shaft, a sprocket chain passing over such sprocket, longitudinally spaced, downwardly directed pusher fingers on such upper sprocket chain having spacings corresponding to the longitudinal spacing of pusher fingers on the lower sprocket chains, whereby such downwardly directed pusher fingers are adapted to engage the upper portions of the leading and trailing walls of an expanded carton embraced by the upwardly directed pusher fingers on the lower conveyer member, and a feeder conveyer for delivering an expanded carton to an individual pocket formed by a set of four upwardly directed pusher fingers on the lower conveyer member, such feeder conveyer comprising an endless chain having a width less than the lateral spacing between fingers on the laterally spaced sprocket chains running over the lower shaft, the discharge end of such feeder conveyer extending partially into the space between the paths of the laterally spaced set of pusher fingers on the lower conveyer as such fingers pass around the sprockets.

9. In a mechanism adapted for opening or expanding collapsed, tubular cartons of the type having interconnected top, bottom and side walls in which the top and bottom walls have outwardly projecting portions, and conveying said cartons in an expanded condition, the combination of conveyer means for advancing a collapsed carton along a predetermined path, guide bar means defining said path and adapted for disposition between the

projecting portions of the top and bottom walls of the carton, said guide bars means terminating in an inclined manner, whereby, to cause relative outward movement of said top and bottom walls toward expanded condition, and off-bearing conveyer means for advancing the cartons in an expanded condition, said last means including upper and lower conveyer members, each having out-

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wardly extending pusher fingers which cooperate in a manner to provide a carton holding pocket.

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