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B. J. NIGRELLI ET AL

3,555,776

MACHINE FOR FORMING A TRAY AROUND A GROUP OF ARTICLES

Original Filed May 4, 1966

4 Sheets-Sheet 1

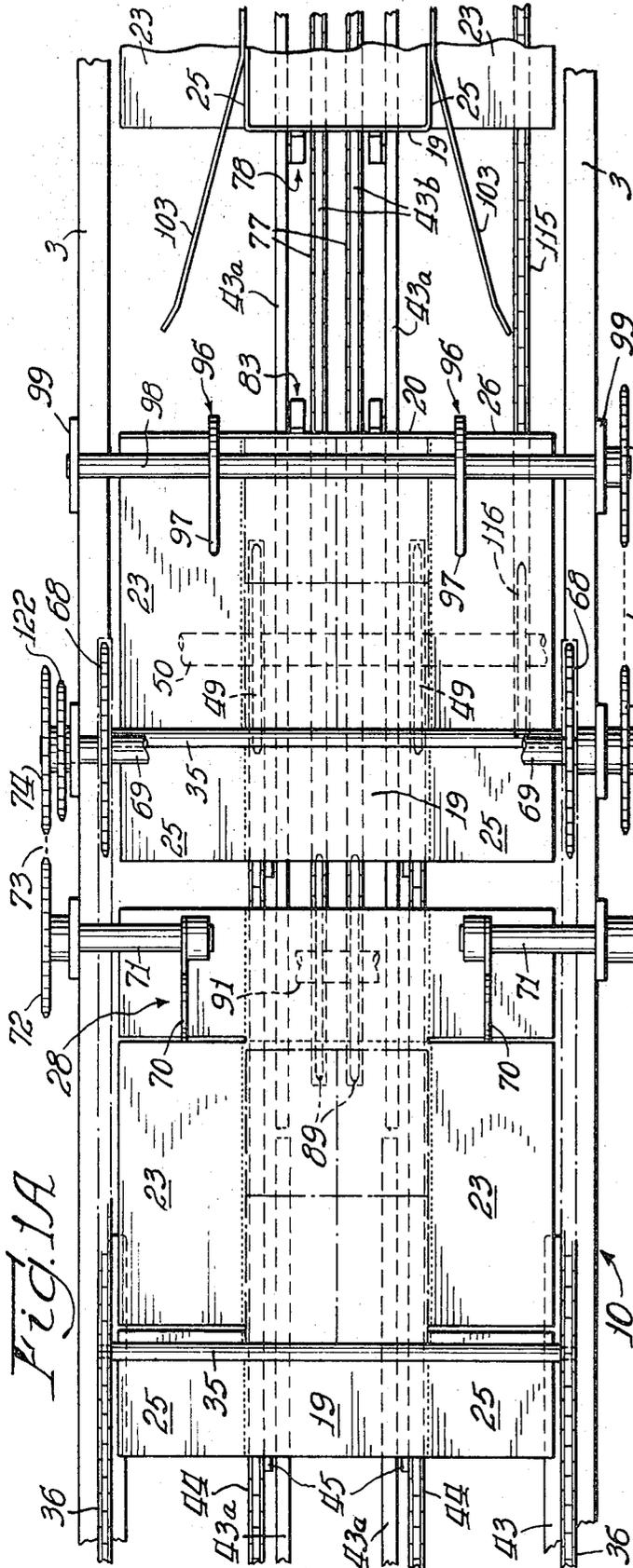


Fig. 1A

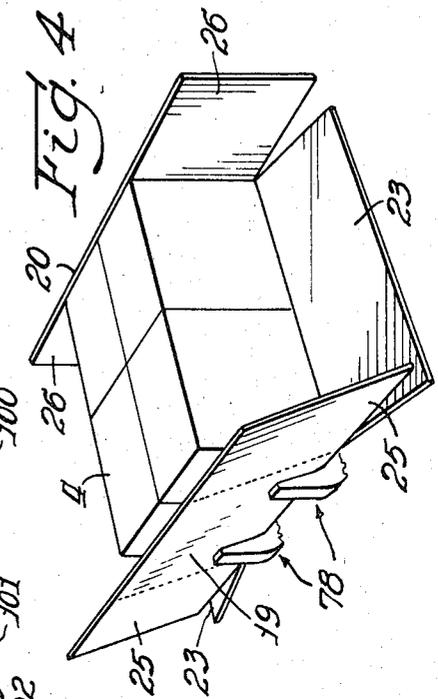


Fig. 4

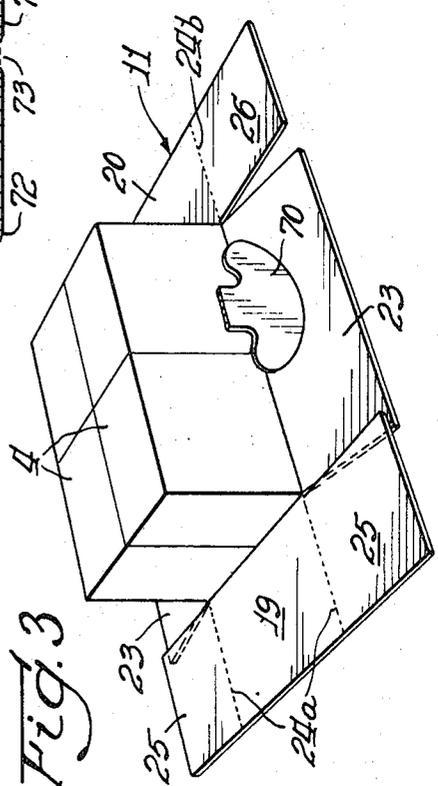
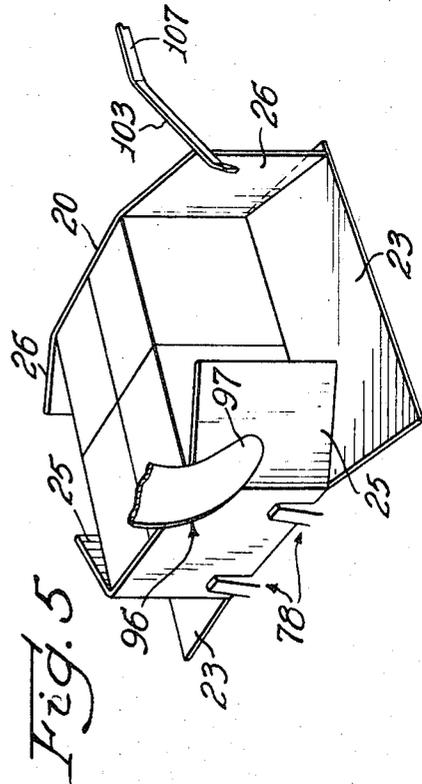
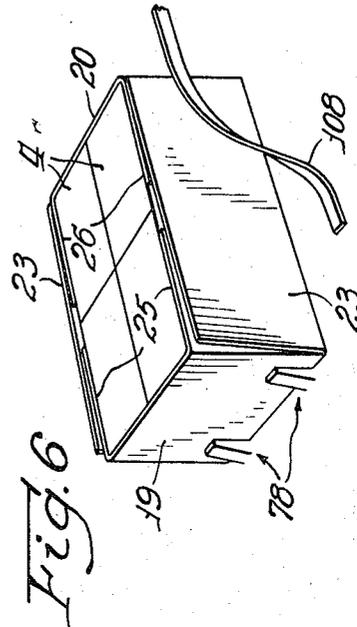
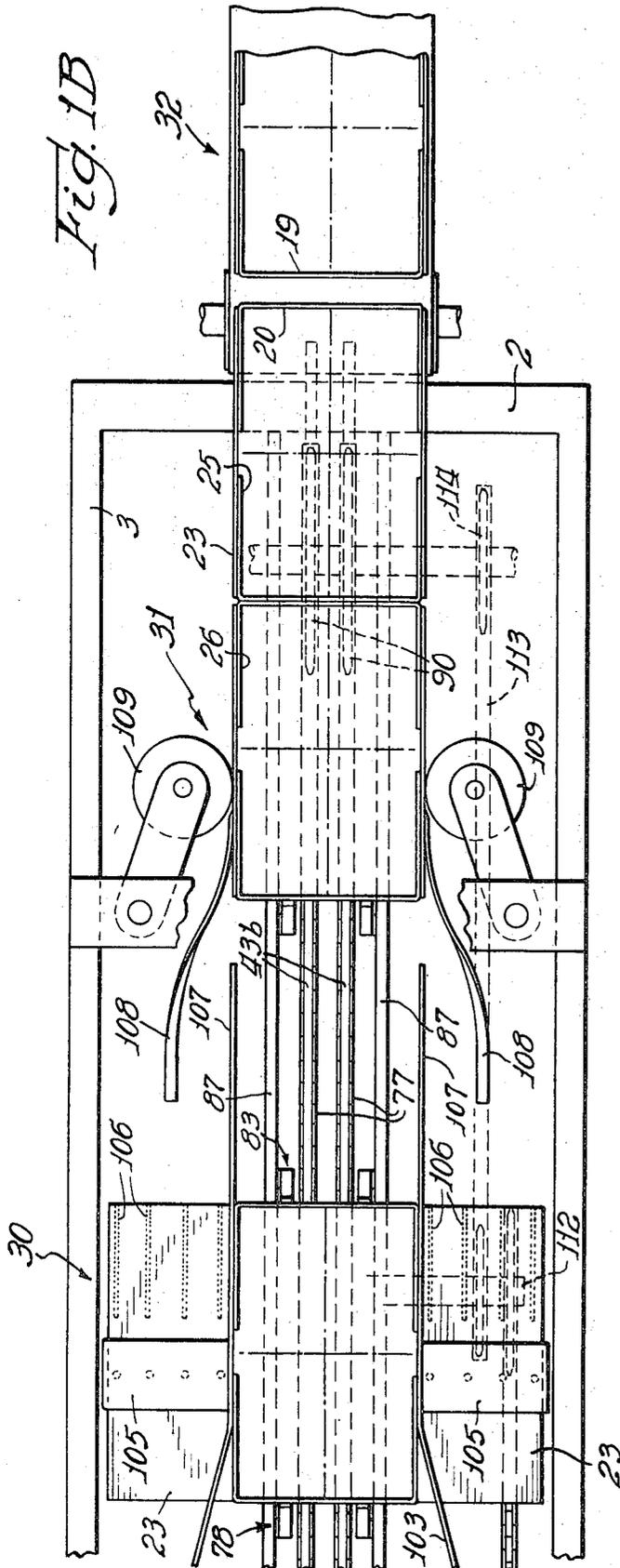


Fig. 3

MACHINE FOR FORMING A TRAY AROUND A GROUP OF ARTICLES

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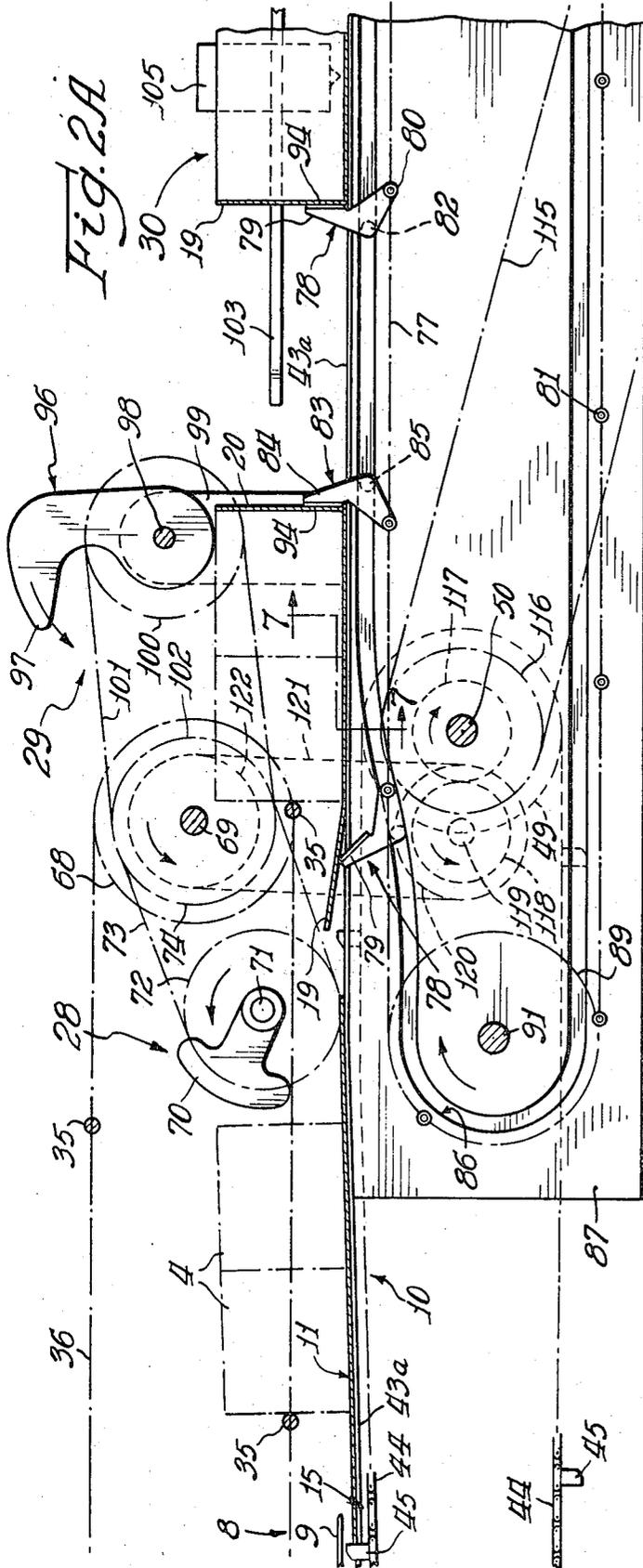


Fig. 2A

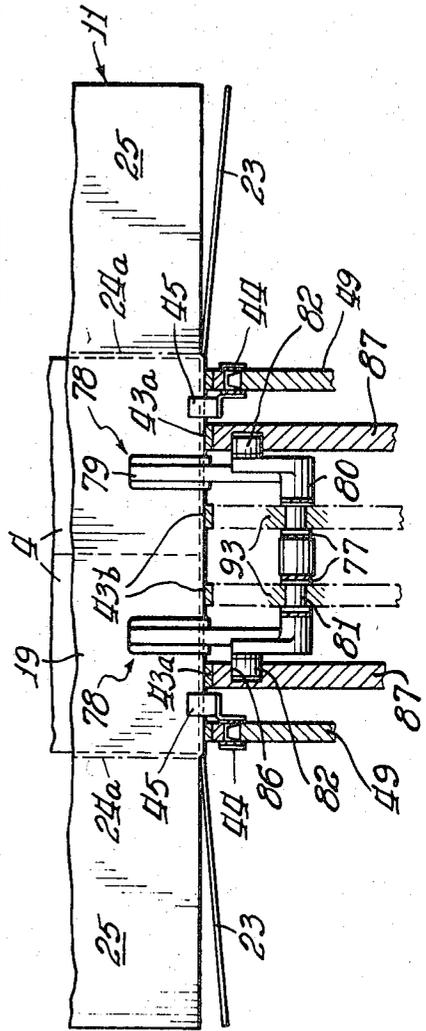


Fig. 7

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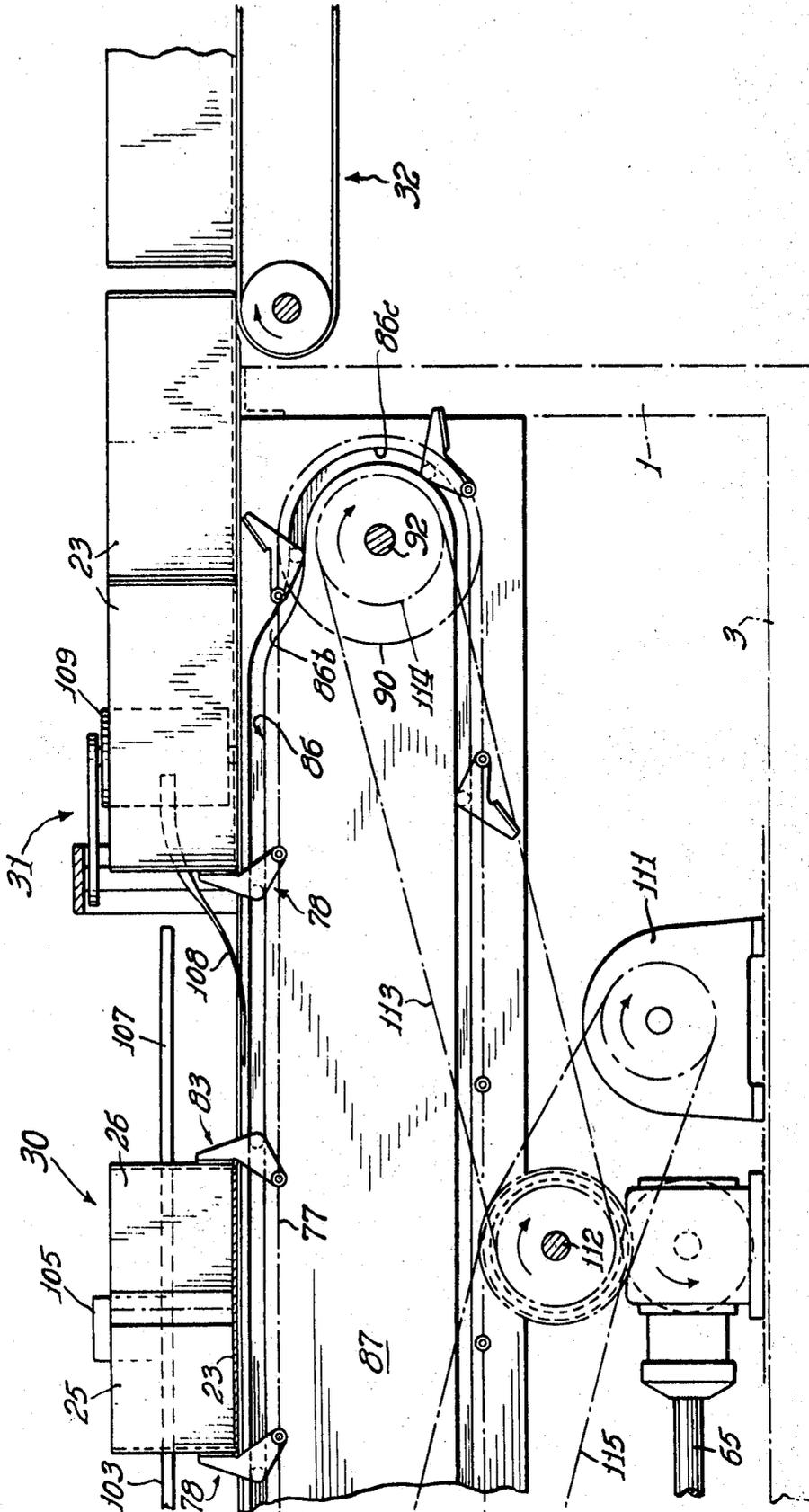
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Fig. 2B



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MACHINE FOR FORMING A TRAY AROUND A GROUP OF ARTICLES

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Original application May 4, 1966, Ser. No. 547,493, now Patent No. 3,454,149. Divided and this application Mar. 12, 1969, Ser. No. 816,870

Int. Cl. B65b 11/08

U.S. Cl. 53—196

6 Claims

ABSTRACT OF THE DISCLOSURE

A machine for advancing a rectangular group of articles positioned on a flat blank, such blank having a bottom panel, foldable side wall panels and foldable leading and trailing end wall panels. The end wall panels have inwardly foldable corner flaps. Folding means are arranged to travel with the blank for folding the end walls upward. Other folding means swing the corner flaps inward. Additional folding means fold the side walls upward to be attached to the corner flaps.

This application is a division of application Ser. No. 547,493, filed May 4, 1966, now U.S. Pat. No. 3,454,149.

The present invention relates to mechanism for forming a flat tray blank about a group of upstanding articles, such as cans, bottles or packages of articles. The blanks are cut and prescored and have a central rectangular panel with opposed side and end walls. One of the pairs of opposed walls have inwardly foldable corner flaps and the other pair of flaps are arranged to be secured to the corner flaps.

The principal object of the invention is to provide improved mechanism for advancing the tray with a group of articles thereon, for folding the leading and trailing flaps upwardly and the corner flaps inwardly, and finally folding the lateral walls upwardly and securing them to the corner flaps.

Additional and more specific objects and advantages of the invention will become apparent as the description proceeds.

In the drawings—FIGS. 1A and 1B are somewhat schematic plan views which, when placed in endwise relation, illustrate the flat blank with the article group thereon being advanced past folding means to form the tray about the article group;

FIGS. 2A and 2B are somewhat schematic, side elevational views, partly in section, showing the mechanism illustrated in FIGS. 1A and 1B;

FIGS. 3, 4, 5 and 6 are schematic perspective views showing in progression the treatment of the blank as it is folded around the article group; and

FIG. 7 is a partial cross-sectional view, taken along line 7—7 of FIG. 2A, showing the folding elements for the trailing wall of the tray as such elements would appear when advanced a short distance beyond the showing in FIG. 2A.

The mechanism herein disclosed is particularly well suited for the packaging of groups of four six-packs of cans or bottles, or groups of three eight-packs, but it is also contemplated that the mechanism may be employed for the packaging of a rectangular group of loose cans or bottles or other types of upright articles.

The groups of articles are advanced along a support slightly above the blank path and the blank is advanced by separate conveyor means synchronized with the article group travel so that the articles are moved off the end of the support and deposited in the desired position on the moving blank. After the article group is in place on the

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blank the leading and trailing wall panels are successively folded upward, the corner flaps on such walls are folded inward, followed by upward folding of the side walls and securing of such walls to the infolded corner flaps.

Referring more particularly to the drawings, the machine is supported on suitable vertical base frame members to which are connected upper and lower transverse and longitudinal frame members 2 and 3.

The articles, indicated at 4, 4, to be packaged in trays are suitably formed into groups, herein indicated as four in a group. The separate groups are advanced by a push rod conveyor, indicated as a whole at 8, along a supporting plate, shown at 9 at the left end of FIG. 2A, to the loading station generally indicated at 10 in FIGS. 1A and 2A.

The individual tray blanks, generally indicated at 11, 11, are carried singly by a conveyor, herein indicated generally as a lug chain conveyor 15.

The tray blank is preferably formed from a relatively stiff, foldable type of paperboard, slotted and scored to provide a central bottom panel 18 having dimensions commensurate with the article group. End walls 19 and 20 are defined from the panel 18 by score lines 21 and 22, and side walls 23, 23 are defined from the panel 18 by score lines 24, 24. Corner flaps 25, 25 are hinged at the ends of end wall panel 19 along score lines 24a formed as extensions of score line 24, and corner flaps 26, 26 are hinged at the ends of end wall 20 along score lines 24b, 24b, also formed as extensions of score line 24. The corner flaps are separated from the adjacent side walls by narrow slots. It is to be understood that the references to side walls and end walls is for convenience of description and that the corner flaps could be carried by the side walls, if desired. However, the hinge connections of the corner flaps to their attached walls are preferably arranged so that they are parallel to the direction of travel of the blank on the principal blank conveyor.

After each blank receives its article group it is advanced past a side flap folding station 28 at which the side flaps are swung downward through a small angle.

As the blank and article assembly advances the leading and trailing walls are swung upward at folding station 29 at which the trailing wall corner flaps 25, 25 are folded forwardly.

During farther advance of the assembly the leading wall corner flaps are folded rearwardly and adhesive is applied to the side wall at station 30. At station 31, as the assembly advances, the side walls are swung upwardly against the infolded corner flaps and pressure is applied on the outside surfaces of the side walls to complete the sealing by adhesive. The operation is then complete and the finished package is conveyed to the desired point by take-away conveyor 32.

The articles are spaced by grouping mechanism and advanced into the control of push rod conveyor 8 comprising a plurality of spaced push rods supported at their ends on sprocket chains 36, 36. See FIGS. 1A and 2A. Each push rod propels an article group off the end of the plate 9 to the loading point where the group is transferred onto a moving blank.

Suitably supported on transverse frame sections are flat rails 43a, 43a, and 43b, 43b which extend longitudinally of the machine and on which the blanks are advanced beyond the loading station. The blank conveyor comprises spaced chains 44, 44 on which are fixed longitudinally spaced push lugs 45, 45. The upper flights of chains 44, 44 may be supported on suitable longitudinal rails, not shown. The lugs 45 project above the upper surfaces of the blank supporting rails to propel the blanks.

The chains 44, 44 pass around suitable tail sprockets, not shown, located at the receiving end of the machine, and pass around head sprockets 49, 49 fixed on a shaft

50 (see FIGS. 1A and 2A) located at a short distance beyond the end of the loading station.

After a blank has been delivered onto the supporting rails the lugs 45, 45 will propel the blanks past the loading station and until the blanks are advanced into the control of the blank folding fingers to be described presently.

The sprocket chains 36 of the push rod conveyor 8 pass around head sprockets, one of which is indicated at 68, mounted on a shaft 69 located beyond the point where the article group is loaded onto the blank. See FIG. 2A. As the loaded blank advances it is propelled by the lugs 45 and the article group is propelled at the same speed by a push rod 35.

Means are provided to depress or slightly fold down the side wall panels 23 as the blank advances as indicated in FIG. 7 to clear the edges of the panels 23 from interference with the lower edges of corner flaps 25 when they have been folded up and are to be swung inward or forward. Farther advance of the blank will bring it into operative relation with a pair of rotary folders 70, 70 fixed respectively on stub shafts 71, 71 suitably journaled on the longitudinal frame members 3, 3. Each shaft has a sprocket 72 fixed thereon driven by a sprocket chain 73 which passes around a sprocket 74 fixed on the ends of the shaft 69 through which the push rod conveyor 8 is driven. The folders 70, 70 are thus timed to engage and depress the side wall panels as the blank advances. See FIGS. 2A and 3. The side wall panels are swung down sufficiently to cause them to remain at least at a slight downward angle, enough to clear the space through which the corner flaps will swing.

Continued advance of the loaded blank will bring the assembly to the end wall folding section in which the folding mechanism assumes control of the travel of the assembly, and propulsion of the blank and article group by conveyor 8 and lug chain conveyor 15 is discontinued.

Closely spaced chains 77, 77 are arranged longitudinally of the machine below the blank path and carry in spaced relation upon selected links a plurality of sets of leading and trailing, wall-folding elements which may be termed folding fingers. The trailing folding fingers 78, 78, as herein shown, have upper free end portions 79 which engage the trailing tray walls. The other ends of the fingers have apertured bosses 80, 80 formed thereon within which are received the end portions of extended chain-link pins 81 upon which the fingers are pivotally carried by the sprocket chains 77, and extended portions on which the upon which there are mounted cam follower rollers 82 by means of which the fingers may be swung.

The leading wall-folding fingers, indicated at 83, 83, are formed reversely to the fingers 78 and have wall engaging upper ends 84, also pivotal connections with the sprocket chains 77, and extended portions on which the cam follower rollers 85 are mounted. The cam followers 82 and 85 are received in grooves or cam tracks 86 formed in plates 87, 87 at each side of the chains 77. See FIG. 2A.

As shown in FIGS. 2A and 2B, the sprocket chains 77 pass around tail sprockets 89 and head sprockets 90, mounted respectively on tail shaft 91 and head shaft 92 which are journaled in suitable bearings, not shown. The projecting link pins on which the folding fingers are pivoted are slidably received within chain guide slots formed in the plates 93, 93 arranged on each side of the sprocket chains 77. See FIG. 7.

The sprocket chains 77 are driven in timed relation to the travel of the blank conveyor chains 44 and the article group conveyor chains 36. The leading and trailing folding fingers carried by the chains 77 travel around the sprockets 89 and continue along a horizontal line for a short distance in which they are held by the cam followers in position below such path. When the cam followers 85 reach the upward sloping portion of each of the cam tracks 86, as shown in FIG. 2A, the leading folding

fingers 83 will be caused to swing counter-clockwise and will engage and swing the leading tray wall 20 to upright position. Each upwardly cam track section merges into a straight, horizontal section by which both folding fingers 83 are held in upright position until near the discharge end of the machine, as shown in FIG. 2B.

The trailing folding fingers 78, after passing around the sprockets 89, will begin to be swung clockwise beneath the trailing tray wall 19 when the cam follower 82 moves up the inclined portion of the cam track. It is to be noted that, as the article and blank assembly advances, the push rod 35 will begin to move upward around the sprockets 68 and, before the trailing fingers 78 have swung the trailing tray wall to upright position, the push rod 35 will pass completely out of contact with the article group and out of the path of the rising end wall 19.

After the leading tray wall reaches its vertical position the propelling action of the push rod 35 tends to urge the lower leading corner of the article group firmly into the angle formed by the wall 20 and bottom panel 18.

It is also to be noted that as soon as the trailing blank wall 19 has been raised by the trailing folding fingers 78, the edge of the wall 19 is removed from contact with push lugs 45, and the fingers 78 will assume the function of propelling the blank and article assembly.

Suitable pads 94 may be provided on the folding fingers and the thickness of these pads may be varied to adjust the mechanism to handle the blanks and article groups of varying sizes.

After both the leading and trailing walls have been swung to raised position the corner flaps on these walls may be folded inward along the sides of the article group. In order to fold the flaps on the trailing wall there are provided rotary folders 96. See FIGS. 2A and 5. The folders may be generally hook shaped with a projecting end 97. They are fixed on shaft 98 journaled on upstanding members 99 on the machine frame. The shaft 98 has a sprocket wheel 100 fixed at one end which is driven by a sprocket chain 101 passing around a sprocket 102 on a shaft 69 which also drives the members 70 for folding the side wall panels downward.

The folders 96, as they rotate, will move in behind the corner flaps 25, 25, folding them forwardly as the assembly advances. The leading corner flaps 26, 26 at approximately the same time are folded rearwardly by fixed plow members 103, 103 mounted on the frame. The folders 96, as they rotate, will retain the trailing corner flaps in folded position until they have advanced sufficiently to come within the control of the plow members 103.

After both sets of corner flaps have been folded into place suitable adhesive applicators 105, 105, which may be of conventional form are employed to apply several lines of adhesive, indicated at 106 (FIG. 1B), upon the outwardly extending side wall panels 23, 23. The adhesive is preferably applied only to the limited areas which will contact the corner flaps as the corner flaps are generally not of sufficient length to overlap the side walls entirely.

The corner flaps will continue to be held in folded position by extended portions 107, 107 of the plows 103 after adhesive has been applied to the side walls. After additional advance of the assembly, the side walls are swung upward by plow members 108. See FIGS. 1B, 2B and 6. The extensions 107 of the plows 103 terminate somewhat beyond the receiving ends of the plows 108 so that the assembly will pass beyond the extensions 107 just before the side walls move up to their final positions against the infolded corner flaps.

Beyond the downstream ends of the plows 108, 108 there are provided suitable spring-loaded rolls 109, 109 arranged to bear forcibly upon the outer faces of the upfolded side walls, pressing them firmly against the flaps for a good adhesive bond.

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The adhesive employed may be of the hot melt type which sets rapidly. If slower setting adhesive is to be used the spring-loaded rolls may be replaced by a suitable pair of endless pressure devices of conventional form that will bear against the side walls of the tray for a longer length of travel.

As best shown in FIG. 2B, the leading folding fingers 83 are swung down out of contact with the leading tray wall as the side walls are passing the spring-loaded rolls 109. For this purpose the cam tracks are formed with downwardly inclined sections 86b which lead into sections 86c concentric with the sprocket shaft 92.

The trailing folding fingers remain in propelling contact with the trailing wall of the tray until the tray has moved past the roll 109. Before the completed tray comes to a stop on the supporting rails it will push the preceding tray, as shown in FIG. 2B, onto the take-away conveyor 32.

The trailing fingers also are swung down when their cam followers reach the downwardly inclined cam track section 86b. After passing around the sprockets 90 the folding fingers travel back to the tail sprockets 89 and into return position to perform repeated folding operations.

Any convenient form of driving and transmission means may be employed for driving the various parts of the machine. As herein shown, a motor 111 is employed to drive shaft 112 and line shaft 65. A sprocket on the shaft 112 drives chain 113 passing around a sprocket 114 fixed on shaft 92 which drives the chains carrying the folding fingers. Another sprocket on shaft 112 drives chain 115 passing around sprocket 116 on shaft 50 to drive the chains 44 carrying the blank push lugs 45.

A spur gear 118 on shaft 119, meshes with a sprocket 120 keyed thereon around which passes a chain 121, passing in turn about a sprocket 122 on shaft 69 which drives the push rod conveyor chains 36, together with the side wall folders 70 and the corner flap folders 96.

It is to be understood that references to an article group are intended to refer to a single article as well as to a plurality of articles.

For convenience of description various machine parts have been referred to as being disposed vertically, horizontally or inclined. It is intended that these terms not be considered as limiting, as the essential consideration is the positioning of the parts in relation to each other.

While the present description sets forth a preferred embodiment of the invention, numerous changes may be made in the mechanism disclosed 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 appended claims rather than to the foregoing description to indicate the scope of the invention.

We claim:

1. Apparatus for forming a tray blank around a rectangular group of articles, said blank being of the type having a central rectangular panel, side wall and end wall panels, and corner flaps at the ends of the end wall panels, said apparatus comprising, in combination, an elongated support comprising laterally spaced elements on which a blank may be advanced, first conveyor means for propelling a blank along said support with the end wall panels in leading and trailing positions, second conveyor means for delivering an article group onto the upper surface of the central panel of said blank and propelling said article group forward in timed relation with the forward movement of said blank, said first and second conveyors operating in unison with one another to propel said blank and said article group conjointly along said support, and third conveyor means for

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folding upwardly the leading and trailing wall panels of said blank as the assembly of the blank and article group advance and for taking over the function of conveying said assembly independently of said first and second conveyor means as said first and second conveyor means become inoperative, said third conveyor means comprising an endless conveyor disposed beneath said support and having leading and trailing folding fingers which move upwardly within the spaces of said support to engage and fold upwardly the respecting leading and trailing end wall panels, said third conveyor means being driven in timed relation to said first and second conveyor means.

2. Apparatus as defined in claim 1 wherein said folding fingers are pivotally carried on said endless conveyor for pivotal movement between lowered inoperative positions wherein said fingers are disposed beneath the path of said blank and raised operative positions wherein said fingers move upwardly within the spaces of said support to fold said end panels upwardly and convey said assembly, each of said folding fingers having a cam follower thereon, and a cam track disposed beneath said support in cooperative relation with said cam followers for controlling the pivotal movement of said folding fingers.

3. Apparatus as defined in claim 2 wherein said cam track has a first section for retaining the folding fingers in inoperative position beneath the blank path, a second angular section for first swinging the leading folding finger upwardly into operative raised position and subsequently swinging the trailing folding finger into operative raised position, and a third section for maintaining the folding fingers in operation position to hold the end wall panels upright while said trailing folding finger serves to propel said assembly along said support.

4. Apparatus as defined in claim 3 wherein said second conveyor means is arranged so that it remains operative to propel said article group forwardly after said leading folding finger has been raised to operative position but disengages from said article group before said trailing folding finger has been pivoted to its fully raised position.

5. Apparatus as defined in claim 1 including means for swinging said corner flaps inwardly toward positions along the lateral surfaces of said article group, and means timed with the travel of said first conveyor means and acting in advance of the inward folding of the corner flaps for depressing said side wall panels downwardly an amount sufficient to clear the edges of said side panels from the paths of said corner flaps as the latter are swung inwardly.

6. Apparatus as defined in claim 1 including folding mechanism for folding at least one of the outwardly projecting corner flaps on the trailing end wall panel, said folding mechanism comprising a rotary member mounted on a horizontal axis for rotation in a vertical plane, and means for rotating said rotary member in timed relation to the operation of said first conveyor trailing side and move the same forwardly to a position along the side of the article group as said assembly advances along said support.

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U.S. Cl. X.R.

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