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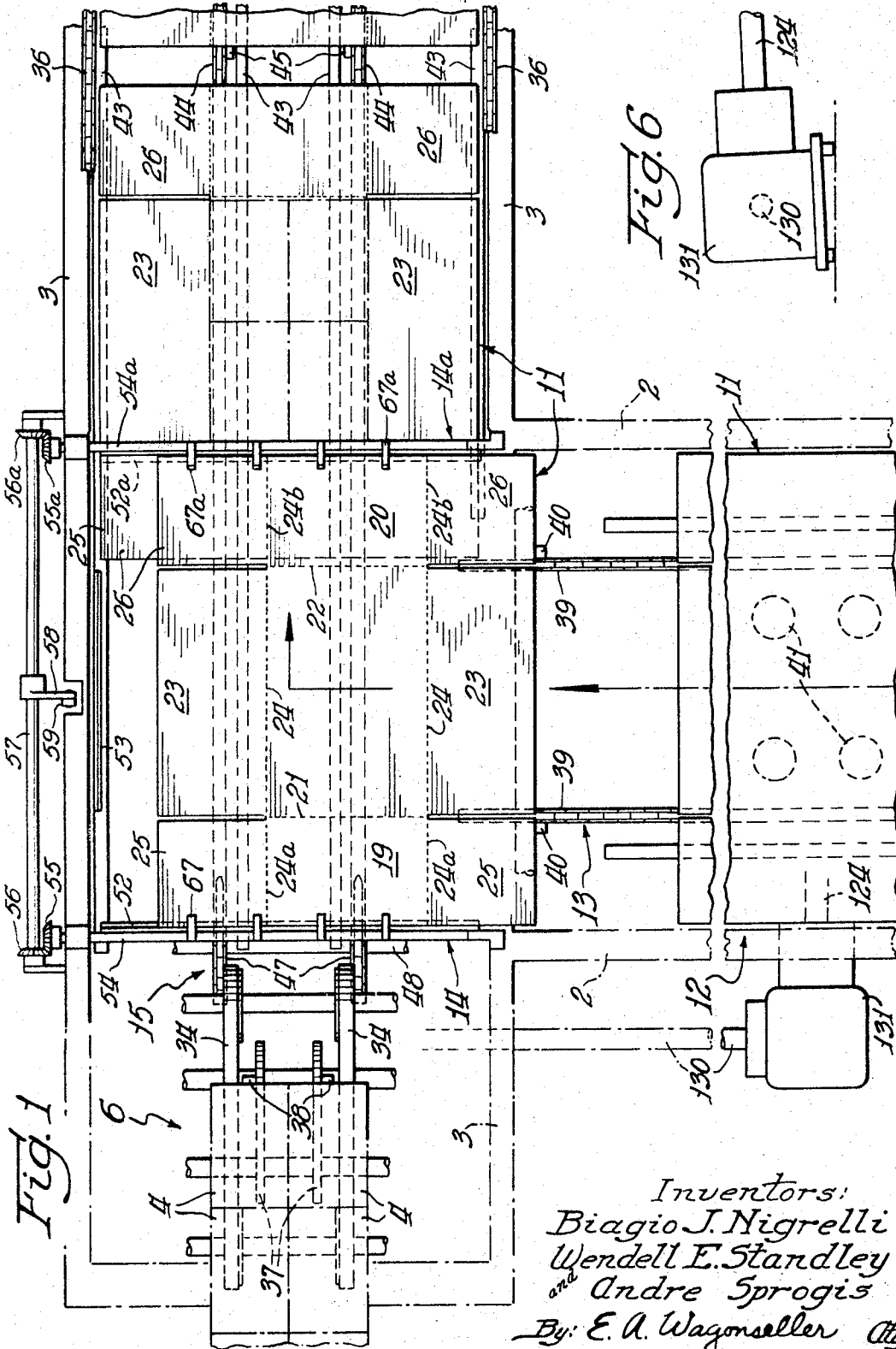
B. J. NIGRELLI ET AL

3,454,149

BLANK CONVEYING APPARATUS AND METHOD

Filed May 4, 1966

Sheet 1 of 3



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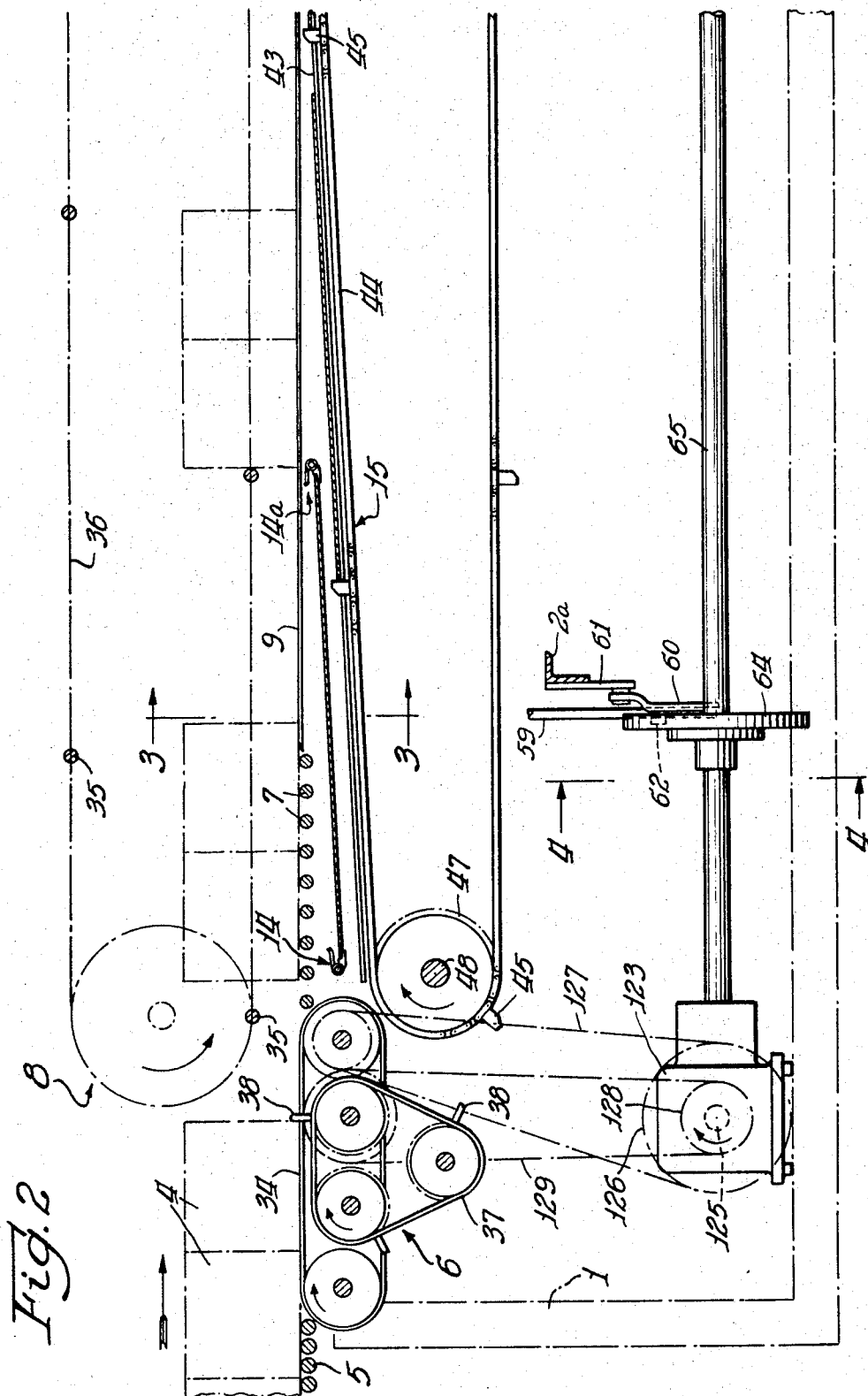
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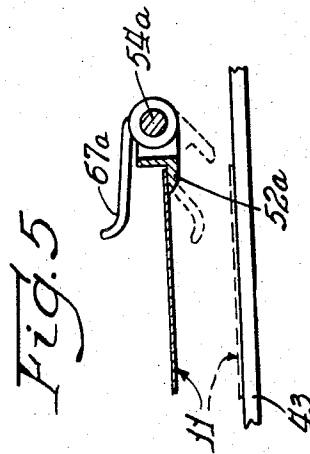
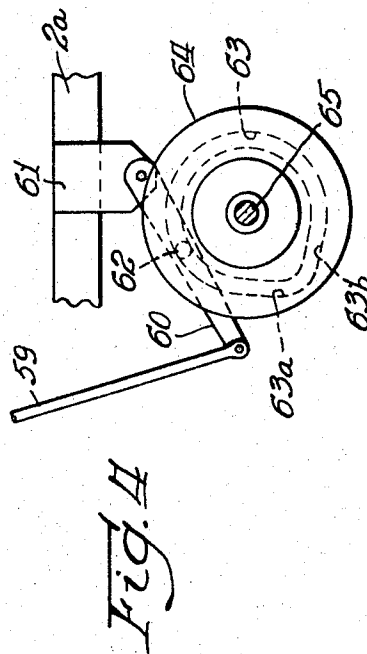
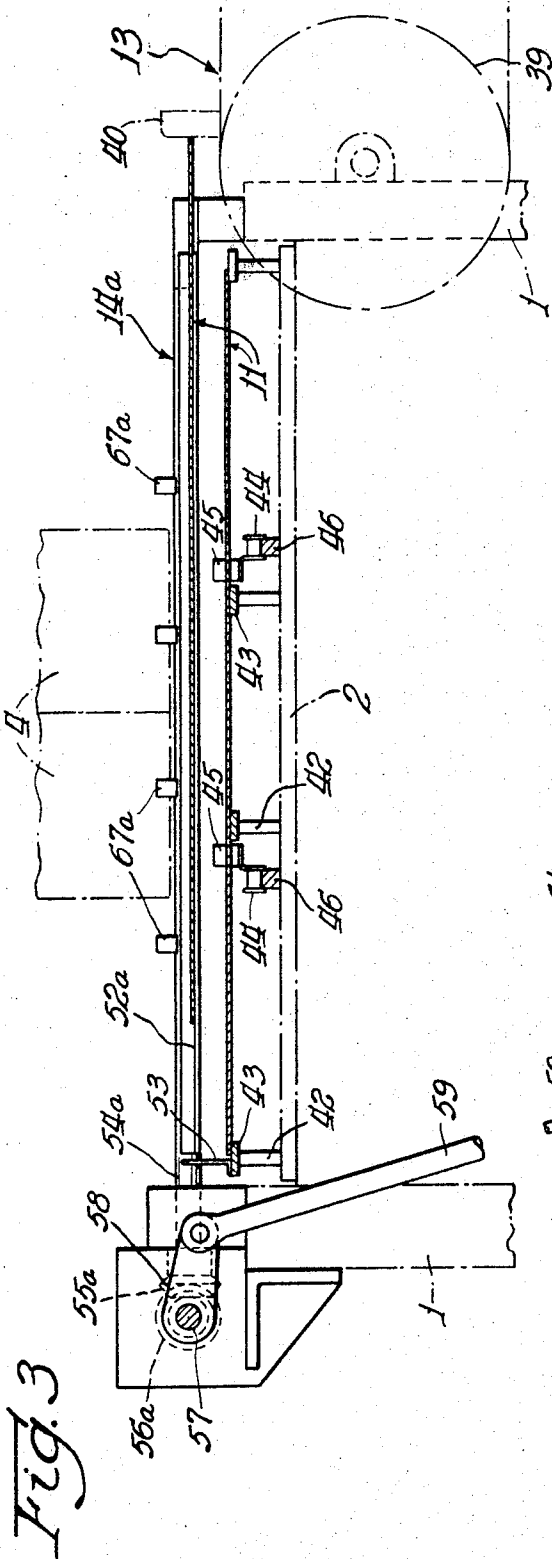
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BLANK CONVEYING APPARATUS AND METHOD
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10 Claims

ABSTRACT OF THE DISCLOSURE

Large, prescored paperboard tray blanks are fed lateral-ly onto a blank conveyor arranged beneath a conveyor for advancing an article group to the point where the group is to be deposited on the blank. The incoming blank is fed into position and held on releasable supports disposed over the blank conveyor. The positioning is completed before the previously fed blank has emerged from below the releasable support area. As soon as the previous blank has cleared the area, the supported blank is released onto the blank conveyor.

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 cans or bottles, or other types of packages or containers. The blanks referred to are of the type having a central rectangular panel with opposed side and end walls, and one of the pairs of opposed walls having foldable corner flaps. More particularly the invention relates to mechanism for the feeding of a flat blank of relatively heavy sheet material, such as corrugated paperboard, to a loading station at which a group of articles may be delivered onto the blank which may then be folded and secured around the article group.

An important object of the invention is to provide an improved mechanism and method for the delivery of relatively large blanks of heavy, foldable sheet material flat-wise onto a conveying means on which the blanks are conducted to the loading point at which point an article group is deposited onto the blank while it is in motion.

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

In the drawings:

FIGURE 1 is a somewhat schematic plan view illustrating the arrangement for feeding blanks to the main blank conveyor where an article group may be delivered onto the blank;

FIGURE 2 is a somewhat schematic side elevational view showing the mechanism illustrated in FIGURE 1;

FIGURE 3 is a partial, transverse sectional view, taken along line 3—3 of FIGURE 2 but on a larger scale, showing one of the tiltable, temporary blank supports;

FIGURE 4 is a detail sectional view, taken on line 4—4 of FIGURE 2 and on the same scale, showing the cam control means for the tiltable supports;

FIGURE 5 is a fragmentary cross sectional view on an enlarged scale, showing one of the tiltable supports appearing in FIGURE 2; and

FIGURE 6 is a fragmentary side elevational view illustrating the gear box, shown in FIGURE 1, from which the transversely positioned blank feed conveyor is driven.

The blank feeding device as herein disclosed is particularly well suited for the packaging of groups of four six-packs of bottles or cans or groups of three eight-packs. A supply of flat tray blanks may be conveniently held in a magazine arranged above a feed conveyor comprising a pair of laterally spaced lug chains between which a suction cup device operates to withdraw a single blank from the bottom of the magazine and deposit such blank upon the feed chain conveyor.

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The blank is then conveyed to a second or principal conveyor extending transversely to the first conveyor. This principal conveyor has a series of blank engaging members for advancing blanks in a single line to the loading point where a group of articles is deposited onto the blank.

Arranged over the principal blank conveyor is a temporary blank-support means to receive the blanks delivered by the feed conveyor. Blanks are delivered successively from this temporary blank-support means in timed relation to the travel of the main blank conveyor which conducts the blanks spaced and in single line to the loading station.

Arranged closely over the principal blank conveyor is an article group conveyor serving to advance article groups to the loading station where each group is deposited on the central panel of a blank.

In the process of loading article groups, such as groups of four six-packs of cans or bottles, onto tray blanks it is desirable to provide a machine that can accept groups of these articles from existing conveyors so that the article groups will advance at substantially the same level from the feeding conveyors and through the machine, and the packaged articles enclosed within the trays formed from the blanks will also travel at such level. It is also highly desirable to keep the length of a machine of this type at a minimum and for this reason the machine is designed to receive tray blanks from feeding means delivering the blanks transversely to the path of travel of the tray blanks past the loading station.

When relatively large blanks of corrugated or similar heavy paperboard are fed in from the side onto a main conveyor to be then advanced in moderately spaced relation to the loading point, it is a distinct disadvantage if the loading conveyor must be slowed down sufficiently so that the feed conveyor may deliver blanks directly in proper timed relation to the push lugs or other blank-engaging members of the main or loading conveyor. It is not feasible to speed up the feed conveyor to any great extent due to the fact that the blank propelling devices, such as lugs, on the feed conveyor might damage the blanks. In the machine of the present invention the conveyor which feeds blanks from the blank supply transversely to the main conveyor may be operated at a relatively slow speed and still be able to supply blanks to the main conveyor while the latter is operating at a reasonable speed.

Referring more particularly to the drawings, the machine may be supported on suitable vertical transverse and longitudinal base frame members, indicated at 1, 1; 2, 2 and 3, 3 respectively.

The articles to be packaged in trays, indicated at 4, 4 may be delivered to the machine in an abutted line on a conventional conveying means 5. The articles are segregated into groups by a suitable grouping means, indicated as a whole at 6. In the present instance the packaging of groups of four articles is illustrated.

From the grouper mechanism the article group may be carried forward onto an anti-friction roll section 7 and from these rolls the groups are advanced by an overhead push rod conveyor, indicated as a whole at 8, onto an elongated supporting plate 9 which extends to the blank loading station.

The individual tray blanks, indicated generally at 11, 11, are preferably fed from a blank supply magazine, indicated as a whole at 12 in FIGURE 1. The blanks are carried singly by conveying means, shown herein as a lug chain conveyor 13, to a releasable temporary support mechanism, herein shown as a pair of spaced, tiltable supports 14, 14a disposed over the principal blank conveyor, indicated as a whole at 15.

The article group is advanced in synchronism with the blank conveyor and the articles are moved off the end of the supporting plate 9 and onto the blank at the loading station.

The tray blank may be formed from relatively stiff, foldable, corrugated paperboard, slotted and crease scored to provide a central or 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 panel 18 by score lines 24, 24. Corner flaps 25, 25 are hinged at the ends of end wall 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.

Any convenient form of article grouper mechanism may be employed. The grouper herein illustrated comprises a pair of laterally spaced, narrow belts 34, continuously operated to advance groups, when released, onto the rollers 7 where the groups may be separately advanced by pushrods 35 carried on spaced chains 36 of push rod conveyor 8. The group release mechanism comprises separate chains 37 for each row of articles. Lugs 38 carried by the chains are spaced so that one lug or set of lugs will engage the leading face of a group and hold the group stationary on the moving belts 34 for a brief period. The chains may be controlled by a single revolution clutch (not shown) so as to advance far enough to release one group. As the lugs holding the leading face of the group pass down around their sprockets the succeeding lugs move up into position between the successive articles at the trailing end of the released group, then continue to a position, such as shown in FIGURE 2, wherein the chains 37 will be stopped. Upon reactivation of the chains 37, a short advance movement of the lugs 38 will release the next group. A push rod 35 then propels the article group over a dead plate or slide plate 9 to the loading point where the group is slid off the plate 9 onto a blank moving in proper relation to the advancing group. Suitable drive control means are employed to synchronize the grouper 6 with the push rod conveyor 8. A similar mechanism is disclosed in Patent 3,194,382.

As shown in FIGURE 1, the conveyor chains 13, passing around sprockets 39, 39, are provided with lugs 40, 40 to propel individual blanks 11 from a blank magazine. A reciprocating frame, carrying vacuum cups indicated at 41, 41, is arranged beneath the magazine to withdraw blanks one at a time and deposit them on suitable rail supports ahead of the travel of the lugs 40 so that such lugs will propel the blanks into a temporarily supported position over the principal blank conveyor 15.

As shown in FIGURES 1, 2 and 3, the blank advanced by the lugs 40 is delivered onto temporary support means, herein shown as tiltable ledge devices or supports 14, 14a arranged closely above the blank conveyor 15 which in this area of the machine is inclined upwardly at a small angle. The tiltable support indicated at 14 is preferably located at a level slightly below that of support 14a so that the two supports will be approximately equi-distant from the conveyor 15.

For the purpose of facilitating delivery of the blanks to the supports 14, 14a, the conveyor 13 and the blank magazine are preferably inclined to correspond with the inclination of the receiving section of conveyor 15. This arrangement provides a more compact construction and assists in keeping to a minimum the size of the angle between the line of infeed of the article groups and the receiving section of the conveyor 15.

As shown in FIGURES 1 and 3, transverse frame sections, one of which is indicated at 2, are supported on vertical frame members 1, 1. On the transverse frame sections are located spaced bars 42, 42 bearing on their top edges flat rails 43, 43 extending longitudinally of the machine and on which the blanks may be advanced to the loading point. The blank conveyor 15 comprises spaced chains 44, 44 on which are fixed longitudinally spaced push lugs 45, 45. The upper flights of chains 44 are supported on chain guide rails 46, 46 secured to the transverse frame sections 2, 2. As shown, the chains 44 are below the supporting surfaces of the blank supporting rails

43 and the lugs 45 project above the upper surfaces of the rails. Blanks resting on the rails will thus be propelled by the lugs 45.

The chains 44 pass around tail sprockets 47, 47 mounted on shaft 48 suitably journaled on the machine frame. The head sprockets for the chains 44 are mounted on a driven shaft journaled on the machine frame at a location beyond the blank loading station.

After a blank has been withdrawn from the magazine and deposited on the supporting rails, the lugs 40, 40 propel the blank transversely of conveyor 15 and into temporary supported position on the horizontal ledge portions 52, 52a of the tiltable members 14, 14a. See FIGURES 1, 2, 3 and 5. A stop member 53 may be secured on the rail 43 at the far side of the supports to limit the travel of the blank.

The tiltable supports, as herein disclosed, are identical, except reversed. They are mounted respectively on rockable rods 54, 54a supported in bearings carried on the machine frame.

The rods 54 and 54a have bevel gears 55, 55a fixed on their ends, meshing with similar bevel gears 56, 56a keyed on a rock shaft 57. Means are provided for rocking the shaft 57 periodically to rock the rods 54, 54a and cause simultaneous tilting of the supports 14, 14a. For this purpose a crank element 58 is keyed centrally of the shaft 57 and this crank is connected through a link 59 to the free end of an operating lever 60, pivotally mounted on a bracket 61, carried on a transverse frame element 2a. The operating lever 60 has a centrally positioned cam follower 62, received into a cam track 63 formed in the face of cam disk 64. This disk is secured on the line shaft 65 which forms part of the main drive of the machine.

For the major part of the rotation of cam disk 64 the cam track, being concentric with the shaft 65, will produce no motion of the operating lever 60. At the outward curve of the cam track, indicated at 63a, the operating lever 60 will be swung up, causing the supports 14 and 14a to swing down and release a blank supported on the ledge portions 52 and 52a. Further rotation of the cam brings the inwardly curved part 63b of the cam track into play with the cam follower to cause the lever 60 to swing back down to its former position thus bringing the tiltable supports back to blank supporting position.

The timing is such that, after a blank is withdrawn from the magazine, a pair of lugs 40 will propel the blank to the waiting temporary supports. After the blank has been moved fully onto these supports the high portion of the cam track will actuate the cam follower to swing the lever 60, causing the supports to deposit the blank on the rails of the principal blank conveyor. The supports then are promptly returned to normal supporting position ready to receive another blank. Following the deposit of the blank on the rails 43, the push lugs 45 will move up around the sprockets 47 and will start to propel the blank toward the loading point. The push rods 35 on the overhead conveyor 8 are synchronized with the blank push lugs 45 to cause the deposit of an article group accurately onto the central or bottom wall panel of the blank.

The advantage in bringing the temporary blank support means quickly back to operative supporting condition is that the next blank being fed from the blank supply can begin its travel over the main blank conveyor before a preceding blank has completely passed the temporary support area. The blank to be delivered onto the main conveyor is preferably deposited before the blank being propelled toward the loading point has completely left the area of deposit. Thus, as shown in FIGURES 1 and 2, a blank may be released before the lugs 45 have completely moved out from under the blank to be deposited so that the deposited blank will overlap the trailing end portion of the propelled blank, and the edge portion of the deposited blank may contact the upstanding ends of the push lugs. It is feasible to have an overlap width of somewhat less than half of the blank dimension. The principal con-

sideration is to restrict the overlap sufficiently to prevent a deposited blank from riding forward on the propelled blank or on the push lugs.

The cam disk 64 may be adjusted to different positions to obtain a change in timing which will give the desired overlap of the blanks. The shape of the cam track may of course be varied to lengthen or shorten the dwell of the temporary blank supports in discharge position.

It is within the contemplation of the invention to have a blank at rest on the temporary blank support while a blank is beginning to be propelled on the main conveyor and also while another blank is moving in transversely over the temporary support area. The blank held at rest will then be deposited, preferably in overlapping relation to the propelled blank, and the blank moving transversely into position at the temporary support area may then be brought to rest and held until it can be deposited in partial overlapping relation onto the blank which precedes it.

Thus, the blank feeding and conveying method comprises first temporarily supporting a blank over the blank path on a main blank support on which it is advanced to the loading point where an article group is to be delivered onto the blank, then depositing a temporarily supported blank onto the blank path of the main blank support and thereafter beginning to propel the deposited blank toward the loading point. A following blank which has been temporarily supported is then deposited onto the blank path, either in partial overlapping or non-overlapping relation to the blank being propelled. While the blank is being advanced from the deposit area another blank will be moved transversely inward over the deposit area. Such transversely moving blank is then brought to rest at the temporary support position ready to be deposited onto the blank path.

By this method a distinct advantage is gained in the feeding of large size blanks into conveying position in operations in which it is desired to convey article groups at a generally uniform level from the supply line to the loading point and thence to the take-away conveyor, this being combined with a main blank conveyor disposed a very small distance beneath the article conveyor. This close arrangement of conveyors requires that the main blank conveyor be supplied by blanks moving transversely from the supply point to the main blank path. Due to this feature of having a transversely fed blank move substantially into starting position on the main conveyor while another blank is moving away from the starting position on such conveyor it is possible to obtain a more advantageous speed relation between the two lines of moving blanks; and the blanks propelled on the main blank conveyor can be spaced relatively closely together. If the movement of blanks on the main conveyor must be slowed down to await the infeed of a blank transversely thereon, the spacing of the blanks on the main conveyor will be either greater than a desirable spacing, or the transverse delivery of blanks to the main conveyor must be speeded up. In the handling of deformable blanks, such as those formed of paperboard, there are speed limits beyond which it is not feasible to attempt to reach.

Above the tiltable blank support there are provided a plurality of inwardly extending fingers 67, 67a. These fingers are preferably formed as a unitary construction with the supports and have upwardly curved ends, projecting in spaced relation above the blank when the blank is supported on the portions 52, 52a. These inwardly extended portions 52 and 52a, together with the two series of fingers 67, 67a, comprise receiving channels for the opposite edges of the blank. Further, when the blank has been released, the fingers 67, 67a engage it and hold it relatively true during the transfer from supported position to released position on the conveyor rails. The blank is thus forced substantially straight down and the tendency for the blank to plane or shift laterally, due to the blank being warped, or due to air resistance, is overcome.

It is to be understood that, while the tiltable supports

14 and 14a constitute a preferred manner of temporarily supporting a blank to be deposited onto the supporting rails of the blank conveyor in the desired timed relation with the blank propelling means, various other means may be employed to support the blank temporarily and release it at a desired time. For example, retractable supports may be employed. It is also within the contemplation of the invention to release only the edge of the blank on the downstream side and depend upon the forward drag of the conveyor lugs or the underlying blank on the conveyor to cause the opposite or upstream edge to slide off the temporary support. Thus, reference herein to the release of the temporary blank support means is intended to include the release of only one edge of the blank and allowing the other edge to slide off the support.

While the present description sets forth a preferred embodiment of the invention, numerous changes may be made in the mechanism as 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. The method of feeding and conveying flat blanks preparatory to the assembly of article groups upon the blanks at a loading point, comprising the steps of providing a principal blank support to conduct blanks flatwise in a fixed path toward a loading point, moving a blank transversely and flatwise into position at a level above the blank path on the principal support, temporarily supporting the blank at rest above such blank path, depositing successively each temporarily supported blank onto the blank path on such principal support, initiating the advance of the deposited blank toward the loading point, during the initial stage in the advance of the deposited blanks successively moving additional blanks transversely at a level above such advancing blanks and bringing such additional blanks successively to rest in temporarily supported condition above the blank path, and forcibly depressing the blank to be deposited from its temporarily supported position toward its position on the blank path of the principal blank support.
2. The method of feeding and conveying flat blanks preparatory to the assembly of article groups upon the blanks at a loading point, comprising the steps of providing a principal blank support to conduct blanks flatwise in a fixed path toward a loading point, moving a blank transversely and flatwise into position at a level above the blank path on the principal support, temporarily supporting the blank at rest above such blank path, depositing successively each temporarily supported blank onto the blank path on such principal support, initiating the advance of the deposited blank toward the loading point, during the initial stage in the advance of the deposited blanks, successively moving additional blanks transversely at a level above such advancing blanks and bringing such additional blanks successively to rest in temporarily supported condition above the blank path, each blank held temporarily at rest being deposited in overlapping relation to the trailing edge portion of the blank being advanced, and thereafter moving such advancing blank clear of the deposited blank.
3. The method of feeding and conveying flat blanks preparatory to the assembly of article groups upon the blanks at a loading point, comprising the steps of

providing a support to conduct blanks flatwise in a fixed path toward a loading point,
 moving a first blank within a series of blanks transversely at a level above the blank path on such support,
 depositing such first blank flatwise on such support then advancing such first blank toward the loading point,
 moving a second blank transversely and flatwise at a level above the first blank as such first blank is advanced along the support,
 depositing the second blank flatwise on said support and in overlapping relation to the trailing edge portion of such first blank, and
 continuing to advance such first blank along the blank path into a position clear of the second blank.

4. A delivery mechanism for flat blanks of sheet material, comprising, in combination, elongated support means on which blanks are movable in a fixed path to a loading station or other desired point, blank propelling means to advance blanks in single file along such elongated support means, temporary releasable blank support means arranged above and in close relation to the elongated support means, such releasable support means being adapted to receive individual blanks as such blanks are moved edgewise transversely of the path of blanks on the elongated support means, and means for actuating said releasable blank support means to release a blank to be deposited onto the elongated support means, the means for propelling blanks on the elongated support means comprising a conveyor having blank-engaging members spaced apart a distance greater than the dimension of the blank in the direction of advancing movement to advance blanks in spaced relation, the means for actuating the releasable blank-support means being timed with the movement of the blank-engaging members to release a succeeding blank before the trailing edge portion of the preceding blank has moved clear of the downstream edge of the released blank.

5. A delivery mechanism for flat blanks of sheet material, comprising, in combination, elongated support means on which blanks are movable in a fixed path to a loading station or other desired point, blank propelling means to advance blanks in single file along such elongated support means, temporary releasable blank support means arranged above and in close relation to the elongated support means, such releasable support means being adapted to receive individual blanks as such blanks are moved edgewise transversely of the path of the blanks on the elongated support means, and means for actuating said releasable blank support means to release a blank to be deposited onto the elongated support means, the means for propelling blanks along the elongated support means comprising a traveling member having push lugs spaced apart a distance greater than the dimension of the blank in the direction of movement, the means for actuating the releasable support means being timed with the movement of the push lugs to release a succeeding blank before the push lug for the preceding blank has moved clear of the downstream edge of the released blank.

6. A delivery mechanism for flat blanks of sheet material, comprising, in combination, elongated support means on which blanks are movable in a fixed path to a loading station or other desired point, blank propelling means to advance blanks in single file along such elongated support means, temporary releasable blank support means arranged above and in close relation to the elongated support means, such releasable support means being adapted to receive individual blanks as such blanks are moved edgewise transversely of the path of the blanks on the elongated support means, means for actuating said releasable blank support means to release a blank to be deposited onto the elongated support means, downwardly movable blank engaging means arranged above and in position to contact the upper face of the

blank, and means operable concurrently with the release of the blank to cause the blank engaging means to move downwardly to depress the blank forcibly toward the elongated blank support means.

7. A delivery mechanism for flat blanks of sheet material, comprising, in combination, elongated support means on which blanks are movable in a fixed path to a loading station or other desired point, blank propelling means to advance blanks in single file along such elongated support means, temporary releasable blank support means comprising movable ledge devices arranged above and in close relation to the elongated support means for supporting opposite lateral edge portions of a blank as it is moved transversely to a position above the elongated support means on which the blanks may be advanced, at least one of the ledge devices being tiltable, and means for tilting the ledge device to blank-release position allowing the supported edge portion of the blank to move down onto the elongated support means, a laterally and inwardly extending element being arranged in spaced relation above the ledge device and operatively associated therewith to swing downwardly as the ledge device is tilted thereby to engage the upper surface of the blank as such element swings and force the blank downwardly toward the elongated blank support means.

8. A delivery mechanism for flat blanks of sheet material which are to receive article groups thereon, comprising, in combination, a first elongated support means over which an article group may be advanced to a loading point, a second elongated support means on which blanks are movable to such loading point, the second elongated support means being disposed in close relation below the first support, blank propelling means for advancing blanks in single line along the second support, temporary blank-support means arranged above the elongated blank support and below the elongated article group support means, and in close relation to both support means, such temporary support means being adapted to receive individual blanks as such blanks are moved edgewise transversely of the path of the blanks on the blank support means, and means for releasing blanks from the temporary blank-support means to deposit a blank onto the elongated blank support means, the blank propelling means comprising a traveling member having a series of uniformly spaced push lugs for engaging the trailing edges of successive blanks, the means for releasing a blank from the temporary blank-support means being timed with the advance of the traveling member to deposit a blank on the second elongated support means before the push lug engaging the trailing edge of the previously released blank has moved clear of the deposited blank.

9. A delivery mechanism for flat blanks of sheet material which are to receive article groups thereon, comprising, in combination, a first elongated support means over which an article group may be advanced to a loading point, a second elongated support means on which blanks are movable to such loading point, the second elongated support being disposed in close relation below the first support and at an acute angle to said first support in the area in which the blanks are fed inwardly between such supports, blank propelling means for advancing blanks in single line along the second support, temporary blank-support means arranged above the elongated blank support and below the elongated article group support means and in close relation to both support means, such temporary support means being adapted to receive individual blanks as such blanks are moved edgewise transversely of the path of the blanks on the blank support means, and means for releasing blanks from the temporary blank support means to deposit a blank onto the elongated blank support means, the elongated support for the article group over the blank support

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means, at least on the downstream side, comprising a relatively thin element, and the temporary support means for the downstream side of the blank comprising a tiltable member disposed in close proximity to the thin supporting element to minimize the angle between the two elongated supports.

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10. A delivery mechanism for flat blanks of sheet material which are to receive article groups thereon, comprising, in combination, a first elongated support means over which an article group may be advanced to a loading point, a second elongated support means on which blanks are movable to such loading point, the second elongated support being disposed in close relation below the first support and at an acute angle to said first support in the area in which the blanks are fed inwardly between such supports, blank propelling means for advancing blanks in single line along the second support,

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temporary blank-support means arranged above the elongated blank support and below the elongated article group support means and in close relation to both support means, such temporary support means being adapted to receive individual blanks as such blanks are moved edgewise transversely of the path of the blanks on the blank support means,

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means for releasing blanks from the temporary blank support means to deposit a blank onto the elongated

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blank support means, the temporary blank support means comprising releasable elements on both the upstream and downstream sides of the blank, both elements being disposed substantially equidistant from the elongated blank support, whereby to support a blank temporarily at an acute angle to the elongated article group support, and conveying means for advancing blanks transversely into position on the temporary blank supports, such conveying means being disposed in substantially the same plane as that defined by the temporary blank supports.

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