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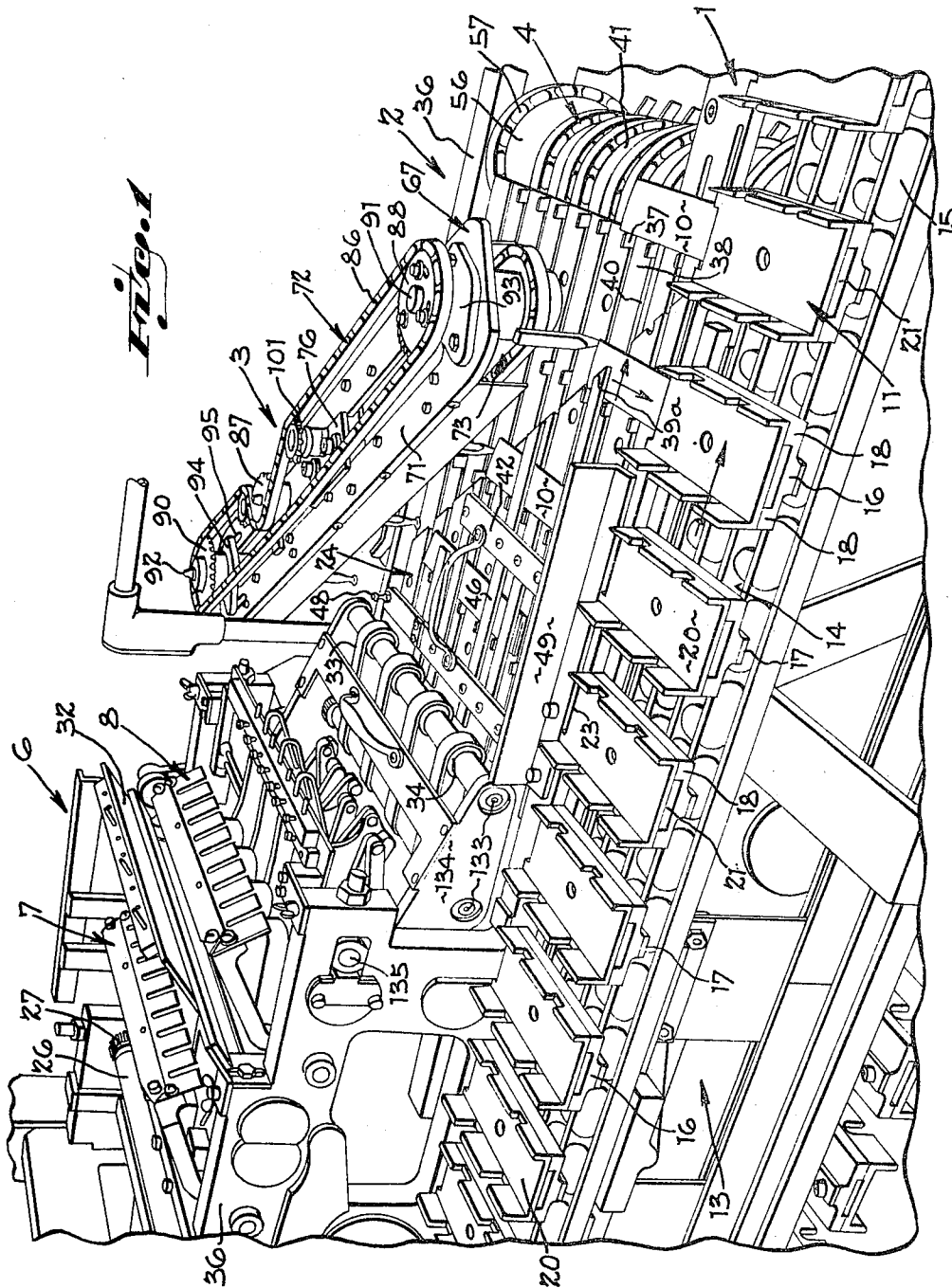
J. A. DIETER

3,282,585

SHEET FEEDING MECHANISM FOR CARTONING MACHINES

Filed June 8, 1964

8 Sheets-Sheet 1



INVENTOR.
Julian A. Dieter
BY
Wood, Herron & Co., Inc.
ATTORNEYS.

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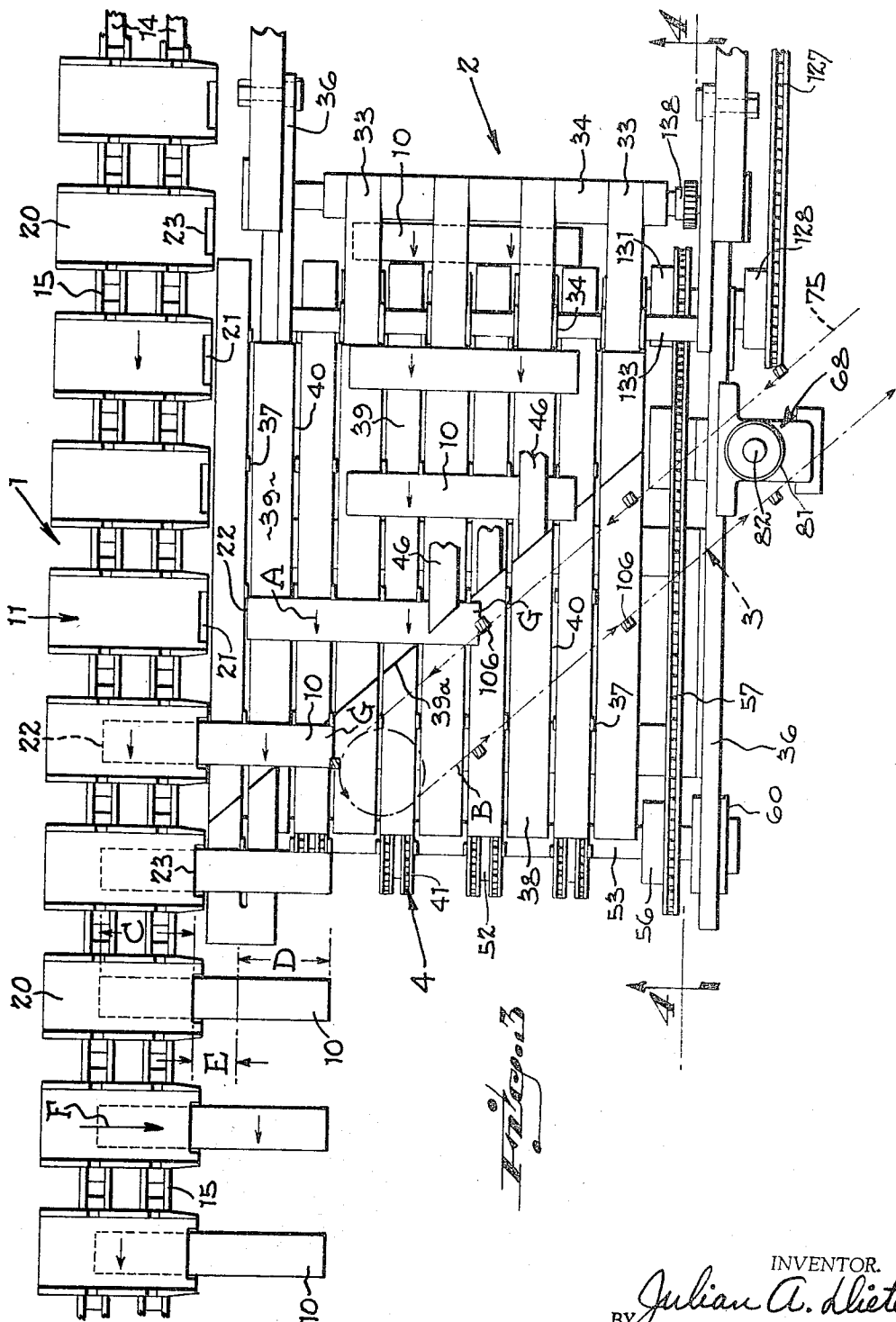
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SHEET FEEDING MECHANISM FOR CARTONING MACHINES

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8 Sheets-Sheet 3



INVENTOR.
Julian A. Dieter
BY *Wood, Herron & Evans*
ATTORNEYS.

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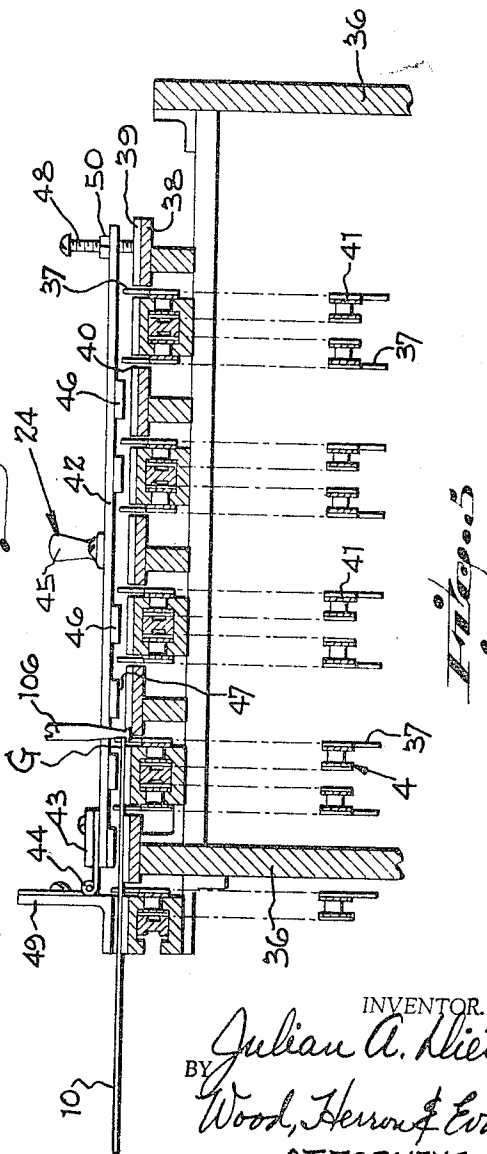
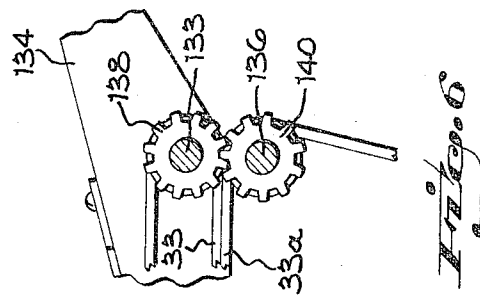
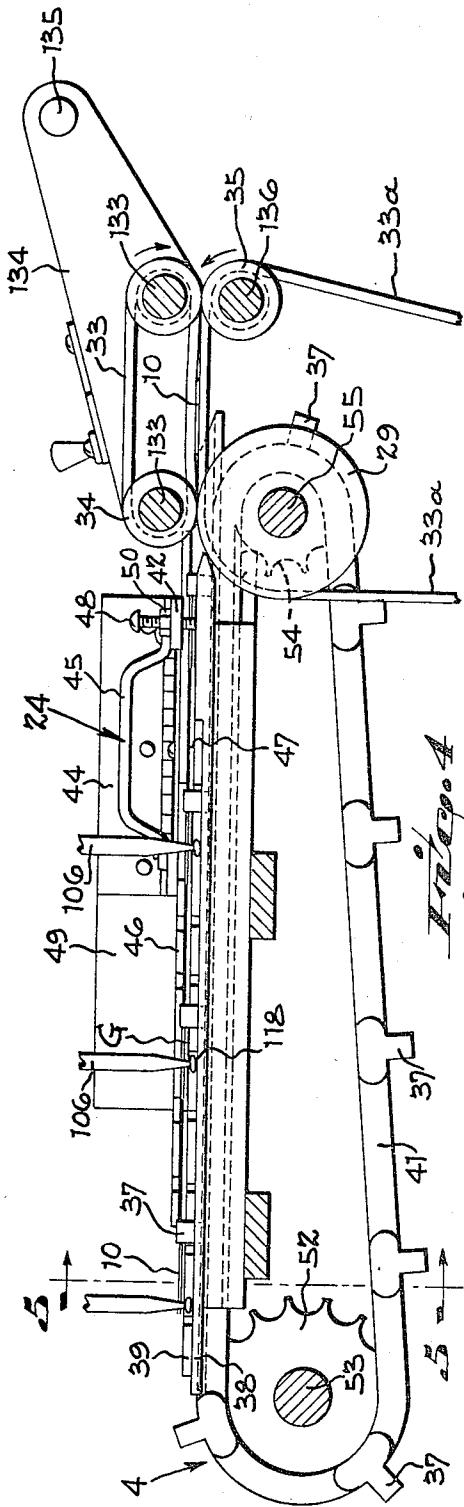
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INVENTOR.
Julian A. Dieter
BY *Wood, Herron & Evans*
ATTORNEYS.

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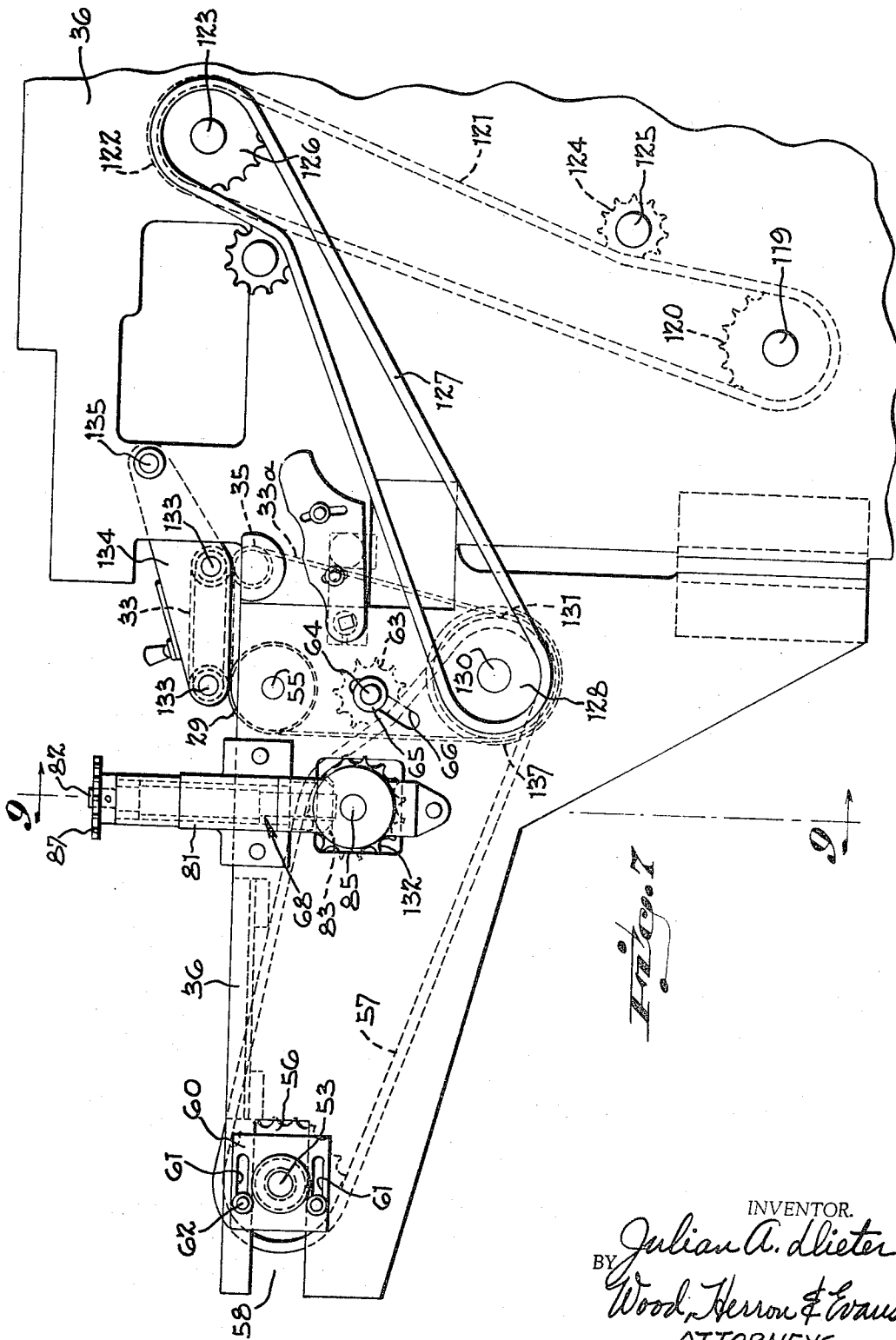
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SHEET FEEDING MECHANISM FOR CARTONING MACHINES

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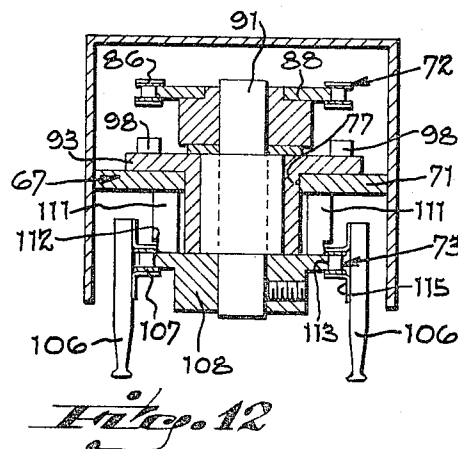
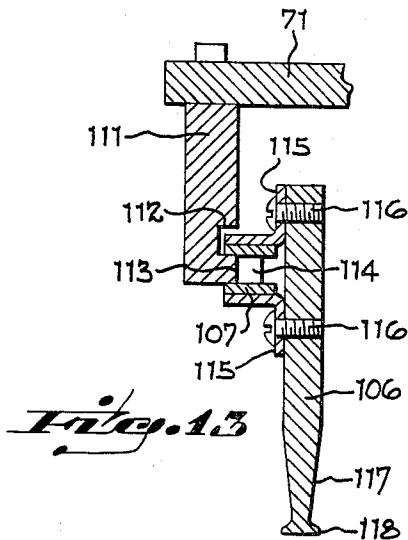
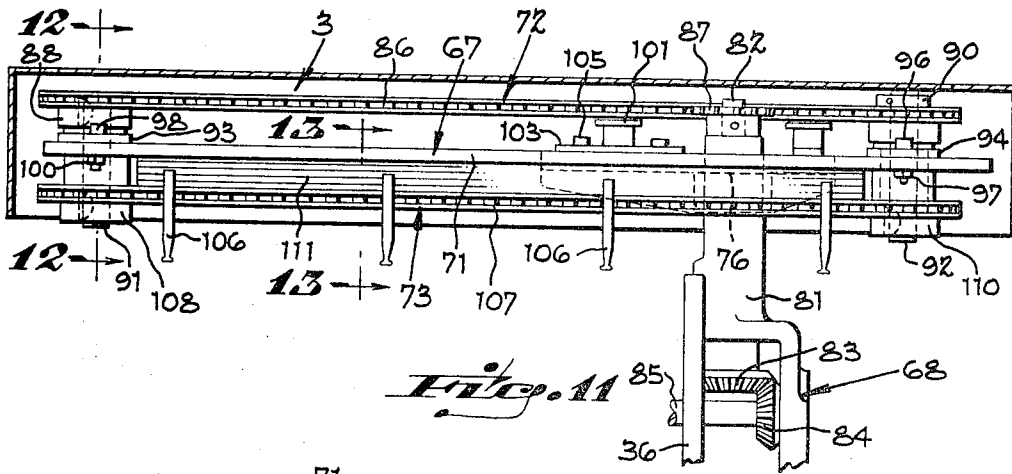
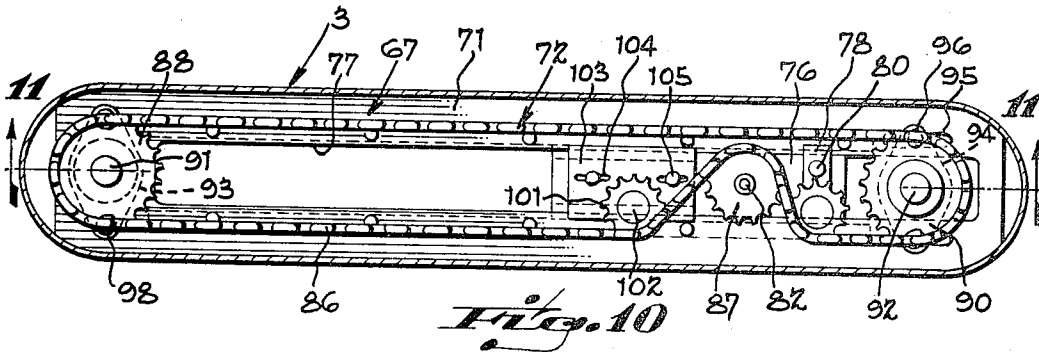
J. A. DIETER

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SHEET FEEDING MECHANISM FOR CARTONING MACHINES

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8 Sheets-Sheet 8



INVENTOR

Julian A. Dieter
BY Wood, Herron & Evans
ATTORNEYS.

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3,282,585 SHEET FEEDING MECHANISM FOR CARTONING MACHINES

Julian A. Dieter, Cincinnati, Ohio, assignor to R. A. Jones and Company, Inc., Covington, Ky., a corporation of Kentucky

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14 Claims. (Cl. 271-3)

This invention relates generally to cartoning machines which are designed to erect cartons from a flat collapsed condition; to insert articles into the individual cartons; to insert a folded leaflet, such as in instruction sheet, into each carton; and finally to close the end flaps of the carton before it is discharged from the machine. The invention is directed particularly to a sheet or leaflet feeding mechanism which folds and inserts the folded leaflets into the article transport buckets of the cartoning machine, adapting the folded leaflets subsequently to be inserted into the carton along with the article when the article reaches the transfer station of the cartoning machine.

One of the primary objectives of the present invention has been to provide a leaflet folding mechanism which is adapted to receive the sheets or leaflets in flat condition from a leaflet magazine; to fold each leaflet upon itself to reduce it to a size to fit within the carton; and to feed each folded leaflet rapidly and in a positive manner into the continuously advancing article transport buckets of the cartoning machine.

Generally speaking, the cartoning machine, for which the present leaflet feeding mechanism is particularly intended, comprises a continuously advancing article conveyor which includes the article transport buckets referred to above. At a point upstream from the leaflet feeding mechanism, the articles are placed individually into the buckets either manually or by a suitable article feeding mechanism. As the transport buckets (each containing one of the articles) moves downstream, the leaflet feeding mechanism of the invention inserts one of the folded leaflets into each continuously advancing bucket, the arrangement being such that the folded leaflet subsequently is doubled over upon the article.

After the leaflets are inserted, the transport buckets advance each article and its leaflet to a carton loading station for transfer of the article (and leaflet) into the open end of a carton. The cartons are advanced continuously by a carton conveyor extending in parallelism with the article transport conveyor. The erected cartons are advanced in erected condition with the open end of each carton located adjacent the open end of a respective article transport bucket, which advances along with the carton.

As noted above, the folded leaflet is doubled over upon the leading end of each article, which is now disposed adjacent the open end of the continuously advancing carton on the carton conveyor. Upon reaching an article transfer station, the article transfer mechanism shifts the article transversely from the article transport bucket, shifting the doubled leaflet into the carton along with the article. The end flaps of the carton are then folded to a closed position, thus completing the carton loading operation, with the article and its doubled over leaflet enclosed therein.

Another objective of the present invention has been to provide an arrangement of article transport buckets in which each bucket includes a transverse pocket located beneath the bottom of the transport bucket (which is generally U-shaped in cross section), such that the folded leaflet may be inserted into the bucket without interference by the article resting upon the bottom of the bucket.

According to this aspect of the invention, the leaflet feeding mechanism is arranged to insert each leaflet into

the pocket of the article transport bucket to a point which is slightly less than half the length of the leaflet. Accordingly, when the leaflet subsequently is doubled over upon the leading end of the article, the leaflet is approximately centered with respect to the leading end of the article. In other words, the doubled-over leaflet extends for approximately equal distances along the upper and lower surfaces of the article to facilitate the subsequent insertion of the leaflet and article into the open end of the carton.

A further objective of the invention has been to provide a leaflet conveyor adapted to advance the leaflets longitudinally in unison with the advancing article transport buckets, combined with a leaflet pusher mechanism which acts upon the folded leaflets along an oblique path, the rate of motion of the leaflet pusher mechanism along the oblique path being coordinated with the rate of longitudinal motion of the leaflets along their longitudinal path. According to this combination, the folded leaflets advance from the leaflet folding mechanism to the leaflet conveyor while traveling longitudinally in alignment with and at the same rate of advancement of the transport buckets, thereby to be shifted transversely into the pockets of the transport buckets during continuous advancement of both the article and the leaflet.

In order to provide positive handling of the folded leaflets, which is one of the objectives of the invention outlined above, the leaflet conveyor comprises a series of conveyor chains having upstanding lugs which engage the trailing side of each folded leaflet to advance the leaflet in time with the article transport buckets. The leaflet conveyor includes a series of longitudinal support bars spaced apart to provide clearance for the leaflet conveyor lugs, which advance longitudinally along the space between the bars. Each support bar includes a slide bar on its upper surface adapted to slidably support the leaflet as it is conveyed in alignment with the article transport bucket into which it subsequently is transferred.

The downstream ends of the slide bars define an oblique angle corresponding to the oblique angle of the pusher mechanism. By virtue of this arrangement, the ends of the folded leaflets are exposed to the pusher mechanism along the oblique angle delineated by the slide bars. The pusher mechanism includes downwardly depending pusher fingers which project below the plane of the leaflets which project outwardly along the oblique ends of the slide bars for positive engagement and advancement of the leaflets into the pockets of the article transport buckets.

For positive transfer of the folded leaflets, there is provided a series of longitudinal hold-down bars mounted above and in parallelism with the longitudinal slide bars. The hold-down bars are spaced upwardly a sufficient distance to confine the folded leaflets without interfering with their transverse sliding motion. In order to facilitate operation of the machine, the hold-down bars form a part of a hinged gate which may be elevated above the slide bars in order to correct any malfunction, such as the jamming of one or more of the folded leaflets during the transfer motion.

The various objectives and advantages of the present invention, outlined above, will be more clearly apparent to those skilled in the art from the following detailed description taken in conjunction with the attached drawings.

In the drawings:

FIGURE 1 is a fragmentary perspective view, illustrating in a general way, the leaflet feeding mechanism of the present invention in relation to the leaflet folding mechanism and article conveyor buckets of a cartoning machine. In this view, the articles are omitted from the conveyor buckets to aid in disclosing the operating principles of the invention.

FIGURE 2 is a fragmentary perspective view similar

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to FIGURE 1, showing the articles in position within the article transport buckets to further illustrate the structure and operation of the leaflet feeding mechanism.

FIGURE 3 is a fragmentary top plan view taken from the side of the machine opposite to that shown in FIGURE 2, illustrating particularly the leaflet conveyor system, with the hold-down gate removed.

FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 3, illustrating the leaflet conveyor in relation to the leaflet pusher mechanism.

FIGURE 5 is a sectional view taken along line 5—5 of FIGURE 4, illustrating, in further detail, the leaflet conveyor system which advances the folded leaflets in time with the advancement of the article conveyor buckets, and also the hold-down gate which confines the folded leaflets with respect to the leaflet conveyor system.

FIGURE 6 is a fragmentary side view detailing the gear drive which operates the belt system for advancing the folded leaflets from the folding mechanism to the conveyor system of the leaflet feeder.

FIGURE 7 is a fragmentary side view, illustrating the driving system of the leaflet feeding mechanism.

FIGURE 8 is a fragmentary top plan view, as projected from FIGURE 7, further illustrating the general arrangement of the leaflet feeder, particularly the multiple chain conveyor system which advances the leaflets in alignment with the advancing article conveyor buckets after the leaflet folding operation. In this view, the hold-down gate and the slide bars have been omitted to more clearly illustrate the leaflet conveyor system.

FIGURE 9 is a sectional view taken along line 9—9 of FIGURE 7, further detailing the leaflet belt conveyor system and multiple chain conveyor system.

FIGURE 10 is a top plan view, with the cover in cross section, illustrating the driving system of the leaflet pusher mechanism which is mounted above the leaflet conveyor for cooperating therewith in advancing the folded leaflets to the transport buckets of the article conveyor.

FIGURE 11 is a sectional view taken along the line 11—11 of FIGURE 10, further detailing the leaflet pusher mechanism.

FIGURE 12 is a sectional view taken along line 12—12 of FIGURE 11, illustrating the driving chain in relation to the conveyor chain of the leaflet pusher mechanism.

FIGURE 13 is an enlarged fragmentary sectional view taken along line 13—13 of FIGURE 11, detailing the conveyor chain and downwardly depending fingers of the leaflet pusher mechanism.

General arrangement

Described generally with reference to FIGURES 1—3, the cartoning machine, for which the leaflet feeder mechanism is particularly intended, is indicated generally at 1. The leaflet feeder mechanism, which is operated in synchronism with the cartoning machine, is indicated generally at 2. Generally speaking, the leaflet feeder mechanism 2 comprises an overhead leaflet pusher mechanism, indicated generally at 3, and a multiple chain leaflet conveyor indicated generally at 4. The pusher mechanism 3 is mounted above the multiple chain leaflet conveyor 4 and is provided with depending pusher fingers, as described in detail later, which shift along a path which is inclined at an oblique angle with respect to the path of motion of the multiple chain conveyor 4.

The leaflets, as indicated at 5 in FIGURE 2, are fed in flat condition from a leaflet magazine (not shown) and are advanced by rollers to a leaflet folding mechanism, which is indicated generally at 6 (FIGURES 1 and 2). In general, the leaflet folding mechanism 6 includes two reciprocating folding arm assemblies operating in time with the advancing leaflets 5 and arranged to fold each flat leaflet 5 twice.

The first folding arm assembly 7 is adapted to act upon the flat leaflet 5 to double the leaflet upon itself. The second folding arm assembly 8 is arranged to double

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over the partially folded leaflet after advancement from the first folding arm assembly 7. Thus, each substantially square leaflet 5 is folded twice upon itself and reduced to the rectangular shape indicated at 10 (FIGURE 1). The folded leaflets 10 are then discharged from the leaflet folding mechanism 6 and delivered to the multiple chain leaflet conveyor, previously indicated at 4.

The multiple chain conveyor 4 includes lugs which engage and advance the folded leaflet 10 in a downstream direction at the same rate of advancement and in alignment with the article transport buckets, which are indicated generally at 11. The article transport buckets 11, as described later, transport the articles 12 (FIGURE 2) individually, such that the folded leaflets 10 subsequently are inserted, along with the articles 12 into individual cartons.

As noted earlier, the cartoning machine does not form a part of the present invention and therefore has not been disclosed in detail. In general, the machine comprises a frame, indicated generally at 13 (FIGURE 1), including guide rails 14 for slidably supporting a pair of transport chain runs 15—15 upon which the article transport buckets 11 are mounted. The chain runs 15 and transport buckets 11 are advanced in the direction shown by the arrow (FIGURE 1) by the driving system of the cartoning machine (not shown).

The articles 12 (FIGURE 2) are loaded into the buckets 11 either by hand or by a suitable article feeding mechanism (not shown), which is located in the upstream portion of the chain runs 15. After advancing in the downstream direction beyond the leaflet feeder mechanism 2 (with the folded leaflets 10 inserted into the buckets, as explained later), each folded leaflet 10 is doubled upwardly by suitable guide means, such that approximately one-half the length of the leaflet 10 overlies the article 12. This mechanism forms a part of the cartoning machine 1 and is not disclosed. After the leaflet 10 is thus doubled over upon the top of the article, the article is pushed by a suitable feeding means transversely in the direction of the overfolded portion of the leaflet 10 into its carton (not shown).

The cartons are transported in erected condition by a carton conveyor (not shown) at the same rate and alignment with the article transport buckets 11. Thus, each article, with the leaflet 10 doubled over its leading portion, may be pushed endwisely into the open end of the carton. In other words, the article itself acts to transfer the leaflet into the carton as the article is shifted transversely.

The cartoning machine is provided with a carton magazine, with means for feeding and erecting the cartons and for transferring the erected cartons to the carton conveyor (not shown). The cartoning machine also includes means for opening the flaps of the cartons at the end which receives the article and for closing the flaps after the article 12, with its folded leaflet 10, has been transferred into the open end of the carton. The loaded cartons subsequently are discharged from the machine.

As shown in FIGURE 1, each article transport bucket 11 is a composite structure comprising a base 16 having lugs 17—17 which connect the base to the transport chain runs 15—15. The base 16 is provided with upstanding flanges 18—18 extending transversely to the longitudinal path of motion of the transport chains. The bucket 11 is generally U-shaped, providing an article receptacle, also extending transversely to the longitudinal path of motion of the buckets. Each bucket includes a bottom plate 20 which is seated upon and attached to the flanges 18—18 of its base 16. This arrangement provides a transverse pocket 21 delineated by the base 16 and the bottom plate 20 of the bucket 11.

As noted earlier, the articles 12 are loaded into the buckets 11 at an upstream portion of the cartoning machine, that is, before the loaded buckets reach the leaflet feeder mechanism 2, as shown in FIGURE 2. The trans-

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verse pocket 21 of each bucket 11 therefore provides an open receptacle arranged to receive the leading end portion 22 (FIGURE 3) of the leaflet 10 in a position beneath the article 12. Otherwise expressed, the article 12 (which is already confined in the bucket) would interfere if it were attempted to insert the leaflet 10 directly beneath the article 12 in the bucket.

In order to facilitate insertion of the leaflet 10, the end of each article transport bucket 11, which is presented to the leaflet feeding mechanism 2, includes an inset portion 23. As explained later in detail, the leaflet conveyor 4 includes a horizontal hold-down gate 24 (FIGURE 1). This gate includes longitudinal bars which overlie the several folded leaflets 10 as they are being shifted transversely into the pockets 21 of the transport buckets. The inset portion 23 of each bucket cooperates with the hold-down bars to guide the leading end of each leaflet in a positive manner into its pocket 21.

Generally speaking, the leaflet folding mechanism 6, the leaflet conveyor 4 and the overhead pusher mechanism 3 are all driven at related speeds in time with the article transport buckets 11 by means of a common driving system. The folded leaflets 10 issue from the leaflet folding mechanisms 6 to the leaflet conveyor 4 in time with the buckets 11 and are advanced longitudinally in time with and in alignment with the buckets. The leaflet pusher mechanism 3 includes pusher fingers, disclosed in detail later, which move along a path of motion angular in relation to the longitudinal path of motion of the folded leaflets 10 as the leaflets are advanced by the leaflet conveyor 4.

The inclined path of motion of the fingers and the longitudinal path of motion of the leaflet conveyor thus move the leaflets 10 along two coordinate paths, consisting of the longitudinal path indicated by the arrows A (FIGURE 3) and the inclined path indicated by the arrows B. As noted earlier, the rate of longitudinal motion indicated by the arrow A corresponds to the rate of longitudinal motion of the article transport buckets 11, with the leaflets 10 aligned therewith. The rate of angular motion, as imparted by the oblique relationship of the pusher mechanism 3, is so related to the longitudinal motion, as indicated by the arrows A and B, to progressively transfer the leaflets 10 into the transverse pockets 21 of the article transport buckets 11.

As best shown in FIGURE 3, a minor portion C of the leaflet 10 is inserted into the transverse pocket 21 of the bucket. Portion C is adapted to underlie the article 12 when the article and leaflet are shifted into the carton. A second portion of the leaflet, indicated at D, has a length equal to the portion C and is adapted to overlie the article 12 upon insertion thereof into the carton. The intermediate portion of the leaflet, indicated at E, passes around the leading end of the article after the leaflet is folded over the article prior to transfer of the article and leaflet into the carton.

The portions C and D of the leaflet 10, in the present example, are equal to or less than the length of the article to facilitate insertion into the carton. The direction in which the article is shifted during insertion into the carton is indicated by the arrow F in FIGURES 2 and 3, the portion D of the leaflet having been folded upwardly to overlie the article prior to the transfer motion.

Leaflet folding mechanism

Referring to FIGURES 1 and 2, the leaflet folding mechanism 6 is mounted above the leaflet feeder mechanism 2 in an upstream position, as noted earlier. As the unfolded leaflets 5 issue from the magazine (not shown) they are slidably confined between a series of longitudinal bars 25—25 leading from the magazine to a pair of rollers 26—26. The rollers 26 are driven by gears 27—27 which are in driving connection with the main driving system of the cartoning machine. The rollers 26 engage the flat leaflet sheet 5 and advance the sheet

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to a position between a pair of rollers 28—28 which are rotatably mounted adjacent the rollers 26. The rollers 28—28 include a plurality of belt runs 30 which are arranged to advance the flat leaflet sheet 5 toward the first leaflet folding arm assembly 7, as indicated by the arrow. The arm assembly 7 engages the sheet 5 at a point approximately mid-way of its length and forces it downwardly to a position between the opposed rollers 31—31, such that the sheet 5 is doubled upon itself as it passes between the rollers 31—31.

When the sheet 5 reaches a position with its center portion approximately beneath the first folding arm assembly 7, the arm descends so as to double the sheet upon itself and to advance the folded edge of the sheet downwardly to be engaged by the opposed folding rollers 31—31. It will be noted in FIGURES 1 and 2, that the folded sheet 5 passes beneath an upwardly inclined plate 32 and passes to the second folding arm assembly 8. After having been doubled upon itself, by the first arm 7, the sheet 5 is engaged between a series of opposed belt runs (not shown) mounted beneath the inclined plate 32 to be folded upon itself by the second folding arm assembly 8.

Upon being folded the second time, as indicated earlier, the folded leaflet, previously indicated at 10, is engaged between the belt runs 33 and 33a to be advanced to the multiple chain leaflet conveyor 4 (FIGURES 1, 4, 7 and 9). The upper belt runs are advanced by an upper set of pulleys 34. The lower belt runs 33a are carried by a lower set of pulleys 29 and 35. The lower pulleys 29 and 35 form a part of the driving system, as explained later. The upper and lower pulleys are driven in tracking relationship with one another by a pair of companion gears, as described later with reference to the driving system. In other words, the opposed belt runs 33 and 33a move at a uniform speed in the same direction at a rate timed with the operation of the cartoning machine.

The several components of the leaflet folding mechanism 6 are mounted between a pair of side plates 36—36 (FIGURES 1, 2 and 4) which are connected to the frame 13 of the cartoning machine. The operating components of the leaflet folding mechanism 6 are driven in time with one another and in time with the cartoning machine by a common driving system, as noted earlier.

Leaflet conveyor

As each folded leaflet 10 advances from the discharge end of the belt runs 33—33a (FIGURES 1—4), it passes to the multiple leaflet chain conveyor 4 to be engaged and advanced by the lugs 37 which form a part of the leaflet conveyor 4. The leaflet conveyor comprises a series of support bars 38 (FIGURES 3, 4 and 5) which extend longitudinally in parallelism with the path of motion of the lugs 37. The support bars 38 are spaced apart as at 40 (FIGURE 3) to provide clearance for the lugs 37 of the leaflet conveyor. In the form shown in the present disclosure (FIGURE 3), the leaflet conveyor comprises four pairs of chain runs 41, the support bars 38 being spaced to accommodate the sets of lugs 37. As best shown in FIGURES 4 and 5, the lugs 37 project upwardly above the support bars 38 so as to engage and advance the folded leaflets 10.

In order to advance the leaflets 10 in a positive manner the support bars 38 include respective slide bars 39 mounted upon the support bars 38. The slide bars 39 thus support the leaflets 10 in a plane above the support bars 38, while the leaflets are confined upon the slide bars 39 as explained later.

As best shown in FIGURE 3, the downstream ends of the slide bars 39 correctively define an oblique angle, indicated at 39a which corresponds with the oblique path of motion of the pusher mechanism 3. The pusher fingers 106, one for each leaflet 10, project downwardly substantially to the plane of the support bars 38, the folded leaflets 10 being slidably supported above this plane by the slide bars 39 while being advanced by the

lugs 37 of conveyor 4. Thus, as best shown in FIGURE 3, the end portion G of each leaflet 10 projects outwardly beyond the obliquely disposed ends 39a of the slide plates 39. This provides positive engagement with the ends G of the leaflets 10 by the lower ends of the pusher fingers 106, which project below the plane of the leaflets, as indicated in FIGURES 4 and 5.

As the folded leaflets 10 issue from the opposed belt runs 33-33a (FIGURES 3 and 4) they pass directly to the slide bars 39 to be engaged and advanced by the advancing lugs 37 of leaflet conveyor 4. In order to advance the folded leaflets 10 in a positive manner, the horizontal hold-down gate, previously indicated at 24, is mounted immediately adjacent the leaflet delivery belts 33-33a. Thus, the folded leaflet 10 passes immediately upon the slide bars 39 to be confined thereon by the hold-down gate 24, which is mounted above the slide bars 39. In other words, the folded leaflet is confined between the slide bars 39 and hold-down gate 24 for positive advancement by the lugs 37 of the leaflet conveyor 4.

The hold-down gate 24 (FIGURES 1, 2 and 4) comprises a frame consisting of a pair of transverse bars 42-42 having their ends secured by riveting or the like to a longitudinal bar 43. The longitudinal bar 43 includes a hinge 44 which is connected to a side piece 49. The transverse bars 42 include a handle 45 permitting the hold-down gate 24 to be elevated above the lower slide bars 39 to facilitate maintenance.

The hold-down gate 24 includes a series of longitudinal hold-down bars 46 which are parallel with the slide bars 39 and in alignment therewith. Thus, as best shown in FIGURE 4, the folded leaflets 10 are confined between the slide bars 39 and the hold-down bars 46, with the lugs 37 projecting above the clearance 47 which exists between the slide bars 39 and hold-down bars 46 (FIGURES 4 and 5).

In order to regulate the clearance or spacing 47 in accordance with the thickness of the various leaflets which may be handled by the machine, the swinging end of the hold-down gate 24 is provided with an adjustment screw 48 passing through one of the transverse bars 42 (FIGURES 2, 4 and 5). The adjustment screw 48 is clamped in its adjusted position by a nut 50.

The lugs 37 of the leaflet conveyor 4 are mounted upon the respective chain runs 41, previously noted. The chain runs pass about respective drive sprockets 52 (FIGURES 7 and 8), which are mounted upon a drive shaft 53. The respective ends of the drive shaft 53 are journaled in the side plates 36-36. The opposite ends of the chain runs 41 pass around respective idler sprockets 54 which are mounted upon the idler shaft 55, which is also journaled in the side plates 36-36. The drive shaft 53 includes a power sprocket 56 meshing with a sprocket chain 57 (FIGURES 7 and 8). The drive sprocket is in driving connection with the carton machine by a driving system, as explained in detail later.

In order to control the tension of the chain runs 51 (FIGURE 7), the end portion of the side plates 36 are slotted as at 58 to provide clearance for the drive shaft 53. To permit adjustment, the opposite ends of the drive shaft 53 are journaled in shiftable bearings 60-60. The bearings 60-60 are slotted as at 61-61, the slots 61 being traversed by screws 62 which are threaded into the side plates 36. In regulating the tension of the chains 41 of the leaflet conveyor 4, it is necessary to compensate by adjusting the drive chain 57. For this purpose (FIGURE 7), there is provided an idler sprocket 63 meshing with the upper run of chain 57 and carried upon a shaft 64. The shaft, in turn, is journaled in a shiftable bearing 65 which traverses a slot 66 formed in one of the side plates 36.

Leaflet pusher mechanism

As noted earlier, the overhead leaflet pusher mechanism 3 is mounted above the leaflet conveyor 4 and is disposed

at an oblique angle to the longitudinal path of motion of the leaflet conveyor 4. The pusher mechanism comprises a frame 67 (FIGURES 2, 10, 11 and 12) having an outer end portion supported by a bracket 68, the bracket 68 being attached to one of the side plates 36 of the frame of leaflet conveyor 4. As pointed out previously (FIGURE 3) the downstream ends of the longitudinal hold-down bars 46 and the slide bars 39 are machined at an oblique angle, as indicated at 39a, the ends of the bars collectively corresponding with the angle of motion by the pusher fingers 106 of the leaflet pusher mechanism 3.

Described in detail (FIGURES 10-13), the frame 67 of the leaflet pusher mechanism 3 comprises an arm 71 which supports the driving system 72 of the pusher mechanism 3. The driving system 72 powers the chain run 73 which advances the fingers 106 of the pusher mechanism along the oblique path of advancement, as indicated by the broken lines 75 in FIGURE 3.

The bracket 68 supports the arm 71 of the leaflet pusher mechanism 3 in cantilever fashion overhanging the leaflet conveyor 4. For this purpose (FIGURES 10 and 11) the bracket 68 (rigidly attached to one of the side plates 36) includes a mounting block 76 at its upper portion. The arm 71 is slotted longitudinally as at 77 and the clamping block 76 underlies the slot 77. The mounting block 76 is locked in position by a cleat 78 overlying the top surface of arm 71. Screws 80-80 pass through the cleat 78 into threaded engagement with the mounting block 76 to clamp the cleat 78 upon the top surface of arm 71. The bracket 68 thus supports the arm in its cantilever fashion with respect to the leaflet conveyor 4.

The bracket 68 includes an upstanding bearing sleeve 81 (FIGURE 11) journalling a vertical shaft 82 which powers the driving system 72 of the leaflet pusher mechanism 3. The lower end of shaft 82 includes a bevel gear 83 (FIGURE 11) meshing with a companion bevel gear 84, which is keyed to a horizontal power shaft 85. The power shaft 85 is rotated in time with the other components of the cartoning machine, such that the folded leaflets 10 are advanced to the buckets 11 of the cartoning machine in timed relationship with the advancement of the buckets.

The driving system 72 of the pusher mechanism 3 comprises the chain run 86 (FIGURES 10 and 11) and a drive sprocket 87 mounted upon the power shaft 82 and meshing with chain run 86. The opposite ends of the chain run 86 pass around respective sprockets 88 and 90 which are journaled upon the stub shafts 91 and 92. The stub shafts 91 and 92 are rotatably journaled in the brackets 93 and 94. In order to regulate the tension of chain 86, the arm 71 is slotted as at 95-95 and the bracket 94 includes bolts 96-96 passing through the slots and including nuts 97 (FIGURE 11) to clamp the bracket 94 in its adjusted position. The bracket 93 is held in place by the bolts 98-98, passing through the arm 71 and including nuts 100 (FIGURE 11).

In order to regulate the tension of the drive chain 86, there is provided an idler sprocket 101 (FIGURES 10 and 11) meshing with chain 86 and rotatably mounted upon an idler shaft 102. The idler shaft 102 rises from a mounting plate 103, which in turn, is adjustably secured to the main mounting block 76 of bracket 68. For this purpose the mounting plate 103 is slotted as at 104 (FIGURE 10), the slots being traversed by the clamping screws 105 which are threaded into the clamping block 76.

The pusher fingers 106 depend downwardly from a chain run 107 (FIGURE 11) which is advanced by the driving system 72. For this purpose, the lower end portion of each stub shaft 91 and 92 is provided with a sprocket. These sprockets, indicated at 108 and 110, are keyed to the respective shafts 91 and 92, such that the chain run 107 is advanced in unison with the chain run 86 of the driving system.

As best shown in FIGURES 12 and 13, the arm 71 in-

cludes longitudinal guide plates 111 for guiding the fingers 106 along the angular path, as previously indicated by the broken line 75 in FIGURE 3. For this purpose, the lower portion of each guide plate is grooved as at 112 to delineate a flange 113 (FIGURE 13) adapted to engage the rollers 114 of the chain run 107. The downwardly depending pusher fingers 106 are attached to the chain run 107 by respective pairs of angle brackets 115—116 (FIGURE 13) attached to the chain run, the fingers being attached to the brackets by the screws 116—116.

The pusher fingers 106 are square in cross section and the lower end portion of each finger is tapered to provide a downwardly converging portion 117 which delineates a head 118 (FIGURE 13). The converging portion 117 engages the end G of the leaflet 10, while the head 118 underlies the edge of the leaflet as best shown in FIGURE 4. The pusher fingers 106 pass across the support bars 38, with the end of each finger slightly spaced from the top surface of the bars 38 for clearance. As noted earlier, the slide bars 39 support the leaflet 10 in a plane above the support bars 38 to provide positive engagement with the leaflet 10 (FIGURE 5), while the hold-down bars 46 prevent upward displacement of the leaflet 10. The rate of longitudinal motion of the lugs 37 is coordinated to the oblique path of motion of the pusher fingers 106 to shift the leaflets 10 transversely into the pockets 21 of the buckets 11, as noted earlier.

Driving system

As best shown in FIGURES 7 and 8 the leaflet feeding mechanism 2 is driven in time with the components of the cartoning machine by way of the power shaft 119 which has its opposite ends journaled in the side plates 36—36. Shaft 119 is connected to the driving system of the cartoning machine and includes a sprocket 120. Sprocket 120 drives a sprocket chain 121 meshing with a sprocket 122 which is keyed to a cross shaft 123. The tension of chain 121 is regulated by an idler sprocket 124 mounted upon a shaft 125. The shaft 125 is carried by shiftable means (not shown) to provide for tension adjustment.

The leaflet feeding mechanism 2 is driven from the shaft 123 by a sprocket 126 (FIGURES 7 and 8) keyed to shaft 123 and in meshing engagement with a sprocket chain run 127. The opposite end of chain run 127 meshes with a sprocket 128 which is keyed to a shaft 130, also journaled in the side plates 36—36. The shaft 130 includes a sprocket 131 meshing with the chain 57, as noted earlier in the description of the leaflet conveyor 4 (FIGURE 3). The chain 57 meshes with the sprocket 56 of cross shaft 53, thus advancing the lugs 37 of the leaflet conveyor in time with the buckets 11 of the cartoning machine.

In order to advance the chains 86 and 107 of the pusher mechanism 3 in time with the cartoning machine, the pusher mechanism is also driven from the sprocket chain 57. Thus, as shown in FIGURES 8 and 11 the cross shaft 85, which drives bevel gear 84, includes a sprocket 132. Sprocket 132 meshes with the sprocket chain 57.

The rollers 34—34, which support the upper belt run 33 (FIGURES 3 and 4) are mounted upon respective cross shafts 133—133. Shafts 133 have their opposite ends journaled in a pair of brackets 134—134. The upstream ends of the brackets 134—134 are pivotally connected as at 135 (FIGURE 7) to the side plates, previously indicated at 36. The upper belt runs 33 thus rest by gravity upon the lower belt runs 33a.

The pulleys 35 of the lower belt runs 33a are mounted upon a cross shaft 136 having its opposite ends journaled in the side plates 36—36. As noted earlier, the pulleys 29 of the lower belt runs are mounted upon the cross shaft 55, which is also journaled in the side plates 36.

In order to advance the opposed belt runs 33 and 33a in time with the cartoning machine, the lower belt runs 33a pass around a series of pulleys 137 (FIGURE 7) which

are keyed to the cross shaft 130. As noted earlier, cross shaft 130 is driven by the chain 127 and sprocket 128.

In order to drive the upper belt runs 33 at the same rate as the lower belt runs 33a, the cross shafts 133 and 136 (FIGURE 6) include companion gears 138 and 140. Thus, the lower set of belt runs 33a are driven by the cross shaft 130 which, in turn, drives the lower cross shaft 136 of the belt runs 33a. By operation of the companion gears 138 and 140, the meeting surfaces of the belt runs 33 and 33a are advanced in the same direction and at matching rates of linear motion.

Having described my invention I claim:

1. A sheet feeding mechanism for a cartoning machine, said cartoning machine including an article conveyor having a series of article transport buckets mounted thereon, a respective pocket formed in the lower portion of each of said article transport buckets, said pockets extending transversely of said buckets, and a driving system for advancing said article conveyor in the downstream direction, said sheet feeding mechanism comprising:

a sheet feeding mechanism, folding mechanism for receiving individual sheets from the sheet feeding mechanism and for folding each sheet at least once upon itself;

a sheet conveyor extending longitudinally in parallelism with said article conveyor and interconnected with said driving system, adapting the sheet conveyor to be advanced in the downstream direction at a rate corresponding to the rate of advancement of the article conveyor;

means delivering the folded sheets from the folding mechanism to the sheet conveyor;

and a pusher mechanism mounted with respect to said sheet conveyor and extending transversely thereof; said pusher mechanism including means adapted to engage and shift said folded sheets transversely across the sheet conveyor and into the pockets of the article transport buckets of said article conveyor.

2. A sheet feeding mechanism for a cartoning machine, said cartoning machine including an article conveyor having a series of article transport buckets mounted thereon and a driving system for advancing said article conveyor in the downstream direction, said sheet feeding mechanism comprising:

a sheet conveyor extending longitudinally in parallelism with said article conveyor and interconnected with said driving system, adapting the sheet conveyor to be advanced at a rate corresponding to the rate of advancement of the article conveyor;

said sheet conveyor including a slide means adapted to slidably support the sheets;

hold-down means disposed above the slide means of the sheet conveyor in spaced relation thereto for holding the sheets in sliding engagement with the slide means; a plurality of lugs mounted upon said sheet conveyor and projecting upwardly above the horizontal plane of the said sheet slide means;

said lugs adapted to engage and advance the sheets at a rate corresponding to the rate of advancement of the said article transport buckets and in transverse alignment therewith in the downstream direction;

a pusher mechanism mounted with respect to said sheet conveyor, extending transversely thereof, and interconnected with the driving system;

said pusher mechanism adapted to engage and shift said sheets transversely across the sheet conveyor and into the article transport buckets of said article conveyor.

3. A sheet feeding mechanism for a cartoning machine, said cartoning machine including an article conveyor having a series of article transport buckets mounted thereon and a driving system for advancing said article conveyor in the downstream direction, said sheet feeding mechanism comprising:

a magazine adapted to confine a stack of sheets in flat condition;
 folding mechanism mounted adjacent said magazine and adapted to fold each sheet at least once upon itself;
 means for feeding the flat sheets individually from the magazine to the folding mechanism;
 a sheet conveyor extending longitudinally in parallelism with said article conveyor and interconnected with said driving system, adapting the sheet conveyor to be advanced in the downstream direction at a rate corresponding to the rate of advancement of the article conveyor;
 means for advancing the folded sheets from the folding mechanism to the sheet conveyor;
 said sheet conveyor adapted to advance the folded sheets at a rate corresponding to the rate of advancement of the said article transport buckets and in transverse alignment therewith in the downstream direction;
 a pusher mechanism mounted with respect to said sheet conveyor, extending transversely thereof, and interconnected with the driving systems;
 said pusher mechanism adapted to engage and shift said folded sheets transversely across the sheet conveyor and into the article transport buckets of said article conveyor.

4. A sheet feeding mechanism for a cartoning machine, said cartoning machine including an article conveyor having a series of article transport buckets mounted thereon and a driving system for advancing said article conveyor in the downstream direction, said sheet feeding mechanism comprising:
 a sheet conveyor extending longitudinally in parallelism with said article conveyor and interconnected with said driving system;
 said sheet conveyor including spaced longitudinal slide bars adapted to slidably support the sheets;
 the downstream ends of the spaced longitudinal slide bars collectively defining an oblique angle extending across the sheet conveyor in the downstream direction;
 hold-down means having spaced longitudinal hold-down bars disposed above and parallel with said longitudinal slide bars for slidably engaging and holding the sheets in contact with the slide bars;
 a plurality of lugs mounted upon said conveyor and projecting upwardly between the spaced slide bars;
 said lugs adapted to advance the sheets along the slide bars at a rate corresponding to the rate of advancement of the said article transport buckets and in transverse alignment therewith in the downstream direction;
 a pusher mechanism mounted above said sheet conveyor and extending along an oblique angle corresponding to the oblique angle delineated by the downstream ends of the slide bars;
 means interconnecting the pusher mechanism with said driving system for advancing the same in time with the sheet conveyor;
 and pusher means on the pusher mechanism which are advanced along an oblique path adjacent the downstream ends of the slide bars at a rate correlated with the rate of longitudinal motion of the sheets;
 whereby said pusher means are adapted to engage and shift said sheets transversely across the sheet conveyor and into the article transport buckets of said article conveyor.

5. A sheet feeding mechanism for a cartoning machine, said cartoning machine including an article conveyor having a series of article transport buckets mounted thereon and a driving system for advancing said article conveyor in the downstream direction, said sheet feeding mechanism comprising:
 a sheet conveyor extending longitudinally in parallelism with said article conveyor and interconnected with said driving system, adapting the sheet conveyor to

be advanced at a rate corresponding to the rate of advancement of the article conveyor;
 respective slide bars spaced apart from one another and extending longitudinally above the sheet conveyor;
 hold-down means disposed above the slide bars;
 a plurality of lugs on the sheet conveyor projecting upwardly between the slide bars and having upper ends extending above the surface of the slide bars and above the lower surface of the hold-down means;
 a pusher mechanism mounted above said sheet conveyor, extending at an oblique angle in the downstream direction of advancement thereof, and interconnected with the driving system;
 said pusher mechanism including downwardly depending pusher fingers;
 the downstream ends of said slide bars and hold-down means delineating an oblique angle corresponding to the oblique angle of the pusher mechanism, whereby the downwardly depending fingers thereof move along an oblique path generally parallel to the oblique angle delineated by the downstream ends of the slide bars and hold-down means;
 the fingers of the pusher mechanism depending downwardly below the top plane of the slide bars, said pusher fingers advancing along the oblique angle which is delineated by the downstream ends of the slide bars and hold-down means, thereby to engage the ends of the sheets during advancement in the downstream direction along said slide bars and to shift said sheets transversely into the article transport buckets of the article conveyor.

6. A sheet feeding mechanism for a cartoning machine, said cartoning machine including an article conveyor having a series of article transport buckets mounted thereon and a driving system for advancing said article conveyor in the downstream direction, said sheet feeding mechanism comprising:
 a sheet conveyor extending longitudinally in parallelism with said article conveyor and interconnected with said driving system;
 said sheet conveyor including spaced, longitudinal slide bars adapted to slidably support the sheets;
 a plurality of lugs mounted upon said sheet conveyor and projecting upwardly between said spaced slide bars;
 said lugs adapted to advance the sheets at a rate corresponding to the rate of advancement of the said article transport buckets and in transverse alignment therewith in the downstream direction;
 a pusher mechanism mounted above said sheet conveyor and extending along an oblique angle in the downstream direction thereof;
 said pusher mechanism including a plurality of pusher fingers depending downwardly therefrom and adapted to engage the ends of the sheets advancing along the sheet conveyor;
 said driving system connected to said pusher mechanism and advancing said fingers at a rate of motion which is coordinated with the rate of longitudinal motion of the sheet conveyor and article transport conveyor;
 said fingers adapted to shift said sheets transversely from the sheet conveyor to the said article transport buckets;
 and hold-down means mounted above the said slide bars in spaced relation thereto, whereby the sheets are held in engagement with the slide bars during the transverse shifting motion of the sheets.

7. A sheet feeding mechanism for a cartoning machine, said cartoning machine including an article conveyor having a series of article transport buckets mounted thereon and a driving system for advancing said article conveyor in the downstream direction, said sheet feeding mechanism comprising:
 a sheet conveyor extending longitudinally in parallelism

with said article conveyor and interconnected with said driving system;
 said sheet conveyor including spaced longitudinal slide bars adapted to slidably support the sheets;
 the downstream ends of the spaced longitudinal slide bars collectively defining an oblique angle;
 respective hold-down bars spaced above and in parallelism with the slide bars and having downstream ends collectively delineating an oblique angle corresponding to the angle of the slide bars;
 a plurality of lugs mounted upon said conveyor and projecting upwardly between the spaced slide bars; said lugs adapted to advance the sheets along the slide bars at a rate corresponding to the rate of advancement of said article transport buckets and in transverse alignment therewith in the downstream direction;
 a pusher mechanism mounted above said sheet conveyor and extending along an oblique angle corresponding to the oblique angle delineated by the downstream ends of the slide bars and hold-down bars;
 means interconnecting the pusher mechanism with said driving system for advancing the same in time with the sheet conveyor;
 and pusher means on the pusher mechanism which are advanced along an oblique path adjacent the downstream ends of the slide bars and pusher bars at a rate correlated with the rate of longitudinal motion of the sheets;
 whereby said pusher means are adapted to engage and shift said sheets transversely across the sheet conveyor and into the article transport buckets of said article conveyor.

8. A sheet feeding mechanism as set forth in claim 4 in which the pusher mechanism comprises an arm extending in cantilever fashion across the sheet conveyor, a pusher chain run passing about said arm and interconnected with the driving system for advancing the pusher means.

9. A sheet feeding mechanism as set forth in claim 8 in which the pusher means comprises a plurality of pusher fingers spaced apart from one another and depending downwardly from the pusher chain run.

10. A sheet feeding mechanism as set forth in claim 9 in which said arm includes a driving chain run interconnected with the driving system and in driving connection with the pusher chain run.

11. A sheet feeding mechanism as set forth in claim 4 in which the article transport buckets each include a pocket in the lower portion thereof, said pockets extending transversely substantially in the same horizontal plane as the top surfaces of the slide bars and adapted to receive the sheets upon transverse shifting thereof by said pusher means.

12. A sheet feeding mechanism as set forth in claim 11 in which the pusher means are adapted to shift the sheets transversely into said pockets to a point which is less than the full length of the sheet, leaving a portion of each sheet protruding transversely from the pocket of the article transport conveyor.

13. A sheet feeding mechanism as set forth in claim 7 in which the sheet conveyor includes framing elements and in which the longitudinally spaced hold-down bars form part of a hold-down gate having one end hingedly connected to the framing elements and adapting the hold-down bars to be raised collectively for servicing the sheet conveyor.

14. A sheet feeding mechanism as set forth in claim 13 in which there is provided an adjustment element on the hold-down gate adapting the spacing between the slide bars and hold-down bars to be regulated.

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M. HENSON WOOD, JR., *Primary Examiner*.

A. N. KNOWLES, *Assistant Examiner*.