

Aug. 18, 1959

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2,899,873

FOLDING AND GLUEING APPARATUS

Filed July 23, 1956

4 Sheets-Sheet 1

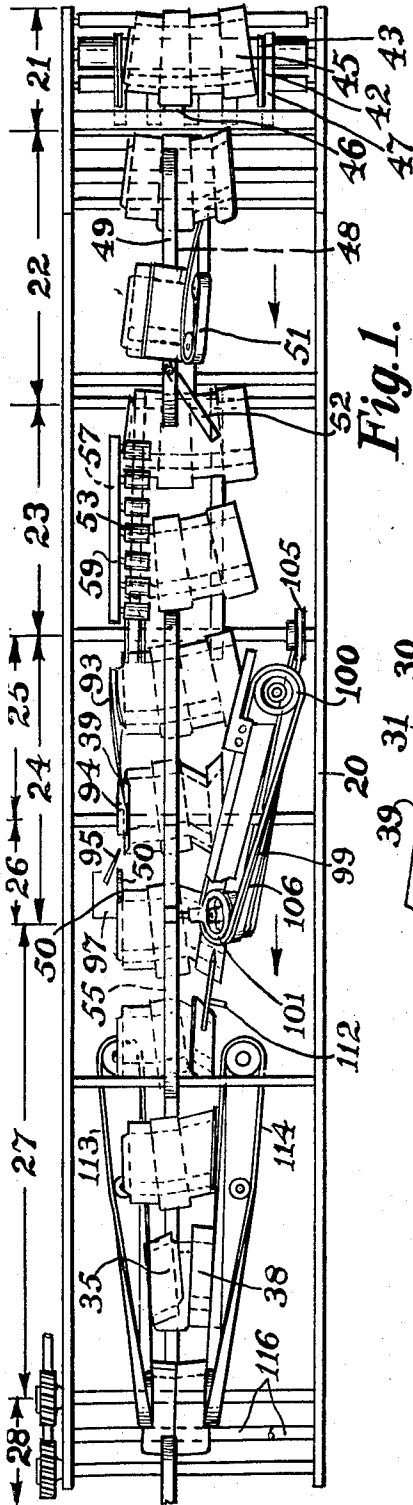


Fig. 1.

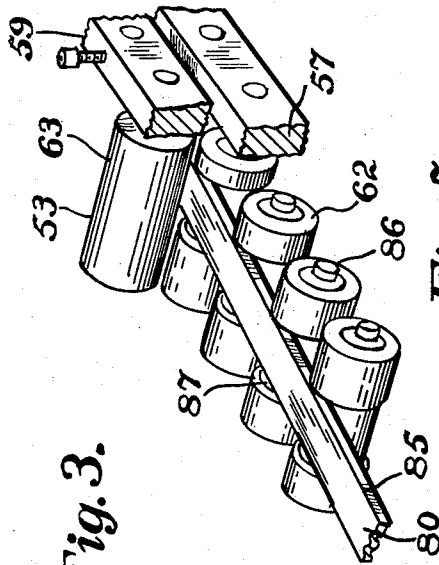


Fig. 3.

Fig. 5.

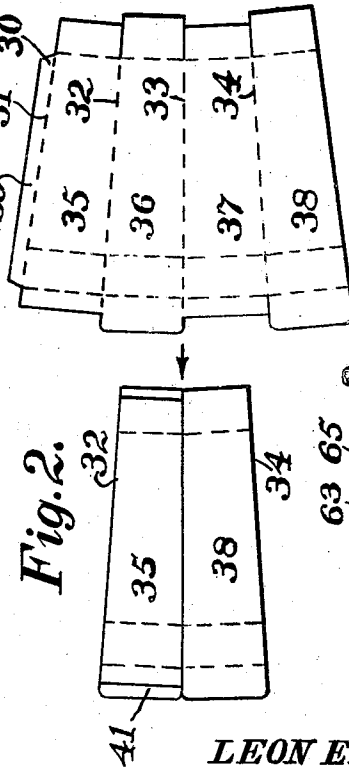


Fig. 2.

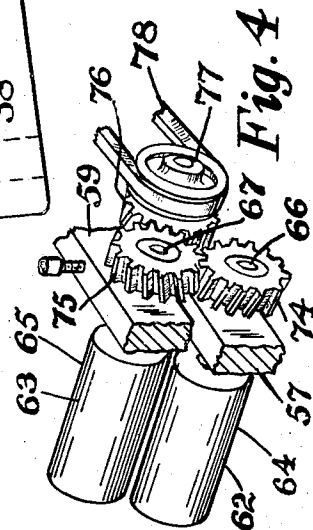


Fig. 4.

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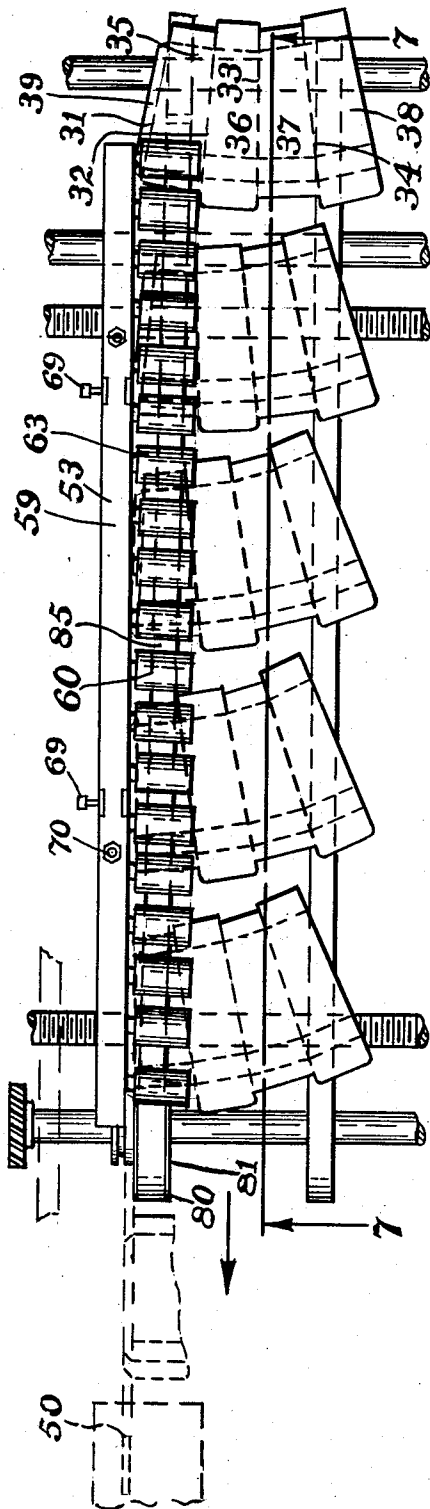


Fig. 6.

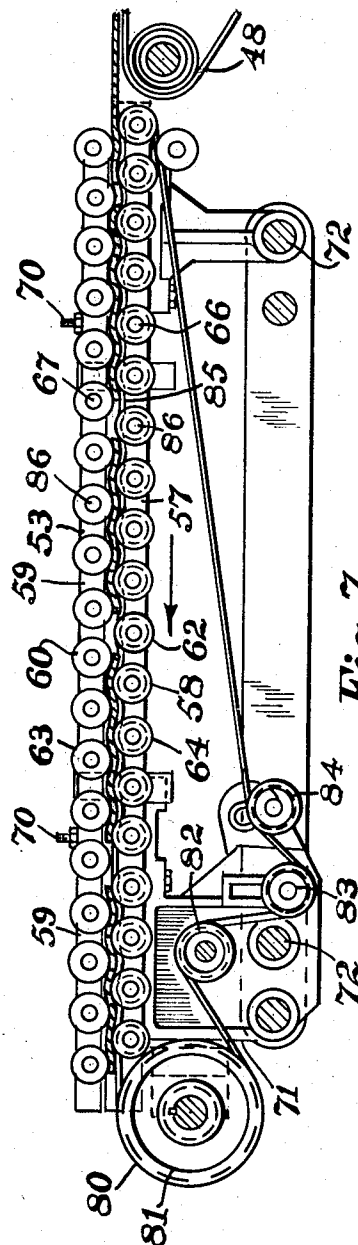


Fig. 7.

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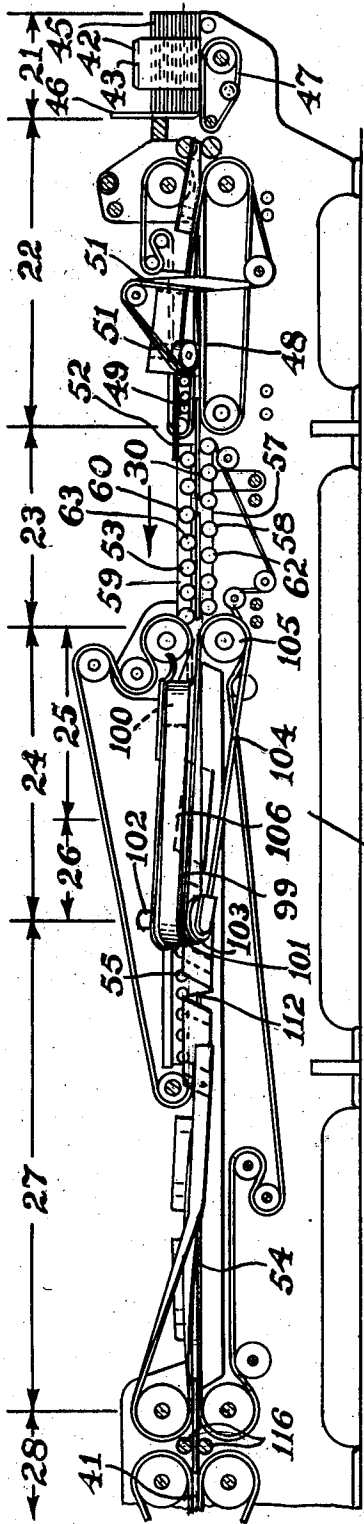


Fig. 8.

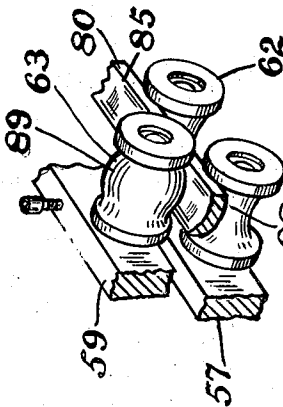


Fig. 10.

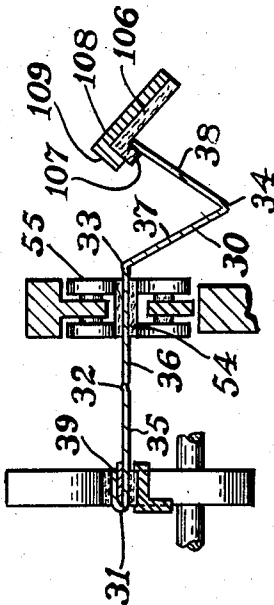


Fig. 9.

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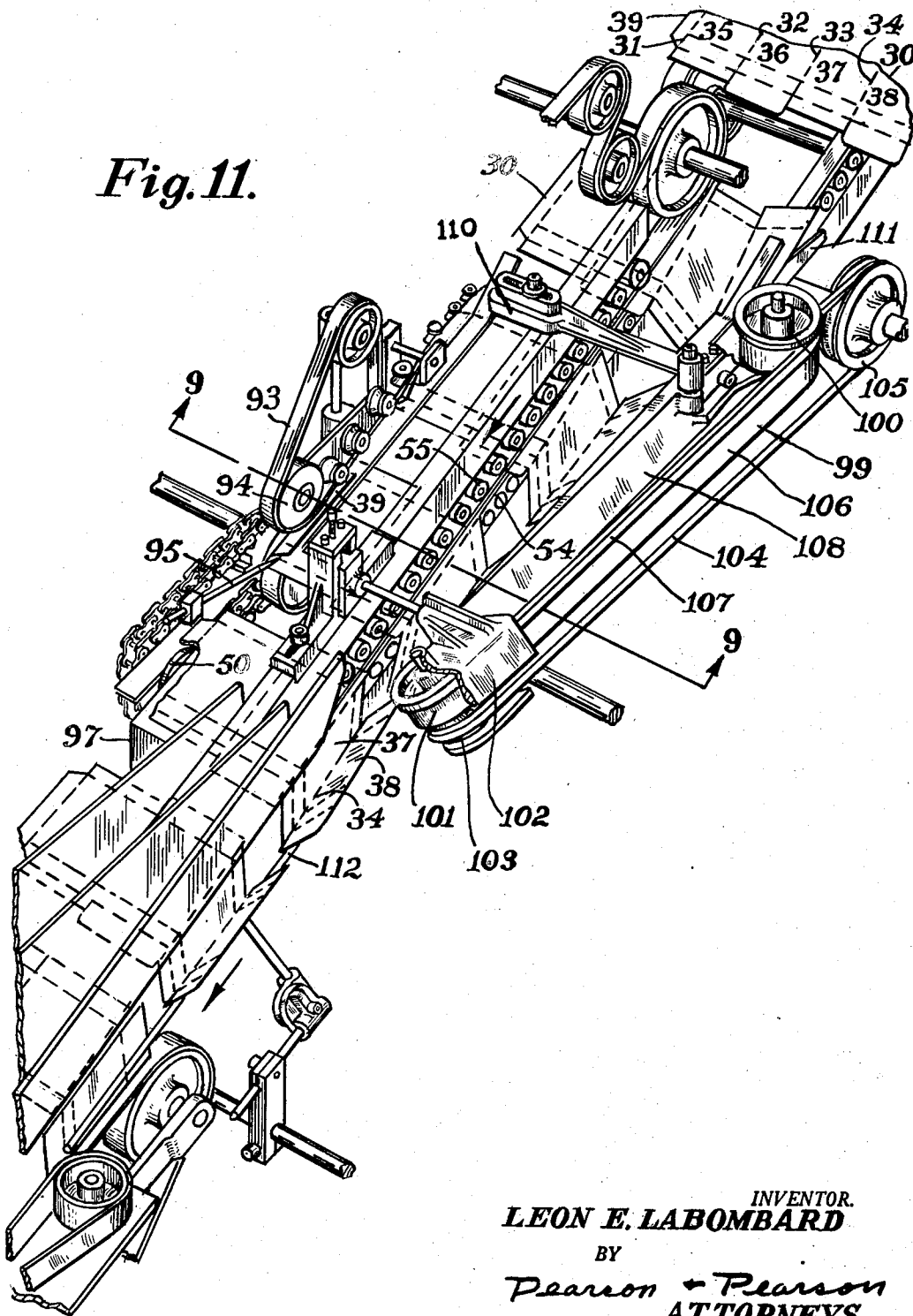
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Fig. 11.



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Application July 23, 1956, Serial No. 599,534

11 Claims. (Cl. 93—52)

This invention relates to high speed untimed carton folding machines for making straight sided and tapered sided cartons.

Such machines are of the straight line type with flat blanks advanced individually and successively by upper and lower carrier belts or cages from a blank magazine, through folding and gluing zones to delivery onto a stacker as completed, collapsed, tubular cartons. Because the collapsed cartons are opened for filling by high speed machines, it is desirable that certain longitudinal creases thereof be prefolded to enable easy and accurate erection of the cartons. Such machines must be capable of forming not only the regular type of tubular folding box but also cartons intended to contain liquid such as milk which are frequently tapered.

One of the principal problems in the making of liquid containing cartons, whether straight or tapered, has been the misapplication of glue on the glue lap because the glue lap has not been accurately aligned with the glue roll or wheel of such machines. This problem is of course aggravated with tapered cartons since the crease lines have a progressively increased taper laterally of the blanks making it difficult to fold on the most tapered lines and making the accurate application of a strip of glue difficult. A large percentage of "leakers" thus results when known machines are used for folding and gluing tapered milk cartons and the like.

One object of this invention is to provide a novel side register means in advance of the adhesive applying zone of such machines, capable of pulling each successive, rapidly advancing blank tightly against a side guide accurately aligned with the adhesive applying roll whether the blank is straight sided or tapered sided. Each blank thus enters the centre carrier of the adhesive applying zone with its glue lap in perfect line with the glue wheel and misaligned glue strips, which cause leakage, are prevented.

Another object of this invention is to locate such a side register means in rear of the feed zone and the third crease prefolding zone but in advance of the adhesive applying zone so that the magazine sides may loosely hold the stack of blanks and the prefold mechanism may slightly misalign the blanks but the strong grip of the side register means still assures proper orientation thereof upon entrance into the adhesive applying zone.

A further object of the invention is to provide such a side register means wherein upper and lower rows of staggered overlapping rolls are provided, flexible blanks thereby being firmly gripped and undulated, as they pass between the rows, to whip off any foreign material thereon as they are drawn into alignment with the straight edge, side guide of the side register means.

Still another object of the invention is to provide a folding machine wherein tapered carton blanks are prefolded on the third crease while that crease is travelling in a straight longitudinal path, then are prefolded on the first crease and glued proximate the first crease while that crease is travelling in a straight longitudinal path

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with the other creases at an increased obliquity and then are prefolded on the fourth crease while that crease is still at maximum obliquity to a longitudinal straight line path.

5 A still further object of the invention is to provide novel prefolding means, capable of prefolding a rapidly advancing tapered sided blank on a crease obliquely to the longitudinal centre line of a folding machine.

10 Other objects and advantages of this apparatus will be apparent from the claims, the description of the drawings and from the drawings in which

Fig. 1 is a diagrammatic plan view of a typical straight line, high speed, untimed folding and gluing machine with the apparatus of this invention incorporated therein.

15 Fig. 2 is a plan view of a completed collapsed tubular carton such as may be accurately folded and glued by the apparatus of the invention.

Fig. 3 is a plan view of the flat flexible carton blank from which the carton of Fig. 2 is formed.

20 Fig. 4 is a fragmentary, perspective view of a train of staggered helical gears which may be used to drive the side register rolls of the invention.

Fig. 5 is a view similar to Fig. 4 showing another form of drive means for the register rolls of the invention.

25 Fig. 6 is an enlarged, plan view of the side register zone of the machine.

Fig. 7 is a side elevation from the outside of the device shown in Fig. 6.

30 Fig. 8 is a diagrammatic side elevation of the machine shown in Fig. 1.

Fig. 9 is an elevation, in section, on line 9—9 of Fig. 11.

Fig. 10 is a view similar to Figs. 4 and 5 showing the preferred form of drive means for the side register rolls of the invention.

35 Fig. 11 is an enlarged, perspective view from the delivery end of the machine showing the novel fourth crease prefolding means of the invention.

In the drawings 20 is a straight line untimed, high speed folding and gluing machine of a type well known in the trade. For clarity of description the machine 20 is separated longitudinally into a feed zone 21, a third crease prefolding zone 22, a side register zone 23, a fourth crease prefolding zone 24 which includes a first crease prefolding zone 25 and a glue applying zone 26, 40 a second and fourth crease overfolding zone 27 and a delivery zone 28. The completed, collapsed, tubular cartons receive pressure on the adhesive seam thereof in zone 28 and are then delivered to a stacker of any well known type not shown and forming no part of this invention.

50 A typical carton blank 30 for which the machine is designed may be straight sided in which case folding problems are less serious or may be tapered sided and present very serious folding and gluing problems. The blank 30, illustrated, is of the tapered type such as often used for containing milk and includes a first crease 31, 55 a second crease 32, a third crease 33 and a fourth crease 34 which divide the blank 30 into four tapered sides 35, 36, 37 and 38 and a glue lap 39. The remaining flaps and crease lines of the blanks 30 form the top and bottom of the tubular carton in a well known manner and are not described herein in detail since they are not folded or glued in the machine of this invention. The purpose of the machine 20 is to prefold a blank 60 such as 30 on its longitudinal crease lines 31 and 33, apply an accurate adhesive strip entirely along glue lap 39 and overfold the blank on crease lines 32 and 34 into a collapsed tubular carton 41.

65 Feed zone 21 includes a blank magazine 42 having a pair of opposite side supports such as 43 for a stack 45 of blanks such as 30 and is of the untimed, bot-

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tom feed type with an adjustable feed gate 46 all well known in the art. Each successive bottom blank is fed individually under gate 46 by feed belts 47 into the grip of a first longitudinally extending blank advancing device comprising a first, lower, centre carrier belt 48 and a first upper, centre presser cage 49. The centre carrier 48 and presser cage 49 advance each blank from feed zone 21 through third crease folding zone 22 to the side register zone 23. Each blank 30 is held rigidly between belt carrier 48 and cage 49, on one side of third crease 33, and advances the blank with the third crease 33 in parallelism with the longitudinal centre line of machine 20 as the blank is prefolded by twist belt 51 on crease 33 and then opened flatwise by folder bar 52.

The side register means 53 of the invention receives each successive blank from the centre carrier 48 and centre cage 49 and conveys the same through the side register zone 23 while properly orienting the same ready for the application of adhesive and then delivers the blanks to a second centre lower carrier belt 54 and second centre upper presser cage 55 at zone 24. Side register means 53 pulls the blanks tight against a longitudinally extending side guide 57, constituting a straight edge accurately fixed with relation to the adhesive applying roll or rolls 50 in the zone 26. In the embodiment shown, the side guide 57 is aligned parallel to the vertical longitudinal plane of the outside face of the glue roll 50 whereby a blank will have its glue lap 39 in exact registration with the glue roll 50 for the application of a straight strip of adhesive entirely therealong. Thus the side supports 43 of the magazine 42 may be loosely spaced from the sides of stack 45 to enable more accurate feeding and the prefolding operation on third crease 33 may result in occasional slight misorientation of the blanks with the side register means 53, in either or both cases, immediately reorienting the blanks. When the cartons are straight sided, the parallel crease lines thereof are thereby realigned parallel with the longitudinal centre line of the machine. When the cartons are tapered sided the tapered crease lines are thereby realigned with the first crease 31 parallel to the longitudinal centre line of the machine and the other tapered creases 32, 33 and 34 progressively increased in misalignment the more remote from crease line 31. In this condition, the tapered blanks are advanced through zone 24 in order that the glue lap 39 may be accurately prefolded on line 31 in sub zone 25 and an accurate strip of adhesive applied to glue lap 39 in sub zone 26, despite the fact that the prefolding of the blanks on the then obliquely advancing tapered crease line 34 is made much more difficult.

The side guide 57 of side register means 53 is preferably the lower supporting bar for a straight, longitudinally extending, lower row 58 of side register rolls 62 and a substantially coextensive upper supporting bar 59 is provided for a straight, longitudinally extending upper row 60 of side register rolls 63. Each roll 62 of row 58 and each roll 63 of row 60 is of identical cylindrical outline with a smooth circumferential face 64 or 65 and each is freely rotatable around parallel shafts such as 66 and 67. The rolls 62 extend laterally inwardly under the path of the blanks in zone 23 and the rolls 63 extend laterally outwardly above the path of the blanks in zone 23 with the axes of the rolls parallel and uniformly biased or angled, preferably about 1° from normal to the side guide 57.

Supporting bar 59 is mounted on side guide 57 by suitable clamps 69 and vertically movable therein by set screws 70, and side guide 57 is carried by a frame piece 71 movable transversely of the machine 20 by threaded shafts 72.

The gap between adjacent rolls 62 and 63 is uniform and short in order to maintain control of small blanks as well as large and the lower and upper rolls are staggered whereby each upper roll is positioned above the

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gap between the adjacent pair of lower rolls. In the embodiment shown in Fig. 4 the shafts 66 and 67 are journaled in the guide 57 or bar 59 and carry a helical gear such as 74 or 75 on the outside thereof. The rolls 62 and 63 are thus driven by a staggered train of helical gears from drive gear 76, the latter being driven in synchronization with the other parts of machine 20, by a belt pulley 77 and drive belt 78.

In the embodiment shown in Figs. 5, 6 and 7 a drive belt 80 is trained around a drive pulley 81 and around suitable idler and tension pulleys 82, 83 and 84 with the upper stretch 85 extending between the rows of side register rolls 62 and 63. The rolls 62 and 63 are carried by stub shafts such as at 86 and are provided with circumferential grooves such as 87 of uniform dimensions but progressively varying axial location. Thus the upper stretch 85 of drive belt 80 commences near the inside face of the first roll and extends obliquely along the row to near the outside face of the last roll in the row. The glue lap side portions of blanks entering zone 23 are engaged from below by the outside or upper face of belt 80 and the adjacent face of the lower rolls and engaged from above by the adjacent face of the upper rolls. The drive pulley 81 is of course, operatively connected to the other moving parts of machine 20 in a manner well known in the art.

It will be understood that because the side register rolls and their shafts are all angled at about 1°, an ordinary belt drive for the same is impractical because the same action which pulls the blanks sidewise into registration also tends to move a drive belt off belt pulleys or to wear the same out very rapidly. In Fig. 10 a preferred drive means is illustrated in which each register roll 62 is provided with a concave grooved pulley 88 and each roll 63 is provided with a convex grooved pulley 89. A drive belt such as 80 remains trained through such rolls without being cast off and without undue wear even though the axes of the pulley are uniformly angled from normal to the supports 57 and 59.

The side register rolls of the invention will align blanks of stiff paper board but are especially useful with blanks of flexible paper board. As indicated in Fig. 7, the upper row 60 of rolls 63 is preferably adjusted so that the blank contacting faces thereof are slightly below the level of the blank contacting faces of the lower rolls 62. Thus flexible blanks are not only gripped more tightly but the blanks are undulated and a whipping action imparted thereto which throws off any foreign material such as flakes of wax, lint from the cutting and the like.

Upon passing through zone 23 and having the adjacent side edge of the blanks pulled into tight engagement with the side guide 57 by the upper and lower rows 58 and 60 of biased side register rolls the blanks are delivered to second carrier belt 54 and second cage 55 for advancement through zone 24. In sub zone 25, the glue lap 39 is prefolded through an angle of 180° by a twist belt 93, ironed down by an ironing roll 94 opened by a folder bar 95 and a parallel glue seam or strip is applied to the glue lap 39 by the adhesive applying roll 50 of a lower glue pot 97 of well known type. The glue lap 39 is thereby continuously coated with a straight uniform line of adhesive.

On the opposite side of the blanks, from the glue lap 39, the crease 34 of tapered blanks 30 enters zone 24 at maximum obliquity and cannot easily be overfolded at high speed by ordinary folding apparatus. To align this side of the blanks with a side guide by a second installation of side register means 53 would take up valuable floor space and misalign the glue lap side thereof. A novel prefolding means 99 is therefore provided in zone 24 capable of prefolding a non longitudinally extending crease accurately on the crease and without fracturing the blank at high speed.

Instead of supporting the blank from below and pre-

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folding the crease 34 above the level of the blank as in the case of crease 33, all support is eliminated from below sides 37 and 38 of the blanks 30 in zone 24 to permit a downfolding action. The second carrier belt 54 and cage 55 engage the blanks on the glue lap side of crease 33 for advancing the blanks through zone 24 without preventing such downfolding.

A horizontal belt pulley 100 and an inclined belt pulley 101 are provided, the former being journaled outside the path of the blanks and the latter being journaled above and inside the path of the blanks. Pulley 101 is carried by a bracket 102 and is driven by a pulley 103, belt 104 and drive pulley 105 synchronized with the drive mechanism of the machine 20. A twist belt 106 is trained around pulleys 100 and 101 and provided with an integral, outwardly projecting flange 107 along the side edge thereof which is uppermost. A fixed backing member 108 is also provided having an overhanging flange 109 and carried by bracket 102 and a bracket 110 for guiding and retaining the belt 106. As the flat, twisted, tapered blanks 30 enter zone 24, the leading outside corner of side 38 is lifted upwardly by a deflector 111 and then engages the inside stretch of belt 105 just under the then downturned flange 107 and as the blank continues to advance the outside edge of side 38 is forced inwardly thus causing a downfold on crease 34. Upon arriving at the end of the flanged and oblique belt 106 the side 38 is prefolded nearly up to side 37 and the blank is retained in this condition by a guide bar 112 until it reaches the final folding zone 27.

In zone 27, a pair of oposite twist belts 113 and 114, of a well known construction, are provided to overfold side 35 flatwise on side 36 and to overfold side 38 flatwise on side 37 thereby forming completed collapsed tubular cartons. The flanged twist belt 106 will prefold the adjacent sides of straight sided cartons passing through the zone 24 but is particularly adapted to prefold tapered cartons. The second carrier 54 and cage 55 overlap slightly into zone 27 to enable the twist belts 113 and 114 to assume control of the blanks and the guide bar 112 is provided to bridge the gap between pulley 101 and twist belt 114. Ironing rolls 116 are provided to iron down the glue seam in zone 28.

I claim:

1. Apparatus for conveying box blanks along a path and side registering the same, said apparatus comprising a longitudinal side guide mounted alongside the path of said blanks; an upper, longitudinal, row of spaced, cylindrical rolls each rotatable around lateral, inwardly extending, parallel axes above said path and adjacent said side guide; a lower, longitudinal row of spaced, cylindrical rolls each rotatable around lateral, inwardly extending, parallel axes below said path, the upper and lower rolls of each row being staggered and overlapping each other vertically a uniform amount for forming an undulating path therebetween and all of said rolls being uniformly angled from normal to said side guide and adapted to urge blanks, gripped between said upper and lower rows of rolls, laterally into edgewise contact with said side guide while whipping and undulating the same and belt and pulley means for driving all of said angled rolls at the same speed.

2. A combination as specified in claim 1 wherein the rolls of one said row are each provided with a circumferential groove of uniform dimensions, said grooves forming a straight line oblique to said guide from the first to the last roll and a drive belt extends obliquely along said grooves for driving said grooved rolls.

3. A combination as specified in claim 1 wherein the drive means for said rolls comprises a plurality of concave grooved pulleys each rotatably connected with one of the rolls of one of said rows, a plurality of convex grooved pulleys, each rotatably connected with one of the rolls of the other of said rows, said concave grooved pulleys being staggered with relation to said convex

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grooved pulleys and a drive belt having a stretch trained between the adjacent grooved faces of said pulleys for the full length of said rows for driving the same.

4. A machine for forming tapered collapsed tubular cartons from flat, flexible carton blanks, said machine comprising means for feeding and advancing a plurality of flat blanks individually and successively in untimed relation along a path through said machine, prefolding means along said path adapted to prefold each blank on the third crease thereof; side register means along said path including upper and lower parallel rows of spaced, staggered, uniformly angled driven rolls for gripping the first crease side of each advancing blank and accurately orienting the glue lap thereof in alignment with the glue roll of said machine while further longitudinally, misaligning the fourth crease of said blank; prefolding means along said path adapted to prefold each blank on the first crease, a glue roll along said path for applying an adhesive strip to the glue lap of each blank, prefolding means along said path adapted to prefold each blank on the fourth crease, while the fourth crease advances in longitudinal misalignment; and twist belt overfolding means along said path for overfolding each blank on the second and fourth creases thereof into collapsed tubular boxes.

5. A machine as specified in claim 4 wherein the individual rolls of said upper and lower rows of side register rolls are of elongated cylindrical outline and closely spaced from each other whereby blanks of small size are under continuous control thereof.

6. A machine as specified in claim 4 wherein the prefolding means for prefolding each blank on the fourth crease includes a flanged twist belt adapted to prefold the blank downwardly at the fourth crease whether the said crease is parallel to, or oblique to, the longitudinal centre line of the machine.

7. A machine as specified in claim 4 wherein all of said rolls are angled at an identical angle of about 1° from normal and the rolls in one row are grooved to receive a drive belt extending obliquely from proximate the inside of the first roll to proximate the outside of the last roll in the row.

8. In a high speed, straight line, folding and gluing machine for forming collapsed, tubular, tapered cartons from flat carton blanks, the combination of side register means, including a side guide accurately aligned with the machine glue roll and upper and lower rows of staggered, vertically overlapping, identical, driven rolls uniformly angled from normal to said side guide, the nips of said upper and lower rows of rolls forming an undulated path and being adapted to pull each blank, advancing therebetween, into tight sidewise engagement with said side guide, while undulating, and longitudinally misaligning the remaining creases of said blanks and prefolding means, for the tapered crease of said blanks most misaligned and remote from said side register means, said prefolding means comprising a twist belt having a projecting flange adapted to engage the side edge of each blank and prefold the blank downwardly on said remote misaligned tapered crease as the blank advances therealong.

9. A machine for forming collapsed, tapered, tubular cartons from flat, tapered blanks of flexible paperboard, said machine comprising means for advancing a plurality of such blanks individually and successively in untimed relation along a path through said machine, prefolding means along said path for prefolding each blank on the third crease thereof and opening the blank while said crease travels in substantial parallelism with the longitudinal centre line of the machine; side register means along said path comprising upper and lower rows of driven, angled, staggered rolls adapted to grip the glue lap portion of each blank, turn the blank and align the longitudinal glue lap edge thereof against a side guide extending parallel to the longitudinal centre line of said

machine, thereby further longitudinally misaligning the tapered creases of said blanks which are remote from said side guide relative to said centre line; rotating glue roller means for applying a longitudinal strip of glue to the glue lap of each blank while said glue lap travels in parallelism with the longitudinal centre line of the machine; flanged twist belt means along the path of said blanks for prefolding each blank downwardly on its longitudinally misaligned fourth crease and final overfolding means along said path for overfolding each blank on the second and fourth creases thereof into a collapsed tubular, prefolded carton.

10. In a folding and gluing machine for forming collapsed, tubular cartons from flat carton blanks, the combination of carrier belts for engaging one side of said blanks and advancing the same individually and successively along a path through a folding zone with the other side of said blanks free of support and a twisted

folding belt extending along said path in said zone, said belt having a projecting flange adapted to engage the free side edge of each successive blank and fold the free side of the same downwardly on a longitudinally extending crease line as the blank advances through said zone.

11. A combination as specified in claim 10 plus a backing member of rigid material mounted in said zone and co-extensive with said belt, said member having a projecting flange adapted to guide the projecting flange on said folding belt along said folding zone.

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