

Dec. 8, 1925.

1,565,167

H. S. LABOMBARDE

CARTON MAKING MACHINE

Filed Feb. 18, 1925

4 Sheets-Sheet 1

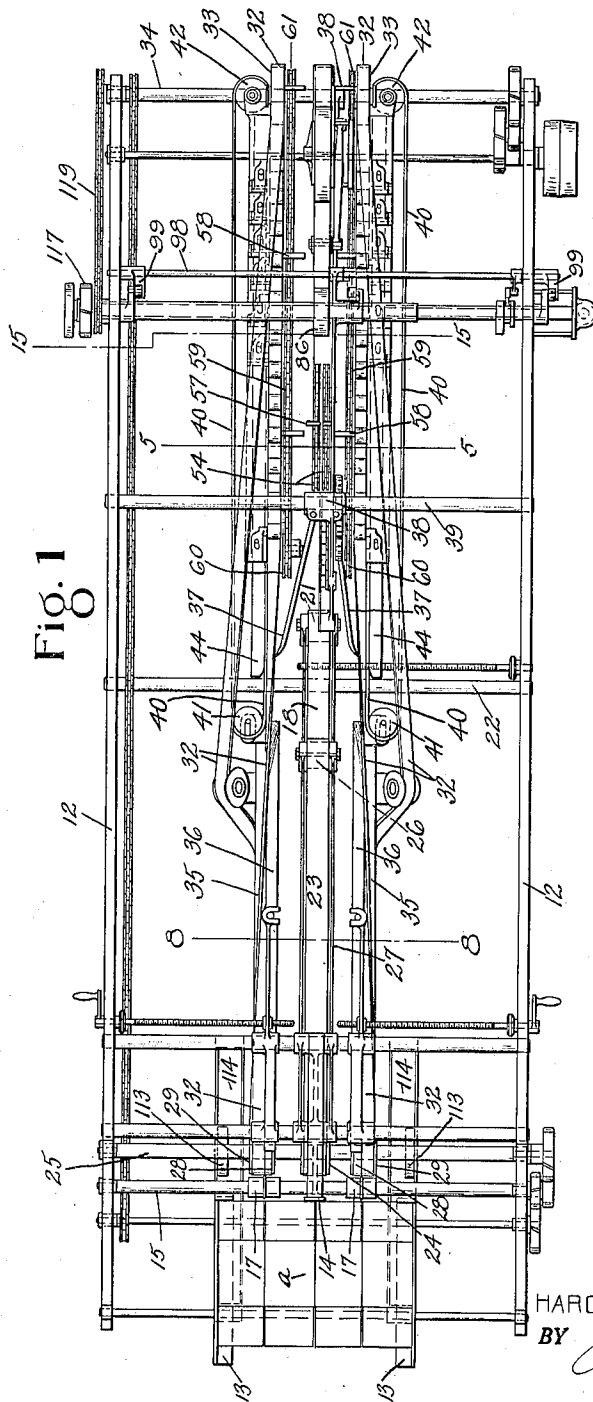


Fig. 1

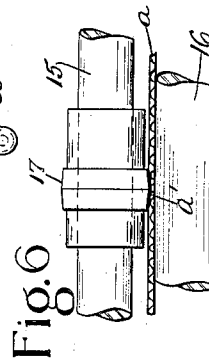


Fig. 6

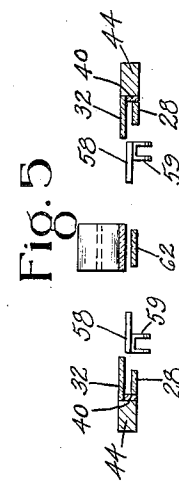


Fig. 5

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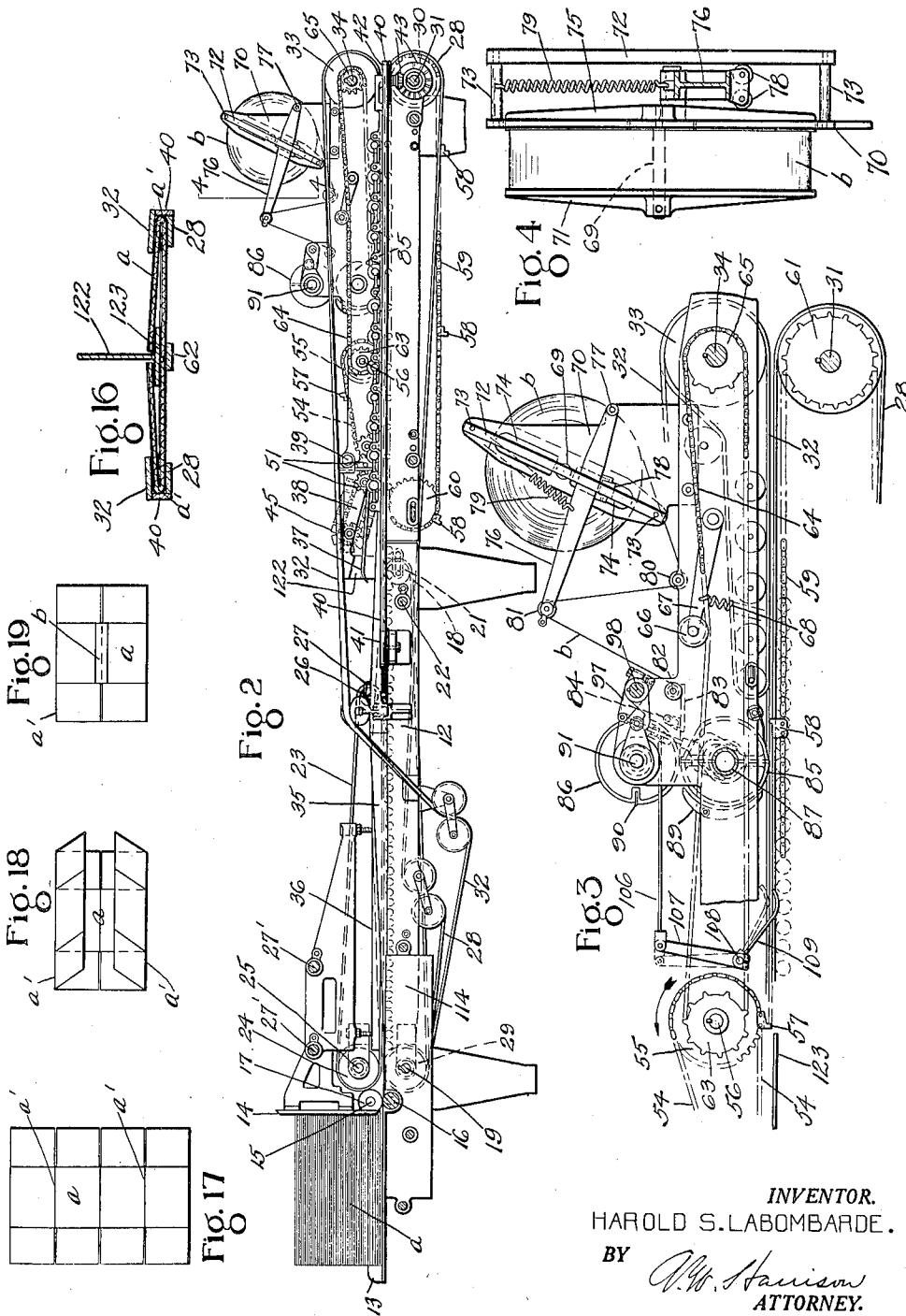
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4 Sheets-Sheet 2



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CARTON MAKING MACHINE

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Fig. 7

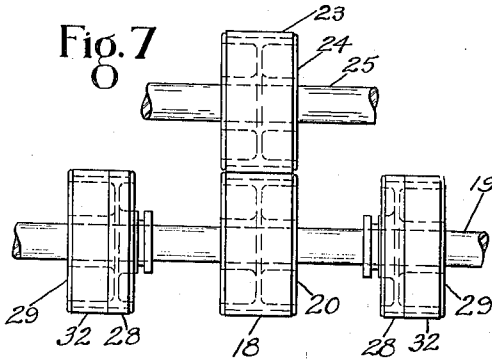


Fig. 8

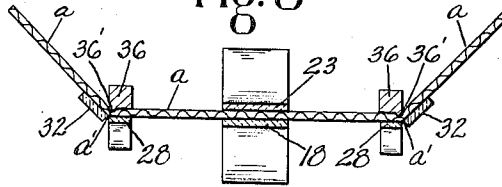


Fig. 9

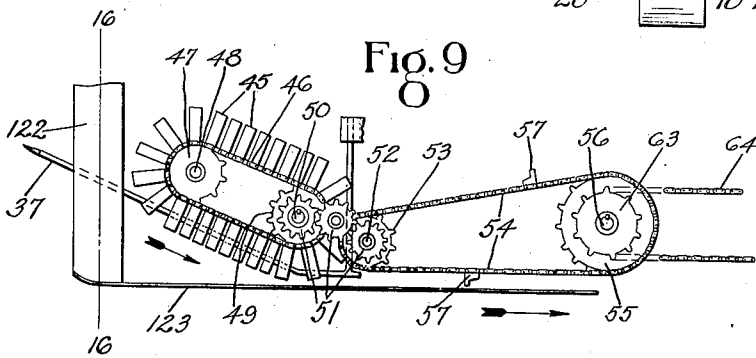
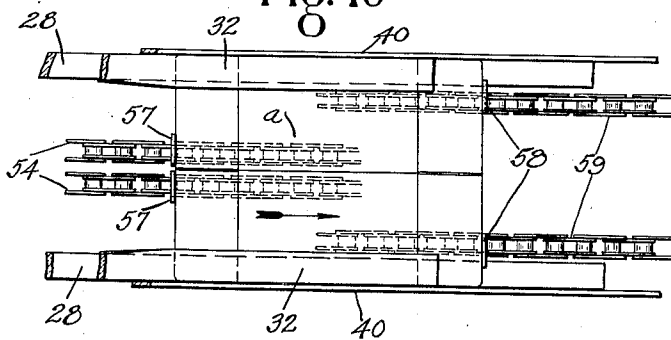


Fig. 10



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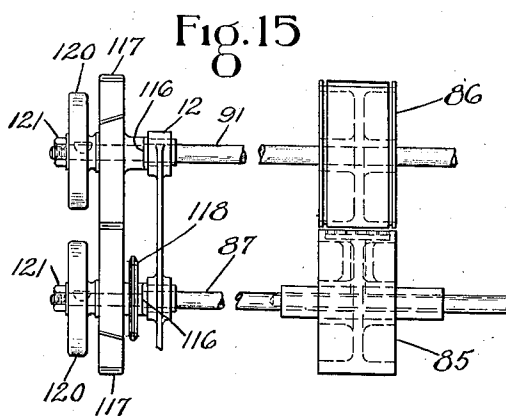
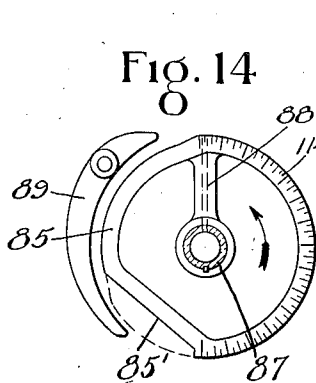
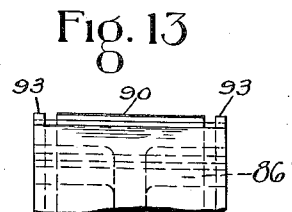
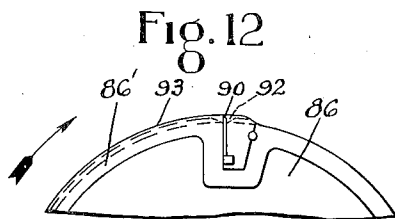
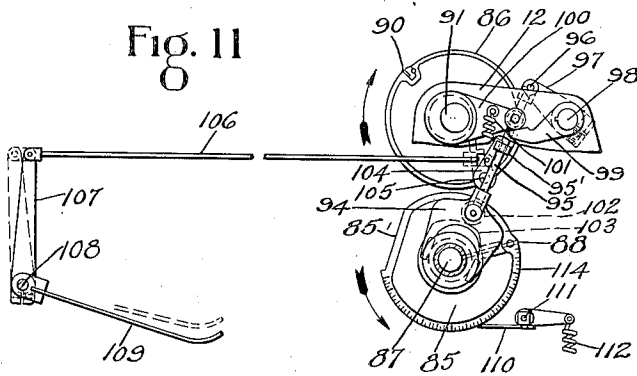
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CARTON MAKING MACHINE

Filed Feb. 18, 1925

4 Sheets-Sheet 4



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Patented Dec. 8, 1925.

1,565,167

UNITED STATES PATENT OFFICE.

HAROLD S. LABOMBARDE, OF NASHUA, NEW HAMPSHIRE.

CARTON-MAKING MACHINE.

Application filed February 18, 1925. Serial No. 9,924.

To all whom it may concern:

Be it known that I, HAROLD S. LABOMBARDE, a citizen of the United States, and resident of Nashua, in the county of Hills-boro and State of New Hampshire, have
5 invented certain new and useful Improvements in Carton-Making Machines, of which the following is a specification.

This invention relates to the production
10 of paper or pasteboard boxes, and has particular reference to the manufacture of corrugated paper cartons of the type comprising a blank cut and creased to provide four
15 wall sections having enclosing flaps, which blank is folded on two lines to bring its opposite side edges sufficiently close together to enable them to be joined by a strip of
20 tape which is applied along and across the line of juncture and adhesively secured in position so as to form a hinge joint when the carton is set up for use.

Machines as heretofore constructed for producing this type of carton have not been
25 entirely satisfactory because of difficulty in effecting a straight and close juncture of the adjacent or abutting edges prior to the application of the strip of tape, this being especially true when the material for making the cartons consists of previously cut
30 and creased blanks of corrugated paper, such material comprising a plurality of layers of paper. Usually the cartons showed lapped joints, or spaces between said edges slightly diverging from one end to the other
35 of the joints. The result was not only to present an unsightly appearance, but the cartons, when set up for use, then tapered somewhat from one end to the other, or the hinge provided by the tape would be too
40 loose.

A particular object of the present invention is to provide a machine which folds the blanks to bring opposite edges of each
45 blank into parallel close or abutting relationship from end to end and hold them so while a joining strip of tape is secured in position to hold said edges close together.

A further object is to provide a machine
50 of this character which, if a folded blank is passing to position for the application of the tape and has its approximately meeting edges not parallel, will automatically straighten or square up said folded blank to ensure parallelism of said edges.

Another object is to provide a high-speed
55 machine which automatically applies to

folded blanks, in accurate locations, sections of tape cut from a strip.

As is well known, strips of paper having a coating of moist adhesive, either due to a
60 dry-gummed coating which is moistened or to a coating of wet paste, are liable to curl up and stick to anything touched thereby. It is difficult to apply such strips correctly
65 to folded cartons. And in the production of cartons of the type described herein, good work can not be effected by applying adhesive to predetermined areas of the blank before folding and then lay strips of dry
70 tape on those areas, because in the work produced some of the adhesive will show beyond the edges of the strips or else the edges of the strips will be loose. This is
75 because it is not practical to always have the areas of adhesive accurately register with the size and locations of the tape sections applied thereon. For these reasons, another and important object of the present
80 invention is to provide a machine which will uniformly and smoothly affix the tape sections. I accomplish this object by applying
85 water to the proper areas of the blank before it is folded and then, after folding, press a strip of dry gummed tape thereon.

With the above and other objects in view,
85 the invention consists in the construction and combination of parts substantially as hereinafter described and claimed.

Of the accompanying drawings:—

Figure 1 is a plan view of the machine. 90

Figure 2 is a side elevation of the same.

Figure 3 is an elevation, similar to a portion of Figure 2 but on a larger scale and partly broken out or in section.

Figure 4 is a detail view on line 4—4 of
95 Figure 2, on a larger scale.

Figure 5 represents a section of some of the parts on line 5—5 of Figure 1.

Figure 6 is a detail view illustrating the
100 operation of the creasing rolls on the blank.

Figure 7 is a detail view illustrating the relative arrangement of the pulleys for the carrier and folding belts.

Figure 8 is a detail view illustrating the
105 action of the bars which condense the crease lines of the blanks.

Figure 9 is a side elevation of the mechanism for ensuring correct folding of the blanks with their edges close together.

Figure 10 is a plan view illustrating the
110 operation of the chain lugs which square up the folded blanks,

Figure 11 is a detail elevation of the tape feeding rolls and their associated parts.

Figure 12 is a detail view of the mounting of the cutter knife blade.

Figure 13 is a view looking from the left of Figure 12.

Figure 14 is a detail sectional view of the vacuum feeding roll.

Figure 15 is a view looking from the left of Figure 11, illustrating the means for adjusting the feed rolls.

Figure 16 is a detail sectional view illustrating how the folded edges are guided together.

Figure 17 is a plan view of a flat blank, and Figures 18 and 19 illustrate the blank as partly folded and as completed, respectively.

Similar reference characters designate similar parts in all of the views.

At one end of a suitable frame portions of which are illustrated at 12, is a feed mechanism for a pile of blanks such as indicated at *a* in Figures 1, 2 and 17. A suitable table for the pile includes angular strips 13. Mechanism not necessary to illustrate since it is not claimed herein, feeds the blanks singly and successively in proper timed relationship under a gate strip 14 and between driven shafts 15, 16, (Figs. 1, 2, and 6). The upper shaft carries two rolls 17 each of which tapers in opposite directions from its mid-length. The two rolls 17 are at such distance apart, and are so close to the lower shaft 16, that they act to compress the corrugated paper blank along the two lines *a'* on which the blank is to be folded as it passes through the machine. Each blank then passes to the forwarding action of several belts of which the lower middle carrier belt 18 is mounted at one end on a driven pulley 20 carried by shaft 19 (Figs 2 and 7) and at the other end on an idle pulley 21 supported by a casting mounted on a tie rod 22 at about the mid-length of the machine (Figs. 1 and 2). The upper carrier belt 23, which coacts with the belt 18, is mounted at one end on a pulley 24 carried by a driven shaft 25 (Figs. 1, 2 and 7) and at the other end on an idle pulley 26 mounted in the far end of a casting 27 supported by tie rods 27'.

Parallel with the operating run of the belt 18 and at opposite sides thereof are two narrow carrier belts 28 which travel the full length of the machine. At one end of said belts are mounted on pulleys 29 carried by the driven shaft 19 (Figs. 2 and 7) and at the other end on pulleys 30 carried by shaft 31 at the delivery end of the machine.

As best illustrated by Figure 7, the pulleys 29 are wide enough to carry belts 32 alongside of the belts 28. At the delivery end of the machine the belts 32 are mounted on

pulleys 33 carried by shaft 34. The operative runs of the belts 32 are twisted to act as folding belts in the manner well known in box-folding machinery, said runs being backed by twist guides 35 in the usual manner.

Above the belts 28 are two elongated bars 36 (Fig. 8) each having a rib 36' along and projecting below its base. Each rib is in line with the center or mid-length of a creasing roll 17 (Fig. 6) and is so close to the belt 28 below it, which belt as is usual for the carrying belts of box-folding machines, runs over supporting rolls, that the thick material of the corrugated paper blank is tightly pinched or compressed along the lines *a'* on which the blank is to be folded. This ensures folding on perfectly straight lines.

As the blank is then carried along, its two side sections ride over and are turned up by suitable inclined bars or rods such as are commonly employed in box-folding machines, after which said side sections are turned in by the twist belts 32 to about the relative positions illustrated by Figure 18. Said side sections of the blank then pass under the inclined folder bars 37 which are usually adjustably supported by a casting 38 mounted on one or more tie rods 39.

As is well known, corrugated paper is employed for making boxes or cartons which are of considerable size. The blanks are of such size and weight that they can not be accurately folded as readily as can be done with smaller blanks or blanks of single thickness material. To ensure such folding of corrugated paper blanks that the edges which are to be joined by tape will neither diverge nor overlap, I employ two coacting elements one of which elements comprises a pair of carrier belts which engage the folded edges of the blanks and not only guide but aid in feeding the blanks during the latter part of the folding operation, the other element comprising a central or mid-width thin guide against which the edges of the two marginal folded sections are urged during said latter part of the folding operation prior to the application of the tape. Preferably this last-mentioned element consists of an endless series of travelling thin plates mounted and operated as presently described.

The two feeding and edge-guiding belts above referred to are indicated at 40 (Figs. 1, 2, 5 and 10) mounted at one end, near the mid-length of the machine, on idler pulleys 41, and at their other or far ends on pulleys 42 which have driving bevel gear connections 43 with the shaft 31. The inner or operative run of each belt 40 is vertical and travels along the inner face of a guide bar 44 which, in practice, is so formed and mounted that the two bars slightly converge

toward the delivery end of the machine so that, as the blanks are being forwarded and their side sections folded in and down, the two belts 40 will urge the said side sections toward each other so that the edges of said sections will be caused to sweep down against opposite faces of the central thin guide. As best illustrated by Figure 9 said central guide consists of a series of thin plates 45 carried by a chain 46 mounted at one end on a sprocket 47 supported by a stud shaft 48, the other end of said chain being mounted on a sprocket 49 carried by a shaft 50 having a driving gear train connection 51 with a shaft 52.

Secured to the shaft 52 are two sprockets 53 close together, on which two chains 54 are mounted, said chains being also mounted on two sprockets 55 carried by a shaft 56 (see Figs. 1, 3, 9 and 10). Each chain 54 carries, at spaced intervals, small lugs 57 hereinafter referred to as kickers, this mechanism being supported in such position and driven at such speed that when a blank passes under the chains a pair of the kickers will contact with rear edge portions of the upper and folded sections of the blank (Fig. 10) and gently push or urge those sections forward. At this time the front edge of the lower or still flat sections of the blank are in contact with lugs 58 carried by two chains 59 (Figs. 2, 3 and 10) mounted on idler sprockets 60 and on driving sprockets 61 carried by the shaft 31. The lugs 58 travel a little slower than the kickers 57. During this portion of the travel of each blank its mid-width is supported by a suitable strip or belt 62 (Fig. 5).

It is to be understood that the belts all travel at the same speed, but it is always possible for a blank to slip relatively to the belts. By mechanism presently described, the shaft 56 is alternately driven at slightly different speeds so that, when at the faster speed, the kickers 57 will catch up with the rear edge of the upper in-folded sections and then slow down. Before this occurs the blank is advanced by the belts until the front edge of the lower flat sections reaches the lugs 58. Then the belts slip past the blank and the kickers or pushers 57 contact with the rear edges of the upper in-folded sections or flaps and square them up with the lower sections or body. The gearing or drive is proportioned so as to cause the kickers 57 to travel faster than the lugs 58 for a little while and then slow down. The mechanism for effecting this will now be described.

The shaft 56 carries a sprocket 63 (Fig. 3) for a chain 64 which, at the other end, is mounted on a sprocket 65 which is eccentrically mounted on the shaft 34 so that for each rotation of the shaft 34 and its sprocket 65 the chain 64 will slacken once and then

tighten; and this occurs once for each passing blank. An idler 66 carried by a pivoted arm 67 bears on the upper run of the chain and is held down resiliently by a spring 68.

The coil of gummed tape *b* (Figs. 1, 2, 3 and 4) is revolvably mounted on a stud 69 projecting from one side of a fixed standard 70 and is held thereon by a bar 71 removably pinned to the outer end of said stud. Projecting from the other side of said standard are two studs or pins 73 which support a bar or rail 72. The standard 70 has slots 74 through which portions of the brake bar 75 project to contact at times as presently described with the side of the tape coil opposite the holder bar 71. To actuate the brake bar, a lever 76 pivoted at 77 is provided with rolls 78 (Fig. 4) one of which rides against the rail 72 and the other against the inclined or cam-shaped surface of the brake bar 75. A spring 79 normally holds the lever raised (Fig. 3) and causes the inner roll 78 to press the brake bar against the tape coil to prevent the latter from revolving on its center stud 69.

The tape *b* passes under a guide roll 80 mounted in stationary position, then over a roll 81 carried by the lever 76, then under another guide roll 82 to and over a fixed plate 83 where it is held, to prevent backward slipping, by a friction pawl 84. The lever 76 acts as a strip take-up as well as the means for effecting intermittent action of the brake bar 75. When the strip is first pulled by the feeding means presently described, the lever 76 yields downwardly and this releases its action on the brake bar 75. The instant that the pulling action on the strip ceases, the lever 76 is swung up by its spring 79 and the brake bar automatically re-applies its holding action on the coil.

The tape *b* extends between feeding and cutting disks or rolls 85, 86, the lower one, 85, being carried by a hollow shaft 87 (Figs. 3, 11 and 14) having a port 88 communicating with the periphery of the disk. By any suitable connections not necessary to illustrate, the hollow shaft is connected with suction mechanism tending to produce a constant partial vacuum so that, by suction, the end of the tape strip will be held to the periphery of the disk 85.

The disk 85 is flattened at 85' to provide a surface to which a segment such as illustrated in Figure 14 can be secured when it is desired that said disk shall be of uniform radius throughout. Such segment will be employed when the lengths of tape to be drawn from the coil and cut are such that they will nearly equal the complete periphery of the disk.

The curved member 89 simply prevents the rear end of the tape section from whipping out as it is carried around after being cut as presently described.

The disk or roll 86 is not of uniform diameter or radius, as only a portion of its periphery is necessary to cooperate with the disk or roll 85, said operative portion being indicated at 86'. Near one end of the said portion 86' the upper disk or roll carries a knife blade 90 (Figs. 3, 11, 12 and 13) the shaft which carries said disk being indicated at 91. The blade 90 is mounted so that its edge projects beyond the surface 86' only an amount equalling the minimum thickness of the tape to be cut which, usually, is approximately 7/1000 of an inch. This is to prevent the knife from being dulled by contact with the roll 85. The knife blade extends through a recess 92 in the surface 86' said recess being formed to enable complete severance to be effected if, and when, it is necessary to cut through a double thickness of tape such as occurs when the portion to be cut consists of an overlapped or "patched" section of the tape.

To avoid any liability of such close contact of the cooperative surfaces of the feed disks 86, 85, that the knife might be dulled the disk 86 is formed with peripheral ribs or rails 93 (Fig. 13) which are about five or six thousandths of an inch higher than the surface 86'.

The mechanism which permits feed of the tape and the cutting off of a section thereof only when a folded blank is approaching position to receive a section of tape, will now be described in connection with Figures 3 and 11.

A yoke 94 engaging shaft 87 so as to be guided thereby, is provided with an upwardly extending arm or rod 95 having a lug 95'. Said rod at its upper end is pivoted at 96 to an arm 97 of a rock shaft 98, the latter having three other arms 99 one near each end as shown in Figure 1 and the third near the middle. Each arm 99 extends under a roll (Fig. 11) of an arm 100 of an eccentric bearing for the shaft 91 whereby, when the rock shaft 98 is actuated as presently described, the shaft 91 and its feed disk 86 will be raised far enough from disk 85 to prevent any feed of the tape. Each arm 100 may have a suitable spring 101 connected to it to pull it down.

The rod 95, at its foot, has a roll 102 in the path of a cam 103 of the shaft 87. A pawl or latch 104 is pivoted at 105 to a suitable fixed support connected to one of the side walls of the frame, the upper end of said latch being shouldered to engage the lug 95' of the rod 95. A link 106 connects the latch 104 to an arm 107 of a rock shaft 108, the latter having a finger 109 (hereinafter referred to as a trip) in the path of a blank approaching position to have a section of tape applied thereto.

The parts just described normally occupy the positions indicated by full lines in Fig-

ure 11, with the latch 104 under the lug 95' of the rod 95 and consequently holding the shaft 91 and the feed disk 86 separated sufficiently from the lower disk 85 to prevent any feed although both disks continue to rotate. This is due to the rod 95 being maintained raised and holding the rock shaft 98 in such position that its arms 99 hold the arms 100 of the eccentric bearings swung up to keep the shaft 91 raised. When a blank approaches position to be taped, it swings the trip 109 up to the dotted line position indicated in Figure 11, resulting in swinging the latch 104 away from the lug 95', thereby permitting the rod 95 to drop and the eccentric bearings to rotate to let the shaft 91 and its disk 86 descend to tape-feeding position. This descent of the rod 95 lowers its foot roll 102 into the path of the cam 103 so that the rod 95 will be raised and carry its lug 95' to position to be re-engaged by the latch 104 as soon as the blank has passed and permitted the trip to drop. When so re-engaged, no further feed of the tape will occur until another blank lifts the trip 109.

To render it certain that no tape section will remain adhering to the periphery of the disk 85, I employ a stripper 110 (Fig. 11) pivoted at 111 and having a spring 112 connected to it to hold its tip in contact with said disk. Said stripper operates in case the tape section fails to adhere to the blank strongly enough to be taken away from the disk by the blank on which it is pressed by said disk.

The tape is what is known as dry gummed. It is not moistened. Instead, water is applied to the areas of the blank to and across which the section of dry gummed tape is to be applied as illustrated by Figure 19. In practice it is preferable that the moistened areas shall be somewhat larger than the tape sections so that said tape sections will be fastened clear to their edges. Any moisture extending beyond or outside of the edges of the tape sections will soon evaporate. The moisture is applied by two rolls 113 (Fig. 1) which revolve in water tanks 114, said rolls applying films of water to the under surface of each blank, close to the side edges thereof, just after said blank leaves the feed hopper and passes the crasing rolls 17, before any folding occurs. The blanks travel through the machine at such speed that the moistened areas are still in condition to cause the gummed tape section to stick when it is pressed thereon by the disk 85.

Ordinarily the gummed tape section carried around by the suction disk 85 and pressed on the folded blank, will adhere to the blank so strongly that it will be pulled away from said disk although the suction remains constant. If for any reason the

tape section is not sticking tight enough to the blank to be pulled away from the suction disk, the stripper 110 will remove it. Said stripper therefore enables me to employ continuous suction instead of employing valves or other expensive mechanism to effect intermittent action of the suction.

To provide for cutting the tape into sections suitable for blanks of different lengths, the disks 85, 86, are independently adjustable relatively to their driving mechanism, and one of them, preferably the disk 85, carries a scale as indicated at 114' in Figure 11. The structure whereby the adjustment can be effected is best illustrated in Figure 15 in which each of the shafts 87, 91, is shown as formed with a collar or annular shoulder 116 outside the frame member 12. Mounted on the outer ends of the two shafts are intermeshing gears 117, and fixed to one of said gears is a sprocket 118 connected by a chain 119 (Fig. 1) with a sprocket carried by the shaft 34. Keyed on the projecting end of each shaft 87, 91, is a hand wheel 120 the hub of which is normally held tightly against the adjacent gear 117 by a nut 121 engaging the threaded end of the shaft so that the drive of the two shafts and their disks or rolls 85, 86, will be effected through the medium of the sprocket chain 119 and the intermeshing gears 117. When it is desired to alter the length of the tape sections to be cut and applied by the rolls 85, 86, the attendant loosens one or both of the nuts 121 so that either or both of the hand wheels 120 can be utilized to rotate one or both of the shafts to the desired degree while leaving the gears 117 stationary. Then the nuts are tightened up. The dial or scale marks 114 on the roll 85 (Fig. 11) enable the exact length to be determined for the tape sections, by cooperating with the knife blade of the roll 86. Numerals may accompany the scale marks. When the nuts are loosened as described, one or both of the shafts may be rotated until the said knife blade registers with a certain scale mark, and that mark will indicate the length of each tape section when the nuts are again tightened and the machine put in operation.

Suitably supported adjacent the shaft 48 is a stationary arm 122 from the lower end of which (Figs. 9 and 16) a strip or narrow plate 123 extends toward the delivery end of the machine.

As the driving mechanism and connections form no essential part of the machine excepting that they are such as to effect timing of the operation of the different successive elements to ensure proper spacing of the blanks as they are fed and caused to travel, and to attach the tape sections *b* (Fig. 19) to the folded blanks in proper locations thereof, a detailed description of the drive and connections is unnecessary.

In operation, each blank delivered by the usual timed feeder to the space between the two shafts 15, 16, is first acted upon by the two rolls 17, one of which is illustrated in Figure 6, so as to crease or score the blank by flattening it down on the two lines *a'* (Figs. 17 and 18) on which it is to be folded. Said rolls 17 press on the upper layer of the triple-thick corrugated paper and somewhat crush the intermediate layer. Such crushing of the intermediate layer facilitates the later folding of the blank on two accurate lines.

From the rolls 17 the blank is taken by the forwarding or carrier belts and its side flaps are turned up (Fig. 8) by the folding belts 32, while the ribs 36' along the bottoms of the rigid bars 36 add to, or ensure continuance of, the pinched or compressed condition of the fold lines *a'* first imparted by the rolls 17, said ribs being in line with the apexes of the said rolls 17.

As the blank travels along, its side flaps are turned up to about 90 degrees by the twist belts 32 and then the blank enters between the two side pressure belts 40 (Fig. 1) which travel at the same speed as the carrier belts 28 and folder belts 32 so that all six of said belts continue to act on the blank. As indicated by Figure 5, the three belts 28, 32, 40, at each side present a three-sided travelling formway, the side pressure belts 40 adding to the carrying or forwarding action of the other belts 28, 32, and maintaining the blank in parallel condition during the time that the usual folder bars 37 and the folder belts 32 are completing the fold.

This folding mechanism swings the side flaps or marginal portions inward and down against opposite sides of the traveling plates 45 (Fig. 9). In all box folding machines employing folder bars, folder belts, or any non-reciprocating mechanisms, there is always a tendency of spreading the rear ends and overlapping the front ends of the inwardly folded flaps. This tendency is much more pronounced when the blanks are of corrugated paper because the blanks are stiff and require heavy pressure on the forward ends to fold them. And the nature of the corrugated layer is such as to interfere with uniform folding. It is essential therefore that means be provided to prevent the overlapping without, however, preventing the edges of the side flaps of the blank from being brought close together to receive the joining tape. This desirable result is effected by the travelling plates 45 or by what is sometimes a practical equivalent thereof, a single stationary thin plate in the same location. As the blank flaps travel forward and swing inward and down, the plates 45 prevent the forward edge portions of the flaps from overlapping and, in fact, act somewhat to spread said portions. In prac-

tice, the flaps, as they fold down flat, strip off from the plates without the rear portions of their edges coming in contact with the plates to any such extent as to spread them. Consequently, during the last folding operation, the blank receives a spreading action only at the front end of the joint, which counteracts the overlapping tendency received during the first part of the folding operation.

As the folded blank leaves the mechanism just described, the forward edge of its lower or body portion arrives against the lugs 58 of the slightly slower travelling chains 59 (see Figure 10 in connection with Figures 2, 3 and 9) while the "kickers" 57 of the closely-adjacent chains 54 arrive against the rear edge corners of the flaps. At this time the edges of the flaps are resting on the strip plate 123 (Fig. 16) so that their rear edges will be maintained in proper plane to be acted upon by the said "kickers" 57. The said "kickers" now slightly accelerate in speed, due to the mechanism hereinbefore described, and push the flaps forward slightly beyond a square position in order to give a permanent set to the folded blank, but as the "kickers" pass up around the sprockets 55 (Fig. 3) and leave the blank, the flaps spring back to square position. Meanwhile, the side pressure belts 40 reduce the width of the folded blank to standard. Said belts 40 are mounted so as to be adjustable to the spacing required to force the flaps toward each other to bring their edges into close or even, when desired, abutting relationship, to receive the joining tape.

When the folded blank reaches position to operate the trip 109, the disk or wheel 86 is dropped against the lower disk or wheel 85, and a section of tape is fed, cut off, and applied to the blank as indicated in Figure 19, and as hereinbefore described. After such application of the tape, the blank passes under suitably mounted pressure rolls indicated in Figure 2 but not necessary to describe in detail, and the finished cartons are delivered to a suitable stacker.

An important feature of my invention is the provision of two parallel formways which prevent the formation of any taper-shaped folded blanks whether the blanks are of corrugated paper or other material. As best illustrated by Figure 16, each formway consists of a lower member 28, an upper member 32, and a side member 40. The two side members 40 traverse the space between the outer edges of the members 28, 32, and consequently hold or guide the side-fold edges of the blanks parallel while the folding members 32 are acting to complete the folding operation. The folding members 32 can not bear down on the partly folded blank close to its fold lines because the side guiding members 40 are high enough

to prevent the members 32, the outer edges of which extend above the upper edges of the members 40, from exerting pressure too close to the fold lines of the blank. In other words, the pressure necessary to swing the side flaps in and down is imparted at a slight distance from the crease or fold lines of the blank. This arrangement of the two formways serves very materially in preventing the folding of the blanks to complete flat folded condition with other than parallel side-folded edges. When the members referred to are belts travelling at uniform speeds, as hereinbefore described, the said members act to forward the blanks as well as fold them, thereby aiding in preventing the formation of taper-folded blanks.

Another important feature of my invention consists in the central thin guide or abutment which, as hereinbefore described, comprises the endless series of travelling plates 45 (Figs. 2 and 9), and the parts which cooperate therewith. Said guide, and the folder bars 37 at opposite sides thereof, are in such position lengthwise of the machine that their functions are performed immediately prior to the application of a tape section to join the adjacent edges of the folded blank. As the blank travels, its side flaps pass under the folder bars 37, and said bars and the folding belts 32 cause the flaps to swing in and down so that the edges of the flaps engage the plates 45. Said plates are then travelling in a forward and downwardly inclined direction, and preferably somewhat faster than the blank is travelling, and consequently there is no such jamming or curling of the flap edges which contact with the said plates as would be liable to occur if the central guide were stationary.

Having now described my invention, I claim:

1. In a machine having means for folding individual blanks to flat condition with adjacent edges, means for moistening areas of each blank near its edges, means for applying a strip of gummed tape to said areas, and means for causing the blanks to travel from the moistening means to the tape applying means in spaced and timed relationship to effect accurate location of the tape on the blanks.

2. In a machine for folding blanks to flat condition with adjacent edges, means for moistening areas of each blank near its edges before the blank is folded, and means for applying a single strip of gummed tape to both of said areas after the edges of the blank are folded to adjacent relationship.

3. In a machine for folding corrugated paper blanks, carrier belts and twisted folding belts, and a pair of bars having ribs for compressing the blanks on lines adja-

cent to the inner edges of the said folding belts.

4. In a machine for making corrugated paper cartons, means for folding the blanks and bringing their side edges into proximity, means for preventing said side edges from overlapping, and means for laterally urging the portions of the blanks having said side edges toward said preventing means.

5. In a machine for folding blanks, a pair of parallel formways to effect correct folding of the blanks while travelling, each formway comprising a lower member, an upper member, and a side member traversing the space between the outer edges of the said lower and upper members.

6. In a machine for folding blanks, a pair of parallel formways to effect correct folding of the blanks, each formway comprising lower and upper belts and a side member traversing the space between the outer edges of said belts.

7. In a machine for folding blanks, a pair of parallel formways to effect correct folding of the blanks, each formway comprising lower and upper belts and a side belt presenting an inner face adjacent the outer edges of the said lower and upper belts.

8. In a machine for making tape-joined corrugated paper cartons, means for folding the blanks and bringing their side edges into proximity, and a pair of belts bearing laterally against the fold-line portions of the blanks to hold them while said side edges are tape-joined.

9. A machine for folding and taping corrugated paper blanks, said machine having means engaging the outer surfaces of the fold lines of the blanks to laterally contract the folded blanks and urge their edges together, and means for applying tape to and across said edges after they are brought together.

10. A machine for folding and taping corrugated paper blanks, said machine having a pair of belts in position to bear flatwise against the outer surfaces of the fold lines of the blanks to urge the edges of the blanks toward abutting relationship, and means for applying tape to and across said edges after they are brought into abutting relationship.

11. In a machine for folding blanks, a thin abutment, means for causing each blank to travel and bring the edges of its in-turned flaps in contact with opposite surfaces of said abutment, and means for causing said abutment to travel toward the delivery end of the machine.

12. In a machine for folding blanks, a thin abutment, means for causing each blank to travel and bring the edges of its in-turned flaps in contact with opposite surfaces of said abutment, and means for caus-

ing said abutment to travel in a forward and downwardly inclined direction.

13. In a machine for folding blanks, an endless series of thin plates, means for causing said plates to travel, and means for bringing the edges of the blanks into contact with the opposite surfaces of said plates while travelling.

14. In a machine for folding blanks, an endless series of thin plates, means for causing said plates to travel in a forward and downwardly inclined direction, and means for bringing the edges of the blanks into contact with the opposite surfaces of said plates while travelling.

15. A machine for folding and taping corrugated paper blanks while said blanks are travelling, said machine having a thin vertical abutment at its mid-width, means for folding marginal sections of each blank toward each other and said abutment, and means for applying tape to connect the edge portions of said marginal sections after passing said abutment.

16. A machine for folding and taping corrugated paper blanks while said blanks are travelling, said machine having a series of travelling plates at its mid-width, means for folding marginal sections of each blank toward opposite surfaces of said series of plates, and means for applying tape to connect the edge portions of said marginal sections after passing said series of plates.

17. A machine for folding and taping corrugated paper blanks, said machine having means for straightening the folded sections of the blanks before application of tape thereto.

18. A machine of the character described, having means for straightening folded sections of blanks before application of tape thereto, said means comprising travelling abutments in the path of the middle portions of the blanks and pushers to engage rear edge portions of the folded sections of the blanks, means being provided for slightly reducing the distance between said pushers and abutments while a blank is between them.

19. A machine of the character described having means for straightening folded sections of blanks before application of tape thereto, said means comprising a pair of chains having abutments in the path of the middle portions of the blanks and another pair of chains having pushers to engage rear edge portions of the folded sections of the blanks, means being provided to intermittently increase the speed of travel of the chains carrying the pushers relatively to the speed of travel of the other chains.

20. In a machine having means for folding blanks to flat condition with adjacent edges, means for applying a section of tape to join the said adjacent edges of each

folded blank, and trip-controlled mechanism for permitting operation of the tape-applying means only when a blank arrives in position to be taped.

21. A machine for folding and taping corrugated paper blanks, having means for cutting sections of tape and transferring the cut sections to passing folded blanks, a trip, and means whereby blanks approaching said cutting means will operate the trip and cause the cutting means to operate.

22. A machine for folding and taping corrugated paper blanks, having means for cutting sections of tape and transferring the cut sections to passing folded blanks, a trip in the path of blanks approaching said cutting means, and means controlled by said trip for permitting the cutting means to operate only when the trip is actuated by a passing blank.

23. A machine for folding blanks and applying tape thereto, having a pair of constantly driven tape-feeding disks, means for normally holding said disks separated to prevent feed of the tape, and means controlled by a folded blank approaching said disks for permitting the disks to grip the tape and feed it.

24. A machine for folding blanks and applying tape thereto, having upper and lower constantly driven tape-feeding disks, means for normally holding the upper disk raised, and trip-controlled mechanism for permitting said upper disk to drop only when a blank is approaching position to be taped.

25. A machine for folding blanks and applying tape thereto, having upper and lower constantly driven tape-feeding disks, means for normally holding the upper disk raised, a trip in the path of blanks approaching the disks, and means actuated by said trip for permitting said upper disk to drop.

26. A machine for folding blanks and applying tape thereto, having upper and lower constantly driven tape-feeding disks, a cam and means actuated thereby for raising the

upper disk, a catch for maintaining said upper disk raised until released, a trip in the path of blanks approaching the disks, and means actuated by said trip for releasing the said catch.

27. A machine for folding blanks and applying tape thereto, having a pair of tape-feeding and cutting disks one of which has means for causing the tape to adhere to it by suction, and a stripper for positively preventing the tape from remaining on the periphery of the suction disk.

28. A machine having means for folding blanks to flat condition with adjacent edges, means for moistening areas of each blank near its edges before the blank is folded, a support for a coil of gummed tape, a pair of coating tape-feeding and cutting disks one of which has a suction air-port communicating with its periphery, and means for conveying each folded blank to position for its moistened areas to have a section of tape pressed thereon by the suction disk.

29. A machine substantially as specified in claim 38, a stripper being located in position to positively ensure removal of the tape section from the suction disk.

30. A machine for folding and taping blanks, said machine having means for squaring up the folded sections of the blanks before application of tape thereto, and a support for the edges of said folded sections during the operation of the said squaring up means.

31. A machine for folding and taping blanks, said machine having means for squaring up the folded sections of the blanks before application of tape thereto, and a thin plate having a free delivery end in position to support the edges of said folded sections during the operation of the said squaring up means.

In testimony whereof I have affixed my signature.

HAROLD S. LABOMBARDE