Feb. 22, 1949. W. H. KUCKLINSKY 2,462,513

BOX FOLDING MACHINE AND METHOD

Filed Sept. 26, 1947

5 Sheets-Sheet 1

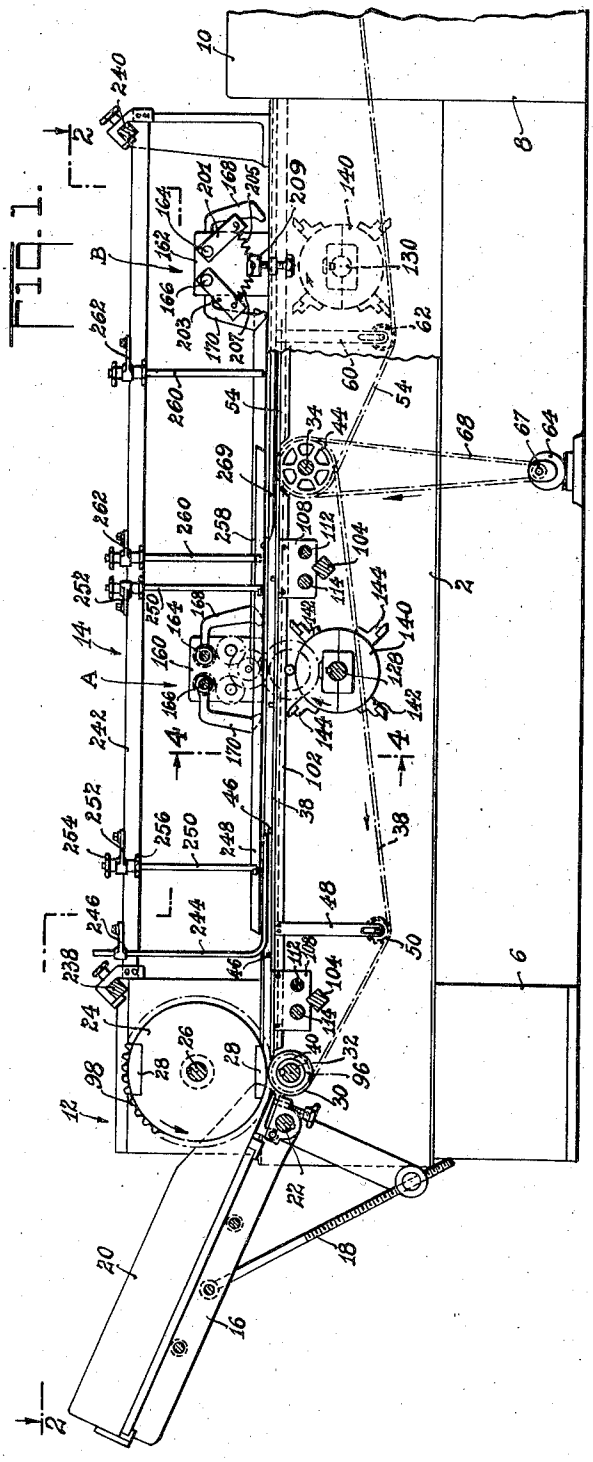


FIG. 1.

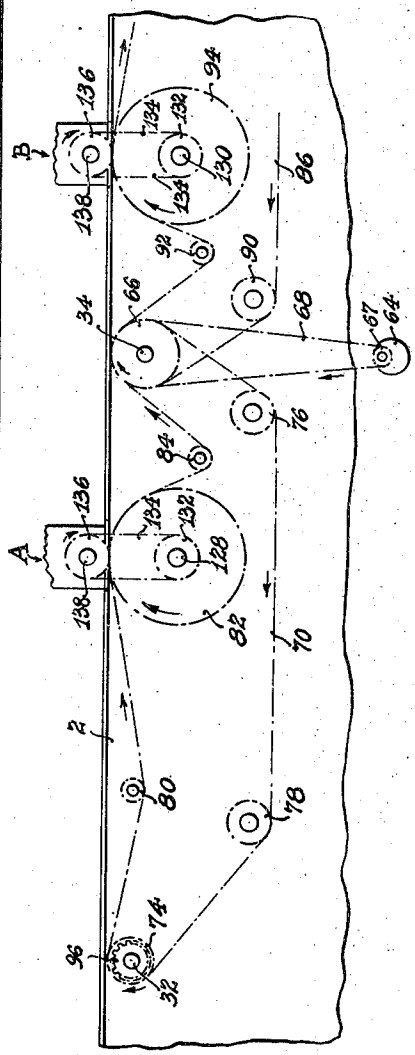


FIG. 2.

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BOX FOLDING MACHINE AND METHOD

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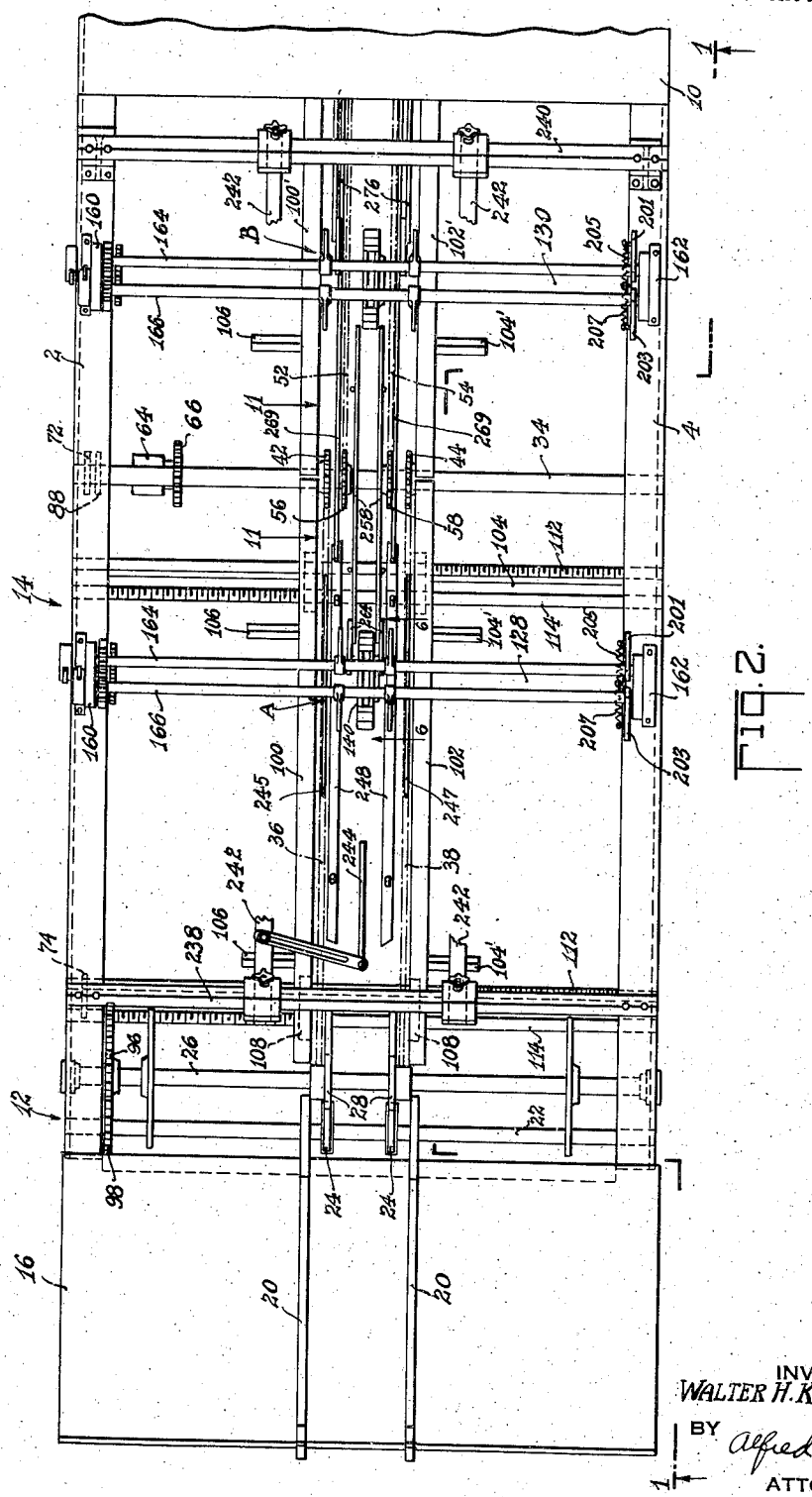


Fig. 2.

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BOX FOLDING MACHINE AND METHOD

Filed Sept. 26, 1947 5 Sheets-Sheet 3

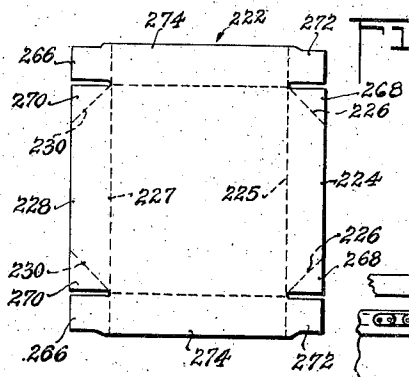


FIG. 5.

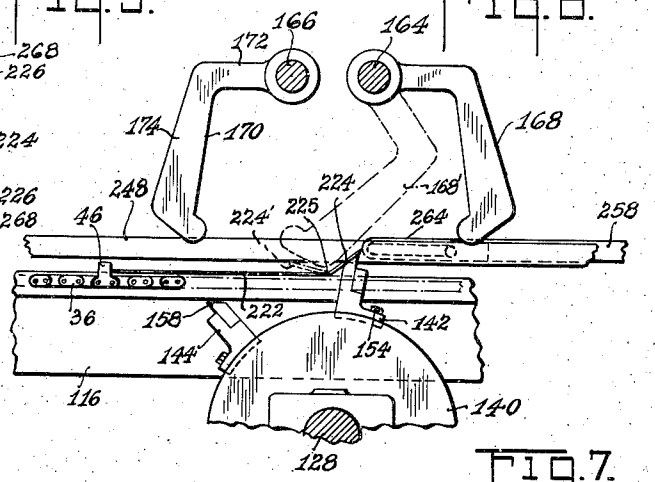


FIG. 6.

FIG. 13

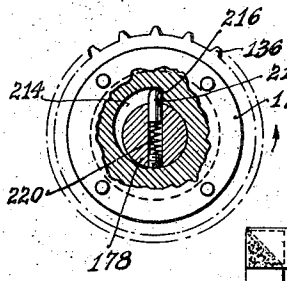


FIG. 17.

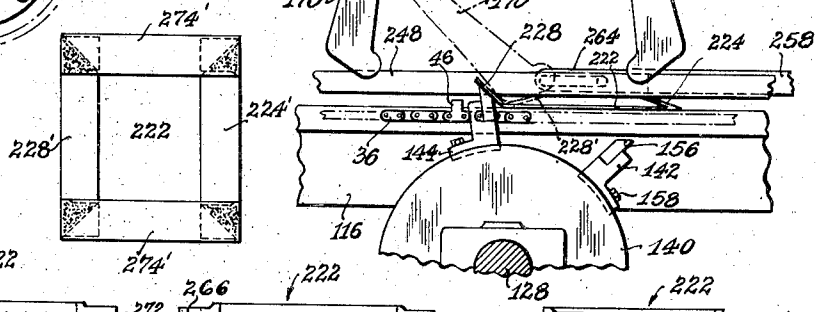


FIG. 7.

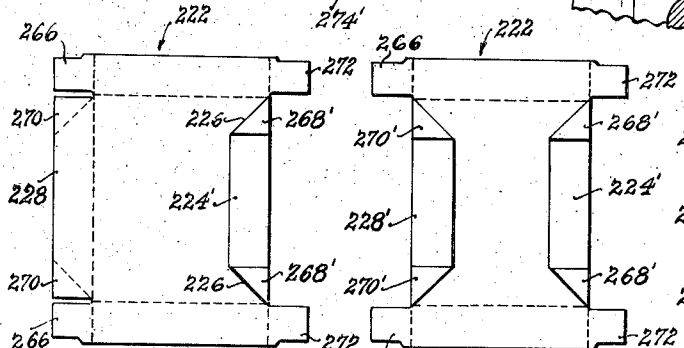


FIG. 14. FIG. 15. FIG. 16.

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BOX FOLDING MACHINE AND METHOD

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Fig. 4.

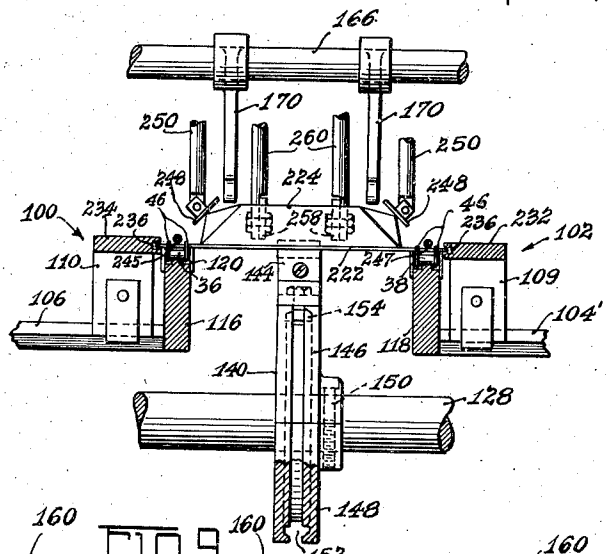


Fig. 8.

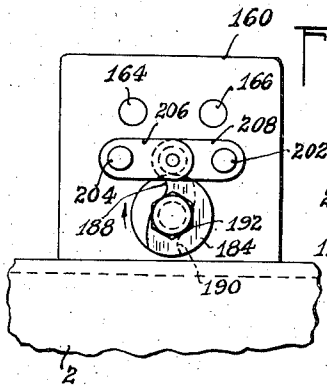


Fig. 9.

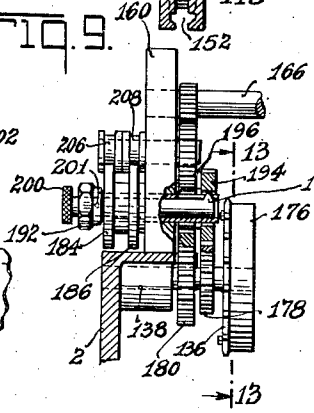


Fig. 10.

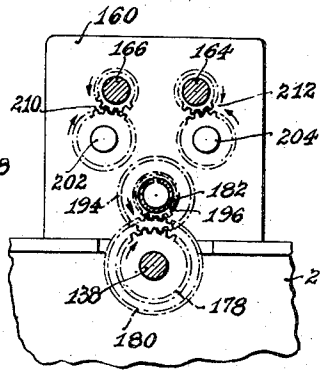


Fig. 11.

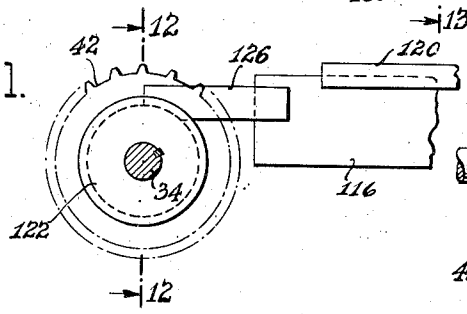
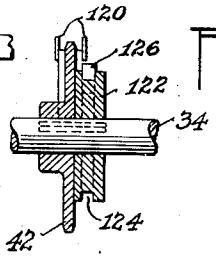


Fig. 12.



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BOX FOLDING MACHINE AND METHOD

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Fig. 18.

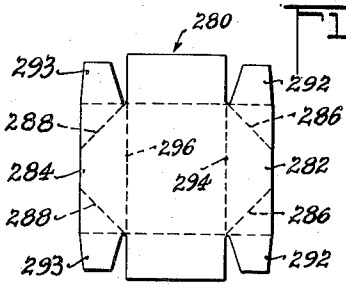


Fig. 19.

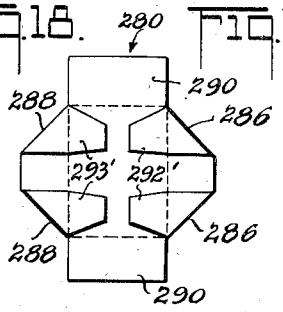


Fig. 20.

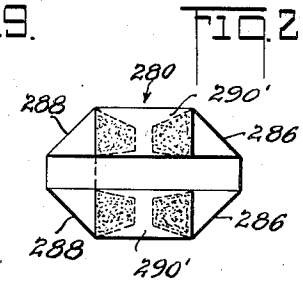


Fig. 21.

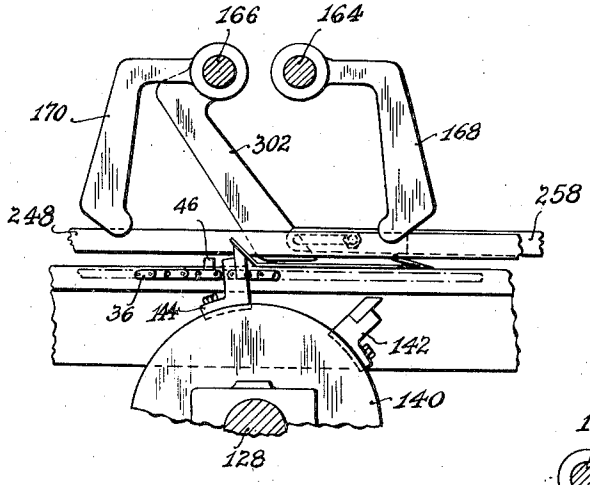
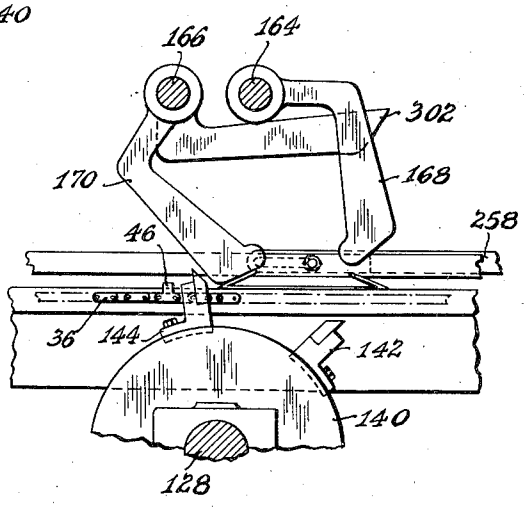


Fig. 22.



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Patented Feb. 22, 1949

2,462,513

UNITED STATES PATENT OFFICE

2,462,513

BOX FOLDING MACHINE AND METHOD

Walter H. Kucklinsky, Paramus, N. J.

Application September 26, 1947, Serial No. 776,227

17 Claims. (Cl. 93—49)

1

This invention relates to a box folding machine and method, more particularly to a machine for and a method of effecting folds in blanks of thin material such as paper and cardboard, such folds being along lines at substantial angles to the path of travel of the blanks, while such blanks travel continuously.

The invention has among its objects the provision of a folding machine of the type indicated which is characterized by its simplicity, its ease of adjustment, and thus the economy of its set-up and maintenance.

The invention has as a further object the provision of such machine which is capable of high speed operation without undue vibration and without subjecting any of its parts to undue strain.

A still further object of the invention is the provision of a box folding machine of the type indicated which may be readily assembled for operation with other box making devices such as blank feeding mechanisms which feed the blanks in definite spaced sequence and with a straight line gluer into which blanks folded by the machine of the invention may be fed.

Another object of the invention lies in the provision of an improved and simplified method of making folds in blanks of thin material, particularly folds transverse to the direction of travel of such blanks.

These and further objects of the invention will be more readily apparent in the description and the accompanying drawings.

Before the present invention, machines have been available for performing folding operations upon sheets of material such as paper or cardboard box blanks, in which such blanks traveled continuously and the folds were effected along lines at substantial angles to such path of travel. All of such prior machines, however, have been cumbersome and complicated, thus being expensive to manufacture and difficult to set up and maintain. The most widely known of such prior machines employs chains which travel parallel to the blanks as the latter are fed through the machine, such chains carrying a plurality of folding fingers which are progressively cammed toward the blanks thereby accomplishing such transverse folding. Such prior machines, however, are expensive to operate, require adjustment of a large number of parts, and are definitely limited as to their speed because of the impracticability of operating such folding finger carrying chains above the speed at which the centrifugal force thereon and the amount of wear on the camming surfaces and fingers become excessive. Furthermore, as stated, a large number of folding fingers are required, and the breaking of but one finger requires the laying down of the whole machine until it is replaced.

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The machine of the present invention is characterized, as before indicated, by its economy, simplicity, flexibility of set-up, and its ability to operate at high speeds.

In its preferred embodiment, the machine of the invention employs one or more rotary wheels carrying lifting fingers beneath the plane of travel of the blank, and a pair of folding finger supporting rock shafts above such wheel carrying one or more relatively light folding fingers, the blanks being presented to such lifting and folding fingers in timed relationship therewith. The machine, therefore, operates with relatively few parts, and the folding mechanism imposes practically no upper limit on the permissible speed of travel of the blanks through the machine.

The invention will be more readily understood by reference to the accompanying drawings, in which:

Figure 1 is a view partially in side elevation and partially in vertical section of the folding machine of the invention in combination with a blank feeding, means, and with a conventional timed spot gluer and straight line folder, only a fragment of such latter mechanism being shown, the section being taken along the line 1—1 in Figure 2;

Figure 2 is a view partially in plan and partially in horizontal section of the apparatus shown in Figure 1, the section being taken along the line 2—2 in Figure 1;

Figure 3 is a schematic view in side elevation of the driving mechanism for the apparatus shown in Figures 1 and 2;

Figure 4 is a view in vertical section through the folding mechanism of the machine at the first folding unit A, the section being taken along the line 4—4 in Figure 1;

Figure 5 is a view in plan of a blank for a Beers style tray;

Figure 6 is a view in vertical section through the first folding unit A of the machine, the section being taken along the line 6—6 in Figure 2, the front flap of the blank entering such folding unit being shown acted upon;

Figure 7 is a view similar to Figure 6 with the blank being shown leaving such unit, and the unit acting upon the rear flap of the blank;

Figure 8 is a view in side elevation of the cam unit for actuating the folding finger carrying rock shafts;

Figure 9 is a view partially in vertical section through the cam unit, the section being taken along a plane parallel to the cam shaft;

Figure 10 is a view partially in side elevation and partially in vertical section through the cam unit, the sectioning plane being transverse to the axis of the cam shaft;

Figure 11 is a view in side elevation of an outer sprocket of the main shaft of the machine and the chain track mechanism cooperating therewith, the view being taken along the line 11—11 in Figure 2;

Figure 12 is a view in vertical section through the axis of the sprocket shown in Figure 11, the section being taken along the line 12—12 in Figure 11;

Figure 13 is a view in transverse section through the one-way clutch in the cam shaft drive, the section being taken along the line 13—13 in Figure 9;

Figure 14 is a view in plan of the blank for the Beers style tray after the first folding operation in the first folding unit A;

Figure 15 is a similar view of the same blank after the second folding operation in the first folding unit A;

Figure 16 is a similar view of such blank after the second folding operation in the second folding unit B;

Figure 17 is a view of the completely folded and glued blank after it has been delivered from the timed spot gluer and straight line folder;

Figure 18 is a view in plan of a blank suitable for preparing either a diagonally out-folded or a diagonally in-folded tray;

Figure 19 is a similar view of the blank shown in Figure 18 at the completion of the folding operations by one folding unit of the machine of the invention, in the formation of a diagonally out-folded box;

Figure 20 is a similar view of the blank of Figure 19 after it has been subjected to the timed spot gluer and straight line folder;

Figure 21 is a view in transverse vertical section similar to Figure 6 of a modified folding unit employing one or more hold-down fingers, with the folding fingers in inoperative position; and

Figure 22 is a view in transverse vertical section, similar to Figure 7, of the modified folding unit, the rear folding finger being in flap folding position.

In the preferred embodiment of the folding machine shown, the machine is provided with a main frame consisting of the parallel side frame members 2 and 4, in the form of deep inwardly facing channels. Such frame is provided with the supporting and transverse connecting member 6, at the left hand end as shown in Figures 1 and 2, the right hand end being provided with a similar support 8 which forms a portion of the base of the conventional timed spot gluer and straight line folder 10 to which, in this instance, the folding machine of the invention is integrally attached.

The machine shown consists in addition to the timed spot gluer and straight line folder, of a feeding section 12 and a transverse flap folding section 14. The feeding section shown includes an inclined table 16 having an inclined adjustable brace 18 by which the inclination of the table may be varied as desired. The table is

provided with a pair of parallel adjustable side guides 20, between which the blanks to be fed are placed in a pile confronting the driven feeding mechanism. The forward lower end of the inclined table is supported on a transverse shaft 22 supported in the longitudinal frame members 2 and 4.

The feeding mechanism includes a pair of feed wheels 24 mounted for adjustment longitudinally of the driven shaft 26, which is journaled in frame members 2 and 4. Feed wheels 24 are provided, in this instance, with two diametrically opposed removable feed segments 28. The machine is operated at "double feed" when the blanks to be folded are less than one-half the circumference of wheels 24 in length. At double feed each of the pockets on the conveyor chains (subsequently to be described) set up as shown has a blank delivered to it, and each of the removable segments 28 employed is faced with material having high coefficient of friction, such as rubber and the like. When the length of the blanks exceeds one-half the circumference of wheels 24, the machine is operated at single feed, and only one such rubber faced segment is employed on each wheel, the other two segments, positioned in the same radial plane, being replaced by metal segments which exert no gripping effect on the blanks. At single feed, corresponding alternate lugs on the conveyor or feed chains are removed. Vertically beneath shaft 26 is positioned the driven transverse shaft 32, on which are positioned the friction feed rollers 30 confronting and cooperating with the feed wheels 24. Such mechanism which is generally known in the art, operates to deliver blanks one at a time in proper spaced relationship to the feed or conveying chains.

In the machine illustrated there are employed two folding units, designated A and B. Unit A, in the set-up shown, performs folding operations upon the central portions of the front and rear flaps of the blank, and subsequently unit B performs folding operations upon the forward and rear outer glue flap portions of the blank. Consequently in the machine shown there are employed two feed or conveyor chain sets, the first or forward set forwarding the blank by contact with the outer portions of its rear edge, and the second set, to which the blank is transferred from the first chain conveyor set at the rear of the first folding unit, forwarding the blank by contact with its now folded central rear edge portion. It is to be understood that the machine of the invention can complete all transverse folds in some box folding operations, as will subsequently be shown, when but one folding unit is employed.

The machine chosen to be illustrated is provided with a transverse shaft 34 designated the "main shaft," journaled in the frame side members 2 and 4. Such shaft constitutes the junction of the two chain conveyor sets and also in the embodiment shown constitutes the main source of drive of the various machine units. The first chain conveyor set is composed of the two chains 36 and 38, which run in spaced parallel vertical planes. Chain 38 is entrained over sprocket 40, on shaft 32, and over sprocket 44, on main shaft 34, being maintained in taut condition by means of the idler sprocket 50, adjustably positioned at the bottom of the vertical member 48 affixed to the laterally adjustable sub-frame 102. Chain 36 is similarly entrained over sprockets on shafts 32 and 34, such sprocket on shaft 34 being

denoted 42, and is held in taut condition by a means similar to parts 48 and 50 attached to laterally adjustable sub-frame 100. Each of chains 36 and 38 is provided with a series of removably mounted spaced lugs or upright pieces 46, corresponding lugs on the two chains being located in the same vertical plane parallel to shaft 34. The lugs are spaced longitudinally of the chains so as to provide blank receiving pockets thereon which are slightly longer than the blank to be folded.

The second chain conveyor set, to which the blank is delivered at the shaft 34 is composed of chains 52 and 54, which likewise run longitudinally of the machine in vertical planes. In the machine illustrated, such second chain conveyor set extends into the timed spot gluer and straight line folder 10 and may constitute if desired, the sole means for moving the blank through the gluer. Chain 52 is entrained over sprocket 56 on shaft 34, and chain 54 runs over sprocket 58 on shaft 34. It is to be understood that the other end of each such chain runs over a sprocket similar to sprocket 40, on a transverse shaft (not shown) supported within the gluer. Each of chains 52 and 54 is maintained in taut condition by the same mechanism as in the first chain conveyor set. Such means includes for chain 54, the vertical support 60 and the adjustable idler sprocket 62, mounted on sub-frame 102.

The various parts of the machine including those of the timed spot gluer and straight line folder, are driven by means of the geared motor 64 connected to shaft 34 by means of the drive sprocket 66 on the latter, sprocket 67 on the motor and chain 68 interposed between such sprockets. The manner in which the various units of the machine are driven from the main shaft will be apparent from the schematc showing in Figure 3 in which a first or forward machine drive chain 70 runs from the main shaft to the forward feeding end of the machine, and a second or rear machine drive chain 86 runs from the main shaft rearwardly into the timed spot gluer and straight line folder where it drives the elements of such gluer by means not shown.

Drive chain 70 runs in the direction of the arrows in Figure 3 from sprocket 72 on shaft 34 under idler sprockets 76 and 78, over sprocket 74 on shaft 32, under idler sprocket 80, over the large sprocket 82 driving folding unit A, under idler sprocket 84, and thence returns to sprocket 72. Chain 86, in its return from the timed spot gluer and straight line folder runs under the idler sprocket 90, over drive sprocket 88 on shaft 34, under idler sprocket 92, and over the large sprocket 94 for driving folding unit B, from which it travels into the timed spot gluer and straight line folder. The driving of shaft 26 and consequently feeding wheels 24 is effected by means of the pinion 96 on shaft 32, which meshes with the large spur gear 98 on shaft 26.

The sizes of sprockets 66, 74, 82, and 94, and of gears 96 and 98, are such that the speed of travel of the two chain conveyor sets is correlated with the speed of delivery of the blanks to the first chain conveyor set. Thus, when the machine is operating at double feed, a blank is delivered to each of the pockets set up as shown on the conveyor consisting of chains 36 and 38. With the same sizes of sprockets and gears, using the machine single feed, blanks will be delivered to successive pockets on such first conveyor, the pockets being twice the length of

the pockets shown, made, as explained, by removal of alternate lugs on the feed chains. It is to be understood that the machine shown, operating at double feed, is illustrative only and that by the proper correlation of sprocket and gear sizes feed wheels having three or even more equally angularly displaced feeding segments may be employed. The sprocket and gear sizes are also chosen so that the folding units A and B, to be specifically described hereinafter, operate in the proper timed relationship with the delivery of the blanks thereto.

In order to make the machine flexible, that is so that it may be adjusted to accommodate a wide variety of blank sizes, there are provided two sub-frame structures 100 and 102, mounted for transverse adjustment within the main frame, on the spaced parallel transverse rails 104, the outer ends of which are attached to frame members 2 and 4 by means not shown. The sub frames 100 and 102 are carried on slides 110 and 108, respectively. Adjustment of the sub-frames laterally in equal amounts from the longitudinal center line is effected by means of the shafts 112 and 114, which extend through the slides 108 and 110. The shafts 112 are threaded along one-half of their lengths and the shafts 114 are threaded along the other half of their lengths, the opening through each of the slides cooperating with the threaded portion of the shaft therethrough being internally threaded, and the opening therethrough cooperating with the smooth part of the other shaft being cylindrical. Means (not shown) are provided for turning shafts 112 and 114 in the proper directions so that the sub-frames 100 and 102 are adjusted as desired toward and away from the longitudinal center line of the machine.

Each of the two chains 36 and 38 of the first or forward chain conveyor set, on each side of such center line of the machine, is carried in the corresponding sub-frame for lateral adjustment therewith. Such chain carrying means includes the longitudinal upright plate 116 on sub-frame 100 and the corresponding plate 118 on sub-frame 102, as shown in Figure 4. Chain 36 runs along the top surface of plate 116, and chain 38 along the top surface of member 118, both the chains being confined for straight line travel thereon by the upstanding side plate 120 affixed to the upper side edges of plates 116 and 118. Sub-frame 100 includes guide member 234 engaging one side of each blank, such member being carried on supports 110 laterally slidable on rails 106 attached to member 116. In sub-frame 102 the corresponding guide member is designated 232, the supports therefor 109, and the rails, attached to member 118, 104'.

The sprockets on shafts 32 and 34, over which chains 36 and 38 run, are caused to move laterally with the sub-frames by the means more clearly shown in Figures 11 and 12. In these figures there is shown the construction of sub-frame 100 and sprocket 42 in the vicinity of the latter. Sprocket 42, which is non-rotatably mounted on shaft 34 for sliding movement thereon as by means of the spline and key connection shown, is provided with a hub 122 in which is cut a peripheral groove 124. The forward end of plate 116 of sub-frame 100 is provided with an extension 126, the forward end of which extends into groove 124. Thus, when the sub-frame is moved laterally, it carries with it the sprocket and the conveyor chain running thereover.

In order to allow the adjustment of the two

chains in the second, rear, conveyor set laterally of the machine, there are provided two separate sub-frames, independent of sub-frames 100 and 102, on which the chains of such second set are carried. Such separate sub-frames, designated respectively 100' and 102', are supported in the same manner as sub-frames 100 and 102, and are also adjusted in the same way by means not shown. Further, they cooperate with, and are connected to, the inner sprockets 56 and 58 on shaft 34, over which they run, in the same manner as sub-frame 100 does with sprocket 42. Since such construction is identical with that previously described, it is not necessary to show it or discuss it in detail.

The construction of the two folding units A and B is the same and thus it will suffice to discuss in detail the construction of unit A. Unit A is driven from the transverse shaft 128, on which sprocket 82 is mounted, and unit B is driven from shaft 130, on which sprocket 94 is mounted. From this point forward each of the elements of the two folding units and their drives is designated by the same reference character, since they are identical. A smaller sprocket 132 mounted on each of shafts 128 and 130 drives shaft 138 of the folding unit through the medium of chain 134 running over such sprocket and sprocket 136 on shaft 138. Also mounted on shafts 128 and 130 are one or more lifter wheels 140 carrying a plurality of radially disposed lifting fingers adjustably mounted circumferentially thereof, the fingers adapted to cooperate with the front flap of a blank being designated 142, and those cooperating with the rear flap of a blank being designated 144.

The construction of the lifting wheels will be more readily apparent from a consideration of Figure 4, in which the wheel is shown as being composed of diametrically divided halves, 146 being the top half and 148 the bottom half. The two halves of the wheel are secured together at the hub by bolts, of which one is shown at 150. The wheel 140 is provided with a circumferentially extending T slot 152 in which set the heads of bolts 154, which extend through the circumferentially extending flange at the base of each lifting finger to secure it to the wheel. In the embodiment shown in Figures 6 and 7, fingers 142 are provided with top surfaces 156 which extend at an angle of approximately 45 degrees to the radius of the wheel 140, each such face sloping downwardly and forwardly toward the feeding end of the machine when the finger lies vertically at the top of the wheel. The top surfaces 158 of fingers 144 extend at an angle of approximately 45 degrees to the radius, sloping inwardly toward shaft 128 in a direction opposite from surfaces 156.

Each folding unit is provided with two upstanding projections 160 and 162 on the side frame members 2 and 4, respectively, frame parts 160 and 162 forming the support for the two rock shafts 164 and 166, which extend between them and are journaled in them, and for the operating mechanism for the rock shafts. Rock shaft 166 carries keyed thereto one or more folding fingers 170, in this instance two, and rock shaft 164 carries two folding fingers 168. Fingers 168 and 170 are similar in shape, each having a portion 172 extending generally horizontal, when the finger is retracted, and a downwardly extending operating end portion 174, which is raised well above the plane of travel of the blanks on the chains when in inoperative position. Fingers 168 cooperate with the leading edge of the blank, as shown in Figure 6, in a manner to be subsequently more fully explained, and fingers 170 coact with the trailing edge of the blank. Shafts 164 and 166 are located on centers spaced equal distances forwardly and rearwardly of the machine, respectively, from the center line of shaft 128.

The means for driving the rock shafts from shaft 138 is shown in Figures 8, 9, and 10. In Figure 9, shaft 138 is shown as driven from sprocket 136 through the medium of one-way clutch 176, which drives the rock shaft operating cams positively in the operating direction but allows free rotation of the driving mechanism, with respect to the cams, in the opposite direction. Affixed to shaft 138 are a small pinion 178 and a large pinion 180 which constitute part of a change speed mechanism for driving cam shaft 182. The cam shaft carries an outer cam 184 and an inner cam 186, such cams being identical in configuration and both having steep drop-offs, that of cam 184 being designated 188 and that of cam 186 being denoted 190, so that the folding fingers swing rapidly from their retracted positions through their operating strokes. The cams are held on shaft 182 by means of the nut 192, which allows the cams to be adjustably positioned angularly with respect to the shaft and each other.

The remainder of the change speed mechanism of the cam drive is made up of the large pinion 194 loosely mounted on shaft 182 and permanently meshed with pinion 178, and the small pinion 196, loosely mounted on shaft 182 and permanently meshed with pinion 180. A key way is provided in shaft 182 in which is located the sliding key 198, which has a projecting tooth as shown which may be positioned selectively within a key slot in either pinion 194 or 196. An operating knob 200 on the outer end of key 198 allows the key to be slid to either of two such positions in which it is stably held by a conventional spring pressed ball detent 201 as shown. In the arrangement shown, such speed change mechanism makes possible either a 1–1 drive between shafts 138 and 182, or a 2–1 drive between such shafts. This allows the reduction of wear upon the folding unit rock shafts when the machine is operating at single feed, since the driving ratios are chosen so that the folding fingers operate only as alternate pockets on the chain conveyers are presented to them when the cam drive is through pinions 178 and 194, which are of equal diameter. When such drive is through pinions 180 and 196, however, the folding fingers operate as each pocket on the chains is presented to them, with the lug spacings on the chains as shown.

Frame 160 has journaled therein two laterally spaced stub shafts 202 and 204, on which are mounted the cam follower arms 206 and 208, respectively. Cam follower 206 coacts with cam 184 to rock shaft 164 counter-clockwise, as shown in Figure 8, through the medium of the interposed gearing 212; cam follower 208 coacts with cam 186 to rock shaft 166 clockwise, as seen in Figure 8, through the medium of interposed gearing 210. The relative sizes of gears composing each of gearings 210 and 212 allow the attainment of the desired included angle of rocking of the shafts, and allow the ready change of such angle for each shaft simply by a change of gear ratio without modification of the cams themselves.

The cam followers 206 and 208 are maintained in contact with their respective cams by means of

the mechanism shown adjacent frame part 162 at unit B in Figure 1, and at the bottom of Figure 2 at both units. Such mechanism consists of the arm 201 on rock shaft 164 and arm 203 on rock shaft 166, coil springs 205 and 207, respectively, being connected to the outer ends thereof, and to the vertically adjustable block 209 (Figure 1), whereby the tension in such springs may be varied. It is to be understood that, instead of the flat peripheral type cams and the spring follower mechanisms shown, there may be employed if desired positive driving double faced cams having cam tracks which allow dispensing with the spring follower mechanism.

The structure of the one-way clutch 176 is shown more clearly in Figure 13, wherein the bore through the clutch body is shown as being in the form of a spiral 214 throughout one-half of its angular extent, there being provided a sharp radial shoulder 216 at the end of such spiral furthest from the center of the bore. A radially disposed pin 218 is provided, spring pressed outwardly from the bore in shaft 178 by spring 220. It will be seen that upon the driving of sprocket 136, which is bolted to the clutch body, in a counter-clockwise direction (Figure 13), shaft 178 will be positively driven therefrom. If, however, sprocket 136 is turned clockwise, shaft 178 is allowed to remain stationary since the pin 218 will merely ride up the spiral 214 and drop off at shoulder 216. The provision of the one way clutch allows the machine to be turned backwardly by hand, if necessary in case of a jam. Such hand turning of the machine would otherwise not be possible without loosening the cams 184 and 186 on shaft 182, because of the sharp drop-off of the cams, against which the cam followers would lock.

The machine shown set up as in Figures 1 and 2, is adapted to perform, among other transverse folding operations, folding operations making a Beers style tray. It will aid in understanding the machine and its operation to consider the typical Beers style blank shown at 222 in Figure 5. Such blank, which is made of heavy paper or cardboard, is adapted to travel through the machine in the horizontal direction as shown in that figure. The blank is provided with a front score line 225 and a front flap 224, the outer edges of which are scored diagonally at 226, and with a rear score line 227 and a rear flap 228, the outer edges of which are diagonally scored at 230. The blank is further provided with two side flaps 274, the front ends of which have short glue flaps 272 thereon, and the rear ends of which have short glue flaps 266 thereon.

The machine of the invention, set up as shown for the formation of a Beers style tray, in unit A folds flaps 224 and 228 upwardly over the main body of the blank, and folds the triangular glue flaps 268 and 270 on the edges of such flaps bounded by a diagonally scored lines 226 and 230, backwardly upon the folded blank. The folding operation in unit B folds flaps 272 and 266 inwardly upon the body of the side flaps 274.

The flat blanks 222, as shown in Figure 5, are fed to the first chain conveyer set by the feeding means previously described, when the machine operates at double feed, so that one blank is deposited in each pocket in the conveyor. When the blanks lie upon the upper surfaces of chains 36 and 38 their edges fit within the guide plates 232 and 234, affixed to the frames 102 and 100, respectively, as shown in Figure 4. Inwardly facing grooves 236 in such guide plates aid in preventing the blank from jumping out of such pockets. Soon after leaving the feeding wheels 24 and being deposited upon the first chain conveyor, the blanks pass under a hold-down bar 244 which is in the form of an L, the vertical stem of which is adjustably attached to the horizontal adjustable cross arm 246, and the bottom arm of which substantially parallels the upper surface of the blank beneath it and contacts such surface of the blank to impose a frictional drag on the blanks, thus retaining them against the rear lugs of the pockets. The machine is further provided with other blank guiding and manipulating mechanisms adjustably supported in the same manner as arm 246. The supporting means for such mechanisms take the form of the forward and rear cross bars 238 and 240, respectively, on which are adjustably positioned the two parallel longitudinal top bars 242. From bars 242 are supported two longitudinally extending plow bars 248 supported by means of vertical rods 250 attached thereto, each of such rods being held by the adjustable transverse arms 252 through the medium of the upper and lower adjusting nuts 254, and 256, respectively. The plow bars, as indicated in Figure 4, are supported on the bottom ends of rods 250 so as to be angularly adjustable about their own longitudinal axes. The top supporting structure of the machine further supports the pick-up bars 258, shown in Figure 4 as lying inside the plow bars, the pick-up bars being attached to the longitudinal supports 242 by means of the vertical rods 260. The transverse arms 262 on supports 242 and the rods 260 allow the adjusting of the pick-up bars as desired toward or from the longitudinal center line of the machine. The forward ends of the pick-up bars 258 are provided with nose pieces 264 which are longitudinally adjustable with respect to the body of the pick-up bars, as shown more clearly in Figures 6 and 7. Further L-shaped hold down and drag imposing members similar to member 244, and similarly supported from the top supporting structure of the machine are employed at the sides of the blank in the zone of unit A, as shown in Figure 2. The bottom portions 245 and 247 of such members lie substantially parallel to and above the feed chains 36 and 38, respectively (see Figure 4), and contact the upper surface of the blanks to impose a retarding drag on the latter. Such construction insures the blanks being maintained in contact with the rear lugs 46 forming the pockets on the feed chains.

The operations of the machine whereby blanks 222 are folded to the form shown at Figure 16 will now be explained. Lugs 46 on chains 36 and 38 of the first conveyor set are so positioned with respect to the lifting finger 142 of wheel 140 in unit A that the upper edge of face 156 of such finger contacts flap 224 of the blank just forward of score line 225. The blank and the lifting finger then both travel to the right in Figure 6, flap 224 being raised progressively. When such flap has been raised to a substantial angle, in this instance about 30 degrees, the folding fingers 168 on rock shaft 164 are brought into action by the cam 184 and attendant mechanism previously described. Fingers 168 then rapidly swing clockwise (Figure 6) from their inoperative position to the position shown in dotted lines at 168'; folding flap 224 over to the position shown at 224'. The fingers 168 remain in their dotted line position for a sufficient length of time to allow the blank with its down-folded flap to travel under it, and under the forward end 264 of the pick-up bar 258, which re-

tains the flap in folded condition during further travel of the blank.

The plow bars 248 during such folding of flap 224 by fingers 168 function to fold the triangular glue flaps 268 back onto the folded blank into the position shown at 268' so that the blank, after the action thereupon by fingers 168, has the form shown in Figure 14. The action of the plow bars will be more clearly apparent by a consideration of Figure 4. As will be clear in that figure, in folding blanks 222, the machine is set so that the lugs 46 on the conveyor chains contact portions of the blank at the rear edge thereof which are not to be folded in the first folding unit. In this case, they contact the rear edges of flaps 266. The plow bars are set so that they lie over the score lines 226 and 230, and thus over glue flaps 268 and 270. The plow bars slope downwardly toward the plane of travel of the blanks in a direction from the forward end of the machine to the rear. When fingers 168 contact flap 224 and turn it back on the main body of the blank, flaps 268 are prevented from so turning by reason of their contact with the plow bars, and thus they are folded downwardly upon folded flap 224' about the score line 226, and extend from such score lines toward the front folded edge of the folded flap 224'.

When the conveyor chains 36 and 38 have traveled further to the right in Figure 6, the blank assumes such position relative to lifting finger 144 that such finger contacts the rear flap 228 just rearwardly of the transverse score line 227. Continued movement of the conveyor to the right and of the lifting wheel 140 clockwise results in the lifting of flap 228 to a substantial angle to the body of the blank, as indicated in Figure 7. Thereupon the folding fingers 170 come into play, rapidly swinging from the full line position in Figure 7 to the dotted line position indicated at 170' thereby folding flap 228 into the position shown in dotted lines at 228'. The finger retains the flap in such folded position long enough for it to enter in that position under the pick-up bars 258 and their nose pieces 264. During such folding of the rear flap 228, triangular glue flaps 270 are folded in the same manner as, but in an opposite direction from, flaps 268, by reason of their contact with the plow bars. When so folded, flaps 270 are denoted 270'. Blank 222 having been subjected to the described action of lifting fingers 144 and folding fingers 170, and having entered under the pick-up bars, has the configuration shown in Figure 15.

The thus folded blank then travels to the right and is transferred from the chains of the first conveyor set to the chains of the second conveyor set at the main shaft 34. The chains of such second set are positioned laterally of the machine so that the lugs forming pockets thereon contact portions of the blank which have already been folded, leaving free those portions of the blank to be acted upon in unit B. In this instance, the chains of the second conveyor are set inwardly of the chains of the first conveyor, and the lugs on the second conveyor chains contact the rear edge of the folded flap 228'. In such further travel of the blank the central folded flaps are held down upon the conveyors by longitudinal hold-down bars 269, which extend rearwardly in line with plow bars 258.

In unit B lifting fingers 142 of the wheels 140 and folding fingers 168 act upon the leading flaps 272 of the side portions 274 of the blanks so as to fold them over, as shown at 272', on the body of such side portions 274. Such folding operation is effected in the same manner as that depicted in Figures 6 and 7 in connection with the flap 224, except that no plow bars are necessary. Pick-up bars 276, positioned rearwardly of unit B, then function to hold flaps 272 in their down-folded position 272'. Further travel of the blank to the right allows the lifting fingers 144 and the folding fingers 170 of unit B to act upon flaps 266 and to fold them over the body of the side portions 274 into the position shown at 266'. After such operations on the blank by unit B, the folded blank has the configuration shown in Figure 16.

The thus folded blank is forwarded on the second conveyor to the time spot gluer and straight line folder where spots of glue, indicated in Figure 17, are placed upon the upper faces of flaps 266' and 272' and the side portions 274 are folded upwardly over the blank body to bring flaps 272' and 266' into contact with flaps 268' and 270', respectively. The blank when thus completed has the configuration shown in Figure 17 in which the glued joints are indicated.

The machine of the invention is useful in forming transverse folds, that is, folds extending at substantially right angles to or diagonally of the length of the blank, in types of boxes other than the Beers style. For the purposes of illustration a typical blank for forming both an out-folded and in-folded box is shown at 280 in Figure 18. Such blank is provided with forward flap 282, diagonally scored at 286, and provided on its ends with glue flaps 292. The blank is also provided with rear flap 284, similarly diagonally scored at 288, and provided with glue flaps 293 at its ends. In performing the transverse folding operations necessary to the formation of an out-folded folding box, only one folding unit such as unit A is necessary. Unit B may be disconnected or removed from the machine, or if the machine is to work upon out-folded boxes exclusively, it need be provided with but one folding unit. In working upon out-folded boxes the plow-bars 248 are removed from the machine. The blank 280 is fed along the horizontal direction in Figure 18, the chains of the first conveyor set being adjusted toward each other so that the lugs 46 thereon engage the rear flap 284 at points centrally within the score lines 288. In this instance two lifting wheels are employed on shaft 138, each wheel being located relative to the path of travel of the blank so that it lies below the path of the score lines 286 and 288, preferably substantially centrally thereof. The two folding fingers 170 and two folding fingers 168 are employed, one finger of each set being located in a vertical plane substantially through the corresponding lifting wheel.

As the leading edge of the blank enters the folding unit, the flaps on its forward end outside the score lines 286 are lifted by the lifting fingers 142, and are then folded over to the position shown at 292' in Figure 19. Further travel of the blank through the folding unit brings the rear glue flaps above the second lifting fingers 144 on the lifting wheels to thrust them upwardly, whereupon they are folded over on the body of the blank as shown at 293'.

The thus folded blank with the folded flaps held down by pick-up bars 258 suitably laterally adjusted is then forwarded to the timed spot gluer and straight line folder, where glue is spotted upon the side flaps 290, and such flaps are folded upon the glue coated flaps to occupy the positions 290', as shown in Figure 20.

Although the machine and method of the in-

vention have been illustrated and described in detail with the forming of transverse folds in Beers style trays and diagonally out-folded trays of the so-called two-piece box, it will be apparent to those skilled in the art that they are capable of use in many other different applications and in the formation of different types of boxes. Thus, for example, they are capable of use to advantage in forming transverse folds in thin material in general, particularly where such folds must be formed on a succession of similar blanks. They may also be used in forming one-piece boxes, with attached cover, simply by suitably supporting and guiding the blanks with the cover forming portion to travel along one side of the folding unit or units.

In Figures 21 and 22 there is shown a second embodiment of the folding unit. In Figure 21 the folding unit is shown with the folding fingers in inoperative position, and in Figure 22 the fingers 170 are shown advanced to rear flap folding position. The construction of such second embodiment is the same as that of the unit previously described, except for the provision of one or more hold-down fingers 302 which are positioned on rock shaft 166. Such fingers are useful in the folding of blanks of stiff material, and are designed to prevent the riding up of the rear edge of the body of the blank upon engagement with the rear flap by the lifting finger 144. The one or more hold-down fingers 302 are affixed to shaft 166 in a position angularly advanced with respect to finger 170 and so that the bottom surface of finger 302 in operative position closely approaches the upper surface of the blank. Thus the body of the blank is held down by finger 302 until the rear flap has been appreciably lifted by finger or fingers 144. Rocking of shaft 166 counter-clockwise (Figure 22) to bring fingers 170 into folding action results in lifting finger 302 so that it is removed from the folding zone.

Although I have described and illustrated preferred embodiments of the method of and machine for folding boxes of my invention, it is to be understood that such embodiments are illustrative only, and that the invention is capable of considerable variation as to details.

I claim as new the following:

1. The method of folding a transverse flap on a transverse edge of a box blank as such blank travels continuously, said transverse flap being scored diagonally at its corners, which comprises pressing the flap out of the plane of the blank to a substantial angle therewith by a pressing force applied to one side of the flap, thereafter completing the fold of such flap by applying a second pressing force to the upbent flap on the same side thereof in a direction generally parallel to the plane of the material, and parallel to the direction of travel of the blank and during the above two folding operations restraining the corners of the flap outside the diagonal score lines from moving with the flap a substantial distance in a direction normal to the blank, whereby each of such corners is given a reverse fold upon the folded flap.

2. The method of folding a transverse flap on a transverse edge of a box blank as such blank travels continuously horizontally, said transverse flap being scored diagonally at its corners, which comprises pressing the flap upwardly out of the plane of the blank to a substantial angle therewith by a pressing force applied to the under side of the flap, thereafter completing the fold of such flap by applying a second pressing force to the upbent flap on the same side thereof in a direction generally parallel to the plane of the material, and parallel to the direction of travel of the blank, and during the above two folding operations restraining the corners of the flap outside the diagonal score lines from rising substantially with the flap, whereby each of such corners is given a reverse fold downwardly upon the folded flap.

3. The method of folding the transverse flaps on the front and rear edges of a box blank as such blank travels continuously horizontally, said front and rear flaps being scored at their junctures with the blank body and diagonally at their corners, which comprises pressing the front flap out of the plane of the blank to a substantial angle therewith by a pressing force applied to one side of the flap, thereafter completing the fold of such flap by applying a second pressing force to the upbent flap on the same side thereof in a direction generally parallel to the plane of the material, and toward its line of fold on the blank, during the above two folding operations restraining the corners of the flap outside the diagonal score lines from rising substantially with the flap, whereby each of such corners is given a reverse fold downwardly upon the folded flap, and repeating such operations on the rear flap.

4. A machine for folding a flap on each of a succession of blanks of sheet material transversely to their path of travel while such blanks travel continuously substantially in their planes, which comprises conveying means for forwarding the blanks in predetermined spaced relationship, a folding station to which the conveying means presents the blanks, means at the folding station operating in timed relationship to the conveying means to press a flap on the same transverse edge of each of the blanks on the conveying means out of the plane of the blank to a substantial angle with the body of the blank, and means at the folding station to complete the folding of the flap on each blank by pressing the raised flap in a direction substantially parallel to the plane of the main body of the blank and toward the line of juncture of the flap and the body of the blank, said last named folding means comprising at least one folding finger on the side of the path of travel of the blanks toward which the first pressing means thrusts the flap, means for supporting the finger and means for operating the folding finger in timed relation to the presentation of the blank at the folding station.

5. A machine for folding a flap on each of a succession of blanks of sheet material transversely to their path of travel while such blanks travel continuously substantially in their planes, which comprises conveying means for forwarding the blanks in predetermined spaced relationship, a folding station to which the conveying means presents the blanks, means at the folding station operating in timed relationship to the conveying means to press a flap on the same transverse edge of each of the blanks on the conveying means out of the plane of the blank to a substantial angle with the body of the blank, and means at the folding station to complete the folding of the flap on each blank by pressing the raised flap in a direction substantially parallel to the plane of the main body of the blank and toward the line of juncture of the flap and the body of the blank, said last named folding means comprising at least one folding finger on the side of the path of travel of the blanks toward which the first

pressing means thrusts the flap, means for supporting the finger, and means for operating the folding finger in timed relation to the presentation of the blank at the folding station, the folding finger being so constructed and arranged that it is spaced substantially from the path of travel of the blanks in its inoperative position and in its operative travel is moved to engage the raised flap and fold it back on the body of the blank.

6. A machine for folding a flap on each of a succession of blanks of sheet material transversely to their path of travel while such blanks travel continuously substantially in their planes, which comprises conveying means for forwarding the blanks in predetermined spaced relationship, a folding station to which the conveying means presents the blanks, means at the folding station operating in timed relationship to the conveying means to press a flap on the same transverse edge of each of the blanks on the conveying means out of the plane of the blank to a substantial angle with the body of the blank, and means at the folding station to complete the folding of the flap on each blank by pressing the raised flap in a direction substantially parallel to the plane of the main body of the blank and toward the line of juncture of the flap and the body of the blank, said last named folding means comprising at least one folding finger on the side of the path of travel of the blanks toward which the first pressing means thrusts the flap, means for supporting the finger and means for operating the folding finger in timed relation with the first pressing means, and means to engage the thus folded flap on each of the blanks as it continues its travel on the conveying means to maintain such flap in its folded position.

7. A machine for folding a flap on each of a succession of blanks of sheet material transversely to their path of travel while such blanks travel continuously, substantially in their planes which comprises conveying means for forwarding the blanks in predetermined spaced relationship, a folding station to which the conveying means presents the blanks, a wheel at said folding station mounted on an axis on one side of and transverse to the path of travel of the blanks, means for rotating said wheel in timed relationship with the speed of travel of the conveying means, a generally radially disposed lifting finger positioned on said wheel so that it is presented to the flap to be folded as a blank travels therepast, the lifting finger being of such length that it projects through the path of travel of the blank at one zone of its travel whereby the lifting finger successively presses a flap on blanks on the conveying means out of the plane of the blank to a substantial angle with the body of the blank, and means at the folding station to complete the folding of the flap on each blank by pressing the raised flap in a direction substantially parallel to the plane of the main body of the blank and toward the line of juncture of the flap and the body of the blank, said last named folding means comprising at least one folding finger on the side of the path of travel of the blanks toward which the lifting finger thrusts the flap, means supporting the folding finger, and means operating the folding finger subsequent to and in timed relation with the pressing of the flap by the lifting finger.

8. A machine for folding a flap on each of a succession of blanks of sheet material transversely to their path of travel while such blanks travel continuously in a line substantially in their planes with their planes horizontal which comprises conveying means for forwarding the blanks in predetermined spaced relationship, a folding station to which the conveying means presents the blanks, a wheel at said folding station mounted on a horizontal axis below and transverse to the path of travel of the blanks, means for rotating said wheel in timed relationship with the speed of travel of the conveying means, at least one generally radially disposed lifting finger positioned on said wheel so that it is cyclically presented to the flaps to be folded as the blanks travel therepast, the lifting finger being of such length that it projects through the path of travel of the blank at one zone in its travel whereby the lifting finger presses a flap on the same transverse edge of each of the blanks on the conveying means out of the plane of the blank to a substantial angle with the body of the blank, and means at the folding station operating in timed relationship with the first pressing means to complete the folding of the flap on each blank by pressing the raised flap in a direction substantially parallel to the plane of the main body of the blank and toward the line of juncture of the flap and the body of the blank, said last named folding means comprising at least one folding finger above the path of travel of the blanks, means for supporting the folding finger, and means for operating the folding finger subsequent to and in timed relationship to operation of the lifting finger, the folding finger and its support being so constructed and arranged that the folding finger is spaced substantially above the path of travel of the blanks in its inoperative position and in its operative travel is moved to engage the raised flap and fold it back on the body of the blank.

9. A machine for folding a flap on each of a succession of blanks of sheet material transversely to their path of travel while such blanks travel continuously in a line substantially in their planes with their planes horizontal which comprises conveying means for forwarding the blanks in predetermined spaced relationship, a folding station to which the conveying means presents the blanks, a wheel at said folding station mounted on a horizontal axis below and transverse to the path of travel of the blanks, means for rotating said wheel in timed relationship with the speed of travel of the conveying means, at least one generally radially disposed lifting finger positioned on said wheel so that it is cyclically presented to the flaps to be folded as the blanks travel therepast, the lifting finger being of such length that it projects through the path of travel of the blanks at one zone in its rotation whereby the lifting finger presses a flap on the same transverse edge of each of the blanks on the conveying means out of the plane of the blank to a substantial angle with the body of the blank, and means at the folding station operating in timed relationship with the first pressing means to complete the folding of the flap on each blank by pressing the raised flap in a direction substantially parallel to the plane of the main body of the blank and toward the line of juncture of the flap and the body of the blank, said last named folding means comprising at least one folding finger above the path of travel of the blanks, means for supporting means for supporting the folding finger, and means for operating the fold-

ing finger subsequent to and in timed relationship to operation of the lifting finger, the folding finger and its support being so constructed and arranged that the folding finger is spaced substantially above the path of travel of the blanks in its inoperative position and in its operative travel is moved to engage the raised flap and fold it back on the body of the blank, and pick-up bars positioned above the conveying means and in the rear of the folding station so as to receive the thus folded blanks from the folding station and retain them in folded condition during further travel on the conveying means.

10. In a machine for folding front and rear flaps on each of a succession of blanks of sheet material transversely to their path of travel while such blanks travel continuously in a line substantially in their planes with their planes horizontal which comprises conveying means for forwarding the blanks in predetermined spaced relationship, a folding station to which the conveyor means presents the blanks, a wheel at said folding station mounted on a horizontal axis below and transverse to the path of travel of the blanks, means for rotating said wheel in timed relationship with the speed of travel of the conveying means, at least one generally radially disposed lifting finger positioned on said wheel so that it is cyclically presented to the front flaps to be folded as the blanks travel therepast, and at least one similar lifting finger positioned on said wheel so that it is cyclically presented to the rear flaps to be folded as the blanks travel therepast, the lifting fingers being of such length that they project through the path of travel of the blanks at one zone in the rotation of each whereby they press their respective flaps on the blanks in the conveying means out of the plane of the blank to a substantial angle therewith, and means at the folding station operating in timed relationship with the two lifting fingers to complete the folding of the front and rear flaps on each blank, said last named means comprising at least one folding finger cooperating with the raised front flap and at least one folding finger cooperating with the raised rear flap on the blank, and means for operating each of such folding fingers subsequently to and in timed relationship to the lifting of the respective flaps to move such fingers in directions parallel to the plane of the main body of the blank, and toward the lines of juncture of such body with the respective flap.

11. A machine for folding a transverse flap on a transverse edge of a box blank as such blank travels continuously horizontally, said transverse flap being scored diagonally at its corners which comprises conveying means for forwarding the blanks in predetermined spaced relationship, a folding station to which the conveying means successively presents the blanks, means at the folding station operating in timed relationship to the conveying means to press the flaps on each of the blanks on the conveying means out of the plane of the blank to a substantial angle with the body of the blank, means at the folding station operating in timed relationship with the first pressing means to complete the folding of the flap on each blank by pressing against the raised flap in a direction substantially parallel to the plane of the main body of the blank and toward the line of juncture of the flap and body of the blank, and plow-bars confronting the corners of the flap outside the diagonal score lines of the blanks to restrain the

corners of the flap from rising substantially with the flap, whereby each of such corners is given a reverse fold upon the folded flap.

12. A machine for folding front and rear flaps on each of a succession of blanks of sheet material transversely to their path of travel while such blanks travel continuously in their planes, each blank being provided with at least two laterally spaced flaps on its front edge and two laterally spaced flaps on its rear edge, corresponding front and rear flaps being aligned longitudinally of the blank, which comprises a first conveying means for forwarding the blanks in predetermined spaced relationship by engagement with the blanks at points spaced laterally from the first set of the front and rear flaps which is the first to be folded, a first folding station to which the first conveying means presents the blanks, means at the first folding station operating in timed relationship to the first conveying means to press the forward flap, of the set of flaps first to be folded, of each of the blanks on the first conveying means out of the plane of the blank to a substantial angle with the body of the blank, means at the first folding station operating in timed relationship with such first pressing means to complete the folding of the front flap of said first set on each blank by pressing against the raised flap in a direction substantially parallel to the plane of the main body of the blank and in a direction opposite to the direction of travel of the blanks, means at the first folding station operating in timed relationship to the first conveying means to press the rear flap, of each of said first set of flaps, on the blanks on the first conveying means out of the plane of the blank to a substantial angle with the body of the blank, and means at the first folding station operating in timed relationship with such last named pressing means to complete the folding of the rear flap of said first set by pressing against such raised flap in a direction substantially parallel to the plane of the main body of the blank and in a direction of travel of the blank, a second conveying means generally aligned with the first conveyor means and overlapping the same for receiving blanks thus folded from the first conveyor means and forwarding them in predetermined spaced relationship, the second conveying means engaging the blanks at points spaced laterally from the flaps on the second set, a second folding station to which the second conveying means presents the blanks, means at the second folding station operating in timed relationship to the second conveying means to press the forward flap of the set of flaps second to be folded of each of the blanks on the second conveying means out of the plane of the blank to a substantial angle with the body of the blank, means at the second folding station operating in timed relationship with such first pressing means of the second folding station to complete the folding of the front flap of said second set on each blank by pressing against the raised flap in a direction substantially parallel to the plane of the main body of the blank and in a direction opposite to the direction of travel of the blanks, means at the second folding station operating in timed relationship to the second conveying means to press the rear flap of each of said second set of flaps on the blanks of the second conveying means out of the plane of the blank to a substantial angle with the body of the blank, and means at the second folding station

operating in timed relationship with such last named pressing means to complete the folding of the rear flap of said second set by pressing against such raised flap in a direction substantially parallel to the plane of the main body of the blank, and in a direction of travel of the blanks.

13. A machine for folding front and rear flaps on each of a succession of blanks of sheet material transversely to their path of travel while such blanks travel continuously in their planes, each blank being provided with at least three laterally spaced flaps on its front edge and three laterally spaced flaps on its rear edge, corresponding front and rear flaps being aligned longitudinally of the blank, which comprises a first conveying means for forwarding the blanks in predetermined spaced relationship, by engagement with the outer two rear flaps, a first folding station to which the first conveying means presents the blanks, means at the first folding station operating in timed relationship to the first conveying means to press the center forward flap of each of the blanks on the first conveying means out of the plane of the blank to a substantial angle with the body of the blank, means at the first folding station operating in timed relationship with such first pressing means to complete the folding of the center front flap on each blank by pressing against the raised flap in a direction substantially parallel to the plane of the main body of the blank, and in a direction opposite to the direction of travel of the blanks, means at the first folding station operating in timed relationship to the first conveying means to press the rear center flap of each of said blanks on the first conveying means out of the plane of the blank to a substantial angle with the body of the blank, and means at the first folding station operating in timed relationship with such last named pressing means to complete the folding of the rear center flap of said first set by pressing against such raised flap in a direction substantially parallel to the plane of the main body of the blank and in a direction of travel of the blank, a second conveying means generally aligned with the first conveyor means and overlapping the same for receiving blanks thus folded from the first conveyor means and for forwarding them in a predetermined spaced relationship, the second conveying means engaging the blanks on the rear edge of the folded center rear flap, a second folding station to which the second conveying means presents the blank, means at the second folding station operating in timed relationship to the second conveying means to press the two outer forward flaps of each of the blanks on the second conveying means out of the plane of the blank to a substantial angle with the body of the blank, means at the second folding station operating in timed relationship with such second pressing means to complete the folding of the two outer front flaps of each blank by pressing against the raised flaps in a direction substantially parallel to the plane of the main body of the blank and in a direction opposite to the direction of travel of the blanks, means at the second folding station operating in timed relationship to the second conveying means to press the two outer rear flaps of each of the blanks on the second conveying means out of the plane of the blank to a substantial angle with the body of the blank, and means at the second folding station operating in timed relationship with such last named pressing means to complete the folding of the two outer rear flaps of each blank by pressing against such raised flaps in a direction substantially parallel to the plane of the main body of the blank, and in a direction of travel of the blanks.

14. In the combination set forth in claim 4, the means for supporting the folding finger being a rock shaft mounted transverse to the path of travel of the blanks and spaced from such path on the side toward which the flap is initially thrust, and the means for operating the folding finger is a cam driven in timed relationship to the conveying means and means coacting therewith and connected to the rock shaft.

15. In the combination set forth in claim 10, means for supporting the finger for folding the front flap comprising a first rock shaft mounted transverse to the path of travel of the blanks, spaced above such path, and spaced from the vertical center line of the lifting wheel in the direction of travel of the blanks, and means for supporting the finger for folding the rear flap comprising a second rock shaft mounted transverse to the path of travel of the blanks, spaced above such path, and spaced from the vertical center line of the lifting wheel in a direction opposite to the direction of travel of the blanks, the means for operating both folding fingers comprising cam means driven in timed relationship to the conveying means and means coacting therewith and connected to the rock shafts.

16. In the combination set forth in claim 10, retractable hold down means above the blank at the folding station, said means being located above the main body of the blank when the rear flap is being lifted by the lifting finger, and retracted from the blank when the rear folding finger is actuated to complete the folding of the rear flap.

17. In the combination set forth in claim 15, a retractable hold down finger mounted on the second rock shaft to lie above the main body of the blank when the rear flap is being lifted by the lifting finger, and retracted from the blank by actuation of such rock shaft when the rear folding finger is oscillated to complete folding of the rear flap.

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