

May 19, 1942.

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2,283,159

PAPERBOARD FOLDING MACHINE AND METHOD

Filed April 2, 1940

4 Sheets-Sheet 1

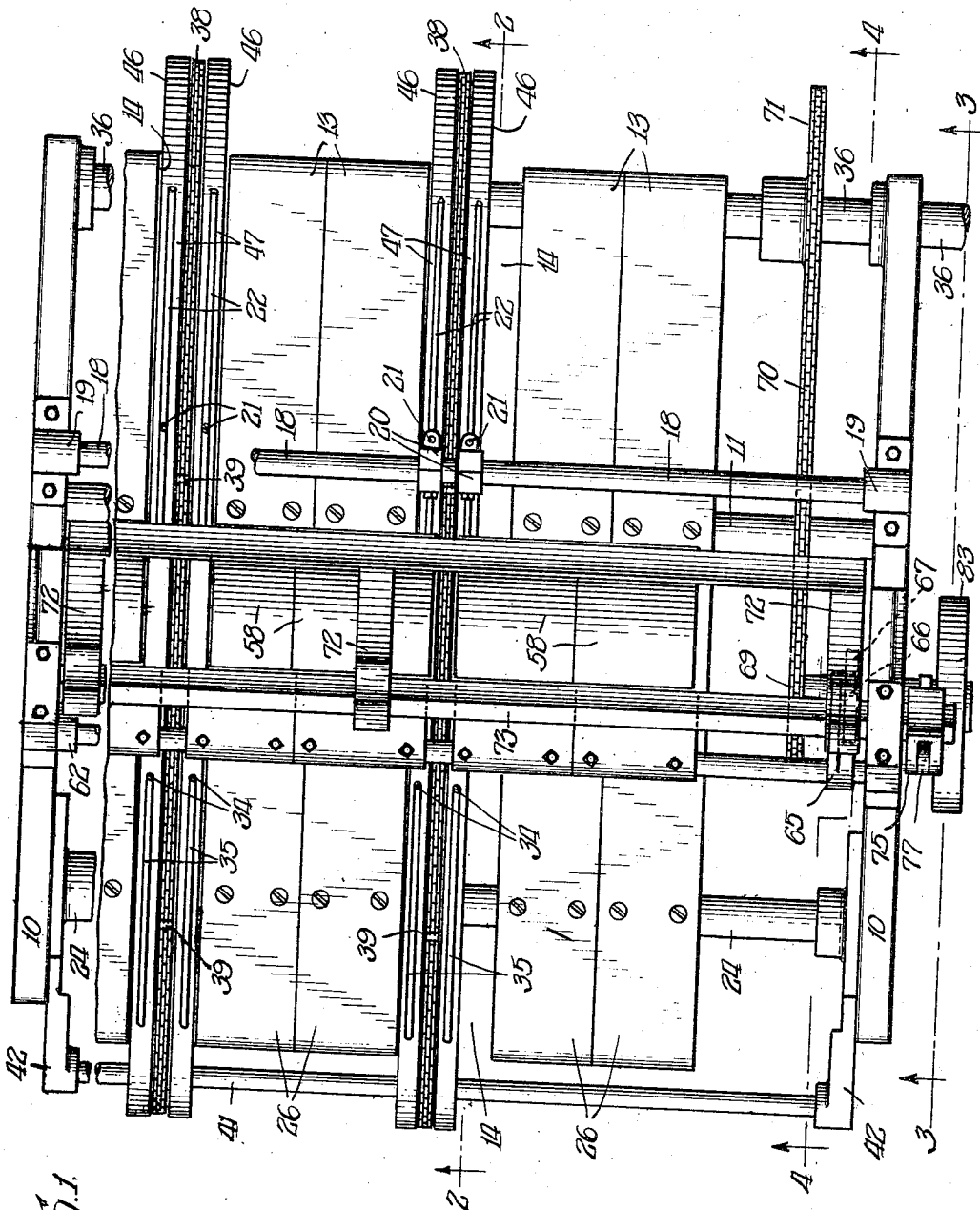


Fig. 1.

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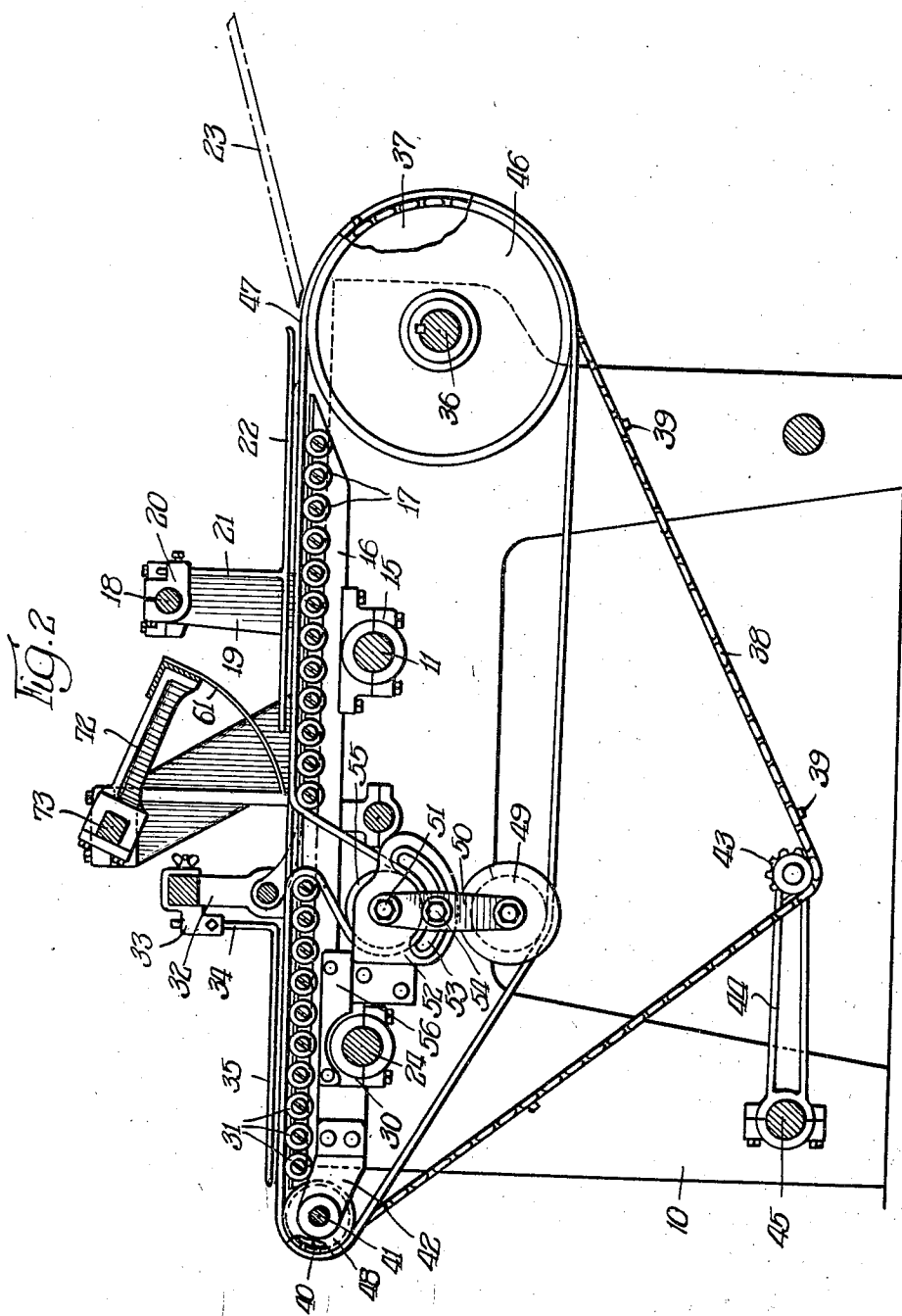
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4 Sheets-Sheet 2



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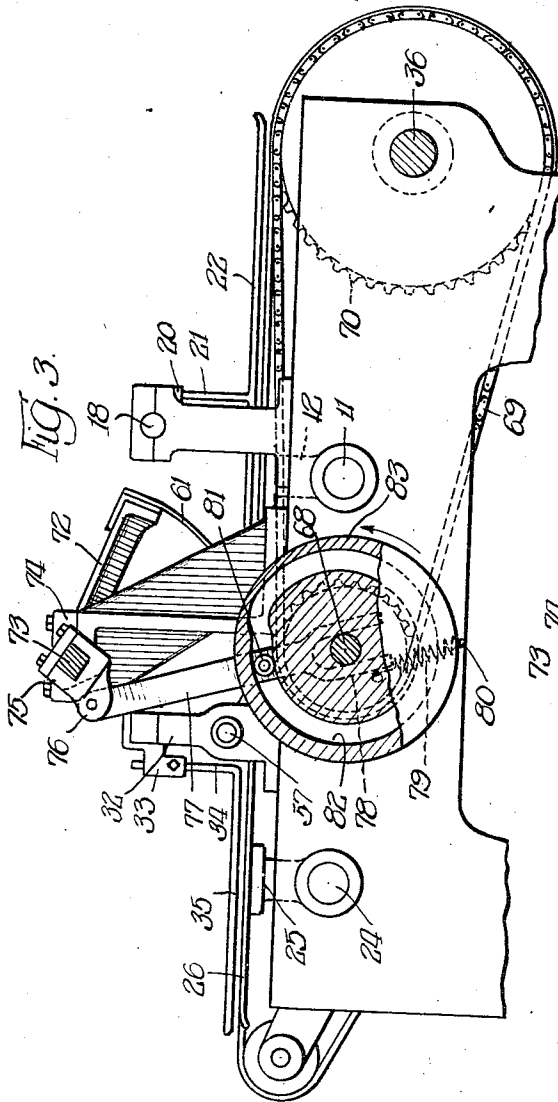
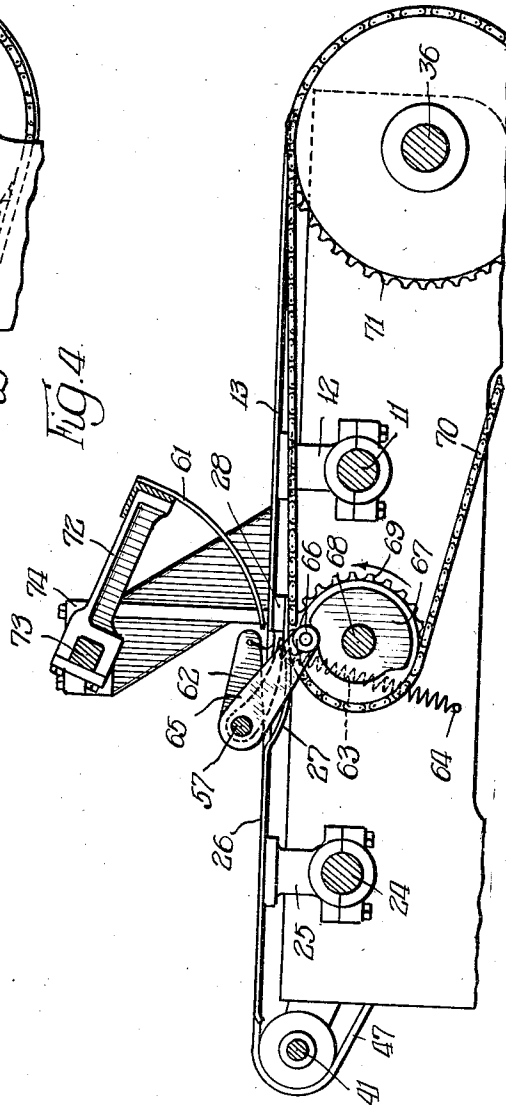
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Filed April 2, 1940

4 Sheets-Sheet 3



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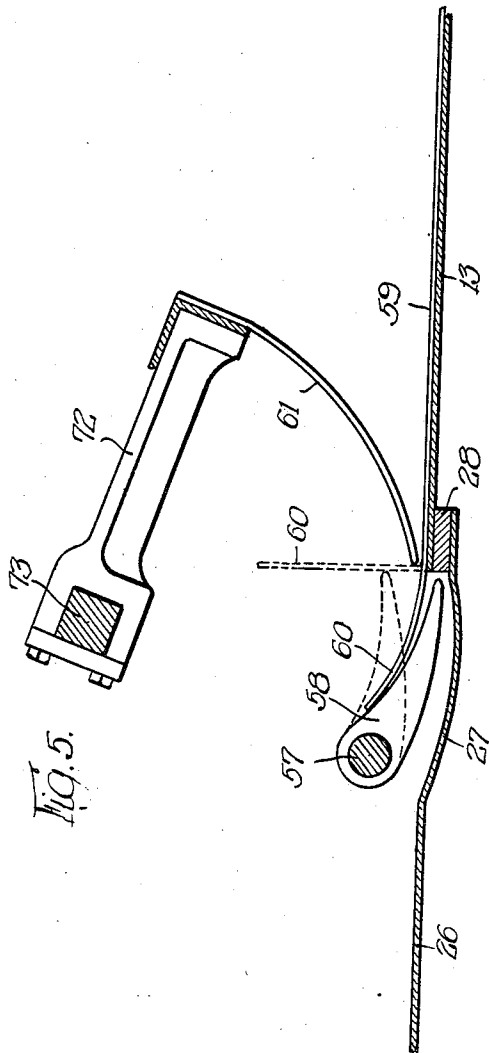
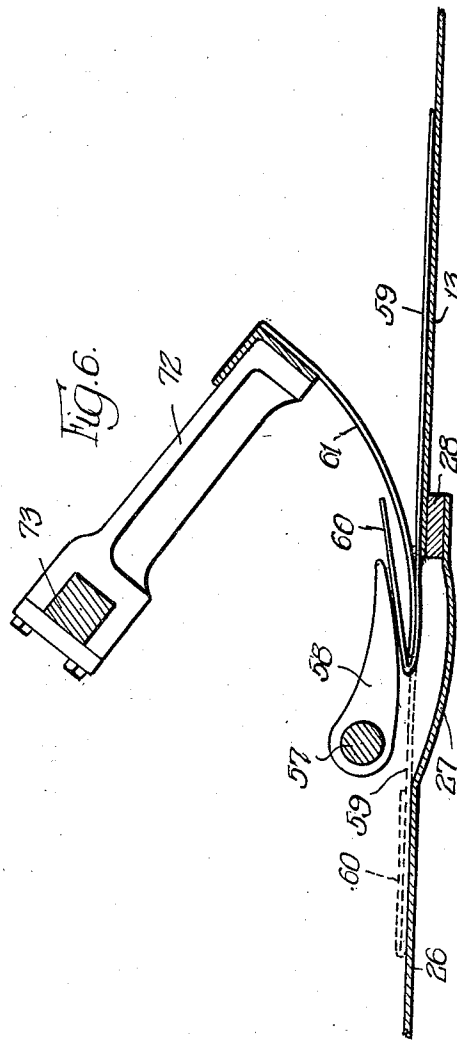
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Filed April 2, 1940

4 Sheets-Sheet 4



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2,283,159

PAPER BOARD FOLDING MACHINE AND METHOD

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Application April 2, 1940, Serial No. 327,479

8 Claims. (Cl. 270—80)

The present invention relates to an improved apparatus and method for the folding of blanks composed of materials such as paper board in such a manner that the leading edge of the blank is turned over during progress of the blank through the folding mechanism.

Various types of mechanisms have been devised heretofore for folding blanks of paper board and as a general rule these operate upon the principle of side folders which turn over side edge portions of the blank while the latter is traveling through the machine. Such continuous operation is highly desirable since it allows for rapid operation without the use of complicated equipment. Intermittently acting mechanisms also have been employed but machines of this character are less desirable since they are slower and usually considerably more complicated.

A principal object of the present invention is the provision of an improved type of machine for turning over the leading edge of a blank of paper board along a predetermined line while the blank is in continuous motion.

An additional object of the invention is to provide a machine for deflecting the leading edge of a blank upwardly during progress of the blank along a conveyor and having a striker member operative upon the trailing side of the deflected edge to progress the blank with its turned-over leading edge beneath the deflector.

Still another object of the invention is the provision of a discontinuous conveyor mechanism for blanks and a combined deflector and striker mechanism operative adjacent the discontinuous portion of the conveyor for rotating the leading edge of a blank upwardly and over during the movement of the blank along the conveyor.

These and other objects will be observed upon a consideration of the following specification and by reference to the accompanying drawings, in which—

Fig. 1 is a plan view of the device constructed in accordance with the invention;

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken along line 4—4 of Fig. 1;

Fig. 5 is an enlarged detailed sectional view of the deflector and striker mechanism showing an initial stage of the operation; and

Fig. 6 is a view similar to Fig. 5 showing a

subsequent step in the operation of the deflector and conveyor mechanism.

As shown in the drawings the machine includes a frame structure 10. Extending across the frame is a support bar 11, the ends of the bar being secured to the frame in any suitable manner. A plurality of upwardly extending brackets 12 are supported along the bar 11, and these brackets carry the bed plates 13 in the manner shown in Figs. 1 and 4. Along certain portions of the width of the machine the bed plates 13 are spaced apart to provide longitudinally extending conveyor channels 14, as shown in Fig. 1.

Adjacent the openings 14 between the plates 13 the support bar 11 carries brackets 15 upon which are mounted the longitudinally extending roller carriers 16, as shown in Fig. 2. The roller carriers 16 have rotatably mounted thereon the conveyor belt rollers 17, these rollers preferably having V-shaped peripheral channels for receipt of the conveyor belts.

An upper support bar 18 is mounted above the frame 10 by means of the standards 19. Adjacent the openings 14 between the bed plates the support bar 18 carries the brackets 20 from which depend the rods 21. The lower end of the rods 21 carry horizontal guide bars 22 which are positioned in somewhat closely spaced relation to the plane of the bed plates. The guide bars 22 are of conventional construction and serve to maintain carton blanks adjacent the bed plates during their conveyance through the machine.

At the right-hand end of the machine in Fig. 2 there is shown diagrammatically a feed platform from which carton blanks may be fed to a position adjacent the bed plates 13 and beneath the guide bars 22. It will be understood that this feed platform 23 simply is to illustrate a conventional device for feeding carton blanks one at a time to the device shown in the drawings, and any suitable type of apparatus may be employed for this purpose.

After the discharge end of the mechanism the frame structure 10 carries a support bar 24. The support bar 24 is similar in vertical position and mounting to the support bar 11 and carries upwardly extending brackets 25 upon which are mounted the bed plates 26, the latter being positioned in a manner similar to the bed plates 13. At their inner ends the bed plates 24 are depressed downwardly as shown at 27 in Fig. 4 to a position below the plates 26 and the plates 13.

The inner ends of the plates 13 are supported upon and the inner ends 27 of plates 26 are secured below the cross member 28 shown in Fig. 4,

thereby providing a downwardly extending connecting ledge between the inner ends of the plates 13 and the inner ends 27 of the plates 26, as shown in Figs. 5 and 6.

Support bar 24 also carries brackets 30 adjacent the open faces between the bed plates 26 and these brackets support the longitudinally extending roller supporting members 16. A series of belt-supporting rollers 31 are rotatably mounted on the after end of members 16 in alignment with the rollers 17.

On top of the frame 10 are mounted the standards 32 which carry brackets 33 adjacent the longitudinally extending members 16. Rods 34 extend from the brackets 33 downwardly and bear on their ends the guide bars 35, the latter extending toward the after or delivery end of the machine and being closely spaced above the plane of the bed plates 26.

In association with the mechanism described there are provided discontinuous conveyor systems including chain and belt drives. The main drive shaft 36, which may be driven by any suitable means such as a motor, has provided on it the sprockets 37 adjacent the openings 14 between the bed plates 13. Chains 38 are mounted on and driven by these sprockets, the chains carrying carton-driving lugs 39 positioned in spaced relation therealong. The chains 38 pass through the machine at a level which permits the lugs 39 to extend slightly above the plane of the bed plates 13 and 26. At the delivery end of the machine the chains 38 pass about sprockets 40 which are rotatably mounted on the shaft 41, the latter having its ends supported by the brackets 42 secured to opposite sides of the frame member.

The chains 38 pass downwardly from the sprockets 40 to the lower sprockets 43 which are rotatably mounted on brackets 44 carried by the transversely extending shaft 45. The tension on the chains 38 may be varied by adjusting the position of the brackets 44 on shaft 45.

On each side of each of the sprockets 37 the main drive shaft 36 carries the pulley wheels 46. The belts 47 are mounted about these pulley wheels and travel along on each side of the chains 38 to form supports and carrying members for carton blanks passing through the machine.

The belts 47 are supported by the rollers 17 and 31, and at the delivery end of the machine the belts pass about the pulley wheels 48, the latter being rotatably mounted on shaft 41. From the pulleys 48 the belts 47 pass on the underside of the adjustable pulleys 49 and then back to the pulleys 46.

The pulleys 49 are rotatably mounted on the arms 50 which are pivoted at 51 to brackets 52. Intermediate portions of the arms 50 are adjustably secured in the slots 53 of the brackets 52 by means of clamp bolts 54. Brackets 52 also carry rotatably mounted pulleys 55. As will be seen in Fig. 2, the belts 47 provide a discontinuous conveyor in that they pass from the rollers 17 beneath the pulleys 55 and then upwardly about the rollers 31. Brackets 52 are supported by the longitudinally extending members 16, as shown at 56.

The mechanism described provides a conveyor system by which blanks are passed along from the feed end of the machine to the delivery end. Adjacent the discontinuous portion of the belts 47 is provided means for turning over the leading edge of the blank during its progress

through the machine. The operation of this mechanism may be seen in Figs. 5 and 6. A rotatable shaft 57 is mounted across the machine and carries the deflector plates 58 which reciprocate from a position traversing the plane of a blank passing through the machine to the position shown in dotted lines in Fig. 5. As a blank 59 passes through the mechanism its leading edge 60 is deflected upwardly by the members 58. Then, the members 58 are rotated upwardly to move the leading edge of the blank into the position shown in dotted lines in Fig. 5. During this motion the blank is maintained adjacent the bed plates 13 by the guide bars and there is positioned adjacent the inner end of the plates 13 a series of striker plates 61. The ends of the plates 61 in retracted position are adjacent the inner ends of the bed plates 13. As the leading edge 60 of the blank is rotated into the position shown in Fig. 5 the striker mechanism is rotated downwardly as will be seen in Fig. 6, thereby engaging the trailing side of the leading edge 60 adjacent the score line about which it is folded and moving the blank forwardly beneath the deflector mechanism 58. From the position shown in Fig. 6 the blank is continued in its travel through the machine by the conveyor mechanism through the position shown in dotted lines in Fig. 6. The deflector mechanism operates within the depression formed by the inner ends 27 of the bed plates 26. It will be seen that the action by which the leading edge of the blank is turned over is quite simple in structure and operation. The deflectors 58 are spaced apart adjacent the chains 38 so as not to interfere with the continuous operation of these conveyor units. It is unnecessary to have the deflector members discontinuous above the belts 47, since the latter are of themselves made discontinuous by means of the pulleys 55.

Similarly, the striker plates 61 may be spaced apart adjacent the chains 38 so as not to strike the lugs 39.

The driving mechanism for the deflector members 58 may be seen in Fig. 4. Shaft 57 is journaled in the oppositely positioned standards 32 slightly above the bed plates. On one side of the machine the shaft 57 carries a rigidly attached arm 62 which is biased toward a downward position in which the deflector members 58 traverse the plane of the bed plates, by means of spring 63 attached to the frame as shown at 64. Adjacent the other end of the shaft 57 is a second rigidly attached arm 65 having a cam roller 66 attached to its lower or free end. The cam roller 66 rides on a cam 67 which is rigidly attached to shaft 68. Shaft 68 is journaled in opposite sides of the frame structure and carries a sprocket 69, the latter being provided with a drive chain 70 which also encompasses the sprocket 71 on the main drive shaft 36. As the main drive shaft rotates, the chain 70 rotates shaft 68 and the cam 67 periodically lifts arm 65, thereby rotating the deflecting members to the position shown in dotted lines in Fig. 5. As the cam roller 66 is received by the low portion of the cam 67 the spring 63 again causes shaft 57 to rotate and the deflector members to rotate into a position traversing the plane of the carton blanks passing through the machine.

The striker plates 61 are mounted on arms 72 which are carried on the shaft 73, the latter being rotatably mounted in the standard 74 positioned on opposite sides of the frame. A clamping bracket 75 also is carried by shaft 73 and

this bracket is provided with an arm 76 to which is attached the downwardly depending arm 77. The lower end of arm 77 is provided with a yoke 78 which surrounds shaft 68. A spring 79 is attached to the yoke 78 and also to a stationary pin 80 attached to the frame. The spring 79 tends to keep the arm 77 in downward position. Arm 77 also carries a cam roller 81 which is received by the groove 82 of cam 83. Cam 83 is rigidly attached to shaft 68 so that rotation of the shaft causes the cam roller 81 and consequently the arm 77 to be raised when the high spot of the cam is reached. As the arm 77 is moved upwardly shaft 73 is rotated and the striker members move rapidly from the position shown in Fig. 5 to the position shown in Fig. 6.

The movement of the deflector members 58 and the striker members 61 are timed so that the striker members 61 pass into the position shown in Fig. 6 after the deflector members have been raised out of the plane of the carton blank. The striker members then are withdrawn from beneath the deflector members before the latter are rotated into their downward position. The desired relation of the movements of the deflector members and the striker members is obtained by properly shaping the cams 67 and 83. The motion of the striker members 61 preferably is slightly faster than the motion imparted to the carton blank by the conveyor mechanism, so that the carton blank is passed at least partially beneath the deflector members in a rapid motion by pressure of the striker members on the rear side of the turned-over edge adjacent the score which forms the fold line. The striker members thus act upon the leading portion of the carton blank to drive the blank through the folding mechanism in a smooth motion without buckling. After the carton blank with its turned-over leading edge has been acted upon by the striker members the latter are reciprocated to the position shown in Fig. 5, the lugs on the conveyor chains and the belts pick up the carton blank and continue its conveyance to the delivery end of the machine, the guide bars 35 acting to prevent rotation of the leading edge 60 away from the position shown in dotted lines in Fig. 6.

It will be recognized that the particular mechanism by which the movements described with respect to turning over the leading edge of the blank during its travel to the machine may be varied somewhat without departing from the principle of the invention. It also will be understood that the mechanism shown may be combined with other folding mechanisms for performing other operations on the blanks. For instance, the carton in the positions shown may be passed through side-folding mechanisms for folding over side portions of the carton in a conventional manner. Since structures of this type are well known it is not thought necessary to describe them in any particular. The same is true with respect to the feeding mechanism for feeding blanks to the device. Although the feed may be by hand it generally will be effected by conventional carton blank feeding units. Separate conveyor units may be provided on each side of the edge-folding device and the delivery of blanks from the edge-folding mechanism may be speeded up to take blanks away from the device at a faster rate of travel than provided by the initial conveyor mechanism. The action of the striker members 61 preferably is sufficiently rapid to progress the blanks beneath the deflector

member at a faster rate of travel than provided by the conveyor units. One advantage of this operation is that the possibility of buckling by too rapid action of the conveyor units is avoided. All of the various modifications of the invention which may be made without departing from the scope thereof are intended to be included in the appended claims.

I claim:

1. A device of the type described, a discontinuous conveyor for blanks to be folded, an oscillating folder bar having an edge portion movable along the discontinuous portion of said conveyor, and a deflector pivotally mounted adjacent said bar for turning the leading edge of a blank on said conveyor upwardly against said edge portion, and means for moving said bar against said edge portion to progress said blank beneath said deflector and across the discontinuous portion of said conveyor.
2. A device of the type described, a blank folding table provided with conveyor means, a deflector pivotally mounted in fixed position mechanism for turning the leading edge of a blank upwardly while the latter is in motion across said table, and a folding bar for driving said blank with overturned edge beneath said deflector mechanism at an increased rate of travel.
3. The method of handling a paper board blank, which comprises scoring said blank along a line spaced from the edge thereof, continuously and unhaltingly progressing the blank with the edge adjacent said score line constituting the leading edge thereof, deflecting said leading edge upwardly about said score line during movement of said blank, and driving said blank forward by engagement of the trailing side of said edge portion adjacent said score line at an increased rate of travel.
4. The method of handling a paper board blank, which comprises scoring said blank along a line spaced from the edge thereof, continuously and unhaltingly progressing the blank with the edge adjacent said score line constituting the leading edge thereof, deflecting said leading edge upwardly about said score lines during movement of said blank, and driving said blank forward by engagement of the trailing side of said edge portion adjacent said score line.
5. A device of the type described, comprising a conveyor table, blank-carrying belts rotatably mounted adjacent said table and moving continuously forward, blank-driving conveyors rotatably mounted adjacent said belts and conveyor, a deflector member adjacent the path of travel of said belt and conveyor, and means for moving said deflector to turn the leading edge of a blank upwardly.
6. A device of the type described, comprising a conveyor table, blank-carrying belts rotatably mounted adjacent said table, blank-driving conveyors rotatably mounted adjacent said belts, a deflector member mounted on a pivotally fixed shaft adjacent said table and having a portion traversing the path of travel of a blank, means for moving said deflector upwardly to turn the leading edge of a blank upwardly, and a striker member operable on the trailing side of the upwardly turned portion of said blank to move the blank under the deflector member to cause the edge to be folded by the deflector.
7. A device of the type described, comprising a conveyor table, blank-supporting belts traveling along said table and having downwardly ex-

tending loops forming a discontinuous portion adjacent an intermediate section of the table, means adjacent said discontinuous portion of the table for turning over the leading edge of a blank, and a blank-driving conveyor adjacent said belts.

8. A device of the type described, comprising a conveyor table, means for continuously progressing a blank along the upper side of said table, a fixed pivotally mounted shaft above said table and above the path of travel therealong 10

of a blank, a deflector member on said shaft having a portion extending downwardly across the path of travel of a blank, and means for pivoting said shaft when a blank is adjacent said member, in such direction as to cause the downwardly extending portion of said member to move upwardly across the path of travel of said blank, whereby said blank can pass beneath said member.

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