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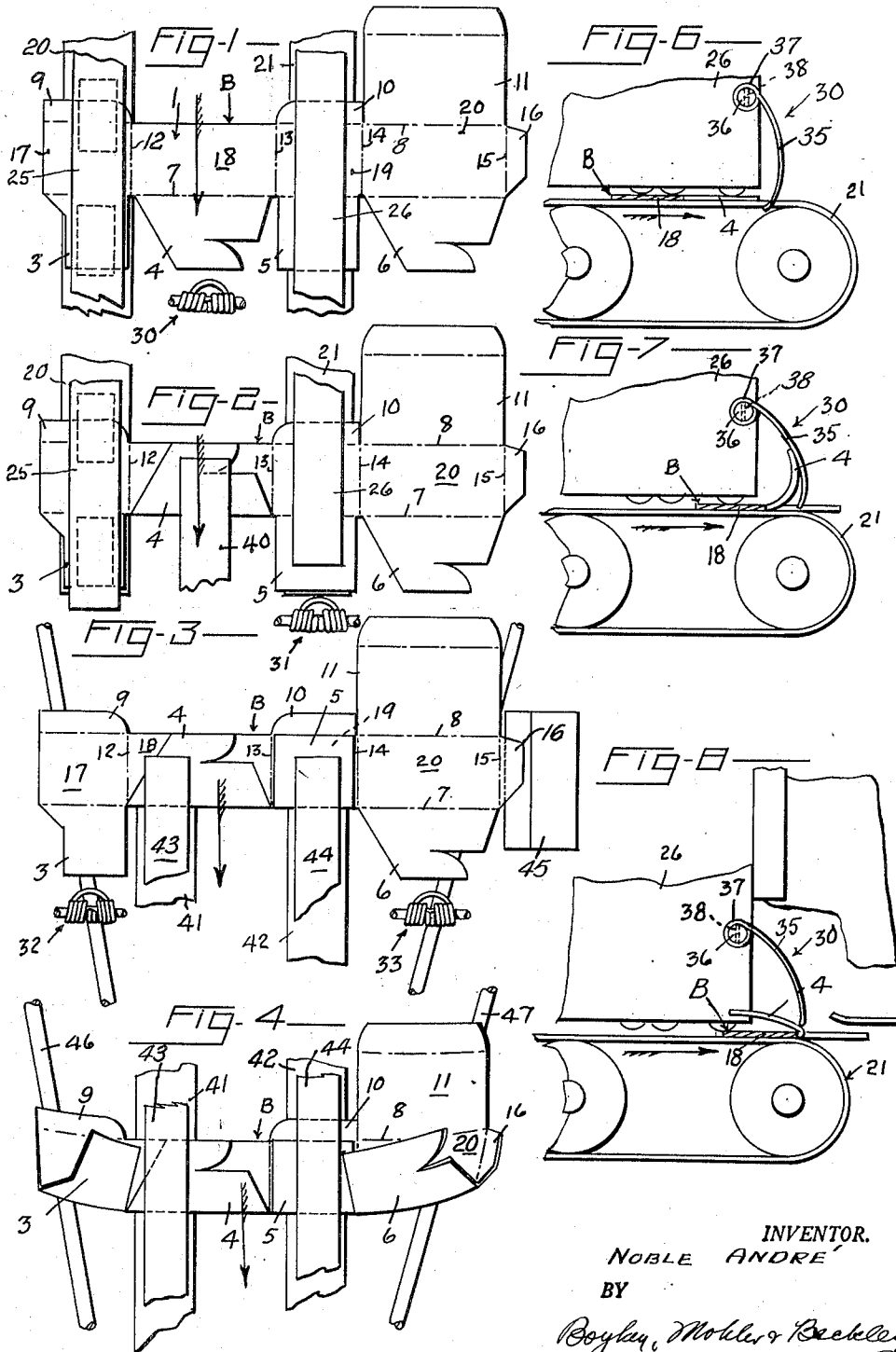
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2,647,447

FLAP FOLDING MEANS

Filed Feb. 28, 1948

2 Sheets-Sheet 1



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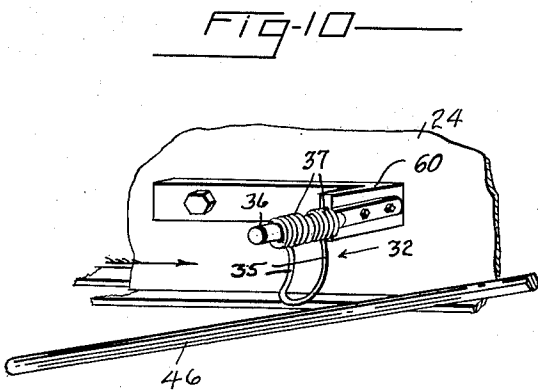
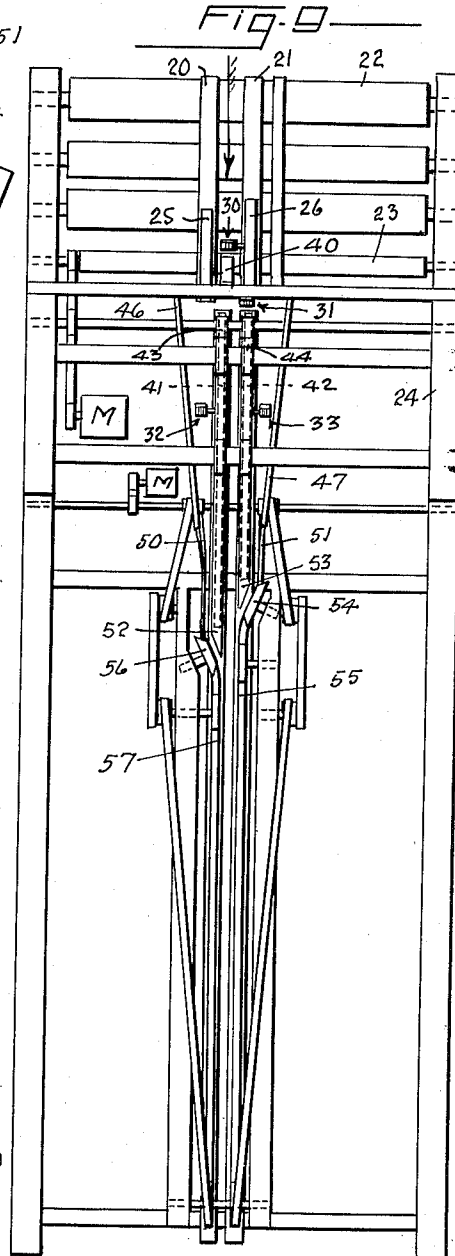
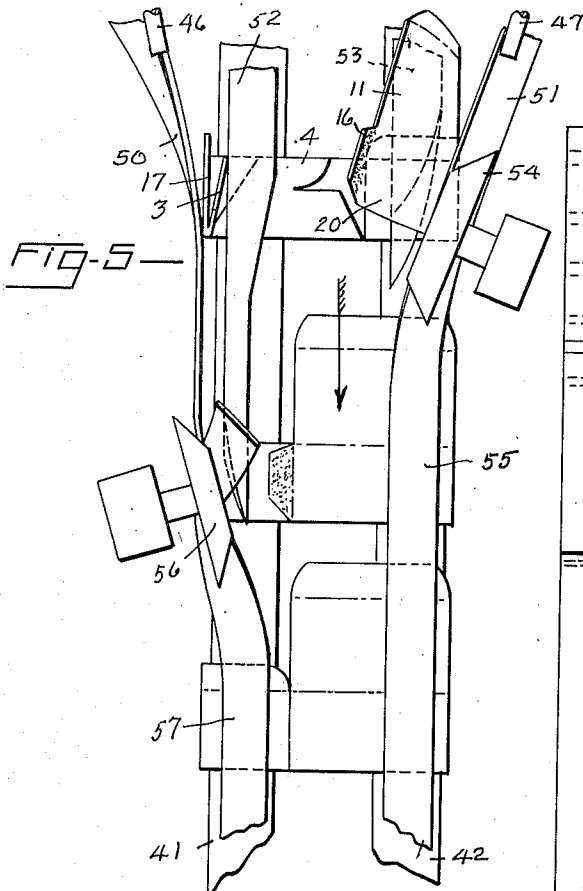
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2 Sheets-Sheet 2



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FLAP FOLDING MEANS

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Application February 28, 1948, Serial No. 11,942

3 Claims. (Cl. 93—49)

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This invention relates generally to a box making method and to means in a box making machine for folding over the flaps on a blank in the steps of making a flat, collapsed folding box of the type adapted to be quickly set up for use when desired.

One of the objects of the invention is the method of folding over closure flaps (in this instance the bottom closure flaps) of a cardboard blank from which a cardboard box is formed.

Another object of the invention is a simple, positive and reliable means in a box folding and gluing machine for folding over the flaps in the process of making the boxes.

A still further object of the invention is the provision of improved economical, positive and simple means in a conventional box folding and gluing machine for folding a blank to form a box substantially as shown in copending application for United States Letters Patent for Louis C. Michetti for a foldable box, Serial No. 769,052, filed August 16, 1947, now U. S. Patent No. 2,554,677.

In conventional foldable boxes of the type having bottom closure flaps, the said flaps are usually not folded until the boxes are set up. Each flap remains coplanar with the side wall of the box carrying the same until the box is ready to be set up for use, and then the operator expands the side walls to rectangular shape and the flaps on opposed side walls are folded toward each other to perpendicular relationship relative to said side walls. Interlocking tabs and slits are sometimes then used to hold the closure flaps in position or tape or glue may be used.

In conventional box folding and gluing machines, where flaps are folded, the blanks are usually carried through the machine in a path of travel with the flaps projecting laterally relative to said path, and side fingers or folding elements fold the flaps laterally inwardly toward the center of said path.

In the present instance, the same conventional folding machine may be used, but the bottom closure flaps are leading during movement of the blanks through the machine, instead of projecting laterally relative to the longitudinally extending path of travel. The leading flaps are folded upwardly and rearwardly onto the body of the blank (which forms the side walls) and then at a later point the said body is folded over the flaps, enclosing them, so the bottom closure flaps are within the flat folded blank against the side walls, instead of extending coplanar with the side walls or projecting therefrom.

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Figs. 1 to 5 inclusive are semi-diagrammatic plan views showing four successive steps in the movement of the blank through a box folding and gluing machine for being carried through the latter, the conventional parts of the said machine being indicated as well as the folding devices of this invention.

Figs. 6 to 8 inclusive are semi-diagrammatic part sectional and part elevational side views showing successive actions of one of the flap folding elements in folding over a flap.

Fig. 9 is a reduced size semi-diagrammatic simplified plan view of a conventional box folding machine restricted to those portions concerned with the present invention and indicating the positions of the flap folding devices.

Fig. 10 is an enlarged fragmentary perspective view showing one of the flap folding elements and an element associated therewith.

In detail, the blanks to be folded are generally designated B, and each comprises a main body 1 that constitutes the four side walls of the box to be formed. Bottom closure flaps 3, 4, 5, 6 are along one edge of said body and are integrally joined therewith along folding crease 7.

Parallel with crease 7 is a folding crease 8 and top closure flaps 9, 10, 11 are along this crease and integral with said body 1.

Other pairs of spaced parallel folding creases respectively designated 12, 13, 14, 15 extend across the body 1 at right angles to creases 7, 8 and between the latter, and creases 12 to 14 inclusive define the junctures between the several side walls 17, 18, 19, 20 that comprise said body. Crease 15 defines the juncture between a sealing or securing flap 16 along one edge of side wall 20, which flap is adapted to be secured to the side wall 17 when the box is folded, as will later be explained.

The blank above described is illustrative of one that is adapted to be folded by the present invention, it being understood that the flaps 3 to 6 and 9 to 11 and 16 are coplanar. The main machine to which the invention hereafter is applied is conventional and is generally called in the trade a folding and gluing machine.

In actual operation, such machines usually would merely fold blanks, such as have been above described, along fold lines 12, 14 so that the tab 16 would be glued to the margin of side wall 17.

By my invention, the bottom or leading flaps 3 to 6 are folded over onto the side walls carrying them and then the blank is folded along lines 12, 14 and the tab 16 is glued to side wall

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17, all without slowing down the machine and without bodily turning the blank during its movement through the machine.

Referring to the machine and method, a pair of horizontally extending, parallel, spaced, endless power-driven belts 20, 21 supported at their ends on pulleys 22, 23, that in turn are carried on a main frame 24 (Fig. 9), are adapted to support the blanks B thereon with the bottom flaps 3 to 6 inclusive in a leading position relative to the direction of movement of the blank. Said direction is indicated by the arrows in each of the Figures 1 to 9.

The blanks at the feed end of the machine (which is indicated at the upper end of Fig. 9) successively pass below a conventional roller clamp 25 and feed device 26 respectively positioned over belts 20, 21. Said blanks are singly carried by said belts.

In the path of travel of the blank, and particularly in the path of flap 4, is a folding device generally designated 30.

In the installation illustrated, there are four folding devices, one for each of the four flaps 3, 4, 5, 6, which are respectively indicated at 31, 32 and 33; said devices 31 to 33 being respectively in the paths of travel of flaps 5, 3 and 6, the latter two devices being about even with each other in direction transversely of the path of travel of the blank, and the device 31 being preferably positioned between device 30 and devices 32, 33 in direction longitudinally of the said path.

The device 32 in Fig. 10 is illustrative of each of the devices 30, 31, 33 and a description thereof will be equally applicable to each of the four devices.

Said device comprises a spring wire formed to provide a downwardly projecting U-shaped finger 35, the legs of which are similarly curved longitudinally and positioned with their concavely curved sides facing the leading oncoming flap on the blank B. The legs of the wire are preferably coiled around a stub shaft 36 so as to form a torsion spring connection 37 between the finger and the shaft, the terminating ends 38 of said coiled portions extending through a suitable opening in the said shaft or being bolted or otherwise rigidly held to the shaft.

The arrangement in which said concavely curved sides of the legs of each finger face the leading edges of the bottom flaps respectively, results in the flaps turning upwardly (Figs. 6, 8) and back onto the body of the blank adjacent thereto (Fig. 8). In Figs. 6 to 8 the flap 4 is shown as being folded back onto side wall 18 by device 30. When the blank reaches devices 31, 32, 33 the same folding action follows as with flap 4 and device 30.

After flap 4 is folded as above described, it will be held down below a strip 40 and will slide below said strip longitudinally thereof as the blank is carried forward.

From belts 20, 21 the blank (with flap 4 folded against side wall 18) will pass the folding device 31 that is in the path of flap 5, and said latter flap will be folded against side wall 19, and then the blank will pass onto belts 41, 42 that are respectively below hold-down belts 43, 44. Said hold-down belts will hold flaps 4, 5 against side walls 18, 19, as the blank continues its movement in the same direction.

After the blank passes the folding device 31, it will be seen that the end flaps 3, 6 remain unfolded. These two flaps may be substantially

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simultaneously folded over by devices 32, 33 (Fig. 3) and at practically the same time the end flap 16 may pass over a conventional glue pot 45 where its lower side will be covered with glue.

Slightly after the flaps 3, 6 are folded over and flap 16 receives the glue, the side walls 17, 20 will engage upwardly and convergently inwardly extending rods 46, 47 respectively, which rods are below said side walls. This will result in said side walls 17, 20 being bent upwardly and toward each other along fold lines 12, 14 and said bending will tend to prevent the unfolding of flaps 3, 6 that are above and respectively integral with side walls 17, 20 (Fig. 4).

The convergent ends of rods 46, 47 (Fig. 5) terminate a distance apart at which the side walls 17, 20 are almost perpendicular relative to the horizontal side walls 18, 19 and as the blank is carried forwardly past said terminating ends the said side walls 17, 20 will be engaged at their oppositely outwardly facing sides by a substantially vertically disposed horizontally extending run of an endless belt 50 and the transversely inclined generally downwardly facing side of an endless belt 51.

At about the point where said belts 50, 51 engage the side walls 17, 20, the side walls 18, 19 and the flaps 4, 5 that are thereover will pass from below the hold-down belts 43, 44 to below strips 52, 53 (Fig. 5). The strip 52 extends farther in the direction of travel of the blank than strip 53 (Fig. 5).

Belt 51 is guided below a tapered roller 54 from its slanted position to horizontal position and from its convergently extending relationship in substantial continuation of rod 47 to horizontal position in longitudinal alignment with strip 53. Thus the side wall 20, flaps 6, 11 and flap 16 will be caused to fold flat, with the flap 6 directly over flap 5 and with the glued side of flap 16 facing upwardly. The belt 51 will function as a hold-down belt for the portions so folded, the straight horizontally disposed hold-down portion being designated 55. The strip 52 is relatively narrow near its terminating end, as seen in Fig. 5, so as to clear the flap 16; and to permit the side wall 17 to overlie the said glued portion for gluing of said flap to said side wall 17.

In the above connection, as best seen in Fig. 3, the flap 3 is cut away along one of its edges so that a marginal part of side wall 17 along its free edge will be exposed when the flap 17 is folded over the upper side of flap 4. Thus when the side wall 17 (Fig. 5) is folded over so that flap 3 will lie against the flap 4, there will be nothing between the said marginal part of side wall 17 to interfere with its engagement with the glued side of flap 16.

The side wall 17 and flap 3 are caused to fold flat above the flap 4 by belt 50 which is guided under tapered pulley 56 to horizontal position parallel with the portion 55 of belt 51. This parallel length of belt 50 is indicated at 57 (Fig. 5). Said portion 57 functions as a hold-down belt and the folded blanks continue to be carried between belts for ultimate discharge from the machine at the end opposite said feed end.

The belts 51, 52, 41, 42 and the strips 52, 53 are conventional in their arrangement for folding blanks along folding creases extending parallel with the belts 41, 42, such as folding creases 12, 14. However, the steps of folding

the bottom closure flaps 3, 4, 5, 6 to a position enclosed by the side walls 17, 18, 19 and 20 in the manner shown and described is believed to be new.

The detailed description of the construction of fingers 30 to 33 inclusive is not intended to be restrictive of the invention to said precise structure. The fingers as shown have been found to be highly successful and their structure is preferred, but the invention is intended to include other fingers that are adapted to function in substantially the same manner.

While the method of folding the blanks can obviously be performed manually, the use of fingers as described enables the folding operation to be performed at a high rate of speed. The fingers in no manner injure or even mark the flaps or side walls. The blanks may be carried through the machine at practically the full capacity of the machine. The only requirement is that the fingers 30 to 33 return after each folding operation with sufficient rapidity to engage the leading flaps on each of the succeeding blanks.

There are numerous ways in which the fingers 30 to 33 may be supported, but a part of the frame 24 of the conventional folding and gluing machine is adapted for bolting bracket members 60 thereto, each of which carries a stub shaft 36 that supports each of the fingers.

As already stated, the present invention is particularly adapted for folding blanks for making boxes of the type disclosed in the aforesaid application by Louis C. Michetti and which box is illustrated herein from the beginning of the folding operation to the completion.

When completed in the form shown in the lowermost folded box in Fig. 5, a mere setting up of the box by expanding side walls to rectangular form results in the bottom closure flaps 4, 6 automatically interlocking with each other below flaps 3, 5 for forming the bottom of the box. Unless all of said flaps are folded so as to be enclosed by the side walls of the box in the order described, the box will not operate to open up in the manner above described and as described in detail in said Michetti application.

The invention herein is not necessarily to be restricted to the folding of flaps in the order herein described, although such folding is preferable for the particular box illustrated. Obviously, the side wall 17 could be folded before side wall 20 in the operation of gluing the tab 16 to said side wall 17, but then the upper side of the tab 16, as seen in Fig. 3, would have the glue and in the finished box the tab 16 would be exposed or outside the box, which is not as desirable as the box illustrated.

I claim:

1. In a machine for folding a blank of cardboard having perpendicularly arranged pairs of folding creases into a flat collapsed folding box with a plurality of bottom closure flaps forming one of the marginal portions of said blank along one crease of said pairs comprising a horizontally extending carrier movable generally horizontally in one direction for supporting said blank flat and substantially horizontally thereon for movement in said path with said flaps leading, a plurality of fingers extending downwardly across said path supported at their upper ends for swinging of their lower ends to the upper side of said blank as said blank is moved there-

past and for folding said flaps rearwardly and flat against the body of said blank adjoining said flaps, means for so supporting said fingers, said last mentioned means being positioned for supporting certain of said fingers at different points along said path longitudinally thereof for folding some of said flaps ahead of others.

2. In a machine for folding a blank of cardboard having perpendicularly arranged pairs of folding creases into a flat collapsed folding box with a plurality of bottom closure flaps forming one of the marginal portions of said blank along one crease of said pairs comprising a horizontally extending carrier movable generally horizontally in one direction for supporting said blank flat and substantially horizontally thereon for movement in said path with said flaps leading, a plurality of fingers extending downwardly across said path supported at their upper ends for swinging of their lower ends to the upper side of said blank as said blank is moved therepast and for folding said flaps rearwardly and flat against the body of said blank adjoining said flaps, means for so supporting said fingers, said last mentioned means being positioned for supporting certain of said fingers at different points along said path longitudinally thereof for folding some of said flaps ahead of others, and means for folding said blank along a pair of said creases that extend longitudinally of said path after said flaps have been folded over by said fingers, and means for securing the ends of said body together at the ends of said one crease.

3. In a box folding machine having endless parallel horizontally extending belts adapted for supporting cardboard blanks having folding flaps thereon flat on said belts for movement therewith in a horizontally extending path in one direction with said flaps leading, a plurality of generally vertically extending fingers respectively supported at their upper ends above said path and extending across said path for engagement by the leading edges of said flaps, the sides of said arms facing said flaps extending slantingly upwardly in the direction of said movement at the point of engagement with said flaps for folding said flaps upwardly upon such engagement, a rigid support for each of said fingers and a spring connection between each finger and the support therefor to permit yieldable swinging of each finger in said direction of movement of such blank against the tension of said spring connection for passage of the blank under said fingers with the flaps folded flat against the upper side of the latter, each of said fingers being a U-shaped spring wire and said connection being coaxial coils formed at the ends of said wire and secured to each support at their ends that are remote from the U-shaped portion.

NOBLE ANDRÉ.

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