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FOLDING MACHINES FOR PRE-PUNCHED CARDBOARD PIECES

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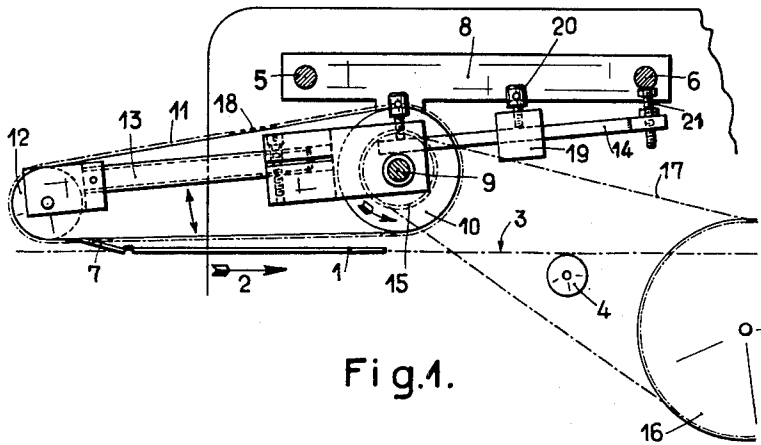


Fig. 1.

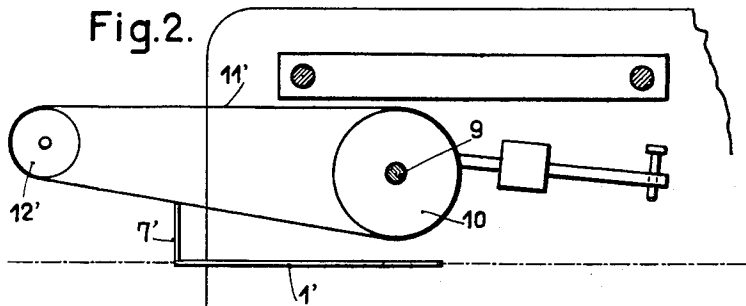


Fig. 2.

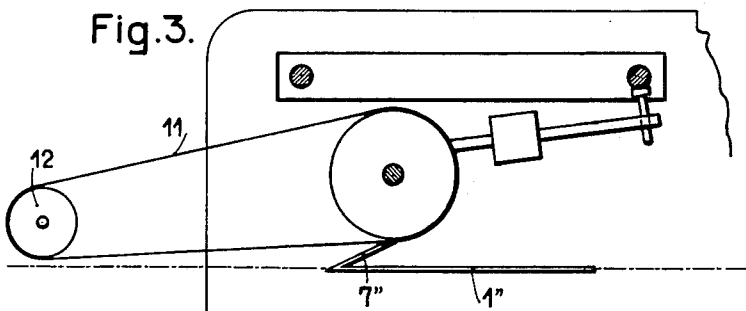


Fig. 3.

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FOLDING MACHINES FOR PRE-PUNCHED
CARDBOARD PIECES

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8 Claims. (Cl. 270-61)

This invention relates to machines for folding pre-formed cardboard blanks into boxes.

In the cardboard shaping industry and in particular, in the manufacturing of cardboard boxes, folding machines and combination folding-glueing machines are utilized to carry out more or less automatically the folding or pre-formed pieces into boxes.

The folding concerns more particularly the folding down of so-called assembling flaps or glueing flaps.

In relation to the conveying direction of the cardboard pieces in such machines, such flaps are generally located in the front or at the sides and their folding down is effected by suitable guides, stops or compressed air jets in the course of transport of the pieces by conveying bands or belts. It also becomes necessary to fold or fold down not only front flap elements preceding the piece to which they are attached, but rear flap elements as well. This is the case for pieces destined for being formed as boxes with so-called automatic bottoms or double automatic bottoms.

The machine according to the present invention aims at allowing the folding of the rear or posterior flap elements, following the piece to which they are attached and onto one face of which they are to be folded down.

This result is obtained by providing for at least one endless band with an outside irregular surface which is placed normally near the conveying plane of the pieces and practically in parallel with the latter, the band being driven in the same direction as that of the pieces, but at a higher speed and arranged so as it can move away from this plane by a swinging around the shaft of its driving pulley the endless band in its initial position adapted to come into contact with the conveyed pieces.

The attached drawing shows an embodiment of a machine according to the invention, given by way of example, and in a simplified form, wherein

FIG. 1 is an elevational view diagrammatically illustrating the beginning of the folding process of a posterior flap of a cardboard piece.

FIG. 2 is a similar view schematically showing the main elements in the course of folding the said flap.

FIG. 3 is a view similar to that of FIG. 2, but at the completion of the folding.

The piece 1 to be folded advances through the machine in the direction of the arrow 2 along the plane of the conveying device 3, constituted for instance by conveying belts running on guiding pulleys such as 4.

The machine frame which extends in the direction of the conveying device 3 has not been represented for purposes of clarity. Moreover, neither the feeding devices nor the known folding and glueing contrivances which are respectively located on the left and on the right of the drawing, have been shown. On the other hand two cross-bars 5 and 6 appear in section joined to the said frame and support the main elements and to be described hereafter.

The device is concerned with the folding down on the piece 1 of its rear or posterior flap 7 during the proper conveyance of the piece 1.

Between cross-bars such as 8, supported by the bars 5 and 6 is arranged a driving assembly in which a pulley 10 is supported by a shaft 9 for driving an endless belt 11 running over a second pulley 12. The belt 11 has a lower

reach located adjacent the plane 3 and is driven in the direction of the advancing piece 1. A bar 13 is interposed between the pulleys and keeps them at a suitable distance, so as to have the belt 11 stretched. A rod 14 projects from the bar 13 beyond the pulley 10 in the general direction of advancement of the pieces.

Finally, the pulley 10 is rotatively integral with a pulley 15 driven by a power pulley 16 through the transmission belt 17.

The outside face of the endless conveying belt 11 is provided with surface irregularities 18, in the form of teeth.

The pulleys 10 and 16 are rotated in the direction indicated by the arrows and, the strand of the belt 11 near the conveying device 3 at the moment of coming into contact with the conveyed pieces is practically parallel to the plane of the conveying device 3. The linear speed of travel of the belt 11 is greater than that of the conveying device 3 such that the following operation takes place.

The piece 1 arriving under the belt 11 which is advancing at a greater linear speed, is engaged at the upper surface of the flap 7 by the teeth of the belt which tend to raise the flap.

As the flap 7 is raised, it will as a result of the stiffness thereof, support and pivot the driving assembly via the belt 11 around shaft 9 and the position of FIG. 2 will be assumed.

Therein, the flap 7 is raised to 7', its free edge having been driven more rapidly than the piece 1'. Swinging around 9, the belt 11 and the pulley 12 will have on their turn passed to positions 11' and 12'.

A moment later, the folding down of the flap is completed as shown in FIG. 3. The flap is at 7'', the piece at 1'', while the belt 11 and the pulley 12 will have been lowered to the original position of FIG. 1.

The motions of the driving assembly already described are performed under their own weight, since they can oscillate freely around the shaft 9.

The pressure thus exerted by the unbalanced weight of the driving assembly should be limited, preferably regulable, so as to insure correct operation without risking bending or crushing of the flap 7.

In this respect there is provided on the rod 14 an adjustable counterweight 19, which is secured by the screw 20. The rod also supports an adjustable stop-screw 21, which contacts the bar 6 and thus makes it possible to fix with great accuracy the lower resting position of the assembly formed by the belt 11 and the pulley 12.

By this simple mechanism, of which it will be possible to arrange side by side on the shaft 9 as many patterns as there will be flaps to be folded down in the conveying direction, it is possible to carry out without difficulty and simply the desired folding operations.

It is noteworthy that the driving direction of the pulley 10 helps to increase the propensity of the belt 11 to be applied against the piece to be processed.

An inverted arrangement of that described is possible, that is the arrangement of the endless band under the conveying device and applied against the piece due to the effect of counter-weights or springs.

In some cases, it will be advantageous to start the raising of the flap 7 by means of a member located beneath the piece 1 and governed, in known manner, by the passage of the piece 1.

What I claim is:

1. Apparatus for folding into the plane of an advancing blank, a rearwardly extending flap which is foldably connected to the blank and initially extends slightly upwardly with respect thereto, said apparatus comprising means for supporting and advancing a blank thereon with the flap extending rearwardly and upwardly, means including a

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conveyed element advancing in the same direction as the blank at a faster speed thereof and having an elongated surface spaced from the blank less than the upward extension of the flap for engaging the flap to pivotally fold the same and means pivotally supporting the aforementioned means in an initial unbalanced position in which the conveyed element is tilted rearwardly down by a magnitude of unbalanced weight to contact the flap and pivot the same, said flap having sufficient stiffness related to the unbalanced weight of the conveyed element to cause the conveyed element itself to be pivotally moved upwardly by the flap itself as the latter is pivotally moved by the engagement of the flap with the conveyed element, whereafter as the flap is lowered into the plane of the blank, the conveyed element returns under its unbalanced weight towards its initial position to engage the opposite surface of the flap and complete the folding thereof into the plane of the blank.

2. Apparatus for folding into the plane of an advancing blank, a rearwardly extending flap which is foldably connected to the blank and initially extends slightly upwardly with respect thereto, said apparatus comprising a conveyor device for supporting and advancing a blank thereon with the flap extending rearwardly and upwardly, a driving assembly located adjacent the conveyor device and including a driven belt having a component of speed in the direction of advancement of the blank which is greater than the speed of advancement of the blank, and means pivotally supporting the driving assembly in an initial position in which said driven belt is spaced from the conveyor device less than the amount of upward extension of the flap such that the belt engages the flap and exerts a force thereon to pivotally raise the flap, said driving assembly having a magnitude of unbalanced weight which urges the driving assembly to its initial position, the flap having sufficient stiffness to overcome the unbalanced weight of the driving assembly and cause the driving assembly itself to be pivotally moved by the flap as the flap is raised, said driving assembly returning to the initial

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position thereof under its own weight as the flap passes the position in which it is raised perpendicular to the blank and is folded downwardly onto the blank.

3. Apparatus as claimed in claim 2, wherein said driven belt is substantially parallel to the blank when the driving assembly is in the initial position.

4. Apparatus as claimed in claim 2, wherein said driving belt has irregularities along the surface which engages the blank.

5. Apparatus as claimed in claim 4, comprising teeth on said driven belt to provide said irregularities.

6. Apparatus as claimed in claim 2, wherein said driving assembly comprises a connected pair of spaced pulleys, one of which is driven, the belt passing around said pulleys, said means which pivotally supports the driving assembly including means which pivotally supports the driven pulley such that the driving assembly undergoes pivotal movement about an axis passing through the driven pulley.

7. Apparatus as claimed in claim 6, wherein said driving assembly comprises an adjustable counterweight supported on a side of the driven pulley opposite the other of the pulleys to adjust the magnitude of unbalanced weight of the driving assembly.

8. Apparatus as claimed in claim 7, wherein said driving assembly comprises a stop element for limiting the degree of pivotal movement of the driving assembly about said axis through the driven pulley to establish said initial position.

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