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(54) **Machine for automatically bending the flaps of cardboard packaging cartons.**

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Description

This design patent application concerns a machine for automatically bending the sides of cardboard packaging cartons.

The problem which the machine according to the invention intends to resolve is the automatic bending of the flaps of cardboard packaging cartons, namely the flaps which are bent to close the top and bottom of the carton in which the product is packaged.

The machine in question specifically resolves the problems encountered by furniture manufacturers in packaging parallelepiped furniture units or furniture of other shapes which can be packaged in a carton consisting of four perpendicular side walls, such as the cabinets of modern fitted kitchens.

The packaging station for these items generally consists of a work surface on which the furniture unit is placed; the preformed packaging carton is then pulled from top to bottom over the unit, with the bottom obviously open; once the carton has been fitted completely over the furniture unit the four bottom flaps of the carton are pressed open on the above work surface.

It is quite obvious that the operator or alternatively the automatic machines sometimes used for turning over and sealing the cartons, will have no problem in bending the four top flaps of the carton but just as obvious that it is impossible to bend the four bottom flaps if the bottom of the furniture unit is not lifted from the resting surface.

To date, the operations which the machine according to the invention performs automatically, have always been carried out by hand with the use of work tables which tip 90° so as to position the furniture unit sideways or backwards, thereby placing it on a second work surface adjacent to the first so that after lowering the work table on which the furniture was initially placed the operator can then bend the four bottom flaps 180°.

The purpose of this invention is to design an automatic machine for bending the four bottom flaps of the packaging box without having to place the furniture sideways, and without having to remove the base of the furniture from the work surface.

Another purpose of this invention is to design a linear machine having compact transverse dimensions along which the package undergoes successive operations while moving in the same rectilinear direction.

The machine according to the invention consists of two identical aligned conveyor belts which can not only reverse their forward direction but can also be inclined slightly in a sub-horizontal direction; it is important to note that the first belt is pivoted on a horizontal pin positioned at the begin-

ning of the belt while the second belt rotates around a pin positioned at its exit.

At the machine according to the invention the two "transverse" flaps close in rapid succession, first the front and then the back flap, following the movement of the packaging and sealing line.

The second of the first pair of said conveyor belts is initially slightly slanted at the top so that the front transverse flap of the box moving forward on the first belt, which is perfectly horizontal in this phase, fits under the entrance of the second belt.

When the front transverse flap is completely under the second belt, the latter automatically oscillates downwards into a slanted position under the horizontal line; the lowering of the second belt rotates the front flap by 90° so that the same positions itself on a vertical plane over the opening which separates the end of the first belt from the beginning of the second belt.

Continuing the pulling action of the first belt, the carton carried on the belt is pushed on to the second belt which, on receiving the carton, tips the front "transverse" flap over by another 90° and in this way closes the flap under the back wall of the furniture item, without being removed from the underlying conveyor belt.

By reversing the direction of the two conveyor belts, the back "transverse" flap can be closed with the same operations as described previously.

This first operating cycle consequently involves the transfer of the package from the first to the second conveyor belt and a subsequent backward passage from the second to the first conveyor belt.

At this point the two conveyor belts, both kept in a perfectly horizontal position and moving in the same direction, carry the half-closed package (the two "side" flaps are still open) towards a second operating station consisting of a machine identical to the machine described above:

In this second station the "side" flaps close in the same way as the "transverse" flaps have closed previously.

In order to get the automatic transfer of the half-closed package from the first to the second bending station it is necessary to introduce a third station between the two stations, at which the half-closed package from the first station is suitably positioned to enter the second station. This third intermediate station consists substantially of a standard motor driven sorting platform which can rotate the half-closed package 90°, if the stations are positioned in line with each other, or can translate the package in two perpendicular directions if the stations are perpendicular to each other.

For major clarity, the description of the invention continues with reference to the enclosed tables intended for purposes of illustration and not in a limiting sense, where:

- fig. 1 is a plan view of the first operating station of the automatic machine in question;
- figs 2A and 2B are two side views of the first operating station of the automatic machine in question illustrating the bending phases of the front and rear transverse flaps respectively;

With reference to figs. 1, 2A and 2B, the first operating station (A) consists of two identical conveyor belts (1a and 1b) supported by two identical frames (2a and 2b), which oscillate with respect to horizontal pivoting pins (3a and 3b) positioned respectively at the beginning of the first belt (1a) and at the end of the second belt (1b).

Two identical jacks (4a and 4b) are used to oscillate the two frames (2a and 2b); said jacks (4a and 4b) are positioned symmetrically with respect to the vertical plane of symmetry passing through the transverse opening (5) which separates the exit of the first belt from the entrance of the second belt.

Attention is drawn to the fact that the end rollers on which the belts (1a and 1b) are wound have a different diameter; in particular, the two rollers (6a and 6b) positioned before and after the opening (5) respectively are much smaller than the two rollers (7a and 7b) placed at the entrance of the first belt (1a) and at the exit of the second belt (1b), respectively.

The difference in size means that the respective overlying half-sections of the belts are not parallel but converging and almost incident at the above rollers (6a and 6b) where they are spaced by a distance equal to that of the smaller diameter of the rollers (6a and 6b).

In figs. 2A and 2B, the number 8 indicates the floor base supporting the pivoting pins (3a and 3b) and the jacks (4a and 4b).

It is easier to understand the complete operating cycle described in the introduction by referring to figures 1 and 2A illustrating the initial phase of the cycle during which the front "transverse" flap (FA) of the carton (S) is fitted under the entrance of the second conveyor (1b), in other words under roller (6b).

As clearly illustrated in fig. 1, as the carton (S) moves forward on the conveyor (1a) towards the belt (1b), the same is slightly lifted so that the front "transverse" flap (FA) tends spontaneously to fit under the belt (1b).

When the flap (FA) is completely inserted under the belt (1b), thanks to the action of the jack (4b), the belt is lowered slightly under the horizontal level thereby rotating the front "transverse" flap (FA) 90° downwards so that the same moves into a vertical position on the plane of symmetry passing through the opening (5).

At this point the carton (S), pushed forward by the belt (1a) is transferred on belt (1b) moving in the same direction as belt (1a); as the carton (S) passes over the opening (5), the corresponding front flap (FA) is gradually rotated a further 90° until it is completely turned over by effect of its interference with the entrance of belt (1b).

Once the carton (S), together with its rear "transverse" flap (FP) has passed on to belt (1b), sensors transmit a signal which reverses the direction of the belts (1a and 1b), lifts the first belt (1a) and levels belt (1b), as illustrated in fig. 2B, in order to repeat the operating cycle in reverse order, thereby overturning said back "transverse" flap (FP) so that the same closes.

Claims

1. An apparatus for automatically folding the flaps forming an end of a cardboard packaging carton, said flaps extending substantially perpendicular outwardly from the lower end of their respective side walls when said packaging carton enters said apparatus, said apparatus comprises a station (a) consisting of two identical first and second conveyor belts (1a, 1b) positioned end to end and supported by horizontal pivoting pins (3a, 3b) positioned at the beginning of the first belt (1a) and at the end of the second belt (1b) respectively; said apparatus further comprises means (4a, 4b) for pivoting each of said two conveyor belts (1a, 1b) up and down independently.
2. An apparatus, according to claim 1, characterized in that the winding rollers (6a and 6b) of the belts (1a and 1b) placed before and after the opening (5) respectively are considerably smaller than the two rollers (7a and 7b), placed respectively at the entrance of the first belt (1a) and at the exit of the second belt (1b).
3. An apparatus, according to claim 1, characterized in that a supporting floor base is provided (8) for the support of the pivoting pins (3a and 3b) and for the means (4a, 4b) for pivoting said conveyor belts.
4. A method for folding the flaps forming an end of a cardboard packaging carton, by means of an apparatus according to claim 1, said flaps extending perpendicular out-wardly from the lower end of their respective side walls, said method comprising the steps of;
 - placing said carton on a first conveyor belt with one of its unfolded flaps extending forwardly in the direction of movement,

- raising slightly the entrance end of the second conveyor,
- moving said carton towards said second conveyor such that its forwardly extending unfolded flap enters under the entrance of said second conveyor,
- lowering said second conveyor to the level of the first conveyor whereby said forwardly extending flap is pivoted downwards,
- moving said carton onto said second belt whereby said flap is pivoted up under the bottom of said carton.

Patentansprüche

1. Vorrichtung zum automatischen Falten der Klappen, die das Ende eines Verpackungskartons bilden, an dem diese Klappen jedesmal senkrecht nach außen vom unteren Ende seiner entsprechenden Seitenwände abstehen, wenn besagter Verpackungskarton in die o.g. Vorrichtung gelangt; diese Vorrichtung besteht aus einer Station (A) mit zwei identischen (erstes und zweites) Förderbändern (1a, 1b), die nebeneinander liegen und von horizontalen Kopfbolzen (3a, 3b) gestützt werden, welche jeweils am Anfang des ersten Förderbandes (1a) sowie am Ende des zweiten Förderbandes (1b) liegen; außerdem besteht diese Vorrichtung aus Elementen (4a, 4b), die es den zwei Förderbändern (1a, 1b) ermöglichen, sich nach oben und nach unten unabhängig zu drehen.
2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Aufwickelrollen (6a und 6b) der Förderbänder (1a und 1b), die sich unmittelbar über und unter dem die Förderbänder voneinander trennenden Spalt befinden, wesentlich kleiner als die beiden Rollen (7a und 7b) sind, welche jeweils am Eingang des ersten (1a) und am Ausgang des zweiten Förderbandes (1b) liegen.
3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß es aus einem Bodengestell (8) zur Stütze der Drehbolzen (3a und 3b) und der Elemente (4a und 4b) besteht, welche besagte Förderbänder drehen.
4. Verfahren zum automatischen Falten der Klappen, die das Ende eines Verpackungskartons nach Anspruch 1 bilden, an dem diese Klappen vom unteren Ende seiner entsprechenden Seitenwände senkrecht nach außen abstehen, bestehend aus den folgenden Phasen:
 - Positionierung des besagten Kartons an einem ersten Förderband mit einer sei-

ner nach vorne in Laufrichtung zeigenden nicht gefalteten Klappen;

- leichtes Anheben des Eingangsendes des zweiten Förderbandes;
- Vorschub des besagten Kartons auf das besagte zweite Förderband, so daß seine zweite nach vorne zeigende, nicht gefaltete Klappe unter den Eingang dieses zweiten Förderbandes gelangt;
- Senkung des besagten zweiten Förderbandes auf Höhe des ersten Förderbandes, so daß die besagte nach vorne zeigende Klappe nach unten gedreht wird;
- Vorschub des besagten Kartons auf das besagte zweite Förderband, so daß diese Klappe unter dem Boden des besagten Kartons nach oben gedreht wird.

Revendications

1. Dispositif pour plier automatiquement les bords qui constituent une extrémité d'un emballage en carton, bords qui se déploient en fait perpendiculairement vers l'externe de l'extrémité inférieure de leurs respectives parois latérales quand le précité emballage en carton entre dans le susdit dispositif; ce dernier comprenant un poste (A) constitué de deux identiques - premier et second - rubans transporteurs (1a, 1b) positionnés l'un à côté de l'autre et supportés par des pivots de tête horizontaux (3a, 3b) placés respectivement au début du premier ruban (1a) et à la fin du deuxième (1b); le précité dispositif comprenant en outre des moyens (4a, 4b) aptes à faire pivoter chacun des deux rubans transporteurs (1a, 1b) vers le haut et vers le bas de manière indépendante.
2. Dispositif selon revendication 1) caractérisé en ce que les bobines d'enroulement (6a et 6b) des rubans transporteurs (1a et 1b), placées respectivement immédiatement en amont et en aval de la fissure (5) qui sépare les rubans (1a et 1b), résultent beaucoup plus petites des deux bobines (7a et 7b) qui sont placées respectivement à l'entrée du premier ruban (1a) et à la sortie du deuxième (1b).
3. Dispositif selon la revendication 1) caractérisé en ce que un socle à terre (8) est prévu pour supporter les pivots (3a et 3b), ainsi que les moyens (4a et 4b) qui font tourner les précités rubans transporteurs.
4. Méthode pour plier les bords qui constituent l'extrémité d'un emballage en carton au moyen d'un dispositif selon la revendication 1), bords qui se déploient en fait perpendiculairement

vers l'externe de l'extrémité inférieure de leurs respectives parois latérales, ladite méthode comprenant les phases suivantes:

- positionnement du ledit carton sur un premier ruban transporteur ayant l'un de ses bords non plié qui se déploie en avant dans la direction du mouvement; 5
- léger soulèvement de l'extrémité d'entrée du deuxième ruban transporteur;
- déplacement du ledit carton vers le précité deuxième ruban transporteur, de manière à ce que son bord non plié qui se déploie en avant entre sous l'entrée du second ruban transporteur; 10
- abaissement du précité second ruban transporteur au niveau du premier, de manière à ce que le précité bord qui se déploie en avant pivote vers le bas; 15
- déplacement du ledit carton sur le second ruban transporteur de manière à ce que ledit bord pivote vers le haut, sous le fond du précité carton. 20

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