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(54) **DEVICE FOR TRANSPORTING FLAT SHEETS AND THE SUBSEQUENT FORMING OF CARDBOARD BOXES**

VORRICHTUNG ZUM TRANSPORTIEREN VON FLACHEN BÖGEN UND NACHFOLGENDE FORMUNG VON KARTONSCHACHTELN

DISPOSITIF POUR LE TRANSPORT DE FEUILLES PLATES ET LE FORMAGE ULTÉRIEUR DE BOÎTES EN CARTON

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## Description

### Field of the Invention

**[0001]** The invention refers to the transport of flat sheets, die-cut or not, from a storage area to a work area in a controlled way, and the subsequent forming of paper or cardboard boxes.

### State of the art

**[0002]** The stacked cardboard, placed on the table of a loader, is picked up by a mechanism of suction cups and introduced between a pair of rollers that push it on guides that support it until it reaches the top of the forming heads.

**[0003]** During this path, the cardboard is supported only from the below and, therefore, is free to make rotations that compromise the following steps as well as being able to damage the raw material itself.

**[0004]** In fact, many systems for the transport of flat sheets and the subsequent forming of paper or cardboard boxes are known in the art.

**[0005]** In particular, EP2809507B1 describes a machine and a method for forming paper or cardboard boxes.

**[0006]** The device described involves transporting the cardboard sheets stacked in a warehouse by means of suction cups to the forming area, where they are released for the subsequent forming step by means of a shaping machine, no longer guided or supported so as to allow any movement of the sheet itself and consequently the imperfect shaping of the box.

**[0007]** A further machine for forming boxes of cardboard is known from US2013/090222A1. This machine describes pulling a blank down from a stack using suction cups, then pushing the blank with a pusher towards a forming station. In the forming station the blank is formed around a mandrel with the help of compression assemblies. Object of the invention

**[0008]** It is therefore felt the need for a device for the transport of flat sheets and the subsequent forming of paper or cardboard boxes that allows the transport of the cardboard from a storage area to a work area in a controlled way, without losing control over the position of the cardboard itself.

### Summary of the Invention

**[0009]** These objects have been achieved by developing a device according to one or more of the appended claims.

**[0010]** A first advantage is that the system, operating the transport with the use of both suction cups and grippers, never loses contact with the sheet to be formed, thus ensuring the optimal forming of the same.

**[0011]** A further advantage is that this system, by varying the descent speed of the forming mould and conse-

quently the relative speed of the external forming counter wheels according to the height of the box, allows the forming force applied to the box to be kept within the minimum parameters that guarantee its integrity. Parameters are, for example, the type and specifications of the board, the die-cutting method, the thickness of the board etc. and can be determined either empirically by testing or by stress calculation, reducing the possibility of tears occurring.

**[0012]** These and other advantages will be better understood by anyone skilled in the art from the following description and the accompanying drawings, given as a non-limiting example, wherein:

- fig. 1 shows an overview of the device;

### Detailed Description

**[0013]** With reference to the attached drawings, a preferred embodiment of a device for the transport of flat sheets and the subsequent forming of paper or cardboard boxes according to the invention is described.

**[0014]** The device includes a mould 1 for forming the cardboard sheet 4a, 4b, a plurality of suction cups 3, at least one gripper 5, preferably two placed orthogonally to the direction of advancement of the sheet, and a plurality of forming wheels 6 placed at the wings 2 of the cross of the cardboard sheet 4b to be formed.

**[0015]** During transport, the sheet 4a is lifted from a loading or picking area P using the suction cups and brought by the grippers to the forming area F where there is a mould 1 for forming the box, of traditional type per se. During loading, the grippers 5 move towards the cardboard 4a and grip it firmly, and transport the sheet 4b below the mould 1 and loosen the grip.

**[0016]** Only then the mould 1 press on the board 4b being formed and pass it through the moulding wheels 6, which, while rotating and translating, form the box, adapting it around the mould 1.

**[0017]** The speed at which the mould 1 descends through the wheels 6 is inversely proportional to the height of the box in order to keep the forming force applied to the board within the minimum parameters that guarantee its integrity. Parameters are, for example, the type and specifications of the board, the die-cutting method, the thickness of the board etc. and can be determined either empirically by testing or by stress calculation, reducing the possibility of tears occurring, in order to avoid tearing.

**[0018]** Preferably, according to the invention, there are spray nozzles 7 placed along the path followed by edges 8 of the sheet to be closed, and configured to deliver hotmelt glue during the transport of the sheet from the picking area P to the forming area F.

**[0019]** Advantageously, with this solution, thanks to the accuracy of transport guaranteed by the use of grippers, it is possible to use fixed nozzles that deliver while the cardboard is being transported with a significant ad-

vantage in terms of process time and accuracy of the glue deposition.

**[0020]** The present invention has been described according to preferred embodiments, however equivalent variants can be conceived without departing from the scope of the present invention.

### Claims

1. Device for transporting cardboard flat sheets and the subsequent forming of cardboard boxes comprising a mould (1) for forming the cardboard flat sheet (4a, 4b), a plurality of picking suction cups (3) for lifting a cardboard flat sheet (4a) from a picking area (P), and a plurality of external forming counter wheels (6) placed at a forming area (F) of the cardboard flat sheet (4b) to be formed, said counter wheels forming the box around said mould (1),  
wherein the device includes one or more gripping members (5), configured to move towards said cardboard sheet and to transport the cardboard flat sheet from said picking area (P) to said forming area (F) without losing contact with the sheet (4a,4b) to be formed and to control its position, thus ensuring its positioning at the forming area (F) and the optimal forming of the same wherein said gripping members (5) comprises one or more grippers arranged to grip firmly the cardboard flat sheet.
2. Device according to claim 1, wherein the descent speed of the mould (1) and consequently of the external forming counter wheels (6) varies according to the height of the box, keeping the forming force applied to the box within predetermined minimum parameters associated with maintaining the integrity of the box, said parameters comprising the type and specifications of the box, the die-cutting method, the thickness of the box, in order to reduce the possibility of tears occurring.
3. Device according to one of the above claims, wherein there are spray nozzles (7) placed along the path followed by edges (8) of the sheet to be closed, and configured to deliver hotmelt glue during the transport of the sheet from a picking area (P) to a forming area (F).
4. Device according to one of the previous claims, including a motorisation (9) of the mould (1) and control means (10) configured to control a descent speed of the mould (1) through the external counter wheels (6) inversely proportional to the height of the box, in order to maintain the forming force applied to the box within predetermined minimum parameters associated with maintaining the integrity of the box, said parameters comprising the type and specifications of the box, the die-cutting method, the thickness of

the box, in order to reduce the possibility of tears occurring.

5. Device according to one of the previous claims, wherein said sheet is a die-cut sheet in the shape of a cross, for example "H-" or "T"-shaped, and said external forming counter wheels (6) are placed at the wings (2) of the cardboard sheet (4b) to be formed.

### Patentansprüche

1. Vorrichtung zum Transportieren von flachen Kartonbögen und zum anschließenden Bilden von Kartonschachteln, umfassend eine Form (1) zum Bilden des flachen Kartonbogens (4a, 4b), mehrere Aufnahmesaugnapfe (3) zum Anheben eines flachen Kartonbogens (4a) von einem Aufnahmebereich (P) und mehrere äußere bildende Gegenräder (6), die in einem Bildungsbereich (F) des zu bildenden flachen Kartonbogens (4b) platziert sind, wobei die Gegenräder die Schachtel um die Form (1) herum bilden,  
wobei die Vorrichtung ein oder mehrere Greifelemente (5) aufweist, die eingerichtet sind, um sich in Richtung des Kartonbogens zu bewegen und den flachen Kartonbogen von dem Aufnahmebereich (P) zu dem Bildungsbereich (F) zu transportieren, ohne den Kontakt mit dem zu bildenden Bogen (4a, 4b) zu verlieren, und um seine Position zu steuern, wodurch seine Positionierung in dem Bildungsbereich (F) und die optimale Bildung desselben sichergestellt wird, wobei die Greifelemente (5) einen oder mehrere Greifer aufweisen, die eingerichtet sind, um den flachen Kartonbogen fest zu greifen.
2. Vorrichtung nach Anspruch 1, wobei die Absenkgeschwindigkeit der Form (1) und folglich der äußeren bildenden Gegenräder (6) gemäß der Höhe der Schachtel variiert, wobei die auf die Schachtel ausgeübte bildende Kraft innerhalb vorbestimmter Mindestparameter gehalten wird, die einem Aufrechterhalten der Unversehrtheit der Schachtel zugeordnet sind, wobei die Parameter den Typ und die Spezifikationen der Schachtel, das Stanzverfahren und die Dicke der Schachtel umfassen, um die Möglichkeit eines Auftretens von Rissen zu reduzieren.
3. Vorrichtung nach einem der vorangehenden Ansprüche, wobei es Sprühdüsen (7) gibt, die entlang des Weges platziert sind, dem die Kanten (8) des Bogens folgen, der zu schließen ist, und die eingerichtet sind, um Heißkleber während des Transports des Bogens von einem Aufnahmebereich (P) zu einem Bildungsbereich (F) zu liefern.
4. Vorrichtung nach einem der vorhergehenden An-

sprüche, aufweisend eine Motorisierung (9) der Form (1) und Steuermittel (10), die eingerichtet sind, um eine Absenkgeschwindigkeit der Form (1) über die äußeren Gegenräder (6) umgekehrt proportional zu der Höhe der Schachtel zu steuern, um die auf die Schachtel ausgeübte bildende Kraft innerhalb vorbestimmter Mindestparameter zu halten, die einem Aufrechterhalten der Unversehrtheit der Schachtel zugeordnet sind, wobei die Parameter den Typ und die Spezifikationen der Schachtel, das Stanzverfahren und die Dicke der Schachtel umfassen, um die Möglichkeit eines Auftretens von Rissen zu reduzieren.

5. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei der Bogen ein gestanzter Bogen in Form eines Kreuzes ist, zum Beispiel "H"- oder "T"-förmig, und die äußeren bildenden Gegenräder (6) an den Flügeln (2) des zu bildenden Kartonbogens (4b) platziert sind.

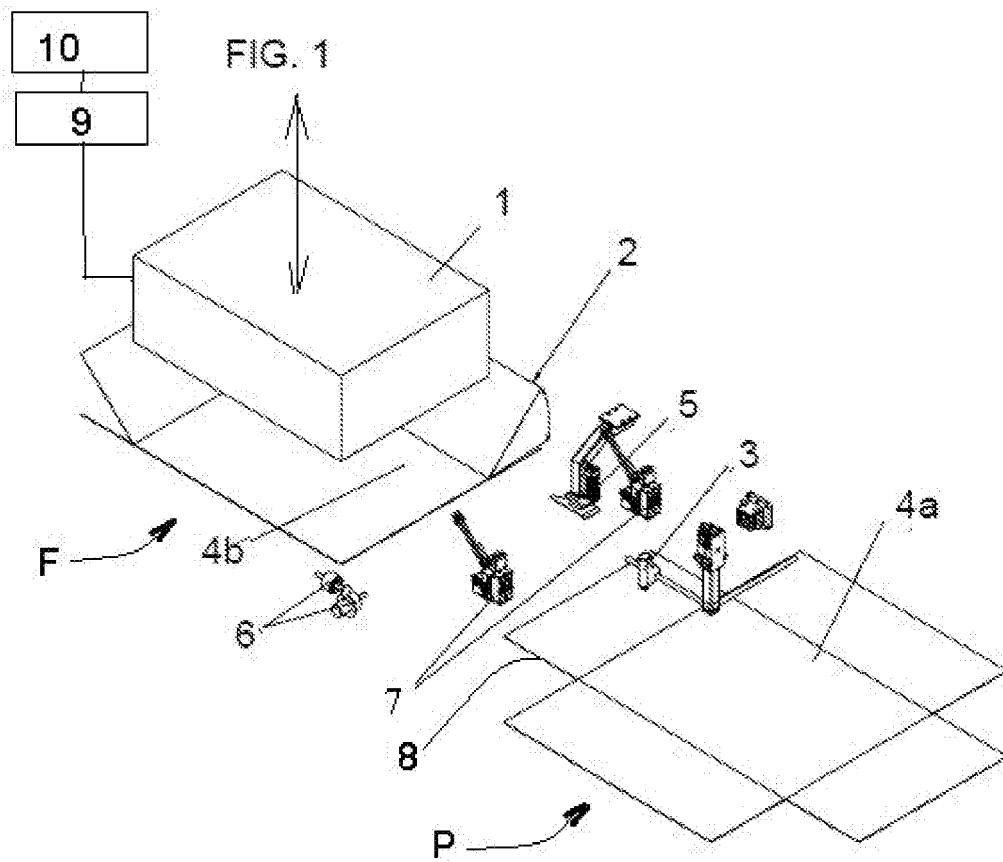
### Revendications

1. Dispositif pour le transport de feuilles plates de carton et la formation subséquente de boîtes de carton, comprenant un moule (1) pour la formation de la feuille plate de carton (4a, 4b), une pluralité de ventouses de saisie (3) pour lever une feuille plate de carton (4a) d'une zone de saisie (P), et une pluralité de contre-roues de formation externes (6) placées au niveau d'une zone de formation (F) de la feuille plate de carton (4b) à former, lesdites contre-roues formant la boîte autour dudit moule (1), dans lequel le dispositif comprend un ou plusieurs éléments de préhension (5), configurés pour se déplacer vers ladite feuille de carton et pour transporter la feuille plate de carton de ladite zone de saisie (P) vers ladite zone de formation (F) sans perte de contact avec la feuille (4a, 4b) à former et pour commander sa position, en assurant ainsi son positionnement au niveau de la zone de formation (F) et la formation optimale de la feuille, dans lequel lesdits éléments de préhension (5) comprennent un ou plusieurs préhenseurs agencés pour la préhension ferme de la feuille plate de carton.
2. Dispositif selon la revendication 1, dans lequel la vitesse de descente du moule (1) et par conséquent des contre-roues de formation externes (6) varie en fonction de la hauteur de la boîte, en gardant la force de formation appliquée à la boîte conforme à des paramètres minimaux prédéterminés associés au maintien de l'intégrité de la boîte, lesdits paramètres comprenant le type et des spécifications de la boîte, le procédé de découpage, l'épaisseur de la boîte, afin de réduire le risque de déchirement.

3. Dispositif selon l'une des revendications précédentes, dans lequel il y a des buses de pulvérisation (7) placées le long du trajet suivi par des bords (8) de la feuille à fermer, et configurées pour distribuer de la colle thermofusible au cours du transport de la feuille d'une zone de saisie (P) à une zone de formation (F).

4. Dispositif selon l'une des revendications précédentes, comprenant une motorisation (9) du moule (1) et un moyen de commande (10) configuré pour commander une vitesse de descente du moule (1) à travers les contre-roues externes (6) inversement proportionnelle à la hauteur de la boîte, afin de garder la force de formation appliquée à la boîte conforme à des paramètres minimaux prédéterminés associés au maintien de l'intégrité de la boîte, lesdits paramètres comprenant le type et des spécifications de la boîte, le procédé de découpage, l'épaisseur de la boîte, afin de réduire le risque de déchirement.

5. Dispositif selon l'une des revendications précédentes, dans lequel ladite feuille est une feuille découpée en forme de croix, par exemple en forme de H ou de T, et lesdites contre-roues de formation externes (6) sont placés au niveau des ailes (2) de la feuille de carton (4b) à former.



**REFERENCES CITED IN THE DESCRIPTION**

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