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(54) **Device and method for the production of corrugated cardboard with a single flat surface**

Vorrichtung und Verfahren zur Herstellung von Wellpappen mit einer ebenen Oberfläche

Dispositif et méthode pour la fabrication de carton ondulé avec une face pleine

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(56) References cited:
**EP-A- 0 559 556 EP-A- 0 850 754
FR-A- 1 538 604 US-A- 4 917 664
US-A- 5 614 048**

EP 0 976 540 B1

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Description

[0001] This invention refers to a device for the production of corrugated cardboard with a single flat surface.

[0002] The machines producing such a cardboard generally comprise as essential elements a pair of corrugating cylinders, a glue applying cylinder and a pressing cylinder. In the cardboard production process, a first cardboard ribbon is corrugated by a pressure simultaneously exerted on it by a pair of corrugating cylinders. The glue applying cylinder then applies the glue on the crests of the corrugations and the pressing cylinder applies a second flat cardboard ribbon under pressure on the crests of the first corrugated cardboard ribbon. During this operation, said ribbon crests are internally supported by the corresponding projections of the corrugating cylinder. The final adhesion is achieved by pressing and heating the glue spread between the ribbons.

[0003] Machines of such a type are for instance described in the patent FR-A-1538604.

[0004] The outer surface of the second flat cardboard ribbon of the product obtained from such machines, consisting in a corrugated cardboard with a single flat surface, reveals the junction lines of the crests with the mentioned second ribbon, usually known as "pressure lines".

[0005] The presence of these lines is a source of both technical and esthetic drawbacks. They decrease the esthetic attractiveness of the product and may further denote that the mechanical pressing action exerted on the cardboard in order to glue the product has determined a certain yielding of its cellulose fibers, thus affecting the cardboard's mechanical properties.

[0006] In order to overcome this drawback, the patent application FR-A-2719521 offers a machine in which the pressure directly exerted on the cardboard by the pressing cylinder is reduced (and eventually annulled), while on the contrary applying a stretching force, through the second corrugating cylinder, on the second flat cardboard ribbon, while both of the cardboard ribbons are still running on the same.

[0007] This kind of operation is not easily managed, as the second flat cardboard ribbon is still substantially applied to the first corrugated cardboard ribbon under pressure, while the latter is still running on the second corrugating roller and the glue has still not taken hold.

[0008] This application won't totally exclude that on the second flat cardboard ribbon of the product obtained from such machines some pressure lines may still appear, especially when the operating production parameters need to be changed.

[0009] The most important prior art reference is constituted by EP-A-599 556, in which the two paper layers, respectively flat and corrugated, are bonded together during their path along the second corrugating cylinder, without any pressure applied between the corrugating roller and the smooth feed roller for the flat paper layer. A significant pressure is applied between the two paper

layers by the outer flat paper layer properly tensioned. The coupling between the flat and the corrugated layers occurs when the crests of the corrugated cardboard ribbon are supported by the projections of the second corrugating cylinder. The paper layers so bonded are then heated on a heating cylinder.

[0010] The purpose of this invention consists in achieving an improved device for the production of corrugated cardboard with a single flat surface, free of any junction lines of the crests of the first corrugated cardboard ribbon on said second flat cardboard ribbon, even if the production parameters are changed; in other words, an easily manageable machine.

[0011] The invention therefore covers both a device as defined in its essential aspects both by claim 1 and claim 2, as well as a process defined in its essential features by claim 3.

[0012] In order to outline the characteristics and advantages of this invention with better clarity, the same will be described with reference to a typical embodiment as shown in Figure 1, for exemplifying and non-limiting purposes, which represents a simplified side view of the device.

[0013] In this machine the corrugating rollers essentially perform only the functions of permanently corrugating and preheating the first cardboard ribbon. In these rollers, no superposition or pressure of the second flat cardboard ribbon occurs on the first permanently corrugated cardboard ribbon. This means that there's no need for any pressing cylinder with a direct or indirect action.

[0014] It is highly interesting that in this embodiment the line along which the first contact occurs between the first corrugated cardboard ribbon 7 and the second flat cardboard ribbon 9 is set either next to the passage between the second corrugating cylinder 3 and the heating cylinder 4, or on the heating cylinder 4. The superposition of the two cardboard layers occurs only by keeping the second flat cardboard ribbon in a stretched and heated condition, while the first corrugated cardboard ribbon is simply laid down in a preheated form and without any significant stretching force which may affect its corrugation. The pre-heating phases allow stabilizing the structure assumed by the product until the glue finally takes hold. The stretching force needed on the produced cardboard in order to extract it from the machine is totally sustained only by the first flat cardboard ribbon.

[0015] In the embodiment shown in Figure 1, the number 1 generally indicates the overall machine for the production of corrugated cardboard with a single flat surface. It essentially comprises a first corrugating cylinder 2 and a second corrugating cylinder 3, a heating cylinder 4, a first cylinder 5 and a second cylinder 6 introducing the first cardboard ribbon 7, at least one cylinder 8 introducing a second ribbon 9 and at least one cylinder 10 extracting the corrugated cardboard with a single flat surface 11.

[0016] The cylinders 2, 3, 4, 5, 6, 8, and 10 are sup-

ported by a frame 12 (only partially shown), so as to be capable of rotating around their respective central symmetry axes 13, 14, 15, 16, 17, 18 and 19, all arranged in parallel to each other.

[0017] The machine 1 comprises certain devices, for instance pneumatic or hydraulic devices not shown for simplicity, capable of generating a depression on the outer face of the cylinders, as in the case shown in the figure on the cylinders 2-4. This depression is aimed at attracting the cardboard ribbons to the surfaces of said cylinders.

[0018] The machine 1 also comprises some devices for the preheating of at least one of said cylinders or the outer surface of said cylinders, with which the cardboard under processing is destined to come into contact. These devices are in themselves known, and are for instance described in the French patent FR-A-2622145.

[0019] Both the devices to apply the glue to said cardboard ribbons as well as the rotary driving devices of said cylinders are known in the state of the art, for instance in the document FR-A-2719521.

[0020] In the device according to the invention the cylinder 4 is fitted with a heating system and connected to a suction system; it is essentially arranged tangentially to the second corrugating cylinder 3 along the line 20, downstream of which the first contact between the first already corrugated cardboard ribbon 7 and the second flat cardboard ribbon 9 occurs.

[0021] The cylinder 8 introducing the second flat cardboard ribbon 9 is positioned above the gluing cylinder 22. The cylinder 10 extracting the corrugated cardboard 11 with a single flat surface is arranged on the side of the heating cylinder 4 that is opposite the one where the first point of contact 20 between the first corrugated cardboard ribbon 7 and the second flat cardboard ribbon 9 occurs.

[0022] The section in which the first contact 20 occurs is therefore the one where the first corrugated cardboard ribbon 7 is transferred, without being subjected to any significant force, from the second corrugating cylinder 3 to the heating cylinder 4. The second corrugating cylinder 3 and the heating cylinder 4 are positioned very closely to each other, but without an actual contact. The line of first contact 20 between the two cardboard ribbons may therefore already rest on the cylinder 4 or in their passage between the cylinders 3 and 4. The adjustment of the line or portion of contact is done based on the processing parameters, and may be performed by modifying the position of the cylinder 8, and/or by eventually increasing the distance between the axes 14 and 15 of the cylinders 3 and 4.

[0023] The adjustment of the contact 20 between the cardboard ribbons 7 and 9 is always made in such a manner as to avoid the formation of pressure lines or the appearance of the junction lines of the crests of the first corrugated cardboard ribbon 7, independently of the changes in the operating parameters.

[0024] According to a preferred embodiment of the in-

vention, the heating cylinder 4, the first corrugating cylinder 2 and the second corrugating cylinder 3 have their rotating axes arranged in the same plane.

[0025] The process for producing the corrugated cardboard 11 with a single flat surface according to this invention substantially unfolds in the following phases.

[0026] In the phase introducing the first cardboard ribbon 7 in the direction of the arrow "F", the process involves a pair of corrugating cylinders 2 and 3 fitted with some projections of a shape corresponding to the corrugation to be applied to the cardboard. The cylinders are facing each other and reciprocally engage so as to permanently corrugate said first cardboard ribbon 7. The cylinders 5 and 6 serve the purpose of introducing and properly channeling the first cardboard ribbon between the pair of corrugating cylinders 2 and 3.

[0027] A phase for the application of glue on the tops of the crests or corrugations of the first cardboard ribbon 7 follows. During this phase the second corrugating cylinder 3 acts as a matching unit against the gluing cylinder 22 of the glue application system 21, preventing the just profiled crests of the first cardboard ribbon 7 from being deformed or squashed.

[0028] This is followed by a phase of applying a second flat cardboard ribbon 9 on the crests of the first cardboard ribbon 7, so as to form a corrugated cardboard 11 with a single flat surface.

[0029] The ribbon 9 runs in the direction of the arrow "G".

[0030] This phase does not provide for a significant pressure between the first cardboard ribbon 7 and the second cardboard ribbon 9, or at most for a very limited pressure, such as to essentially merely affect the interspersed layer of glue. The first contact 20 between the first corrugated cardboard ribbon 7 and the second cardboard ribbon 9 occurs downstream of the gluing cylinder 22, and is preferably set just before or on the heated lateral surface of the heating cylinder 4. On this surface the second cardboard ribbon 9 is kept stretched, while the opposite crests of said first cardboard ribbon 7 are left unsupported.

[0031] The contact and superposition of the two ribbons is followed by a glue heating and activating phase, designed to shape and produce the corrugated cardboard 11 which is discharged from the machine along a path marked by the arrow "H". The cylinder 10 takes care of extracting it.

Claims

1. A device (1) for the production of corrugated cardboard (11) with a single flat surface, comprising a first corrugating cylinder (2) and a second corrugating cylinder (3), a heating cylinder (4), at least one introducing cylinder (5, 6) for the first corrugated cardboard ribbon (7), at least one introducing cylinder (8) for a second cardboard ribbon (9) and at

least one extracting cylinder (10) for the corrugated cardboard produced with a single flat surface (11), all said cylinders (2, 3, 4, 5, 6, 8, and 10) being supported by a frame (12) and being capable of rotating around their respective axes all arranged parallel to each other, where the heating cylinder (4) is arranged tangentially to the second corrugating cylinder (3), the introducing cylinder (8) for the second flat cardboard ribbon is positioned above the gluing cylinder (22), and the extracting cylinder (10) for the produced corrugated cardboard (11) with a single flat surface is arranged on the side of the heating cylinder (4) that is opposite the side on which the first point of contact (20) occurs, **characterised in that** the point (20) where the first contact occurs between the first corrugated cardboard ribbon (7) and the second cardboard ribbon (9) lies on the lateral surface of the heating cylinder (4) without the first corrugated cardboard ribbon (7) being subjected to any significant force.

2. A device according to claim 1, **characterised in that** the heating cylinder (4), the first corrugating cylinder (2) and the second corrugating cylinder (3) are arranged with their rotating axes (13-15) in the same plane.

3. A process for the production of corrugated cardboard (11) with a single flat surface comprising the phases of:

- introducing a first cardboard ribbon (7) between a pair of corrugating cylinders (2, 3) fitted with projections engaging each other, so as to corrugate said first cardboard ribbon (7);
- applying glue on the crests of the corrugations of said first corrugated cardboard ribbon (7);
- applying a second flat ribbon (9) on the tops of the corrugations of the first ribbon (7), so as to form a corrugated cardboard (11) with a single flat surface;
- heating and activating the glue, said gluing so occurring during the residence on the heating cylinder (4); **characterised in that** the application of the second flat ribbon (9) on the crests of the first cardboard ribbon (7) is carried out without a significant pressure between the ribbons,

in that the first point of contact (20) between the first already corrugated cardboard ribbon (7) and the second flat cardboard ribbon (9) is set where the first corrugated cardboard ribbon (7) is transferred, without being subjected to any significant force, from the second corrugating cylinder (3) to the heating cylinder (4), and **in that** the first contact between the ribbons occurs with the second cardboard ribbon (9) kept stretched on the cylinder (4),

while the opposite crests of said first corrugated cardboard ribbon (7) are unsupported.

5 Patentansprüche

1. Vorrichtung (1) zur Herstellung einer Wellpappe (11) mit einer einzigen flachen Oberfläche, umfassend einen ersten Wellenzylinder (2) und einen zweiten Wellenzylinder (3), einen Heizzylinder (4), mindestens einen Einführungszyylinder (5, 6) für das erste gewellte Pappenband (7), mindestens einen Einführungszyylinder (8) für ein zweites Pappenband (9) und mindestens einen Entnahmezyylinder (10) für die Wellpappe, welche mit einer einzigen flachen Oberfläche (11) hergestellt ist, wobei alle diese Zylinder (2, 3, 4, 5, 6, 8 und 10), welche von einem Rahmen (12) gehalten sind und sich um ihre entsprechenden Achsen herum drehen können, alle parallel zueinander angeordnet sind, wobei der Heizzylinder (4) tangential zu dem zweiten Wellenzylinder (3) angeordnet ist, wobei der Einführungszyylinder (8) für das zweite flache Pappenband über dem Klebezylinder (22) angeordnet ist, und wobei der Entnahmezyylinder (10) für die hergestellte Wellpappe (11) mit einer einzigen flachen Oberfläche auf der Seite des Heizzylinders (4), das heißt, gegenüber zu der Seite, auf welcher der erste Berührungspunkt (20) liegt, angeordnet ist, **dadurch gekennzeichnet, dass** der Punkt (20), bei welchem die erste Berührung zwischen dem ersten gewellten Pappenband (7) und dem zweiten Pappenband (9) auftritt, auf der seitlichen Oberfläche des Heizzylinders (4) liegt, ohne das erste gewellte Pappenband (7) irgendeiner wesentlichen Kraft auszusetzen.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Heizzylinder (4), der erste Wellenzylinder (2) und der zweite Wellenzylinder (3) mit ihren Drehachsen (13-15) in derselben Ebene angeordnet sind.

3. Verfahren zur Herstellung von Wellpappe (11) mit einer einzigen flachen Oberfläche, die Phasen umfassend:

- Einführung eines ersten Pappenbandes (7) zwischen ein Paar von Wellenzylindern (2, 3), welche mit Vorsprüngen, die sich miteinander in Eingriff befinden, derart angepasst sind, dass sie das erste Pappenband (7) wellen;
- Aufbringen eines Klebstoffes auf die Scheitelpunkte der Wellen des ersten gewellten Pappenbandes (7);
- Aufbringen eines zweiten flachen Bandes (9) auf die oberen Seiten der Wellen des ersten Bandes (7), so dass eine Wellpappe (11) mit einer einzigen flachen Oberfläche ausgebildet

wird;

- Heizen und Aktivieren des Klebstoffes, wobei das Kleben während des Verweilens auf dem Heizzyylinder (4) erfolgt;

dadurch gekennzeichnet,

dass das Aufbringen des zweiten flachen Bandes (9) auf die Scheitelpunkte des ersten Pappenbandes (7) ohne einen wesentlichen Druck zwischen den Bändern ausgeführt wird,

dass der erste Berührungspunkt (20) zwischen dem ersten bereits gewellten Pappenband (7) und dem zweiten flachen Pappenband (9) darauf eingestellt wird, wo das erste gewellte Pappenband (7) von dem zweiten Wellenzylinder (3) auf den Heizzyylinder (4) übertragen wird, ohne irgendeiner wesentlichen Kraft ausgesetzt zu sein, und

dass die erste Berührung zwischen den Bändern auftritt, wobei das zweite Pappenband (9) auf dem Zylinder (4) gedehnt gehalten wird, während die gegenüberliegenden Scheitelpunkte des ersten gewellten Pappenbands (7) nicht gehalten werden.

Revendications

1. Dispositif (1) de production de carton ondulé (11) avec une seule face plate, comprenant un premier cylindre onduleur (2) et un second cylindre onduleur (3), un cylindre chauffant (4), au moins un cylindre introducteur (5, 6) pour le premier ruban de carton ondulé (7), au moins un cylindre introducteur (8) pour un second ruban de carton (9) et au moins un cylindre extracteur (10) pour le carton ondulé produit avec une seule face plate (11), tous lesdits cylindres (2, 3, 4, 5, 6, 8 et 10) étant supportés par un châssis (12) et étant aptes à tourner autour de leurs axes respectifs tous agencés parallèles les uns aux autres, où le cylindre chauffant (4) est agencé tangentielllement au second cylindre onduleur (3), le cylindre introducteur (8) pour le second ruban de carton plat est positionné au-dessus du cylindre encolleur (22), et le cylindre extracteur (10) pour le carton ondulé produit (11) avec une seule face plate est agencé sur le côté du cylindre chauffant (4) qui est opposé au côté sur lequel le premier point de contact (20) se produit, **caractérisé en ce que** le point (20) où se produit le premier contact entre le premier ruban de carton ondulé (7) et le second ruban de carton (9) repose sur la face latérale du cylindre chauffant (4) sans le premier ruban de carton ondulé (7) se trouvant soumis à une force quelconque importante.

2. Dispositif selon la revendication 1, **caractérisé en ce que** le chauffage chauffant (4), le premier cylindre onduleur (2) et le second cylindre onduleur (3) sont agencés avec leurs axes de rotation (13 à 15)

dans le même plan.

3. Méthode de production de carton ondulé (11) avec une seule face plate comprenant les phases consistant à :

- introduire un premier ruban de carton (7) entre une paire de cylindres onduleurs (2, 3) pourvus de parties saillantes engrenant les unes avec les autres, afin d'onduler ledit premier ruban de carton (7) ;
- appliquer de la colle sur les crêtes des ondulations dudit premier ruban de carton ondulé (7) ;
- appliquer un second ruban plat (9) sur les sommets des ondulations du premier ruban (7), afin de former un carton ondulé (11) avec une seule face plate ;
- chauffer et activer la colle, ledit collage se produisant pendant la présence sur le cylindre chauffeur (4) ; **caractérisé en ce que** l'application du second ruban plat (9) sur les crêtes du premier ruban de carton (7) est effectuée sans une pression importante entre les rubans,

en ce que le premier point de contact (20) entre le premier ruban de carton déjà ondulé (7) et le second ruban de carton plat (9) est défini là où le premier ruban de carton ondulé (7) est transféré, sans se trouver soumis à une quelconque force importante, depuis le second cylindre onduleur (3) jusqu'au cylindre chauffant (4),

et **en ce que** le premier contact entre les rubans se produit avec le second ruban de carton (9) maintenu étiré sur le cylindre (4), tandis que les crêtes opposées dudit premier ruban de carton ondulé (7) ne sont pas supportées.

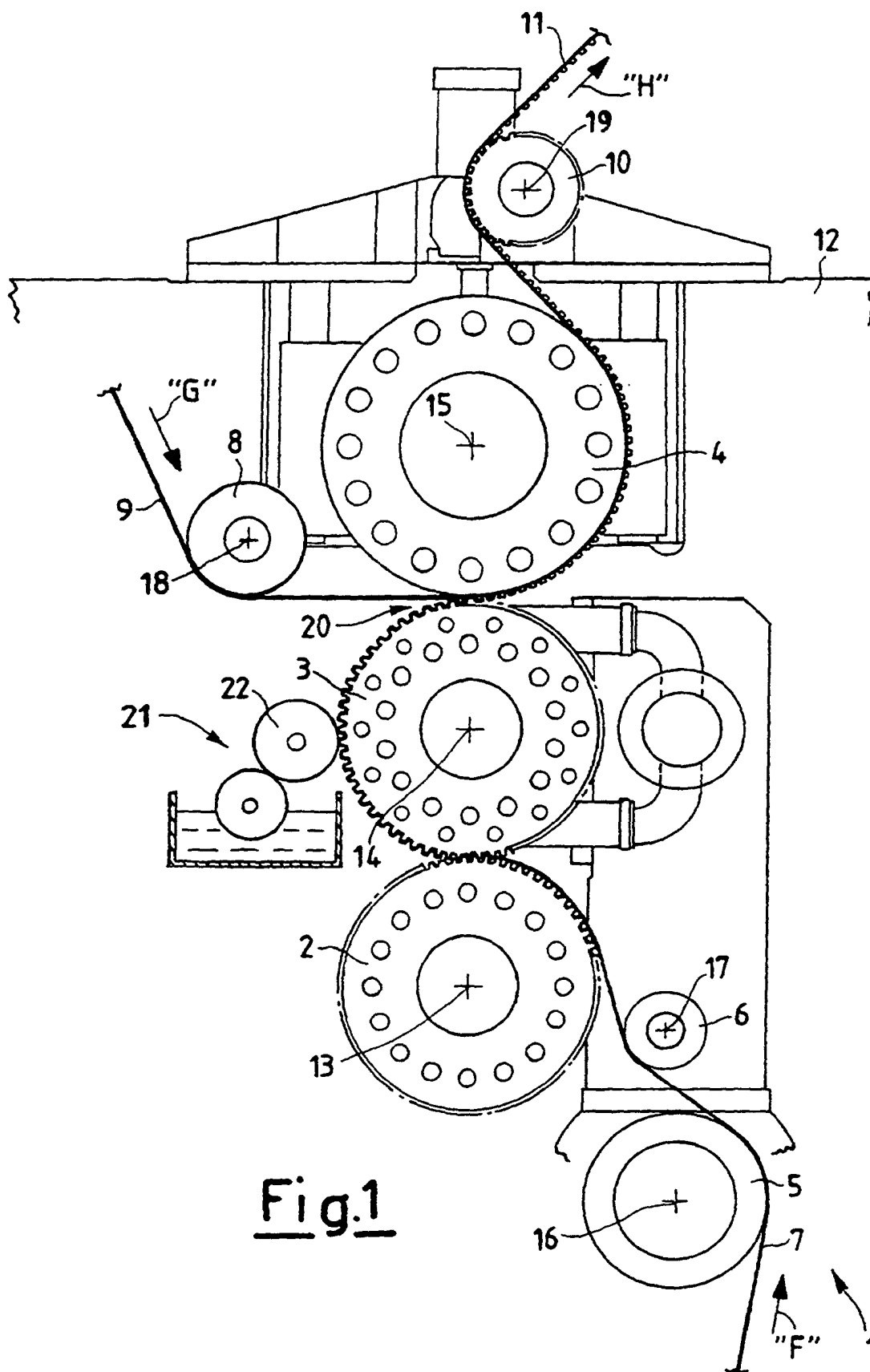


Fig.1