

Description

This invention relates to a method of forming sandwich structures, comprising one or more non-corrugated sheet elements (liners) to which are bonded one or two corrugated (fluted) sheet elements (mediums) which are themselves bonded together.

Australian Patent Application 62323/86 discloses an improved corrugated paper board structure in which two layers of corrugated medium (flutes) are bonded together at the peaks of the flutes, and are sandwiched between two outer liners. The disclosures of Application 62323/86 are incorporated herein by reference.

Australian Patent Application 62323/86 also discloses a method of forming the structural paper in which two separate layers of corrugating medium are corrugated and then brought into flute tip to flute tip contact on synchronised corrugating rollers.

U.S. Patent 3,700,518 disclosed a method of forming board having two outer liners and two inner fluted mediums bonded at their flute peaks. The method adopted is to corrugate two mediums together, bond liners to each separate the two single faced boards and adhere the boards together at the flute peaks of the fluted mediums. This method has the disadvantage of not being able to accurately bond the flute peaks together.

Australian Patent Application 11926/88 addresses the problem of capital cost in constructing a new corrugating plant for the flute tip to flute tip paper board. As such, specification 11962/88 focused on a modification to existing corrugating machinery which enabled conventional corrugated board, as well as the new flute tip to flute tip corrugated board to be made.

Conventional machinery for forming corrugated board incorporates a unit for making single faced corrugated board, (a liner adhered to a single fluted layer). More complex board constructions can be formed by bonding the exposed flutes to another liner and, if desired, subsequently bonding that to another single faced corrugated board.

A "single facer" plant such as described in EP-A-0 279 609 which constitutes a prior art in accordance with Article 54(3) EPC normally includes as its essential components:

- (a) Mill roll stands for liner and corrugating medium.
- (b) A pair of corrugating rollers for corrugating the medium into a fluted medium
- (c) A pair of heated smooth (non corrugated) guide rolls for the liner board.
- (d) A non corrugated pressure roll for bringing the liner into contact with the second corrugating roller to form the single faced board.

(e) An idler roll to guide the formed single faced board to subsequent processing units.

With conventional single faced board a degree of pressure is applied to ensure secure bonding between the liner and the corrugated medium. This application of pressure creates pressure lines on the outer face of the liner corresponding to the position of the flute tips. The need to apply pressure can adversely affect the strength of the single faced structure and adversely affects the appearance of the board and its suitability for printing.

This invention has as its object the manufacture of new corrugated machinery to produce the improved corrugated paperboard structure in which one or two layers of corrugated medium (flutes) are precisely bonded together at the peaks of the flutes and are sandwiched between two outer liners. This is the primary purpose of this machinery. It is also a secondary object to produce a conventional single faced board without using any pressure to secure the bonding of the liner to the corrugated medium.

To this end the invention provides a single face corrugated board making apparatus capable of forming corrugated boards having two fluted mediums bonded together at the flute tips comprising:

- (a) Mill roll stands for two mediums and one liner.
- (b) A carrier roll fluted to support a first fluted medium.
- (c) A single corrugating roll engaging with the carrier roll to corrugate the first fluted medium.
- (d) A pair of corrugating rolls adapted to produce a second fluted medium said pair being located and driven relative to the carrier roll to enable the first and second fluted mediums to be brought into precise flute tip to flute tip contact and to be conveyed by the carrier roll.
- (e) A first adhesive application station to apply adhesive to one of said fluted mediums prior to the flute tips of the said first and second fluted mediums coming into contact.
- (f) A second adhesive application station to apply adhesive to the exposed flute tips of the bonded mediums or to a liner board.
- (g) A liner applicator roll located adjacent to said carrier roll downstream of said second adhesive applicator adapted to apply a liner board to said bonded fluted mediums.

The carrier roll is involved in every operation of the machine and is the key to ensuring retention of the product and precision of location of the mediums relative to each other. Although it is preferred to use a carrier roll of larger diameter than the other three corrugating rolls, it is quite acceptable to use corrugating and carrier rolls of the same diameter.

The single corrugating roll is precisely located relative to the flutes on the carrier roll and is so loaded against the carrier roll to produce the first corrugated medium. The first corrugated medium is held within the grooves of the carrier roll in which it was formed preferably by the use of vacuum in the carrier roll. The vacuum can be applied from within the carrier roll or externally to the grooves on the surface of the carrier roll. Alternatively positive air pressure can be applied externally to press the medium onto the carrier roll. It is also preferred that the carrier roll is arranged to have controlled camber on its surface in the axial direction at the point of contact of the corrugating roll and the carrier roll. Controlled camber rolls are commonly used on paper making machines in the paper industry.

The second fluted medium is corrugated in a pair of fairly conventional corrugating rolls, one loaded against the other. The inner roll of this pair of corrugating rolls is precisely located relative to the flutes on the carrier roll to ensure that the first and second mediums are brought together tip to tip, with great precision. The pair of corrugating rolls, as a pair are loaded against the carrier roll to give the flute tip to flute tip pressure bond.

An additional controlled camber on the carrier roll surface in an axial direction can be provided at the point of contact between the inner corrugating roll and the carrier roll.

It is not essential for the flute mediums to have the same pitch as long as a sufficient number of flute tips of each medium can be aligned. For example the machine of this invention can be used to make corrugated structural panel comprising a flat sheet and a first and second corrugated element wherein said first corrugated element is attached to said flat sheet, said second corrugated element has fewer flutes per metre than said first element, said second element having flutes of greater height than the flutes of said first element and the flute peaks of said second element being attached to alternate flute peaks of said first element. Preferably, in this embodiment, one of the corrugated mediums has half as many flutes per metre as the other medium with flutes two (2) times as high as those of the other medium.

Conventional heated "S" wrap liner applicator and drive rolls are preferably positioned to allow tangential approach of the liner prior to bonding to the flute to flute structure. Preferably the liner will run over an adjustable wrap preheater drum before the tension is controlled by the "S" wrap rolls.

Very similar treatment is preferably provided for each of the mediums prior to corrugating. This includes the provision of tension control, preheater/preconditioners, heated "S" wrap drive rolls and steam box conditioners.

The improved strength characteristics of the double flute construction enable lighter weight board to be made having strengths equivalent to those found in heavier boards of conventional structure. Thus savings in material costs are possible using the flute to flute construction.

It has been found that boxes formed from flute to flute board exhibit superior durability and strength. The creasing and folding characteristics of board having flute to flute bonding are such that the corner and edge folds of boxes provide added strength to the construction. The flute to flute structure creases in a well defined manner to produce a hinged joint which is superior in strength, flexibility and visual appearance compared with creases in conventional board.

Bonded fluted mediums according to this invention can be subsequently bonded to any suitable liner material to form light weight structural laminates. The mediums can be manufactured from 100% cellulose fibre or ligno-cellulose fibre or combinations of cellulose, ligno-cellulose and synthetic fibres, or they may be laminated structures.

The liners or sheet elements may be of any material and structure of varying thickness including, but not limited to, paper board made of cellulose fibres, ligno-cellulose fibres, cellulose, ligno-cellulose and/or synthetic fibre mixtures; natural or synthetic polymers, wood, or metal; or laminates made of bonded layers of any combinations of these materials. Strips or strings of any material may also be fed intermittently, between the mediums across the flutes and thus be bonded at the flute tip to flute tip junction. The inclusion of such strips or strings will constrain the bonded mediums and prohibit expansion of the flute tip to flute tip structure until one or more liners are added and may additionally confer added strength to the board.

Bonding may be achieved by use of adhesives or by other means such as, but not limited to, soldering, brazing and fusion welding.

Where a light weight structural panel for building is required, such as ceiling panels or for use in furniture, the liners can be wood veneer. In other applications such as air-frame skins for aircraft, the liners may be metal foil or synthetic polymers.

The introduction of a machine of this type into a conventional corrugator line, enables the elimination of the need for pressure application to secure the bond between the liner and corrugating medium. This innovation allows the existing line to be used fully and in addition has the advantage of not adversely affecting the strength of the board and of not adversely affecting the appearance of the board by the presence of pressure lines.

A preferred embodiment of this invention will now be described with reference to the drawings in

which figure 1 represents a schematic view of a conventional single facer unit; figure 2 shows a schematic view of the unit as described as this invention for forming a flute to flute structure; figure 3 shows a detailed view of figure 2 and figure 4 shows the modified unit of this invention when used to make conventional single faced corrugated board. Figure 5 is a view similar to that of Figure 3 wherein a carrier roll of the same size as the corrugating rolls is used.

In Figure 1, the conventional single facer unit includes mill roll stand 5, a preheater roll 6, a single facer station 7 and a mill roll stand 8 for the fluting medium.

The single facer station 7 comprises the corrugating rolls 10 and 11, adhesive applicator 12, pressure roll 13 for pressing the liner against the corrugated medium 23 on roll 11. The liner board 21 is fed from stand 5 over preheater roll 6 to the heated smooth guide rolls 14 and 15.

The formed single faced board 24 is transferred to idler roll 16 and then to conveyor 17 which transports the single faced board 24 for further processing.

The present invention is exemplified in Figures 2 and 3 for manufacture of board when two fluted mediums are adhered at their flute peaks.

The two corrugating mediums 22 and 23 from mill back stands 5 and 8 are preconditioned by preconditioners 42 and 45. The driven "S" wrap rolls 15 and 55 feed the corrugating mediums into the corrugating nips. Steam boxes 51, 52 and 53, 54 further condition the mediums before they enter the nips.

Guide rolls 31, 32, 43, 44, 46 and 47 are located to guide the liner and mediums to and from the respective items of equipment.

The first corrugating medium 23 is fluted between corrugating roll 10 and the carrier roll 36. These rolls are ground with the same flute form or a flute form of 1/2 or double pitch as are corrugating rolls 34 and 35. The carrier roll in this embodiment is suitably of 900 mm diameter and the corrugating rolls are of 300 mm diameter

The corrugated medium 23 is held in the flutes of the carrier roll by a vacuum applied from inside the carrier roll. The surface of the carrier roll is arranged at points 49 and 50 to provide a positive pressure. This pressure causes the single medium at position 50, and the flute to flute structure at position 49 to "fluffout". This feature ensures a good transfer of the adhesive from applicators 37 and 12 to the exposed flute tips.

As an alternative to applying vacuum, guides or fingers could be used to retain the first medium and then the flute to flute structure in the flutes of the carrier roll. Also as mentioned previously externally applied vacuum to the flutes of the carrier roll

or positive oil pressure to the fluted mediums will serve to maintain the fluted medium in the grooves of the carrier roll.

An adhesive applicator station 12 is located after corrugator roll 10 to apply adhesive to the flute tips of the first medium 23.

The corrugating medium 22 is fluted between corrugating rolls 34 and 35.

Roll 35 is provided with positive pressure at the point of discharge of the corrugated medium to assist in its release from the roll and bonding of the tip to tip flutes.

Corrugating roll 35 can be arranged with a vacuum facility to hold the fluted product in the roll flutes. As an alternative, guides or fingers may also be provided to achieve the positioning of the second medium as it contacts the first medium on the carrier roll.

The two corrugated mediums 22 and 23 are adhered together between rolls 35 and 36 which are driven synchronously to ensure precise flute tip to flute tip bonding. This can be achieved by installing a direct drive, meshed gear drive or toothed belt drive between the driven lower corrugating roll 35 and the carrier roll 36. Two camber elements to control the camber of roller 36 can be incorporated in the roll 36. The incorporation of camber control elements in carrier roll 36 will probably result in the removal of heating means from the carrier roll and the heating of the fluted mediums will be controlled by heating the corrugating rolls.

"S" wrap rolls 38 guide the liner 21 after preheater 6 to join with the flute to flute structure to form one particular example of the structures which are the subject of the invention disclosed in Patent Application No. 62323/86.

The top liner 21 is assisted in bonding to the flute to flute structure after the glue application by an input of energy in the form of radiant or convected heat, microwave or other energy by the units 39.

All components may be pre-heated, moistened or pre-treated to accelerate bonding of the component to component interfaces.

The carrier roll is assisted in discharging the product by positive air pressure from blow box 40 inside the carrier roll 36, or by a vacuum from the liner side. The combined liner and flute to flute structure 25 is transported via section 41 to the next processing station.

The transport section 41 may be straight or curved in shape, and if curved, the curve will be arranged to utilise tension forces in the liner to apply gentle pressure to the glue bond. A change in radius will achieve further beneficial bond development.

An automatic splicer may be utilised with each medium coming from roll stands 5 and 8 with the liner coming from roll stand 4.

As shown in Figure 4 the modified unit of this invention can also be used to make an improved form of conventional single faced corrugated board.

This is achieved by ceasing to feed the corrugating medium 22 to the corrugating rolls 34 and 35 and also ceasing to apply glue at glue station 12 while continuing application at glue station 37 to corrugated medium 23. In this case the glue station 37 is moved towards the carrier roll 36 to contact the thinner conventional corrugated sheet.

Figure 5 shows an alternative embodiment in which the carrier roll and the corrugating rolls are of equivalent diameters e.g. 460 mm or 600 mm. The first medium 61 is drawn past steam boxes 68 over the corrugating roll 64 where it is fluted by the intermeshing of rolls 64 and 65. The fluted medium 61 is blown off roll 64 by positive pressure and is retained on the surface of roll 65. Adhesive is applied at glue station 70. The second medium 62 is drawn past steam box 69 and between the corrugating rolls 66 and 67. Fluted medium 62 is carried on roll 67 until its flute peaks contact those of medium 61. The medium 62 is blown off roll 37 by positive pressure and the bonded mediums are retained on roll 65. Adhesive is applied to the outer flute peaks at station 72 and the liner 63 is then bonded to the mediums with the assistance of the energy applicator 74. Heat moulds 71 protect the glue stations 70 and 72 from the heat emanating from rollers 64 and 67 which are heated rolls.

From the above it can be seen that the production of board structures with flute tip to flute tip bonding can be achieved with the construction of new machinery as described here or by modification of existing machinery as described elsewhere.

Also from the above it can be seen that of conventional board structures with improved appearance can be produced by way of non pressure bonding technique.

Claims

1. A single face corrugated board making apparatus capable of forming corrugated boards having two fluted mediums bonded together at the flute tips comprising:

- (a) Mill roll stands (4,5,8) for two mediums (22,23) and one liner (21).
- (b) A carrier roll (36) fluted to support a first fluted medium (23).
- (c) A single corrugating roll (10) engaging with the carrier roll (36) to corrugate the first fluted medium (23).
- (d) A pair of corrugating rolls (34,35) adapted to produce a second fluted medium (22)

said pair being located and driven relative to said carrier roll to enable said first and second fluted mediums to be brought into flute tip to flute tip contact and to be conveyed by said carrier roll.

(e) A first adhesive application station (12) to apply adhesive to one of said fluted mediums prior to the flute tips of the said first and second fluted mediums coming into contact.

(f) A second adhesive application station (37) to apply adhesive to the exposed flute tips of the bonded mediums or to the liner board.

(g) A liner applicator roll (38) located adjacent to said carrier roll downstream of said second adhesive applicator adapted to apply the liner board to said bonded fluted mediums.

2. A corrugated board making apparatus as claimed in claim 1 wherein the carrier roll (36) is larger in diameter than the single (10) and pair of corrugating rolls (34,35).

3. A corrugated board making apparatus as claimed in claim 1 wherein the carrier roll (36) and the single (10) and pair (34,35) of corrugating rolls are all of the same diameter.

4. A corrugated board making apparatus as claimed in claim 1 wherein the carrier roll (36) is arranged with camber control means.

5. A corrugated board making apparatus of claim 1 wherein the adhesive bonds are formed with the application of minimum pressure and are cured by the input of heat or electrical energy applied by an energy unit (39).

6. A method of forming a corrugated paperboard having a pair of fluted mediums bonded together at their flute peaks in which a first medium is passed between a fluted carrier roll and a single corrugating roll and retained on said carrier roll; a second medium is passed between a pair of corrugating rolls and retained on one roll of said pair of corrugating rolls; the first and second fluted mediums are brought into contact at their flute peaks and adhered together by the juxtaposition of said one roll of said pair of corrugating rolls and said carrier roll; the bonded fluted mediums are held onto said carrier roll and a liner sheet is adhered to the outer second fluted medium; and the adhesive bonds are cured and the board withdrawn.



An automatic splicer may be utilised with each medium coming from roll stands 5 and 8 with the liner coming from roll stand 4.

As shown in Figure 4 the modified unit of this invention can also be used to make an improved form of conventional single faced corrugated board.

This is achieved by ceasing to feed the corrugating medium 22 to the corrugating rolls 34 and 35 and also ceasing to apply glue at glue station 12 while continuing application at glue station 37 to corrugated medium 23. In this case the glue station 37 is moved towards the carrier roll 36 to contact the thinner conventional corrugated sheet.

Figure 5 shows an alternative embodiment in which the carrier roll and the corrugating rolls are of equivalent diameters e.g. 460 mm or 600 mm. The first medium 61 is drawn past steam boxes 68 over the corrugating roll 64 where it is fluted by the intermeshing of rolls 64 and 65. The fluted medium 61 is blown off roll 64 by positive pressure and is retained on the surface of roll 65. Adhesive is applied at glue station 70. The second medium 62 is drawn past steam box 69 and between the corrugating rolls 66 and 67. Fluted medium 62 is carried on roll 67 until its flute peaks contact those of medium 61. The medium 62 is blown off roll 37 by positive pressure and the bonded mediums are retained on roll 65. Adhesive is applied to the outer flute peaks at station 72 and the liner 63 is then bonded to the mediums with the assistance of the energy applicator 74. Heat moulds 71 protect the glue stations 70 and 72 from the heat emanating from rollers 64 and 67 which are heated rolls.

From the above it can be seen that the production of board structures with flute tip to flute tip bonding can be achieved with the construction of new machinery as described here or by modification of existing machinery as described elsewhere.

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- (a) Mill roll stands (4,5,8) for two mediums (22,23) and one liner (21).
- (b) A carrier roll (36) fluted to support a first fluted medium (23).
- (c) A single corrugating roll (10) engaging with the carrier roll (36) to corrugate the first fluted medium (23).
- (d) A pair of corrugating rolls (34,35) adapted to produce a second fluted medium (22)

said pair being located and driven relative to said carrier roll to enable said first and second fluted mediums to be brought into flute tip to flute tip contact and to be conveyed by said carrier roll.

(e) A first adhesive application station (12) to apply adhesive to one of said fluted mediums prior to the flute tips of the said first and second fluted mediums coming into contact.

(f) A second adhesive application station (37) to apply adhesive to the exposed flute tips of the bonded mediums or to the liner board.

(g) A liner applicator roll (38) located adjacent to said carrier roll downstream of said second adhesive applicator adapted to apply the liner board to said bonded fluted mediums.

2. A corrugated board making apparatus as claimed in claim 1 wherein the carrier roll (36) is larger in diameter than the single (10) and pair of corrugating rolls (34,35).
3. A corrugated board making apparatus as claimed in claim 1 wherein the carrier roll (36) and the single (10) and pair (34,35) of corrugating rolls are all of the same diameter.
4. A corrugated board making apparatus as claimed in claim 1 wherein the carrier roll (36) is arranged with camber control means.
5. A corrugated board making apparatus of claim 1 wherein the adhesive bonds are formed with the application of minimum pressure and are cured by the input of heat or electrical energy applied by an energy unit (39).
6. A method of forming a corrugated paperboard having a pair of fluted mediums bonded together at their flute peaks in which a first medium is passed between a fluted carrier roll and a single corrugating roll and retained on said carrier roll; a second medium is passed between a pair of corrugating rolls and retained on one roll of said pair of corrugating rolls; the first and second fluted mediums are brought into contact at their flute peaks and adhered together by the juxtaposition of said one roll of said pair of corrugating rolls and said carrier roll; the bonded fluted mediums are held onto said carrier roll and a liner sheet is adhered to the outer second fluted medium; and the adhesive bonds are cured and the board withdrawn.



7. The method of claim 6 in which the corrugating rolls and the carrier roll are of equal diameter.
8. The method of claim 6 in which the corrugating rolls are of equal diameter which is smaller than that of the carrier roll.

Patentansprüche

1. Vorrichtung zum Herstellen einer einseitigen Wellpappe, wobei mit dieser Vorrichtung Wellpappen gebildet werden können, welche zwei gewellte, an den Wellenkuppen aneinandergelundene Materialien aufweisen, mit
 - (a) Prägwalzengerüsten (4, 5, 8) für zwei Materialien (22, 23) und eine Auflage (21);
 - (b) einer Trägerwalze (36), die geriffelt ist, um ein erstes gewelltes Material (23) zu tragen;
 - (c) einer einzelnen wellenprägenden Walze (10), die mit der Trägerwalze (36) im Eingriff steht, um das erste gewellte Material (23) in eine gewellte Form zu bringen;
 - (d) einem Paar von wellenprägenden Walzen (34, 35), die so ausgebildet sind, daß sie ein zweites gewelltes Material (22) erzeugen sowie bezüglich der genannten Trägerwalze derart angeordnet sind und angetrieben werden, daß das erste und das zweite gewellte Material mit ihren Wellenkuppen miteinander in Berührung gebracht und durch die Trägerwalze weitertransportiert werden;
 - (e) einer ersten Klebstoffauftragsstation (12), um auf eines der gewellten Materialien Klebstoff aufzubringen, bevor die Wellenkuppen des ersten gewellten Materials und diejenigen des zweiten gewellten Materials miteinander in Kontakt kommen;
 - (f) einer zweiten Klebstoffauftragsstation (37), um auf die freiliegenden Wellenkuppen des verbundenen Materials oder auf den Auflegekarton einen Klebstoff aufzubringen; und
 - (g) einer Aufbringwalze (38) für die Auflage, wobei die Aufbringwalze von der zweiten Klebstoffauftragsstation stromabwärts in der Nähe der Trägerwalze angeordnet ist, um den Auflegekarton auf die verbundenen gewellten Materialien aufzubringen.
2. Vorrichtung zum Herstellen einer Wellpappe nach Anspruch 1, worin die Trägerwalze (36) einen größeren Durchmesser aufweist als die einzelne wellenprägende Walze (10) und das Paar der wellenprägenden Walzen (34, 35).

3. Vorrichtung zum Herstellen von Wellpappe nach Anspruch 1, worin die Trägerwalze (36), die einzelne wellenprägende Walze (10) und das Paar der wellenprägenden Walzen (34, 35) den gleichen Durchmesser aufweisen.
4. Vorrichtung zum Herstellen von Wellpappe nach Anspruch 1, worin die Trägerwalze (36) zusammen mit Mitteln zur Krümmungssteuerung angeordnet ist.
5. Vorrichtung zum Herstellen von Wellpappe nach Anspruch 1, worin die Klebstoffbindungen unter Anwendung eines minimalen Drucks erzeugt und durch Einbringen von Wärme oder elektrischer Energie mittels einer Energieeinheit (39) gehärtet werden.
6. Verfahren zum Bilden eines Wellkartons mit einem Paar gewellter Materialien, die an ihren Wellenkuppen aneinander gebunden sind, bei dem ein erstes Material zwischen einer geriffelten Trägerwalze und einer einzelnen wellenprägenden Walze hindurchgeführt und auf der Trägerwalze zurückgehalten wird, ein zweites Material zwischen einem Paar von wellenprägenden Walzen hindurchgeführt und auf einer Walze des Paares der wellenprägenden Walzen zurückgehalten wird, das erste und das zweite gewellte Material durch Anordnen der einen Walze des Paares der wellenprägenden Walzen und der Trägerwalze nebeneinander an ihren Wellenkuppen miteinander in Kontakt gebracht und verklebt werden, die verbundenen gewellten Materialien auf der Trägerwalze gehalten werden und ein Auflegematerial auf das äußere zweite gewellte Material aufgeklebt wird sowie die Klebeverbindungen gehärtet werden und der Karton entnommen wird.
7. Verfahren nach Anspruch 6, worin die wellenprägenden Walzen und die Trägerwalze den gleichen Durchmesser aufweisen.
8. Verfahren nach Anspruch 6, worin die wellenprägenden Walzen den gleichen Durchmesser aufweisen, der geringer ist als jener der Trägerwalze.

Revendications

1. Dispositif de fabrication de carton ondulé simple face apte à former des cartons ondulés ayant deux éléments cannelés réunis au niveau des sommets des cannelures comprenant:
 - (a) Des supports de rouleaux d'amenée (4, 5, 8) pour deux éléments (22, 23) et une



- couverture (21).
- (b) Un rouleau porteur (36) cannelé pour supporter un premier élément cannelé (23).
- (c) Un rouleau d'ondulation unique (10) venant en contact avec le rouleau porteur (36) pour onduler le premier élément de milieu cannelé (23). 5
- (d) Une paire de rouleaux d'ondulation (34, 35) adaptés pour produire un second élément cannelé (22), ladite paire étant disposée et entraînée par rapport audit rouleau porteur, afin que lesdits premier et second éléments cannelés puissent être amenés en contact sommet de cannelure contre sommet de cannelure et transportés par ledit rouleau porteur. 10 15
- (e) Un premier poste (12) d'application d'adhésif pour appliquer de l'adhésif à l'un desdits éléments cannelés avant que les sommets des cannelures desdits premier et second éléments cannelés viennent en contact. 20
- (f) Un second poste (37) d'application d'adhésif pour appliquer de l'adhésif aux sommets exposés des cannelures des éléments réunis ou au carton de couverture. 25
- (g) Un rouleau applicateur de couverture (38) disposé à proximité dudit rouleau porteur, en aval dudit second applicateur d'adhésif, adapté pour appliquer le carton de couverture auxdits éléments cannelés réunis. 30
2. Dispositif de fabrication de carton ondulé tel que revendiqué dans la revendication 1, dans lequel le rouleau porteur (36) a un diamètre supérieur à celui du rouleau d'ondulation unique (10) et de celui des rouleaux d'ondulation appariés (34, 35). 35 40
3. Dispositif de fabrication de carton ondulé tel que revendiqué dans la revendication 1, dans lequel le rouleau porteur (36) et le rouleau d'ondulation unique (10) et les deux rouleaux d'ondulation appariés (34, 35) ont tous le même diamètre. 45
4. Dispositif de fabrication de carton ondulé tel que revendiqué dans la revendication 1, dans lequel le rouleau porteur (36) est agencé avec des moyens de contrôle de cambrage. 50
5. Dispositif de fabrication de carton ondulé selon la revendication 1, dans lequel les liaisons adhésives sont formées avec l'application d'une pression minimale et sont durcies par apport de chaleur ou d'énergie électrique appliquée par une unité d'énergie (39). 55
6. Procédé de formation d'un carton ondulé ayant une paire d'éléments réunis au niveau de leurs crêtes de cannelures, dans lequel un premier élément est avancé entre un rouleau porteur cannelé et un rouleau d'ondulation unique et est retenu sur ledit rouleau porteur; un second élément est avancé entre une paire de rouleaux d'ondulation et est retenu sur un rouleau de ladite paire de rouleaux d'ondulation; les premier et second éléments cannelés sont amenés en contact au niveau de leurs crêtes de cannelures et collés ensemble, par la juxtaposition dudit rouleau de ladite paire de rouleaux d'ondulation et dudit rouleau porteur; les éléments cannelés réunis sont maintenus sur ledit rouleau porteur et une feuille de couverture est fixée par adhésion au second élément cannelé extérieur; et les liaisons adhésives sont durcies et le carton extrait.
7. Procédé selon la revendication 6, dans lequel les rouleaux d'ondulation et le rouleau porteur ont un diamètre égal.
8. Procédé selon la revendication 6, dans lequel les rouleaux d'ondulation ont un diamètre égal, qui est plus petit que celui du rouleau porteur.