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(71) Applicant: **Delicarta S.p.A.**
55016 Porcari (LU) (IT)

(72) Inventor: **Stefani, Emi**
55016 Porcari (LU) (IT)

(74) Representative: **Mannucci, Michele et al**
Ufficio Tecnico Ing.A. Mannucci S.r.l.
Via della Scala 4
50123 Firenze (IT)

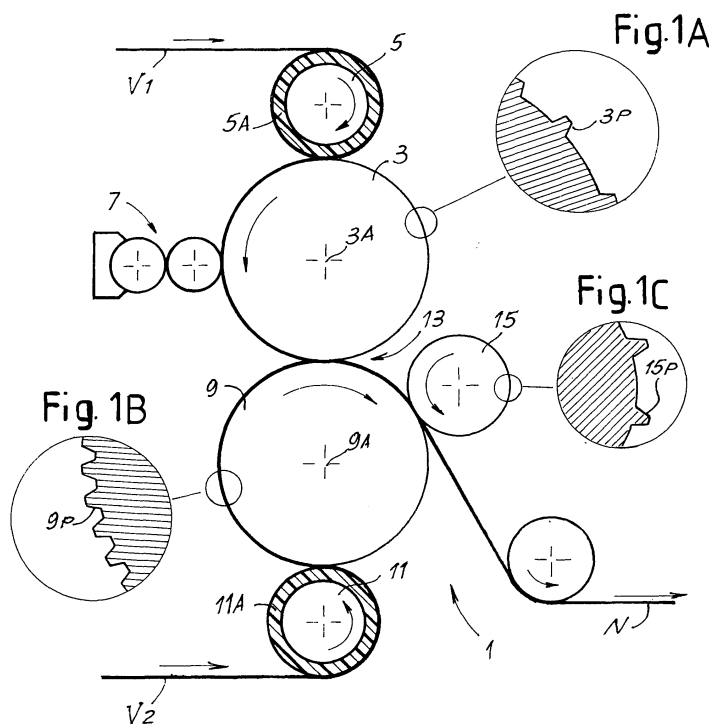
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(54) **Embossing-laminating unit and embossing method**

(57) The embossing - laminating unit (1), comprises: a first embossing roller (3) provided with a series of first embossing protuberances (3P); a first pressure roller (5), cooperating with said first embossing roller to emboss a first ply (V1) of web material; a second embossing roller (9) provided with a series of second embossing protuberances (9P); a second pressure roller (11), cooperating with said second embossing roller to emboss a second

ply (V2) of web material; a glue applicator (7), cooperating with said first embossing roller (3); a laminating roller (15), cooperating with said second embossing roller (9); The laminating roller is provided with protuberances (15P) in phase with at least some of the first protuberances of the first embossing roller in order to generate a laminating effect in correspondence of areas of the first ply embossed by the first embossing roller.

Fig.1



Description

Technical Field

[0001] The present invention relates to machines and methods for the converting of web materials, in particular for converting or processing paper, such as so-called tissue paper for the production of toilet paper, kitchen towels, napkins or other products in absorbent paper.

Background Art

[0002] In order to give particular aesthetical and functional characteristics to a paper ply or paper web, and also to join more plies to each other so as to form a multi-ply web material, it is well known to carry out embossing operations on the plies of cellulosic fibers. Embossing is used in particular for processing so-called tissue paper, i.e. a paper commonly used for the production of absorbent products, such as toilet paper, kitchen towels or the like, napkins and other products.

[0003] During embossing one or more plies are passed between an embossing roller, provided with protuberances, and a pressure roller. This latter can be a roller engraved with an embossing pattern complementary to that of the protuberances of the embossing roller, so that the embossing roller and the pressure roller mesh with one another. More frequently, the pressure roller is a roller coated with a yielding material, for example rubber, and in this case embossing is obtained by making the embossing protuberances of the embossing roller penetrate in the elastically yielding coating layer of the pressure roller. The paper ply or plies passed in the nip between the embossing roller and the pressure roller are subjected to a permanent deformation, which entails the formation of a raised embossing pattern on the ply, corresponding to the pattern defined by the protuberances of the embossing roller. Projections and cavities are therefore formed on the ply, corresponding to the cavities and to the projections of the embossing roller.

[0004] When two plies or groups of plies are embossed separately, each between an embossing roller and a pressure roller, they must be mutually bonded to form the final multi-ply web material. Bonding is normally obtained by gluing. In this case so-called embossing-laminating units are used, i.e. units suitable to carry out embossing on one or more plies and subsequently to bond the processed plies to one another.

[0005] In some known embossing-laminating devices or units, embossing and lamination are carried out according to a so called tip-to-tip technique, according to which the two plies separately embossed between two embossing rollers and two corresponding pressure rollers, are laminated and bonded by gluing, after having applied a glue on at least one of the plies, by passing them through a nip defined by the first and by the second embossing roller, in this nip at least some of the protuberances of the first roller being in correspondence of

protuberances of the second roller. The protuberances corresponding to each other exert a laminating pressure between the two plies where the glue has been applied, so that bonding by gluing is obtained.

[0006] In other embodiments the two plies embossed separately by two embossing rollers and two corresponding pressure rollers are glue-bonded by means of a so-called laminating roller, which cooperates with one of the embossing rollers. In this case an embossing generally of the so called nested type is obtained, i.e. wherein the embossing projections of one ply enter in the cavities between the embossing projections of the other ply. The laminating roller is usually a roller with a flat surface, made of a relatively hard material, such as a very hard rubber, or a metallic roller. Also a glue dispenser is associated to the embossing roller, with which the pressure or laminating roller cooperates. The laminating roller presses the two plies against the embossing protuberances of the embossing roller to which it is associated. The effect is obtained of a substantial compression of the multi-ply web product, with a partial damage of the embossing motifs obtained during the previous embossing phase between each embossing roller and the corresponding pressure roller.

[0007] US 4,483,728 discloses an embossing-laminating unit comprising a first embossing roller cooperating with a first pressure roller, a second embossing roller cooperating with a second pressure roller, the two embossing rollers being provided with embossing protuberances to separately emboss two plies in tissue paper. The embossing-laminating unit described in the mentioned prior patent document furthermore has a glue dispenser, associated with the second embossing roller, which applies glue on the protuberances generated on the second ply by the protuberances of the second embossing roller. To the same embossing roller to which the glue dispenser is associated, also a laminating roller is associated that, contrary to what normally occurs, is provided with projections. The laminating roller defines with the second embossing roller a lamination nip, through which the two embossed plies pass. In this lamination nip the two plies, previously provided with respective embossing motifs, are pressed by the protuberances of the laminating roller. In this way the lamination is limited to the surface of the protuberances of the laminating roller, instead of being on the entire surface of the protuberances of the second embossing roller, as occurs in the embossing-laminating units of the traditional type. In any case, also in this known device the two previously embossed plies are at least partially pressed in the areas on which the protuberances of the laminating roller act.

Summary of the Invention

[0008] According to one aspect, the present invention provides for a laminating-embossing unit which allows to obtain a better processing of the web material, maintaining the embossing unchanged, or substantially reducing

the alteration of the embossing generated before lamination.

[0009] According to a different aspect the invention provides for an embossing and laminating method which allows to reduce the damage caused by the laminating roller to the embossing of the two plies, or groups of plies, before lamination.

[0010] Substantially in one embodiment the present invention provides for an embossing-laminating unit comprising: a first embossing roller provided with a series of first embossing protuberances; a first pressure roller, cooperating with said first embossing roller to emboss a first ply of web material; a second embossing roller provided with a series of second protuberances; a second pressure roller, cooperating with said second embossing roller to emboss a second ply of web material; a glue dispenser, cooperating with said first embossing roller; a laminating roller, cooperating with said second embossing roller. The laminating roller is provided with protuberances in phase with at least some of the first protuberances of the first embossing roller in order to generate a laminating effect in correspondence of areas of the first ply embossed by the first embossing roller. In this way a lamination is obtained between plies of the web material without compression or in any way with a lower effect of compression of the embossing pattern of the plies.

[0011] In some advantageous embodiments the first and the second embossing rollers are synchronized in a nested arrangement, with the protuberances of the first embossing roller phased with cavities between protuberances of the second embossing roller. Preferably, the protuberances of the laminating roller have a greater height than the protuberances of the second embossing roller and preferably also than the protuberances of the first embossing roller.

[0012] According to another aspect, the invention relates to a method for embossing and bonding plies of web material, comprising the steps of:

- embossing a first ply between a first pressure roller and a first embossing roller provided with first protuberances;
- embossing a second ply between a second pressure roller and a second embossing roller provided with second protuberances;
- applying a glue on at least some of the embossing protuberances generated by the first embossing roller;
- laminating said first and said second ply between said second embossing roller and a laminating roller provided with laminating protuberances in phase with at least some of the first protuberance of the first embossing roller.

[0013] Each ply can be formed by an individual layer or by a plurality of layers, made of cellulose based fibers, for example.

Brief description of the drawings

[0014] The invention will be better understood by following the description and the attached drawings, which show practical non-limiting embodiments of the invention. More in particular, in the drawings:

figure 1 shows a diagram of an embossing-laminating unit according to the present invention;
 figures 1A, 1B, 1C show enlargements of details of figure 1;
 figure 2 shows an enlargements of the laminating nip;
 figure 2 shows an enlargement of figure 2;
 figure 3 shows an enlargement of a schematic section of a multi-ply web material obtained by means of an embossing-laminating unit and with a method according to the present invention;
 figure 4 shows a section similar to that of figure 3 in a modified embodiment.

Detailed description of embodiments of the invention.

[0015] Figure 1 schematically shows a possible embodiment of an embossing-laminating unit according to the present invention. In this embodiment, the embossing-laminating unit, indicated as a whole with number 1, comprises a first embossing roller 3 provided (figure 1A) with first embossing protuberances 3P. The protuberances 3P can define an embossing motif or pattern of various type, for example used to impart particular technical-functional characteristics and/or a particularly pleasant appearance to the product. The first embossing roller 3 cooperates with a first pressure roller 5. In some embodiments, the pressure roller 3 is coated with a layer 5A made of an elastically yielding material, such as for example rubber.

[0016] A glue dispenser 7, of a known type and therefore not described in greater detail herein, cooperates with the first embossing roller 3. The glue dispenser 7 applies a glue on all or some of the projections generated on a first ply V1, made of paper or other ply material, embossed between the pressure roller 5 and the embossing roller 3. The glue can be applied on all the projections, or, by using a glue dispenser 7 of a particular shape, only on some of the projections formed on the web material. This can be obtained for example by means of a clichéd glue dispenser, i.e. a dispenser having a pattern on the surface thereof one.

[0017] The embossing-laminating unit 1 further comprises a second embossing roller 9, the axis of rotation 9A of which is substantially parallel to the axis of rotation 3A of the first embossing roller 3. The second embossing roller 9 has, on its own surface, embossing protuberances indicated with 9P (see detail of figure 1B). The second embossing roller 9 cooperates with a second pressure roller 11. In some embodiments the second pressure roller 11 can be coated with a layer 11A of an elastically

yielding material such as for example rubber, similarly to what has been described with reference to the first pressure roller 5. In the nip formed by the second embossing roller 9 and by the second pressure roller 11 a second ply V2 is fed, which is embossed between the second embossing roller 9 and the second pressure roller 11, similarly to what occurs to the first ply V1 in the embossing nip between the first pressure roller 5 and the first embossing roller 3.

[0018] In some embodiments, the embossing rollers 3 and 9 are arranged with their respective axes 3A and 9A at such a distance that they do not touch each other in the nip 13 formed between the rollers. In this nip the first embossed ply V1 is detached from the first embossing roller 3 and placed on the second embossing roller 9 as schematically represented in figure 2. The embossing protuberances 3P and 9P are preferably arranged so that the projections S1 formed by embossing on the ply V1 enter in cavities formed between projections S2 generated on the second ply V2, as shown in particular in the enlargement of figure 2A.

[0019] On the projections S1, or on some of them, a glue C has been applied by the glue dispenser 7. To obtain gluing and therefore bonding between the plies V1 and V2 it is necessary to exert a laminating pressure between the two plies on these glued areas.

[0020] Characteristically, according to the present invention, this lamination is obtained by providing a laminating roller 15, cooperating with the second embossing roller 9 and provided with protuberances 15P, as shown in particular in the enlargement of figure 1C. The protuberances 15P are arranged in such a manner that, with an adequate synchronism between the rotation of the embossing roller 3 and of the laminating roller 15, they enter between adjacent protuberances 9P (figure 2A) of the second embossing roller 9, at the projections S1 of the ply V1 provided with glue C.

[0021] In this way the laminating pressure between the two plies V1 and V2 is substantially concentrated in the valleys between protuberances 9P of the second embossing roller, where there are the areas of the first ply V1, on which the glue C has been applied.

[0022] Contrary to what occurs in the traditional embossing-laminating units, provided with a laminating roller, in this case the pressure is not exerted on the protuberances 9P of the embossing roller to which the laminating roller is associated, but at the cavities of that roller, or at least in some of said cavities, corresponding to the projections S1 of the ply V1 which have received the glue. Substantially, the laminating roller 15 has therefore protuberances 15P phased with protuberances 3P of the first embossing roller 3.

[0023] Furthermore, contrary to what occurs in the traditional devices, the laminating roller 15 and the glue dispenser 7 are associated to two different embossing rollers: in the illustrated example the glue dispenser 7 is associated to the first embossing roller 3, whilst the laminating roller 15 is associated to the second embossing

roller 9. Also an inverse arrangement is possible. Vice versa, in the traditional devices the laminating roller acts against the embossing roller to which the glue dispenser is associated, this due to the fact that the traditional laminating unit acts on the protuberances of the embossing roller, to which it is associated, on which the glue has been applied.

[0024] With the arrangement according to the present invention a lamination of the two plies V1 and V2 is obtained by means of a application of pressure which does not damage the embossing, whilst generally the pressure of the laminating roller is exerted on the protuberances 9P of the embossing roller 9 with consequent at least partial compression of the previously generated embossing pattern.

[0025] In some embodiments the height H (figure 2A) of the protuberances 15B of the laminating roller 15 is greater than the height h of the protuberances 9B of the second embossing roller 9, and this further reduces the risk of damage resulting from the compression of the embossing pattern generated by the embossing rollers 3, 9 and by the corresponding pressure rollers 5, 11.

[0026] Figure 3 schematically shows a cross section of web material manufactured by means of the device and the method described herein. In this example of embodiment the projections S1 generated on the ply V1 are of greater dimensions and more distanced from one another than the projections S2 generated on the ply V2, although this is not strictly necessary. In this case the projections S1 impart a decorative pattern to the product, whilst the projections S2 form a background embossing which is dense and of small dimensions. In other embodiments, dimensions and/or density of the protuberances S1, S2 can be substantially similar on the two plies, or an inverse arrangement relative to that illustrated.

[0027] In the configuration described above the two embossing rollers 3 and 9 are phased, i.e. they are synchronized with a nested arrangement: the protuberances 3P are arranged, relative to the protuberances 9P, so that the projections S1 formed on the ply V1 enter in the cavities between projections S2 of the ply V2. However, this is only one possible embodiment of the method and of the device according to the present invention.

[0028] Figure 4 schematically shows, in an intermediate phase of processing, a web material N obtained with a different arrangement and phasing of the projections S1 of the ply V1 and S2 of the ply V2. As it can be seen in figure 4, some of the projections S1, S2, indicated here with S1(X) and S2(X), are in a tip-to-tip arrangement, i.e. one corresponding to the other. These projections correspond to protuberances of the embossing rollers arranged in a tip-to-tip arrangement in the embossing nip 13. Other projections, indicated with S1(Y) and S2(Y), are arranged in a nested arrangement. C indicates the glue applied by the glue dispenser 7 on the projections S1, S1(X), S1(Y) of the ply V1.

[0029] The section represented in figure 4 shows the web material in an intermediate processing phase, before

it enters the lamination nip between the embossing roller 9 and the laminating roller 15. For the sake of clarity of the drawing, the rollers are not shown in figure 4, but it must be understood that the ply V2 is engaged with the embossing roller 9, and therefore inside the projections S2 there are the protuberances 9P of the embossing roller 9 and the whole ply V2 is in contact with and engaged with the surface of the embossing roller 9. The ply V1 has been detached from the embossing roller 3 and put on the ply V2, in order to pass in the lamination nip between the rollers 15 and 9.

[0030] In this nip the protuberances 15P of the laminating roller 15 will enter at the arrows 15X so as to exert the laminating pressure which glues the projections S1 (Y) inside the cavities between projections S2(Y) of the ply V2. A mixed product is thus obtained, embossed partially in a tip-to-tip arrangement and partially in a nested arrangement. Also in this case, by using a laminating roller 15 according to the present invention a reduction or an elimination of the compression of the embossing pattern, previously imparted to the plies V1 and V2 by the embossing rollers 3 and 9 and the corresponding pressure rollers 5 and 11, is achieved.

[0031] It is understood that the drawing shows only an example given only as a practical demonstration of the invention, and this invention can vary in the forms and arrangements without departing from the scope of concept underlying the invention. Any reference numbers in the appended claims are provided for the sole purpose of facilitating reading of the claims in the light of the description and the drawing, and do not limit the scope of protection represented by the claims.

Claims

1. An embossing-laminating unit, comprising:

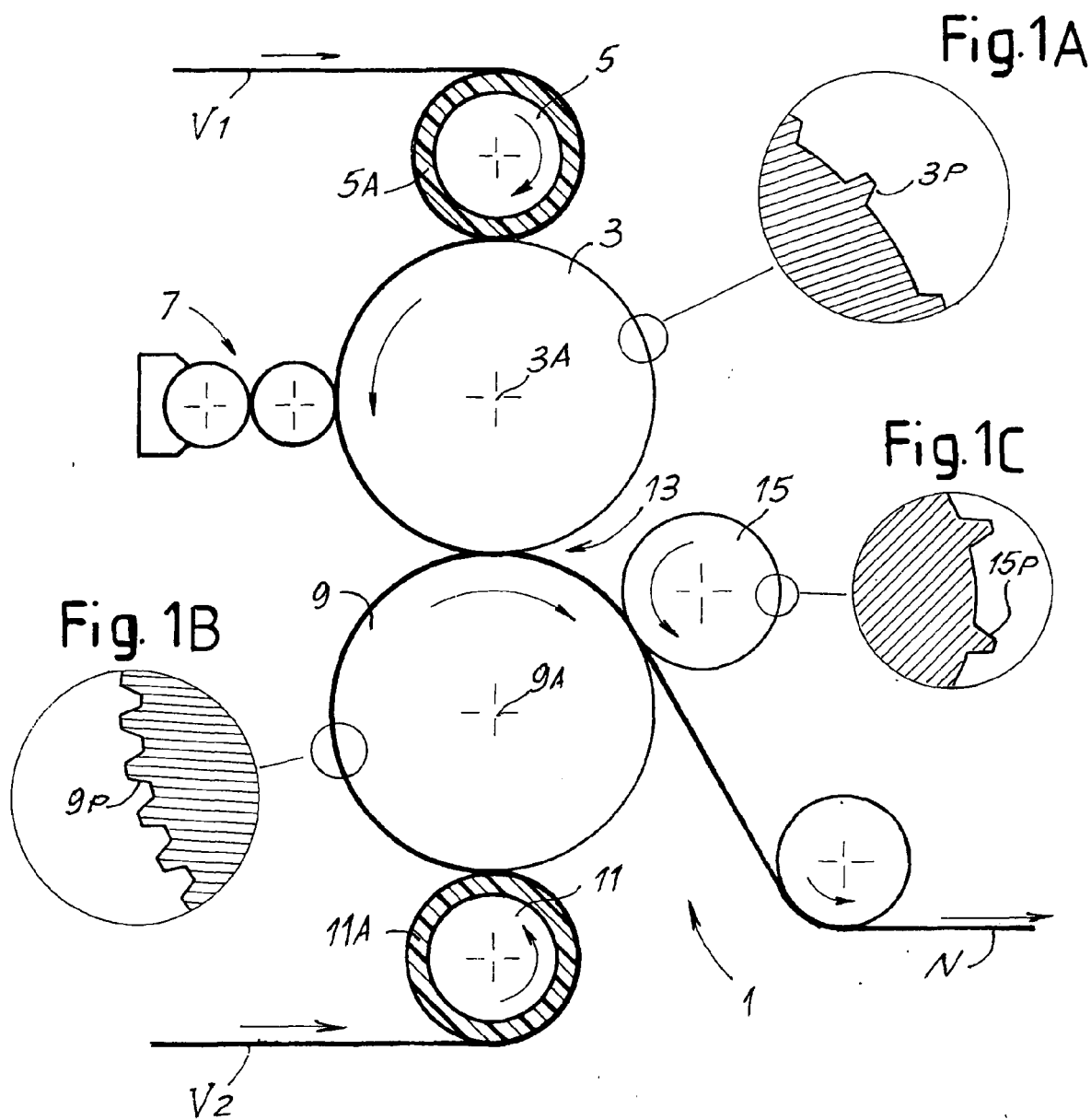
- a first embossing roller provided with a series of first embossing protuberances;
- a first pressure roller, cooperating with said first embossing roller to emboss a first ply of web material;
- a second embossing roller provided with a series of second embossing protuberances;
- a second pressure roller, cooperating with said second embossing roller to emboss a second ply of web material;
- a glue applicator, cooperating with said first embossing roller;
- a laminating roller, cooperating with said second embossing roller;

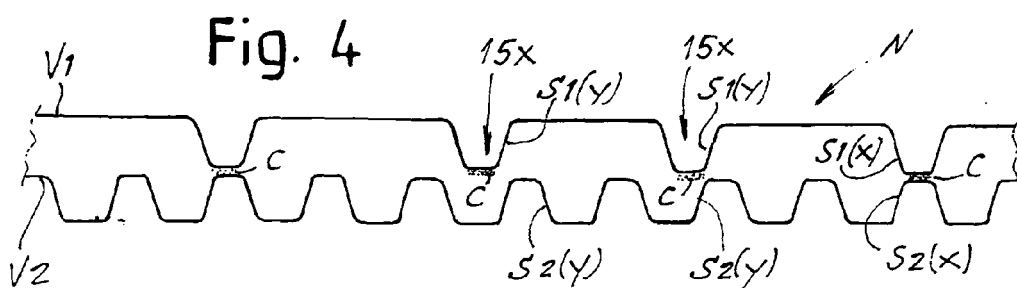
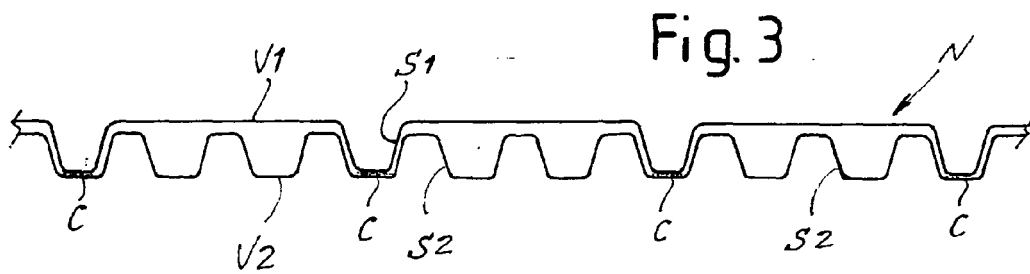
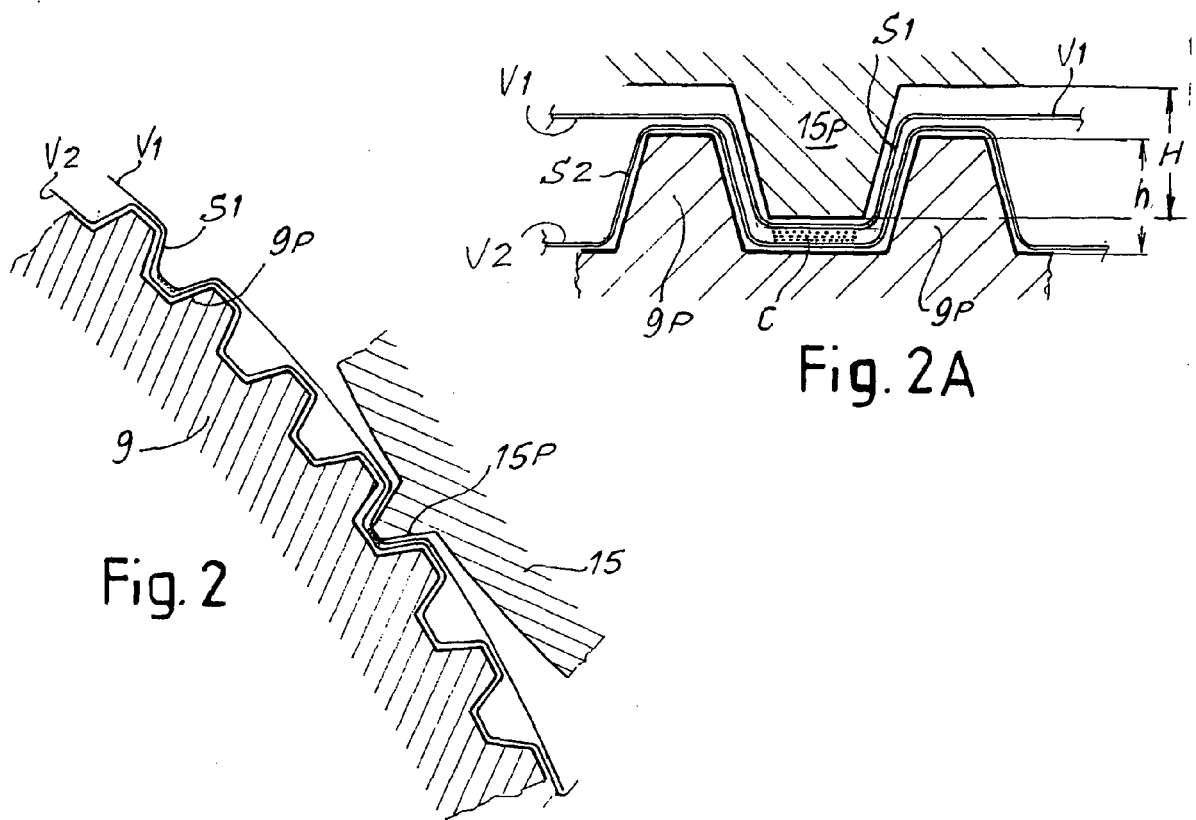
wherein said laminating roller is provided with protuberances in phase with at least some of the first protuberances of the first embossing roller in order to generate a laminating effect in correspondence of areas of the first ply embossed by the first embossing

roller.

2. The embossing-laminating unit as claimed in claim 1, wherein said first and said second embossing roller are phased in a nested arrangement, with the protuberances of the first embossing roller in phase with cavities between protuberances of the second embossing roller.
3. The embossing-laminating unit as claimed in claim 1 or 2, wherein the protuberances of the laminating roller have a height greater than the protuberances of the second embossing roller.
4. The embossing-laminating unit as claimed in claim 1, 2, or 3, wherein said first protuberances define a decorative pattern and said second protuberances define a background pattern.
5. A method for embossing and coupling plies of web material, comprising the steps of:
 - embossing a first ply between a first pressure roller and a first embossing roller provided with first protuberances;
 - embossing a second ply between a second pressure roller and a second embossing roller provided with second protuberances;
 - applying a glue on at least some of the embossing protuberances generated by the first embossing roller;
 - laminating said first and said second ply between said second embossing roller and a laminating roller provided with laminating protuberances in phase with at least some of the first protuberance of the first embossing roller.
6. The method as claimed in claim 5, wherein said first and second protuberances are phased so that the first protuberances are in correspondence of cavities between the second protuberances.

Fig.1







EUROPEAN SEARCH REPORT

Application Number
EP 09 42 5478

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 March 2010	Examiner Farizon, Pascal
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 09 42 5478

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