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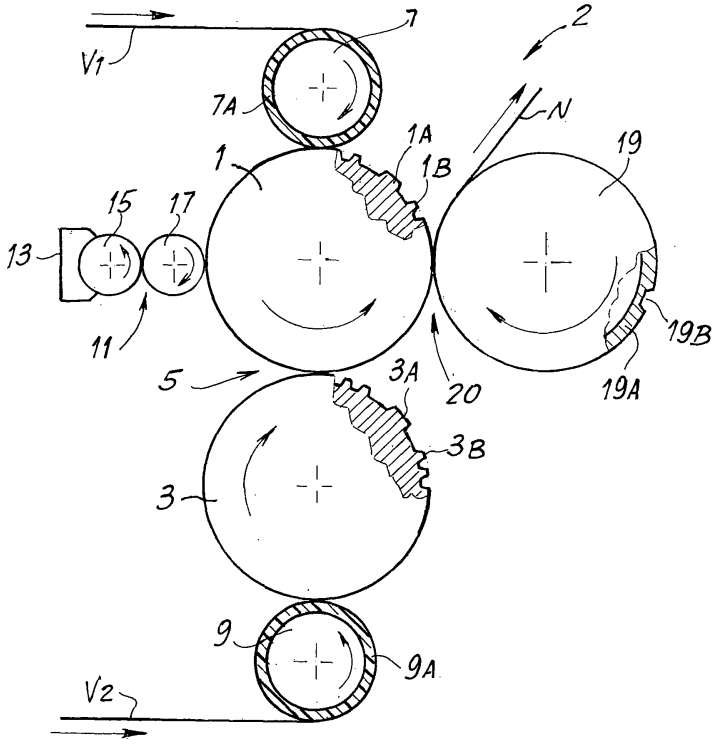
(54) Embossing-laminating unit, method of embossing a web material and embossed material

(57) The embossing laminating unit comprises a first embossing roller (1) comprising a cylindrical surface provided with protuberances and cooperating with a first pressure roller (7); a second embossing roller with (3) with a cylindrical surface provided with protuberances and cooperating with a second pressure roller (9). The first embossing roller and the second embossing roller define therebetween a lamination nip (5). The protuberances on the first and on the second embossing roller are disposed so that in said lamination nip some protuberances are disposed in tip-to-tip configuration and some are disposed in nested configuration.

Fig. 1



EP 1 908 579 A1

Description

Technical field

[0001] The present invention relates to machines for processing web materials and more specifically for processing multi-ply web materials, such as, in particular, but not exclusively, materials made of tissue paper.

[0002] According to a particular aspect, the invention relates to improvements to embossing or embossing-laminating units for processing plies of web material, in particular intended for use in the production of kitchen towels, toilet paper, paper handkerchiefs and napkins or similar disposable products.

State of the art

[0003] In the paper converting industry the processing of plies of paper material, especially tissue paper, through embossing operations, is known. Embossing is an operation consisting in the permanent deformation of plies of paper by passing the plies between an embossing roller made of substantially rigid material (such as steel) having protuberances, which cooperates with a counter roller or pressure roller. The counter roller can be designed with a smooth yielding surface, for example made of rubber or the like, into which the surface of the embossing roller provided with protuberances is pressed. Alternatively, the pressure roller can be formed by a roller provided with recesses coinciding with the protuberances of the embossing roller, so that the ply of paper or similar material, passing between the embossing roller and pressure roller, is deformed between protuberances and recesses to undergo permanent deformation that results into a plurality of protuberances on the ply.

[0004] The embossing process is implemented both to provide the product with specific decorative motifs and give it specific technical characteristics, in particular apparent thickness, softness and absorption capacity. Embossing is also utilized to define limited regions of the web material on which to apply a glue, used to reciprocally bond two or more plies. Bonding of the plies is typically performed by laminating the two or more plies between two embossing rollers disposed one against the other, or between an embossing roller and a marrying roller.

[0005] Embossing and embossing-laminating techniques have been developed in substance from two embossing principles, commonly called tip-to-tip and nested. In the first case, two or more plies of web material are embossed separately by passing them between a respective embossing roller and a pressure roller or counter-roller. The two separately embossed plies are then bonded in the nip between the two embossing rollers, in which the protuberances of the one coincide with the protuberances of the other. More precisely, the front surfaces of the protuberances of one embossing cylinder or roller coincide with front surfaces of the protuberances of the opposed roller. Sufficient pressure is exerted between the protuberances of the two rollers to cause bonding of the two plies by gluing when they pass through the nip between the rollers after a glue has been applied to the protuberances of at least one of the plies. Examples of embossing units, of this type are described in US-A-6,032,712, US-A-6,053,232; US-A-6,245,414; EP-A-370,097; WO-A-97/48, 551.

[0006] In the nested embossing technique, two or more plies are embossed separately between a respective embossing roller an a respective pressure roller. One of the two plies is detached from the respective embossing roller and placed on top of the other ply which is still in contact with the protuberances of the respective embossing roller on which it was decorated and processed. Prior to reciprocal bonding, a glue is applied to the projections or protuberances produced on the ply that remains in contact with the surface of the respective embossing roller for the longest time. The two plies are bonded by lamination between the embossing roller and a marrying roller. An example of this type of embossing is described in WO-A-01/23172. In the nip between the embossing rollers there is no reciprocal contact between the protuberances of the one and of the other of the two rollers and consequently the plies are not laminated.

[0007] There are also embossing-laminating units capable of alternatively processing according to one or other of the two techniques described schematically above, through adjustment of the reciprocal angular and/or axial position of the two embossing rollers and through activation or deactivation of a laminating roller. An example of an embossing laminating device of this type is described in WO-A-98/53985.

[0008] From these two basic techniques, embossing-laminating units have been developed with specific characteristics as regards the type of processing, the pattern produced by the two embossing rollers, the reciprocal configuration of the protuberances on the two plies and the like.

[0009] Embossing represents a particularly critical processing operation, as on the one hand it must provide the finished product with specific aesthetic characteristics and on the other it must satisfy specific technical requirements, to be found not only in the thickness, softness and absorption properties of the two plies, but also in the distribution of an adequate, but not excessive quantity of glue to bond the plies one on top of the other without the formation of excessively stiff regions and without the risk of accidentally detaching the plies during use or storage.

Object and summary of the invention

[0010] An object of an embodiment of the invention is to provide an embossing-laminating unit that makes it possible to obtain improved specific aesthetic and/or technical characteristics of the material with respect to those obtainable with conventional embossing-laminat-

ing units.

[0011] In a possible embodiment of the invention, the embossing-laminating unit comprises: a first embossing roller comprising a cylindrical surface provided with protuberances and cooperating with a first pressure roller; a second embossing roller comprising a cylindrical surface provided with protuberances and cooperating with a second pressure roller, said first embossing roller and said second embossing roller defining a lamination nip therebetween. According to one embodiment, the protuberances on the first and on the second embossing roller are disposed so that in said lamination nip some protuberances are disposed in tip-to-tip configuration and some are disposed in nested configuration.

[0012] In this way a multi-ply web material is obtained wherein some regions of the material have tip-to-tip embossing and others have nested embossing. Preferably, the protuberances in tip-to-tip configuration are surrounded by protuberances in nested configuration.

[0013] In a possible embodiment, the embossing-laminating unit comprises a laminating roller cooperating with the first embossing roller. In this case, in one embodiment the laminating roller has recesses coinciding with the protuberances of the first embossing roller which, in the lamination nip, are phased tip-to-tip with corresponding protuberances of the second embossing roller. In this way compression of the tip-to-tip bonded protuberances is avoided.

[0014] In a possible embodiment of the invention, the first embossing roller comprises a first group of protuberances which, in the lamination nip, are disposed in tip-to-tip configuration with corresponding protuberances of a second group of protuberances on said second embossing roller. In an advantageous embodiment the first embossing roller also comprises a third group of protuberances which in said lamination nip are disposed at least in part in nested configuration with respect to a fourth group of protuberances on said second embossing roller.

[0015] In a possible embodiment all the protuberances of the first embossing roller can be of the same height and analogously also the protuberances of the second embossing roller can be of the same height. In a different embodiment, the protuberances of the embossing roller arranged in tip-to-tip configuration in the lamination nip with respect to the corresponding protuberances of the other embossing roller can have a different height with respect to the protuberances arranged in nested configuration. For example, the protuberances that generate tip-to-tip embossing can be of a greater height than the protuberances that generate the nested embossing, or vice versa.

[0016] In a possible embodiment, the embossing-laminating group can comprise a glue dispenser cooperating with one or other of the embossing rollers, preferably with the first embossing roller. In another possible embodiment, the embossing-laminating unit comprises two glue dispensers, associated with the same embossing roller or with two different embossing rollers. The glues of the two dispensers can be of different color and the glue applicator rollers can be plate rollers to apply the glue according to a pattern, i.e. only to some protuberances. For example, plate rollers can be provided which apply the glue only to the protuberances that give rise to tip-to-tip bonding of the plies, or only to protuberances that give rise to nested bonding. In an advantageous embodiment, glues of different colors are applied to the two types of protuberances, preferably with two different glue dispensers.

[0017] According to a possible embodiment, the protuberances in tip-to-tip configuration define one decorative motif, while the protuberances arranged in nested configuration give rise to a background embossing, having a prevalently technical rather than aesthetic and decorative function.

[0018] The invention also relates to a multi-ply web material. According to an advantageous embodiment of the invention, the web material comprises at least a first embossed ply and a second embossed ply bonded together by gluing, characterized in that the said two plies comprise a plurality of protuberances arranged in tip-to-tip configuration and a plurality of protuberances arranged in nested configuration.

[0019] According to an advantageous embodiment, the protuberances arranged in tip-to-tip configuration are bonded together by gluing. In a possible embodiment the protuberances arranged in tip-to-tip configuration form a repetitive pattern and elements of said repetitive pattern can be surrounded by protuberances arranged in nested configuration, which for example form a background embossing. With this configuration the web material is provided with particular aesthetic prestige, due to the fact that the decorative embossing is made to stand out with respect to the background embossing.

[0020] In one embodiment, the first ply comprises a first group of protuberances projecting towards the inside of the web material and at least some of which are arranged in tip-to-tip configuration coinciding with the protuberances of a second group of protuberances on the second ply, projecting on the inside of the web material. Advantageously, the first ply comprises a third group of protuberances and the second ply comprises a fourth group of protuberances, the protuberances of the third and of the fourth group facing the inside of the web material and being arranged at least partially in nested configuration with respect to each other.

[0021] Further advantageous features of the embossing-laminating unit and of the embossed multi-ply web product according to the invention are indicated in the appended claims and will be described in greater detail hereunder with reference to the drawings, which show a preferred but non-limiting embodiment of the invention.

Brief description of the drawings

[0022] The invention will be better understood follow-

ing the description and accompanying drawing, which shows non-limiting practical embodiments of the invention. More specifically, in the drawing:

Figure1 shows a diagram of an embossing-laminating unit according to the invention in a first embodiment;
Figure 2 shows a schematic flattened sectional view of the two embossing rollers in the laminating region, with the two embossed plies interposed therebetween;
Figure 3 shows a schematic local section of the laminating roller;
Figure 4 shows a schematic flattened sectional view of the two embossing rollers in a different embodiment;
Figure 5 shows a schematic and enlarged cross section of the web material in an embodiment of the invention;
Figure 6 shows an enlarged and schematic plan view of a portion of web material in a possible embodiment;
Figure 7 shows a cross section analogous to Figure 5 in a different embodiment;
Figure 8 shows a cross section analogous to the one in Figures 5 and 7 in a further embodiment;
Figure 9 shows a cross section analogous to the one in Figures 5, 7 and 8 in yet another embodiment; and
Figure 10 shows a schematic view of an embossing-laminating unit in a modified embodiment.

Detailed description of embodiments of the invention

[0023] With initial reference to Figure 1, according to a possible embodiment an embossing-laminating unit, generically indicated with 2, typically comprises a first embossing roller 1 and a second embossing roller 3 arranged so as to define a lamination nip 5 therebetween. In a possible embodiment of the invention, the first embossing roller 1 cooperates with a pressure roller 7 which is preferably coated with a layer of yielding material 7A, such as rubber or the like. The embossing roller 3 cooperates with an analogous pressure roller 9, also preferably coated with a layer of yielding material 9A.

[0024] A glue dispenser 11, of the type known per se and not described in greater detail below, is disposed around the circumferential extension of the first embossing roller 1. In a possible embodiment, the dispenser unit 11 has a glue reservoir 13, an anilox roller 15 that picks up glue from the reservoir 13 and a plate roller 17 that applies the glue received from the anilox roller 15 to the protuberances of a first ply V1 of web material embossed between the embossing roller 1 and the pressure roller 7.

[0025] A marrying roll 19 is also arranged along the circumferential extension of the first embossing roller 1, positioned (with respect to the direction of rotation of the embossing roller 1) downstream with respect to the nip 5 formed between the embossing rollers 1 and 3. In a possible embodiment, the marrying roll 19 is coated with a layer of rubber 19A typically stiffer than the coating 7A and 9A of the pressure rollers 7 and 9 respectively.

[0026] V2 indicates a second ply of web material, which is fed around the pressure roller 9 and embossed between the latter and the embossing roller 3. The two plies V1 and V2 can in turn be formed of several plies bonded to one another, and/or a third ply or several plies can be fed therebetween directly in the nip 5 between the embossing rollers 1 and 3.

[0027] As shown in the enlargement in Figure 2, which shows a local flattened section of a portion of the embossing roller 1 and of the embossing roller 3 in the lamination nip, according to an advantageous embodiment of the invention a first series or group of protuberances 1A is provided on the cylindrical surface of the embossing roller 1, having a front surface S which, in the lamination nip 5 between embossing rollers 1 and 3, coincides with a front surface S' of corresponding protuberances 3A of a second group of protuberances provided on the cylindrical surface of the embossing roller 3. The distance between the centers of the embossing rollers 1 and 3 is such that sufficient pressure is exerted between the front surfaces S and S' of the protuberances 1A and 3A of the first and of the second group of protuberances to cause gluing of the plies V1 and V2, which are laminated between the embossing rollers 1 and 3. Gluing is obtained due to the fact that the roller 17 of the glue dispenser 11 applies a certain quantity of glue to the surface portions of the ply V1, which coincide with the protuberances 1A. Therefore, the glue distributed on the front surfaces S of the protuberances 1A of the first group causes reciprocal adhesion of the two plies V1 and V3 at the protuberances 1A, 3A as a result of the reciprocal pressure exerted between the embossing rollers 1 and 3.

[0028] According to a possible embodiment, shown schematically in Figure 2, a second series or group of protuberances 1 B, preferably of the same height as the protuberances 1A of the first group, is provided on the cylindrical surface of the embossing roller 1. The material forming the ply V1 is consequently deformed to generate thereon protuberances P_B and P_A coinciding with the protuberances 1 Band 1A of the embossing roller 1. As the height of the protuberances 1 B of the third group of protuberances provided on the cylindrical surface of the embossing roller 1 is the same as the height of the protuberances 1A of the first group, a layer of glue is applied to the front surface of the protuberances or projections P_B, formed as a result of embossing the ply V1 between the pressure roller 7 and the embossing roller 1, in the same manner as the glue applied to the front surface of the protuberances or projections P_A produced in the group V1 by the pressure of the protuberances 1A against the yielding surface 7A of the pressure roller 7.

[0029] On the embossing roller 3, besides the second group of protuberances 3A in tip-to-tip configuration with respect to the protrusions or protuberances 1A of the embossing roller 1, a fourth group of protuberances 3B

is also provided, which in the lamination nip are arranged in nested configuration with respect to the second group of protuberances 1 B of the first roller 1, i.e. the protuberances 3B coincide with the recesses between protuberances 1 B. In a possible embodiment, the protuberances 3B are substantially the same as the protuberances 3A.

[0030] Passage of the ply V2 between the embossing roller 3 and the pressure roller 9 causes the formation of protuberances P'_A and P'_B coinciding with the protuberances 3A and 3B respectively.

[0031] As the protuberances 1B are of the same height as the protuberances 1A, a glue is applied by the dispenser 11 to the front surface of the projections or protuberances P_B of the ply V1 embossed by the embossing roller 1. In the same manner as the glue applied to the front surfaces of the protuberances P_A of the ply V1 generated at the projections or protuberances 1A of the roller 1, this glue is used to glue the plies V1 and V2 together. In this case gluing takes place as a result of lamination between the first embossing roller 1 and the marrying roll 19.

[0032] In fact, the two plies V1 and V2 embossed with the protuberances P'_B on the ply V2 inserted in the recesses between the protuberances P_B of the ply V1 pass through the nip 20 defined between the rollers 1 and 19. To prevent lamination in the nip 20 from compressing the protuberances P_A, P'_A generated on the plies V1 and V2 by the protuberances 1A and 3A of the first and of the second group of protuberances on the first and second embossing roller 1 and 3, the laminating roller or marrying roll 19 has a surface provided with recesses which during operation is in phase with, i.e. coincide with, the protuberances P_A, P'_A of the plies V1, V3 and consequently coincide with the protuberances 1A of the embossing roller 1. One or these recesses, indicated with 19B, is shown in the enlargement in Figure 3.

[0033] According to a possible embodiment, shown schematically in Figure 4 (similar to Figure 1, but in which in order to simplify the drawing the plies V1 and V2 have been omitted), between each protuberance 1A of the first group and the protuberances 1B of the third group of protuberances, a relatively large recessed region R surrounding each protuberance 1A has been left free. An analogous free recessed region R', i.e. without protuberances, is provided on the surface of the embossing roller 3, between each protuberance 3A of the second group of protuberances and the adjacent protuberances 3B of the fourth group of protuberances. In this way the embossing pattern obtained by the protuberances 1A, 3A is more prominent.

[0034] Figure 5 shows by way of example a portion of web material formed of the plies V1, V2 obtained after lamination between the embossing roller 1 and the marrying roll 19. Figure 5 shows a greatly enlarged and schematic cross section of the web material N. The position taken by the recess or recessed region 19B of the marrying roll 19, with respect to the web material during lamination between the rollers 19 and 1, is indicated with a broken line 19X. As can be seen in Figure 5, the recess 19X is positioned coinciding with the protuberances P_A, P'_A, so that the protuberance P'_A is not compressed by the laminating roller, while the bottom of the recesses between the protuberances P'_B is pressed against the front surface of the protuberances P_B, when these are still engaged on the corresponding protuberances 1 B of the embossing roller 1, to prevent compression of the protuberances P_B.

[0035] It must be understood that the height of the protuberances 1A, 3A, 1B, 3B can differ with respect to that shown. For example, protuberances 1B of a lesser or greater height with respect to the protuberances 1A can be provided. This is also the case for the protuberances 3B with respect to the protuberances 3A. It would also be possible for the protuberances 1 B and 3B to differ in height from each other and/or differ in height within the same group, i.e. for the protuberances 1B to be of different heights and similarly for the protuberances 3B to be of different heights according to the processing requirements of the web material V1, V2.

[0036] In general, the height of the protuberances also depends on the need to distribute the glue according to particular motifs dictated by aesthetic and/or functional requirements.

[0037] In general, the protuberances 1A, 3A will be greater in height than the protuberances 1B, 3B. In fact, the former will normally be utilized to define decorative elements with large surfaces, for example defined by one or more projections with linear extension, while the protuberances 1B, 3B of the third and fourth group of protuberances will have a structure with a prevalently simple geometrical shape, such as truncated-cone or truncated-pyramid shaped. In fact, these protuberances 1B, 3B preferably form a background decoration, the purpose of which is to make the embossed pattern formed by the protuberances 1A, 3A stand out. Linear protuberances are intended as protuberances with a width substantially less than the length, i.e. the dimension calculated along the linear extension of the protuberances. For example, protuberances 1A, 3A with a width in the order of 0.1-3 mm, preferably 0.5-1.5 mm and with a length in the order of 0.5-50 mm, preferably 2-25 mm can be provided. The protuberances 3A can be composite, in the sense that several protuberances even of complex shape define a single decoration surrounded by background protuberances 1B, 3B.

[0038] Figure 6 shows by way of example a possible type of decoration obtainable with combined "nested" and "tip-to-tip" embossing as described above. The floral pattern is formed by a set of protuberances P_A of the ply V1 and/or protuberances P'_A of the ply V2. This floral pattern is surrounded by an unembossed region, and by protuberances P_B or P'_B. In this example, the protuberances P_A (P'_A) have larger dimensions, and have an elongated form, while the protuberances P_B (P'_B) have a geometrical form, for example truncated-cone or truncated-

pyramid shaped and small dimensions, to form a background decoration or embossing providing the product with prevalently technical characteristics.

[0039] To obtain particular patterns and specific aesthetic effects colored glues can be used, which can be distributed with plate rollers if necessary by means of more than one dispensing unit 11. In this case it is possible to apply a colored glue to front surfaces of the protuberances 1A and 1B, or of the protuberances 1A only, or instead of the protuberances 1B only. Alternatively, with two glue dispensing units with plate roller it is possible to apply a glue of one color to the protuberances 1A and a glue of a different color to the protuberances 1B. Figure 10 schematically shows an embossing-laminating unit analogous to the one in Figure 1, but with two glue dispensing units, indicated with 11A and 11B. The components of the glue dispensing units 11A, 11B are indicated with 13A, 13B; 15A, 15B; 17A, 17B. It would also be possible to arrange a dispensing unit 11A at the roller 1 and a dispensing unit 11B at the second roller 3. In this case, the dispensing unit 11A applies the glue to the protuberances 1B, while the dispensing unit 11B applies the glue to the protuberances 3A. In an advantageous embodiment, the two glues dispensed from the two dispensing units 11A, 11B are of different colors.

[0040] Figure 7 shows an enlarged local cross section (analogous to the section in Figure 5) of a web material N obtained with an embossing laminating unit in a modified embodiment. The same numbers indicate the same or equivalent parts to those in Figure 5. In this case the glue C is only applied to the protuberances P_A, P'_A, while the protuberances P_B and P'_B are smaller in height and without glue. In this case it is not necessary to utilize the marrying roll 19. Conversely, in the case of the product in Figure 5, the laminating roller 19 is utilized to laminate the plies V1, V2 in the areas in which the glue C has been applied to the front surfaces of the protuberances P_B, while in both cases (Figure 5 and Figure 7) the glue on the protuberances P_A, P'_A is compressed in the nip 5 between the rollers 1, 3.

[0041] Figure 8 shows a schematic local section of a web material N in a modified embodiment, wherein the protuberances of larger dimension are arranged in nested configuration and the protuberances of smaller dimension are in tip-to-tip configuration.

[0042] Figure 9 shows a schematic local cross section of a web material N according to a further embodiment of the invention. In this case the protuberances 1 B of the embossing roller 1 are greater in height than the protuberances 1A and consequently the protuberances P_B are greater in height (deeper) than the protuberances P_A. The height of the protuberances P_B is indicated with H and the height of the protuberances P_A with H'. If a marrying roll 19 without recessed regions or recesses 19B is used, with this form of the embossing roller 1 partial compression of the protuberances P'_A generated by the roller 3 is obtained, but due to the difference in the heights H and H', the protuberances P'_A will not be completely compressed, but will remain at a height h (with h=H-H') after lamination between the embossing roller 1 and the marrying roll 19. The web material N will therefore have two faces with different patterns, or more precisely characterized by a different marking of the protuberances P_A with respect to the protuberances P'_A, but the production thereof will be simplified by the lack of angular phasing of the marrying roll 19 with respect to the embossing rollers 1, 3.

[0043] It is understood that the drawing only shows an example provided by way of a practical arrangement of the invention, which may vary in forms and arrangements without however departing from the scope of the concept underlying the invention.

Claims

1. An embossing-laminating unit comprising:

   - a first embossing roller comprising a cylindrical surface provided with protuberances and cooperating with a first pressure roller;
   - a second embossing roller comprising a cylindrical surface provided with protuberances and cooperating with a second pressure roller, said first embossing roller and said second embossing roller defining a lamination nip therebetween;

   characterized in that the protuberances on the first and on the second embossing roller are arranged such that in said lamination nip some protuberances are arranged in tip-to-tip configuration and some are arranged in nested configuration.

2. Embossing-laminating unit as claimed in claim 1, comprising a laminating roller cooperating with said first embossing roller.

3. Embossing-laminating unit as claimed in claim 2, wherein said laminating roller has recesses coinciding with the protuberances of the first embossing roller which, in the lamination nip, are phased tip-to-tip with corresponding protuberances of the second embossing roller.

4. Embossing-laminating unit as claimed in claim 1, 2 or 3, wherein:

   - said first embossing roller comprises a first group of protuberances which, in the lamination nip, are arranged in tip-to-tip configuration with corresponding protuberances of a second group of protuberances on said second embossing roller; and
   - said first embossing roller comprises a third group of protuberances which in said lamination

nip are arranged at least in part in nested configuration with respect to a fourth group of protuberances on said second embossing roller.

5. Embossing-laminating unit as claimed in claim 4, wherein said laminating roller comprises recessed regions coinciding with protuberances of said first group.

6. Embossing-laminating unit as claimed in claim 4 or 5, wherein each protuberance of the first group is at least partially surrounded by protuberances of the third group.

7. Embossing-laminating unit as claimed in one or more of claims 4 to 6, wherein each protuberance of the second group is at least partially surrounded by protuberances of the fourth group.

8. Embossing-laminating unit as claimed in one or more of claims 4 to 7, wherein the protuberances of the third group have a greater height than the protuberances of the first group.

9. Embossing-laminating unit as claimed in one or more of claims 4 to 8, wherein said protuberances of the fourth group have a greater height than the protuberances of the second group.

10. Embossing-laminating unit as claimed in one or more of the preceding claims, comprising a glue dispenser cooperating with said first embossing roller.

11. Embossing-laminating unit as claimed in claim 10, wherein said protuberances of the first group and of the third group are substantially of the same height, said glue dispenser applying glue to the surface of a ply embossed between the first embossing roller and the first pressure roller on the protuberances of the first and of the third group of protuberances.

12. Embossing-laminating unit as claimed in one or more of claims 4 to 11, wherein said protuberances of the third and of the fourth group form a background geometrical motif and the protuberances of the first and of the second group define a decorative motif, with a distribution of protuberances with lesser density and larger dimensions of the front surface of said protuberances of the first and second group with respect to the protuberances of the third and of the fourth group.

13. An embossed web material comprising at least a first embossed ply and a second embossed ply bonded together by gluing, **characterized in that** said two plies comprise a plurality of protuberances arranged in tip-to-tip configuration and a plurality of protuberances arranged in nested configuration.

14. Web material as claimed in claim 13, wherein said protuberances arranged in tip-to-tip configuration are bonded together by gluing.

15. Material as claimed in claim 13 or 14, wherein said protuberances arranged in tip-to-tip configuration form a repetitive pattern on said material, elements of said repetitive pattern being surrounded by protuberances arranged in nested configuration.

16. Material as claimed in claim 13, 14, or 15, wherein said first ply comprises a first group of protuberances projecting toward the inside of the web material and at least some of which are arranged in tip-to-tip configuration coinciding with protuberances of a second group of protuberances on said second ply, projecting toward the inside of the web material, and wherein said first ply comprises a third group of protuberances and said second ply comprises a fourth group of protuberances, the protuberances of the third and of the fourth group facing the inside of the web material and being arranged at least partially in nested configuration with respect to the each other.

17. Web material as claimed in claim 16, wherein at least some of the protuberances of the first group are surrounded by protuberances of the third group.

18. Web material as claimed in claim 16 or 17, wherein at least some of the protuberances of the second group are surrounded by protuberances of the fourth group.

19. Web material as claimed in one or more of claims 16 to 18, wherein all the protuberances of the first group are surrounded by protuberances of the third group.

20. Web material as claimed in one or more of claims 16 to 19, wherein all the protuberances of the second group are surrounded by protuberances of the fourth group.

21. Web material as claimed in one or more of claims 16 to 20, wherein said first ply and said second ply are bonded together by glue applied to the protuberances of the first group.

22. Web material as claimed in one or more of claims 16 to 21, wherein said first ply and said second ply are bonded together by glue applied to the protuberances of the second group.

23. Web material as claimed in one or more of claims 16 to 22, wherein said first and said second ply are bonded together by glue applied to the protuberances of the third group.

24. Web material as claimed in one or more of claims 16 to 23, wherein said protuberances of the third group are higher than the protuberances of the first group.

25. Web material as claimed in one or more of claims 16 to 24, wherein protuberances of the fourth group are higher than protuberances of the second group.

26. Web material as claimed in one or more of claims 16 to 25, wherein said protuberances of the third and of the fourth group form a geometrical background embossing motif and the protuberances of the first and of the second group define a decorative embossing motif, with a distribution of protuberances of lesser density and greater dimensions of the front surface of said protuberances of the first and second group with respect to the protuberances of the third and fourth group.

27. Web material as claimed in one or more of claims 13 to 26, wherein said plies are bonded by at least one colored glue.

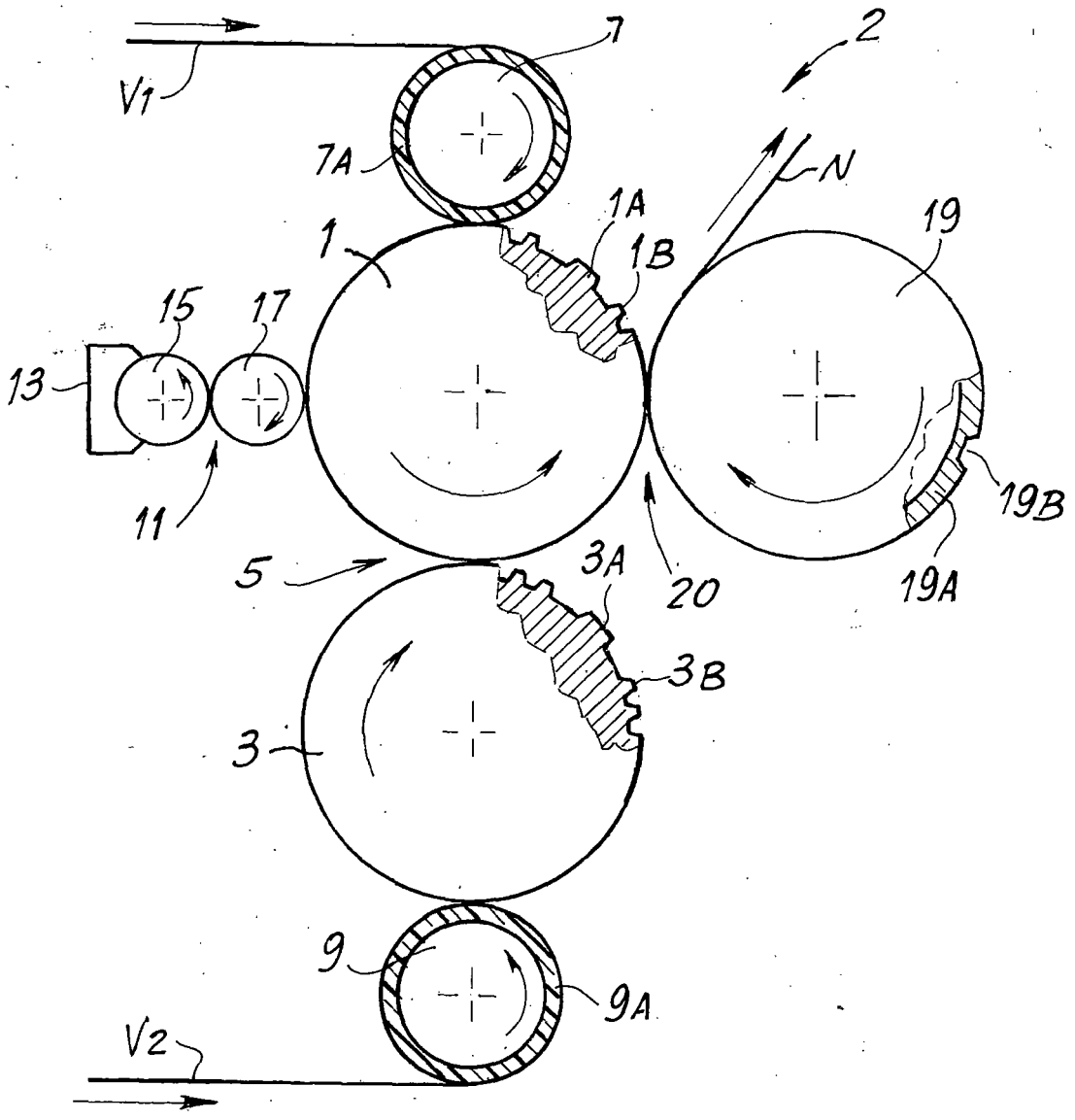
28. A method for embossing a multi-ply web material, wherein at least a first ply and at least a second ply are embossed separately and bonded by gluing, **characterized in that** said plies are embossed and bonded with regions comprising protuberances in tip-to-tip configuration and regions comprising protuberances in nested configuration.

29. Method as claimed in claim 28, wherein said at least a first ply is embossed between a first embossing roller and a first pressure roller, and said second ply is embossed between a second embossing roller and a second pressure roller, said first and second embossing roller being provided with protuberances and defining therebetween a lamination nip, in said lamination nip some embossing protuberances of the first embossing roller being arranged in tip-to-tip configuration with corresponding protuberances of the second embossing roller and some embossing protuberances of the first embossing roller being arranged in nested configuration with respect to the embossing protuberances of the second embossing roller, such that the two plies are laminated in the lamination nip at said protuberances in tip-to-tip configuration.

30. Method as claimed in claim 29, wherein a glue is applied to the first ply in surface areas of the first ply located on the protuberances which, in the lamination nip, are in tip-to-tip configuration with the protuberances of the second embossing roller.

31. Method as claimed in one or more of claims 28 to 30, wherein a first glue is applied to at least some of the protuberances in tip-to-tip configuration and a second glue is applied to at least some of the nested protuberances, said first and second glue having different colors from each other.

Fig. 1



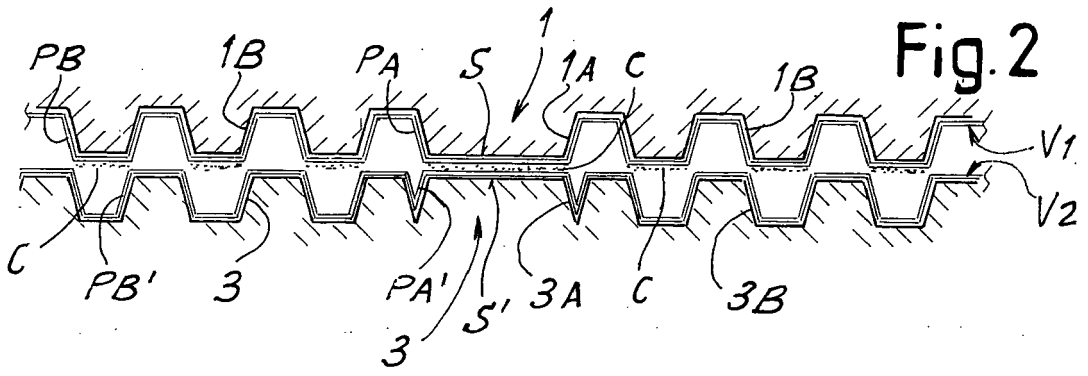


Fig. 2

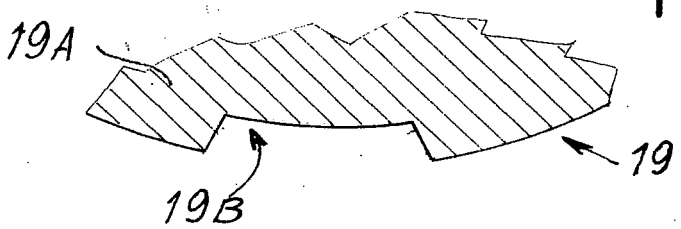


Fig. 3

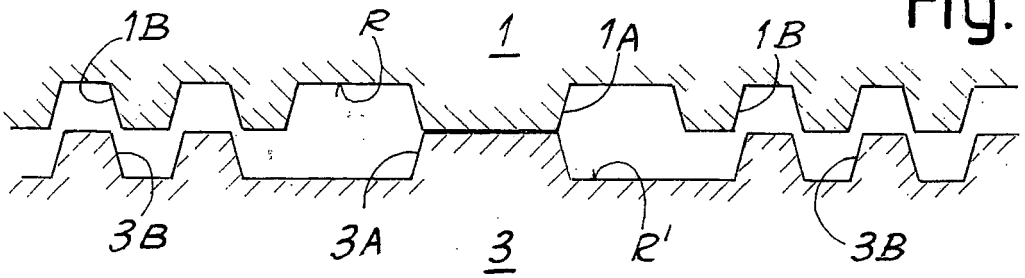


Fig. 4

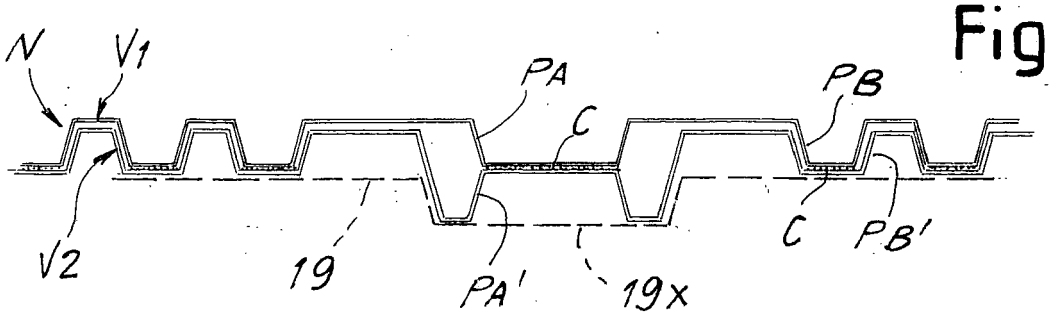


Fig. 5

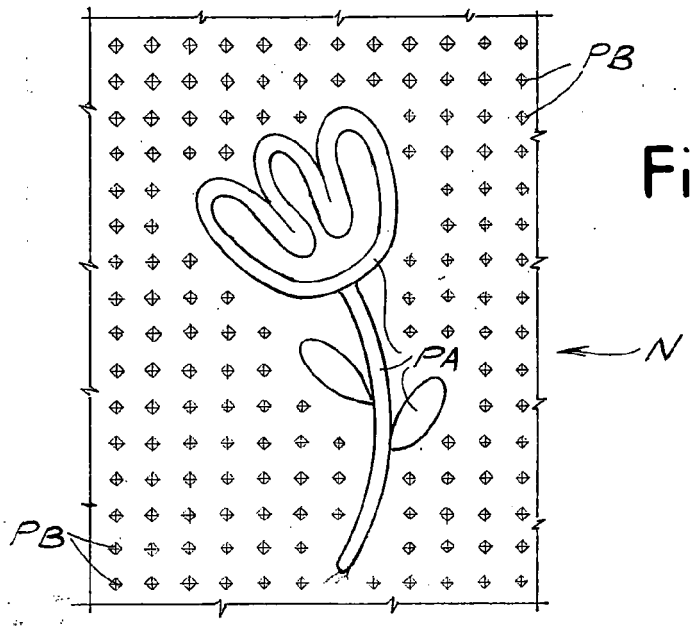


Fig. 6

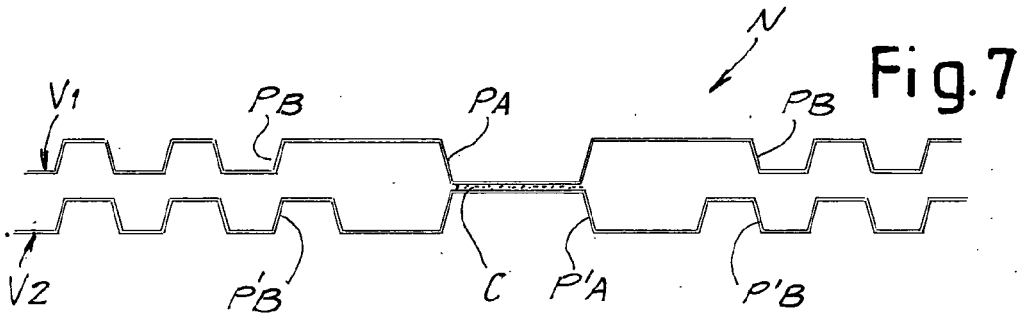


Fig. 7

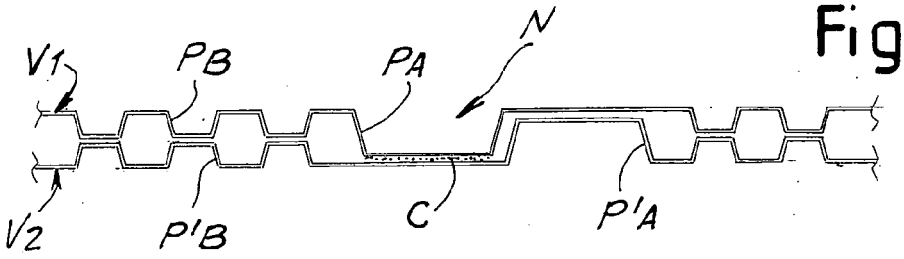


Fig. 8

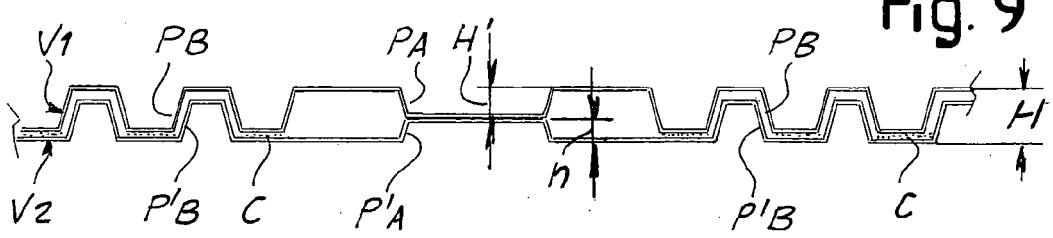
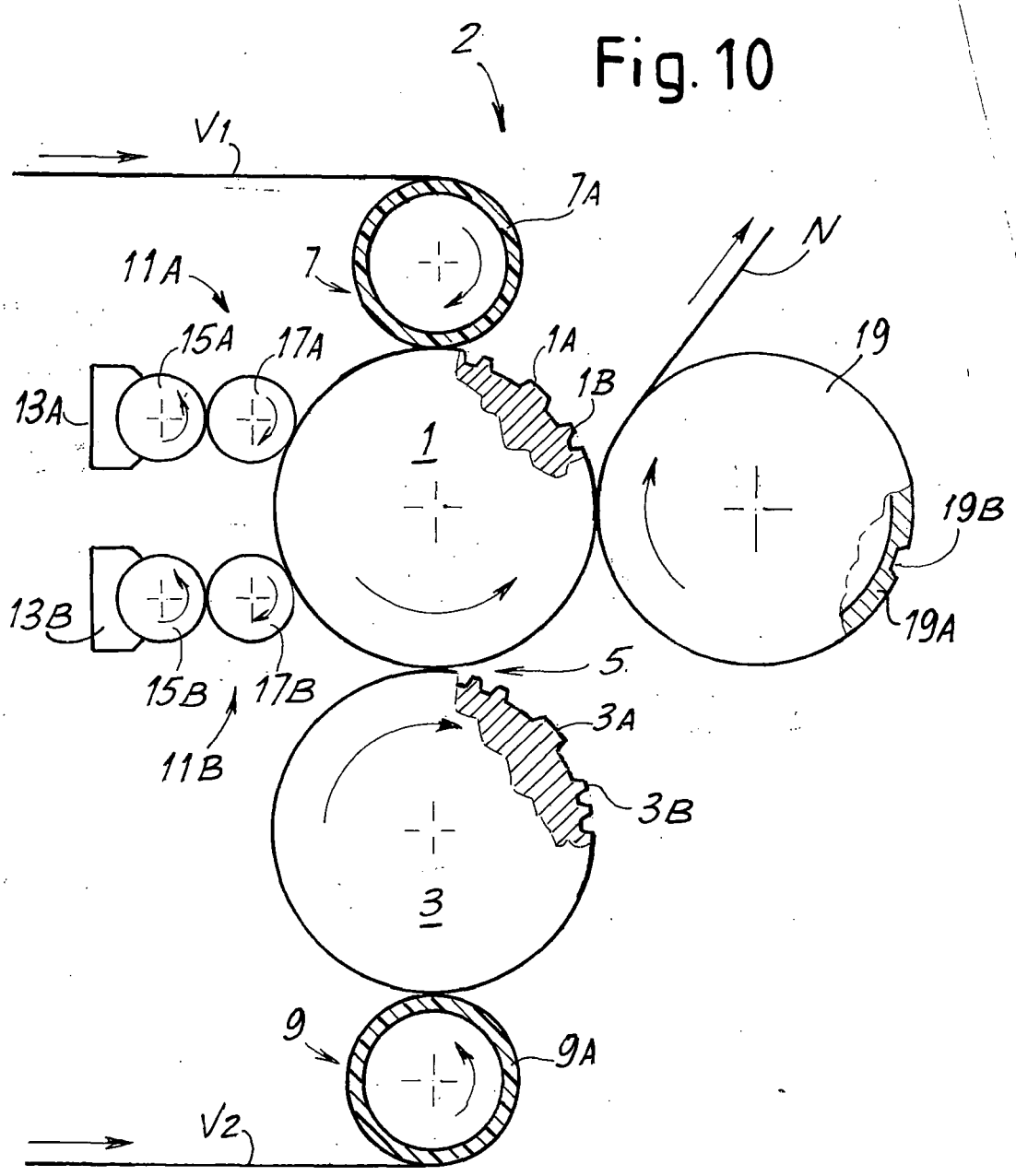


Fig. 9

Fig. 10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EUROPEAN SEARCH REPORT

Application Number
EP 07 42 5605

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Y		2,3,5,31	
X	US 6 551 691 B1 (HOEFT BENOIT [FR] ET AL) 22 April 2003 (2003-04-22) * column 4, line 31 - column 8, line 11; figures 1,2 *	13, 16-21, 23-28	
Y		2,3,5	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 November 2007	Johne, Olaf

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