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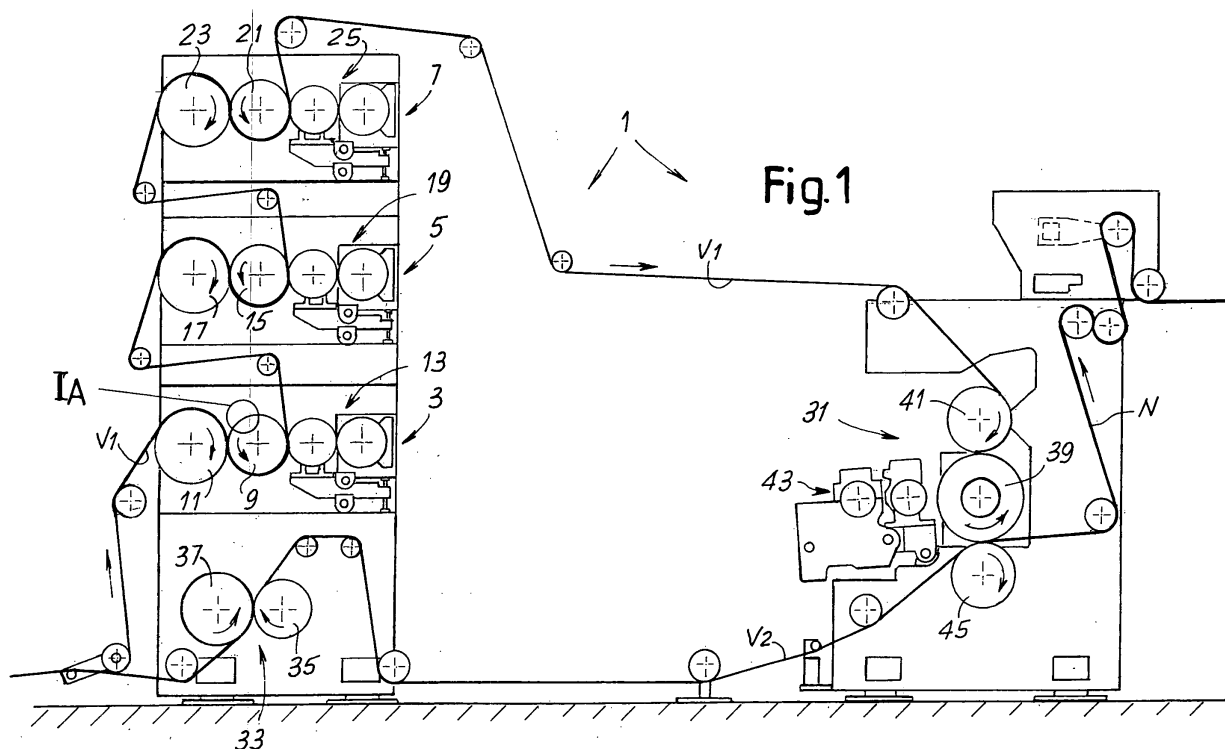
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(54) **An embossing device for producing a multi-ply polychromatic material and the related method**

(57) The embossing device for embossing a web material comprises at least a first path for at least one ply (V1) of web material, along which a plurality of embossing groups is arranged in series (3, 5, 7), each of which comprising an embossing roller with embossing protuberances,

a pressure roller cooperating with the embossing roller and a dispenser for dispensing a liquid colored product. The embossing groups are mutually phased in order to create on the ply of web material a complex embossing pattern, colored in a plurality of colors through said dispensers for dispensing a liquid product



Description

Technical Field

[0001] The present invention relates to methods and machines for converting ply materials, in particular materials based on cellulose fibers, and specifically paper, such as tissue paper or the like.

[0002] More in particular, the present invention relates to an embossing device for embossing single plies destined to form a multi-ply paper web material.

State of the Art

[0003] In the field of paper converting for the production of sanitary products, napkins or the like, such as in particular toilet paper, kitchen towel, paper napkins or similar disposable products, usually embossing groups and devices are used, which permanently deform the layers of cellulose material to obtain particular technical-functional and also aesthetical effects on the finished product. Embossing is used in particular to decorate the product, to increase its apparent thickness, to change and to increase the absorption, softness and similar features, and for other purposes known to those skilled in the art.

[0004] Usually, the embossing groups include means for joining two or more plies and to form a multi-ply web. Joining is performed generally by means of glues. In some cases the glues may be colored to combine the embossing effect with a chromatic decorative effect. WO-A-2005/077649 describes and illustrates for example an embossing group with a central embossing roller and a plurality of pressure rollers arranged along the circumference of the embossing roller. One or more gluing units are associated with the central embossing roller, which are arranged and designed so as to apply a duly colored glue, in order to obtain particular chromatic effects, also with combination of colors, which add to the embossing effects. The colored glue generates a chromatic decoration, in addition to assuring reciprocal gluing of the plies, which form the multi-ply web material.

Summary of the Invention

[0005] According to an aspect, an object of the invention is to provide a new type of embossing device, which allows obtaining particular technical and aesthetical effects, which currently cannot be obtained through the conventional systems.

[0006] Substantially, a first subject of the present invention is an embossing device for embossing a web material, comprising at least a first path for at least one ply of web material, along which a plurality of embossing groups is arranged in series, each of which comprising an embossing roller with embossing protuberances, a pressure roller cooperating with the embossing roller and a dispenser for dispensing a liquid colored product. The

embossing groups are mutually phased in order to create on the ply of web material a complex embossing pattern, colored in a plurality of colors by the dispensers for dispensing a liquid product

[0007] Further variants, characteristics and embodiments of the device according to the invention are indicated in the appended claims and shall be described in greater detail hereunder.

[0008] A further subject of the present invention is a method for producing an embossed and decorated web material, wherein said web material is embossed in a sequential manner forming series of protuberances of different heights forming a decorative design and coloring said series of protuberances with different colors.

[0009] Further characteristics, variants and embodiments of the method according to the invention are indicated in the appended claims.

Brief Description of the Drawings

[0010] The invention will be better understood by following the description below and the attached drawing, which shows a non-limiting practical embodiment of the invention. More in particular, in the drawing:

figures 1 and 2 show side and schematic views of an embossing device with a plurality of embossing groups and/or embossing-laminating groups according to the invention in two possible embodiments;

figure 1A shows an enlargement of a portion of the embossing roller of one of the embossing group of figure 1 or 2;

figure 3 shows a plan view of a schematic portion of a multi-ply or multi-layer web product obtained by means of a device according to the invention;

figures 4 and 5 show schematic sections according to IV-IV and V-V of figure 3;

figure 6 shows a schematic enlarged cross section of a first ply embossed sequentially by three embossing groups of the device according to the invention; and

figure 7 shows an enlarged schematic section of the embossing nip of one of the embossing groups of figure 1 or 2.

Detailed Description of Embodiments of the Invention

[0011] As shown in figure 1, in some embodiments the embossing device according to the invention, indicated as a whole with the number 1, comprises a first path for a first ply material V1 and a second path for a second ply material V2. A series of embossing groups is arranged along the first path of the ply V1. In the illustrated example three embossing groups 3, 5, 7 are provided in series, for embossing sequentially the ply material V1.

[0012] In some embodiments, the first embossing group 3 comprises an embossing roller 9 provided with

protuberances 9P, as shown in the enlargement of figure 1A. A first pressure roller 11 cooperates with the embossing roller, the pressure roller forming with the roller 9 an embossing nip, through which the ply material V1 passes. Furthermore, for dispensing ink or other colored liquid, the roller 9 cooperates with a dispenser, for example a printing unit, schematically indicated with the number 13. This inking unit or printing unit 13 applies the ink or other colored liquid on the projections formed by embossing on the ply material V1 due to the effect of the pressure between the pressure rollers 11 and the embossing roller 9, which causes the penetration of the protuberances 9P inside the elastically yielding thickness, with which the outer surface of the pressure roller 11 is coated. In some embodiments, the inking unit or printing unit 13 comprises a tank for the colored liquid with one or more distribution doctor blades, a screened roller or anilox roller, which takes the colored liquid and transfers it to a cliché roller, which is in contact with the front surface of the projections obtained on the ply material V1. With the described arrangement, on the ply V1 a first embossed pattern is obtained, which corresponds to the pattern according to which the protuberance 9P of the embossing roller 9 are arranged. In practice, the projections generated in the embossing nip between the rollers 9 and 11 form a portion of a more complex pattern which is completed by the remaining embossing and printing units, as described in greater detail below.

[0013] Similarly to the group 3, the embossing group 5 includes an embossing roller 15 and a corresponding pressure roller 17. These latter are substantially similar to the rollers 9 and 11, as the roller 15 is provided with projections radially projecting toward the outside and cooperating with an elastically yielding surface of a layer, with which the pressure roller 17 is coated. Moreover, the protuberances of the roller 15 may have a pattern and an arrangement different or partially equal and partially different from that of the protuberances 9P of the roller 9. In the case of even partial correspondence of protuberances, a particular combination of colors is obtained, and thus a particular chromatic effect, typically a four-color effect obtained through combination of colors. The rollers 9 and 15 are mutually phased, so that the projections obtained by embossing the ply V1 which passes through the two embossing groups 3, 5 form part of a more complex pattern together with the projections generated in the embossing nip between the rollers 15 and 17.

[0014] Lastly, the number 19 indicates a dispensing unit for dispensing ink or other colored liquid, which applies on the protuberances formed by the embossing roller 15 with the pressure roller 17 a further ink or other colored liquid which is preferably different in color or shade from that applied by the unit 13.

[0015] In order to simplify application of the color without the need for using particular application cliché, according to some embodiments the protuberances of the roller 15 have a height greater than the protuberances

of the embossing roller 9, so that on one hand it is possible to avoid compression of the protuberances or projections formed on the ply V1 by the embossing roller 9 and on the other hand protuberances of greater height are generated on the ply V1 through a roller 15, so that the colored liquid applied by the unit 19 only wets the protuberances of greater height formed by the roller 15 and not the protuberances formed by the roller 9. Alternatively, in order to obtain in the second embossing group 5 protuberances of the embossed ply higher than the projections generated by the embossing group 3, it is possible to use a greater pressure and/or a lesser hardness of the coating layer of the pressure roller. Combinations of these measures may also be adopted, in order to obtain substantially in the second embossing group 5 a greater deformation than the deformation in the first embossing group.

[0016] It is also possible to obtain on the second (and then on the third) embossing group projections of the ply V1 with equal height than those generated in the embossing groups upstream, but with higher protuberances of the embossing roller, so that the areas of the ply V1 already embossed find space between adjacent protuberances of the subsequent embossing group, thus preventing the application thereon of the color and also preventing their compression.

[0017] The embossing group 7 comprises, similarly to the previous groups 3 and 5, an embossing roller 21 cooperating with a pressure roller 23 and with an applicator 25 for a colored liquid, said elements being substantially equivalent to those indicated with the numbers 9, 11 and 13 for the embossing group 3 and with the numbers 15, 17 and 19 for the embossing group 5. The projections formed in the ply material V1 by the embossing group 7 are preferably higher than those generated in the same ply by the two upstream groups 3 and 5, for the above-mentioned reasons.

[0018] Figure 6 schematically illustrates a cross section of the ply V1 coming out from the embossing group 7 after having been subjected to the triple operation of embossing through the groups 3, 5 and 7. P3, P5 and P7 indicate by way of example three projections or protuberances generated respectively by the protuberances of the embossing rollers 9, 15 and 21 of the embossing groups 3, 5 and 7. The height of the protuberance or projection P3 is lesser than the height of the protuberance or projections P5, and this latter is lesser than that of the protuberance or projection P7, in such a way so as to avoid, during each embossing phase, the compression of the protuberance generated during the previous phase, as it will be better explained in greater detail with reference to figure 7, and to obtain an adequate controlled and selective distribution of dye or ink. C1, C2 and C3 indicate the three dyes, inks or the like, applied by the unit 13, 19, 25 respectively.

[0019] Figure 7 shows a schematic enlargement of a detail of the embossing area defined in the nip between the embossing roller 21 and the pressure roller 23. 21 P

indicates a protuberance of the embossing roller 21 which coacts with the pressure roller 23, penetrating inside the elastically yielding layer which covers the lateral cylindrical surface thereof. The ply V1 is deformed and embossed in this area in correspondence of the protuberances 21P. As it is shown in the schematic representation of figure 7, these latter have a height such that the projections P7 generated by them in the ply V1 project radially more than the projections or protuberances P3, P5 formed on the ply V1 in the two previous embossing phases performed by the embossing group 3 and by the embossing group 5, respectively. In this way, on one hand it is possible to avoid the compression of the protuberances P3, P5, and on the other hand it is possible to prevent the applicator unit 25 from applying the dye also on the protuberances P3, P5, which are at a lesser height, i.e. project less than the protuberances P7.

[0020] It is also possible for one or the other of the embossing groups to be designed so as to generate in the ply V1 projections of the same height than those generated, for example, by the upstream group. In this way it is possible for example to mix two different dyes on some of the projections generated in the ply.

[0021] It should be understood that along the feed path of the ply material V1 even only two embossing groups, or more than three embossing groups can be provided.

[0022] By combining the projections or protuberances P3, P5, P7 with the colors C1, C2, C3 a complex polychromatic pattern is obtained, formed by the mutually phased combination of the various projections generated in the three embossing groups 3, 5, 7.

[0023] In some embodiments the ply V1 so embossed and colored is fed to an embossing-laminating group 31, to which also the second ply V2 arrives along its own feed path. This second ply can be previously subjected to a micro-embossing through an auxiliary embossing group 33. In some embodiments the auxiliary embossing group 33 includes an embossing roller 35 and a pressure roller 37. In other embodiments the auxiliary embossing group can be omitted, or more than one auxiliary embossing group can be provided.

[0024] In some embodiments, the embossing-laminating group 31 comprises an embossing roller 39 provided with own protuberances according to a pattern that can complete the pattern formed by the projections P3, P5, P7 on the ply V1. The embossing roller 39 cooperates with a pressure roller 41 having a elastically yielding lateral surface for example coated with synthetic rubber or other adequate material, similarly to the pressure rollers 11, 17, 23 of the embossing groups 3, 5, 7.

[0025] The number 43 indicates a dispensing unit for dispensing glue, which applies glue on the protuberances generated in the embossing nip between the embossing roller 39 and the pressure roller 41. The protuberances or projections generated on the ply V1 have preferably a height greater than the height of the projections or protuberances P3, P5, P7, so that the glue applied by the dispenser 43 is distributed in a uniform manner on the

front surfaces of the projections generated by the embossing roller 39 but not on the projections P3, P5, P7. In some embodiments, the glue applied by the dispenser 43 can be colored. Preferably, the protuberances generated by the embossing roller 39 on the ply V1 are phased with the projections or protuberances P3, P5, P7, so as to form, in combination with these latter, a complex pattern which can be colored with four different colors, as also the glue applied by the dispenser 43 can be colored and in particular it can have a color or a shade different from that of the inks or other colored liquids applied by the dispenser 13, 19, and 25.

[0026] The embossing roller 39 forms a laminating nip together with a laminating roller 45. In the laminating nip between the rollers 39, 45, the ply V2 is fed, which can be previously micro-embossed in the auxiliary embossing group 33.

[0027] What is obtained at the output of the device 1 is a web material N formed by two plies mutually coupled, embossed and colored. Each ply V1, V2 can in turn be composed of several layers.

[0028] An embodiment of an embossed and colored pattern so obtained is represented in figure 3 and in the sections of the figures 4 and 5. Purely by way of example, in this case the pattern is represented as a floral decoration with a flower comprising petals A, a center B, a stem C, projecting from a vase D.

[0029] As shown in particular in the sections of figures 4 and 5, the petals A are formed by protuberances P3 generated by the embossing group 3 and colored with the dye C1, the center B of the flower is formed by protuberances P5 colored with the dye C2 in the embossing group 5, and lastly the stem C is formed by a protuberance P5 of greater height colored with the dye C3. As shown in figure 5, the vase D from which the flower projects is formed by a projection P6 of greater height than the protuberances P3, P4, P5, formed by the embossing roller 39 in cooperation with the pressure roller 41. Between the ply V2 and the protuberances or projections P6 of the ply V1 a glue CC is applied, dispensed by the gluing unit 43.

[0030] In a modified embodiment, it is also possible to provide for the pattern to be realized by coloring the inner part of the petals, of the stem and of the vase through the embossing groups 3, 5, 7, whilst the embossing-laminating group 31 applies the glue along linear protuberances which define the contour of the stem, of the petals and of the vase. In this way a full coloring is obtained and a gluing along thin lines, which outline the various element of the pattern, with optimum distribution of the glue. A fourth color, obtained through combination i.e. overlapping of two colors of two distinct embossing groups 3, 5, 7 can be used to provide the centre of the flower with a fourth color (four-color effect).

[0031] Figure 2 shows a modified embodiment of the device 1. The same or equivalent parts are indicated with the same reference numerals as used for the device in figure 1. Differently from this latter, the device of figure 2

includes a third path for a ply V3 intermediate between the plies V1 and V2. The ply V3 can be embossed in an auxiliary embossing group 51 with a pressure roller 53 and an embossing roller 55 provided with micro-protuberances in order to generate for example a micro-embossing. The product obtained with the device of figure 2 is substantially similar to that obtained with the device of figure 1, with the difference that between the outer plies V1 and V2 a third ply V3 is interposed, which increases the volume and thickness of the end multi-ply web product N.

[0032] It is understood that the drawing only shows an example provided by way of a practical arrangement of the invention, which can vary in forms and arrangement without however departing from the scope of the concept underlying the invention. Any reference numerals in the appended claims are provided for the purpose of facilitating reading thereof with reference to the description and to the drawing and do not limit the scope of protection represented by the claims.

Claims

1. An embossing device for embossing a web material, comprising at least a first path for at least one ply of web material, along which a plurality of embossing groups are arranged in series, each of which comprising an embossing roller with embossing protuberances, a pressure roller cooperating with said embossing roller and a dispenser for dispensing a liquid colored product, wherein said embossing groups are mutually phased in order to generate on said ply of web material a complex embossing design, colored with a plurality of colors through said dispensers of liquid product.
2. A device as claimed in claim 1, wherein said embossing groups are arranged and designed to generate on the ply which passes across them embossing protuberances of increasing height along the direction of feed of the ply of web material along said path,
3. A device as claimed in claim 1 or 2, comprising a second path for a second ply of web material and an embossing-laminating group to emboss and join to each other said first and said second ply of web material.
4. A device as claimed in claim 3, wherein said embossing-laminating group comprises a glue applicator.
5. A device as claimed in claim 3 or 4, wherein said embossing-laminating group comprises an embossing roller with embossing protuberances, cooperating with a pressure roller, the embossing roller of the embossing-laminating group being phased with said embossing groups and the path of said first ply extending in the nip defined between said embossing roller and said pressure roller of the embossing-laminating group.
6. A device as claimed in claim 3, 4, or 5, wherein along said second path at least one embossing group is provided, in order to emboss said second ply.
7. A device as claimed in one or more of claims 3 to 6, comprising a third path for a third ply.
8. A device as claimed in claim 7, wherein said third path extends in order to convey the third ply to said embossing-laminating group.
9. A method for producing an embossed and decorated ply material, wherein said ply material is embossed in a sequential manner forming series of protuberances of different heights defining a decorative pattern and coloring said series of protuberances with different colors.
10. A method for the production of an embossed and decorated web material comprising the steps of:
 - feeding a first ply material along a first feed path;
 - generating in sequence on said first ply material embossing protuberances in embossing groups arranged in series along said path;
 - applying in sequence on said protuberances different dyes in order to form a polychromatic pattern on said first ply material.
11. A method as claimed in claim 10, wherein the protuberances generated on said first ply material are of increasingly great height.
12. A method as claimed in claim 10 or 11, wherein to said first ply material a second ply material is applied.
13. A method as claimed in claim 12, wherein said second ply material and said first ply material are glued to each other.
14. A method as claimed in claim 12 or 13, wherein said first ply material is joined to said second ply material through embossing and laminating, by applying a glue.
15. A method as claimed in claim 13 or 14, wherein said glue is colored.
16. A method as claimed in one or more of claims 10 to 15, comprising the following sequence of steps:

- a. embossing said first ply material in a first embossing group, in order to form a first series of protuberances;
- b. coloring at least some of the protuberances of said first series of protuberances with a first colored liquid; 5
- c. further embossing said first ply material in order to form a further series of protuberances;
- d. coloring at least some of the protuberances of said further series of protuberances with a further colored liquid different from the first colored liquid; 10
- e. if necessary, repeating steps (c) and (d) in order to obtain a polychromatic pattern on said first ply material. 15

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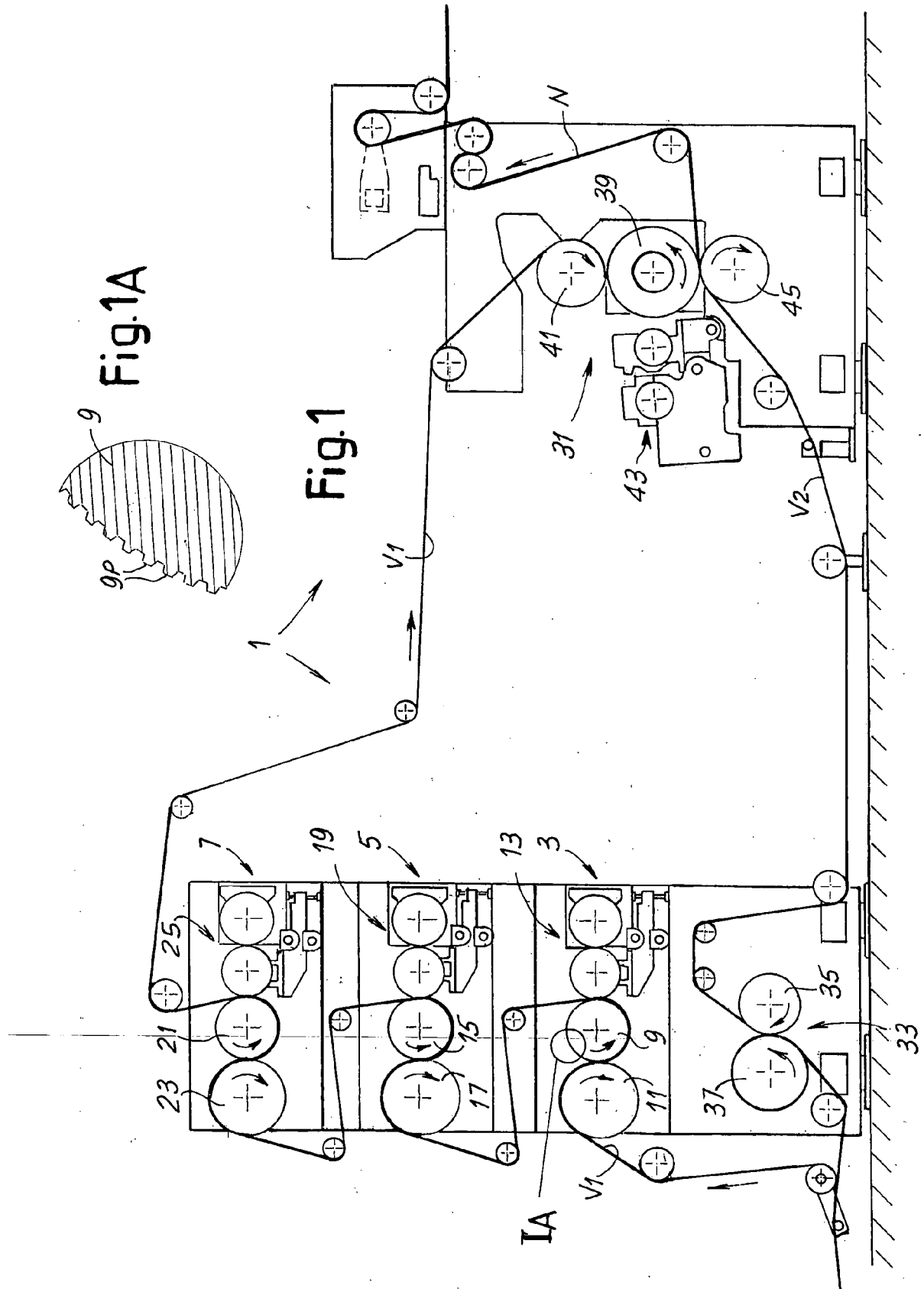
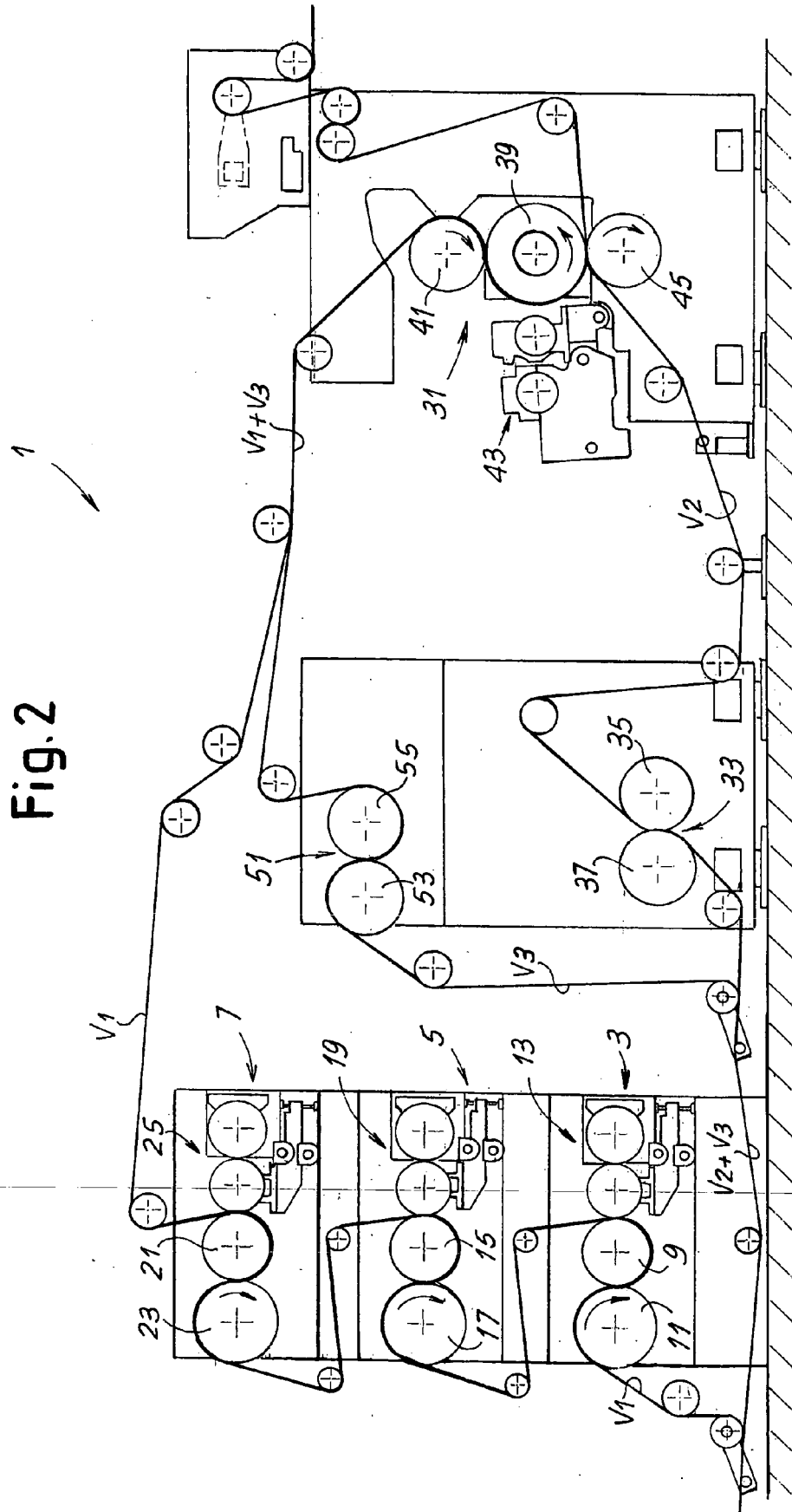
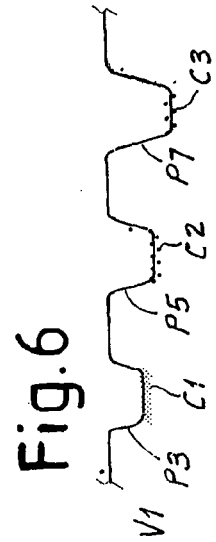
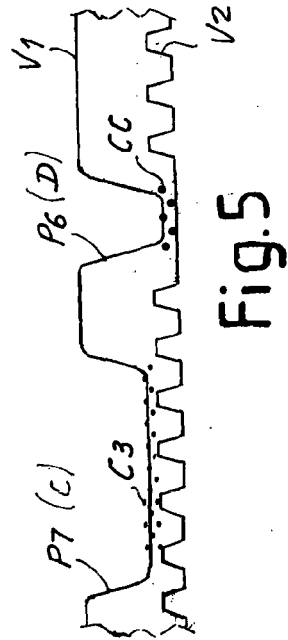
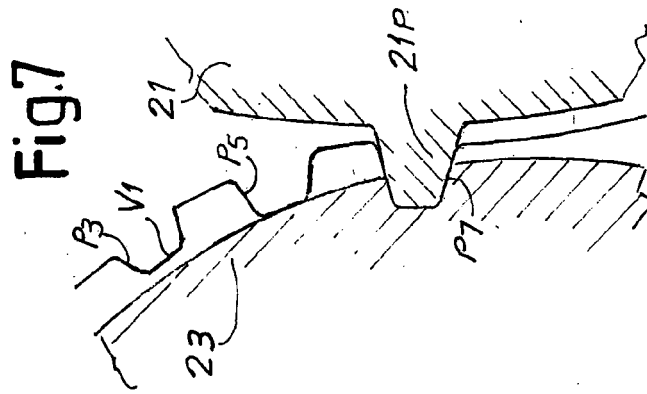
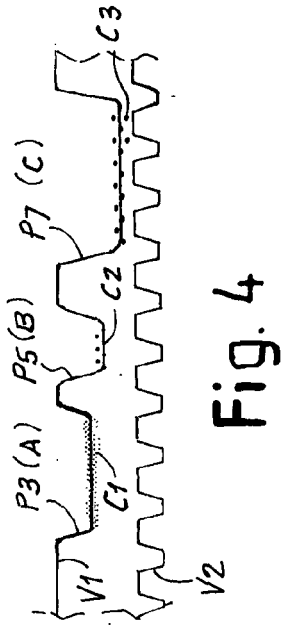
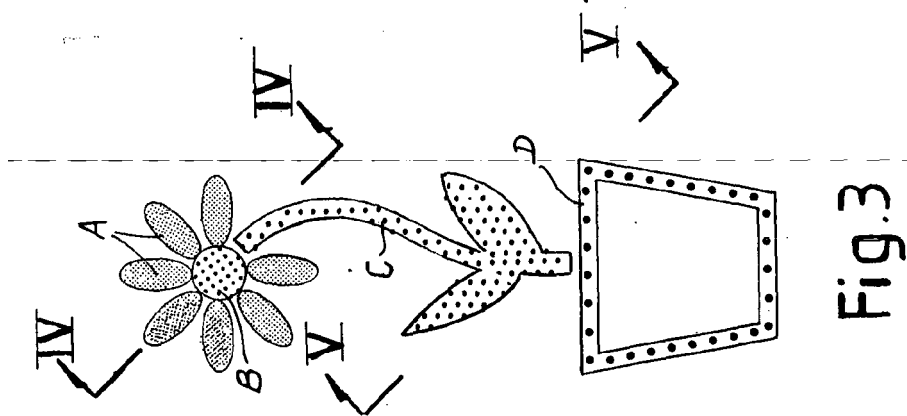


Fig. 2







EUROPEAN SEARCH REPORT

Application Number
EP 08 42 5737

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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 May 2009	Examiner Farizon, Pascal
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 08 42 5737

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REFERENCES CITED IN THE DESCRIPTION

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