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(71) Applicant: **SCA HYGIENE PRODUCTS AB** [SE/SE]; S-405 03 Göteborg (SE).

(72) Inventors: **FERNFORS, Ingemar**; Alfhöjdsgatan 13, S-431 38 Mölndal (SE). **LINDER, Michael**; Löparegatan 1 A, S-416 69 Göteborg (SE). **NILSSON, Urban**; Veneröd 570, S-442 95 Hålta (SE).

(74) Agent: **ALBIHNS GÖTEBORG AB**; Box 142, S-401 22 Göteborg (SE).

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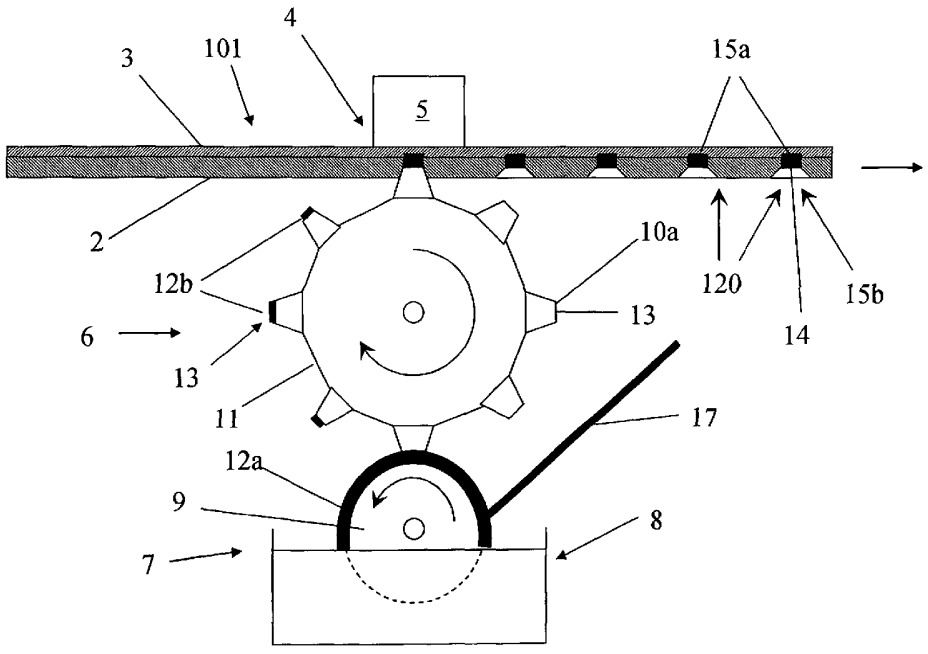
(54) Title: PRODUCTION OF A DYED PATTERNED WEB



(57) Abstract: The present invention relates to a method for production of a three-dimensional dyed macropattern (20, 21) in a web (1, 101) of web-shaped flexible material. The method comprises a bonding device (4) being made, in interaction with the dye-coated tops (13) of the raised macroportions (10a), to form bonding points (15a) and three-dimensional bonding areas (15b) at the same time as the bonding areas (15b) and/or the bonding points (15a) are dyed, the three-dimensional dyed macropattern (20, 21) being formed in this operation.

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TITLE

Production of a dyed patterned web

TECHNICAL FIELD

The present invention relates to a method for production of a three-dimensional dyed macropattern in a web of web-shaped flexible material. The method comprises at least parts of a pattern device, which has a three-dimensional macropattern of alternate raised macroportions and lowered macroportions, being brought into contact with a dye-application device in such a way that a dye is applied to the pattern device only on the tops of the raised macroportions. The method also comprises the web being brought into contact with the tops of the dye-coated raised macroportions in such a way that dyeing of the web takes place in a dyed macropattern corresponding to the design of the tops of the raised macroportions. The web is moreover brought into contact with a bonding device which forms bonding points in the web and also three-dimensional bonding areas coinciding with the bonding points. The invention also relates to a device for manufacturing the web and also the web manufactured by means of the method.

BACKGROUND ART

In the manufacture of, for example, absorbent articles, it is known to emboss mechanically a three-dimensional pattern in one or more layer(s). It is also known to dye the embossed pattern so as to obtain a visually improved pattern.

It is also known to laminate two or more layers together in a multilayer web in order to manufacture the end product. In this way, a softer and more flexible end product is obtained than if a single layer with thickness and weight per unit area corresponding to those of the laminated product had been manufactured. It is known that the lamination of two or more layers is effected by means of gluing. The glue can then be coloured so as to dye those parts of the laminate which have been glued together. One problem with this technique is what is known as glue bleed-through, that is to say that

the adhesive is pressed through the layer, the adhesive soiling the counter-roller. Soiling of other machinery and parts in the process by adhesive is moreover a widely known problem.

A further problem with using adhesive is that hard crust-like surfaces appear on one or both side(s) of the layer, which can feel unpleasant for a user. The solidified adhesive may moreover be liquid-impermeable and can therefore give rise to liquid-permeability problems in the material. Other disadvantages of adhesive are that it is consumed in great quantities and therefore generates undesirable cost.

A further problem associated with the use of coloured adhesive is that it can be difficult to combine with other joining methods, such as welding, as the risk of glue bleed-through increases and there is also a risk of the adhesive burning and soiling the machinery further.

All the previously known methods of dyeing and connecting a multilayer web comprise the step of dyeing the bonding points before or after the layers are connected. In the case of the bonding points being dyed before bonding takes place, the dye can flow out and cause a problem with an unclear pattern. When the bonding points are dyed after bonding has taken place, problems arise with the precision of the dyeing.

It is therefore desirable to find an improved method of dyeing and embossing a web. It is especially desirable to dye and join together a multi-layer web. The method should give an improved visual pattern irrespective of the thickness of the layers, but preferably for thin material. The product desired is to feel soft and comfortable to the user and is to be aesthetically attractive by virtue of a three-dimensional dyed pattern. The pattern is to consist of the three-dimensional bonding areas which originate in the bonding points and also dyeing of the bonding areas and/or the bonding points.

DISCLOSURE OF INVENTION

The object of the present invention is to solve the abovementioned problems by providing an improved method of creating a three-dimensional dyed macropattern in a web, preferably a multi-layer web, of web-shaped flexible material. The material in the web is to be thermally bondable. Examples of such materials are non-woven material comprising thermally bondable material, wadding, foam and plastic film made of, for example, polyethylene and polypropylene. The web is intended mainly to be used, after processing such as cutting, as a layer in an absorbent article, where the dyed three-dimensional pattern is intended to face away from a user but can also be applied so as to face towards a user.

The improved method is brought about by virtue of at least parts of a pattern device, which has a three-dimensional macropattern of alternate raised macroportions and lowered macroportions, being brought into contact with a dye-application device in such a way that a dye is applied to the pattern device only on the tops of the raised macroportions. The web is brought into contact with the tops of the dye-coated raised macroportions in such a way that dyeing of the web takes place in a dyed macropattern corresponding to the design of the tops of the raised macroportions. The web is moreover brought into contact with a bonding device which forms bonding points in the web and also three-dimensional bonding areas coinciding with the bonding points.

Bonding points mean those parts of the material in the web which, on account of the bonding device, have been connected thermally.

Bonding areas mean those three-dimensional areas in the web which are formed coinciding with the bonding points on account of the tops of the raised macroportions and the bonding points. The three-dimensional raised macroportions press the material in the web together in such a way that an indentation of the web material takes place in the form of the bonding areas coinciding with the bonding points. The bonding points moreover draw the

material coinciding with the bonding areas together in such a way that the bonding areas do not return elastically to their original shape when the raised macroportions cease bearing against the web.

The invention is characterized in that the bonding device is made, in interaction with the dye-coated tops of the raised macroportions, to form the bonding points and the three-dimensional bonding areas at the same time as the bonding areas and/or the bonding points are dyed.

The bonding points are dyed in those cases where the bonding points have an extent which means that the bonding points coincide with the three-dimensional bonding areas. The bonding points are moreover dyed in cases where the dye spreads into the material to the bonding points. A bonding point can therefore be dyed completely or partly. Since the bonding point consists of a solidified melt, the dye is preferably mixed at least partly with the melt when the bonding point is formed. The above dyeing depends on the properties of the dye together with the material properties of the web.

As mentioned above, the bonding device forms a three-dimensional macropattern in the web in the same step as the pattern device forms the dyed macropattern. Owing to the fact that the three-dimensional macropattern is formed in the same points as the dyed macropattern, the three-dimensional dyed macropattern is formed.

The dye-coated tops of the raised macroportions therefore bring about simultaneous formation of both the three-dimensional macropattern (in the form of the bonding points and the three-dimensional bonding areas) and the dyed macropattern. Owing to the fact that the three-dimensional macropattern is created in the same step and in the same place as the dyed macropattern, the dyeing of the three-dimensional bonding areas and/or the bonding points is very exact, and the three-dimensional dyed pattern is clear and has a good visual effect.

A number of advantages are achieved by carrying out the formation of the three-dimensional macropattern and the dyeing of the three-dimensional pattern at the same time and in the same points. For example, the fact that use of the method according to the invention results in the dyeing of an embossed pattern in the web and the embossed pattern coinciding in the same points irrespective of the production line speed may be mentioned. The present invention therefore allows a high production speed with good quality of the three-dimensional pattern being retained. In the case of the previously known art, the web is embossed on one occasion and dyed on another, which gives rise to difficulties in fitting the dyed pattern to the three-dimensional embossed macropattern with precision. In such cases, smeary and imprecisely dyed three-dimensional macropatterns are common, which gives rise to a poor visual effect with a blurred and unclear impression.

Another advantage of the invention is that not all the tops have to be dye-coated, but those tops which are not dye-coated form bonding points and a three-dimensional macropattern which is not dyed. The freedom of choice to form a product pattern consisting of both dyed and undyed three-dimensional macropatterns is of course an advantage for the manufacturer.

When the web consists of one layer, the bonding points are formed inside the layer at the same time as the raised macroportions press the layer together at the bonding points, the three-dimensional bonding areas appearing in the form of indentations in the material coinciding with the bonding points. The bonding points ensure that the three-dimensional bonding area retains its shape because the layer cannot return to its original shape on account of the bonding points. A great advantage of the bonding points being located inside the layer is that the bonding points, which are often hard, are not located in the surface layer of the web and therefore cannot irritate a user.

According to one embodiment of the invention, the web consists of a multilayer web comprising a first layer and a second layer of web-shaped

flexible material. The first layer is brought into contact with the tops of the dye-coated raised macroportions. The first layer is moreover connected to the second layer in such a way that bonding points are formed between them.

In the embodiment concerned, the bonding device forms the bonding points by joining the first layer to the second layer in interaction with the dye-coated tops, in which way the multilayer web is provided with the three-dimensional dyed macropattern where the bonding areas and/or the bonding points are dyed.

In the said embodiment, the bonding points are advantageously formed between the layers with a certain spreading between the layers. Just as in the case of the web in the form of one layer, the bonding points are formed at the same time as the raised macroportions press the layers together at the bonding points, the three-dimensional bonding areas appearing in the form of indentations in the material in the web coinciding with the bonding points. The bonding points ensure that the three-dimensional bonding area retains its shape because the two layers cannot return to their original shape on account of the bonding points.

In the embodiment with two layers, the said advantages of the invention are especially marked. As mentioned previously, it is known to join a layer made with a dyed pattern consisting of a coloured adhesive to another layer made with an embossed pattern, which gives rise to problems with the precision of the synchronization of the joining of the two patterns. Moreover, the dyed layer may be smeared around the embossed portions and give rise to a blurred macropattern. In cases where the dyeing takes place after bonding, problems also arise with the precision of the dyeing. Such problems are eliminated by the invention according to the said embodiment because the embossing, the joining of the layers via the bonding points, and the dyeing of the pattern take place at the same time, that is to say in one step.

According to another embodiment of the invention, the tops of the raised macroportions comprise a topographical surface comprising raised microportions. In accordance with the inventive idea, the tops of the raised macroportions, which in the said embodiment consist of the raised microportions, are dye-coated. The raised microportions are therefore dye-coated and give rise to micropatterns in the macropattern in such a way that the three-dimensional dyed macropattern becomes visible. The raised microportions can be designed in any known manner, for example in the form of cylindrical elements, rhombic elements, wave-shaped elements etc. When the macropattern is formed, it is normally the case that the dye spreads between the raised microportions and brings about a relatively uniform distribution of dye over the entire macropattern. It may also be the case that the macropattern consists of a number of micropatterns which create a visual impression of uniform dyeing of the macropattern for an observer when the observer is located at a certain distance from the pattern.

The raised microportions can moreover give rise to bonding micropoints and three-dimensional bonding microareas coinciding with the raised microportions in the same way as the raised macroportions give rise to bonding points and three-dimensional bonding areas. In such cases, the bonding points consist of a number of bonding micropoints and the three-dimensional bonding areas of the same number of three dimensional bonding microareas.

In cases where there are no raised microportions, the macropattern consists of course of the three-dimensional bonding area, with a size which corresponds to the size of the top of the raised macroportion. In this case, the dyeing of the bonding points and the three-dimensional bonding areas will be uniformly distributed over the entire macropattern.

According to another embodiment of the invention, the pattern device comprises an embossing roller or a pattern roller which forms the three-dimensional macropattern. The pattern device can also consist of a die with

raised macroportions and lowered macroportions or a conveyor belt with raised macroportions and lowered macroportions.

As mentioned above, the web is to be treated in such a way that bonding points arise. This is brought about by thermal joining of material. Since the bonding points are to be formed by thermal joining, at least parts of the web are to comprise thermally bondable material. Such materials are well known and can consist of individual fibres which bond other thermally bondable fibres or which bond fibres which are not thermally bondable.

According to one embodiment of the invention, the bonding device consists of an ultrasonic device which forms the bonding points via a melt in the web. The ultrasonic device is made to operate with a frequency above 18 kHz, preferably in the range 20-60 kHz, and most advantageously in the range 20-40 kHz.

One advantage of the ultrasonic device is that the melt arises inside a material in the case of a web consisting of one layer or between the layers in the case of a multilayer web in such a way that the solidified melt which forms the bonding points does not appear on the outside of the web. As mentioned previously, this is an advantage as a user does not experience discomfort from the rigid bonding points.

In another embodiment, the bonding device forms the bonding points in the web via a melt by use of a support roller against the pattern device. In such a device, use is made of the frictional heat in the material in order to obtain a melt in the web at the points marked by the raised macroportions and any raised microportions. The frictional heat depends on the pressure which arises in the material between the support roller and the pattern device and also the speed of the various parts.

When use is made of a support roller, the support roller and/or the pattern device can be hot, or both can be cold. A hot device supplies heat to the web

because some materials can require a greater amount of heat in order for the bonding points to be formed, or in order to speed up the melting process at the bonding points.

The invention advantageously uses a non-adhesive dye for dyeing the web. In this way, production is less expensive, and the risk of production-hampering soiling of machinery included in the production is reduced.

Non-adhesive dye means a dye which is not intended to bond fibres or several plies of film together. The dye does not on this account have to be repellent to all materials, but the dye bonds to various materials in a way which is normal for dye pigment or dye pigment in a liquid solution. Should the dye have a slightly adhesive effect, that is to say should the dye, as a secondary effect or in a more random manner, be capable of bonding fibres or films together, such a dye does not have to be excluded from the inventive idea. The primary criterion is that the dye does not have such an adhesive effect as is intended to form bonding points in a material or between different layers. An example of such an adhesive dye is coloured glue.

One advantage of using a non-adhesive dye is that the disadvantages indicated in the description of previously known art can be avoided. An example of such an advantage is that glue bleed-through is avoided, a soft user-friendly product being obtained. Problems of soiling of the parts included in the process are moreover avoided.

The invention also relates to a product manufactured by means of the method according to the invention described above. Such a product consists of a web or part of a web comprising a product pattern consisting of one or more macropattern(s), some or all of which can be dyed according to the invention.

Such a web therefore consists of a web-shaped flexible material with a three-dimensional dyed macropattern. The web comprises bonding points and

three-dimensional bonding areas coinciding with the bonding points. The product is characterized in that the bonding points consist of a solidified melt from joined material produced by a bonding device in interaction with the tops of the raised macroportions of a pattern device. The bonding points and the three-dimensional bonding areas bring about the formation of a three-dimensional macropattern in the web. The bonding areas and/or bonding points have been dyed with a dye via the tops of the raised macroportions at the same time as the bonding points were formed, the three-dimensional dyed macropattern having been formed in this operation.

An advantageous embodiment of the product is when the web consists of two layers which have been treated according to a method according to the embodiments above.

The invention also relates to a device for implementing the method of producing the product as above. The device comprises a pattern device having a three-dimensional macropattern of alternate raised macroportions and lowered macroportions. The device moreover comprises a dye-application device arranged so as to apply a dye only to the tops of the raised macroportions. The pattern device is arranged so as to dye the web with the dyed macropattern. The device also comprises a bonding device which is arranged so as to form bonding points in the web and also three-dimensional bonding areas coinciding with the bonding points.

The device is characterized in that the bonding device is arranged so as, in interaction with the dye-coated tops of the raised macroportions, to form the bonding points and the three-dimensional bonding areas at the same time as the bonding areas and/or the bonding points are dyed, the three-dimensional dyed macropattern being formed in this operation.

Advantages of using certain special devices, for example an ultrasonic device and embossing roller, have been mentioned previously.

In a case with two layers, the device is arranged so as advantageously to cause the bonding device to act simultaneously on the first layer, the second layer and the dye-coated raised macroportions of the embossing roller, exact dyeing of the desired three-dimensional pattern being achieved.

In the present invention, the terms bonding points and bonding areas mean any shape of bonding points and thus bonding areas. Examples of such shapes are dots, lines or any other geometrical shape. The raised macroportions of the pattern device give rise to the shape of the bonding points, for which reason the raised macroportions of the embossing roller can therefore be arranged in any geometrical shape.

According to the invention for a multilayer web, the first layer and/or the second layer is/are thermally bondable. Examples of such materials are fibrous materials comprising at least partly thermally bondable materials. The quantity of thermally bondable materials is to be so great that a melt is produced, which can connect the two layers. Such materials can consist of thermally bondable polymers, for example polyester, polypropylene, polyethylene or the like. The materials can moreover consist of mixtures of thermally bondable polymers and/or other fibrous materials.

As mentioned above, the present invention can advantageously be used for manufacturing a dyed three-dimensional web which, after processing, can be used in an absorbent article such as a diaper, incontinence pad, panty liner, sanitary towel or the like. A sanitary article usually consists of a number of layers arranged in a layered structure, one layer of which constitutes a backing, another layer of which constitutes a surface layer, and a further layer of which constitutes an absorbent body positioned therebetween. Use can moreover be made of a spreading layer. The various layers can advantageously consist of a part of a dyed three-dimensionally patterned web of the type to which the present invention relates.

The various layers can consist of a large number of materials to which the present invention can be applied. Examples of such materials are given below in a description of an absorbent article.

Backing

The liquid-blocking backing layer consists of a liquid-impermeable material. Thin, liquidtight plastic films are suitable for the purpose, but it is also possible to use materials which are initially liquid-permeable but have been provided with a coating of plastic, resin or another liquidtight material. In this way, leakage of liquid from the underside of the absorbent article is prevented. The barrier layer can therefore consist of any material which satisfies the criterion of liquid-impermeability and is sufficiently flexible and skin-friendly for the purpose.

Examples of materials which are suitable as barrier layers are plastic films, non-wovens and laminates of these. The plastic film can be made of, for example, polyethylene, polypropylene or polyester. Alternatively, the barrier layer can consist of a laminate of a liquid-impermeable plastic layer, facing the absorbent body, and a non-woven, facing the undergarments of the user. Such a construction provides a leakproof barrier layer with a textile feel. The liquid-blocking backing layer can also consist of a vapour-permeable material. Such a breathable backing layer can be made of, for example, what is known as an SMS (spunbond-meltblown-spunbond) material or a breathable plastic film consisting of polyethylene. Such a plastic film is described in EP 283 200. In order to retain the breathability even when the material has been applied to a product, the underside of the product should not be completely covered by attachment means.

Surface layer

The surface layer can be made of any conventional material, for example non-woven, perforated plastic film or a laminate of a perforated plastic film and a non-woven. It is also possible to use tow, which is a fibrous web with continuous fibres, or material made from foam.

Absorbent body

The absorbent body is suitably made from one or more ply(ies) of cellulose pulp. The pulp can initially be in the form of rolls, bales or webs which, during manufacture of the sanitary towel, are dry-defibred and converted into fluffed form to form a pulp mat, sometimes with the addition of what are known as superabsorbents, which are polymers with the capacity to absorb several times their own weight of water or bodily fluid. An alternative to this is to dry-form a pulp mat as described in WO 94/10956. Examples of other absorbent materials which can be used are various types of natural fibre such as cotton fibres, peat or the like. It is of course also possible to use absorbent synthetic fibres, or particles of a highly absorbent polymer material of the kind which, during absorption, chemically binds great quantities of liquid while forming a liquid-containing gel, or mixtures of natural fibres and synthetic fibres. The absorbent body can also include other components, such as shape-stabilizing means, liquid-spreading means, or bonding means such as, for example, thermoplastic fibres which have been heat-treated in order to hold short fibres and particles together in a coherent unit. It is also possible to use various types of absorbent foam material in the absorbent body.

It is also possible for the invention to be applied to transparent materials.

According to one embodiment of the invention, the web comprising one layer has a weight per unit area of 5-100 g/m^2, preferably 8-40 g/m^2 and most advantageously 8-30 g/m^2. In the case of a web comprising two layers, each layer can have a weight per unit area as above.

Further features of the invention emerge from the following description and the subclaims.

DESCRIPTION OF FIGURES

The invention will be described in greater detail below with reference to illustrative embodiments shown in the accompanying drawings.

Fig. 1 shows diagrammatically a device for carrying out the method according to an embodiment of the invention, comprising an ultrasonic device and a web consisting of two layers.

Fig. 2 shows diagrammatically a device for carrying out the method according to an embodiment of the invention, comprising an ultrasonic device and a web consisting of one layer.

Fig. 3 shows diagrammatically a device for carrying out the method according to an embodiment of the invention, comprising a counter-roller and a web consisting of two layers.

Fig. 4 shows diagrammatically a pattern device according to the invention with raised macroportions comprising raised microportions.

Fig. 5 shows diagrammatically a product pattern according to the invention comprising macropatterns and micropatterns.

PREFERRED EMBODIMENTS

Fig. 1 shows diagrammatically a device for carrying out the method according to an embodiment of the invention. Fig. 1 shows a multilayer web 101 consisting of a first layer 2 and a second layer 3 of web-shaped flexible material. The multilayer web 101 runs between a bonding device 4 in the form of an ultrasonic device 5 and a pattern device in the form of an embossing roller 6. Fig. 1 also shows a dye-application device 7 consisting of a dye bath 8, in the form of a vessel filled with dye, and a dye-application roller 9. The dye-application roller 9 is partly submerged in the vessel and is in this way dye-coated on that part of the dye-application roller 9 which is submerged. There are a number of possible application techniques for dye-coating the tops, for example by means of a series of several rollers and doctor blade chamber systems. In order to facilitate understanding of the invention, however, only one dye-application roller 9 and one doctor blade 17 are shown in Fig. 1.

In Fig. 1, the multilayer web 101 runs in the direction of the arrow, that is to say from left to right in the figure. The embossing roller 6 rotates clockwise so as to be capable of rotating with the multilayer web 101. The dye-application roller 9 rotates anticlockwise so as to be capable of rotating with the embossing roller 6.

The embossing roller 6 has a three-dimensional pattern of alternate raised portions, in the form of macroportions 10a, and lowered macroportions 11. The raised macroportions 10a are brought into contact with the dye-application roller 9 in such a way that a dye is applied to the embossing roller 6 only on the tops 13 of the raised macroportions 10a. The dye-application device 7 comprises a doctor blade 17 which acts on the dye-application roller 9. When the dye-application roller 9 rotates in the dye bath 8, the dye is applied to the surface of the rotating dye-application roller 9 in the form of a dye layer 12a. The doctor blade 17 ensures that the dye layer 12a remains at the desired thickness by virtue of the doctor blade 17 being arranged at a distance from the surface of the dye-application roller 9 which corresponds to the desired thickness of the dye layer 12a. The thickness of the dye layer 12a determines how thick the dye layer 12b applied to the tops 13 of the raised macroportions 10a is. The pattern device can also consist of another device suitable for the purpose, for example engraved rollers.

Fig. 1 shows that the first layer 2 is brought into contact with a dye-coated top 13 of a raised macroportion 10a. In conjunction with the first layer 2 coming into contact with the raised dye-coated top 13, the multilayer web 101 passes through the ultrasonic device 5. The ultrasonic device 5 acts with ultrasonic waves in the direction of the raised macroportions 10a in a known manner. The ultrasonic waves acts on the material in the multilayer web 101 in such a way that the temperature is increased and thermally influencable material melts, a melt arising between the layers 2, 3. According to the invention, the first layer 2 and/or the second layer 3 contain(s) sufficient thermally bondable material for a melt to arise.

The melt gives rise to bonding points 15a between the layers 2, 3 which connect the two layers. The bonding points 15a, together with the raised macroportions 10a, in turn give rise to bonding areas 15b being formed in such a way that they coincide with the bonding points 15a.

The ultrasonic device 4 is positioned in such a way that its active horn acts with a contact pressure against the web but at a distance from the tops 13 of the raised macroportions 10a. The distance between the horn and the tops 13, together with the frequency at which the ultrasonic device 5 operates, influences the material in a known manner so that the bonding points 15a and bonding areas 15b arise.

The bonding points 15a and bonding areas 15b form a three-dimensional macropattern (see Fig. 5) in the multilayer web 101. The bonding area 15b preferably has a design which corresponds to the design of the top 13 of the raised macroportion 10a. The bonding points 15a also have an appearance which, in the direction of travel of the web, corresponds to the top 13 of the raised macroportion 10a. The thickness of the bonding point can vary depending on the characteristics of the ultrasonic device 5 and also the material in the various layers. Thickness means an extent fundamentally at right angles to the direction of travel of the web 101.

Fig. 1 shows that the three-dimensional macropattern 15b is formed only in the first layer 2, but in an actual case the second layer 3 would also be provided with a certain three-dimensional character because the bonding points 15a draw the material in the two layers 2, 3 together at the bonding points. The reason for the three-dimensional macropattern 20, 21 being shown in the form of the bonding areas 15b only in the first layer 2 is that the raised macroportions 10a of the embossing roller 6, together with the bonding points 15a between the layers 2, 3, give rise to a clear three-dimensional pattern in the first layer 2.

Fig. 1 shows that the dye-coated tops 13 bear against the first layer 2 at the same time as the ultrasonic device 5 acts on the multilayer web 101. At the same time as the bonding points 15a and the bonding areas 15b are formed, the dye-coated tops 13 bear against the bonding areas 15b. The bonding areas 15b are therefore dyed at the same time as they are formed, a dyed three-dimensional macropattern 120 being formed.

The method shown in Fig. 1 gives rise to a bonding point 15a between the first layer 2 and a bonding area 15b in the second layer 3 having an appearance which corresponds to the shape of the top 13 of the raised macroportion 10a. The method according to the invention moreover provides a dyeing 14 of the bonding area 15b which also corresponds to the shape of the top 13 of the raised macroportion 10a. The method therefore brings about distinct and clear dyeing and embossing of a multilayer web 101 in the form of a dyed three-dimensional macropattern 120.

Fig. 1 shows that the dyed part 14 of the first layer 2 has dyed the bonding point 15a and the bonding area 15b. Depending on the material properties of the web, the properties of the dye and the properties of the melt, parts of or the entire melt may be dyed.

One advantage of using ultra sonic waves is that the melt arises in the boundary layer between the materials and spreads from there. Depending on the properties of the material, the pressure between the ultrasonic device and the raised macroportions, and the frequency of the ultrasonic waves, a melt can therefore arise in the joined web, where the melt passes through to neither, or only one, of the surfaces of the web. This yields a softer and better product as the solidified melt is not present in the surface and cannot irritate a user.

Fig. 2 shows another embodiment of the invention, where the bonding device 4 consists of an ultrasonic device 5 and the web 1 consists of only one layer 2b.

The method according to the invention described in Fig. 1 with simultaneous dyeing and embossing also functions on a web 1 consisting of one layer 2b. In the embodiment according to Fig. 2, the ultrasonic device acts on the dye-coated tops 13 of the raised macroportions 10a, a melt arising inside the layer at the same time as dyeing takes place. The melt also gives rise to bonding points 15a and bonding areas 15b, exactly as in the case of a multilayer web according to Fig. 1.

The difference between a multilayer web and a web comprising one layer 2b is that the bonding points 15a in the multilayer web arise between the layers, whereas the bonding points in the web 1 comprising one layer 2b arise inside the layer 2b. The bonding points 15a in Fig. 2 nevertheless give rise to the same type of bonding area 15b as in Fig. 1, which bonding areas 15b in turn give rise to a three-dimensional macropattern.

Fig. 2 shows that the dyeing of the bonding areas 15b takes place at the same time as the formation of the bonding points 15a and the bonding areas 15b. Fig. 2 shows that the dyed parts 14 coincide with the bonding areas 15b in such a way that a dyed three-dimensional pattern 120 is formed. The dyeing of the web has been discussed in detail in connection with the description of Fig. 1 and also applies in the case of an embodiment according to Fig. 2.

Fig. 3 shows diagrammatically a device for carrying out the method according to another embodiment of the invention. In Fig. 3, the bonding device 4 consists of a support roller 16 which presses a multilayer web 101 against the tops 13 of the dye-coated raised macroportions 10a in a press nip. In other respects, the devices and layers shown in Fig. 3 correspond to the devices and layers shown in Fig. 1.

The support roller 16 and the embossing roller 6 press the multilayer web 101 together in such a way that a temperature increase takes place and a

melt arises. As in the embodiment described in Fig. 1, a melt is formed at the bonding points 15a between the first layer 2 and the second layer 3. As in the previously described embodiments, the bonding points 15a give rise to the bonding areas 15b which in turn give rise to a three-dimensional macropattern. The dye from the tops of the dye-coated raised macroportions 10a dyes the bonding areas 15b in the same way as described previously, a dyed three-dimensional pattern 120 being formed.

The melt in the embodiment described in Fig. 3 can have an extent through the two layers in such a way that the dye can be mixed completely or partly in the melt, dyed distinct embossing of the multilayer web 101 taking place at the bonding points 15a. The support roller can also be used on a web consisting of one layer, as described in Fig. 2.

The support roller 16 can be hot or cold depending on which is most advantageous considering the material selection in the multilayer web 101. The embossing roller 6 can moreover be hot or cold depending on the material selection in the multilayer web 101. As the rolling technique described gives rise to heat which emanates from the rollers, the melt, that is to say the bonding point, is visible on at least that side of the web where a hot roller has been applied.

Fig. 4 shows an embodiment of the invention where the tops 13 of the raised macroportions 10a comprise a topographical surface comprising raised microportions 10b. Fig. 4 shows an enlargement of two raised macroportions 10a and a lowered macroportion 11. In accordance with the inventive idea, the tops 13 of the raised macroportions 10a, which tops consist of the raised microportions 10b in the said embodiment, are dye-coated. The raised microportions 10b are therefore dye-coated and give rise to micropatterns (see Fig. 5) in the abovementioned macropattern in such a way that the three-dimensional dyed macropattern becomes visible.

The raised microportions 10b can be designed in any known way, for example in the form of cylindrical elements, rhombic elements, wave-shaped elements etc. Fig. 4 shows raised microportions in the form of cylindrical elements 24 on one raised macroportion 10a and raised microportions in the form of wave-shaped elements 25 on the other raised macroportion 10a. The raised macroportions can therefore be designed in different ways in order to bring about different types of macropattern in the web.

When the macropattern is formed, it is normally the case that the dye spreads between the raised microportions 10b and brings about a relatively uniform distribution of dye over the entire macropattern. It may also be the case that only the raised microportions 10b are dye-coated, the macropattern consisting of a number of micropatterns which create a visual impression of uniform dyeing of the macropattern for an observer when the observer is located at a certain distance from the pattern.

The raised microportions 10b can moreover give rise to bonding micropoints and three-dimensional bonding microareas coinciding with the raised microportions in the same way as the raised macroportions give rise to bonding points and three-dimensional bonding areas. In such cases, the bonding points consist of a number of bonding micropoints and the three-dimensional bonding areas of the same number of three dimensional bonding microareas.

In cases where there are no raised microportions, the macropattern consists of course of the three-dimensional bonding area, with a size which corresponds to the size of the top of the raised macroportion. In this case, the dyeing of the bonding points and the three-dimensional bonding areas will be uniformly distributed over the entire macropattern.

Fig. 5 shows diagrammatically a product/web 18 with a product pattern 19 according to the invention. The product pattern 19 comprises macropatterns 20, 21 and micropatterns 22. Fig. 5 shows an oval macropattern 20a, 20b

and a rectangular macropattern 21a, 21b. The macropatterns indicated by 20a and 21a are dyed and represent the dyed three-dimensional macropatterns to which the present invention relates. The macropatterns indicated by 20b and 21b are not dyed and represent three-dimensional macropatterns which arise on account of the formation of the bonding points and the bonding areas described in connection with Figures 1-3 where dyeing of the bonding areas has not taken place.

The various macropatterns 20a, 20b, 21a and 21b together give rise to the product pattern 19. The product pattern 19 can therefore be selected to consist entirely or partly of dyed macropatterns in different designs.

Fig. 5 also shows micropatterns 22 in the macropattern. The micropatterns 22 consist of the black dots in the various macropatterns 20a, 20b, 21a and 21b and can themselves, like the macropatterns, be dyed or undyed.

The method is not limited to what has been disclosed in the embodiments above but can be varied within the scope of the accompanying patent claims. By way of example, it may be mentioned that the present invention can be used for the formation of a product pattern comprising a number of different dyed three-dimensional macropatterns and moreover a number of three-dimensional macropatterns which are undyed. The macropatterns can have different colours and different appearances. One advantage of the present invention is that the pattern device can in a simple manner be dye-coated on different parts and with different colours, the method described above providing a product pattern which is sharp and clear for an observer.
Another example is that the dye-coating of the tops can take place by dye powder being applied to the tops via electrostatic fields. Another alternative to dye-coating the tops may be to introduce a dye strip or coloured layer together with the web, which imparts colour to the web on those parts of the web which come into contact with the tops.

CLAIMS

1. Method for production of a three-dimensional dyed macropattern (20, 21) in a web (1, 101) of web-shaped flexible material, which method comprises at least parts of a pattern device (6), which has a three-dimensional macropattern of alternate raised macroportions and lowered macroportions (10a, 11), being brought into contact with a dye-application device (7) in such a way that a dye is applied to the pattern device (6) only on the tops (13) of the raised macroportions (10a), the web being brought into contact with the tops (13) of the dye-coated raised macroportions (10a) in such a way that dyeing of the web takes place in a dyed macropattern corresponding to the design of the tops of the raised macroportions (10a), which web is brought into contact with a bonding device (4) which forms bonding points (15a) in the web and also three-dimensional bonding areas (15b) coinciding with the bonding points (15a), characterized in that the bonding device (4) is made, in interaction with the dye-coated tops (13) of the raised macroportions (10a), to form the bonding points (15a) and the three-dimensional bonding areas (15b) at the same time as the bonding areas (15b) and/or the bonding points (15a) are dyed, the three-dimensional dyed macropattern (20, 21) being formed in this operation.

2. Method according to Claim 1, where the web (1) consists of a multilayer web (101) comprising a first layer (2) and a second layer (3) of web-shaped flexible material, the first layer (2) being brought into contact with the tops (13) of the dye-coated raised macroportions (10a), which first layer (2) is connected to the second layer (3) in such a way that bonding points (15a) are formed between them, characterized in that the bonding device (4) forms the bonding points (15a) by joining the first layer (2) to the second layer (3) in interaction with the dye-coated tops (13), in which way the multilayer web (101) is provided with the three-dimensional macropattern (20, 21) where the bonding areas (15b) and/or the bonding points (15a) are dyed.

3. Method according to Claim 1 or 2, where the tops of the raised macroportions comprise a topographical surface comprising raised microportions (10b), characterized in that the raised microportions (10b) are dye-coated and give rise to the three-dimensional dyed macropattern (20, 21).

4. Method according to any one of the preceding claims, characterized in that the pattern device forms the three-dimensional macropattern by means of an embossing roller (6).

5. Method according to any one of the preceding claims, characterized in that at least parts of the web comprise thermally bondable material.

6. Method according to Claim 5, characterized in that the bonding device (4) forms bonding points (15a) via a melt in the web by use of an ultrasonic device (5).

7. Method according to Claim 6, characterized in that the ultrasonic device (5) is made to operate with a frequency above 18 kHz, preferably in the range 20-60 kHz, and most advantageously in the range 20-40 kHz.

8. Method according to Claim 7, characterized in that the bonding device (4) forms bonding points (15a) in the web (1) via a melt by use of a support roller (16).

9. Method according to any one of the preceding claims, characterized in that the dyeing takes place by means of a non-adhesive dye.

10. Web (1, 101) of web-shaped flexible material with a three-dimensional dyed macropattern (20, 21), which web comprises dyed macropatterns, which web moreover comprises bonding points (15a) and three-dimensional bonding areas (15b) coinciding with the bonding points (15a), characterized in that the bonding points (15a) consist of a solidified melt from joined

material produced by a bonding device (4) in interaction with the tops (13) of the raised macroportions (10a) of a pattern device (6), which bonding areas (15b) and/or bonding points (15a) are dyed with a dye via the tops (13) of the raised macroportions (10a) at the same time as the bonding points (15a) are formed, the three-dimensional dyed macropattern (20, 21) being formed in this operation.

11. Web according to Claim 10, characterized in that the three-dimensional macropattern (20, 21) consists of a number of micropatterns (22), the said micropattern (22) having been applied to the web (1) via raised microportions (10b) located on the tops (13) of the raised macroportions (10a).

12. Web according to Claim 10 or 11, characterized in that the dye is non-adhesive.

13. Web (1) according to any one of Claims 10-12, the web (1) consisting of a multilayer web (101) comprising a first layer (2) and a second layer (3) of web-shaped flexible material, which first layer is dyed via the tops (13) of the raised macroportions (10a) and is connected to the second layer (3) via the bonding points, characterized in that the bonding points were formed by the bonding device (4) joining the first layer (2) to the second layer (3) in interaction with the dye-coated tops (13) at the same time as the bonding areas (15b) and/or the bonding points (15a) were dyed, in which way the three-dimensional dyed macropattern (20, 21) was obtained in the multilayer web (101).

14. Web (1) according to any one of Claims 10-13, characterized in that the web comprises thermally bondable material.

15. Web (1) according to any one of Claims 10-14, characterized in that the melt was produced by means of an ultrasonic device (5) or in a press nip.

16. Web (1) according to any one of Claims 10-15, characterized in that the dye in the bonding points (15a) is fixed in the bonding points (15a) via the melt.

17. Device (23) for production of a three-dimensional dyed macropattern (21, 22) in a web (1) of flexible material, which device (23) comprises a pattern device (6) having a three-dimensional macropattern of alternate raised macroportions (10a) and lowered macroportions (11), the device (23) moreover comprising a dye-application device (7) arranged so as to apply a dye only to the tops (13) of the raised macroportions (10a), the pattern device being arranged so as to dye the web with the dyed macropattern (21, 22), which device (23) moreover comprises a bonding device (4) which is arranged so as to form bonding points (15a) in the web (1) and also three-dimensional bonding areas (15b) coinciding with the bonding points (15a), characterized in that the bonding device (4) is arranged so as, in interaction with the dye-coated tops (13) of the raised macroportions (10a), to form the bonding points (15a) and the three-dimensional bonding areas (15b) at the same time as the bonding areas (15b) and/or the bonding points (15a) are dyed, the three-dimensional dyed macropattern (20, 21) being formed in this operation.

18. Device (23) according to Claim 17, where the web consists of a multilayer web (101) with a first layer (2) and a second layer (3) of web-shaped flexible material, the first layer (2) being arranged so as to be brought into contact with the tops (13) of the dye-coated raised macroportions (10a), which first layer (2) is arranged so as, in the bonding device (4), to be connected to the second layer (3) at bonding points (15a) between them, characterized in that the bonding device (4) forms the bonding points by joining the first layer (2) to the second layer (3) in interaction with the dye-coated tops (13), in which way the multilayer web (101) is provided with a three-dimensional pattern where the bonding areas (15b) and/or the bonding points (15a) are dyed.

19. Device (23) according to Claim 17 or 18, where the tops of the raised macroportions comprise a topographical surface comprising raised microportions (10b), characterized in that the raised microportions (10b) are arranged so as to be dye-coated and to give rise to the three-dimensional dyed macropattern (20, 21).

20. Device (23) according to any one of Claims 17-19, characterized in that the pattern device comprises an embossing roller (6).

21. Device (23) according to any one of Claims 17-19, characterized in that at least parts of the web comprise thermally bondable material.

22. Device (23) according to any one of Claims 17-19, characterized in that the bonding device (4) comprises an ultrasonic device (5).

23. Device (23) according to Claim 22, characterized in that the ultrasonic device (5) is arranged so as to operate with a frequency above 18 kHz, preferably in the range 20-60 kHz, and most advantageously in the range 20-40 kHz.

24. Device (23) according to any one of Claims 17-21, characterized in that the bonding device (4) comprises a support roller (16).

Fig. 1

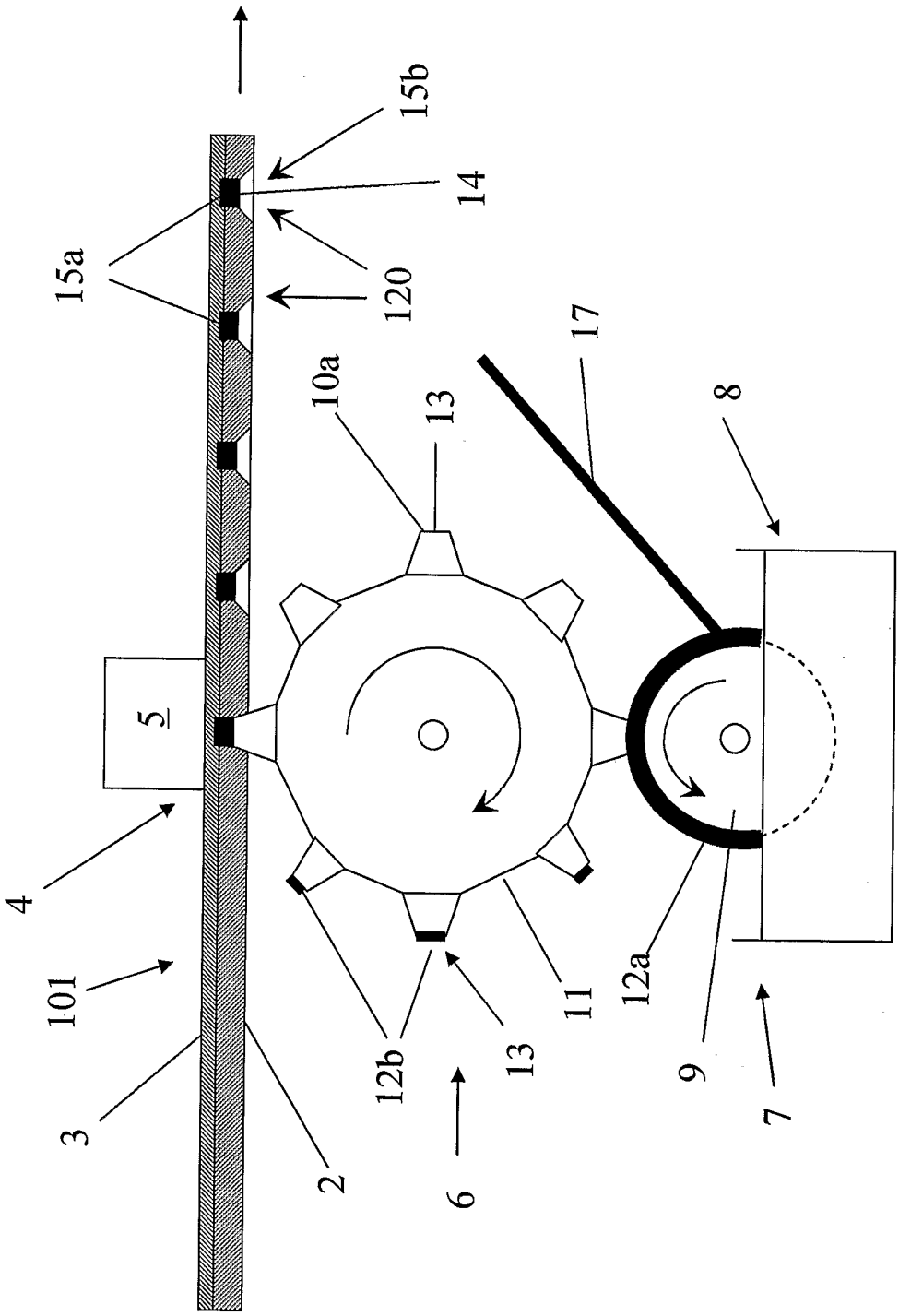


Fig. 2

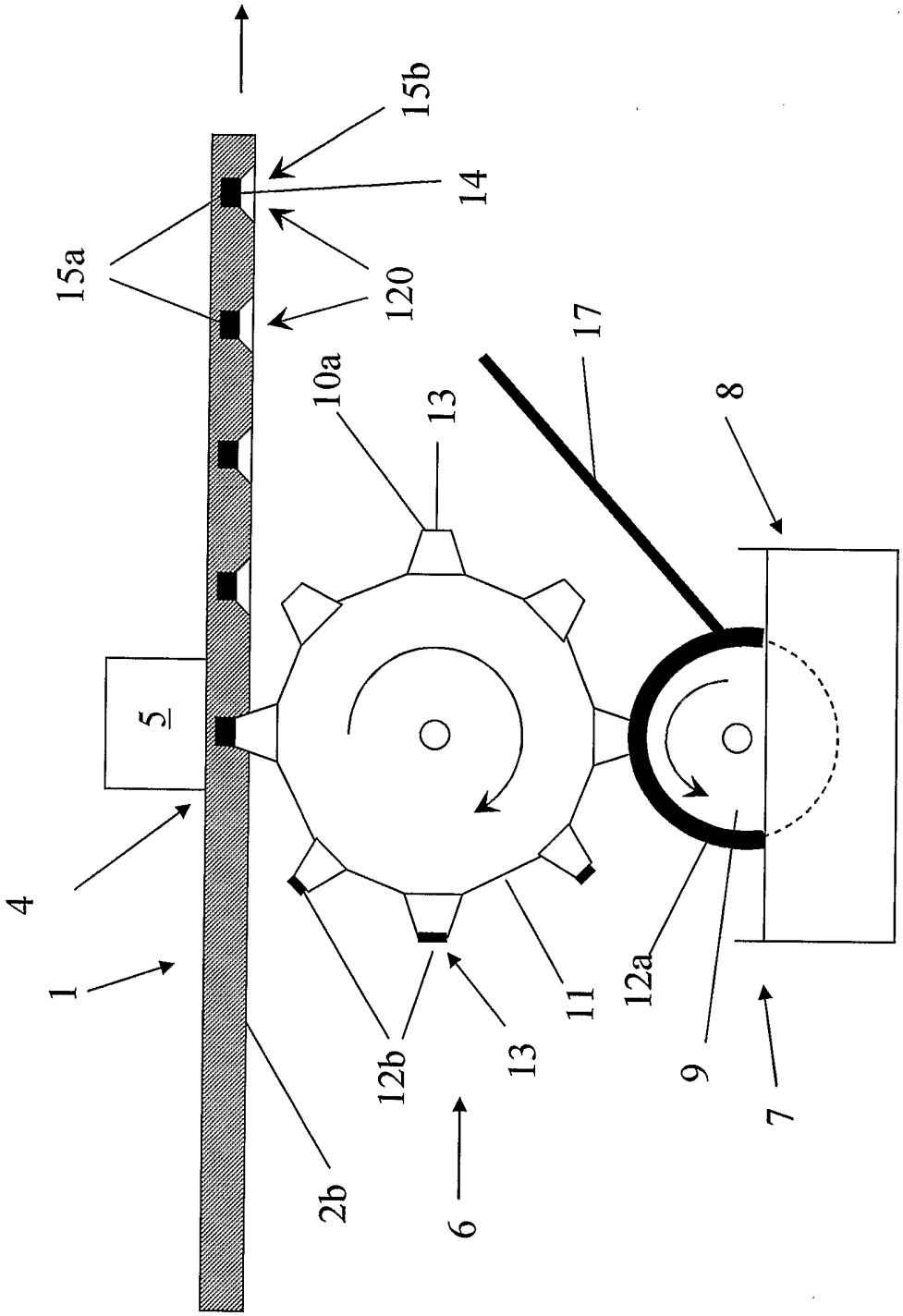
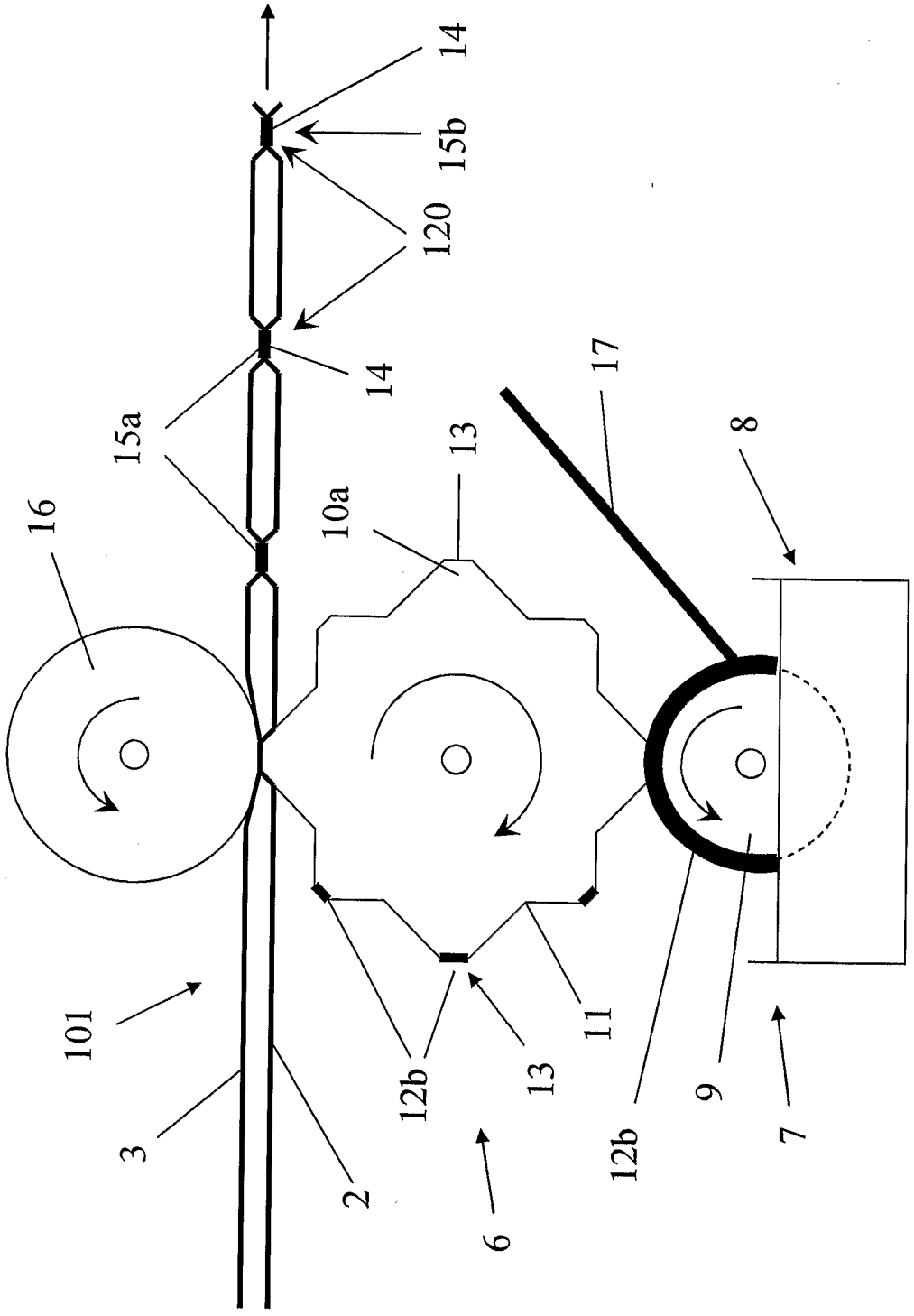


Fig. 3



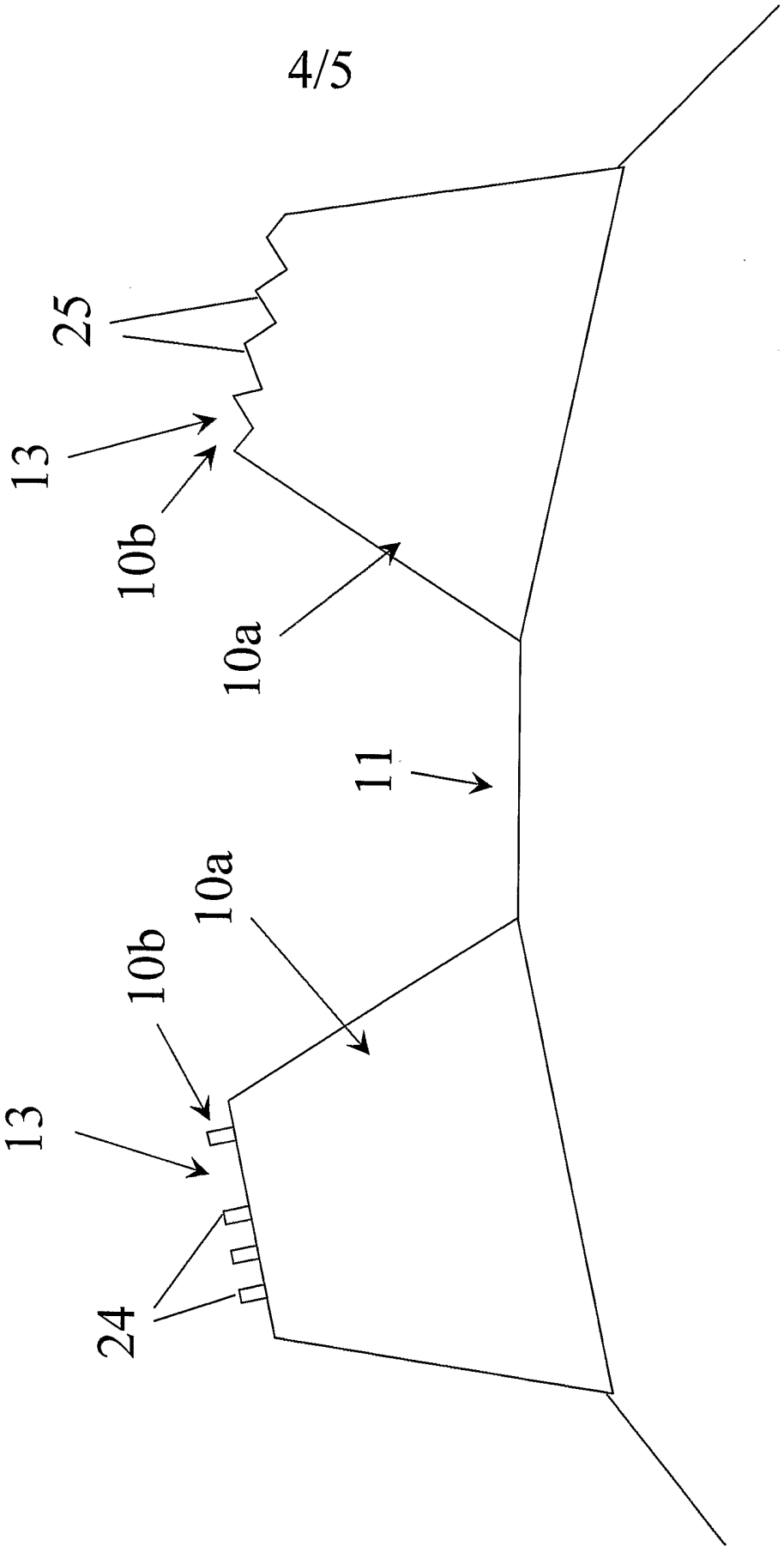


Fig. 4

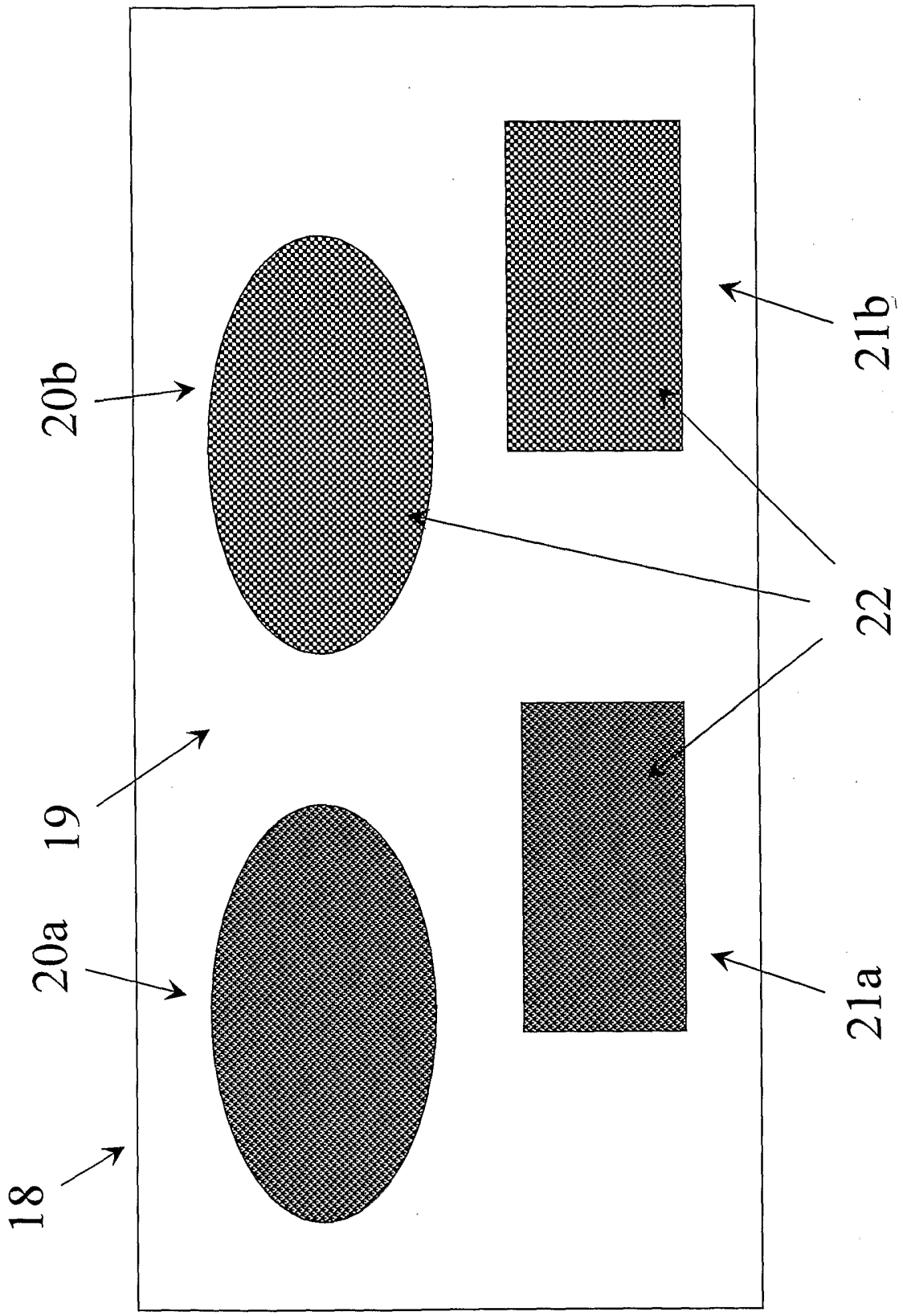


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2003/001959

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21H 27/02, B31F 1/07, B32B 3/28, B32B 31/12 // B05C 1/16, B05D 5/06, B44C 1/00, D06C 23/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC7: D21H, B05C, B05D, B31D, B31F, B32B, B41F, B44C, D06C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 0227098 A1 (SCA HYGIENE PRODUCTS GMBH), 4 April 2002 (04.04.2002), page 3, line 27 - line 38, page 4, line 17 - line 24, page 7, line 28 - line 32, page 9, line 33 - line 36, figures, claims, abstract	1-5,10-21,24
Y	--	6-8,22-23
Y	US 5223329 A (JOHN A. AMANN), 29 June 1993 (29.06.1993), column 4, line 18 - line 25, figure 4, abstract	6-8,21-23
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Y	US 5204165 A (WALTER E. SCHORTMANN), 20 April 1993 (20.04.1993), column 2, line 2 - line 27; column 2, line 59 - column 3, line 13, figures, abstract	6-8,21-23
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 March 2004	11 -03- 2004
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Monika Bohlin/Els Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2003/001959

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT
Information on patent family members

27/02/2004

International application No.
PCT/SE 2003/001959

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