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Office européen des brevets



(11)

EP 1 712 667 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

18.10.2006 Bulletin 2006/42

(51) Int Cl.:

D04H 1/54 (2006.01)

D04H 3/14 (2006.01)

D04H 13/00 (2006.01)

B29C 59/04 (2006.01)

B31F 1/07 (2006.01)

(21) Application number: **05425203.6**

(22) Date of filing: **11.04.2005**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR**

Designated Extension States:

AL BA HR LV MK YU

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(54) **Method for producing a nonwoven fabric and a product obtained with said method**

(57) To obtain a web of nonwoven fabric (V1) consolidated but soft and pliable, a web of unconsolidated fibers, such as a carded web (V), is fed between two rollers (7, 9) provided with protuberances (7P, 9P) disposed out of phase, so that in the nip between the rollers

only some of the protuberances of the two rollers are positioned opposite one another and perform bonding according to points disposed in concentrated areas, separated by areas essentially devoid of bonding points or in any case with a distribution of points of a much lesser density.

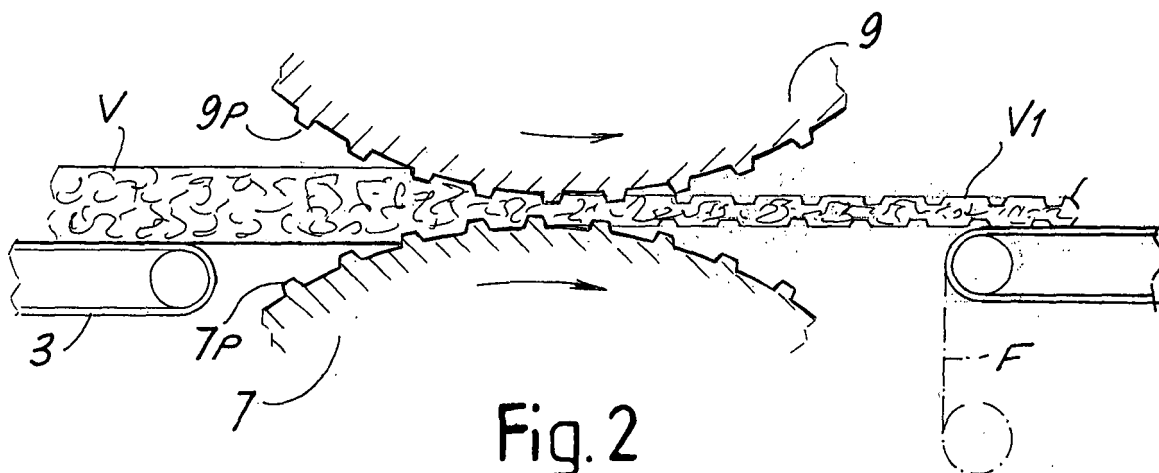


Fig. 2

EP 1 712 667 A1

Description

Technical Field

[0001] This invention relates to a method for producing a layer or web of textile material, and more specifically a nonwoven fabric.

[0002] More specifically, the invention relates to a method for producing a nonwoven fabric by means of thermal consolidation of the fibers.

[0003] The invention also relates to a nonwoven fabric obtained with said method.

State of the art

[0004] Nonwoven fabrics are used increasingly in various industrial and domestic sectors. In particular, webs of nonwoven fabric are used to produce disposable sheets, disposable garments and above all in the sector of hygiene and sanitary products and products for infants, such as sanitary napkins, incontinence pads and baby diapers.

[0005] Nonwoven fabrics can be manufactured with various techniques. Essentially, the process to form the web of nonwoven fabric entails a phase to form a web of continuous filaments or discontinuous fibers (staple fibers), which are then consolidated according to various techniques, to bond the web and obtain the actual nonwoven fabric.

[0006] The web of fibers can, for example, be a web of carded fibers, or a layer of continuous filaments delivered from extrusion heads.

[0007] The bonding techniques can be of various types, such as mechanical (needle-punching), hydraulic (hydro-entanglement), gluing or thermal bonding.

[0008] In the case of thermal bonding or thermal consolidation, the unconsolidated, i.e. unbonded, web is fed through a calender, comprising a smooth cylinder and an engraved cylinder, i.e. provided with protuberances. The two cylinders are pressed against each other at high pressure and at least one of the two is heated, to cause at least partial localized melting of the fibers which are (in this case) one-component or bicomponent thermoplastic fibers.

[0009] WO-A-9855295 describes a procedure for producing a composite material composed of two or three textile layers, wherein the fibers forming the textile layers are bonded and the layers are bonded to one another by means of a calender comprising a pair of engraved rollers. The rollers are produced and controlled for tip-to-tip operation, i.e. with all the protuberances of one roller in phase with the protuberances of the other roller and form a pattern of bonding spots with a density corresponding to the density of the protuberances on the two rollers.

[0010] WO-A-0004215 describes a method for producing a nonwoven fabric by means of thermal consolidation of a web of fibers or filaments, such as a web of textile fibers, made of a thermoplastic material such as polypro-

pylene. Bonding or consolidation is obtained through calendering with a roller provided with protuberances, the configuration of which forms the specific object of the invention described in that publication, and which cooperates with a smooth roller.

[0011] WO-A-9925911 (corresponding to US-A-6395211) describes a device and a procedure for producing a perforated nonwoven fabric. The web of textile fibers is pre-bonded to form a nonwoven fabric. This is then fed through a calender with a smooth cylinder coated in a yielding material and a cylinder provided with protuberances. Perforation of the nonwoven fabric is obtained by applying sufficient pressure and heat between the rollers.

[0012] WO-A-03064001 describes techniques for producing vacuum bags. These bags are formed of several components joined to one another, including a layer of nonwoven fabric. This is produced by hot calendering a web of fibers between a smooth roller and a roller provided with protuberances.

[0013] WO-A-03086709 describes a procedure for producing a non-woven fabric by lamination of a web of carded fibers in a calender comprising a smooth roller and a roller provided with protuberances.

[0014] WO-A-03021024 describes a device and a procedure for consolidating webs of textile fibers, wherein consolidation or bonding is obtained by calendering the web between a smooth roller and a roller provided with a high density distribution of protuberances.

[0015] WO-A-9713909 describes a procedure and a system for producing a semi-finished product in the form of a composite web of fibers having the function of acquisition and distribution layer in a sanitary napkin or baby diaper. Consolidation of a web of carded fibers is obtained by hot calendering between two rollers. To reduce pull on the web, i.e. the difference between the speed at which the web of fibers is fed to the calender and the peripheral rotation speed of the calender rollers, an air current is produced to press the web against one of the two rollers.

[0016] WO-A-0186050 describes a procedure for producing a composite web of nonwoven fabric by hot calendering and point bonding. The configuration of the calender rollers is not described in detail.

[0017] DE-A-3416004 describes a procedure and a device for producing a perforated nonwoven fabric. A web of unconsolidated fibers is fed to a calender formed by a smooth roller and by a roller provided with protuberances. The two heated rollers are pressed against each other to cause consolidation of the web and perforation thereof according to a distribution of holes corresponding to the protuberances of the roller.

[0018] DE-A-19750459 describes a method and a device for perforating a web of textile fibers again by smooth roller and a roller provided with protuberances.

[0019] US-A-5656119 describes a procedure for producing a multi-layer article with a plastic film interposed between two webs of fibers. The three components are

fed to a calender formed of two engraved cylinders, arranged and phased tip-to-tip, which cause adhesion of the fibers and perforation of the interposed film.

[0020] US-A-2003168194 describes a device and a procedure for embossing a web of textile fibers by means of a calender comprising two rollers, which can both be engraved, and with the engravings kept in phase.

[0021] EP-A-1418094 describes a procedure for producing a nonwoven fabric, wherein a web of fibers is initially pre-bonded by needle punching and subsequently bonded further by a heat process in a calender.

Objects and summary of the invention

[0022] The object of this invention is to provide a method for producing a nonwoven fabric, which has improved characteristics in terms of thickness, coverage and softness, aspects that can be present separately or can co-exist.

[0023] The object of a particular embodiment of the invention is to provide a method for producing an embossed, perforated, or perforated and embossed, nonwoven fabric, which can also include a subsequent calendering phase.

[0024] Essentially, according to a first aspect, the invention relates to a method for processing a web of fibers and for producing a nonwoven fabric, wherein an essentially unbonded web of thermoplastic fibers or filaments is bonded by bonding points which are distributed according to concentrated areas; these areas of concentrated bonding points are combined with areas devoid, either partially or totally, of bonding points.

[0025] In a possible embodiment, to produce the bonding points distributed in areas, the web of unbonded fibers or filaments is fed between two counter-rotating rollers both provided with protuberances; during rotation in the nip between the two rollers, part of the protuberances of a first roller are carried opposite corresponding protuberances of a second roller, while part of the protuberances of said first roller are disposed opposite depressions between the protuberances of the second roller. The bonding points are formed between pairs of protuberances opposite each other and at least partially coinciding.

[0026] This allows bonded areas to be obtained, in which the bonding points of the fibers are concentrated, surrounded by areas devoid (partially or totally) of bonding points. The distance between the bonding areas is in any case suitable to guarantee sufficient bonding of the fibers or filaments.

[0027] Typically, the bonding points in the areas in which these are concentrated have a density ranging from 5 to 200 points/cm², preferably from 30 to 100 points/cm² and even more preferably in the order of 30 to 70 points/cm², while the distance between bonding areas is in the order of 5 to 30 mm and preferably 8-20 mm, but in any case chosen to guarantee (also as a function of the density and of the length of the fibers) adequate bonding, i.e. adequate cohesion between fibers of the

web, reducing the welding points to a minimum to obtain a particularly soft and thick web.

[0028] The fibers or filaments can have a count ranging from 1 to 15 dtex, although these values must be considered preferred but not binding. The fibers or filaments can be composed of: polyethylene, polypropylene, polyester or biodegradable PLA fibers. The fibers or filaments can also be bicomponent, i.e. with a core and sheath formed of different polymers. For example, the following combinations can be used: polypropylene-polyethylene; polyester-polyethylene; polyester-copolyester; PLA-co-PLA. Viscose or cotton can also be used as materials for the fibers or filaments. In general, the fibers or filaments can be produced with materials known and typically used to produce nonwoven fabrics consolidated using heat, chosen on the basis of the final use of the product.

[0029] The web can be a web of continuous filaments or of discontinuous fibers, or also a combination of filaments and fibers. Nonetheless, according to an advantageous embodiment, the web is formed of discontinuous carded fibers.

[0030] The consolidated web with bonding points distributed in areas can be used in this form as a component of a final article, such as a sanitary napkin, a baby diaper or the like. However, the web bonded in this way can also be subjected to further processes, such as a supplementary bonding process, an embossing process, a perforation process, or a combination of these. Furthermore, the bonded web of fibers or filaments as described can be joined to a plastic film or to another component to form a composite semi-finished material. This semi-finished product can be embossed or perforated and subjected to both embossing and perforation, or also to other additional processes.

[0031] Further advantageous characteristics and embodiments of the method according to the invention are indicated in the appended claims and will be described hereunder with reference to some examples of embodiments.

[0032] According to a different aspect, the invention relates to a web of thermoplastic textile fibers or filaments bonded by point bonding, characterized in that said bonding points are disposed in concentrated areas, said areas of concentrated bonding points combined with areas with more or less dense bonding points.

Brief description of the drawings

[0033] The invention shall now be better understood by following the description and accompanying drawing, which shows non-limiting practical embodiments of the invention. More specifically, in the drawing:

Figure 1 is a diagram of a system to carry out the method according to the invention;

Figure 2 is an enlargement of the nip between the rollers of the first thermal bonding calender;

Figure 3 is a schematic plan view of a web delivered

from the first thermal bonding calender;

Figure 4 is a schematic enlargement of the nip between the rollers of the second embossing or perforating calender;

Figures 5 and 6 are greatly enlarged schematic cross sections of the product delivered from the second calender in the case of perforation and embossing respectively.

Detailed description of preferred embodiments of the invention

[0034] Figure 1 schematically shows a possible configuration of a line for producing a nonwoven fabric according to the invention. A carding machine is indicated with 1, which produces a textile web V of carded and unbonded fibers. The web V can also be formed by superimposing more than one web produced by more than one carding machine. Typically, the web V is composed of fibers, also bicomponent, with a core composed of a first thermoplastic material and a sheath composed of a second thermoplastic material, where the second thermoplastic material has a lower softening temperature than the material forming the core of the fiber. The optionally bicomponent fibers and the materials with which they can be produced are known to those skilled in the art and not described herein.

[0035] The fibers can typically have a length in the order of 10-100 mm, preferably 20-80 mm and even more preferably 25-50 mm, with a count ranging, for example, from 1 dtex to 15 dtex. The weight of the web V ranges, for example, from 5 g/m² to 150 g/m², preferably from 10 to 35 g/m² and even more preferably from 15 to 30 g/m². Although currently preferred, the values indicated must not be considered as binding and limiting.

[0036] By means of a belt conveyor 3 the web V of carded and unconsolidated textile fibers is fed to a first calender 5, comprising a first bottom roller 7 and a second top roller 9, made of steel or another sufficiently hard material. Characteristically, the two rollers 7 and 9, counter-rotating as indicated by the arrows in the drawing, are both provided with respective protuberances 7P and 9P, as shown schematically in the enlargement in Figure 2. The protuberances are obtained for example by mechanical engraving or chemical etching, by laser engraving or in another suitable way. Typically, they will have a truncated cone or truncated pyramid shape, although other configurations of the protuberances would also be possible.

[0037] The protuberances 7P and 9P are disposed with a density which can typically be in the order of 5-200 protuberances/cm², preferably in the order of 30-100 protuberances/cm² and even more preferably in the order of 30-70 protuberances/cm². The height of the protuberances can be in the order of 0.1-5 mm. The dimension of the front surface of the protuberances and the density with which they are distributed are such that the front surface of the protuberances of each of the two rollers

occupies a percentage ranging from 5 to 40% and preferably from 15 to 30% of the total cylindrical surface enveloping the respective roller.

[0038] According to the invention, characteristically in the nip between the rollers 7 and 9 the protuberances are disposed in such a way that only some protuberances of the roller 7 are opposite to and aligned with the protuberances of the roller 9, i.e. in a tip-to-tip arrangement. The other protuberances are out of phase with one another. This effect can be obtained in various ways. For example, the engraving of the rollers can essentially be the same but the peripheral speeds of the rollers may differ slightly from each other, or the pitch of the protuberances on one roller may not be identical to the pitch of the protuberances on the opposed roller; or yet again, the protuberances may be disposed aligned according to helical alignments chosen so as to obtain said partial correspondence between the tips of one roller and the tips of the other. These different methods could also be combined to obtain non-correspondence of all the tips of the two rollers along the nip of the calender. Moreover, the diameters of the two rollers could be slightly different, also so that with each revolution of the rollers, the protuberances disposed in a tip-to-tip arrangement change to distribute wear of the protuberances evenly throughout the entire surface of the rollers 7 and 9.

[0039] Distribution, dimension and density of the protuberances 7P, 9P and reciprocal difference in phase therebetween are chosen so that the average bonded surface of the web preferably ranges from 1% to 15%, preferably from 3 to 10% and even more preferably from 4% to 8% of the total surface of the web.

[0040] The distance between centers of the rollers 7 and 9 is advantageously chosen so that the front surfaces of the protuberances in the tip-to-tip arrangement only press against each other with modest pressure. For example, the force per unit of length, i.e. the linear pressure, in the nip between the two rollers (without the web interposed) could be equal to or less than 30 N/mm against the conventional 75 N/mm. According to an advantageous embodiment, the distance between centers of the rollers can be chosen so that, in the absence of a web of fibers, there is no contact between these rollers, but rather the protuberances in tip-to-tip arrangement are spaced apart, for example, by an amount above 0 mm but below 1 mm, preferably in the order of 0.02-0.8 mm and even more preferably between 0.05 and 0.5 mm.

[0041] When the web V of unbonded fibers is fed into the nip between the rollers 7 and 9, the web is compressed and the thickness thereof is essentially calibrated by the rollers of the calender. As one or other or preferably both the rollers are heated to a temperature close to the softening or melting temperature of the fibers and when these are bicomponent, melting of the sheath of the fibers is obtained. This melting takes place in the areas in which the protuberances 7P and 9P are in the tip-to-tip arrangement, while in areas in which said reciprocal correspondence between protuberances is absent,

bonding takes place purely through the action of heat. In the areas with tip-to-tip correspondence the web is compressed sufficiently to obtain compression and bonding, even if when the web is absent the front surfaces of opposite protuberances might not touch. The noteworthy reduction in linear pressure (from the conventional 75 N/mm to 30 N/mm) means that both rollers used can be perfectly cylindrical and without systems to take up the flexure, greatly simplifying said systems.

[0042] Due to imprecise correspondence between protuberances 7P and 9P, the bonding points produced on the web V1 delivered from the calender 5 are distributed in a discontinuous and inconstant manner. Figure 3 schematically shows the distribution of these bonding points S in a possible configuration. It must be understood that the design or distribution of the bonding points of the fibers is not binding and does not require to be determined precisely a priori, as it can vary due, for example, to more or less marked slipping between the rollers, said slipping which can even be of a non-negligible extent, especially when the rollers 7 and 9 are not in reciprocal contact.

[0043] The only relevant factor is that the bonding points S are distributed according to discrete zones or areas A and that the areas are spaced apart to an extent essentially greater than the pitch between the protuberances on one or on the other of the two rollers, but sufficiently close to guarantee adequate overall bonding of the fibers of the web V.

[0044] The product delivered from the calender 5 is a bonded or partially bonded, i.e. consolidated or partially consolidated, web, which differs substantially from thermally bonded webs of the conventional type. In fact, the latter are bonded according to a very dense and even distribution of points throughout the entire extension of the web, with a pitch of bonding points corresponding to the pitch of the protuberances on the engraved roller of the calender. On the other hand, the product obtained with the method according to this description is characterized by discontinuity in the distribution of bonding points and therefore uneven distribution of said points, with large surface zones (surrounding the areas A), in which the fibers are partially free, i.e. devoid of bonding by pressure.

[0045] The product thus obtained is essentially softer and more voluminous than the web bonded by conventional thermal bonding. However, even when the fibers are staple fibers, they are sufficiently bonded, or consolidated, as the areas A in which the bonding points are concentrated are spaced apart from each other by a distance generally below the average length of the fibers. For example, if the fibers have a length of 40 mm, the areas A can be spaced apart from one another by an extent of, for example, between 5 and 20 mm. Consequently, each fiber is statistically affected by at least two bonding points S or in general by several bonding points S, thereby guaranteeing adequate consolidation of the fibers.

[0046] Moreover, the web V initially having a high thickness (10-20 mm) when fed into the calender 5, when delivered therefrom also has a calibrated thickness. This thickness is in the order of 0.20-1.00 mm and preferably from 0.25 to 0.50 mm. With the same basis weight, i.e. weight per surface unit, the consolidated web delivered from the calender 5 is essentially thicker than the web obtained with conventional point bonding. The increase in thickness with the same basis weight has been quantified in the order of about 20-80% according to the basis weight and the operating conditions of the calender. The basis weight of the bonded web V1 typically ranges from, for example, 10 to 40 g/m², preferably from 12 to 35 g/m², and even more preferably from 15 to 30 g/m².

[0047] As known to those skilled in the art, in calenders conventionally used for thermal bonding it is necessary for the web being fed to be subjected to a certain degree of pull. This pull is obtained by imparting a peripheral speed to the rollers of the calender approximately 10-30% greater than the speed with which the conveyor belt feeds the unbonded web V. Pull is necessary to counterbalance the aerodynamic effect of the air which from the nip of the calender is pushed backwards towards the area from which the web is fed. This reverse motion of the air is due to the fact that the volume of the web fed to the calender is drastically reduced. The air present inside the unbonded web is expelled as a consequence of compression of the web by the calender and tends to be blown backwards.

[0048] As the web V fed to the calender is unbonded and therefore has essentially no mechanical resistance, the air current which is produced causes disturbance in the feed of the web and disarranges the fibers. The peripheral speed of the rollers greater than the advance speed of the web being fed compensates this effect.

[0049] Nonetheless, the pull has a negative effect on the final quality of the consolidated web. This negative effect takes the form of unevenness in the density of the fibers in the consolidated web, with the onset of areas with a density below the desired density, i.e. with reduced coverage. This phenomenon is the result of the stress to which the web is subjected as a consequence of pull.

[0050] It has now been found that by using two rollers both provided with protuberances and additionally disposed so that the protuberances of one roller do not correspond entirely with the protuberances of the other roller in the lamination nip, the pull that must be imposed on the web being fed (i.e. the difference between peripheral speed of the rollers and feed speed of the web) is essentially lower than the pull required in conventional calenders and can even be entirely eliminated.

[0051] Notwithstanding the absence of pull or the presence of very limited pull (below 10% and preferably equal to or below 5%) at particularly high production speeds, a product is obtained which is not affected by the aerodynamic effects described above. On the other hand, the absence of pull or the use of a very low percentage of pull improves the quality of the product in terms of even-

ness of the fiber density, without the formation of areas with low coverage, i.e. with a density of fibers much lower than the density of the surrounding areas.

[0052] Although not entirely clear, this beneficial effect seems to be due to the fact that the presence of protuberances on both rollers increases the empty space in the nip between the rollers 7 and 9 of the calender 5 with respect to conventional calenders and therefore increases the possibility for air to be ejected from the opposite side of the nip with respect to the side from which the web is fed, thereby reducing the amount of air blown backwards towards the unconsolidated web. The lack of complete correspondence between opposite protuberances 7P and 9P makes this effect even more significant.

[0053] Besides the aforesaid advantages, the thermal bonding procedure using a pair of rollers provided with protuberances partially out of phase allows a reduction in linear pressure between the rollers, i.e. the force per unit of axial length of the rollers. In fact, considering that only about 20-30% of the protuberances of the rollers are in reciprocal contact or in any case in tip-to-tip opposition, as the pressure on the web in the bonding point must in any case always be equal to the pressure normally used to obtain bonding also in conventional devices, the linear pressure and therefore the overall flexural stress are essentially lower (about 20-30% of those found in conventional systems). This reduces or eliminates the problem represented by flexural deformation of the rollers, and consequently the need to produce convex rollers to guarantee bonding along the entire width of the web. This results in a considerable saving in costs and reduction of complications during the production of the rollers.

[0054] The consolidated web V1 delivered from the calender 5 can be used as is, for example (although not exclusively) to produce topsheets for sanitary napkins or diapers, or as an intermediate layer for the acquisition and/or distribution of body fluids immediately below a top-sheet which can, for example, be made of a perforated plastic material.

[0055] According to a further development of this invention, on the other hand, the web V1 consolidated by the calender 5 can be subjected to further processing. For this purpose, it is fed to a second calender 15 composed of a counter-rotating bottom roller 17 and top roller 19, both, for example, made of steel. The roller 17 has a smooth surface, i.e. without protuberances, while the roller 19 is provided with protuberances 19P. According to a possible embodiment of this further development of the invention, the distance between the centers of the two rollers 17, 19 of the second calender 15 is such that the protuberances 19P press against the smooth surface of the roller 17 (see the schematic enlargement in Figure 4 of the nip of the second calender). The pressure between the two rollers can be essentially greater than the pressure between the rollers 7 and 9. Typically, the linear pressure can, for example, in this case be between 50 N/mm and 200 N/mm. One or other or both of the rollers 17, 19 can be heated to a temperature in proximity and

preferably greater than the softening temperature of the fibers forming the web V1.

[0056] In a possible embodiment of the method according to the invention, the peripheral speed of the two rollers is the same. In this way the web V1, already consolidated in the first calender 5, is subjected to embossing with compression by the protuberances 19P. The result is indicated schematically in Figure 5, where E indicates the depressions produced by the protuberances 19P. These are located on one side of the web V2 delivered from the second calender 15, as the opposite side is in contact with the smooth surface of the roller 17 and therefore remains essentially smooth. Figure 5 schematically indicates the areas A of concentration of the bonding points.

[0057] The embossed web V2 obtained is considerably softer and thicker than those obtained with conventional technologies.

[0058] Alternatively, according to a further possible embodiment of the invention, the web V1 bonded in the first calender 5 is perforated in the calender 15. This can be obtained, for example, with a combined effect of pressure, temperature and reciprocal slipping between the rollers 17, 19, in a manner known to those skilled in the art. Figure 6 schematically shows a section of a web V2 thermally bonded in points (S) and perforated (P).

[0059] Also in this case the thickness and softness obtained on the perforated web V2 are greater with respect to those of webs obtained with conventional thermal bonding systems.

[0060] A second component, such as a plastic film F, fed from a reel B, can also be joined to the web V1.

[0061] It is understood that the drawing only shows a possible embodiment of the invention, which may vary in forms and arrangements, without however departing from the scope of the concept on which the invention is based.

Claims

1. A method for processing a web of fibers and for producing a nonwoven fabric, wherein an essentially unbonded web of thermoplastic fibers or filaments is bonded by bonding points, **characterized in that** said bonding points are produced according to concentrated areas, said areas of concentrated bonding points being combined with areas with a substantially lower density of bonding points.
2. Method as claimed in claim 1, **characterized in that** said areas of concentrated bonding points are combined with areas completely devoid of bonding points.
3. Method as claimed in claim 1 or 2, **characterized in that:** said web of unbonded fibers or filaments is fed between two counter-rotating rollers both provid-

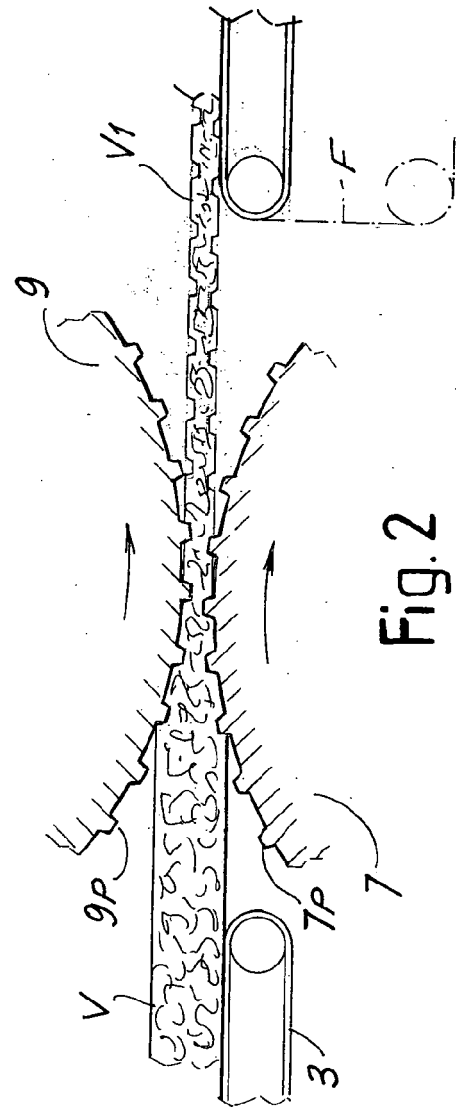
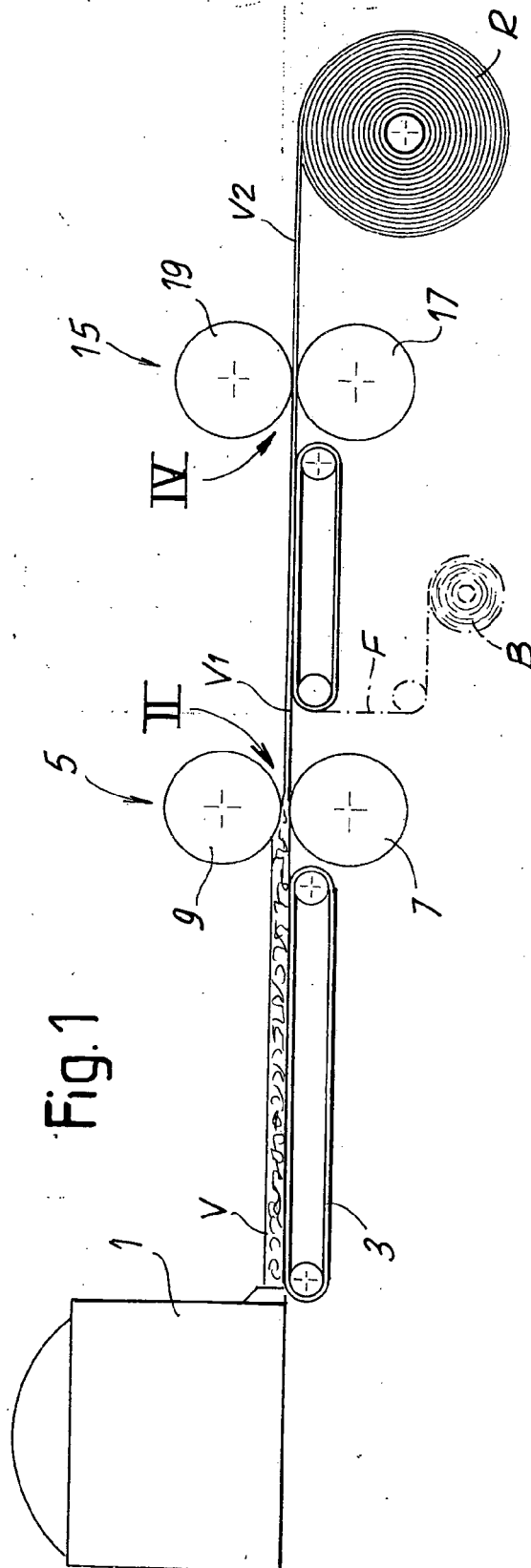
ed with protuberances; and **in that** during rotation in the nip between said two rollers part of the protuberances of a first roller are carried at least partially opposite corresponding protuberances of a second roller, while part of the protuberances of said first roller are disposed corresponding depressions between the protuberances of the second roller, the bonding points being formed between pairs of protuberances opposing each other.

4. Method as claimed in claim 1, 2 or 3, **characterized in that** said areas of concentrated bonding points are separated from one another by areas at least partially devoid of bonding points.
5. Method as claimed in claim 1, 2 or 3, **characterized in that** said web is a web of discontinuous carded fibers.
6. Method as claimed in claims 4 and 5, **characterized in that** the distance between the areas in which the bonding points are concentrated is below the average length of said fibers.
7. Method as claimed in one or more of the previous claims, **characterized in that** the web bonded by means of said point bonding is subsequently embossed.
8. Method as claimed in claim 7, **characterized in that** the web is embossed in a calender comprising a roller equipped with protuberances cooperating with a smooth roller, at least one of said two rollers being preferably heated and said two rollers being pressed against each other.
9. Method as claimed in one or more of claims 1 to 6, **characterized in that** said web bonded by point bonding is subsequently perforated.
10. Method as claimed in claim 9, **characterized in that** said web is perforated in a calender comprising a roller provided with protuberances cooperating with a smooth roller, at least one of said two rollers being preferably heated and said two rollers being pressed against each other.
11. Method as claimed in one or more of the previous claims, **characterized in that** said web of fibers or filaments is joined to a second layer of material to form a composite product.
12. Method as claimed in claim 11, **characterized in that** said second layer of material is a plastic film.
13. Method as claimed in one or more of the previous claims,

characterized in that in the areas in which the bonding points are concentrated said points have a density ranging from 5 to 200 points/cm², preferably from 30 to 100 points/cm² and even more preferably in the order of 30 to 70 points/cm².

14. Method as claimed in one or more of the previous claims, **characterized in that** said areas provided with said concentrated bonding points are separated from one another by a distance ranging from 5 to 30 mm and preferably from 8 to 20 mm.
15. Method as claimed in one or more of the previous claims, **characterized in that** said web is formed of fibers having a count ranging from 1 to 15 dtex.
16. Method as claimed in one or more of the previous claims, **characterized in that** a web of fibers of a length ranging from 10 to 100 mm, preferably from 20 to 80 mm and even more preferably from 25 to 50 mm is formed.
17. Method as claimed in one or more of the previous claims, **characterized in that** the bonded web has a basis weight ranging from 10 to 40 g/m², preferably from 12 to 35 g/m², and even more preferably from 15 to 30 g/m².
18. Method as claimed in one or more of the previous claims, **characterized in that** the bonded area ranges from 1% to 15%, preferably from 3% to 10% and even more preferably from 4% to 8% of the overall surface of the web.
19. Method as claimed in one or more of the previous claims, **characterized in that** said two rollers are pressed against each other with a force per unit of length equal to or less than 30 N/mm.
20. Method as claimed in one or more of the previous claims, **characterized in that** the distance between centers of said two rollers is such that the distance between opposite protuberances of the two rollers in the nip therebetween is below 1 mm, preferably in the order of 0.02-0.8 mm and even more preferable from 0.05 to 0.5 mm.
21. Method as claimed in one or more of the previous claims, **characterized in that** the thickness of the web delivered from the nip between said two rollers is calibrated to a value ranging from 0.20 to 1.00 mm and preferably from 0.25 to 0.50 mm.

22. A web of thermoplastic textile fibers or filaments bonded by point bonding, **characterized in that** said bonding points are disposed in concentrated areas, said areas of concentrated bonding points being combined with areas with a substantially lower density of bonding points.
23. Web as claimed in claim 22, **characterized in that** said areas of concentrated bonding points are associated with areas essentially devoid of bonding points.
24. Web as claimed in claim 22 or 23, **characterized in that** said areas of concentrated bonding points are surrounded by areas essentially devoid of bonding points.
25. Web as claimed in claim 22, 23 or 24 **characterized in that** it is formed of discontinuous carded fibers.
26. Web as claimed in claims 24 and 25, **characterized in that** the distance between the areas in which the bonding points are concentrated is below the average length of said fibers.
27. Web as claimed in one or more of claims 22 to 26, **characterized in that** it has embossed applied subsequent to said bonding.
28. Web as claimed in one or more of claims 22 to 26, **characterized in that** it is perforated.
29. Web as claimed in one or more of the previous claims, **characterized in that** it is joined to a second layer of material to form a composite product.
30. Web as claimed in claim 29, **characterized in that** said second layer of material is a plastic film.
31. Web as claimed in one or more of claims 22 to 30, **characterized in that** in the areas in which the bonding points are concentrated said points have a density ranging from 5 to 200 points/cm², preferably from 30 to 100 points/cm² and even more preferably in the order of 30 to 70 points/cm².
32. Web as claimed in one or more of claims 22 to 31, **characterized in that** said areas provided with said concentrated bonding points are separated from one another by a distance ranging from 5 to 30 mm and preferably from 8 to 20 mm.
33. Web as claimed in one or more of claims 22 to 32, **characterized in that** it is formed mainly of fibers having a count ranging from 1 to 15 dtex.
34. Web as claimed in one or more of claims 22 to 33, **characterized in that** it is formed with fibers of a length ranging from 10 to 100 mm, preferably from 20 to 80 mm and even more preferably from 25 to 50 mm.
35. Web as claimed in one or more of claims 22 to 34, **characterized in that** it has a basis weight ranging from 10 to 40 g/m², preferably from 12 to 35 g/m², and even more preferably from 15 to 30 g/m².
36. Web as claimed in one or more of claims 22 to 35, **characterized in that** the bonded area ranges from 1% to 15%, preferably from 3% to 10% and even more preferably from 4% to 8% of the overall surface of the web.
37. Web as claimed in one or more of claims 22 to 36, **characterized in that** it has a thickness ranging from 0.20 to 1.00 mm and preferably from 0.25 to 0.50 mm.



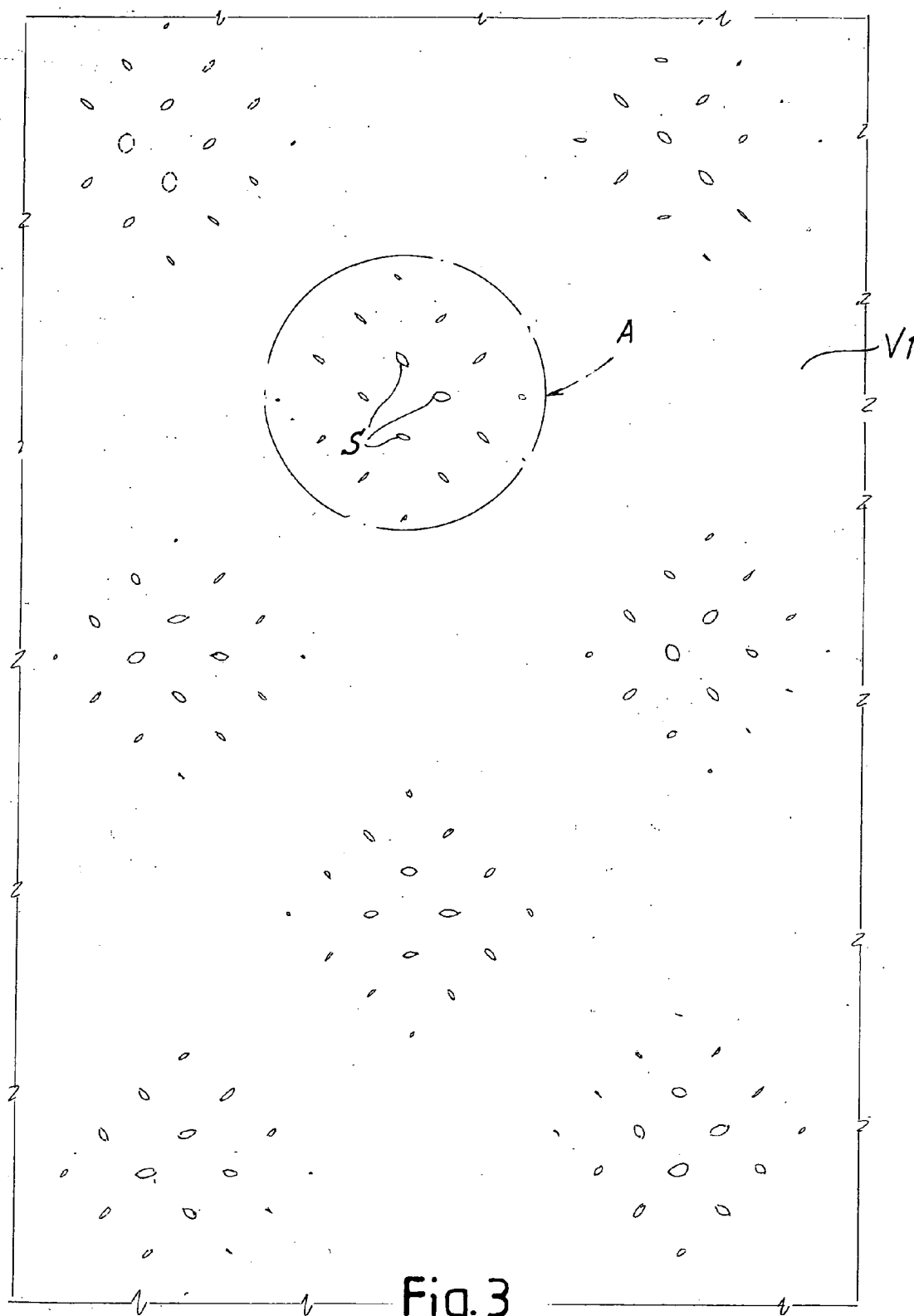
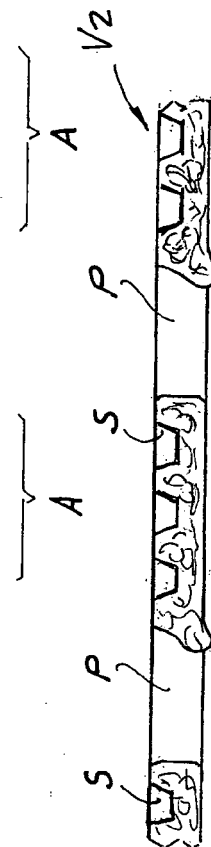
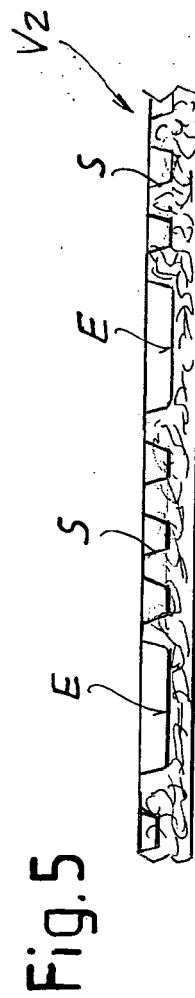
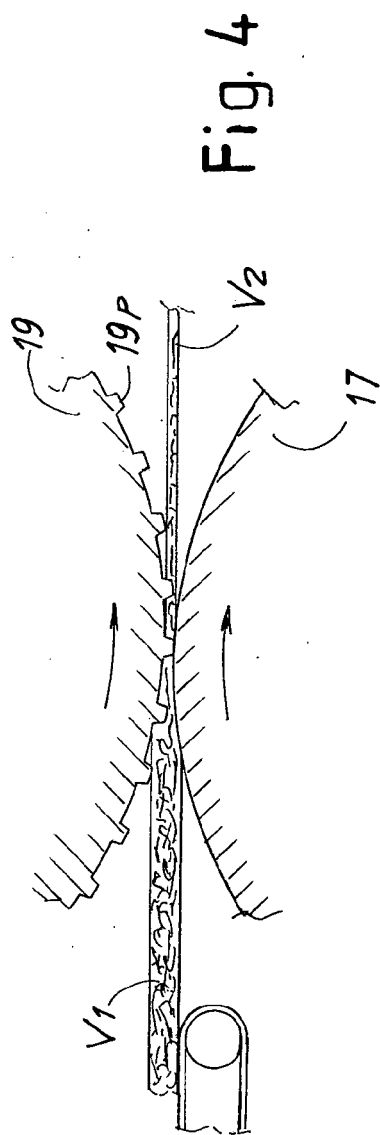


Fig. 3





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 42 5203

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 4 005 169 A (CUMBERS ET AL) 25 January 1977 (1977-01-25) * column 1, lines 17-23 * * column 1, line 61 - column 2, line 12 * * column 4, lines 38-64 * * examples * * claims; tables * -----	1-6, 13-19, 22-26, 31-34,36	D04H1/54 D04H3/14 D04H13/00 B29C59/04 B31F1/07
X	US 4 493 868 A (MEITNER ET AL) 15 January 1985 (1985-01-15) * figures 2,7,16 * * column 2, lines 37-50 * * column 4, line 41 - column 6, line 3 * * claims; examples * -----	1-4,13, 22-24	
X	US 4 902 366 A (BADER ET AL) 20 February 1990 (1990-02-20) * figures 3,45,6 * * column 1, lines 8-31 * * column 2, lines 39-46 * * column 2, line 59 - column 4, line 20 * * claims 1-7 * -----	1,5, 22-24	TECHNICAL FIELDS SEARCHED (Int.Cl.7) D04H B29C B31F D21H A61F
X	WO 95/09261 A (KIMBERLY-CLARK CORPORATION) 6 April 1995 (1995-04-06) * page 1, line 33 - page 2, line 3 * * page 3, lines 2-7 * * page 3, line 12 - page 4, line 2 * -----	1-4, 13-15, 18,22-24	
A	WO 97/20688 A (FABIO PERINI S.P.A; BIAGIOTTI, GUGLIELMO) 12 June 1997 (1997-06-12) * figures 1,4a,8,10,12 * ----- -/-	1-37	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 12 August 2005	Examiner Barathe, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

2

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Office

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Application Number
EP 05 42 5203

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 6 235 373 B1 (GRAFF PIERRE) 22 May 2001 (2001-05-22) * figures *	1-37	
A	US 5 173 351 A (RUPPEL ET AL) 22 December 1992 (1992-12-22) * figure 4 *	1-37	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 12 August 2005	Examiner Barathe, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

2
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 42 5203

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-08-2005

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4005169	A	25-01-1977	GB 1474101 A	18-05-1977
			AT 349428 B	10-04-1979
			AT 323375 A	15-09-1978
			AU 8050075 A	28-10-1976
			CA 1051161 A1	27-03-1979
			CH 596366 B5	15-03-1978
			CH 532075 A	15-04-1977
			DE 2518532 A1	25-03-1976
			DK 181575 A ,B,	27-10-1975
			ES 436999 A1	16-03-1977
			FR 2268893 A1	21-11-1975
			IT 1037627 B	20-11-1979
			JP 1199687 C	05-04-1984
			JP 50152073 A	06-12-1975
			JP 57027221 B	09-06-1982
			NL 7504925 A ,B,	28-10-1975
			SE 403630 B	28-08-1978
			ZA 7502477 A	31-03-1976

US 4493868	A	15-01-1985	NONE	

US 4902366	A	20-02-1990	DE 3700609 A1	21-07-1988
			AT 75267 T	15-05-1992
			DE 3870260 D1	27-05-1992
			EP 0285707 A2	12-10-1988
			EP 0275231 A2	20-07-1988
			JP 2659118 B2	30-09-1997
			JP 63264963 A	01-11-1988

WO 9509261	A	06-04-1995	US 6093665 A	25-07-2000
			AU 688319 B2	12-03-1998
			AU 6622094 A	18-04-1995
			CA 2113931 A1	31-03-1995
			DE 69421713 D1	23-12-1999
			DE 69421713 T2	06-07-2000
			EP 0721520 A1	17-07-1996
			ES 2138079 T3	01-01-2000
			KR 270797 B1	01-11-2000
			WO 9509261 A1	06-04-1995

WO 9720688	A	12-06-1997	IT F1950247 A1	05-06-1997
			AT 186674 T	15-12-1999
			AU 1108497 A	27-06-1997
			BR 9611687 A	02-03-1999
			CA 2239435 A1	12-06-1997
			CN 1203550 A	30-12-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 42 5203

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-08-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9720688 A		DE 69605210 D1	23-12-1999
		DE 69605210 T2	13-07-2000
		EP 0868302 A1	07-10-1998
		ES 2138392 T3	01-01-2000
		GR 3032079 T3	31-03-2000
		IL 124774 A	20-05-2001
		WO 9720688 A1	12-06-1997
		JP 2000501349 T	08-02-2000
		PL 327080 A1	23-11-1998
		RU 2162414 C2	27-01-2001
		US 6245414 B1	12-06-2001
US 6235373 B1	22-05-2001	FR 2774707 A1	13-08-1999
		CA 2262020 A1	06-08-1999
		EP 0935021 A1	11-08-1999
		NO 990549 A	09-08-1999
		TR 9900240 A2	21-10-1999
US 5173351 A	22-12-1992	FR 2653793 A1	03-05-1991
		AT 114756 T	15-12-1994
		DE 69014558 D1	12-01-1995
		DE 69014558 T2	13-04-1995
		DK 426548 T3	23-01-1995
		EP 0426548 A1	08-05-1991
		ES 2064693 T3	01-02-1995
		FI 96343 B	29-02-1996
		GR 3015025 T3	31-05-1995
		NO 904672 A ,B,	02-05-1991
EP 1428654 A	16-06-2004	EP 1428654 A1	16-06-2004
		WO 2004052635 A1	24-06-2004

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 9855295 A [0009]
- WO 0004215 A [0010]
- WO 9925911 A [0011]
- US 6395211 A [0011]
- WO 03064001 A [0012]
- WO 03086709 A [0013]
- WO 03021024 A [0014]
- WO 9713909 A [0015]
- WO 0186050 A [0016]
- DE 3416004 A [0017]
- DE 19750459 A [0018]
- US 5656119 A [0019]
- US 2003168194 A [0020]
- EP 1418094 A [0021]