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(54) **Process for the production of a fabric made of super-extra-fine yarns of high-quality fibres, which may not otherwise be produced industrially**

(57) A process for the production of a fabric made of super-extra-fine yarns of high-quality animal fibre, which may not otherwise be produced industrially, includes spinning single-ply or double-ply extra-fine yarns (1), consisting of an intimate blend of high-quality animal fibres and water-soluble synthetic fibres; doubling said ex-

tra-fine yarns (1) with respective water-soluble yarns (2), weaving the doubled yarns (3) and dissolving said water-soluble synthetic fibres and said water-soluble yarns (2) by means of a slightly acidic aqueous solution at the temperature required for the dissolution to obtain fabrics consisting of super-extra-fine yarns (1') of pure animal fibres only.

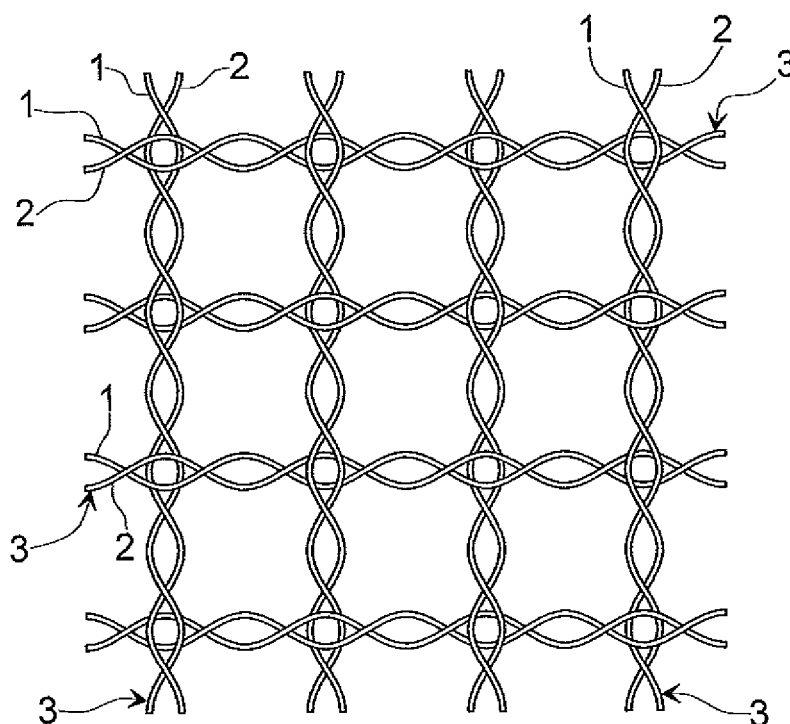


Fig.2

Description

[0001] The present invention relates to a process for the production of a fabric made of super-extra-fine yarns of high-quality fibres, which may not otherwise be produced industrially.

[0002] Based on modern technologies, a fabric made of extra-fine yarns of high-quality animal fibres, such as, for example, pure cashmere yarns or an intimate blend of cashmere and silk or extra-fine wool, vicuna, angora, alpaca etc., may be produced with a yarn count that may reach a maximum fineness of about 100 dtex / 83 dtex.

[0003] As a matter of fact, the poor kinetic strength of these extra-fine yarns means that they are extremely difficult to be woven.

[0004] In some cases, a solution has already been found involving the use of doubling techniques that allow to guarantee a sufficient kinetic strength on the loom. This allows to produce fabrics in high-quality animal fibre yarns which may reach the fineness level described above, but may not exceed it.

[0005] The object of the present invention is now to provide a process which allows to produce fabrics made of high-quality animal fibre yarns which are super-extra-fine, i.e. yarns having a higher degree of fineness, not currently available commercially, able to reach a yarn count of 33 dtex and finer.

[0006] In view of this object, the process according to the present invention includes the following steps:

- a. spinning extra-fine yarns consisting of an intimate blend of high-quality animal fibres and water-soluble synthetic fibres;
- b. doubling said extra-fine yarns with respective water-soluble yarns;
- c. weaving the doubled yarns;
- d. dissolving said water-soluble synthetic fibres and said water-soluble yarns by means of a slightly acidic aqueous solution brought to the temperature required for the dissolution to obtain fabrics consisting of super-extra-fine yarns of pure animal fibres.

[0007] The starting extra-fine yarns may consist of an intimate blend of very-high-quality animal fibres (e.g. pure cashmere or an intimate blend of 80% cashmere and 20% silk) and water-soluble fibres, not necessarily with an extra-fine yarn count, the latter in a varying percentage between a minimum of 5% and a maximum of 95% depending on the final yarn count of the desired super-extra-fine yarn, as well as on the specific characteristics of the desired type of fabric (particularly in terms of "feel"). The above-mentioned super-extra-fine yarns may be single ply or double ply.

[0008] The expression "water-soluble yarns" refers to synthetic-fibre yarns that may dissolve in a slightly acidic aqueous solution brought to the temperature required for the dissolution. They preferably, but not necessarily, have the same yarn count as the extra-fine yarns.

[0009] Doubling may be achieved through two different procedures concerning the direction of twist to be performed during the step of coupling, with the main reference direction being that of the extra-fine yarn having animal fibres. The direction of twist of the yarn entirely made of water-soluble material is actually completely un-influential and irrelevant.

[0010] Depending on the desired final product, the following two assumptions are possible:

- doubling the water-soluble yarn with the extra-fine yarn(s), with a low number of twists, in the opposite direction to the twist of the extra-fine yarn(s). This allows to obtain a final product which is particularly soft, fluffy and delicate;
- doubling the water-soluble yarn, with a low number of twists, in the same twist direction as the extra-fine yarn(s). This allows to obtain a final product which is particularly dynamic, fresh and less subject to the problems of 'peeling'.

[0011] By way of mere example, an extra-fine yarn made of a blend of fibres in the proportions of 50% cashmere (WS) and 50% water-soluble yarn (PVA) is considered, with a yarn count of 111 dtex, which is doubled with a yarn entirely made of PVA, with the same yarn count as the extra-fine yarn.

[0012] A doubled yarn with a yarn count of 111 dtex multiplied by 2 and an overall composition of 25%WS - 75%PVA is thus obtained, which will be employed in the normal step of weaving to create a coarse fabric.

[0013] The coarse fabric is then subjected to a step of scouring dyeing, which includes an operation of dissolving or melting the water-soluble fibres (based on the procedures required by/provided for the specific type of PVA), in order to be able to obtain a final fabric entirely made of 100% WS, with a final super-extra-fine yarn count of 55 dtex, which it is absolutely impossible to be achieved through the currently known techniques.

[0014] The above-mentioned super-extra-fine yarn count may be simply calculated beforehand from the step of composing the starting extra-fine yarn blend; in the above described case, since the starting yarn count of 111 dtex and the fibre blend compound of 50% WS and 50% PVA are known, once the said 50% PVA aliquot has dissolved, the final yarn count for the fabric (100%WS) will be twice the initial yarn count, i.e. 55 dtex, which is well beyond the fineness parameters which are currently possible or imaginable.

[0015] As previously mentioned, the variability of the parameters concerning the percentage of PVA and animal fibres in the starting extra-fine yarn, may also be detected for specific needs, such as those of 'feel'.

[0016] In fact, a hypothetical yarn count of 55 dtex may be achieved either by exactly applying the fineness parameters and/or composition percentages described above, or by means of a similar procedure involving however the use of a lower extra-fine yarn count, equivalent

to 222 dtex, along with a composition of 25% WS and 75% PVA. However, the product thus obtained, although it also has a yarn count of 55 dtex, might display a slightly different "feel", naturally as desired result.

[0017] It will be apparent that, based on the composition aliquots of the extra-fine yarn, the starting yarn count thereof might also be well below the levels which are considered fine and/or extra-fine.

[0018] The accompanying drawings show two practical embodiments of the process according to the present invention. Specifically:

figure 1 shows an extra-fine yarn of high-quality animal fibres, in particular extra-fine cashmere fibres and possibly silk fibres, in an intimate blend with water-soluble fibres, doubled in the opposite direction with a yarn of water-soluble synthetic fibres, specifically polyvinyl fibres;

figure 2 shows a portion of a coarse fabric obtained by weaving doubled yarns such as those in figure 1; figure 3 shows the same portion of fabric after the synthetic fibre yarns have been dissolved;

figure 4 shows an extra-fine yarn of high-quality animal fibres, in particular extra-fine cashmere fibres and possibly silk fibres, in an intimate blend with water-soluble fibres, doubled in the same direction with a yarn of water-soluble synthetic fibres, specifically polyvinyl fibres;

figure 5 shows a portion of a coarse fabric obtained by weaving doubled yarns such as those in figure 1; figure 6 shows the same portion of fabric after the synthetic fibre yarns have been dissolved;

figure 7 shows an example of doubling an extra-fine two-ply yarn with a water-soluble synthetic fibre yarn. Figure 8 shows a different kind of representation of the doubled yarns of figure 7.

[0019] The starting extra-fine yarn, indicated by numeral 1, was created by traditional spinning with a Z-twist, preferably with 850 turns per linear metre.

[0020] The yarn 1 is then doubled with a yarn 2 having substantially the same yarn count, also having a Z-twist, preferably with 850 turns per linear metre, consisting of the so-called 'water-soluble' synthetic fibres, i.e. fibres which may dissolve in a slightly acidic aqueous solution at the appropriate temperature, specifically polyvinyl material (PVA). The yarn 2 may be made of fibres woven with a cotton-type cut (thus having a discontinuous nature).

[0021] Doubling is carried out with an S-twist, preferably with 340 turns per linear metre, so as to obtain a correct final balancing of the doubled yarn, indicated by numeral 3 in figure 1.

[0022] As shown in figure 2, an appropriate number of doubled yarns 3 is then subjected to a traditional warp and weft weaving (or on a circular Jersey-type machine), in which the polyvinyl yarns 2 serve as a support to allow the extra-fine yarns 1 to be woven, which may not otherwise be woven industrially.

erwise be woven industrially.

[0023] The coarse fabric thus obtained, which may have any cloth-, twill- or jacquard-type weave, clearly has the same composition as the doubled yarn 3.

[0024] Such a coarse fabric is then subjected to a step of scouring dyeing, wherein it is immersed in an aqueous solution of about 50 litres per 1 kg of polyvinyl with a slightly acidic pH (about 4.5) at a dissolution temperature in the range between 30°C and 100°C (depending on the nature of the PVA yarn).

[0025] The PVA yarn 2 and any similar water-soluble fibres present in the yarn 1 are thus eliminated by dissolving or melting, leaving a final fabric (fig. 3) exclusively consisting of yarns 1' with a super-extra-fine yarn count (even up to 33 dtex) made of high-quality animal fibres only (pure cashmere or cashmere and silk), which would otherwise have been impossible to be achieved by means of traditional techniques.

[0026] In virtue of the doubling S-twist in a direction opposite to that of the single yarns 1 and 2, after the water-soluble material has dissolved, the remaining yarn 1' has a twist equivalent to the algebraic sum of the spinning (850 Z) and doubling (340 S) twists, i.e. in the example shown equivalent to 510 Z. In virtue of this reduced twist, the resulting fabric is therefore extremely soft, as well as with an extra-fine yarn count.

[0027] Alternatively, the doubling operation may be carried out by a doubling Z-twist, i.e. in the same direction as that of the yarns 1, as shown in figures 4 and 5.

[0028] In such a case, after the water-soluble yarns 2 and the water-soluble fibres which make up the yarns 1 have melted, the remaining yarn 1' has a twist equivalent to the sum of the spinning and doubling twists, i.e. in the example shown equivalent to 1190 Z, but this is still low enough to make the final fabric soft, while considerably reducing the "peeling" effect.

[0029] Finally, as shown in figures 7 and 8, a water-soluble yarn 2 may be doubled (in a clockwise or anti-clockwise direction) with two extra-fine yarns or a two-ply yarn 1. After the weaving, a coarse fabric made of three-ply warp and weft yarns is obtained, which, once the water-soluble yarns have been dissolved, will become a finished fabric with super-extra-fine yarns completely identical to that shown in figures 3 and 6, but with two-ply yarns.

Claims

1. A process for the production of a fabric made of super-extra-fine yarns of high-quality animal fibres, which may not otherwise be produced industrially, characterised in that it includes the following sequence of steps:

a. spinning extra-fine yarns (1) consisting of an intimate blend of high-quality animal fibres and water-soluble synthetic fibres;

- b. doubling said extra-fine yarns (1) with respective water-soluble yarns (2);
 c. weaving the doubled yarns (3);
 d. dissolving said water-soluble synthetic fibres and said water-soluble yarns (2) by means of a slightly acidic aqueous solution at the temperature required for the dissolution to obtain fabrics consisting of super-extra-fine yarns (1') of pure animal fibres.
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2. A process according to claim 1, **characterised in that** said animal fibres are pure cashmere.
3. A process according to claim 1, **characterised in that** said animal fibres are cashmere and silk.
- 15
4. A process according to anyone of the claims 1-3, **characterised in that** the doubling is carried out with yarns (1) and (2) having the same yarn count.
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5. A process according to anyone of the claims 1-4, **characterised in that** the doubling is carried out with a twist in an opposite direction to that of the extra-fine yarns (1).
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6. A process according to claim 5, **characterised in that** the doubling is carried out with an S-twist.
7. A process according to anyone of the claims 1-4, **characterised in that** the doubling is carried out with a twist in the same direction as that of the extra-fine yarns (1).
- 30
8. A process according to claim 7, **characterised in that** the doubling is carried out with a Z-twist.
- 35
9. A process according to anyone of the preceding claims, **characterised in that** said extra-fine yarns (1) are single-ply.
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10. A process according to anyone of the preceding claims, **characterised in that** said extra-fine yarns (1) are double-ply.

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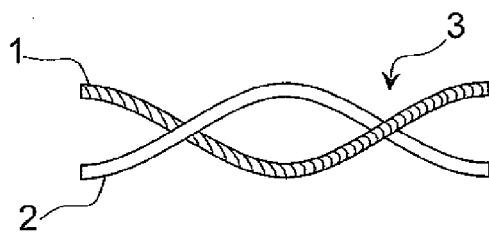


Fig.1

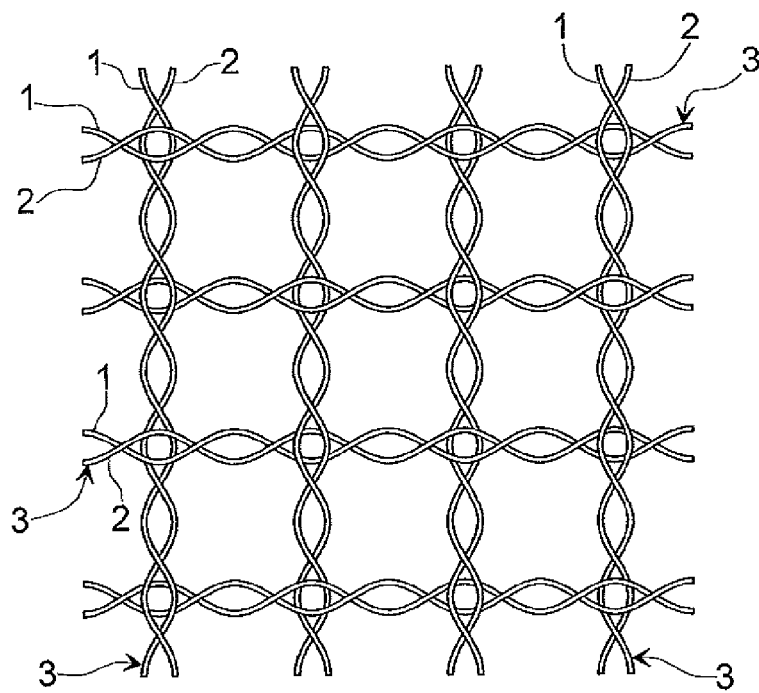


Fig.2

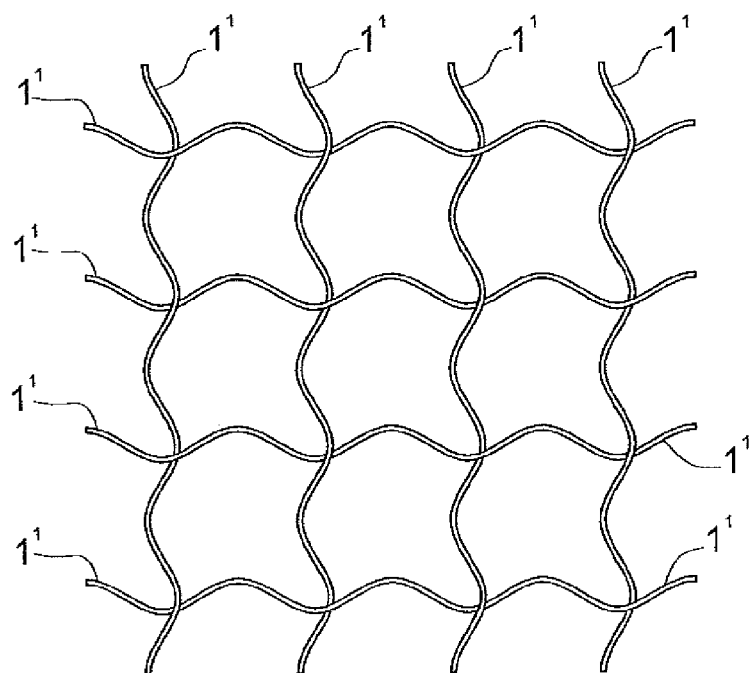


Fig.3

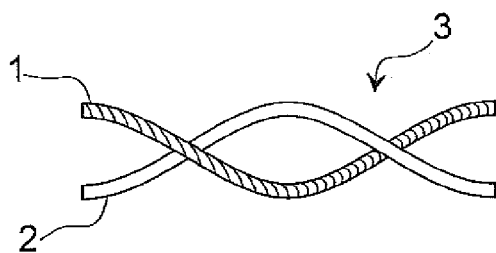


Fig. 4

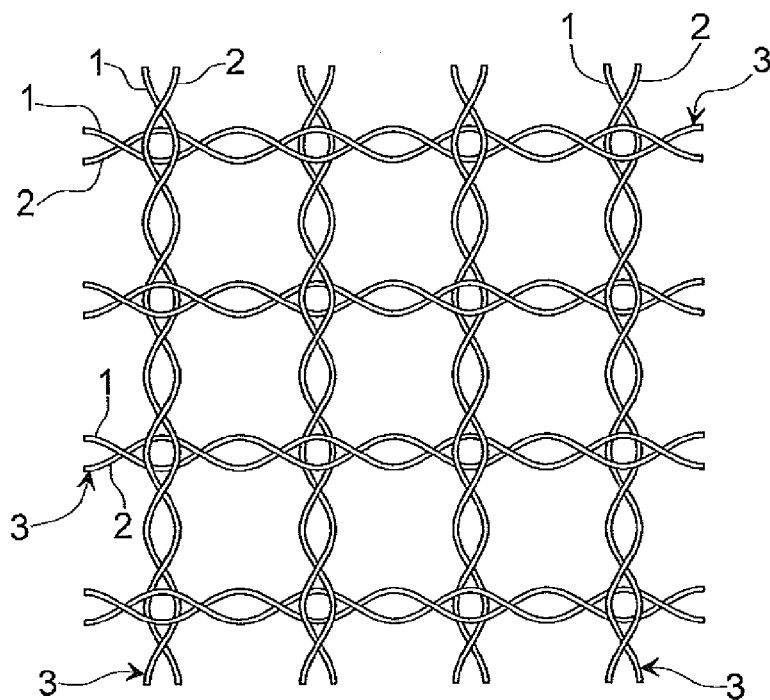


Fig. 5

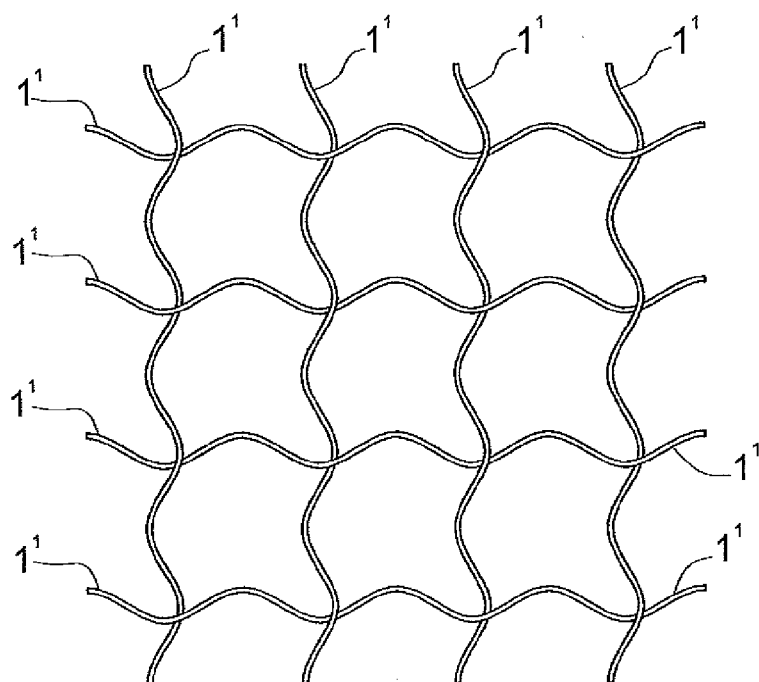


Fig. 6

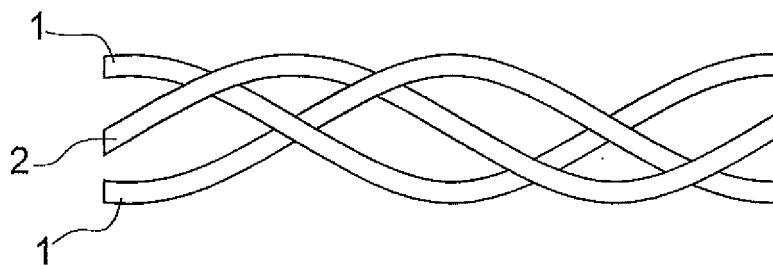


Fig.7

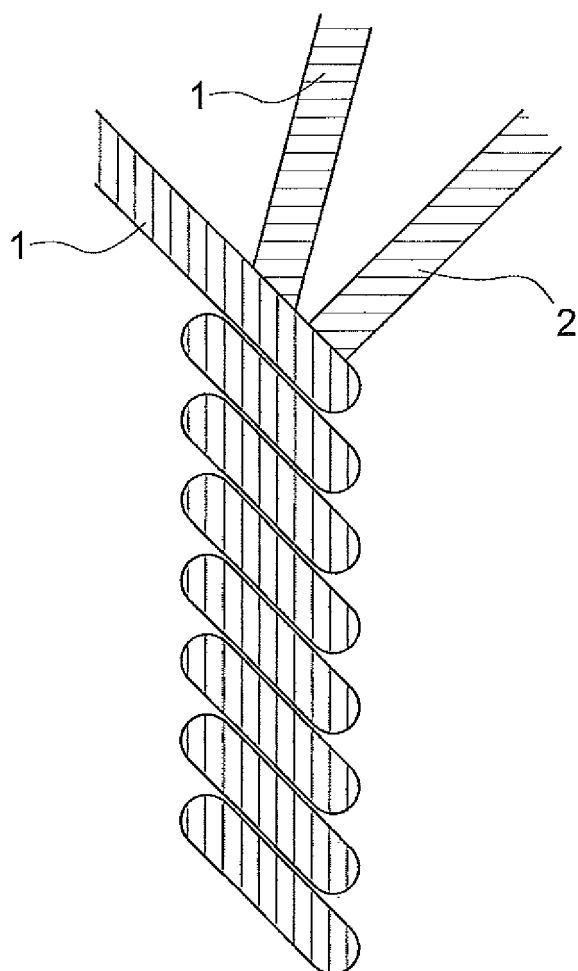


Fig.8



EUROPEAN SEARCH REPORT

Application Number
EP 08 16 6318

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 December 2008	Examiner Pollet, Didier
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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