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(11) **EP 1 428 915 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:

16.06.2004 Bulletin 2004/25

(51) Int Cl.7: **D02G 3/32, D02G 1/18**

(21) Application number: **02026478.4**

(22) Date of filing: **27.11.2002**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
IE IT LI LU MC NL PT SE SK TR**
Designated Extension States:
AL LT LV MK RO SI

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(54) **Manufacturing method for elastic fiber having fur-like touch, elastic fiber having fur-like touch made from the same, and fabric woven by said fiber**

(57) A manufacturing method for elastic fiber having fur-like touch elastic fiber having fur-like touch made from the same, and fabrics woven by said fiber is provided to improve the defects caused by the conventional wool fiber or lack in the elasticity, wearing comfortability and maintenance of fabric having fur-like touch.

Two kinds of thermoplastic polymer in different heat shrinkage rate by using same spinnerette arranged in side by side in the way of melt conjugate spinning to form conjugate fiber having spiral structure like spring. Elastic thermoplastic polymer is adopted to central core yarn, general thermoplastic fiber or modified thermoplastic polymer of crystalline retarded by third compo-

nent is used to peripheral effect yarn, and by means of draw-twister, draw-winder or other filament combination equipment with heat setting and air entanglement, spin texturing to get a combined filament heat draw yarn. then said combined filament yarn is subjected to twisting heat setting, warping or battenning to weave or knit to fabric, then via fabric finishing and processing. High temperature treatment makes core yarn of combined filament yarn elastic due to heat shrinkage difference and makes effect yarn of combined filament yarn low Young's modulus. This leads to elastic fiber having fur-like touch and fabrics woven by said fiber.

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Description

Technical Field of the Invention

[0001] The present invention relates to a manufacturing method for elastic fiber having fur-like touch. elastic fiber having fur-like touch made from the same, and fabrics woven by said fiber and said fiber of the present invention is characterized by having core-sheath structure and elasticity after twisting and heat-treatment.

[0002] For the manufacturing method of the present invention, elastic thermoplastic polymer is adopted to central core yarn (CORE YARN), general thermoplastic fiber or modified thermoplastic polymer of crystalline retarded by third component is used to peripheral effect yarn (EFFECT YARN), and by means of draw-twister, draw-winder or other filament combination equipment with heat setting and air entanglement, spin texturing to get a combined filament yarn having heat drawing characteristic. then said combined filament yarn is subjected to twisting heat setting, warping or battening to weave or knit to fabric, then via fabric finishing and processing. High temperature treatment makes core yarn of combined filament yarn elastic due to heat shrinkage difference and makes effect yarn of combined filament yarn low Young's modulus. This leads to elastic fiber having fur-like touch and fabrics woven by said fiber.

Prior Art

[0003] Wool fabrics are mainly comprised of sheep's wool fabrics, which are well appreciated by the public due to moisture absorption, temperature retention, softness etc. The wool fabrics have some defects such as felting, poor resistance to acid and alkali, insect pest, uneasy maintenance and expensive price, so, most polyester fibers having fur-like touch via false twisting or air jet texturing are developed to fit the long-felt need, though the fabric woven or knitted from these polyester fibers having fur-like touch. but there still exists elasticity and resilience problems in these polyester fabrics.

[0004] Furthermore conjugate yarn made by covering the outside of polyurethane elastic filament (Spandex, a brand name of one kind of polyurethane elastic fiber) with staple filament having fur-like touch, but the manufacturing process of said conjugate yarn is so complicated and there are many defects as follows:

1. Weak in caustic (NaOH) reduction denier reduction.
2. Poor to high-temperature dyeing and processing.
3. Complex processibility and high cost.
4. Uneasy process tension control, influence product quality.

Detailed Description

[0005] Viewing over the defects of the above prod-

ucts, through careful review on the selection of raw materials and researches and improvement on process technology, the inventor finally develops a manufacturing method for elastic fiber having fur-like touch. elastic fiber having fur-like touch made from the same, and fabrics woven by said fiber and reduces into practice.

[0006] The present invention of a manufacturing method for elastic fiber having fur-like touch which is characterized in spinning two kinds of thermoplastic polymer in different heat shrinkage characteristics by using same spinnerette arranged in side by side in the way of melt conjugate spinning with winding up velocity of m/min m/min, then heated to draw and set to form conjugate fiber having spiral structure like spring. Elastic yarn having crimp characteristic is spun as the core yarn of said conjugate fiber. Different heat shrinkage in used two kinds of thermoplastic polymer makes core yarn of conjugate fiber elastic and makes effect yarn of conjugate fiber low Young's modulus. This makes fiber having fur-like touch and fabrics woven by said fiber elastic

[0007] Said thermoplastic polymers used in the present invention which is spun to form conjugate fiber, subject to heat drawing and setting through draw twister under the drawing temperature being set as the glass temperature. Tg. of said thermoplastic polymer $\pm 50.$, setting temperature being set as the crystalline temperature (Tc) of said thermoplastic polymer to Tc+100., to get a core-sheath(effect) yarn having core shaped in the center and sheath covered in the outer layer; If the setting temperature is too low, crimp elasticity will not exhibit at all. While the setting temperature is too high, shrinkage difference becomes smaller to affect the elasticity of fabric.

[0008] Said core yarn having elasticity is formed by using thermoplastic polymer selected from the group of polyethylene terephthalate(PET), polybutylene terephthalate(PBT), poly trimethylene terephthalate(PTT) and their modified polymer,

[0009] Said sheath(effect) yarn is formed by using thermoplastic polymer selected from the group of polyethylene terephthalate(PET) and said modified thermoplastic polymer of crystalline retarded by third component; said modified thermoplastic polymer of crystalline retarded by third component is one or more than one selected from the group of orthophthalic acid, adipic acid, sebacic acid, isophthalic acid and terephthalic acid. Specification and kind of conjugate yarn can be prepared by one filament or more than one filament for the requirement of fabric gloss. Different amount of delustering agent or basic dyeable polymer can be added during the polymerization to produce elastic fabric having fur-like touch of different gloss or different color. Said effect yarn is made into pre-drawn filament via high speed spinning of 2400 meters/min to 4500 meters/min and then via heat drawing treatment. The treatment temperature is set as the crystallization temperature Tg. of said thermoplastic polymer $\pm 50.$ the treatment time is set as second. The effect yarn after treatment has

heat drawing characteristic with boiling water shrinkage rate below 2% at 130.

[0010] The core-effect yarn obtained from elastic fiber having fur-like touch as per the manufacturing method in this invention, is put into heat drawing treatment in the same process, then subject to form combined filament yarn via air nozzle, and the twisting count of 300~2300 T/M (twist/meter) is given as per the fabric texture density and hand feeling demand and the separately textured yarn can be combined by the combiner to entangle with each other ready for use. The weaving can be easily influenced due to the torque occurred in yarn after the yarn being highly twisted so the yarn should be heat set by steaming. Its treatment temperature is between 50 to 90, the residual twisting torsion(Kr value) of set yarn is below 3. High shrinkage combined filament yarn, such as textured yarn having fur-like touch (trademark: MILPA, Teijin corporation, Japan)is conventionally used, and corrugate paper or other stuffing object is used to reserve space in the inner layer for prevention of the shrinkage difference of core and effect yarn(outer and inner layer) in the core-effect yarn to affect the dyability when steaming. Said shrinkage differences always induce to undesirable stain (unevenness) in fabric quality.

[0011] Said core-sheath(effect) yarn is then subject to spin texturing to form fiber having heat drawing characteristic, and combining to tangle with each other by air nozzle to get elastic fiber having fur-like touch.

[0012] To give full play to elasticity effect the elongation rate of the effect yarn of fiber having fur-like touch obtained from as per the manufacturing method in this invention is 50~150% higher than that of the core yarn. Said fiber having fur-like touch is then subject to twisting to form core-effect yarn structure for use in warp yarn or weft yarn, regulated as per fabric texture to manufacture fabric having elastic elongation over 10%. The elasticity effect can be elevated and wearing comfortability can be highly satisfied. Additionally, elastic fiber having fur-like touch obtained from as per the manufacturing method in this invention has high temperature and acid-alkali resistance capable of high temperature dyeing and caustic reduction without influence on elasticity effect, and the effect yarn under heat drawing has thick dyeing effect meeting the demands for deep color fabric.

Explanation of an analysis method

[0013]

1. Crystallization temperature: yarn sample 1.0~2.0 mg; with differential scanning calorimeter (Perkin-Elmer DSC., temperature range 50~300., heating rate 20./minute), take the peak point of scanning crystallization temperature as crystallization temperature(Tc).
2. Elastic elongation rate: fabric sample in...cm X 30 cm length; with universal tensile testing machine

(INSTRON -6012); measure the initial length L_1 with initial load 12g; test the length L_2 under tension speed 1.667 mm/sec, recovery speed 10 mm/min constant tension 750g. The Elastic elongation rate can be expressed as following formula. Elastic elongation rate= $(L_2-L_1)/L_1 \times 100\%$

3. Twisting torsion(Kr value)

Put the yarn before and after setting on the five points of the upper and lower end of Kringelfakter meter, wind the yarn and fix the upper end, allow the lower end depart the supporting point, then hang the standard hook at the lower end, read the twisting count scale, take the five times mean value as twisting torsion.

Brief Description of the Drawings

[0014]

Fig. 1 illustrates the drawing equipment for carrying out the method of the invention.

Fig. 2 illustrates other drawing equipment for carrying out the method of the invention.

1. pre-oriented yarn A having potential crimped characteristic
2. modified pre-oriented yarn having spontaneously elongation characteristic
3. feed roller of drawing apparatus
4. heating roller
5. heating plate
6. drawing roller 1
7. drawing roller 2
8. air nozzle
9. heat drawn elastic yarn

Example

[0015] The present embodiments are to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein

Example 1

[0016] Two thermoplastic polymers with different heat shrinkage coefficient at the ratio of 50:50 are adopted by using same spinnerette arranged in side by side in the way of melt conjugate spinning to form conjugate fiber. The core yarn is spun under spinning temperature 285., 12 spinnerettes in spinning head, winding speed 3200m/min, wound to form pre-oriented yarn POY A(.) of 80d/12f. via the heating roller(4), heating plate(5), draw roller(6)of drawing machine shown as Fig.1.with draw ratio 1.6 times, drawing temperature 90 ., setting

temperature 160., drawn and heat set to get crimped elastic core yarn. While the effect yarn is spun by use of semi-dull polyester polymer under spinning temperature 290., 36 spinnerettes in spinning head, winding speed 3600m/min, wound to form pre-oriented yarn POY B(2), via drawing roller 1(6) and drawing roll .(7), to posses heat draw characteristic after 120. low tension heat treatment, 130. boiling water shrinkage rate of 1.0%. To entangle said two yarn after heat draw treatment via air nozzle (8) with each other to get elastic fiber having fur-like touch (heat drawn elastic yarn)(9) of 1000 d/48f.

[0017] Then, the elastic fiber having fur-like touch(9) is subject to twisting in the manner of 1100T/m, steaming to set (65 . x.5 min) for warping and battening, woven in 1/1 plain weave to form fabric. The fabric then is subject to relaxation treatment (120. x 20 min), pre-setting (160 x 30 sec). caustic reduction NaOH 3%, 95. x 60 min to reduction rate 10%, dyeing with disperse dyestuff (135 . x 60 min) and post- setting(160 . x 30 sec).The finished fabric has elasticity and fur-like touch, warp density of 160 stripes/inch and weft density of 90 stripes/inch, longitudinal elasticity of 15..traversal elasticity of 12%.

Example 2

[0018] Two thermoplastic polymers with different heat shrinkage coefficient at the ratio of 50:50 are adopted by using same spinnerette arranged in side by side in the way of melt conjugate spinning to form conjugate fiber. The core yarn is spun under spinning temperature 285., 12 spinnerettes in spinning head, winding speed 3200m/min, wound to form pre-oriented yarn POY A(.) of 50d/12f. A basic dyeable polymer is spun under spinning temperature 285., 36 spinnerettes(hole diameter 0.2 mm) in spinning head, winding speed 3200m/min, wound to form pre-oriented yarn POY B(2), via 100. heating roller(4), drawing roller(6)of drawing machine. shown as Fig.2, low tension heat treatment to get effect yarn having heat elongation characteristic. The 130. boiling water shrinkage rate of said effect yarn is 1.5 %, while the hot water(70.) shrinkage is 15%. The difference of elongation rate between POY A(.) and POY B (2) is 70%. To entangle said two yarn via air nozzle (8) with each other to get basic dyeable elastic fiber having fur-like touch(heat drawn elastic yarn) (9) of 1000 d/48f.

[0019] Then, the elastic fiber having fur-like touch(9) is subject to twisting in the manner of 1100T/m, steaming to set (65 x.0 min) for warping and battening, woven in dobby weave to form dobby cloth. The cloth then is subject to relaxation treatment (120. x 20 min),pre-setting(160 . x 30 sec), caustic reduction .NaOH 1%, 95. x 60 min.to reduction rate 10%, dyeing with basic dyestuff (120 x 60 min) and post- setting(160. x 30 sec).The finished cloth has different color and elasticity, warp density of 130 stripes/inch and weft density of 90 stripes/inch, longitudinal elasticity of 20..traversal elasticity of

15%.

Claims

1. manufacturing method for elastic fiber having fur-like touch which is **characterized in** :

spinning two kinds of thermoplastic polymer in different heat shrinkage characteristics by using same spinnerette arranged in side by side in the way of melt conjugate spinning to form conjugate fiber having spiral structure like spring;

heat drawing and setting said conjugate fiber through draw twister for second, the drawing temperature being set as the glass temperature.Tg. of said thermoplastic polymer $\pm$ 50., setting temperature being set as the crystalline temperature (Tc) of said thermoplastic polymer +100., to get a core-sheath(effect) yarn having core shaped in the center and sheath covered in the outer layer; said core yarn having elasticity is formed by using thermoplastic polymer selected from the group of polyethylene terephthalate(PET), polybutylene terephthalate (PBT), polytrimethylene terephthalate(PTT) and their modified polymer, and said sheath(effect) yarn is formed by using thermoplastic polymer selected from the group of polyethylene terephthalate(PET) and said modified thermoplastic polymer of crystalline retarded by third component;

spin texturing said core-sheath(effect) yarn to form fiber having heat drawing characteristic and combining to tangle with each other by air nozzle to get elastic fiber having fur-like touch.

2. The manufacturing method of claim1, said modified thermoplastic polymer of crystalline retarded by third component is one or more than one selected from the group of orthophthalic acid, adipic acid sebacic acidisophthalic acid and terephthalic acid.
3. An elastic fiber having fur-like touch, which is **characterized in** being made from the manufacturing method according to claim 1, wherein the elongation rate of the outer effect(sheath) yarn is 50%~150% higher than that of the center core yarn, said fiber is formed into core-sheath structure by draw twisting and used for warp or weft.
4. An elastic fabric having fur-like touch, which is **characterized in** being woven or knitted from the fiber made from the manufacturing method according to claim 1~3 to get a fabric having an elastic elongation over 10%.

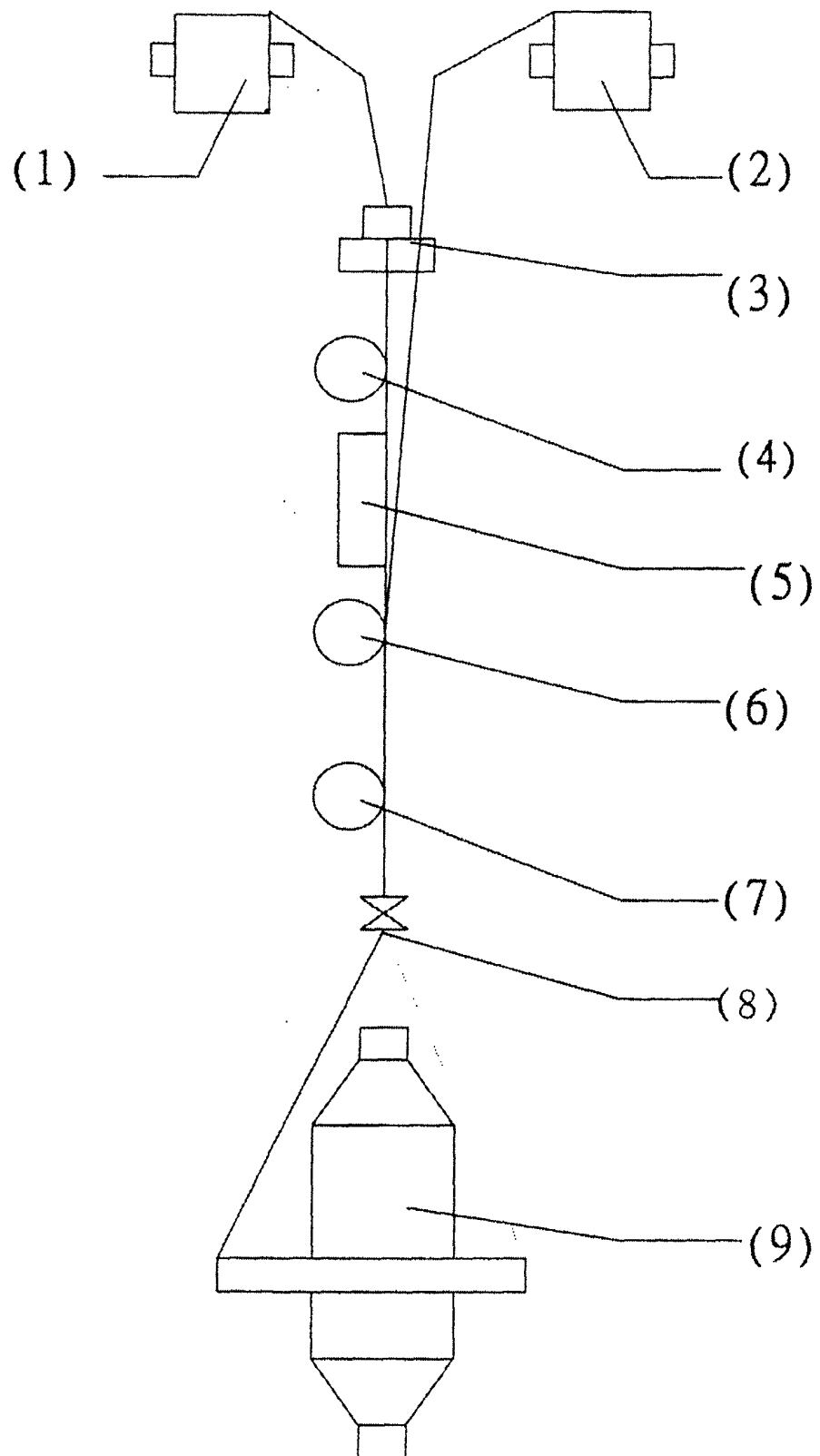


Fig. 1

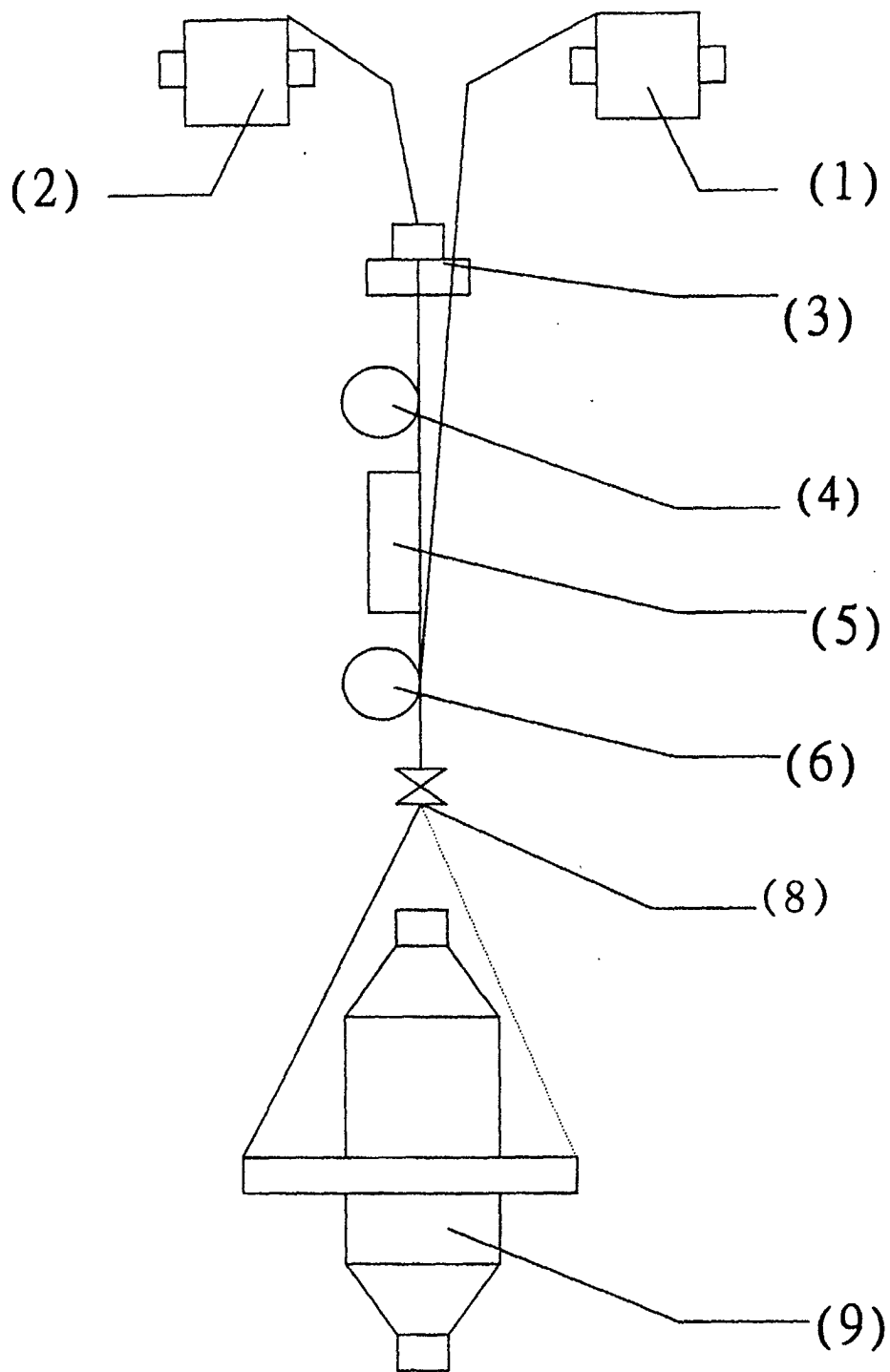


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 02 02 6478

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 5 June 2003	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	

EPO FORM 1503 03.82 (P04C01)



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Application Number
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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