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(54) **Title:** PRODUCTION OF SOFT YARNS

(57) **Abstract:** This invention relates to a process for the preparation of synthetic fibres for yarns, in which a polymer mass is melted under pressure and then forced through a spinning block to form fibres, and in which the fibre bundle thus obtained is cooled, wherein a slip agent and a softening polymer are added to the molten polymer stream, so that the hand of the synthetic fibres are improved. The invention also relates to the synthetic fibres for yarns, made in this way. The invention further relates to the use of a slip agent in combination with a softening polymer in the production of synthetic yarns for carpets as a means for improving the softness of the produced synthetic fibres.

PRODUCTION OF SOFT YARNS

The present invention relates to a process for the preparation of synthetic fibres for yarns for carpets or rugs, in which a polymer mass is melted under pressure and then
5 forced through a spinning block to form fibres, and in which the fibre bundle thus obtained is cooled. The invention also relates to the synthetic fibres for yarns, made in this way.

Synthetic fibres are some of the starting materials used in the rug and carpet (textile
10 floor coverings) industry, along with natural fibres such as cotton, wool and silk, for example. For making such fibres, synthetic starting materials are supplied in the form of granulates or particles, examples being polyamides (PAs), polyesters (PET or PESs), polypropylene (PP) and polyethylene (PE). These starting materials are converted into synthetic fibres by melting, and the semi-finished product thus
15 obtained is used as the starting material for further processing in the textile industry.

Synthetic textile fibres can be either staple fibres or filaments, depending on their length:

- staple fibres or simply "fibres" have a fairly short length of a tens or
20 hundreds of millimetre, while
- filaments have a continuous length of thousands of metres.

Fibres can be spun into yarns in spinning mills. Filaments, on the other hand, are taken together to form a bundle of fibres, or in particular a bundle filaments, at the
25 bottom of a spinning shaft. The number of filaments involved here varies according to the quality and the application envisaged. Yarns are used to make woven fabrics, carpets, knitwear and clothes.

Synthetic fibres are marketed in various forms, such as continuous fibres (CF), bulked continuous fibres (BCF), staple fibres, tapes and monofilaments, which have the following characteristics:

- continuous fibres are endless untextured yarns
- 5 - bulked continuous fibres are endless but textured or bulked yarns, which
- have been made fuller by texturing or bulking
- staple fibres are filaments that have been cut into fibres for further
- processing and can be used either in spinning mills or for making non-
- woven materials
- 10 - tapes are made by cutting a film and are often used as a starting material
- in
- the production of packaging materials or for the backing and/or binding
- of carpets, and
- monofilaments are threads consisting of only one fibre.

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In the production of synthetic fibres for yarns for rugs and carpets, polypropylene homopolymer is often used and has economic and physical advantages, e.g. stain free and a low cost compared to other polymers. The major inconvenience is the “hand” of polypropylene rugs. When touching a cut pile rug a “crispy” feeling is typical for

20 PP BCF yarns. An enhanced “hand” can be obtained by the use of softening spinoils or transforming BCF yarn into heatset yarn and by decreasing the size of the filaments (dpf). Most filaments for carpet use are Y-type (trilobal) and have a dpf between 7 – 18 for rug use.

The extrusion of a yarn with a dpf lower than 10 requires perfectly tuned machines, experienced operators, and prime grade polymers and masterbatches because

25 filaments are highly fragile and the melt strength is often too low to assure steady extrusion conditions. The overall aspect of softness of a rug or carpet is not only a matter of properties of the used yarn, but also strongly influenced by the pile height and the pile density.

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In automotive applications it is known by those skilled in the art to use various copolymers to improve the touch, the toughness and flexibility of polypropylene. Most used polymers are copolymers of ethylene and other alfa-olefins, SEBS, EVA, EMA, EEA, EBA and copolymers of polypropylene with other alfa-olefins. These copolymers are commercial available products and are highly compatible with homo or co-polypropylene and have a low glass transition temperature and a rather low degree of cristallinity. LDPE is a homopolymer but is also known to soften blends with PP. The modern copolymers are however specially engineered as modifier.

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These polymers can modify the cristallinity of PP, modify the amorphous polypropylene domains flexibility, glass transition temperature and may alter the surface properties of the polypropylene blend object. A number of parameters (tensile strength, notch izod impact strength, Young modulus, toughness, flexural modulus) used to characterise polymers are altered by using these modifiers.

Also in the production of yarns or fibres, the use of various copolymers added to polyolefins in order to improve the touch, elasticity and softness have been described. However, when applied in carpet yarn production, the touch of the rug or carpet is not remarkably improved and modification of the physical aspects is only noticed at higher doses, creating unwanted side effects (increased shrinkage during heatsetting of the yarn, increased flammability, reduced crimp and hence bulk, reduced resilience, reduced stain resistance). Especially, sometimes extrusion of BCF yarn at high, economical acceptable, speed becomes difficult. Another problem is the resilience of the yarn and aspect of the pile "point" (the aspect that all filaments remain close creating an aspect of a spun yarn) after heatsetting. This will render these yarns unusable for rug manufacturing. In most patents describing the use of copolymers in order to soften polyolefins, the addition of auxiliary products is described e.g. slipagents, delustering agents, fillers.

US 3.985.933 discloses a blend of polypropylene and 0,5 % to 30 % of a rubber selected from the group of polybutadiene or polystyrene/polybutadiene blockcopolymers for fibre production.

5 US 4.769.279 discloses a fibre of ethylene acrylic copolymers with other fibre forming polymers.

US 4.774.277 discloses a composition useful in the preparation of film and fibres which is soft comprising polyolefin plastics blended with an elastomeric plasticizer, the latter comprises polyethylene or a copolymer of ethylene and an unsaturated ester
10 of a lower carboxylic acid, olefinic elastomer and hydrocarbon oil.

WO 2004/081087 discloses a fibre (slit or meltspun) containing a polypropylene polymer and from 1 to 30 % weight of at least one ethylene – acrylate copolymer.
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US 2002/0099107 discloses a textile fibre including polypropylene blended with an impact modifier (EPDM, SEBS, SEPSEP).

WO 96/16122 discloses a composition containing 70 – 95 % weight of one or more monovinylidene aromatic monomer conjugated diene block copolymer and from 5 to
20 30 part% weight of a thermoplastic polymer comprising a copolymer comprising a monovinylidene aromatic monomer and an anhydride, polystyrene, polyethylene, an ethylene vinylacetate copolymer or a mixture thereof.

25 WO 99/46435 discloses fibres comprising alfa-olefin/vinyl or vinylidene aromatic and/or hindered cycloaliphatic or aliphatic vinyl or vinylidene interpolymers.

US 2005/0106978 discloses articles and non woven fabrics with improved elastic properties composed of a blend of a polypropylene polymer and an alpha-olefin
30 copolymer component.

The aim of the present invention is to provide a process for the preparation of synthetic fibres for yarns, in particular BCF production, with an improved hand, easy to extrude and without unwanted side effects on the final product.

5 The aim of the invention is achieved with a process for the preparation of synthetic fibres for yarns for carpets or rugs, in which a polymer mass is melted under pressure and then forced through a spinning block to form fibres, and in which the fibre bundle thus obtained is cooled, wherein prior to extrusion a slip agent and a softening polymer are added to the molten polymer stream, so that the hand of the synthetic
10 fibres are improved.

In this description the expression slip agent has to be understood as slip agent and/or anti-blocking agent because the expressions slip agent and anti-blocking are frequently used in many publications concerning the state of the art, to describe a
15 group of product having a similar result when applied on polymer films, avoiding polymer films to block or to stick together. Some chemicals reduce the coefficient of friction of the polymer surface, others reduce the Van der Waals forces between two film layers by reducing the contact surface between the films. In this description we use the expression "slip agent", without wanted to be bound to the type of
20 mechanism at the origin of the observed result, a decreased friction between the polyolefin filaments.

Because it's unavoidable to use spinoil in yarn production, in particular in BCF extrusion of yarns, in order to achieve a more flexible way of operations (different
25 types of spinoils and different doses are in use taking into account further requirements and processes), it isn't obvious to add a slip agent to the molten polymer stream, certainly when you know that adding a slip agent may cause problems during texturising of the yarn due to a lack of friction, or during back coating of the final rug or carpet (pile binding). Furthermore, none of the prior art
30 documents claims the slip agent as one of the essential components in order to obtain

a soft yarn, particularly adequate in rugs and carpet manufacturing. High doses of common slipagents (e.g. erucamide, stearamide) added to polypropylene in carpet yarn production create insurmountable problems with pile binding of the yarn in the rug or carpet using classical latex formulas.

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As a softening polymer we understand a polymer modifier with the aim of toughening and flexibilising the resulting blend. The combination of a slip agent and a softening polymer (modifier) greatly improves the hand of the synthetic fibres by lowering the friction between filaments, reducing the flexural modulus and modifying the surface properties of the polymer.

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In a preferred embodiment of the process according to the present invention the softening polymer is selected from the group consisting of ethylene alkylacrylate copolymers, ethylene vinylacetate copolymers, ethylene co- α -olefin polymers, propylene co- α -olefin polymers or a blend from these different polymers. In particular the softening polymer is a ethylene methylacrylate copolymer (EMA).

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If the softening polymer in the blend is highly compatible and improves the rheology of the blend finer dpf yarns can be extruded, further enhancing the softness of the yarn. Finer dpf yarns relates to yarns with a dpf lower than 10.

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Ethylene alkylacrylates are particularly useful in this application. The used ethylene alkyl acrylates are copolymers of ethylene and alkylacrylates wherein the alkyl moiety contains from one to six carbon atoms. EMA is a copolymer of ethylene and methylacrylate. EEA is a copolymer of ethylene and ethyl acrylate, and EBA is a copolymer of ethylene and butylacrylate. In particular the softening polymer is an ethylene methylacrylate copolymer (EMA). An advantage of EMA as a polymer modifier for BCF production is the excellent spinability of the polymer mass allowing the production of finer filaments at a high speed, the temperature resistance during processing, a good dispersion of pigments and the general aspect and aesthetics of the final fibre.

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Without wanted to be limited by this example, useful for our application is especially
EMA with a methylacrylate copolymer content from 10 - 30 weight percent, and in a
preferred case a content of 20 % methylacrylate. The MFR of the EMA (ISO1133 at
190 °C and pressure of 2,16 kg) is selected in order to optimise the blend (dispersion
5 in the polypropylene matrix), and in case of the fibre quality homo polypropylene
(MFR 25 at 230°C and 2,16 kg), a MFR of 8 is used in these experiments, also a
MFR of 20 has been used with the same polypropylene quality.

10 In the case of EVA copolymer, a copolymer of ethylene and vinylacetate, a vinyl
acetate content from 10 - 40 % by weight could be used, as an example good results
were obtained with a 28 % vinylacetate content, and a MFR of 25 (ASTM 1238/ ISO
1133).

15 In a particularly preferred embodiment of the process according to the present
invention, the softening polymer is added in an amount of between 1 and 20 wt-%. In
fact, it is preferable added in an amount of between 1 and 15 wt-%, especially in an
amount of between 1 and 8 wt-%.

20 In a more preferred embodiment of the process according to the invention, said slip
agent is selected from the group consisting of N,N'-alkylene-bis fatty acid amides
having a general structural formula $R-CO-NH-(CH_2)_n-NH-CO-R'$ wherein R and R'
are identical or different alkyl or alkenyl groups with 15 to 21 carbon atoms, -CO- is
a carbonyl group and n is an integer from 2 to 4.

25 Preferably, said slip agent is used pure or as a mixture.

Examples of N,N'-alkylene-bis-fatty acid amides are N,N'-ethylene-bisstearamide,
N,N'-ethylene-bisoleamide, N,N'-ethylene-bisbehenamide, N,N'-ethylene-
biserucamide, N,N'-propylene-bisstearamide, N,N'-butylenebisoleamide.

Preferably said slip agent is a N,N'-alkylene-bis fatty acid amide, in particular N,N'-ethylene-bisstearamide (UIPAC: N-(2-octadecanoylaminoethyl) octadecanamide, (CAS number 110-30-5 , Chemical formula C₃₈H₇₆N₂O₂)).

5 In a particularly preferred embodiment of the process according to the present invention, said slip agent is added in an amount of between 0.1 and 3 wt-%. In fact, it is preferable added in an amount of between 0.1 and 2 wt-%, especially in an amount of between 0.3 and 1.3 wt-%.

10 In a most preferred embodiment of the process according to the invention the polymer mass comprises polypropylene homopolymer and/or polypropylene copolymer. The polymer mass may also comprise a non miscible polymer selected from the classes of the polyamides, polyesters and/or polystyrene homo or copolymers.

15 In a particularly preferred embodiment of the process according to the present invention, said process further comprising heatsetting the obtained fibre bundle. The obtained fibre bundle is preferably heatsetted at a temperature in the range of 120 °C to 160 °C.

20 Another aspect of the present invention relates to synthetic fibres for yarns wherein said fibres comprise a slip agent and a softening polymer so that the hand of the synthetic fibres are improved. A process as described above preferably produces the synthetic fibres in question.

25 In a preferred embodiment of the fibre according to this invention, the fibre comprises between 89 and 98 wt-% polypropylene, between 1 and 10 wt-% EMA and 1% N,N'-ethylene-bis-stearamide (EBS).

In another preferred embodiment of the fibre according to this invention, the fibre comprises between 89 and 98 wt-% polypropylene, between 1 and 10 wt-% EVA and 1% N,N'-ethylene-bisstearamide (EBS).

5 Twisting, cabling and heatsetting can further process the fibre according to this invention. In particular the fibre according to the invention can be used for the manufacturing of interior textile, rugs, carpets and upholstery.

10 This invention relates further to the use of a slip agent in combination with a softening polymer in the production of synthetic yarns for carpets or rugs as a means for improving the softness of the produced synthetic fibres.

15 The used softening polymer is preferably EMA or EVA, because of there more polar nature than polyolefin, and the relatively low melting point, both having a positive effect on pile binding. Most preferably, the used softening polymer is EMA because of a more thermostable behaviour compared to EVA at 230 – 250 °C and the low coefficient of friction of the EMA polymer. Preferably, the slip agent should have a melting temperature above 75 °C, and most preferably above 105 °C. The used slip agent is preferably N,N'-ethylene bisstearamide. The melting point of N,N'-ethylene
20 bisstearamide is 135 – 146 °C and boils at 260 °C. The final carpet yarn is soft due to a low degree of friction between the filaments, but has no “greasy” touch mostly found by liquid or low temperature melting slip agents. Pile or tuft binding using SBR latex coating is good.

25 The following more detailed description of the process according to the invention is given to illustrate the features, advantages and special characteristics of the invention in more detail. However, it will be obvious that the scope of protection sought in the claims in respect of the synthetic fibres according to the invention is not restricted by anything stated in the following description.

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To produce synthetic fibres for yarns, in particular yarns for rugs or carpets, by the process according to the invention, a polymer mass is first melted under pressure and then forced through a spinning block to form fibres, after which the resulting bundle of fibres is cooled. A continuous process produces the synthetic fibres. The individual filaments may be of any cross-sectional shape, including trilobal, round, multilobal, deltashape, hollow, etc... .

A synthetic starting material, preferably a homopolypropylene (PP) or a random or block copolymer of propylene and ethylene or a blend of both polymers, supplied in granulate or particulate form, is melted under pressure in a melting device, which may be an extruder, for example. In order to improve the hand and softness of the produced fibres, a slip agent in combination with a softening polymer are added to the molten polymer stream (see example 1) prior to extrusion. The slip agent and the softening polymer may be added directly in the extruder on a BCF carpet yarn extrusion line, or preferably a masterbatch may be prepared in order to add the components to the polypropylene before extrusion. A compound containing all the fibre constituents may also be prepared. Colour masterbatch and any other classical adjuvant (e.g. UV stabiliser) may also be added by adequate dosing equipment.

The combination of a slip agent and a softening polymer (modifier), such as for example EMA, greatly improves the hand of the synthetic fibres and the rugs or carpets made thereof. We add between 1 and 20 wt-% softening polymer, in particular EMA and between 0.1 and 3 wt-% slip agent, preferably N,N'-ethylene-bisstearamide. The use of a softening polymer permits a lower amount of slip agent to be used, hence improving softness without unwanted side effects (pile binding, greasy touch of the carpet pile). This has been demonstrated by the following test.

Following yarns have been produced and the aspect has been evaluated by a test panel on pompons made of the produced yarns. Softness and touch is appreciated, from 1 (hard) to 5 (soft) by a team of experienced yarn specialists. Since "touch" of a

carpet or rug is a complicated matter, since tactile sensation is influenced by flexibility, friction, hydrophobic-hydrophylic behaviour of the surface, normalised test for non woven product (Handle-o-meter) of for mattress covers (Draper test Norm BS 5058: 1973) are not applicable.

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	Polypropylene (%)	EMA (%)	EBS (%)	Results softness test panel
Ref.	100	-	-	1
Sample 1	95	5	0	2
Sample 2	95	4	1	5
Sample 3	99	0	1	3
Sample 4	98	0	2	4

This experiment shows that the required properties, softness and touch of the final yarn, can be successfully obtained by a low amount of slip agent in presence of a softening polymer modifier hence avoiding unwanted side effects with higher levels of slip agent. According to our knowledge, no prior art documents disclose the use of slip agents, and in particular slip agents with a high melting point and most in particular N,N' – alkyl-bis-fatty acid amides in polyolefin yarns for carpet production as softness enhancing adjuvant and the impact of a softening polymer in order to keep the concentration of the slip agent low enough to prevent unwanted side effects like insufficient pile binding and a greasy touch of the yarn.

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Example 1

We prepare a softening masterbatch containing one part w/w of N,N'-ethylene-bisstearamide and 4 parts w/w EMA (Dupont Elvaloy AC 1820).

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An industrial BCF extruder (Rieter) is fed with 5 % w/w of the above mentioned masterbatch, 2 % of a colour masterbatch, and 93 % polypropylene.

The extrusion is carried out in standard conditions (temperature extruder 245 °C), known by those skilled in the art, and a 2150 dtex, 138 filament or 210 filament trilobal yarn is produced. The softening masterbatch has no negative effect on extrusion speed and efficiency.

5

The obtained yarn has classical values for crimp and shrinkage and has a very soft hand. Heating up the yarn samples during 3 minutes in an oven at 100 – 135 °C will increase the migration speed of the slip agent and accelerate the development of the soft hand of the yarn. In industrial conditions, the yarn will be heated during heatsetting or during the backcoating of the rug or carpet and the soft aspect will be developed. A test panel identifies the modified fibre according to the invention as a soft hand yarn.

10

A rug is produced on a double rapier loom Reed 318/8 core with a 2150 dtex-138 Y soft yarn according to the invention and with a reference yarn (according to the state of the art, thus without a slip agent in combination with a softening polymer modifier). After weaving, the rug is finished on a latex backing line and an SBR based latex is used to assure the pile binding. After shearing and drying a test panel evaluated the strips and identified unanimously the modified yarn as being softer than the reference yarn. The typical “crispy” feeling of unmodified polypropylene BCF has completely disappeared. Pile binding is excellent.

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Example 2

A blend of 90 % homopolypropylene, 9% polypropylene-co-alfa-olefin (Exxon Vistamaxx VM 3000, MFR at 230 °C: 8) and 1% EBS is extruded with a colour masterbatch and a 2150 dtex and 138 filament yarn is produced on an industrial line at 2400 m/minute. The final yarn is soft and has a good hand.

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Example 3

5 A blend containing 95% w/w polypropylene homopolymer, 4 % w/w EVA (ethylene vinyl acetate copolymer containing 28 % vinyl acetate) and 1 % w/w EBS (N,N'-ethylene-bis-stearamide) is extruded with a colour masterbatch and a 2150 dtex and 138 filament yarn is produced on an industrial line at 2400 m/minute. The final yarn is soft and the rug made thereof has a strongly improved touch compared to a standard non modified reference sample.

CLAIMS

- 1 Process for the preparation of synthetic fibres for yarns for carpets or rugs, in
5 which a polymer is melted under pressure and then forced through a spinning
 block to form fibres, and in which the fibre bundle thus obtained is cooled,
 characterized in that prior to extrusion a slip agent and a softening polymer
 are added to the molten polymer stream, so that the hand of the synthetic
 fibres are improved.
- 10 1. Process according to claim 1, **characterized in that** the softening polymer is
 selected from the group consisting of ethylene alkylacrylate copolymers,
 ethylene vinylacetate copolymers, ethylene co-alfa-olefin polymers,
 propylene co-alfa-olefin polymers or a blend from these different polymers.
- 15 2. Process according to claim 1 or 2, **characterized in that** the softening
 polymer is a ethylene methylacrylate copolymer.
- 20 3. Process according to one of the preceding claims, **characterized in that** the
 softening polymer is added in an amount of between 1 and 20 wt-%.
- 25 4. Process according to any one of the preceding claims, **characterized in that**
 said slip agent is selected from the group consisting of N,N'-alkylene-bis
 fatty acid amides having a general structural formula
 R-CO-NH-(CH₂)_n-NH-CO-R' wherein R and R' are identical or different
 alkyl or alkenyl groups with 15 to 21 carbon atoms, -CO- is a carbonyl group
 and n is an integer from 2 to 4;
- 30 5. Process according to claim 5, **characterized in that** said slip agent is used
 pure or as a mixture.

6. Process according to any one of the preceding claims, **characterized in that** said slip agent is N,N'-alkylene-bisstearamide.
7. Process according to any one of claims 1 to 6, **characterized in that** said slip agent is N,N'-ethylene-bisstearamide.
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8. Process according to any one of the preceding claims, **characterized in that** said slip agent is added in an amount of between 0.1 and 3 wt-%.
- 10 9. Process according to any of the preceding claims, **characterized in that** the polymer mass comprises polypropylene homopolymer and/or polypropylene co-polymer.
- 10 10. Process according to any one of the preceding claims, **characterized in that** said process further comprising heatsetting the obtained fibre bundle.
15
11. Synthetic fibres for yarns, **characterized in that** said fibres comprise a slip agent and a softening polymer so that the hand of the synthetic fibres are improved.
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12. Synthetic fibres for yarns according to claim 12, **characterized in that** the said synthetic fibres are made by a process specified in any one of claims 1 to 11.
- 25 13. Use of a slip agent in combination with a softening polymer in the production of synthetic yarns for carpets as a means for improving the softness of the produced synthetic fibres.

14. Use of a slip agent according to claim 14, **characterised in that** said slip agent is N,N'-ethylene-bis stearamide and said softening polymer is ethylene methylacrylate copolymer.

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER INV. D01D5/08 D01F1/02 D01F1/10 D01F6/00		
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) D01D D01F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006/118794 A (EXXONMOBIL CHEM PATENTS INC [US]; LIN CHON-YIE [US]; CHAPMAN BRYAN R []) 9 November 2006 (2006-11-09) the whole document	1-14
X	US 4 774 277 A (JANAC KAREL C [US] ET AL) 27 September 1988 (1988-09-27) the whole document	1-14
X	WO 96/16122 A (DOW CHEMICAL CO [US]) 30 May 1996 (1996-05-30) the whole document	1-14
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> 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 *E* earlier document but published on or after the international filing date *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 3 March 2008		Date of mailing of the international search report 10/03/2008
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer Lux, Rudolf

INTERNATIONAL SEARCH REPORT

Information on patent family members

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