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(54) **FILLED BICOMPONENT FILAMENT**

(57) Bicomponent filament comprising a filler, where-
in said filler is between 4% and 30% by weight of said
filament, said filler comprising at least two among baryte,

aluminum powder and calcium carbonate, preferably all
of baryte, aluminum powder, and calcium carbonate.

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of bicomponent synthetic filaments, and in particular the field of nonwoven fabrics made from such synthetic filaments.

KNOWN PRIOR ART

[0002] Synthetic filaments adapted to produce a nonwoven fabric are known. Such synthetic filaments are typically made of polymer materials. Furthermore, adding fillers to the polymer materials that form such filaments is known in order to vary the properties of the synthetic filaments.

[0003] For example, it is known to add metal materials to increase the electrical conductivity of the filaments, when needed. The use of minerals to make nonwoven fabrics that insulate against radiation is also well known.

[0004] It is further known that synthetic materials are typically thermally insulating, so they retain heat.

[0005] Minerals are typically good thermal conductors, so that the thermal conductivity of filaments can be increased with metal fillers.

[0006] However, there is no known composition of a filled filament adapted to make a nonwoven fabric that allows effective heat transfer, and adapted to be used in specific fields where flexibility or malleability is also required, for example in the field of footwear or in the construction field, as reinforcement or wall insulation, etc.

[0007] It is therefore object of the present invention to provide a filament, and a related nonwoven fabric, which allows fast heat transfer while having, at the same time, mechanical properties suitable for use in specific fields such as the footwear field or the construction field.

[0008] These and other objects are achieved by the present invention according to one or more of the appended claims.

[0009] Specifically, the present invention relates to a filament and a nonwoven fabric according to the independent claims. Preferred aspects are set forth in the dependent claims.

[0010] According to an aspect of the present invention, a bicomponent filament comprises a filler, wherein said filler is between 4% and 30% by weight of the bicomponent filament. The filler comprises at least two elements selected from baryte, aluminum powder and calcium carbonate, preferably all three of the elements discussed.

[0011] Such a composition of the filler allows the filament, and thus the nonwoven fabric comprising that filament, to have the desired mechanical and thermal properties, in particular allowing rapid heat transfer and being flexible and easily conformable. The percentage of filler can be adjusted according to the required properties.

[0012] As discussed, the filler comprises at least two elements selected from baryte, aluminum powder and calcium carbonate. However, additional mineral materials may be comprised.

[0013] Typically, each of the elements in the filler is between 2% and 15% by weight of the yarn. Therefore, if baryte is present, it is between 2% and 15% by weight of the yarn, if aluminum powder is present, it is between 2% and 15% by weight of the yarn, and if calcium carbonate is present, it is between 2% and 15% by weight of the yarn. If additional minerals are present, they are typically in smaller amounts than each of the other elements named above (baryte, aluminum powder and calcium carbonate). According to a preferred aspect, the bicomponent filament has core-sheath or side-by-side configuration.

[0014] According to an aspect, the filament comprises a first component made of PP and a second component made of HDPE, or their copolymers, or a first component made of PA and a second component made of PET, or their copolymers.

[0015] According to an aspect, in both the first component and the second component there is the filler.

[0016] An aspect of the present invention further relates to a nonwoven fabric comprising filaments according to one or more of the preceding claims, wherein preferably at least 50% of the filaments are made according to one or more of the preceding aspects, more preferably comprising exclusively filaments according to one or more of the preceding aspects.

[0017] An aspect of the present invention further relates to a process for making a nonwoven fabric, comprising the step of extruding a plurality of filaments according to one or more of the preceding aspects, cooling, drawing and depositing these filaments, comprising the step of heating these filaments so as to crimp them.

[0018] The heating step can be carried out before filament deposition, or after filament deposition.

[0019] Multiple embodiments of the present invention will now be described, by way of example only and without limitation.

DETAILED DESCRIPTION OF SOME EMBODIMENTS OF THE PRESENT INVENTION

[0020] A bicomponent filament consists of two components typically made of polymer material.

[0021] The two components can be arranged in different configurations (i.e., different geometries), although preferred configurations are side-by-side or core-sheath.

[0022] Preferably, in section, the geometry of the components is asymmetrical. Specifically, in side-by-side configuration, the contact surface between the components has at least one inflexion and the first component forms at least one protrusion within the second component. Such protrusion has progressively decreasing width.

[0023] The "width" of the protrusion is measured along a direction parallel to a straight line joining the ends of the

contact surface section, that is, the points where the contact surface touches the edge of the filament section.

[0024] In case of core-sheath configuration, the core is preferably eccentric, that is, not concentric with the sheath. As a matter of fact, this configuration is known in the art as eccentric core-sheath.

[0025] According to a possible aspect, the volume ratio of the two components in the bicomponent filament is between 1:4 and 4:1.

[0026] According to an aspect of the invention, the first and second components are made of materials having different viscosities from each other, preferably with a difference of more than 20%, when measured by the same method and under the same conditions. In other words, the value of the viscosity of the material of the first component is different from the value of the viscosity of the second filament, with the difference preferably exceeding 20%.

[0027] The two components are formed from materials preferably having melting temperatures different from each other by at least 10°C. In other words, the melting temperature of the first component is different from the melting temperature of the second component by at least 10°C, preferably by at least 20°C.

[0028] Preferably, the component with material with lower melting temperature is also the one with lower viscosity.

[0029] Such differences allow the bicomponent filament to be crimped. Actually, bicomponent filaments with these characteristics can be heat-treated, usually heated, so as to cause different behavior (typically shrinkage) between the two components. The bicomponent filament therefore tends to bend, that is, to generate a crimp.

[0030] Such crimp can be performed on the filaments before or after the formation of the nonwoven fabric.

[0031] Specifically, a nonwoven fabric is typically formed by deposition of a plurality of filaments on a supporting, typically movable, surface. The filaments are arranged and overlapped on this surface in an at least partially random manner to form a layer of filaments, that is, a nonwoven fabric. Thereafter, this layer can be consolidated by means of known treatments, either thermal (typically by heating) and/or mechanical (calendering, needle-felting, etc.).

[0032] Therefore, tissue crimping can be performed during the fall (before the formation of the nonwoven fabric), or after deposition (i.e., after the formation of the nonwoven fabric).

[0033] A nonwoven fabric with crimped filaments has greater volume, and in particular greater thickness, compared to a corresponding nonwoven fabric made from the same filaments that are not crimped.

[0034] Therefore, crimped filaments (and thus a nonwoven fabric comprising such filaments) are a preferred embodiment of the present invention. Embodiments in which the filaments are not crimped, that is to say their bending is basically caused solely by deposition on the

deposition surface, are still possible.

[0035] Different material couplings can be used for the two components. Preferred couplings are PP-HDPE and PA-PET, or their copolymers. These acronyms are familiar to the field technician and, in particular, PP stands for polypropylene, HDPE stands for high-density polyethylene, PA stands for polyamide and PET stands for polyethylene terephthalate.

[0036] The bicomponent filament is filled. Preferably both components are filled, typically differently from each other (i.e., with at least weight percentages different from each other). The possibility of filling only one component of bicomponent filaments cannot be excluded.

[0037] As discussed, the filler is between 4% and 30% by weight of the filament.

[0038] The filler comprises at least two of baryte (or barium sulphate), aluminum powder and calcium carbonate, preferably all three these components.

[0039] The yarn preferably comprises baryte between 2% and 15%, calcium carbonate between 2% and 15% and aluminum powder between 2% and 15% by weight. In this case, if all three components are present, the minimum total filler is at least 6%. Therefore, a nonwoven fabric made according to the invention comprises bicomponent filaments as discussed above. Preferably, at least 50% of the filaments are made according to the invention. Preferred nonwoven fabrics comprise exclusively (or at least 90% of) bicomponent filaments made according to the invention.

[0040] The nonwoven fabric can be made according to various methods. Preferably, the nonwoven fabric is made by a spunbond process, whereby filaments are extruded from a spinneret (typically by co-extrusion of the two components), then cooled, drawn (mechanically, for example by rollers or, more typically, aerodynamically) and finally deposited on a moving surface.

[0041] Preferably, during their fall to the moving surface or, more commonly, after deposition, the filaments are crimped to form a voluminous nonwoven fabric.

[0042] After deposition, the nonwoven fabric may be treated in known ways, such as heat-treated (by heating) and/or heat-treated (calendering, binding, etc.). Heat and mechanical treatments can be carried out either sequentially or simultaneously (e.g. by heated calender or by mechanical treatment performed within a furnace, etc.).

Claims

1. Bicomponent filament comprising a filler, wherein said filler is between 4% and 30% by weight of said bicomponent filament, said filler comprising at least two of baryte, aluminum powder and calcium carbonate, preferably all of baryte, aluminum powder, and calcium carbonate.
2. Bicomponent filament according to claim 1, wherein said bicomponent filament has core-sheath or side-

by-side configuration.

3. Bicomponent filament according to one or more of the preceding claims, comprising a first component made of PP and a second component made of HDPE, or their copolymers, or a first component made of PA and a second component made of PET, or their copolymers. 5

4. Bicomponent filament according to one or more of the preceding claims, wherein said filament comprises at least two of: 10
 - 2 to 15% baryte
 - 2 to 15% aluminum powder 15
 - 2 to 15% calcium carbonate

5. Bicomponent filament according to one or more of the preceding claims, comprising a first component and a second component, wherein said filler is present in both the first component and the second component. 20

6. Nonwoven fabric comprising filaments according to one or more of the preceding claims, wherein preferably at least 50% of the filaments are made according to one or more of the preceding claims, which more preferably comprise exclusively filaments according to one or more of the preceding claims. 25
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7. Nonwoven fabric according to claim 6, wherein said filaments are crimped.

8. Process for making a nonwoven fabric, comprising the step of extruding a plurality of filaments according to one or more of claims 1 to 5, cooling, drawing and depositing said filaments, comprising the step of heating said filaments so as to crimp them. 35

9. Process according to claim 8, wherein said heating step is carried out before filament deposition. 40

10. Process according to claim 8, wherein said heating step is carried out after filament deposition. 45

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EUROPEAN SEARCH REPORT

Application Number

EP 23 21 0460

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A	* paragraphs [0008], [0013], [0045], [0048], [0050], [0057], [0065], [0077], [0108], [0113], [0118], [0121] *	4	D01F1/10 D01F8/06 D01F8/14 D04H3/16 D01F8/12
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			D01F D04H
Place of search			Examiner
The Hague			Van Beurden-Hopkins
Date of completion of the search			
1 May 2024			
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