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(54) **THREAD OR SEWING THREAD, AND METHOD FOR PRODUCING A THREAD OR A SEWING THREAD**

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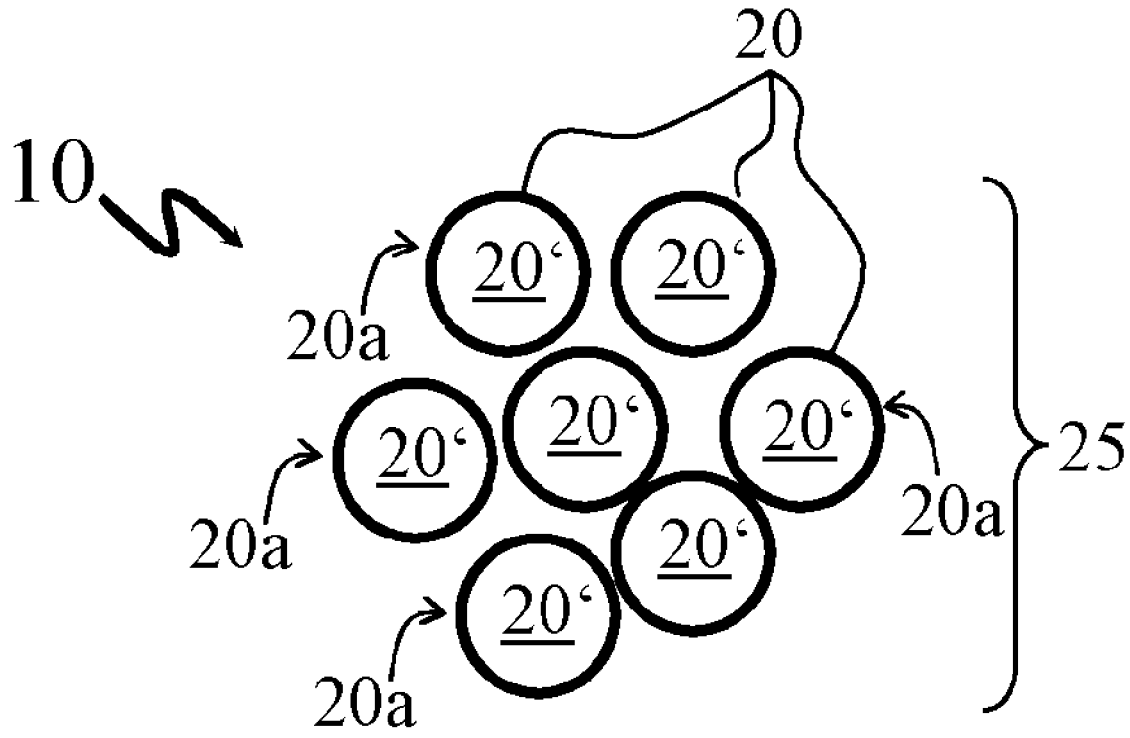
(57) **ABSTRACT**

A sewing thread is formed as a staple fiber thread. The staple fiber thread is formed as a spun fiber thread from a staple fiber material with or from staple fibers. The staple fibers are or contain carbon fiber materials. A certain proportion or all of the staple fibers are wholly or partially coated or impregnated as individual fibers, as groups of individual fibers, or as a whole, with one or a plurality of coating materials and/or impregnation materials respectively.



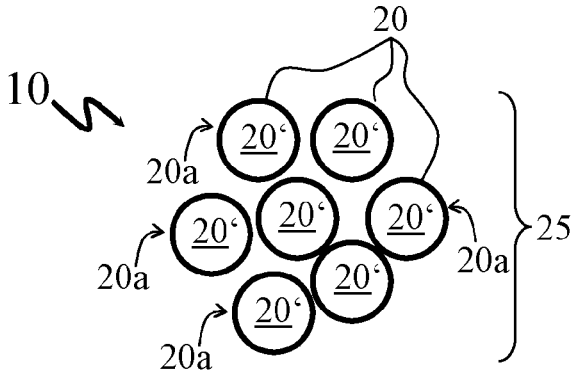

20
10
20'
20'
20a
20'
20'
20'
20a
25
20'
20a
20'
20a

Fig. 1A

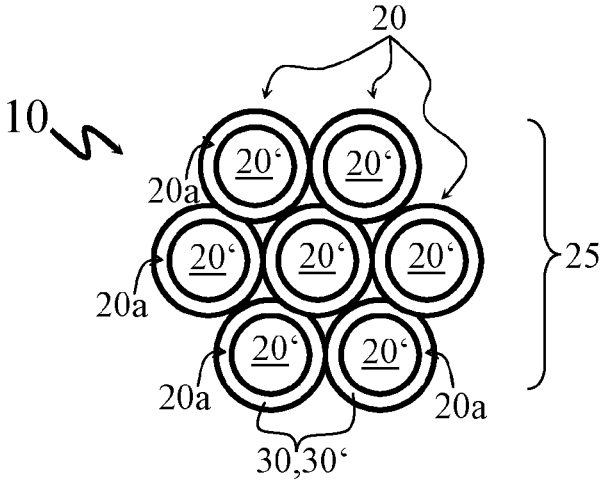

20
10
20'
20'
20a
20'
20'
20'
20a
25
20'
20'
20a
20a
30,30'

Fig. 1B

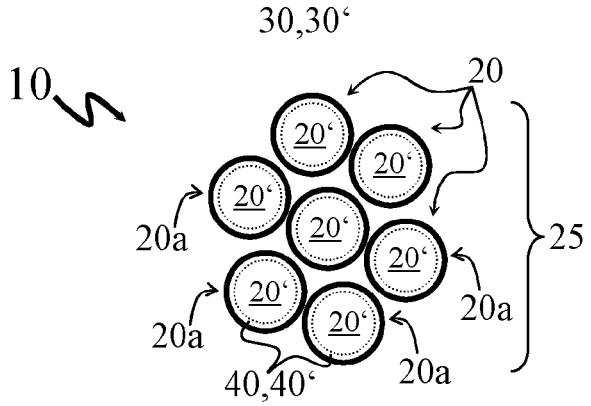


Fig. 1C

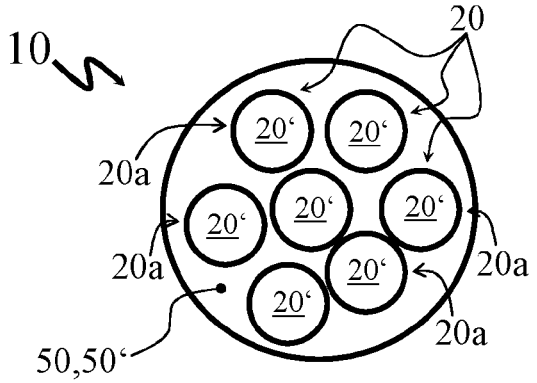


Fig. 1D

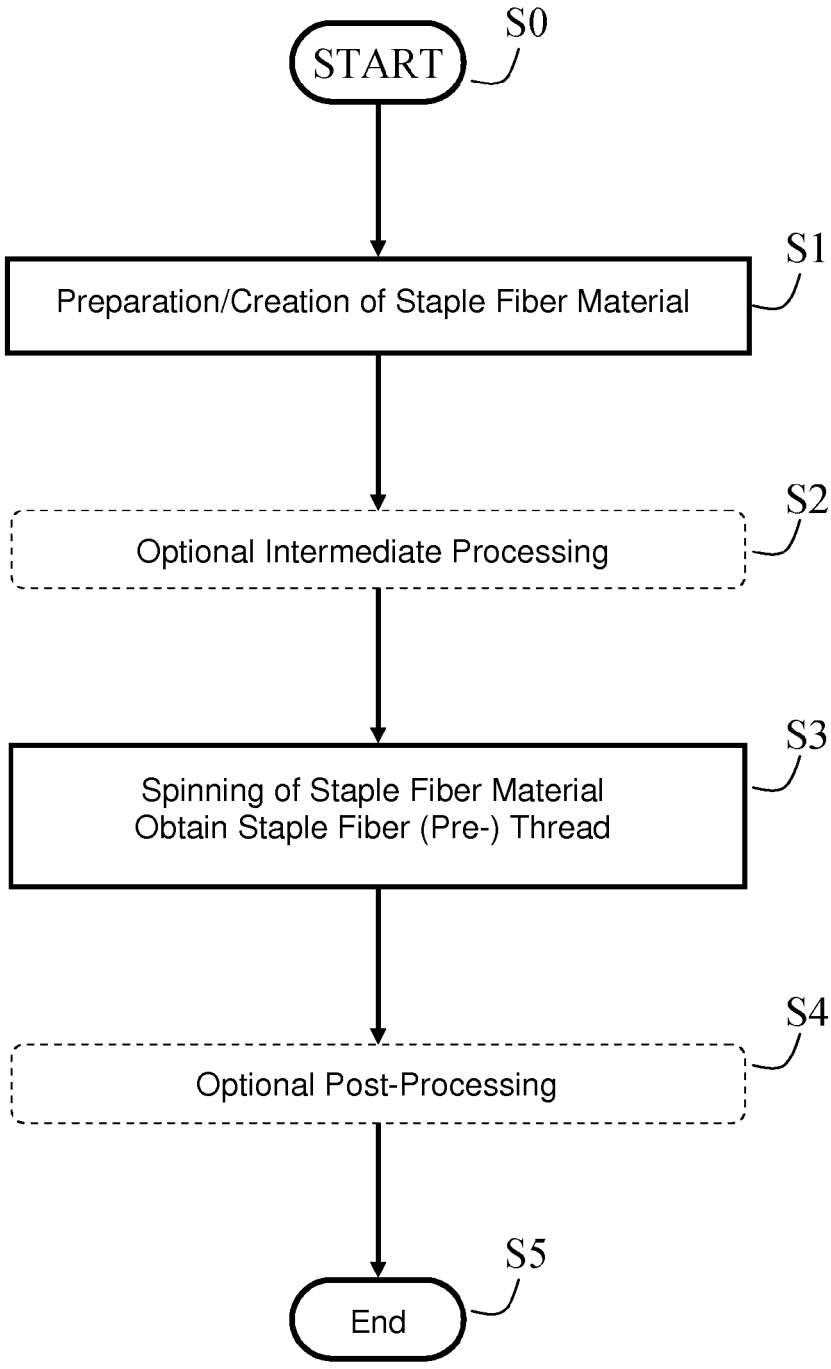

S0
START
S1
Preparation/Creation of Staple Fiber Material
S2
Optional Intermediate Processing
S3
Spinning of Staple Fiber Material
Obtain Staple Fiber (Pre-) Thread
S4
Optional Post-Processing
S5
End

Fig. 2

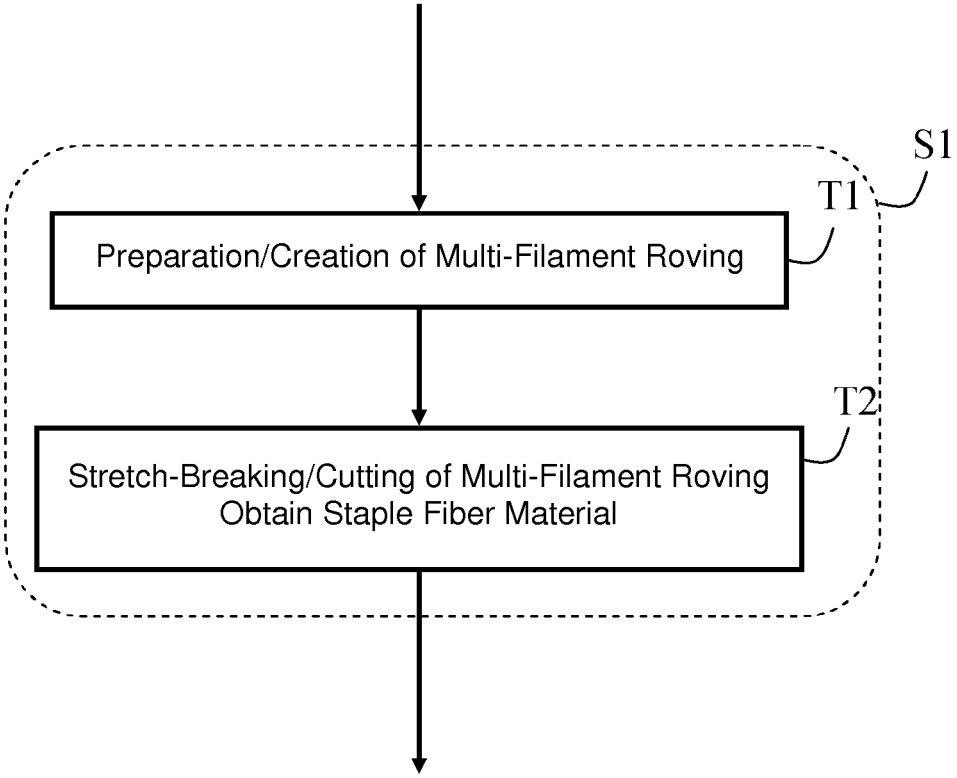

S1
T1
Preparation/Creation of Multi-Filament Roving
T2
Stretch-Breaking/Cutting of Multi-Filament Roving
Obtain Staple Fiber Material

Fig. 3

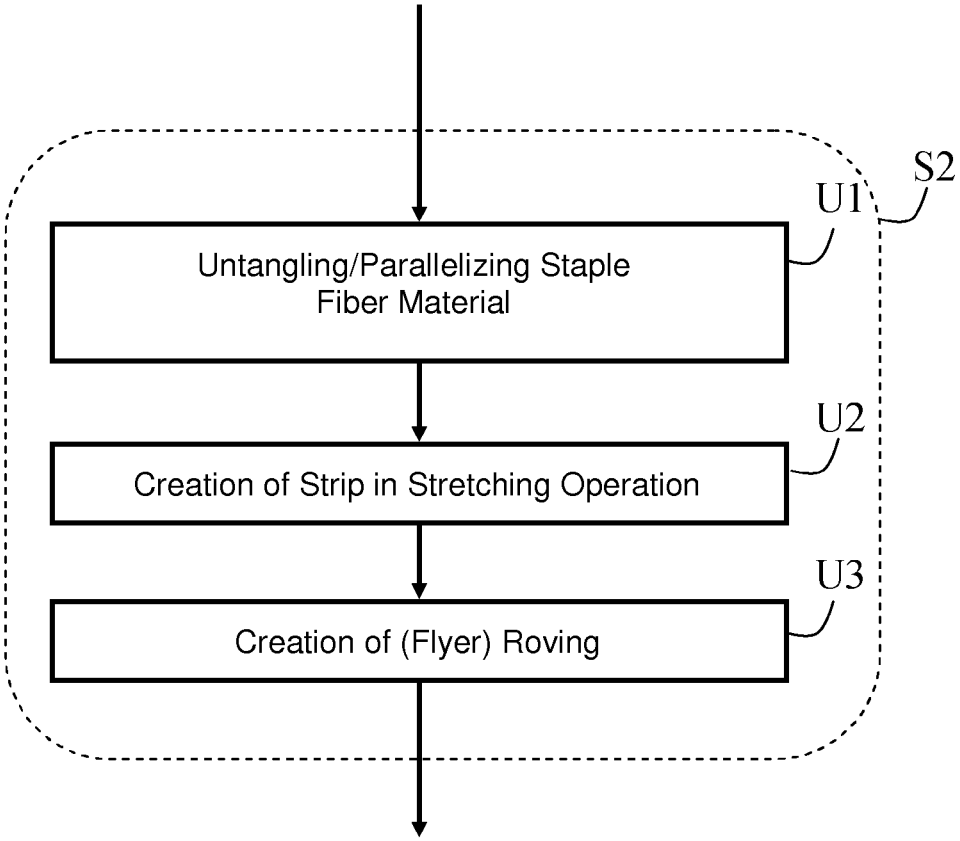

S2
U1
Untangling/Parallelizing Staple Fiber Material
U2
Creation of Strip in Stretching Operation
U3
Creation of (Flyer) Roving

Fig. 4

THREAD OR SEWING THREAD, AND METHOD FOR PRODUCING A THREAD OR A SEWING THREAD

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation, under 35 U.S.C. §120, of copending international application No. PCT/EP2011/060290, filed Jun. 21, 2011, which designated the United States; this application also claims the priority, under 35 U.S.C. § 119, of German patent application No. DE 10 2010 030 773.4, filed Jun. 30, 2010; the prior applications are herewith incorporated by reference in their entirety.

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0002] The present invention concerns a thread or a sewing thread, and also a method for producing a thread or a sewing thread. The present invention concerns in particular a sewing thread of the type of a staple fiber thread of carbon, and in particular an appropriate production method. In addition the present invention also concerns measures for improving the properties of CF rovings and CF staple fiber threads, in particular for deployment in an embedding matrix of elastomers, thermoplastics and/or thermosetting plastics, such as phenolic resins.

[0003] In the production, processing and use of threads, and in particular of sewing threads, that is to say of threads that are deployed and used in sewing processes, limitations and other problems that cannot be tolerated often occur as a result of the underlying source materials and their properties.

[0004] These relate to aspects of static and/or dynamic load-bearing capacity and internal and external friction, and also in the context of consequential symptoms, e.g. effects on the thread or sewing thread itself ensuing as a result of internal and external friction in terms of structure and properties, and also aspects of contamination of the thread or the application environment in the context of the friction as a result of abrasion and similar.

SUMMARY OF THE INVENTION

[0005] It is accordingly an object of the invention to provide a thread, sewing thread or a staple fiber thread and a production method which overcome the above-mentioned disadvantages of the heretofore-known devices and methods of this general type and which provides, in a simple and nevertheless reliable manner, in particular with simple processability, a property profile of the thread or sewing thread that is ensured to be as constant as possible.

[0006] With the foregoing and other objects in view there is provided, in accordance with the invention, a sewing thread, comprising:

[0007] a staple fiber thread formed as a spun fiber thread from a staple fiber material with or from staple fibers; and

[0008] consisting of or containing carbon fiber materials.

[0009] In a preferred embodiment, a proportion or all of said staple fibers are wholly or partially coated or impregnated as individual fibers, as groups of individual fibers, or as a whole, with one or a plurality of coating materials and/or impregnation materials respectively.

[0010] In accordance with a first aspect of the present invention a thread, and in particular a sewing thread, is created, which is designed as a staple fiber thread, or in the manner of the latter—in particular as a spun fiber thread of a staple fiber material with or from staple fibers - and which is designed with or from one or a plurality of carbon fiber materials.

[0011] Thus it is a first aspect of the present invention to design a thread or a sewing thread with a particularly constant property profile, such that this is or will be designed on the basis of a staple fiber thread, or in the manner of the latter, wherein this staple fiber thread and finally the thread of the sewing thread itself is or will be designed with or from one or a plurality of carbon fiber materials.

[0012] In chemical and physical process engineering and in many technical fields of application carbon fibers have proven to be particularly advantageous, because their property profile can be adjusted in a particularly suitable and constant manner, and as such are of particular advantage in many areas of deployment in terms of their mechanical, thermal, chemical and electrical properties.

[0013] In accordance with an alternative procedure the present invention creates a thread, and in particular a sewing thread, which is designed as a staple fiber thread, or in the manner of the latter - in particular as a spun fiber thread of a staple fiber material with or from staple fibers- and in which a proportion or all of the fibers of the fiber material(s) are wholly or partially coated or impregnated respectively with one or a plurality of coating materials and/or impregnation materials, either as individual fibers, as groups of individual fibers, or as a whole.

[0014] In accordance with the said alternative aspect the design of a thread or a sewing thread is therefore likewise focused on one staple fiber thread, or the manner of one staple fiber thread, wherein the latter and thus the thread or sewing thread itself is or will be designed with or from one or a plurality of fiber materials. A limitation to carbon fiber materials does not occur here in the first instance. In contrast, for purposes of improving and maintaining the property profile constant, in particular in terms of static and dynamic load bearing capacity, and/or in terms of internal and external friction, there is an additional focus such that a coating and/or impregnation is or will be provided with a coating material or an impregnation material. Through the selection of the respective materials for the coating and/or impregnation, the properties of the individual filaments, the interactions between the individual filaments, and thus the properties of the end product, namely the thread or sewing thread, both in terms of the internal interactions between the fibers and also in terms of the external interactions between individual fiber strands, that is to say, sections of the thread or sewing thread, and also with the environment, can be designed, adjusted and held constant in an advantageous manner.

[0015] It will be understood, of course, that the two inventive aspects can be combined with one another.

[0016] On the one hand this means that in the context of the carbon fiber material based staple fiber thread for the sewing thread recourse can likewise be made to a partial or complete coating and/or impregnation, namely in individual filaments or individual filaments sections, in their groups, or in the whole structure, the thread or roving.

[0017] On the other hand this means that the generally held thread or sewing thread on the basis of one or a plurality of fiber materials can or will be designed in the context of a coating and/or impregnation on the basis of carbon fiber materials.

[0018] The staple fiber thread can or will be extracted wholly or partially from a multi-filament thread or roving, in particular from a multi-filament carbon roving.

[0019] The staple fiber thread can thereby in particular be wholly or partially extracted from a stretch-broken and/or cut multi-filament thread or roving, in particular from a stretch-broken multi-filament carbon roving.

[0020] Furthermore the staple fiber thread can also be extracted wholly or partially from a textile surface structure, a multi-layer mat, in particular a carbon multi-layer mat, a woven fabric, in particular a carbon woven fabric, and/or combinations of these.

[0021] Here the use of recycled materials is particularly conceivable.

[0022] In addition the staple fiber thread can be formed from filaments, or filament sections with a length in the range from approximately 10 mm to approximately 250 mm.

[0023] Various possibilities therefore present themselves, on the basis of which the underlying staple fiber thread for a thread or a sewing thread can be developed.

[0024] All aspects can, of course, also be applied to multi-filament threads and or multi-filament rovings and their reconfiguration, e.g. their introduction into an enveloping matrix material, e.g. of an elastomer, a thermoplastic, and/or a thermosetting plastic, e.g. a phenolic resin, wherein in particular an impregnation and/or coating, e.g. by means of sizing, or in the manner of sizing, are suitable so as to develop advantageously aspects of the static and/or dynamic loading, of the internal and/or external friction, and/or from the embedding process, and also interaction with the embedding matrix material, and thus the transfer of force, thrust and pressure.

[0025] The staple fiber thread can or will be designed with or from filaments of filament sections on the basis of glass material fibers, acrylic material fibers, polyester fibers, polyamide fibers, basalt material fibers, and/or combinations of these, in particular as a hybrid, or in the manner of the latter, preferably with a carbon fiber proportion of more than 10%.

[0026] The coating and/or the impregnation with the coating material or the impregnation material respectively can or will be formed by means of sizing, and in particular as a size.

[0027] The inventively provided basic principles can also be applied to other types of fibers other than carbon fibers and staple fibers, in particular in terms of the coating and/or impregnation.

[0028] In accordance with further aspects of the present invention the principles underlying the invention are also introduced in appropriate production methods in an advantageous manner.

[0029] The present invention therefore also creates on the one hand a method for the production of a thread or a sewing thread, in which the thread or sewing thread is designed as a staple fiber thread, or in the manner of the latter—in particular as a spun fiber thread from a staple fiber material with or from staple fibers—and in which the thread or sewing thread is designed with or from one or a plurality of carbon fiber materials.

[0030] A proportion or all of the fibers of the one or more carbon fiber materials can thereby be wholly or partially coated or impregnated with one or a plurality of coating materials and/or impregnation materials, as individual fibers, as groups of individual fibers, or as a whole.

[0031] In accordance with a further aspect of the present invention a method for the production of a thread, or sewing thread, is also created, in which the thread, or sewing thread, is designed as a staple fiber thread, or in the manner of the latter—in particular as a spun fiber thread of a staple fiber material with or from staple fibers—in which the sewing thread is designed with or from one or a plurality of fiber materials, and in which a proportion or all of the fibers of the one or more fiber materials is wholly or partially coated or impregnated with one or a plurality of coating materials and/or impregnation materials, as individual fibers, as groups of individual fibers or as a whole.

[0032] Thereby one or a plurality of fiber materials can be designed with or from one or a plurality of carbon fiber materials, e.g. in the manner of a hybrid.

[0033] In accordance with the method the staple fiber thread can be wholly or partially extracted from a multi-filament thread or roving, in particular from a multi-filament carbon roving.

[0034] The staple fiber thread can thereby in particular be wholly or partially extracted from a stretch-broken and/or cut multi-filament thread or roving, in particular from a stretch-broken multi-filament carbon roving, wherein the process of the stretch-breaking and/or cutting can be designed into the method in an integrated manner.

[0035] On the other hand the staple fiber thread can also be extracted wholly or partially from a textile surface structure, a multi-layer mat, in particular a carbon multi-layer mat, a woven fabric, in particular a carbon woven fabric, and/or combinations of these, e.g. also within the framework of a recycling process.

[0036] The filaments or filament sections for the staple fiber thread can be designed with a length in the range from approximately 10 mm to approximately 250 mm.

[0037] The staple fiber thread can—in addition to the carbon-based materials—be designed with or from filaments or filament sections on the basis of glass material fibers, acrylic material fibers, polyester fibers, polyamide fibers, and/or combinations of these, in particular as a hybrid, or in the manner of the latter, preferably with a carbon fiber component in the range of more than 10%.

[0038] In accordance with the method the coating and/or the impregnation with the coating material or the impregnation material respectively can be formed by means of sizing, and in particular as a size.

[0039] Other features which are considered as characteristic for the invention are set forth in the appended claims.

[0040] Although the invention is illustrated and described herein as embodied in a thread or a sewing thread, and a method for producing a thread or a sewing thread, it is nevertheless not intended to be limited to the details shown, since various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

[0041] The construction and method of operation of the invention, however, together with additional objects and advantages thereof will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0042] FIGS. **1**A-**1**D are schematic and sectioned cross-sectional views of various embodiments of the thread or sewing thread according to the invention;

[0043] FIG. **2** is a schematic block diagram illustrating an exemplary embodiment of a process according to the invention for the production of an inventive thread or sewing thread;

[0044] FIGS. **3** and **4** are schematic block diagrams that explain the detailed aspects of exemplary embodiments of a process according to the invention for the production of an inventive thread or sewing thread.

DETAILED DESCRIPTION OF THE INVENTION

[0045] The following is a description of a variety of exemplary embodiments of the invention. All of the embodiments of the invention, and also their technical features and properties, can be individually isolated or combined with one another in any manner and without limitation, as required.

[0046] First, reference is made to the drawings in general, where a thread is identified with numeral **10** and individual filaments are identified with numeral **20**.

[0047] The present invention also concerns in particular staple fiber threads of carbon and their production, and also a method and possibilities for the improvement of the properties of CF rovings and CF staple fiber threads, in particular for deployment in elastomers, thermoplastics and thermosetting plastics, e.g. phenolic resins.

[0048] In the process this leads to tensile forces, which can have a negative effect on the finished product. As a result of the loads the filaments **20** can be damaged, and thus the mechanical strengths can be reduced. Disruptions to the process can also occur, e.g. in the context of thread tearing or similar.

[0049] With the aid of a rotation in the thread **10** the surface area can be increased, this rotation serves to protect the compound thread. However, here too processing is only possible to a limited extent. The filament threads have a very high strength, but a low extensibility. If on the other hand a staple fiber thread, i.e. a spun fiber thread of staple fibers **20**, is produced with a limited length, it is possible to produce a thread **10** with a higher extensibility.

[0050] For the stretch-broken staple fiber thread a carbon roving with a high number of filaments can be used as the raw material. On the other hand, the production of a 1 K roving with a filament diameter of or less than 6 μm is very cost-intensive.

[0051] Carbon fibers have a high strength, but also a low ductility, unfortunately. For this reason carbon fibers can only be processed comparatively slowly and with a comparatively high level of effort in textile processes.

[0052] Inter alia it is also an objective of the invention to specify a coating for carbon fibers **20**, threads **10** of stretch-broken fibers **20** or fire-retardant textile fibers **20** (e.g., Panox® available from SGL Carbon, Germany), and also other brittle fibers, which improve the processing properties.

[0053] The improvement can inter alia also be measured in terms of the fiber abrasion, the number of fiber fractures, and also the speed of the process. As a consequence an improvement is then also hereby achieved in the sewing and operational processes. Threads sized in this manner can be woven more effectively, which inter alia results in a higher productivity.

[0054] One exemplary embodiment of a possible inventive production method can have the following steps:

[0055] A. Stretch-breaking and/or cutting of a multi-filament roving, e.g. a roving of more than 48 K, or from textile surface structures, e.g. recycled material from a carbon multi-layer mat or woven fabric, to form filaments, which have a length in the range from 10 mm to 250 mm.

[0056] B. Untangling and parallelizing in a carding operation.

[0057] C. Production of a strip in a stretching operation.

[0058] D. If required, further processing to form a flyer roving, as a function of a spinning method to be deployed.

[0059] E. Thread production by means of spinning, e.g. with the aid of a ring spinning machine, a rotor spinning machine, or a friction spinning machine.

[0060] F. Twisted thread production, e.g. to form a two-ply thread.

[0061] G. Optional treatment with a textile finishing agent so as to improve the stick/slip behavior, to reduce the static friction, to increase the dynamic friction, to improve thermal protection and also the fiber's frictional characteristics, and to increase its extensibility.

[0062] An exemplary embodiment of the surface treatment can inventively be based on the following aspects:

[0063] The use of an elastic size with a low glass transition temperature, for purposes of coating fibers **20** and threads **10**, leads to a more suitable surface, which ensures improved processability.

[0064] Inter alia, self-crosslinking carboxylated styrene-butadiene copolymers have proved to be particularly suitable, which crosslink in a thermal drying process.

[0065] In addition to a very smooth surface, the electrical contactability of the fibers represents an interesting property. Here deployment as a heating conductor in conveying equipment, as hoses or in hoses, conveyor belts, heatable surface structures, etc., is conceivable.

[0066] By virtue of the flexibility, a gentle transmission of thrust between the fibers **20**, and thus a good introduction of force into the whole strand **10**, or the whole thread **10**, is ensured.

[0067] This process is equally suitable for the treatment of all types of fibers, in particular, however, of carbon and ceramic fibers.

[0068] Furthermore, good compatibility with elastomer matrices can also be ensured in this manner.

[0069] In terms of the improvement of properties of CF rovings and CF staple fiber threads, in particular for deployment in elastomers or thermoplastics, the improvement of the process properties is in particular realized in terms of the reduction and/or avoidance of abrasion, in particular in structures that are created by means of braiding, sewing, weaving or similar.

[0070] The avoidance of friction between individual filaments, which is also designated as internal friction, is enabled by means of partial or complete coating, impregnation and/or enveloping of a particular individual filament, or a section of an individual filament, with a thermoplastic or another appropriate material that reduces friction. By this means improved stability is achieved, in particular in the event of dynamic loading. This can concern applications such as lift cables, drive belts, conveyor belts or similar.

[0071] Furthermore by the impregnation, coating and/or enveloping improved integration of a CF roving, CF staple fiber thread or of the particular individual filaments in matrix systems, e.g. of rubber, thermoplastics, and/or thermosetting plastics, is also possible. Furthermore, by means of such impregnation, embedding and/or coating, improvement of the transmission of force, thrust and/or pressure can also be achieved.

[0072] For this purpose appropriate inventive methods for the introduction of thermoplastic fibers **20** and/or materials into continuous rovings or filament threads are described. Since such processes can also be undertaken with the supply of heat, such forms of embodiment ensure that the thermoplastic melts and provides complete integration of the CF filaments. The complete integration and protection of the filaments **20** or filament sections **20** reduces the internal friction between the filaments and in this manner enhances the dynamic strength of the product.

[0073] Impregnation **40** and/or coating **30** of the fibers **20**, fiber groups **25**, or the thread **10** as a whole, on the one hand reduces or prevents the generation of dust as a result of abrasion, but on the other hand it also reduces or prevents the adhesion of dust generated or existing on the fibers **20**, the fiber groups **25**, or the thread **10** as a whole.

[0074] Referring now to the figures of the drawing in more detail and first, particularly, to FIGS. **1**A to **1**D thereof, there is shown a schematic cross-sectional view of various exemplary embodiments of an inventive thread **10** or sewing thread **10**.

[0075] In the exemplary embodiment of FIG. **1**A a group **25** or a bundle **25** of individual filaments **20** or fibers **20** of a fiber material **20'** is represented in a schematic cross-sectional view; after an appropriate spinning process as a group **25** or bundle **25** these form a thread **10** and in particular a sewing thread **10**.

[0076] Here it is essential to the invention that the actual fibers **20** take the form of staple fibers, that is to say, fiber or filament sections of a finite length, which have been or will be spun together by way of a spinning process. The material **20** of the underlying fibers **20** or filaments **20** is preferably a carbon material, such that the filaments **20** or fibers **20** can be designated as carbon fibers to a greater or lesser degree.

[0077] In the exemplary embodiment of FIG. **1** B the individual fibers or filaments **20** on their surfaces **20***a*, that is to say, the covering surfaces **20***a* of the fibers **20** or filaments **20** are formed with a coating **30** of a coating material **30'**.

[0078] In the exemplary embodiment of FIG. **1**C the individual fibers **20** or filaments **20** over their surfaces **20***a*, that is to say, over their covering surfaces **20***a*, are designed with an impregnation **40** with an impregnation material **40'**. This means that the impregnation material **40'** penetrates into, or is driven into the surfaces **20***a* of the fibers **20** or filaments **20**, so as to effect a surface modification.

[0079] The representations of FIG. **1**B with the coating **30**, and of FIG. **1**C with the impregnation **40**, represent extreme views of the conditions that are to be anticipated in reality. As a rule mixing processes will start to occur as soon as a coating material **30'** or an impregnation material **40'** is applied onto the surface **20***a* of any fiber **20** or any filament **20**. This means that the applied materials **30'**, **40'** on the one hand will implement or promote a coating **30**, but on the other hand will also promote impregnation **40**.

[0080] In the exemplary embodiment of FIG. **1**D the group **25** or bundle **25** of the majority of the fibers **20** or fiber segments **20** is embedded in an embedding matrix **50** with or from an embedding material **50'**, such that the surfaces **20***a* of the individual or single fibers **20** or fiber sections **20** can no longer be seen.

[0081] Needless to say the aspects discussed in the context of the forms of embodiment of FIGS. **1**B and **1**C can also be combined with the embedding matrix **50**, in that e.g. fibers **20** or fiber sections **20** designed with a coating **30** or impregnation **40** can be embedded as a group **25** in total in an embedding matrix **50**.

[0082] FIG. **2** shows, in the manner of a schematic block diagram, aspects of a exemplary embodiment of the inventive method for the production of an inventive thread **10** or sewing thread **10**.

[0083] After a preparatory step S**0**, staple fibers, or a staple fiber material, are prepared in a following step S**1**.

[0084] In an intermediate processing step S**2** the prepared staple fiber material is optionally intermediately processed, in order e.g. to resolve or produce a particular arrangement of the staple fibers, or to execute a surface treatment or similar. This intermediate processing step S**2** is, however, optional and is only to be provided in certain forms of embodiment of the inventive production method, i.e. it is not essential in every exemplary embodiment of the invention.

[0085] After this there follows the step of the actual production of the thread **10** or sewing thread **10**, namely a process of spinning S**3** of the prepared and, if required, intermediately processed, or intermediately treated, staple fibers.

[0086] A post-processing step can then follow, in which the thus ensuing product is seen as a pre-thread, which e.g. is still to be surface treated and/or introduced into an embedding matrix **50**.

[0087] The final step S**5** completes the process.

[0088] FIG. **3** shows sub-aspects of the step S**1** of the preparation of the staple fibers, or the staple fiber material.

[0089] In the exemplary embodiment presented here a roving, e.g. in the sense of a multi-filament roving, preferably on the basis of a carbon fiber material, if required, however, also on the basis of other fiber materials, is thereby firstly prepared in a first sub-step T**1**.

[0090] This is then followed by a process T**2** of so-called stretch-breaking and/or cutting, in which the intrinsically continuous individual filaments of the roving are subdivided in a more less defined manner into fiber or filament segments or sections. This subdivided material then forms the source material for the further processing processes.

[0091] Alternatively sections of fiber material that are already available can, for example, also be provided for this purpose; these originate, for example, from a recycling process and use fiber material waste, for example, in a felt-like manner.

[0092] FIG. **4** shows sub-aspects of the optional intermediate processing step S**2**.

[0093] In this exemplary embodiment the prepared basic staple fiber material is untangled and/or rendered parallel in a first sub-step U**1**, and in particular by means of a so-called carding operation.

[0094] This is then followed by a second sub-step U**2** of the production of a strip in a stretching operation.

[0095] In a third sub-step U**3** intermediate processing then follows to form a so-called roving or flyer roving.

[0096] As has already been described above, the actual production of the thread **10** or sewing thread **10** takes place within the framework of a spinning process for the underlying staple fiber material, e.g. using a ring spinning machine, a rotor spinning machine, or a friction spinning machine.

[0097] For purposes of improving the properties and in particular for purposes of increasing the stability of the thread **10** or sewing thread **10**, the fundamental thread obtained can be seen as a pre-thread and subjected to a twisting process, in order e.g. to create a two-ply thread or similar.

[0098] Before or after a finishing process can take place in the form of a coating, sizing, impregnation and/or an embedding process.

[0099] The following tables show properties of forms of embodiment of inventively produced threads **10** or sewing threads **10**.

EXAMPLE 1

[0100]

Physical property	Dimensional unit	Numerical average value
Tensile strength (impregnated)	MPa	2,750
Tensile strength (dry)	MPa	1,000
Thread strength	N	43
Young's modulus (tensile)	GPa	220
Extension (impregnated)	%	1.1
Density	g/cm^3	1.79
Knot tensile strength	N	2.2
Loop tensile strength	N	14.4
Electrical resistance	Ω/m	averaged 405
Specific electrical resistance	Ω/m	16.7
Staple fiber length	mm	average: 123 max: 220 min: 15
Twist	Tpm	310 S/230 T

EXAMPLE 2

[0101]

Physical property	Dimensional unit	Numerical average value
Tensile strength (impregnated)	MPa	2,950
Tensile strength (dry)	MPa	820
Thread strength	N	90
Young's modulus (tensile)	GPa	200
Extension (impregnated)	%	1.4
Density	g/cm^3	1.79
Knot tensile strength	N	2.7
Loop tensile strength	N	60
Electrical resistance	Ω/m	averaged 140
Specific electrical resistance	Ω/m	16.0
Staple fiber length	mm	average: 123 max: 220 min: 15
Twist	Tpm	310 S/230 T

[0102] In a further development of the inventive method a textile structure is designed with or from the thread **10** or sewing thread **10**, in particular by means of a web process, preferably as a two-dimensional textile, or in the manner of the latter, as a woven fabric, a multi-layer mat, a mesh, a knotted fabric, a knitted fabric, or in the manner of these, and/or in combinations of these.

1. A sewing thread, comprising:

a staple fiber thread formed as a spun fiber thread from a staple fiber material with or from staple fibers; and

consisting of or containing carbon fiber materials.

2. The sewing thread according to claim **1**, wherein:

a proportion or all of said staple fibers are wholly or partially coated or impregnated as individual fibers, as groups of individual fibers, or as a whole, with one or a plurality of coating materials and/or impregnation materials respectively.

3. The sewing thread according to claim **2**, wherein a content of the coating materials and/or impregnation materials lies in a range from substantially 0.1% to substantially 50%.

4. The sewing thread according to claim **1**, wherein said staple fiber thread is wholly or partially extracted from a multi-filament thread.

5. The sewing thread according to claim **4**, wherein said staple fiber thread is wholly or partially extracted from a multi-filament carbon roving.

6. The sewing thread according to claim **1**, wherein said staple fiber thread is wholly or partially extracted from a stretch-broken and/or cut multi-filament thread.

7. The sewing thread according to claim **1**, wherein said staple fiber thread is wholly or partially extracted from a stretch-broken multi-filament carbon roving.

8. The sewing thread according to claim **1**, wherein said staple fiber thread is extracted wholly or partially from a structure selected from the group consisting of a textile surface structure, a multi-layer mat, a woven fabric, a mesh, a knotted fabric, a knitted fabric, and combinations thereof.

9. The sewing thread according to claim **8**, wherein said staple fiber thread is extracted wholly or partially from a carbon multi-layer mat or a carbon woven fabric.

10. The sewing thread according to claim **1**, wherein said staple fiber thread is formed with or from filaments or filament sections with a length in a range from approximately 10 mm to approximately 250 mm.

11. The sewing thread according to claim **1**, wherein said staple fiber thread is formed with or from filaments based on a material selected from the group consisting of glass material fibers, acrylic material fibers, polyester fibers, polyamide fibers, and combinations thereof.

12. The sewing thread according to claim **11**, wherein said staple fiber thread is a hybrid with a carbon fiber component.

13. The sewing thread according to claim **12**, wherein said carbon fiber component lies in a range of more than 10%.

14. The sewing thread according to claim **1**, wherein the coating and/or the impregnation with the coating material or the impregnation material respectively is configured as a size.

15. A method for producing a sewing thread, the method which comprises:

forming a staple fiber thread as a sewing thread from a staple fiber material with or from staple fibers; and

forming the sewing thread with or from one or a plurality of carbon fiber materials.

16. The method according to claim **15**, which comprises forming the sewing thread as a spun fiber thread from the staple fiber material.

17. The method according to claim **15**, which comprises forming the staple fiber thread from filaments or filament sections having a length in a range from approximately 10 mm to approximately 250 mm.

18. A method of producing a textile structure, the method which comprises:

providing a yarn or a sewing thread according to claim **1**; and

forming the yarn or sewing thread into a two-dimensional textile structure.

19. The method according to claim **18**, which comprises weaving the yarn or sewing thread into a woven textile structure or a woven fabric, or forming a multi-layer mat, a mesh, a knotted fabric, a knitted fabric, or a combination thereof.

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