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Fűtőszövedék

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmas az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.

Heating fabric

Description

The invention relates to a heating fabric according to the preamble to claim 1. Such a heating fabric comprises threads running in the warp direction and in the weft direction, wherein at least a part of the threads is designed as electrically conductive threads.

Heating fabrics of this type are used for example for seat heaters in vehicles. For the production of heat, a voltage is applied to the electrically conductive threads. Heat is produced through the electrical resistance of the threads that is used to heat the seat.

A generic heating fabric with woven-in electrically conductive threads is disclosed in US 2011/278282 A1. The conductive threads run in the rectangular heating fabric as heating conductors for the production of heat in parallel in a width direction between two connecting strings of different polarity running in the longitudinal direction. The connecting strings are arranged on opposite sides of the heating area, through which the heat conductors pass.

To produce a planar heating of the heating fabric the electrically conductive threads can be arranged in different ways. For example it is known to guide at least one electrically conductive thread as a heating wire in a meandering manner along the heating fabric. However, the problem here is that in the event of cutting through the heating thread the heating effect is lost over a large area. A heating element with a meandering heating wire arrangement is known from WO 2006/054853 A1.

A surface heating element with a plurality of heating strips consisting of a respective group of electrically conductive threads, which heating strips are connected over plate-like connecting devices, is described in EP 1 835 786 A1. Through the interconnection of the individual heating strips, a substantially meandering progression is also formed, wherein areas can be purposefully created with heat output and without heat output.

EP 1544869 A1 and US 2009/0223946 A1 disclose layered heating elements, wherein connecting strings with comb-shaped lead lines made of a resistant ink are applied to a flexible substrate.

DE 42 33 118 A1 describes a heating mat with a fabric formed from carbon fibres, which forms a flexible resistance material and into which flexible contact wires which represent the electrodes are incorporated. By applying a voltage a heating effect is produced between the contact wires along the resistance material.

It is the **object** of the invention to indicate a heating fabric which provides a reliable heating effect and can have flexible dimensions.

The object is achieved according to the invention by a heating fabric having the features of claim 1. Preferred embodiments of the heating fabric are indicated in the dependent claims.

A first core idea of the invention can be seen in that a connecting string which serves for connection of the electrically conductive threads to a voltage source is incorporated into the heating fabric. The connecting string runs according to the invention along an area formed by the heating fabric, thus in the plane formed by the heating fabric. For example the connecting string can be incorporated into the fabric or applied to a fabric surface.

The connecting string is conductively connected to at least a part of the electrically conductive threads in order to connect the electrically conductive threads to the voltage source. The connecting strings which can also be described as connecting electrodes serve for the common connection of the electrically conductive threads to the voltage source.

According to a preferred further development of the invention the heating fabric is formed in the region of the connecting string as a hollow fabric. The hollow fabric section comprises at least two separate fabric layers and a hollow space in channel-form running between the fabric layers in a longitudinal direction along the fabric. The connecting string extends along the longitudinal direction of the hollow fabric section or of the hollow space.

Two fabric regions are provided by the hollow fabric section which are, or can be, insulated against each other. In this way electrically conductive threads can cross the connecting string without contact insofar as the connecting string is arranged on one of the fabric layers and the electrically conductive threads on the respective other fabric layer. For example a part of the electrically conductive threads or an end of an electrically conductive thread, lying opposite the connecting string, can pass by the connecting string to an anti-polar voltage connection.

In a heating section of the heating fabric following to the hollow fabric section the fabric is preferably designed in one layer. The heating fabric is preferably configured in one layer on both sides of the longitudinally running hollow fabric section.

Threads are understood in the present case to be all textile structures in line-form which can be processed to form fabrics, in particular yarns, wires as well as mono-filaments and multi-filaments.

According to a preferred embodiment of the invention at least one first connecting string and at least one second connecting string are provided and a first hollow fabric section is formed in the region of the first connecting string and a second hollow fabric section is formed in the region of the second connecting string. One of the connecting strings preferably forms a plus pole and the other connecting string a minus pole. In this way electrically conductive threads can be guided past the two connecting strings electrically contact-free or in any case with reduced contact. It is further made possible to configure the electrical connections on one side close to each other.

The connecting strings can also be provided on a common hollow fabric section. Through the hollow space between the fabric layers the connecting strings can be spatially separated from each other and thus insulated against each other.

Through the at least one hollow fabric section according to the invention two anti-polar connecting strings can be arranged at one and the same edge region of the area to be heated of the fabric. The heat is not therefore produced then between the two connecting strings but instead beyond the two connecting strings. The electrical connection is realised only from one side of the heating area. In this way it is guaranteed that the area to be heated of the heating fabric can be extensively freely cut. The heating fabric can thus be provided with particularly flexible dimensions.

The connecting strings can be arranged in principle at any given point of the fabric. However, the connecting strings preferably run along an edge region of the fabric, in particular at a short distance from a side edge of the fabric. They preferably run along an edge of the heat fabric, at the edge of an area to be heated. The at least two connecting strings are preferably of different

polarity in parallel and / or arranged at a short distance from each other, wherein the area between the connecting strings is preferably unheated.

An improved conductivity along the connecting string can be produced by at least one connecting string bundle being provided which comprises a plurality of connecting strings. A plurality of connecting strings are thus brought together to form a connecting string bundle which serves as an electrode for the electrical conductive threads. As a result of the overall enlarged cross-section of the thus formed connecting string device a more even heat output can be guaranteed along the length of the heating fabric, i.e. along the connecting strings. An improved conductivity can also be achieved by using one or more foils as connecting strings, in addition to or in place of wires or threads. The foil can be incorporated in particular into the hollow fabric.

An electrically conductive material for the at least one connecting string can be for example copper or silver. For example a pure copper or silver strand can be provided. A conductive-coated thread can also be used, for example a silver-plated, a zinc-plated or nickel-plated copper strand.

An insulating separation layer can be incorporated into the hollow space for improved electrical separation of the two layers of the hollow fabric section. The insulating separation layer, for example an insulating foil, ensures that, even if the two layers of the hollow fabric section spatially approach each other, for example through a tensile load of the fabric, a reliable insulation is retained.

According to a further preferred embodiment of the invention the insulating separation layer is conductive-coated on at least one side. The separation layer is preferably conductive-coated on a side facing towards the connecting strings. In this way the conductivity of the supply, thus the electrode, is increased once again, and supply losses can be reduced. The conductive coating can be formed for example by a flexible circuit board. If the two connecting strings (plus and minus) are arranged on one and the same hollow fabric section, the insulating separation layer can also be conductive-coated on both sides. Besides, a single-side conductive coating is preferred.

It is possible in production terms for the connecting strings to run in the warp direction.

The electrically conductive threads preferably run transversely to the connecting strings, thus in the weft direction.

A reverse configuration can also be provided, wherein the connecting strings are guided with the hollow fabric section in the weft direction and the conductive threads in the warp direction, in order to thus achieve a separation between plus and minus bundles. Furthermore, for better contacting of the individual threads / yarns, a leno weave can also be provided, wherein an entwinement is produced.

The invention provides that a first connecting string is connected to a plurality of first, electrically conductive threads and a second connecting string to a plurality of second, electrically conductive threads. The electrically conductive threads preferably extend into an area to be heated of the heating fabric and are respectively either electrically conductively connected to the first connecting string or to the second connecting string. The electrically conductive threads can be connected to each other along the area to be heated of the heating fabric, for example by a high-impedance conductor medium.

A first core idea of this embodiment provides that a plurality of electrically conductive threads are distributed in the heating fabric which constitute lead threads for a resistance medium, in which the predominant part of the heat is produced. A first part of these

lead threads constitutes the plus pole and a further part the minus pole of a current circuit. The current circuit is closed via the high-impedance resistance medium between the first lead threads and the second lead threads.

The heat production is thus realised predominantly between the electrically conductive threads in the high-impedance resistance medium. Due to the lead threads to be preferably distributed evenly in the area to be heated and the high conductivity of the lead threads in comparison with the resistance medium, an even heat effect can be produced in the heating fabric.

According to a further aspect all electrically conductive threads of the same polarity (plus or minus) are respectively connected to a common connecting string or connecting string unit. A first group of electrically conductive threads is thus connected to a first connecting string which forms for example a plus pole and a second group is connected to a second connecting string which then forms the minus pole. The threads do not thereby contact the other respective connecting string, so that an electrical separation between the plus threads and the minus threads is provided. The electrically conductive threads are thus respectively connected only to one of the connecting strings (plus or minus).

Through the at least one hollow fabric section the selective connection of the electrically conductive threads to the first or the second connecting string can be reliably achieved by the threads being guided past the connecting string not to be contacted on the respectively other fabric layer of the hollow fabric section. The electrically conductive threads preferably run parallel to each other and do not contact each other in this way.

If the two connecting strings are arranged on a hollow fabric section the electrically conductive threads can run along the whole length or width direction of the fabric without contacting the respective anti-polar connecting string running transversely thereto.

The electrically conductive threads which extend as lead lines into the area to be heated are preferably orientated transversely to the connecting strings. In the region of the area to be heated the electrically conductive threads are electrically connected to each other via the high-impedance conductor medium.

A high-impedance conductor medium is understood in particular to be a conductor medium, in which heat can be produced by applying a voltage and which has a higher electrical resistance than the electrically conductive lead threads.

The electrically conductive threads of the first connecting string and those of the second connecting string are preferably evenly distributed over the fabric, whereby this is to be understood to mean that lead lines and return lines are distributed either alternately or in another predefined regular sequence over the area of the fabric. A plurality of current circuits are formed via the high-impedance conductor medium along the area of the fabric, wherein an extensively regular heating effect is produced through the regular arrangement of the electrically conductive threads.

A high-impedance conductor medium can be provided according to a preferred embodiment of the invention by at least one high-impedance thread. A plurality of high-impedance threads are preferably arranged transversely to the electrically conductive threads. The high-impedance threads thus respectively contact a plurality of electrically conductive threads which are connected alternately to the two connecting strings or connecting string bundles.

For a reliable contacting between a high-impedance thread and the electrically conductive threads it is preferred that the high-impedance thread is entwined by at least one thread pair of the electrically conductive threads, wherein a first thread of the

thread pair contacts the high-impedance thread on a first fabric side and a second thread of the thread pair the high-impedance thread on a second fabric side. The lead threads in the weft direction are thus designed in dual form so that the high-impedance thread is better entwined or contacted.

According to a further preferred embodiment a planar coating is provided as a high-impedance conductor medium. The planar coating, for example a resistor paste, forms the heating resistance material. The planar coating can be for example a carbon or graphene coating. The coating can also be designed as a nanotube coating. The area of the connecting strings is thereby preferably not coated. A combination of high-impedance threads and high-impedance fabric coating is also possible.

The invention will be described further below by reference to the preferred example embodiments which are shown in the attached schematic drawings, in which:

Fig. 1 shows a first embodiment of a heating fabric according to the invention;

Fig. 2 shows a cross-sectional view in the area of the connecting strings of a heating fabric according to the invention;

Fig. 3 shows a heating fabric according to the invention including an enlarged view of a fabric section;

Fig. 4 shows a second embodiment of a heating fabric according to the invention;

Fig. 5 shows a heating fabric according to the invention with cable connection, and

Fig. 6 shows a third embodiment of a heating fabric according to the invention.

The same components or those acting in the same way are provided with the same reference numerals in all the figures.

A first embodiment of a heating fabric 10 according to the invention is shown in Figs. 1 to 3. The heating fabric 10 comprises a base fabric with weft threads 12 running in a weft direction and warp threads 4 running in a warp direction (cf Fig. 3). The threads 12, 14 are designed as non-conductive threads and can for example consist of PET filaments.

A plurality of electrically conductive threads 62, 64 are woven into the non-conductive base fabric. The electrically conductive threads 62, 64, can in their entirety be formed from a conductive material or be conductive-coated. The electrically conductive threads 62, 64 run exclusively in one direction of the fabric, here in a weft direction along the non-conductive weft threads 12.

In the region of a side edge of the heating fabric 10 which forms a connection area 16 of the heating fabric 10, two connecting string bundles 30, 50 are arranged. These constitute respectively a connecting electrode for the electrically conductive threads 62, 64. The connecting string bundles 30, 50 are incorporated into the fabric so that a first connecting string bundle 30 is connected exclusively to a group of first electrically conductive threads 62 and a second connecting string bundle 50 exclusively to a group of second electrically conductive threads 64. The connecting string bundles 30, 50 each comprise a plurality of individual connecting strings 32, 52 which can be designed for example as copper or silver strands or as conductive-coated yarns. The first

connecting strings 32 are connected in terms of web technology to the first electrically conductive threads 62. The second connecting strings 52 are connected in terms of web technology to the second electrically conductive threads 64. In terms of weave technology, no second electrically conductive threads 64 have contact with the first connecting strings 32, and vice versa.

The electrical separation of the first connecting strings 32 from the second electrically conductive threads 64 and of the second connecting strings 52 from the first electrically conductive threads 62 is realised in that a hollow fabric section 20, 40 is formed in the area of each of the connecting string bundles 30, 50. The warp threads 14 of the fabric are for this purpose incorporated so that in the region of the hollow fabric sections 20, 40 two fabric layers 22, 24, 42, 44 are produced. The two fabric layers 22, 24, 42, 44 of this hollow fabric or double layer fabric sections are electrically insulated against each other.

Fig. 2 shows a cross-sectional view of the connection area 16 of the heating fabric 10 with its two hollow fabric sections 20, 40. The first hollow fabric section 20 has an upper fabric layer 22 and a lower fabric layer 24. The second hollow fabric section 40 has an upper fabric layer 42 and a lower fabric layer 44. The first connecting strings 32 are arranged on the upper fabric layer 22 of the first hollow fabric section 20. The second connecting strings 52 are arranged on the lower fabric layer 44 of the second hollow fabric section 40. A respective hollow space 26 or 46 is formed between the fabric layers 22 and 24 or 42 and 44.

As can be deduced from Fig. 1, the threads 62 electrically connected to the first connecting strings 32 run along the upper fabric layer 42 of the second hollow fabric section 40 and the threads 64 connected to the second connecting strings 52 along the lower fabric layer 24 of the first hollow fabric section 20. In this way the threads 62 are electrically separated from the connecting strings 52 and the threads 64 from the connecting strings 32.

The first connecting strings 32 and the second connecting strings 52 can also be described as plus poles or minus poles which are to be connected to a voltage source. To produce a current circuit the electrically conductive threads 62, 64 are electrically connected to each other along a heating area 60 or an area to be heated of the heating fabric 10 to be heated by means of a high-impedance conductor medium. Through the high-impedance conductor medium which is formed in the first embodiment of the heating fabric 10 by a plurality of high-impedance threads 66 running transversely to the lead threads 62, 64, an even heating over the whole heating area 60 is produced. The high-impedance threads 66 running in the warp direction cross the electrically conductive threads 62, 64 and produce in this way a plurality of electrical circuits over the heating area of the fabric.

Fig. 3 shows a preferred thread configuration in the heating area of the fabric. The electrically conductive threads 62, 64 are each provided in dual configuration, i.e. between non-conductive weft threads 12 there are at least two electrically conductive threads 62 or 64 which entwine the high-impedance thread 66 on opposite sides, so that the thread 66 is entwined on both sides. Through the arrangement in pairs of electrically conductive threads 62, 64 between the non-conductive threads 12, a particularly good contact of the high-impedance threads 66 is achieved.

To provide an additional electrical separation or insulation between plus and minus (first connecting strings 32 with threads 62 with respect to second connecting strings 52 with threads 64) a respective separating device or separation layer 34, 54 can be incorporated into the hollow fabric portions 20, 40. The separating device 34, 54 can comprise in particular a separating foil which is incorporated along the respective hollow fabric section 20, 40 into the heating fabric 10. The separating foil can be electrically coated on its side facing towards the connecting string to improve the conductivity of the connecting strings 32, 52.

A second embodiment of a heating fabric 10 according to the invention is shown in Fig. 4. Instead of the high-impedance threads or yarns running in the warp direction, the heating fabric 10 is provided in the area to be heated with a high-impedance coating 68. For example the heating fabric 10 can be coated with a resistor paste. The connection region 16, in which the connecting strings 32, 52 are arranged, is preferably not coated. The already completely woven fabric is preferably coated.

By connecting the strands 32, 52 to a voltage source the current supply is distributed via the threads 62, 64 over the area and guided into the resistance coating. The heat is produced in the resistance coating. The distance between the threads 62, 64 is determined by the operating voltage, the resistor paste or the paste thickness and the desired heat output.

Fig. 5 shows a possibility of realisation of a cable connection for the electrode strands 32, 52. In the embodiment shown, a sheet metal bracket 70 is clamped to the electrodes. The sheet metal bracket 70 connects all connecting strings 32, 52 of a connecting string bundle 30, 50 and forms a connecting device for a voltage source not shown in the figures. Alternatively it is also possible to introduce a conductive foil, for example a copper foil, into the hollow space 26, 46 or channel, and then to apply, for example crimp, solder, weld or bond, cables to the foil.

Due to the design of the heating fabric 10 according to the invention the fabric can be cut almost as desired without the area heat output changing. According to a rectangular configuration of the fabric the fabric can be cut almost as desired along three of the four sides. The connection region 16 with the connecting strings 32, 52 may not, however, be separated.

Fig. 6 shows a possibility of also heating the full area of a fabric with a hole 18. For this, two homo-polar connecting strings 32, 52 are provided on opposing fabric areas or fabric edges. Although individual electrically conductive threads 62, 64 are separated by the hole 18, the heating fabric 10 is heated along the whole heating area 60. The electrically conductive threads 62 are electrically conductively connected for this purpose to first connecting strings 32 arranged on opposite sides of the hole 18. The second electrically conductive threads 64 are connected to two corresponding connecting strings 52 on opposite sides of the hole 18. As also in the other embodiments, the connecting strings 32, 52 can be designed as connecting string bundles 30, 50. In the case of a plurality of holes on the same line, further connecting strings lying there-between are to be provided in order to also ensure a power supply between holes lying one beside the other.

By using elastic and/or textured, electrically conductive threads 62, 64 and elastic weft yarns (e.g. Lycra) a heating fabric can be produced to be elastic in one direction.

The invention provides a heating fabric which can be particularly flexibly cut. This is achieved by the connecting strings not being arranged on opposite sides of the fabric or its heating area but instead on one and the same side, so that the fabric or the heating area, apart from the region of the connecting strings, can be extensively freely cut. The heating effect in the area of the fabric is produced by the connecting strings each been connected to separate, electrically conductive threads which extend into the area of the fabric. The contacting of the electrically conductive threads is realised via a high-impedance conductor medium, in which the predominant part of the heat is produced due to its electrical resistance.

Fűtőszövedék
Szabadalmi igénypontok

1. Fűtőszövedék láncirányba és vetülékirányba futó száakkal, ahol a száalnak legalább egy része villamosan vezetőképes száalkként (62, 64) van kivitelezve,
és a fűtőszövedék (10) egy fűtési tartománya (60) mentén, a villamosan vezetőképes száal (62, 64) csatlakoztatásához, legalább két csatlakozó száal (32, 52) fut,
azzal jellemezve,
 - **hogy két, különböző polaritású csatlakozó száal (32, 52) egymáshoz képest párhuzamosan és egymáshoz képest kis távolságban fut a fűtendő fűtési tartomány (60) ugyanazon oldalán,**
 - **hogy egy első csatlakozó száal (32) nagyszámú első villamosan vezetőképes száallal (62), és egy második csatlakozó száal (52) nagyszámú második villamosan vezetőképes száallal (64) össze van kötve, amelyek a fűtőszövedék fűtendő fűtési tartományához (60) kiterjednek, és**
 - **hogy az első villamosan vezetőképes száal (62) és a második villamosan vezetőképes száal a fűtőszövedék (10) fűtendő fűtési tartományához nagy ohmos ellenállás médiumon keresztül egymással össze vannak kötve, ami hőképzésre van kiképezve, és**
 - **hogy az első és második villamosan vezetőképes száal (62, 64) nagy vezetőképeségűek, és a nagy ohmszámú ellenállás médiumhoz hozzávezető száalakat képeznek.**
2. Az 1. igénypont szerinti fűtőszövedék, **azzal jellemezve, hogy egy csatlakozó száal (32, 52) tartományában üreges hálózszakasz (20) van kiképezve, a csatlakozó száal (32, 52) mentén futó üreges térrel (26, 46).**
3. A 2. igénypont szerinti fűtőszövedék, **azzal jellemezve, hogy az első csatlakozó száal (32) tartományában egy első üreges hálózszakasz (20), és a második csatlakozó száal (52) tartományában egy második üreges hálózszakasz (40) van kiképezve.**
4. Az 1.-3. igénypontok egyike szerinti fűtőszövedék, **azzal jellemezve, hogy legalább egy csatlakozó száal köteg (30, 50) van, amely nagyszámú csatlakozó száalt (32, 52) tartalmaz.**
5. A 2.-4. igénypontok egyike szerinti fűtőszövedék, **azzal jellemezve, hogy az üreges térbe (26, 46) szigetelő szétválasztó réteg bevonat (34, 54) van behelyezve.**
6. Az 5. igénypont szerinti fűtőszövedék, **azzal jellemezve, hogy a szigetelő szétválasztó réteg (34, 54), legalább egyik oldalon, vezetőképesen van réteggel ellátva.**
7. Az 1.-6. igénypontok egyike szerinti fűtőszövedék, **azzal jellemezve, hogy a csatlakozó száal (32, 52) láncirányban futnak.**

8. A 7. igénypont szerinti fűtőszövedék, **azzal jellemezve, hogy a villamosan vezető szálak (62, 64) vetülék irányba futnak.**
9. Az 1.-8. igénypontok egyike szerinti fűtőszövedék, **azzal jellemezve, hogy az első villamosan vezető szálak (62) és a második villamosan vezető szálak (64) egymáshoz képest párhuzamosan futnak, és nem érintkeznek.**
10. Az 1.-9. igénypontok egyike szerinti fűtőszövedék, **azzal jellemezve, hogy a nagyohmos vezetőműdium legalább egy nagyohmos szálat (66) tartalmaz.**
11. A 10. igénypont szerinti fűtőszövedék, **azzal jellemezve, hogy a nagyohmos szálat (66) a villamosan vezető szálak legalább egyike körülhurokolja, ahol a szál pár egy első szála a nagyohmos szállal (66) egy első hálódoldalon, és a szál pár egy második szála a nagyohmos szállal egy második hálódoldalon érintkezik.**
12. Az 1.-11. igénypontok egyike szerinti fűtőszövedék, **azzal jellemezve, hogy a nagyohmos vezetőműdiumnak sík rétege (68) van.**
13. Az 1.-6. igénypontok egyike szerinti fűtőszövedék, **azzal jellemezve, hogy egy-egy azonos pólusú első csatlakozó szál (32), és egy-egy azonos pólusú második csatlakozó szál (52) a fűtőszövedék (10) szembefekvő tartományain található.**

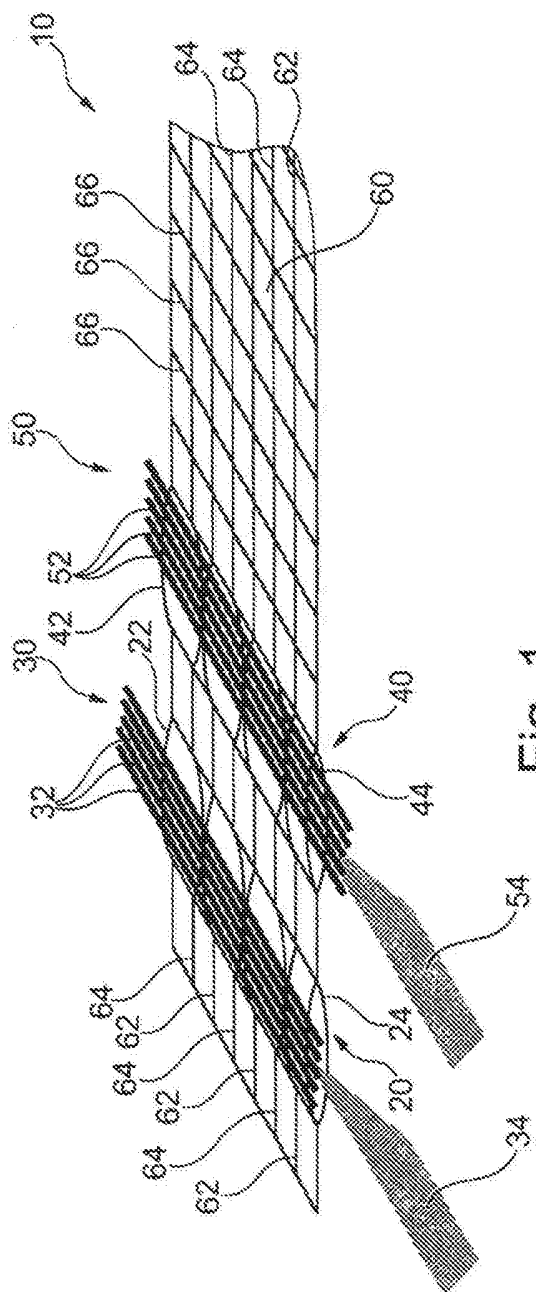


Fig. 1

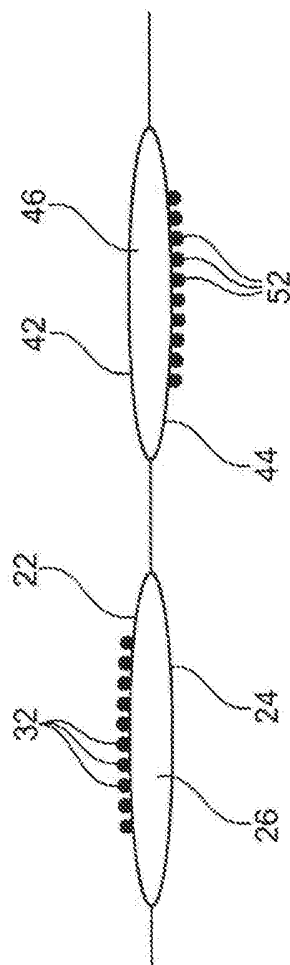
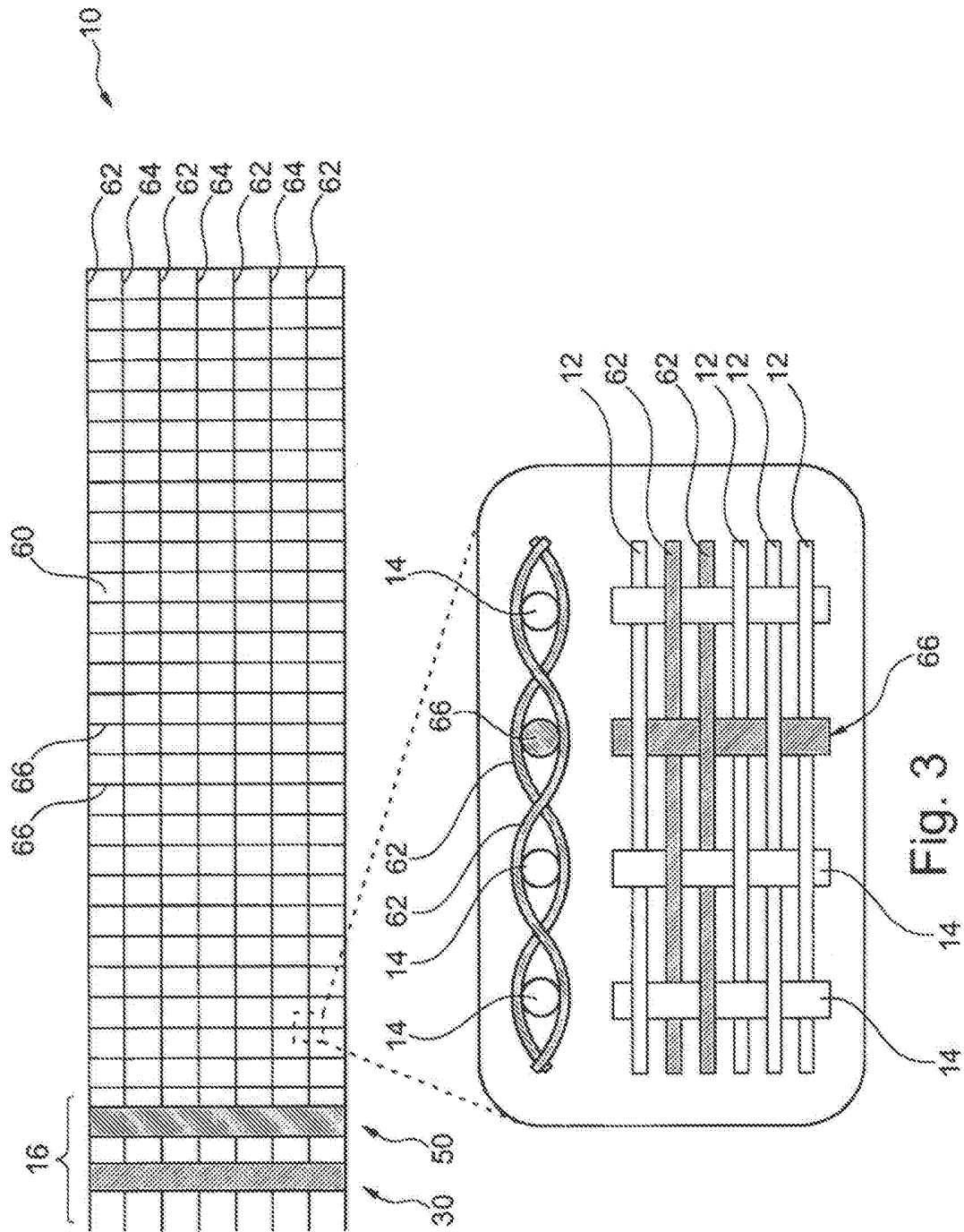


Fig. 2



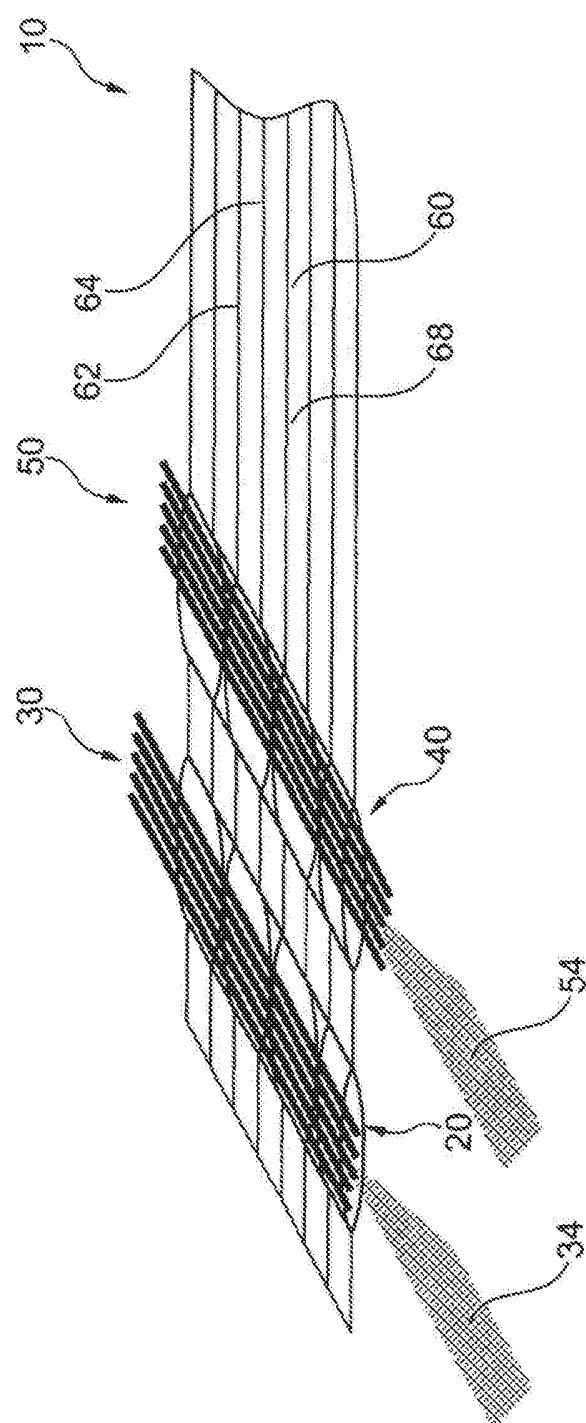


Fig. 4

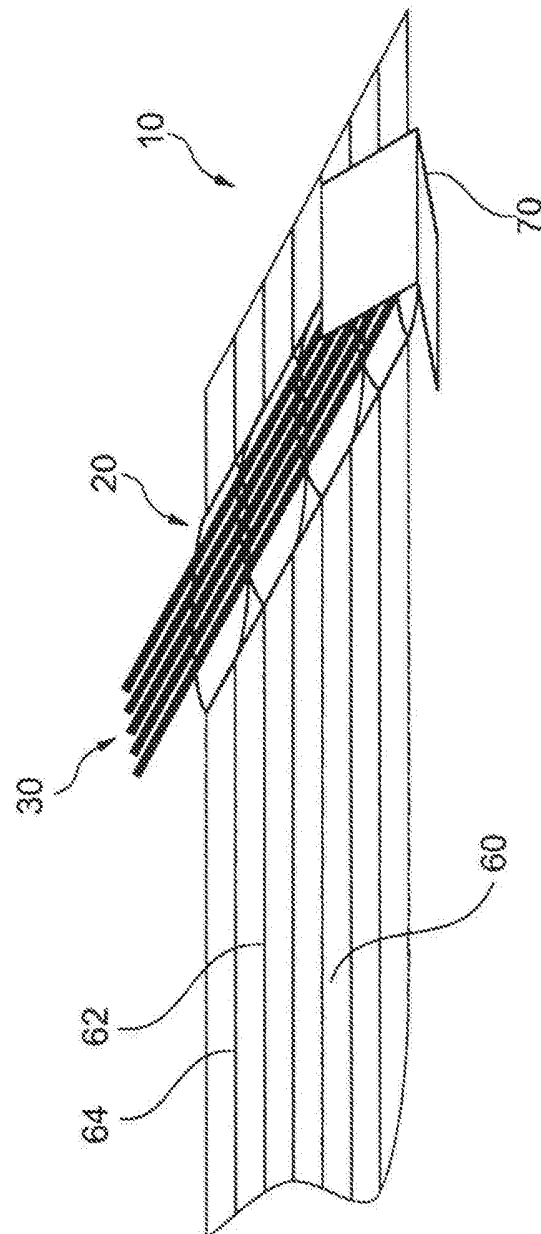


Fig. 5

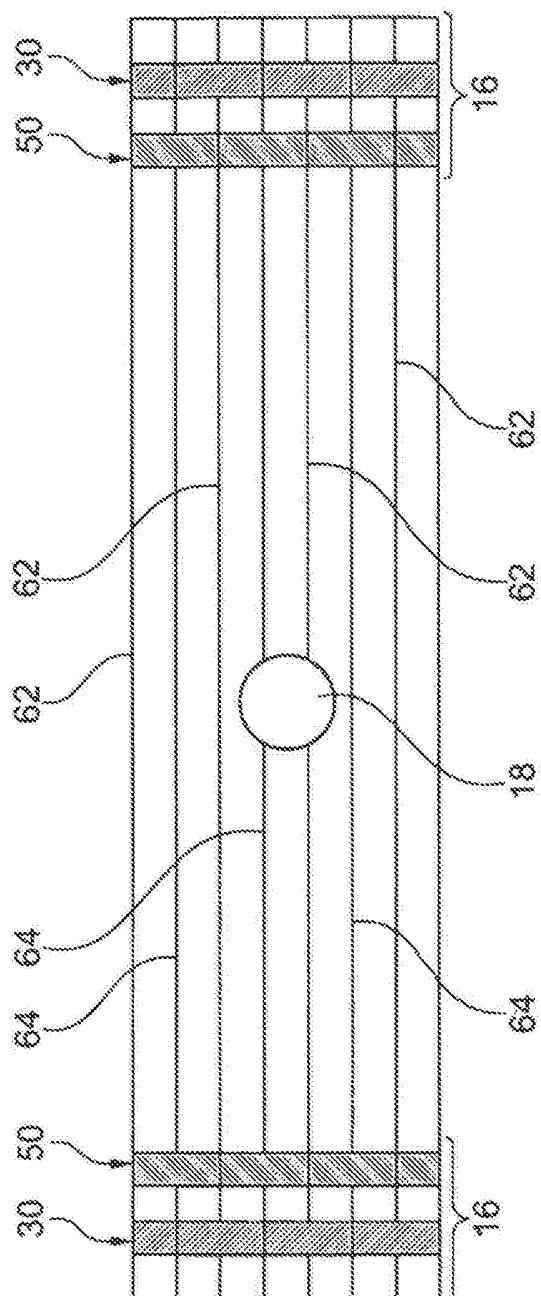


Fig. 6