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(54) Electrically conducting set of fibers in sheet form.

(57) The set of fibers in sheet form has conducting fibers in such an amount, with respect to the non-conducting fibers, that there is electrical continuity. The set of fibers may be incorporated in a fabric by holding the non-conducting fibers (10) together in the weft and the warp of the fabric with the non-conducting fibers (11,12).

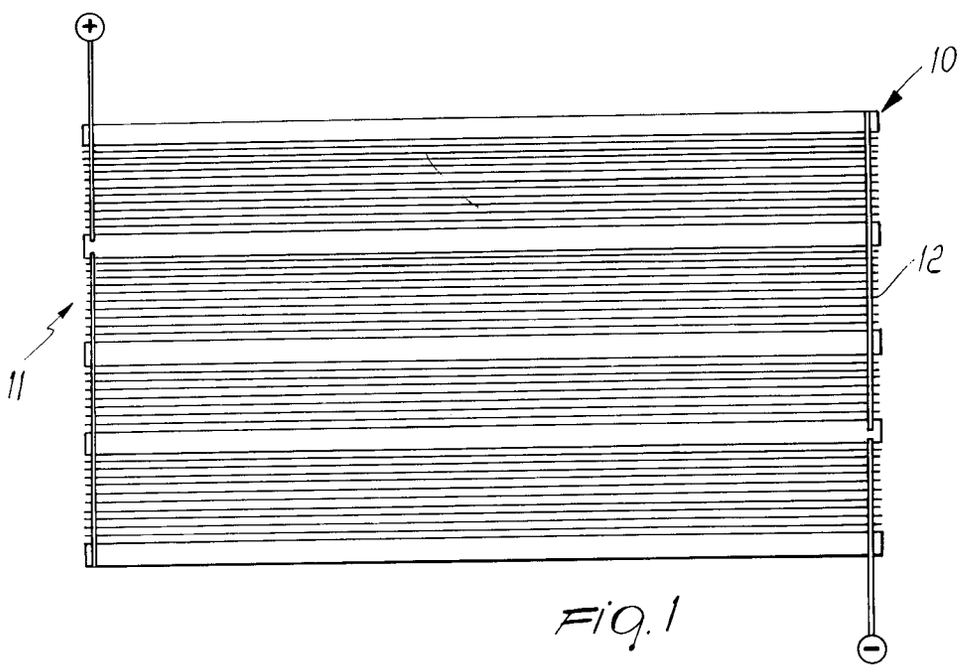

Fig. 1

EP 0 563 919 A1

The present invention relates to a set of fibers in sheet form.

Non-woven fabrics, made for example of polyester, containing metallic fibers, such as copper, nickel or stainless steel fibers in addition to the synthetic fibers, are already known.

The percentage of metallic fibers contained is currently approximately 5-6% and is in any case such that there is no electrical continuity between said fibers.

This type of product is termed anti-static, since it eliminates the effects of static electricity caused for example by electric or electromagnetic fields, etc., and is used for example to line rooms in which electric and electronic equipment is accommodated.

Paddings are also known, constituted by non-woven fabrics inside which a coil of an electric conductor is passed; said coil constitutes a heating resistor to be powered with an electric current.

However, these paddings have the disadvantage that the potential difference between the terminals of the conductor is very high, and therefore, in order to obtain the effect of heating the resistor, the power supply must have a high voltage (220 volts), with the consequent hazards.

Fabrics containing carbon fibers in addition to conventional fibers are also known.

The percentage of carbon fibers contained is currently approximately 5-6% and is in any case such that there is no electrical continuity between them.

This kind of fabric is termed anti-static, since it eliminates the effects of static electricity and is used for clothing.

So-called electric blankets are also known; in said blankets, a coil of an electric conductor, which constitutes a heating resistor to be powered with current, is passed in a padding between two fabrics.

However, these paddings have the disadvantage that the potential difference between the terminals of the conductor is very high, and therefore the power supply must be at a high voltage to obtain the effect of heating the resistor.

The aim of the present invention is to provide a set of fibers in sheet form, both of the woven fabric type and of the non-woven fabric type, which can be used as a heating product conveniently powered with low-voltage current.

An object of the present invention is to provide a product for which lack of electrical continuity of some parts in any case does not compromise operation.

Another important object is to provide a product which has relatively low electrical resistance over large areas.

Another important object is to provide an electrically conducting product which is safe, reliable and efficient in use.

Another important object is to provide a product which can warm up, when supplied with electric current, in a short time.

Another important object is to provide a product which can be used for paddings or heated linings.

Another object is to provide a product which can be manufactured with machines and equipment currently in use.

This aim, these objects and others which will become apparent hereinafter are achieved by a set of fibers in sheet form, characterized in that it comprises conducting fibers in such an amount, with respect to the non-conducting fibers, that there is electrical continuity.

Advantageously, the set can be a non-woven fabric in which the conducting fibers are present in such an amount, with respect to the non-conducting fibers, that there is uniform electrical continuity.

Conveniently, the set can be a fabric comprising regions in which a conducting thread is present in such an amount, with respect to the non-conducting thread, that there is electrical continuity.

Further characteristics and advantages of the present invention will become apparent from the detailed description of a non-woven fabric and of a woven fabric according to the invention, illustrated only by way of non-limitative example in the accompanying drawing, wherein:

figure 1 is a diagram of an electric blanket manufactured with a fabric according to the present invention.

A non-woven fabric according to the invention is composed, in a first embodiment, substantially of 50% polyester fibers and 50% metallic conducting fibers, for example copper fibers and/or nickel fibers and/or stainless steel fibers.

The amount is such as to produce electrical continuity between the metallic fibers.

Alternatively, the non-woven fabric can be made entirely of polyester fibers, at least 50% of which is metalized, i.e. coated with a conducting metallic layer.

The metalization operation is per se known and is currently usually used for anti-static non-woven fabrics.

By providing electrical continuity among the various parts of the structure, said structure can be powered with electric current and warm up.

Power can be supplied at low voltage, since the potential difference between the most distant points in which contact may be performed is in any case low.

The non-woven fabric itself thus becomes a low-voltage electrical resistor and can be used as

heated padding for example for blankets, car seats, wall linings, etc.

Warm-up is practically immediate after power is supplied, differently from electric blankets provided with an internal resistor, and any localized interruption of electrical continuity does not compromise operation at all.

It should be stressed that all machines currently used to manufacture current non-woven fabrics can be used to manufacture this electrically conducting non-woven fabric.

With reference now to the above described figure 1, an electric blanket manufactured with a fabric according to the present invention, for example sized for a single bed, comprises regions 10 made of a non-conducting thread, made for example of polyester, cotton etc., interlaid with regions 11 made of thread with conducting fibers, for example copper fibers and/or nickel fibers and/or stainless steel fibers and/or carbon fibers.

In these regions 11, the amount of conducting fibers is at least 50% of the total and is in any case such as to provide electrical continuity between said fibers.

The conducting regions 11 can also be manufactured from polyester fibers, at least 50% whereof is metalized, i.e. coated with a conducting metallic layer.

The metalization operation is per se known and currently in normal use.

In the case of a blanket sized for a single bed, in order to have a relatively low electrical resistance in a wide space it is possible to provide three strips made of fabric formed with conducting thread which occupy a width of 20 cm composed of metallic thread with a diameter of 2 mm interlaid with spaces of 0.5 cm which are held together, both on the weft and on the warp, by non-conducting thread.

Regions 10 with a width of 5 cm are provided between regions 11; the width is internally composed of non-conducting thread both on the weft and on the warp.

The regions with conducting thread are connected in parallel to links 12 made of copper conductor for the flow of electric current and for the power supply contacts.

A blanket of this type is supplied with 27 volts and absorbs approximately 160 watts of power with an absorbed current of approximately 6 amperes.

In practice, the regions with thread made of conducting fibers become low-voltage electrical resistors in themselves which warm up substantially immediately when they are connected to an electric power supply.

It should be noted that the links may also be provided with a series-type connection.

The constructive technology allows, by working on:

-- combinations of fabrics in series and/or in parallel;

-- geometries differing in terms of conducting strips and non-conducting intervals;

-- arrangements of the links;

to meet the most disparate requirements in the widest-ranging fields of application; for example, it is possible to use fabrics for heating roofs connected to car batteries, accident-aid electric blankets for cars, ambulances, etc., paddings for windcheaters, ski boots, etc.

It should be stressed that conventional looms used to produce current fabrics can be used to manufacture this electrically conducting fabric.

In practice it has been observed that the intended aim and objects of the present invention have been achieved.

The invention thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept.

All the details may furthermore be replaced with other technically equivalent elements.

In practice, the materials employed, so long as they are compatible with the contingent use, as well as the dimensions, may be any according to the requirements.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Set of fibers in sheet form, characterized in that it comprises conducting fibers in such an amount, with respect to the non-conducting fibers, that there is electrical continuity.

2. Non-woven fabric according to claim 1, characterized in that it comprises conducting fibers in such an amount that there is uniform electrical continuity.

3. Non-woven fabric according to one or more of the preceding claims, characterized in that said conducting fibers are present in an amount equal to at least 50% of the total.

4. Non-woven fabric according to one or more of claims 1 to 3, characterized in that said non-conducting fibers are made of polyester.

5. Non-woven fabric according to one or more of claims 1 to 4, characterized in that said conducting fibers comprise metallic fibers.

6. Non-woven fabric according to one or more of claims 1 to 5, characterized in that said conducting fibers comprise fibers made of a non-conducting material which are metalized, by being externally coated with a layer of metal.

7. Fabric including a set of fibers in sheet form according to claim 1, characterized in that it comprises regions in which a conducting thread is present in such an amount, with respect to the non-conducting thread, that there is electrical continuity.

8. Fabric according to one or more of claims 1 and 7, characterized in that it comprises regions of non-conducting thread interlaid with regions made of conducting fibers, the latter regions being connected to links to be powered with electric current, and in that said links are connected in series and/or in parallel.

9. Fabric according to one or more of claims 1 and 7 to 9, characterized in that said regions made of non-conducting thread are made of polyester and/or cotton and/or equivalent materials, and in that said conducting fibers are constituted by metallic fibers or carbon fibers.

10. Fabric according to one or more of claims 1 and 7 to 13, characterized in that said regions of thread made of conducting-fiber thread comprise metallic threads interlaid with spaces and held together, both in the weft and in the warp, by non-conducting thread.

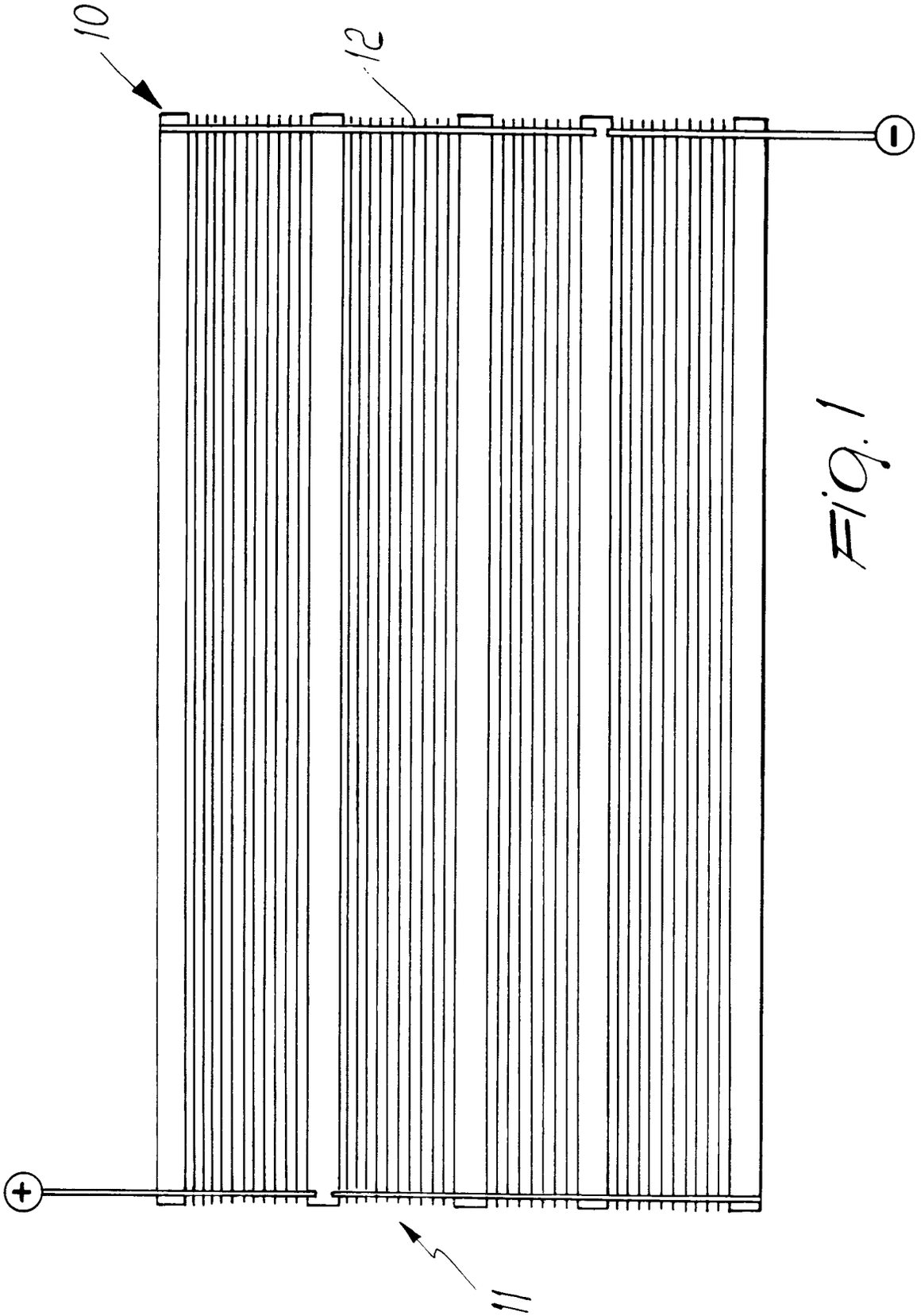

Fig. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 93 10 5338

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 323 641 (CHISSO) * abstract; claims 1-10; examples 1-6 *	1-8	D04H1/42 D03D15/00
X	EP-A-0 323 642 (CHISSO) * abstract; claims 1-4,7; examples 1-4 *	1-8	
X	US-A-4 943 477 (TOMOTSUGU KANAMURA) * the whole document *	1-5	
A	US-A-4 534 886 (ROBERT G. KRAUS) * abstract; claims *	1-6	
A	US-A-4 606 968 (PETER B. THORNTON) * abstract; claims; figures *	7-10	
A	GB-A-2 089 851 (FIBERITE) * abstract; claims; figures *	1,7-10	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

D04H
D03D
D02G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	02 JULY 1993	DURAND F.C.

CATEGORY OF CITED DOCUMENTS

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