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(54) **Thermal protection fabric**

(57) It comprises two layers of stable fiber thread: a high thermal protection, low absorption outer layer (1), and a high absorption, fire-resistant inner layer (2). Both layers (1, 2) are arranged spaced apart by an air layer (3). The outer layer (1) may be made out of meta-aramid, para-aramid, polyamideimide, modacrylic and mixtures

thereof; and the inner layer (2) may be made out of fire-resistant viscose, treated cotton or polybenzimidazole or mixtures with meta-aramid, para-aramid, polyamideimide and modacrylic. The fabric may be knitted fabric or double cloth fabric.

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Description

Field of the invention

[0001] The present invention relates to a technical fabric for thermal protection and comfort. The fabric of the invention is formed of an outer layer and an inner layer that is near or in contact with the user, both layers comprising different types of fibers. Said layers are spaced apart by an air layer.

BACKGROUND ART

[0002] Thermal protection fabrics are known formed of fiber thread layers that can be of different nature according to the properties desired to provide to the fabric concerned.

[0003] Although theoretically, in general, in order to obtain a good fire protection non combustible materials must be used, this is not easy in the event they are fabrics for garments. Other difficulties further exist in the use of certain materials in thermal protection clothing such as obtaining suitable steam permeability and water impermeability values. Certain synthetic fibers, such as para-aramid (e.g. Kevlar®, Twaron®, Technora®), meta-aramid (e.g. Nomex®, Conex®) or polybenzimidazole (PBI®), allow good results to be obtained.

[0004] One example of the use of such materials for making technical protection fabrics is the international application WO01/64985, which describes a fabric with an outer layer having Nomex® threads and an inner layer having Kevlar® threads. In one embodiment, both layers are interlaced by warp Nomex® threads.

[0005] Although prior art solutions can be effective in certain applications, they are not completely effective in providing a protection and comfort combined action. On the other hand, the use of Nomex® fibers for the outer layer does not promote user sweating as these fibers have a low moisture absorption (absorption index of the order of 5.5%). In addition, the use of Kevlar® fibers in the inner layer does not provide appropriate protection and comfort.

SUMMARY OF THE INVENTION

[0006] The present invention provides a fiber technical fabric for thermal protection that allows to overcome the disadvantages of the fabrics which for the same purpose have been used so far, further providing other additional advantages, as it will be seen hereinafter.

[0007] Particularly, the invention provides a thermal protection fabric formed of two fiber layers: a high thermal protection, low moisture absorption (lower than 10%) outer layer, and a high absorption, fire-resistant inner layer. The outer layer and the inner layer are formed of respective weft and warp threads, and they are conveniently spaced apart by an air layer.

[0008] Particularly, the outer layer of the fabric accord-

ing to the invention is made out of stable fiber threads. These outer layer fibers can be selected from meta-aramid, para-aramid, polyamideimide, modacrylic fibers and mixtures thereof.

[0009] On the other hand, the inner layer of the fabric is made out of fibers selected from fire-resistant viscose, treated cotton or polybenzimidazole or mixtures with meta-aramid, para-aramid, polyamideimide and modacrylic.

[0010] The fabric of the invention can be made out of fibers forming staple fiber threads. The fabric can be double shed fabric. Other variants of the described fabric can be plated knitted fabric.

[0011] It is envisaged that at least one of the layers of the fabric includes carbon fibers. At least one of the layers of the fabric could also include metal fibers to provide the fabric with antistatic properties. Both said carbon fibers and said metal fibers would be included in small proportions.

[0012] With a fabric as the one of the invention a highly effective garment is obtained as for thermal protection and with a great sweat absorption power due to the composition of the inner layer (the one in contact with the skin) promoting the passage of sweat to the fabric providing a greater comfort since the skin is dried. This comfort is promoted by the use of staple (non multifilament) fibers further obtaining a more aesthetic visual appearance. A good moisture transference is further obtained due to the composition of the outer layer of the fabric which prevents the fabric from being impregnated and, therefore, with the water remaining in the surface and thus easily evaporated. The fabric of the invention is a high air permeability and low water steam resistance fabric.

[0013] Other objects, advantages and features of the thermal protection fabric of the invention will be clear from the description of the invention of a preferred embodiment. This description is given by way of a non limiting example and it is depicted in the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] In said drawings,

Figure 1 is a diagrammatic view showing one embodiment of a double cloth fabric according to the invention; and

Figure 2 is a diagrammatic view showing one embodiment of a knitted fabric according to the invention.

DETAILED DESCRIPTION OF ONE PREFERRED EMBODIMENT

[0015] Several exemplary embodiments of a thermal protection fabric according to the invention are described hereinbelow.

[0016] As it can be seen from figure 1 of the drawings

herein enclosed, the fabric comprises an outer layer 1 and an inner layer 2. This inner layer 2 is the one in contact or in the proximity of the user's skin. Both layers 1, 2 are formed of fiber threads 6 forming the weft 4 and the warp 5 of the fabric. The fiber composition of the outer layer 1 is different from the fiber composition of the inner layer 2.

[0017] As it can be seen, the outer layer 1 and the inner layer 2 are spaced apart by an intermediate air layer 3.

[0018] The outer layer 1 of the fabric that is herein described according to the invention has high thermal protection and low moisture absorption (lower than 10%) features. The outer layer 1 of the fabric can be made out of stable fiber threads selected from meta-aramid, para-aramid, polyamideimide, modacrylic fibers and mixtures thereof.

[0019] On the other hand, the inner layer 2 is a high absorption, fire-resistant layer. This inner layer 2 of the fabric can be made out of staple fiber threads selected from viscose, treated cotton or polybenzimidazole or mixtures of meta-aramid, para-aramid, polyamideimide and modacrylic.

[0020] The configuration of the fabric with the weft 6 and warp 4 thread 5, forming a double joined cloth (figure 1) or knitted (figure 2) fabric according to the invention, respectively, is shown in figure 1.

[0021] While the present invention has been described in the specification and it has been depicted in the appended drawings with reference to one preferred embodiment thereof, different changes can be made in the thermal protection fabric of the invention without departing from the scope of protection defined in the following claims.

Claims

1. - Thermal protection fabric comprising an outer layer (1) and an inner layer (2) of fibers, **characterized in that** the outer layer (1) is a high thermal protection, low absorption layer, the inner layer (2) being made out of high absorption, fire-resistant fibers.
2. - Fabric as claimed in claim 1, **characterized in that** the outer layer (1) is made out of one or more of fibers selected from meta-aramid, para-aramid, polyamideimide, modacrylic and mixtures thereof.
3. - Fabric as claimed in claim 1, **characterized in that** the inner layer (2) is made out of fibers selected from fire-resistant viscose, treated cotton or polybenzimidazole or mixtures of meta-aramid, para-aramid, polyamideimide and modacrylic.
4. - Fabric as claimed in any of the preceding claims, **characterized in that** said fibers form stable fiber threads.
5. - Fabric as claimed in any of the preceding claims,

characterized in that said fabric is a plated knitted fabric.

6. - Fabric as claimed in any of the preceding claims, **characterized in that** this fabric is a double cloth fabric.
7. - Fabric as claimed in any of the preceding claims, **characterized in that** both layers (1, 2) are spaced apart by an air layer (3).
8. - Fabric as claimed in any of the preceding claims, **characterized in that** at least one of the layers includes carbon fibers.
9. - Fabric as claimed in any of the preceding claims, **characterized in that** at least one of the layers includes metal fibers.

FIG. 1

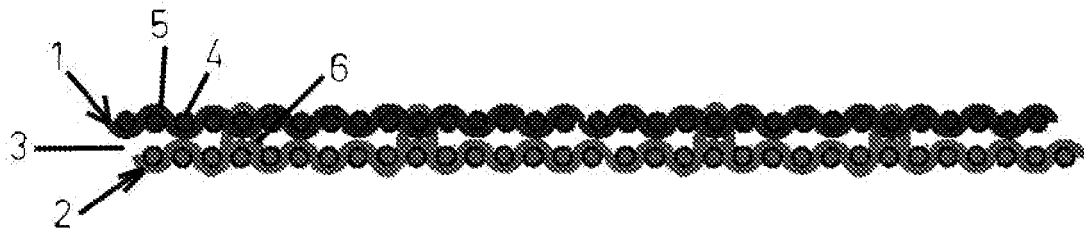
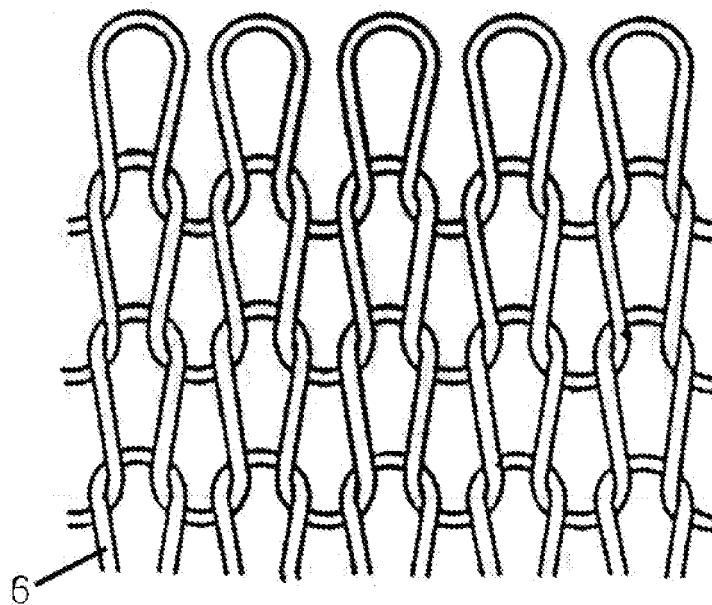


FIG. 2



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 0164985 A [0004]