(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 468 365 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.06.2012 Bulletin 2012/26

(51) Int Cl.:
A63B 39/00 *(2006.01)* ***A63B 39/06*** *(2006.01)*

(21) Application number: **11195658.7**

(22) Date of filing: **23.12.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **24.12.2010 JP 2010288246**

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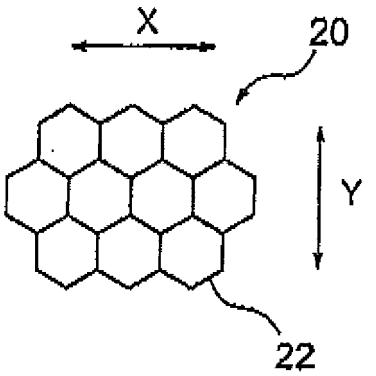
(54) Tennis ball felt and tennis ball

(57) To provide a tennis ball felt which has less occurrence of creases at the time of forming a tennis ball. According to one embodiment, a tennis base felt (12), which is covered on a core (10) of a tennis ball, includes: a base fabric formed of stretchy material; and fibers fixed with the base fabric.

FIG. 1A



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Description

BACKGROUND

1. Field of the Invention

[0001] The present invention relates to a felt used for an outer surface (melton) of a tennis ball and a tennis ball using the felt, and more particularly to a tennis ball felt which has less occurrence of creases at the time of forming a tennis ball and a tennis ball using the felt.

2. Description of the Related Art

[0002] As a tennis ball, as shown in Fig. 3, there is used what includes a core 10 and a felt 12 covered on the core. Usually, the core is formed of rubber in a spherical shape, and the felt is substantially gourd-shaped. Two sheets of felt are adhered to the core with a rubber adhesive. In Fig. 3, reference numeral 14 represents a joint between two sheets of felt where the above rubber adhesive is exposed.

[0003] As the above-mentioned tennis ball felt, a woven felt or a needle felt is used (refer to JP-A-2003-154037). The woven felt, in which a surface of a woven fabric is fluffed up, is made by subjecting a raw fabric to raising-processing and milling-processing. The needle felt is, as shown in Fig. 4, made by implanting and fixing short fibers (batt fibers) 18 onto a base fabric 16 by a needle-punch method (refer to JP-A-2007-308822).

[0004] The tennis ball using the woven felt for the outer surface (hereinafter, referred to as a "woven felt ball") is more excellent in performance than the tennis ball using the needle felt for the outer surface (hereinafter, referred to as a "needle felt ball"). However, the woven felt ball, since the felt is prone to fluff up and become worn, is mainly used for game. On the other hand, though the needle felt ball is inferior in performance to the woven belt ball, since the felt of the needle felt ball is hard to fluff up and become worn and the needle felt ball is inexpensive, the needle felt ball is mainly used for practise.

[0005] As types of tennis court, there are an en-tout-cas court made from lateritious clay, an omni court made from sand-filled artificial turf, a clay court made from clay, a hard court made from concrete subjected to rubber processing, a carpet court (for indoor) made from carpet-like material, and a grass court made from natural grass.

[0006] Of the aforementioned courts, there is a court where the felt of the tennis ball is prone to fluff up and therefore a ball using a felt which is high in durability is preferably used. Its court is, for example, the carpet court. Accordingly, in such the court, the aforementioned needle felt ball is preferably used. However, in case that the needle felt ball is formed, there is a problem that creases are prone to occur particularly in a circumferential edge portion (in the vicinity of joint) of the felt.

SUMMARY

[0007] An object of the invention is to provide a tennis ball felt which has less occurrence of creases at the time of forming a tennis ball, and a tennis ball using the felt.

[0008] Upon investigation of a cause of the aforementioned crease occurrence, the inventors have found out that: since the conventional tennis ball needle felt uses, as a base fabric, a woven fabric which uses a cotton fiber having no stretch property for one of the warp and the woof, and a polyester fiber having no stretch property for the other thereof, the base fabric and the needle felt have the stretch property in neither of the longitudinal direction and the lateral direction, so that it is conceivable that when the felt is adhered to the core having the spherical body, creases are produced on the felt due to lack of the stretch property; and therefore, by providing the stretch property for the base fabric thereby to provide the stretch property for the needle felt, it is possible to prevent the creases from being produced on the felt in the forming time of the needle felt ball.

[0009] The invention has been made on the basis of the above findings, and an object of the invention is to provide a tennis ball felt of the followings.

According to a first aspect of the invention, there is provided a tennis bass felt, which is covered on a core of a tennis ball, including: a base fabric formed of stretchy material; and fibers fixed with the base fabric.

According to a second aspect of the Invention, there is provided a tennis bass felt, which is covered on a core of a tennis ball, including: a base fabric having a mesh structure which develops stretch property; and fibers fixed with the base fabric.

According to a third aspect of the invention, there is provided a tennis bass felt, which is covered on a core of a tennis ball, including: a base fabric formed of stretchy material and having a mesh structure which develops stretch property; and fibers fixed with the base fabric.

[0010] Further, according to a fourth aspect of the invention, there is provided a tennis ball including a core and felt covered on the core, in which the felt is any of the first to third aspects.

[0011] Since the tennis ball felt of the invention has the aforementioned constitution of the first to third aspects, it is conceivable that the felt has the stretch property and therefore has less occurrence of creases at the time of forming the tennis ball.

[0012] According to the tennis ball felt and the tennis ball of the invention, creases are hard to be produced on the felt at the forming of the tennis ball. Namely, according to the invention, it is possible to obtain a tennis ball which is excellent in aesthetic appearance, and prevent effectively the irregular ball bound resulted from the creases produced on the felt.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The present invention will become more fully

understood from the detailed description given hereinbelow and the accompanying drawing which is given by way of illustration only, and thus is not limitative of the present invention and wherein:

Figs. 1A and 1B are schematic diagrams each showing an example of the mesh structure of a base fabric;
Fig. 2 is a graph showing a result of a test using a Tensilon tester in an embodiment;
Fig. 3 is a partially sectional front view showing an example of a tennis ball; and
Fig. 4 is an explanatory view showing a needle felt.

DETAILED DESCRIPTION OF THE INVENTION

[0014] The invention will be described below more detailedly. A tennis ball felt of the invention is formed by fixing a base fabric and fibers together. In the invention, in case that the base fabric is formed of stretchy material, examples of the stretchy material can include stretchy polyurethane, polyethylene terephthalate, nylon, a mixture of polyurethane and polyethylene terephthalate, a mixture of polyurethane and nylon, a mixture of nylon and polyethylene terephthalate, a mixture of polyurethane, nylon and cotton, and synthetic rubber. The most preferable material of these materials is, from points of excellent stretch property, and suitable thickness and weight, polyurethane.

[0015] Further, in case that the base fabric having the mesh structure which develops the stretch property is used, examples of the above mesh structure can include the structure shown in Figs. 1A and 1B. In a mesh structure 20 shown in Fig. 1A, each mesh 22 is hexagonal; and in a mesh structure 30 shown in Fig. 1B, each mesh 32 is rhomboidal. The base fabric having the mesh structure of Fig. 1A or 1B has the stretch property in both of a longitudinal direction X and a lateral direction Y. Therefore, the felt using the above base fabric has the stretch property in both of the longitudinal direction X and the lateral direction Y. Examples of the mesh structure which develops the stretch property can include, in addition, the structure in which each mesh has the shape of an even-gon such as an octagon, and the structure in which each mesh is circular.

[0016] In case that the base fabric having the mesh structure which develops the stretch property is used, the base fabric may be formed of material having no stretch property. Examples of such the material having no stretch property can include non-stretch cotton and linen.

[0017] Though material of the fibers fixed to the base fabric is not limited, examples of the material can include a single material or a two or more sorts-mixture selected from a wool fiber, a nylon fiber, a polyester fiber, an acrylic fiber, and a rayon fiber.

[0018] The tennis ball felt of the invention may have the stretch property in one or two directions of the longitudinal direction, the lateral direction, and an oblique direction, or in all the directions. From a point that the occurrence of creases on the felt is effectively prevented at the forming time of the tennis ball, it is preferable that the felt has the stretch property in all the directions. However, in case that the stretch property is provided for the felt by the base fabric having the mesh structure which develops the stretch property, since there is a direction where the felt cannot stretch depending on the pulling direction, it is preferable that the felt is punched out so as to stretch at least in the longitudinal direction of the substantially gourd-shape.

[0019] In the invention, the fiber forming the felt is processed with a fiber softening agent and subjected to soft finishing, whereby softening property is provided for the fiber of the felt, and the occurrence of the creases on the felt can be prevented more at the forming time of the tennis ball. The fiber softening agent, which gives the softening property to the fiber, is selected appropriately in response to material of the fiber.

[0020] As a main component of the fiber softening agent, there are, for example, cationic surfactants such as a polyamide type cationic surfactant, a quarternary-ammonium salt type cationic surfactant, and a non-ion cationic surfactant; anionic surfactants such as an ester type nan--ion/anionic surfactant, a non-ion anionic surfactant, a higher alcohol-based anionic surfactant, a wax/non-ion/anionic surfactant, a wax/non-ion/weak anionic surfactant; nonionic surfactants such as a polyhydric alcohol-based nonionic surfactant, a polyhydric alcohol ester type nonionic surfactant, a polyether type nonionic surfactant, a wax/nonionic surfactant, and a wax/weak cation/nonionic surfactant; a silicon oil; and a modified silicon oil,

[0021] A particularly preferable main component of the fiber softening agent is the polyamide type cationic surfactant. By using this surfactant, it is possible to obtain effects that resilient and soft textures can be added to the fiber and a fiber which is small in hue change and decrease of fading resistance can be obtained.

[0022] An example of the processing method with the fiber softening agent includes a method of immersing the raw fibers of felt or felt in the watered-down softening agent, but the processing method is not limited to this method.

[0023] In the invention, in case that a felt in which fibers have been processed with the fiber softening agent is made, the felt may be made by the fibers processed with the fiber softening agent in advance, or the felt after being made may be processed with the fiber softening agent.

[0024] The tennis ball of the invention is more preferably formed into a needle felt ball. Hereby, it is possible to obtain a tennis ball which can be used appropriately in a court (for example, a carpet court) where the felt is prone to fluff up and therefore, a ball felt which is high in durability is preferably used.

[0025] In the manufacture of needle felt used in the above-mentioned needle felt ball, short fibers (batt fibers) are implanted and fixed onto a base fabric by a needle-

punch method, whereby the needle felt which is a non-woven fabric having a fluffing-up surface can be obtained (refer to Fig. 4).

[0026] Further, the above needle felt may have a single-layer structure or a multilayer structure. As the needle felt having the multilayer structure, there is; for example, the needle felt in which a polyester fiber or an acryl fiber is used as a fiber, a nylon fiber or a mixed fiber of wool and nylon is used as a fiber in a lower felt layer having the above-mentioned structure (1) to (3), and an upper felt layer having the above-mentioned constitution (1) to (3) is laminated on the lower felt layer.

[0027] In case that the needle felt having the above multilayer structure is processed with the fiber softening agent, it is necessary to select a main component of the fiber softening agent so that the softening property can be provided for the fibers in all the layers. However, in the invention, it is permissible that the softening agent is not used at all, the softening agent may be used in only the felt having the aforementioned constitution (1), the softening agent may be used in only the felt having the aforementioned constitution (2), or the softening agent may be used in only the felt having the aforementioned constitution (3).

[0028] The felt of the invention in which the base fabric and the fibers are fixed together may be made by other methods than the needle punch method.

[0029] The tennis ball shown in Fig. 3 was made by the following procedure.

(1) A fiber blend containing a wool fiber and a nylon fiber at a predetermined ratio was formed in the shape of a sheet, and plural fiber blend sheets were layered as a raw fabric of felt fibers.
(2) A base fabric was prepared, which is formed of polyurethane fibers having stretch property, has a mesh structure in which each mesh is hexagonal, and is stretchy in a longitudinal direction, a lateral direction, and an oblique direction.
(3) The base fabric and the raw fabric were laminated and subjected to needle-punch processing by a needle-punch machine in which needles are stuck into the lamination from the raw fabric side, whereby the base fabric and the short fibers were fixed together and needle felt which is a non-woven fabric having a fluffing-up surface was made.
(4) The obtained needle felt was immersed in a watered-down softening agent, and thereafter dried. As a main component of the fiber softening agent, a polyimide type cationic surfactant was used.
(5) The needle felt processed with the fiber softening agent was punched out in the substantially gourd-shape.
(6) Two sheets of the above needle felt were adhered onto the periphery of a spherical core formed of cross linked rubber with a rubber adhesive, whereby a needle felt ball was made.

[0030] When the tennis ball was made using the above-mentioned needle felt, no creases were produced on the felt.

[0031] Further, by the needle-punch method, the following needle felt A to C were made. In this case, the softening agent was not used.

*Needle felt A: a felt which uses a base fabric formed of polyurethane that is stretchy material and having a hexagonal mesh structure developing stretch property, and which has the stretch property in both of a longitudinal direction and a lateral direction (refer to Fig. 1A)

*Needle felt B: a felt which uses a base fabric composed of a woven fabric, the woven fabric using a cotton fiber having no stretch property for one of warp and woof, and a polyester fiber having no stretch property for the other thereof, and therefore having stretch property in neither of the longitudinal direction and the lateral direction, the felt having stretch property in neither of the longitudinal direction and the lateral direction

*Needle felt C: a felt which uses a base fabric of which material is the same as the material of the base fabric of the needle felt B and of which thickness is larger than the thickness of the base fabric of the needle felt B.

[0032] Regarding felt pieces obtained by punching out the needle felt A to C in the substantially gourd-shape, a relationship between stress and elongation when each felt piece was pulled till each felt was broken was been examined by a Tensilon tester. A result of the examination is shown in Fig. 2. From the result in Fig. 2, it is found that the felt using the stretchy base fabric is higher in stretch property than the felt using the base fabric having no stretch property.

[0033] When the tennis balls were made using the above-mentioned needle felt A to C punched out in the substantially gourd-shape, creases were produced on the felt B and C, but creases were not produced on the felt A.

Claims

1. A tennis ball felt, for covering a core of a tennis ball, comprising:

   a base fabric formed of stretchy material; and
   fibers fixed with the base fabric.

2. A tennis ball felt, for covering a core of a tennis ball, comprising:

   a base fabric having a mesh structure which develops stretch property; and
   fibers fixed with the base fabric.

3. A tennis ball felt, for covering a core of a tennis ball, comprising:

   a base fabric formed of stretchy material and

having a mesh structure which develops stretch property; and
fibers fixed with the base fabric.

4. The tennis ball felt according to any one of claims 1 to 3, wherein:

the felt is needle felt formed by fixing the base fabric and the fibers together by a needle punch method.

5. The tennis ball felt according to any one of claims 1 to 4, wherein:

the fibers are processed with a fiber softening agent.

6. The tennis ball felt according to claim 5, wherein a main component of the softening agent is a polyimide type cationic surfactant.

7. A tennis ball comprising:

a core; and
the tennis ball felt according to any one of claims 1 to 6, the tennis ball felt covering the core.

FIG. 1A

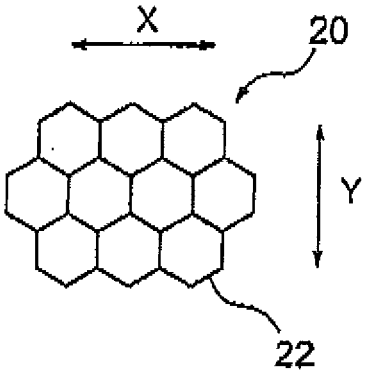


FIG. 1B

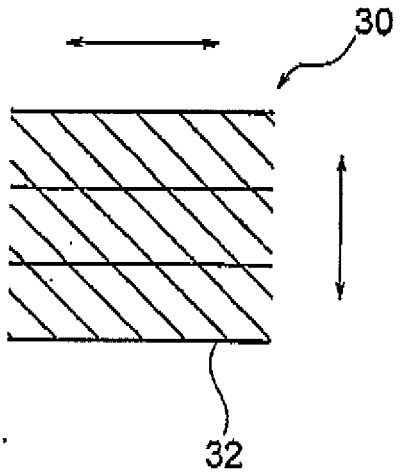


FIG. 2

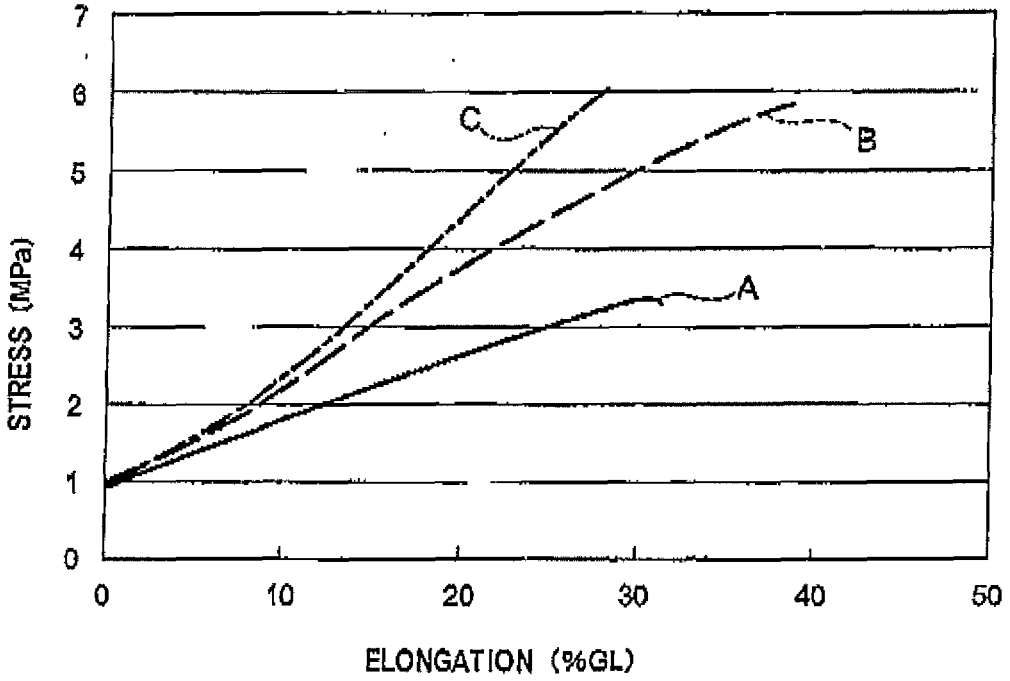


FIG. 3

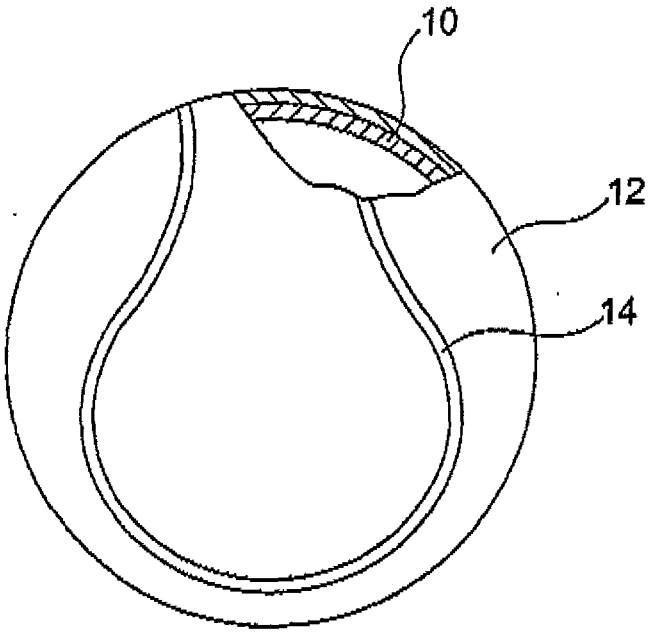
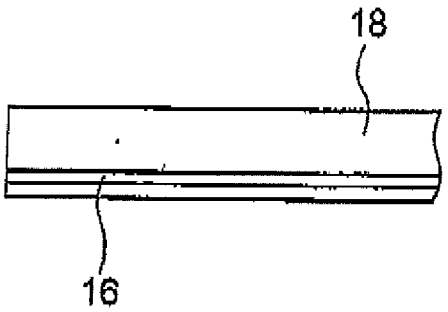


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 11 19 5658

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 1 074 779 A (SPALDING & BROS LTD AG) 5 July 1967 (1967-07-05) * page 1, line 76 - page 2, line 60; figures * -----	1-7	INV. A63B39/00 A63B39/06
X	GB 1 588 380 A (WEBRON PRODUCTS LTD) 23 April 1981 (1981-04-23) * page 1; table 1 * -----	1-7	
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			TECHNICAL FIELDS SEARCHED (IPC) A63B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 March 2012	Lundblad, Hampus

CATEGORY OF CITED DOCUMENTS

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30-03-2012

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REFERENCES CITED IN THE DESCRIPTION

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- JP 2003154037 A **[0003]**
- JP 2007308822 A **[0003]**