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71 Applicant: **Mitsubishi Yuka Badische Co., Ltd.**
1000, Kawajiri-cho
Yokkaichi-shi Mie Prefecture(JP)

72 Inventor: **Kato, Naoyuki c/o Mitsubishi Yuka**
Badische Co., Ltd. 1000, Kawajiri-cho
Yokkaichi-shi Mie(JP)
Inventor: **Wakabayashi, Etsuo c/o Mitsubishi**
Yuka
Badische Co., Ltd. 1000, Kawajiri-cho
Yokkaichi-shi Mie(JP)

74 Representative: **Hansen, Bernd, Dr.**
Dipl.-Chem. et al
Hoffmann, Eitle & Partner Patentanwälte
Arabellastrasse 4 Postfach 81 04 20
D-8000 München 81(DE)

54 **Fibrous laminate and process of producing the same.**

57 A process of producing a fibrous laminate is described which comprises laminating a thermoplastic resin fiber binder non-woven fabric (A) having a melting point of from 60 to 200 °C on the surface of a fiber mat (B) composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40 °C higher than the melting point of the aforesaid fiber binder non-woven fabric, applying needling to the laminate from the side of the thermoplastic resin fiber binder non-woven fabric (A), whereby the binder fibers of the non-woven fabric (A) and the fibers of the fiber mat (B) are entangled with each other to provide a laminate mat (C), placing a surface decorating material (D) on the surface of the non-woven fabric (A), and heating the laminate to a temperature of not melting the surface decorating material (D) and the fibers of the fiber mat (B) but melting the binder fibers of the non-woven fabric (A) to weld the surface decorating material (D) and the laminate mat (C) in a body.

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FIBROUS LAMINATE AND PROCESS OF PRODUCING THE SAME

FIELD OF THE INVENTION

5 This invention relates to a fibrous laminate excellent in heat moldability, form-retentability, and cushioning property and a process of the production thereof. More particularly, the invention relates to a fibrous laminate excellent in heat moldability, form retentability, and cushioning property as internal decorating materials for vehicles such as motor cars, etc., and a process of the production thereof.

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BACKGROUND OF THE INVENTION

Hitherto, as internal decorating materials for motor cars, etc., there are known, for example, moldable
 15 fiber fabric mats obtained by coating or impregnating a needle punched non-woven fabric with an aqueous emulsion of a thermoplastic resin having a softening point of from 100°C to 130°C followed by drying and a carpet obtained by heating a non-woven fabric mat composed of mixed fibers of high-melting fibers such as polyethylene terephthalate fibers, etc., and a thermoplastic resin fiber binder having melting point of from 100°C to 130°C and press molding the non-woven fabric mat in conformity with the floor form of motor
 20 car.

However, since these carpets are lacking in gorgeousness by themselves and are insufficient in either performance such as rigidity, elasticity, moldability, etc., it has been attempted to adhere a tufted carpet or a needle punched carpet to the surface of the aforesaid carpet as a surface decorating material using an adhesive or a hot melting agent, or to line the carpet with a resin sheet or a foam resin sheet.

25 As a process of lining a carpet without reducing the gas permeability of the carpet, the inventor previously proposed a process of lining a tufted carpet by applying a web onto the carpet through a fiber binder non-woven fabric under heating and pressing and forming them, said web being produced by needling a felt layer composed of a mixture of a thermoplastic resin fiber binder having melting point of from 60°C to 200°C and fibers having melting point of at least 40°C higher than the melting point of the
 30 aforesaid fiber binder in JP-A-61-135614 (The term "JP-A" as used herein means an "unexamined published Japanese patent application").

The method of lining a carpet proposed by JP-A-61-135614 described above is excellent in the point of not reducing the gas permeability and flexibility of the carpet since the fiber non-woven binder is a discontinuous layer having vacant spaces, different from conventional processes wherein a hot melt
 35 adhesive film is a continuous layer. However, in the aforesaid process, (1) there was a problem in the uniformity of the felt layer for lining in the case of mixing the fiber and the fiber binder and hence by sufficiently mixing the fiber binder with other fibers, moldability and fixing of fibers of fiber mat are obtained as uniformly as possible and (2) for more certainly adhering a surface decorating material and the fiber mat, they are pressed under heating with a waterpermeable non-woven fabric composed of a thermoplastic fiber
 40 binder between them.

As described above, in the aforesaid process, hot melt adhesives (i.e., non-woven binder, thermoplastic resin film, thermoplastic resin powder, etc.) are required for adhering the surface decorating material to other material.

45 In addition, by needling only, there are surface roughness of the surface decorating material and adhesive strength is insufficient. Also even using the course of a hot melt adhesive and needling, there are surface roughness of the surface decorating material.

SUMMARY OF THE INVENTION

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An object of this invention is to provide a process of producing a fibrous laminate capable of producing easily and at low cost a lined carpet having excellent moldability and form-retentability by further improving the aforesaid carpet lining process.

That is, the 1st embodiment of this invention provides a process of producing a fibrous laminate which

comprises laminating a non-woven fabric (A) composed of a thermoplastic resin fiber binder having a melting point of from 60 °C to 200 °C on the surface of a fiber mat (B) composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40 °C higher than the melting point of the aforesaid fiber binder under non-woven fabric, applying needling to the laminate from the side of the thermoplastic resin binder non-woven fabric (A) to provide a laminate mat (C) wherein the binder fibers of the non-woven fabric (A) and the fibers of the fiber mat (B) are entangled with each other, placing a surface decorating material (D) on the surface side of the non-woven fabric (A), and heating them to a temperature of not melting the surface decorating material (D) and the fibers of the fiber mat (B) but melting the binder fibers of the non-woven fabric (A) to weld the surface decorating material (D) and the fiber mat (B) in a body.

The 2nd embodiment of this invention provides a fibrous laminates obtained by laminating non-woven fabrics (A) and (A') composed of a thermoplastic resin fiber binder having a melting point of from 60 °C to 200 °C, respectively, on both surfaces of a fiber mat (B) mainly composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40 °C higher than the melting point of the aforesaid fiber binder, applying needling to the laminate to provide a laminate mat (C) wherein the fibers of the fiber binder non-woven fabric (A), (A') and the fibers of the fiber mat (B) are entangled with each other, superposing a surface decorating material (D) on the laminate mat (C), and heating them under compressing to a temperature of higher than the melting point of the fiber binder of the aforesaid fiber binder non-woven fabric (A) but not melting the aforesaid surface decorating material (D) and the fibers as the main component of the fiber mat (B) to adhere the aforesaid surface decorating material (D) onto the laminate mat (C).

In the embodiment of this invention, by sandwiching the fiber mat (B) in the fiber binder non-woven fabrics (A) and (A') and applying needling to the assembly, the entangling of the high-melting fibers of the fiber mat (B) and the low-melting fibers of the fiber binder non-woven fabrics (A) and (A') is enhanced to more strongly fix the fibers of the fiber mat (B) by the molten binder fibers. Furthermore, since the fiber non-woven fabric (A') exists at the opposite side of the fiber mat (B) to the side of carrying the surface decorating material (D), if an under felt or a foam resin sheet is brought into contact with the surface of the non-woven fabric (A') at press molding, the felt or sheet adheres to the surface of (A').

The 3rd embodiment of this invention provides a fibrous laminate comprising a surface decorating material (D), a non-woven fabric (A) composed of a thermoplastic resin fiber binder having a melting point of from 60 °C to 200 °C, and a base material (B') composed of a fiber mat (B) composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40 °C higher than the melting point of the aforesaid fiber binder non-woven fabric (A) having dispersed therein resin particles of an aqueous resin emulsion, which are adhered to each other in this order (D/A/B') in a body.

While in the aforesaid 1st embodiment of this invention, the fibers of the fiber mat (B) are fixed by applying needling to entangle the fibers of the fiber mat (B) and the fibers of the fiber binder non-woven fabric (A) with each other and melting the fiber binder, in the 3rd embodiment of this invention, the fibers of the base material layer (B') are fixed by impregnating the fiber mat (B) with a resin emulsion.

In the 3rd embodiment of this invention, however, the fibers of the fiber binder non-woven fabric (A) and the fibers of the fiber mat (B) may be entangled with each other by the application of needling and in the case of employing needling for entangling fibers in the 3rd embodiment of this invention, the fibers of the base material layer (B') can be more strongly fixed by the synergistic action of the needling and the impregnation of the emulsion.

When needling is shallowly applied in the 3rd embodiment of this invention, the fiber mat (B) layer is wholly impregnated with the resin emulsion but when needling is wholly applied, the fiber mat (B) layer may be impregnated with the resin emulsion wholly or to an extent of the depth of from 30 to 80% in the thickness direction of the fiber mat (B) layer. The latter case of imperfectly impregnating, the fiber mat layer less loses the cushioning property of the fibrous laminate.

Thus, the 4th embodiment of this invention provides a fibrous laminate comprising a laminate mat (C) and a surface decorating material (D) laminated thereon, said laminate mat (C) comprising a pair of outer non-woven fabric layers (A) and (A') composed of a thermoplastic resin fiber binder having a melting point of from 60 °C to 200 °C and a fiber mat layer (B) mainly composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40 °C higher than the melting point of the aforesaid thermoplastic fiber binder non-woven fabric, sandwiched in said outer non-woven fabric layers (A) and (A'), the fibers of the fiber non-woven fabric of said outer non-woven fabric layers (A) and (A') being entangled and joined with the synthetic fibers or natural fibers of the fiber mat layer (B) by the application of needling, and the aforesaid fiber mat layer (B) mainly composed of the synthetic fibers or natural fibers containing an aqueous emulsion of a resin having a glass transition point of at least 50 °C in an amount of

from 10 to 100 parts by weight as solid resin components per 100 parts by weight of the fibers.

The 5th embodiment of this invention provides a fibrous laminate obtained by applying the steps of needling and the impregnating with the aqueous resin emulsion in the aforesaid 4th embodiment of this invention to the case of sandwiching the fiber mat (B) in the fiber binder non-woven fabrics (A) and (A').

that is, the embodiment provides a fibrous laminate obtained by laminating a surface decorating material (D) on a laminate mat (C) comprising a pair of outer non-woven fabric layers (A) and (A') composed of a thermoplastic fiber binder having a melting point of from 60°C to 200°C and a fiber mat layer (B) mainly composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40°C higher than the aforesaid thermoplastic fiber binder non-woven fabric, sandwiched in said outer non-woven fabric layers (A) and (A'), said fiber mat layer (B) at least partially containing solid components of an emulsion of a resin having a glass transition point of at least 50°C.

In this embodiment, the fiber mat layer (B) may be impregnated with the resin emulsion wholly or partially in the thickness direction of the layer.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic sectional view showing the fibrous laminate according to the 1st embodiment of this invention,

Fig. 2 is a schematic sectional view showing the fibrous laminate according to the 2nd embodiment of this invention,

Fig. 3 and Fig. 4 each is a schematic sectional view showing the fibrous laminate according to the 3rd embodiment of this invention,

Fig. 5 is a schematic sectional view showing the fibrous laminate according to the 4th embodiment of this invention, and

Fig. 6 is a schematic sectional view showing the fibrous laminate according to the 5th embodiment of this invention.

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DETAILED DESCRIPTION OF THE INVENTION

Then, the embodiments 1 to 5 of this invention are described in order and prior to the explanation thereof, materials common to these embodiments of this invention are explained.

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Fiber Binder Non-Woven Fabric (A) or (A')

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The fiber binder non-woven fabric (A) or (A') for using in this invention is a non-woven fabric composed of thermoplastic resin fibers. That is, the non-woven fabric is obtained by entangling fibers of a thermoplastic resin such as polyethylene, polypropylene, linear polyester, polyamide, etc., or composite fibers thereof having a melting point of from 60°C to 200°C, and preferably from 90°C to 170°C, the size of the fibers may be thick or thin but is usually at least 3 deniers and the fiber length being preferably at least 8mm from the point of entangling, by a spun bond method, a needle punch method, etc. Also, the non-woven fabric may be a fiber web obtained by carding engine, etc. or a fiber fabric of fibers fixed by a binder. The non-woven fabric has gas permeability. In general, the non-woven fabric is preferably composed of the fibers having a unit weight per square of from 6 g/m² to 600 g/m².

Also, the fiber binder non-woven fabric (A) or (A') may be produced by melting pellets of a resin such as polypropylene, low-melting polyester, low-melting polyamide, etc., using an extruder, extruding the molten resin through a die having many fine holes into filaments while carrying them by wind so that the filaments are not collected, accumulating them on a screen under the die, and gathering them by a winder.

Such fiber binder non-woven fabrics are commercially available as follows. That is, for example, non-woven fabrics having many pores capable of passing water therethrough are commercially available as a trade name of Meltron W from Diabond Kogyo K.K., with polyamide series non-woven fabrics having grade names of PAY-200 and PAS-200, polyester series non-woven fabrics having grade names of ES-500, etc., acetic acid copolymer series non-woven fabrics having grade name of Y-7. Further, polypropylene series

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non-woven fabrics as trade names of Sintex PK-103, PK-106, PK-404, and PK-408 from Mitsui Petrochemical Industris, Ltd., polyethylene series non-woven fabrics as trade name of Admel from Mitsui Petrochemical Industries, Ltd., and similar non-woven fabrics trade name of DYNAC with grade names of LNS-0000, LNS-2000, ES-00, B-1000, B-2000, B-3000, etc., from Kureha Suni K.K. are commercially available.

5 It is preferred that the melting point of the fiber binder non-woven fabric (A) or (A') for use in this invention is at least 40° C lower than the melting point of the fibers mainly constituting the fibers of the fiber mat (B). This is because the temperature of melting the non-woven fabric (A) is usually from 20° C to 30° C higher than the melting point of the binder fibers of the non-woven fabric (A).

The basis weight of the non-woven fabric (A) or (A') is generally from 10 g/m² to 500 g/m².

10 Also, the fiber binder non-woven fabric may be composed of a single kind of fibers or mixed fibers of, for example, polypropylene fibers and polyamide fibers. That is, the non-woven fabrics may be composed of mixed fibers or a laminate of these mixed fibers if the melting points of these fibers are at least 40° C lower than the melting point of the fiber mat (B). Furthermore, the mixed fibers may contain high-melting fibers to some extent (less than 30%). Recovered fibers may be used but in this case, the fibers are
15 required to be mixed well.

Fiber Mat (B)

20 As the fibers constituting the fiber mat (B) which is used for the fiber laminates of this invention, synthetic fibers or natural fibers are used.

The synthetic fibers or natural fibers have a melting point of at least 40° C, and preferably at least 70° C higher than the melting point of the aforesaid fiber binder non-woven fabric (A), (A') (practically having a melting point of from 200° C to 280° C). The synthetic fibers are used such as polyethylene terephthalate
25 fibers, polyamide fibers, polyacrylonitrile fibers, etc. and as natural fibers, cotton, hemp, wool, rough felt, waste poly fibers, etc. are used.

The fiber mat (B) may contain a fiber binder having a melting point of from 60° C to 200° C in a ratio of from 15 to 50% by weight.

When the fiber mat (B) for use in this invention is subjected to needling together with the aforesaid fiber
30 binder non-woven fabric (A) or (A') laminated on the surface thereof for entangling the fibers of the mat and the fibers of the non-woven fabric in a body, it is unnecessary to previously impart a sufficient form retentability to the fiber mat itself by needling and also the purpose is sufficiently attained by using a web of waste fibers by not always using fibers of good quality.

For example, a web obtained from fibers having a melting point of at least 40° C, and at preferably at
35 least 70° C higher than the melting point of the fiber binder non-woven fabric (A), (A'), such as the fibers of wool, nylon, polyacrylonitrile, polyacetate, polyethylene terephthalate, etc., by carding, is used as the fiber mat.

40 Surface Decorating Material (D)

As the surface decorating material (D), an original good for tufted carpet obtained by raising piles of polyamide or polyethylene terephthalate on a primary base cloth formed by knitting with flat polypropylene yarns, an original good for tufted carpet obtained by raising piles on a primary base cloth of the aforesaid
45 needle punched carpet, a needle punched carpet, woven-fabrics, papers, etc., are used.

Aqueous Resin Emulsion

50 The aqueous resin emulsion is an emulsion of resin particles having a glass transition point of at least 50° C, and preferably from 80° C to 180° C, and the particle size is from 0.05 to 1.5 μm.

Practical examples of the aforesaid resin having a glass transition point of at least 50° C are thermoplastic resins such as a lower ester copolymer of styrene•lower alkyl ester of acrylic acid (carbon atoms of the ester being from 2 to 6), a copolymer of lower alkyl ester of acrylic acid•styrene•acrylic acid,
55 a copolymer of a lower alkyl ester of methacrylic acid (carbon atoms of the ester being from 2 to 6), a vinylidene chloride copolymer (containing more than 85% by weight of vinylidene chloride), a styrene•diene copolymer, etc.

Examples of the most suitable resin are (a) an aqueous emulsion of a homopolymer such as n-propyl

polymethacrylate (Tg 81 °C), polystyrene (Tg 100 °C), polyacrylonitrile (Tg 100 °C) methyl polymethacrylate (Tg 105 °C), polymethacrylic acid (Tg 130 °C), polyitaconic acid (Tg 130 °C), polyacrylamide (Tg 153 °C), etc.,

(b) an aqueous emulsion of a copolymer of from 50 to 100% by weight, and preferably from 65 to 95% by weight of the vinyl monomer which is the raw material of the aforesaid homopolymer and other vinyl monomer such as 2-ethylhexyl acrylate (Tg 85 °C), n-butyl acrylate (Tg -54 °C), ethyl acrylate (Tg -22 °C), isopropyl acrylate (Tg -5 °C), 2-ethylhexyl methacrylate (Tg -5 °C), n-propyl acrylate (Tg 8 °C), n-butyl methacrylate (Tg 20 °C), vinyl acetate (Tg 30 °C), t-butyl acrylate (Tg 45 °C), 2-hydroxyethyl methacrylate (Tg 55 °C), ethyl methacrylate (Tg 65 °C), isobutyl methacrylate (Tg 67 °C), vinyl chloride (Tg 79 °C), etc., or a copolymer of the aforesaid vinyl monomer and at most 50% by weight, and preferably from 35 to 5% by weight of vinylidene chloride (Tg -18 °C) [wherein Tg shown in the parenthesis is the glass transition point of the homopolymer of the vinyl monomer or vinylidene chloride], and

(c) a mixture of from 50 to 97% by weight, and preferably from 55 to 95% by weight of an aqueous emulsion of a resin having Tg of from +50 °C to 155 °C and from 50 to 3% by weight, and preferably from 45 to 5% by weight of an aqueous emulsion of a resin having Tg of from -85 °C to 50 °C.

The aforesaid aqueous emulsion may contain a filler such as calcium carbonate, iron oxide, ferrite, barium sulfate, etc., for imparting a massive feeling to the fibrous laminate obtained and may contain a powder of a low-melting resin such as a low-density polyethylene or polystyrene, an ethylene.vinyl acetate copolymer, etc., for imparting a moldability to the fibrous laminate.

Such an aqueous emulsion is generally coated on the fiber mat (B) or a laminate mat obtained by laminating the fiber binder non-woven fabric (A) on the fiber mat (B) followed by, if necessary, needling at the back side surface of the fiber mat layer (B) for impregnation and dried or the laminate mat described above is immersed in the aqueous emulsion followed by drying, whereby the resin particles of the emulsion are dispersed in the fiber mat (B).

It is preferred that the resin particles of the aqueous emulsion having a glass transition point of at least 40 °C lower than the heat deformation temperature of the materials for the surface decorating material (D) and the fiber mat (B) of the base material layer (B').

30 Fibrous Laminate (1)

Then, the fibrous laminate according to the 1st embodiment of this invention is described in detail.

As shown in Fig. 1, the fibrous laminate obtained according to the process in the 1st embodiment of this invention has the structure formed by laminating a carpet (D) as the upper layer of a surface decorating material, such as a needle punched carpet, tufted carpet, etc., on the surface of a laminate mat (C) having a double layer structure formed by laminating a fiber binder non-woven fabric (A) on the surface of a fiber mat (B) followed by needling and heating under compression the laminate to melt the aforesaid fiber binder non-woven fabric (A) and weld the surface decorating material (D) and the laminate mat (C).

The fiber binder non-woven fabric (A) is used in an amount of from 10 to 200% by weight of the fiber mat (B).

Needling is performed in the manner that the fiber binders of the non-woven fabric (A) are perpendicularly inserted into the fiber mat (B) and needles penetrate through the fiber mat (B).

Thus, the fiber binders of the non-woven fabric (A) exist throughout the whole fiber mat (B) layer in an amount of from 5 to 80% by weight. In this case, however, when the fiber mat (B) containing from 5 to 50% by weight of a fiber binder therein before needling is used, it is unnecessary to insert needles until the needles completely penetrate the fiber mat (B) layer.

Also, the fiber binder of the non-woven fabric (A) is inserted in the fiber mat (B) in an amount of from 5 to 80% by weight and also always remain at the surface thereof in an amount of from 95 to 20% by weight to form a clear double layer structure of the fiber binder layer (A) and the fiber mat layer (B). Also, the binder fibers of the non-woven fabric (A) exists in the fiber mat (B).

The surface decorating material (D) is placed on the fiber binder non-woven fabric (A) and is finally brought into a form of being heat-adhered thereto. In this case, a system of entangling the fibers of the surface decorating material (D) by applying light needling and then heat-adhere the surface decorating material (D) to the fiber binder non-woven fabric (A) at heat-molding may be employed but this system roughens the surface of the surface decorating material (D) and also has an disadvantage of requiring the addition step.

In this invention, it is particularly important to heat the laminated materials to at least a temperature of melting the fiber binder non-woven fabric (A) and a temperature of not melting the upper layer carpet (D)

and the fiber mat (B). In this case, a roll pressure of about 1 kg/cm² is enough for heat-adhering only but when molding and the control of density are performed simultaneously with heat adhering, a roll pressure of from 5 kg/cm² to 50 kg/cm² is required. In the case of applying heat-adhering only, the heating and compression can be continuously performed using ordinary rolls. It is preferred to apply needling so that
 5 from 5% to 100% of the binder fibers of the non-woven fabric (A) are entangled with the fibers of the fiber mat (B).

The fibrous laminate of this invention can be heat molded in conformity with a floor, etc., being laid. In this case, the fibrous laminate can be molded into a desired form according to the purposes simultaneously with or after adhering the aforesaid upper layer carpet thereto.

10 The 1st embodiment of this invention described above has the following effects.

In the fibrous laminate according to the 1st embodiment of this invention, the fibers of the fiber binder non-woven fabric (A) enter the fiber mat (B) by needling and are entangled with the fibers of the fiber mat (B), the fiber mat (B) itself is set to impart the strength, hardness and form retentability as the backing material layer (C).

15 Since the surface of base layer is mainly composed of the binder fibers of the fiber binder non-woven fabric (A) after needling, there is an advantage that the surface decorating material (D) adheres to the base material layer (B') without particularly requiring an adhesive means such as adhesive cloth, powder, hot melt, etc.

Also, the fibrous laminate is excellent in moldability by heat molding by the existence of the fiber binder non-woven fabric, with particularly suitability for deep drawing molding, and good in form retentability after molding.

Furthermore, since the fiber mat (B) and the fiber binder (A) are entangled by needling in a laminated state of both the components, a step of uniformly mixing the fibers of both components different from conventional techniques is unnecessary and the production process for the fibrous laminate is simplified.

25 The 1st embodiment of this invention is explained practically by Examples 1 to 4 and Comparison Examples 1 and 2.

Fibrous Laminate (2)

30

Then, the fibrous laminate according to the 2nd embodiment of this invention is described in detail. As shown in Fig. 2, the fibrous laminate has the structure obtained by superposing, for example, a needle punched carpet as a surface decorating material (D) on one surface of a laminate mat (C) formed by needling the laminate of three-layer structure comprising a fiber mat (B) and fiber binder non-woven fabrics (A) and (A') laminated on both surfaces of the fiber mat (B) followed by heating them under compression to melt the binder fibers of the aforesaid fiber binder non-woven fabric (A) and, thereby, adhere the surface decorating material (D) to the laminate mat (C).

The non-woven fabric (A) is used in a ratio of from 10 to 100% by weight of the fiber mat (B). The non-woven fabric (A') of the lower layer is used in unit weight per square of from 10 to 500 g/m².

40 By applying needling to the laminate composed of the three-layer structure composed of the fiber mat (B) having the fiber binder non-woven fabrics (A) and (A') laminated on both surfaces thereof, the laminate mat (C) wherein the fibers of the fiber binder non-woven fabrics (A) and (A') and the fibers of the fiber mat (B) are entangled with each other is obtained and for the purpose it is required to perform the needling so that the needles penetrate the fiber mat (B).

45 By the application of aforesaid needling, the binder fibers of the fiber binder non-woven fabric (A) or (A') exists in the whole layer of the fiber mat (B) at from 5 to 80% by weight. In this case, however, when the fiber mat (B) containing from 5 to 50% by weight of fiber binder in the layer of the fiber mat (B) before needling is used, it is not always necessary to insert the needles in the fiber mat (B) until the needles completely penetrate therethrough.

50 Needling may be applied to the laminate from any side of the laminate but when needling is applied thereto from the side of the fiber binder non-woven fabric (A), the binder fibers of the fiber binder non-woven fabric (A) are inserted in the fiber mat (B) in an amount of from 5 to 80% by weight thereof by the needling but remaining 95 to 20% by weight of the fibers remain as a fiber binder layer at the surface of the laminate mat (C) to give the clear layer structure of the fiber binder layer (A) and the fiber mat (B) and also
 55 the binder fibers of the fiber binder fabric (A) exist in the fiber mat (B). In this case, part of the fibers of the fiber mat (B) are inserted into the fiber binder non-woven fabric (A') disposed at the opposite side to the fabric (A) and are entangled therewith.

That is, in the laminate mat (C), the fibers of the fiber binder non-woven fabric (A) are perpendicularly

inserted into the fiber mat (B) and also the fibers of the fiber mat (B) are inserted into the fiber binder non-woven fabric (A') disposed at the opposite side to the fabric (A) by needling, whereby the fibers of the three layers are entangled with each other in a body.

As a matter of course, needling may be applied to the laminate from the side of the fiber binder non-woven fabric (A').

The needling being applied after laminating the aforesaid fiber mat (B) and the fiber binder non-woven fabric (A) is applied by piercing needles into the opposite side in the perpendicular direction at a ratio of from 80 to 300 needles per square inches.

The needling is performed so that from 5 to 80% by weight of the binder fibers of the fabric (A) are entangled with the fibers of the fiber mat (B).

The surface decorating material (D) is placed on the fiber binder non-woven fabric (A) of the laminate mat (C) and is finally in the form of being heat-adhered thereto and in this case, a system of entangling the surface decorating material (D) by light needling and letting the material heat-adhere to the fiber binder nonwoven fabric (A) at heat molding may be employed. However, the system roughens the surface of the surface decorating material (D) and has a disadvantage of requiring an addition step.

In this embodiment, it is particularly important to heat the laminate to at least a temperature of melting the fiber binder non-woven fabrics (A) and (A') and a temperature of not melting the surface decorating material (D) and the fiber mat (B). A pressure of about 1 kg/cm² by press rolls is enough in the case of heat-adhering only but a pressure of from 5 to 50 kg/cm² is necessary in the case of molding and controlling the density of the mat simulataneously with heat-adhering.

In the case of heat adhering only, the heating and the compression can be continuously performed using rolls, etc.

The fibrous laminate according to the 2nd embodiment of this invention can be heat-molded in conformity with the form of a floor to be layed and in this case, the fibrous laminate can be heat-adhered to other materials. The aforesaid molding can be performed simultaneously with the adhesion of the aforesaid surface decorating material. Also, the assembly once heat-adhered can be formed into a necessary form according to the purpose.

The fibrous laminate of this embodiment has the following effects.

That is, since in the fibrous laminate, the fiber mat (B) is sandwiched in the fiber binder non-woven fabrics (A) and (A'), and the fibers of the fiber binder non-woven fabric (A) are inserted into the fiber mat (B) and are entangled with the fibers of the latter, the fiber mat (B) itself is heat set by heating to be imparted with the strength, hardness, and form retensivity as a backing layer.

Also, since the surface of the laminate mat (C) of the backing layer is mainly composed of the binder fibers of the fiber binder non-woven fabric (A) after needling, there is an advantage that for adhering the laminate mat (C) to the surface decorating material (D), an adhesive means such as adhesive cloth, powder, hot melt, etc. is not required.

Also, since the fibrous laminate has a layer mainly composed of the fiber binder non-woven fabric (A') as the lower layer, the fibrous laminate is excellent in moldability at heat molding and hence the laminate is particularly suitable for molding of deep drawing and is good in form retensivity after molding. Furthermore, the fibrous laminate can be adhered to other material by the fiber binder non-woven fabric (A') as the lower layer.

Moreover, since in the fibrous laminate, the fiber mat and the fiber binder non-woven fabric (A) and (A') are entangled with each other by needling the laminate of them, it is unnecessary to uniformly mix the fibers of both the components different from conventional techniques, which can simplify the production process for the fibrous laminate.

The 2nd embodiment of this invention is explained more practically by Examples 5 to 8 and Comparison Examples 3 and 4.

50 Fibrous Laminate (3)

Then, the fibrous laminate according to the 3rd embodiment of this invention is described in detail.

As shown in Fig. 3, the fibrous laminate has the structure composed of a surface decorating material (D), a fiber binder non-woven fabric (A) of a thermoplastic resin having a melting point of from 60°C to 200°C, and a base material layer (B') composed of a fiber mat (B) of synthetic fibers or natural fibers, said synthetic fibers having a melting point of at least 40°C higher than the melting point of the aforesaid fiber binder non-woven fabric (A) having dispersed therein resin particles of an aqueous resin emulsion adhered with each other in this order (D/A/B) in a body.

The fibrous laminate is obtained by laminating the fiber binder non-woven fabric (A) of a thermoplastic resin having a melting point of from 60°C to 200°C on the surface of the fiber mat (B) composed of synthetic fibers or natural fibers having a melting point of at least 40°C higher than the melting point of the aforesaid fiber binder non-woven fabric (A), applying needling to the laminate from the side of the fiber binder non-woven fabric (A) thereof to provide a laminate mat wherein the binder fibers of the non-woven fabric (A) and the fibers of the fiber mat (B) are entangled with each other, placing the surface decorating material (D) on the side of the non-woven fabric (A), coating and impregnating the laminate mat with a resin emulsion at the side of the fiber mat (B) followed by drying, and heating the assembly to a temperature of not melting the surface decorating material (D) and the fiber mat (B') but melting the binder fibers of the non-woven fabric (A) and the resin particles of the resin emulsion to weld the surface decorating material (D) and the fiber mat (B') in a body.

In addition, in this case, the non-woven fabric (A) is used in a ratio of from 10 to 200% by weight of the fiber mat (B). Also, the unit weight per square thereof is generally from 10 to 500 g/m².

In the fibrous laminate, the resin particles (a) may be dispersed in the whole fiber mat (B) in the mat (B') as shown in Fig. 3 or may be dispersed in the lower layer side (B₂), i.e., in the layer of from 30 to 80% of the thickness of the whole mat (B) as shown in Fig. 4.

In the latter case, the fibrous laminate has a fiber mat layer (B₁) containing no dispersion of the resin particles of the emulsion and hence the fibrous laminate is excellent in cushioning property but inferior in rigidity as compared with the former case. Also, in the latter case, it is preferred for not causing intralayer separation of the fibrous laminate at the mat layer (B₁) that the fibers of the fiber binder non-woven fabric (A) and the fibers of the fiber mat (B) are previously entangled with each other by the application of needling or the fiber mat (B) is composed of mixed fibers of from 50 to 85% by weight synthetic fibers or natural fibers each having a melting point of at least 200°C and from 50 to 15% by weight a resin fiber binder having a melting point of at least 40°C lower than the melting point of the aforesaid fibers.

In this case, the resin emulsion imparts a heat moldability and form retentability to the fibrous laminate by the resin-impregnated fiber mat layer (B₂) formed at the lower layer of the fiber mat (B) and also the resin mat layer (B₁) containing no resin formed at the upper layer thereof imparts a cushioning property to the fibrous laminate.

The fiber laminate is produced by laminating the thermoplastic resin fiber binder non-woven fabric layer (A) on the surface of the fiber mat layer (B) mainly composed of synthetic fibers having a melting point of at least 40°C higher than the melting point of the fibers of the aforesaid fiber binder non-woven fabric layer (A) or natural fibers to provide a laminate mat, applying thereto, if necessary, needling, coating the back surface of the laminate mat with an emulsion of a resin having a glass transition point of at least 50°C to impregnate the aforesaid resin mat layer (B) partially or wholly with the emulsion followed by drying, superposing the surface decorating material (D) on the surface of the laminate mat, and heating under compression the assembly to melt the resin particles of the emulsion and the fiber binder of the non-woven fabric (A) and weld the surface decorating material (D) to the fiber mat layer (B').

In other production process, the fibrous laminate is produced by laminating the thermoplastic fiber binder non-woven fabric (A) on the back surface of the aforesaid fiber mat layer (B) followed by needling to provide a laminate mat, and after placing the surface decorating material (D) on the laminate mat followed by heating to weld them, coating an emulsion of a resin having a glass transition point of at least 50°C on the back surface of the laminate mat to form the resin-containing fiber mat layer (B') in the aforesaid fiber mat layer (B).

In still other process, the fibrous laminate may be produced by coating or impregnating the fiber mat (B) with the resin emulsion or immersing the fiber mat (B) in the resin emulsion followed by semi-drying or completely drying them, placing the fiber binder non-woven fabric (A) on the surface of the mat (B') and further thereon the surface decorating material (D), and molding the assembly under heating and compressing.

In this case, it is particularly important to heat the assembly to at least a temperature of melting the resin particles of the emulsion and the fiber binder non-woven fabric (A) and a temperature of not melting the surface decorating material (D) and the high-melting fibers of the fiber mat layer (B).

In the case of welding by heating only, the compression may be sufficiently performed at a pressure of about 1 kg/cm² by press rolls but in the case of molding in conformity of the form of, for example, floor and controlling the density of the mat simultaneously with heat welding, a pressure of from 5 to 50 kg/cm² is necessary.

When the emulsion-impregnated layer is left at a part of the resin mat layer (B'), it is preferred that the compression is performed after drying the impregnated emulsion to some extent.

The aforesaid needling which is applied in necessary in this embodiment is performed for preventing

the occurrence of deformation of the laminate mat or enabling the molding work.

For forming the laminate mat (C) in which the fibers of the fiber binder (A) are entangled with each other, it is necessary to perform needling so that the needles penetrate through the fiber mat layer (B'), whereby the binder fibers of the fiber binder non-woven fabric (A) are inserted in the fiber mat layer (B) at
 5 from 5 to 80% by weight of the fibers in the whole range of the fiber mat layer (B'). In this case, however, when the fiber mat layer (B) already contains from 15 to 50% by weight of the fiber binder before the application of needling is used, it is not always necessary to insert the needles until the needles completely penetrate the fiber mat layer (B).

The needling may be applied to the aforesaid laminate from any side thereof but when the needling is
 10 applied thereto from the fiber binder non-woven fabric layer (A), the binder fibers of the fiber binder non-woven fabric (A) are inserted in the resin mat layer (B) at from 5 to 80% by weight thereof by needling and from 95 to 20% by weight of remaining fibers remain at the surface of the laminate mat (C) as the fiber binder non-woven fabric layer (A) to form a clear layer structure of the fiber binder layer (A) and the fiber mat layer (B) as well as the binder fibers of the fiber binder layer (A) exist in the fiber mat layer (C). In this
 15 case, as the matter of course, the fibers of the fiber mat layer (B) are partially inserted in the fiber binder non-woven fabric (A) and entangled with the fibers of the non-woven fabric.

That is, in the laminate mat, the binder fibers of the fiber binder non-woven fabric (A) are perpendicu-
 20 larly inserted in the fiber mat layer (B) and the fibers of the fiber mat layer (B) also are inserted into the fiber binder non-woven fabric layer (A) by needling, whereby the fibers of the two layers are entangled with each other in a body.

As a matter of course, the needling may be applied from the side of the fiber mat (B).

The needling is applied by piercing needles into the opposite side in the perpendicular direction at a ratio of from 80 to 300 needles per square inches are performed so that from 5 to 80% by weight of the binder fibers of the fiber binder non-woven fabric layer (A) are entangled with the fibers of the fiber mat
 25 layer (B).

Also, needling may be applied after laminating the surface decorating material (D) on the laminate mat.

The 3rd embodiment of this invention is described more practically by Examples 9 to 13 and Comparison Examples 5 and 6.

30

Fibrous Laminate (4)

Then, the fibrous laminate according to the 4th embodiment of this invention is described in detail.

The 4th embodiment of this invention provides a fibrous laminate formed by laminating a surface
 35 decorating material (D) on a laminate mat (C) composed of a pair of outer non-woven fabric layers (A) and (A') of a thermoplastic resin fiber binder non-woven fabric having a melting point of from 60°C to 200°C and a fiber mat layer (B) mainly composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40°C higher than the melting point of the aforesaid thermoplastic fiber binder non-woven fabric, sandwiched in said outer non-woven fabric layers (A) and (A'),
 40 the fibers of the outer fiber binder non-woven fabric layers (A) and (A') being entangled and joined with the synthetic fibers or natural fibers of aforesaid fiber mat layer (B), wherein the aforesaid fiber mat layer (B) mainly composed of the synthetic fibers or natural fibers may contain an emulsion of a resin having a glass transition point of at least 50°C in an amount of from 10 to 100 parts by weight as solid resin components of the emulsion per 100 parts by weight of the fibers (B').

As shown in Fig. 5, the fibrous laminate has the structure formed by laminating a surface decorating
 45 material (D) such as a needle punched carpet on one surface of a laminate mat (C) composed of a laminate having a three-layer structure formed by placing a fiber binder non-woven fabric layer (A) as an upper layer and a fiber binder non-woven fabric layer (A') as a lower layer on both surfaces of a fiber mat layer (B') containing solid resin components of a resin emulsion, the fibers of the fiber binder non-woven fabric layers
 50 (A) and (A') being entangled and joined with the fibers of the fiber mat layer (B') by applying needling, etc., to the laminate.

The fibrous laminate is produced by laminating the thermoplastic resin fiber binder non-woven fabric layers (A) and (A'), respectively, on both surfaces of the fiber mat (B) mainly composed of synthetic fibers having a melting point of at least 40°C higher than the melting point of the aforesaid thermoplastic resin
 55 fiber binder non-woven fabric layers (A) and (A') or natural fibers, applying needle punching thereto to provide the laminate mat (C) and after immersing the laminate mat (C) in an emulsion of a resin having a glass transition point of at least 50°C to impregnate the laminate mat with the emulsion, placing the surface decorating material (D) on the laminate mat (C) followed by heating and compressing, whereby the

emulsion is dried and the fiber binder of the aforesaid fiber binder non-woven fabric layers (A) and (A') are melted to heat-weld the surface decorating material (D) and the laminate mat layer (C).

The fiber binder non-woven fabric layers (A) and (A') each may not be composed of a single kinds of fibers. For example, they may be composed of a mixed fibers of polypropylene and polyethylene. Furthermore, the fibers may be mixed with high-melting fibers if the content thereof is within 30% by weight. In the case of using recovered fibers, fibers having high melting point are sometimes intermingled.

Also, a polypropylene fiber binder non-woven fabric may be used as the non-woven fabric (A) and a polyethylene fiber binder non-woven fabric may be used as the non-woven fabric (A').

By applying needling to the laminate composed of a three-layer structure formed by laminating the fiber binder non-woven fabric layers (A) and (A'), respectively, on both surfaces of the aforesaid fiber mat layer (B), the laminate mat (C) wherein the fibers of the fiber mat layer (B) are entangled with the fibers of the fiber binder non-woven fabric layers (A) and (A') is obtained and by impregnating the laminate mat (C) with the resin emulsion from the side of the non-woven fabric layer (A') or by immersing the laminate mat (C) in the resin emulsion, the laminate mat (C) having wholly impregnated with the emulsion is obtained.

Also, the laminate mat (C) wherein the fiber mat layer (B) is impregnated with the resin emulsion may be obtained by previously impregnating the fiber mat of the fiber mat layer (B) with the emulsion or immersing the fiber mat in the emulsion and after semi-drying or completely drying the emulsion, sandwiching the fiber mat layer (B) in the fiber binder non-woven fabric layers (A) and (A').

The laminating amount of each of the fiber binder non-woven fabric layers (A) and (A') is from 10 to 100% by weight of the fiber mat layer (B).

The emulsion can be uniformly dispersed in the laminate mat (C) as solid resin components of the emulsion by generally immersing the laminate mat (C) in the emulsion followed by squeezing by rolls to impregnate the mat with the emulsion and, if necessary, drying the mat.

The content of the solid resin components of the emulsion impregnated is from 10 to 100 parts by weight, and preferably from 20 to 80 parts by weight per 100 parts by weight of the synthetic fibers or natural fibers of the aforesaid fiber mat layer (B). If the content of the solid resin components of the emulsion is less than the aforesaid range, because the improvement of the rigidity can not be obtained, the improvement of the form retentability after molding can not be expected. Also, if the content is too large, the fibrous laminate become hard and shows a resin felt feeling.

For producing the fibrous laminate according to the 4th embodiment of this invention, there are also;

(1) a process of immersing a laminate mat (C) formed by laminating the fiber binder non-woven fabric layers (A) and (A'), respectively, on both surfaces of the aforesaid fiber mat layer (B) and applying needle punching to the laminate to entangle the fibers of fiber binder non-woven fabric layers (A) and (A') with the fibers of fiber mat layer (B), and after squeezing the laminate mat by rolls, etc., to impregnate the mat with the emulsion, placing the surface decorating material (D) on the laminate mat (C) followed by heating and compressing, whereby the emulsion is dried and the fiber binders of the aforesaid fiber binder non-woven fabric layers (A) and (A') are melted to weld the surface decorating material (D) to the laminate mat layer (C);

(2) a process of placing the surface decorating material (D) on the laminate mat (C) followed by heat-welding them, impregnating at least the whole mat range of the laminate mat (C) with the emulsion from the side of the fiber binder non-woven fabric (A') followed by drying to heat-forming it; the processes (1) and (2) being suitable for tufted carpet, gigged carpet, and woven cloth; and

(3) a process of placing the surface decorating material (D) on the fiber binder non-woven fabric layer (A), applying light needling to the laminate to entangle the surface decorating material (D) with the fiber binder non-woven fabric layer (A), and heat-welding the surface decorating material (D) to the fiber binder non-woven fabric (A).

The 4th embodiment of this invention is further explained more practically by Examples 14 to 18 and Comparison Examples 7 and 8.

Fibrous Laminate (5)

Then, the fibrous laminate according to the 5th embodiment of this invention is explained in detail.

As shown in Fig. 6, the 5th embodiment of this invention provides a fibrous laminate obtained by laminating a surface decorating material (D) on a laminate mat (C) composed of a pair of outer non-woven fabric layers (A) and (A') of a thermoplastic resin fiber binder non-woven fabric having a melting point of from 60 to 200°C and a fiber mat layer (B) mainly composed of synthetic fibers or natural fibers, said synthetic

fibers having a melting point of at least 40° C higher than the melting point of the aforesaid thermoplastic resin fiber binder non-woven fabric, sandwiched in the aforesaid outer non-woven fabric layers (A) and (A'), wherein the aforesaid fiber mat (B) partially contains solid resin components of an emulsion of a resin having a glass transition point of at least 50° C.

5 The fiber mat layer (B) constituting the fibrous laminate of this embodiment is composed of a fiber mat layer (B₂) containing solid resin components of the emulsion of a resin having a glass transition point of at least 50° C as the upper layer and a fiber mat layer (B₁) containing no such resin as the lower layer. The unit weight per square of the fiber mat layer (B) is generally from 100 to 1000 g/m², and preferably from 300 to 740 g/m².

10 After applying the emulsion to the lower surface of the fiber mat layer (B) before lamination or to the lower layer portion (A') of the laminate mat (C) after forming the laminate mat (C) by spraying or coating using a foam coater or immersing the lower surface of the fibrous mat layer (B) or the lower layer portion (A') of the laminate mat (C) in the emulsion followed by squeezing by rolls to impregnate the lower layer portion of the fiber mat layer (B) or the laminate mat (C) with the emulsion, the laminate is dried to form the resin-impregnated fiber mat layer (B₂) as the lower layer of the fiber mat layer (B).

15 The resin-impregnated fiber mat (B₂) is generally formed in a thickness of from 5 to 80%, and preferably from 30 to 65% of the thickness of the fiber mat layer (B).

The fibrous laminate is imparted with a heat moldability and form retentability by the resin-impregnated fiber mat layer (B₂) formed as the lower layer and also imparted with a cushioning property by the fiber mat layer (B₁) containing no resin formed as the upper layer.

20 By applying, if necessary, needling to the laminate having the three-layer structure composed of the aforesaid fiber mat layer (B) sandwiched in the fiber binder non-woven fabric layers (A) and (A'), the laminate mat (C) wherein the fibers of the fiber mat layer (B) are entangled with the fibers of the fiber binder non-woven fabric layers (A) and (A') can be obtained. Since the laminate mat (C) as described above is reluctant to deform, it is preferred to apply needling.

25 The laminating amounts of the fiber binder non-woven fabric layers (A) and (A') are from 10 to 100% by weight of the amount of the fiber mat layer (B) and each of the fiber binder non-woven fabric layers (A) and (A') as the upper and lower layers is laminated in an amount of from 10 to 500 g/m².

30 For forming the laminate mat (C) wherein the fibers of the fiber binder are entangled, it is necessary to apply needling so that the needles pierce through the fiber mat layer (B), whereby from 5 to 80% by weight of the binder fibers of the fiber binder non-woven fabrics (A) and (A') are inserted into the fiber mat layer (B) in the whole range of the fiber mat layer (B). In this case, however, when the fiber mat layer (B) before the application of needling already contains from 5 to 50% by weight of the fiber binder, it is not always necessary to insert the needles until the needles completely penetrate the fiber mat layer (B).

35 The needling may be applied to the aforesaid laminate from any side thereof but when the needling is applied from the side of the fiber binder non-woven fabric layer (A), the binder fibers of the fiber binder non-woven fabric layer (A) are inserted in the fiber mat layer (B) in an amount of from 5 to 80% by weight by needling but remaining 95 to 20% by weight of the binder fibers remain on the surfaces of the laminate mat (C) as fiber binder non-woven fabric layers (A) and (A') to give the clear layer structure of the fiber binder layer (A) and the fiber mat layer (B) as well as the binder fibers of the fiber binder layers (A) and (A') exist in the fiber mat layer (B). In this case, as a matter of course, part of the fibers of the fiber mat layer (B) are inserted in the fiber binder non-woven fabric (A') and entangled with the fibers of the non-woven fabric.

40 That is, since in the laminate mat (C), the binder fibers in the fiber binder non-woven fabric layer (A) are perpendicularly inserted in the fiber mat layer (B) and also the fibers of the fiber mat layer (B) enter the fiber binder non-woven fabric layer (A') at the opposite side to the layer (A) by needling, the fibers of the three layers are entangled in a body.

45 As a matter of course, needling may be applied from the side of the fiber binder non-woven fabric layer (A').

50 The needling is performed by piercing needles into the opposite side in the perpendicular direction at a ratio of from 80 to 300 needles per square inches and is performed until from 5 to 80% by weight of the binder fibers of the fiber binder non-woven fabric layers (A) and (A') are entangled with the fibers of the fiber mat layer (B).

Also, needling can be performed after laminating the surface decorating material (D) on the laminate mat (C).

55 The fibrous laminate of the 5th embodiment of this invention is produced by laminating the thermoplastic fiber binder non-woven fabric layers (A) and (A') on the front and back surfaces, respectively, of the aforesaid fiber mat layer (B) mainly composed of synthetic fibers having a melting point of at least 40° C higher than the melting point of the thermoplastic fiber binder non-woven fabric layers (A) and (A') or

natural fibers followed by needling to form a laminate mat (C), coating an emulsion of a resin having a glass transition point of at least 50 °C on the back surface of the laminate mat (C) to impregnate a part of the fiber mat layer (B) with the emulsion, and placing the surface decorating material (D) on the surface of the laminate mat (C) followed by heating and compressing, whereby the fiber binder was melted to heat-weld the surface decorating material (D) to the laminate mat layer (C).

In other production process, the fibrous laminate is produced by laminating each of the thermoplastic fiber binder non-woven fabric layers (A) and (A') on the front and back surfaces of the aforesaid fiber mat layer (B) followed by needling to form a laminate mat (C) and after placing the surface decorating material (D) on the laminate mat followed by heating to heat weld them, coating an emulsion of a resin having a glass transition point of at least 50 °C on the back surface thereof followed by drying to form a resin-impregnated fiber mat layer (B₂) at the lower layer portion of the aforesaid fiber mat layer (B).

In still other process of producing the fibrous laminate, after coating a resin emulsion on the back surface of the fiber mat layer (B), the fiber mat layer (B) is semi-dried or completely dried and sandwiched in the fiber binder non-woven fabric layers (A) and (A'), and then the surface decorating material (D) is placed on the fiber binder layer (A) followed by heat molding.

Furthermore, a process of placing the surface decorating material (D) on the fiber binder non-woven fabric layer (A), applying light needling to the surface decorating material (D) to entangle the surface decorating material with the fiber binder non-woven fabric (A), and heat-welding the surface decorating material (D) and the laminate mat (C) by the fiber binder non-woven fabric (A) at heat molding may be employed.

For forming the emulsion-impregnated layer at a part of the fiber mat layer (B), it is preferred to perform the compression after drying the impregnated emulsion to some extent.

The 5th embodiment of this invention is further described more practically by Examples 19 to 22 and Comparison Example 9.

Example 2

As the fiber binder non-woven fabric (A), a web obtained by carding 250 g/m² of propylene (melting point 164 °C) fibers of 16 deniers and 50 mm in length was used.

The non-woven fabric (A) was superposed on the surface of a phenol felt (B), "Felt Top 10t" (trade name, made by Howa Seni K.K., 10 mm thick, soft type, and unit weight per square 550 g/m²) and needling was applied thereto using needles of 15-18-32-3RB at 150 needles/in² to provide a laminate mat (C) of about 13 mm in thickness and 0.062 g/cm³ in apparent density.

A plain type needle punched carpet (D) composed of 300 g/m² of a fiber mat formed by randomly laminating cards of colored polyethylene terephthalate (melting point 264 °C) fibers of 6 deniers and 85 to 120 mm in fiber length was superposed on the upper surface of the fiber binder layer of the aforesaid laminate mat (C). Then, after melting the fiber binder made of polypropylene by heating the laminate at 190 °C through a suction dryer, the laminate was immediately press-molded using a cold press mold at a pressure of 10 kg/cm² to provide an integrated carpet for an internal decorating material having a thickness of 6 mm or 3 mm.

The carpets having 6 mm and 3 mm thick, respectively thus obtained each was cut into a piece of 150 mm x 50 mm and when the adhesive strength of the surface decorating material was measured using an Instron type testing machine, the peeling strength was 5.5 kg/5 cm width.

Example 2 and Comparison Example 1

By following the same procedure as Example 1 except that the fiber binder non-woven fabric (A) was not used (Comparison Example 1) or a non-woven fabric made of polyethylene having melting point of 119 °C ("Adomel", trade name, made by Mitsui Petrochemical Industries, Ltd., unit weight per square 100 g/m²) was used as the non-woven fabric (Example 2), fibrous laminates were obtained.

Example 3

By following the same procedure as Example 1 except that "Fine Needle 650L" (trade name of a felt containing 20% by weight of fiber binder, unit weight per square 660 g/m², made by Aoyama Sangyo K.K.) was used as the fiber mat (B), a fibrous laminate was obtained.

5

Example 4

By following the same procedure as Example 1 except that a polyester-series rough felt "Needl felt" (trade name of 8 mm thick, unit weight per square 650 g/m², made by Kansai Felt K.K.) was used as the fiber mat (B), a fibrous laminate was obtained.

15

Comparison Example 2

By following the same procedure as Example 2 except that the needling operation was not employed, a fibrous laminate was obtained.

The properties of these fibrous laminates obtained are shown in Table 1.

20

Table 1

	Example				Comparison Example	
	1	2	3	4	1	2
Adhesive Strength of (D)/(C)	>5kg/5cm width	>5kg/5cm width	>5kg/5cm width	>5kg/5cm width	Not adhered	>5kg/5cm width
Moldability, Form Retentivity	Good	Good	Very good	Good	No good	×
Breaking Strength of Fiber Mat (B)	>5kg/5cm width	>5kg/5cm width	>5kg/5cm width	>5kg/5cm width	<0.1kg/5 cm width	<0.1kg/5 cm width

35

Example 5

40

A web formed by carding 250 g/m² of polypropylene (melting point 164° C) fibers of 16 deniers and 50 mm in length was used as the fiber binder non-woven fabric (A) and also a web formed similarly by carding 50 g/m² of the aforesaid fibers was used as the fiber binder non-woven fabric (A').

These fiber binder non-woven fabrics (A) and (A') were respectively laminated on both surfaces of a phenol felt (B) (Feltop 10t, trade name, 10 mm thick, soft type, unit weight per square 550 g/m², made by Howa Seni K.K.) and needling was applied thereto in the state at 150 needles/in² to provide a laminate mat (C) having a thickness of about 13 mm and an apparent density of 0.065 g/cm³.

Then, after superposing as a surface decorating material (D) a plain type needle punched carpet composed of 300 g/m² of a fiber mat formed by randomly laminating cards of colored polyethylene terephthalate (melting point 264° C) fibers of 16 deniers and from 85 to 120 mm in fiber length on the fiber binder non-woven fabric (A) of the aforesaid laminate mat (C) and heating the laminate to 190° C to melt the fiber binder made of polypropylene, the laminate was press-molded using a cooled press mold for 60 seconds at a pressure of 10 kg/cm² to provide an integrated carpet for an internal decorating material having a thickness of 7 mm. Also, Feltop 6t (6 mm thick), a phenol felt made by Howa Seni K.K. was placed in the mold at molding the aforesaid laminate and the laminate was molded as above to provide a carpet.

55

Various properties of the carpets thus obtained were evaluated as follows. The results are shown in Table 2 below.

(1) Adhesive Property of Surface Decorating Material:

A piece of 150 mm x 50 mm was cut from the carpet, and the peeling strength of the laminate mat (D) and the laminate mat (C) was measured using an Instron type testing machine.

5

(2) Breaking Strength of Fiber Mat (B):

By the same manner as above, the breaking strength of the fiber mat (B) was measured between the fiber binder non-woven fabrics (A) and (A').

10

(3) Heat Set Property:

The possibility of controlling the thickness of the laminate mat (C) in the case of peat-compressing the mat of 5 cm in thickness for 60 seconds at 180°C was determined. The sample capable of controlling the thickness was shown by ○.

15

20 (4) Moldability:

The form retentability of the aforesaid product formed by molding using the mold at 180°C and 10 kg/cm² was evaluated. The product having the same form as the cavity of the mold was defined as ⊙.

25

(5) Adhesive Property to Other Element:

When the laminate was molded by the mold while placing "Feltop 6t" in the mold and the felt adhered to the fiber binder non-woven fabric (A') at the back surface thereof was peeled by broken at the adhered "Feltop" layer, the case that the felt fibers remained on the surface of the non-woven fabric (A') was defined as ⊙.

30

(6) Tape Adhesive Power of the Back Surface:

35

The adhesion in the case of sticking a gum tape made of a cloth onto the surface of the non-woven fabric (A') of the carpet formed by molding the laminate without placing "Feltop" in the mold and the state of fibers in the case of peeling off the gum tape thus stuck were observed and the case that the fibers were not peeled off was defined as ○.

40

Example 6 and Comparison Example 3

By following the same procedure as Example 5 except that the fiber binder non-woven fabrics (A) and (A') were not used (Comparison Example 3) or non-woven fabric of polyethylene fibers having a melting point of 119°C ("Adomel", trade name, made by Mitsui Petrochemical Industries, Ltd., unit weight per square 100 g/m²) was used in place of the aforesaid fiber binder non-woven fabric (Example 6), fibrous laminates were obtained.

50

Example 7

By following the same procedure as Example 5 except that "Fine Needle 650L" (trade name of a felt containing 20% of fiber binder, unit weight per square 650 g/m², made by Aoyama Sangyo K.K.) was used as the fiber mat (B), a fibrous laminate was obtained.

55

Example 8

By following the same procedure as Example 5 except that a polyester series rough felt ("Needle Felt", trade name, 8 mm thick, unit weight per square 650 g/m², made by Kansai Felt K.K.) was used as the fiber mat (B), a fibrous laminate was obtained.

Comparison Example 4

By following the same procedure as Example 6 except that the needling operation was not employed, a fibrous laminate was obtained.

The properties of these fibrous laminates obtained are shown in Table 2.

Table 2

		Example				Comparison Example	
		5	6	7	8	3	4
	Fiber binder material*	PP	PE	PP	PP	-	PE
	Adhesive	Good	Good	Good	Good	Not adhesive	Good
	Adhesive property between (D) and (C)	>5	>5	>5	>5		>5
	strength kg/5cm width	>5	>5	>5	>5	0.1>	0.1>
	Breaking strength of fiber mat (B)						
	Heat set property	○	○	○	○	×	×
	Moldability	◎	◎	◎	◎	×	×
	Adhesive property to other materials	◎	◎	◎	◎	×	◎
	Tape adhesive strength at back surface	○	○	○	○	×	○

*Fiber binder material

PP : Polypropylene (m.p. 163 °C)

PE : Polyethylene (m.p. 123 °C)

Example 9

A web formed by carding 250 g/m² of polypropylene (melting point 164 °C) fibers of 16 deniers and 50 mm in fiber length was used as the fiber binder non-woven fabric (A).

The non-woven fabric (A) was superposed on the surface of a phenol felt (B) ("Feltop 10t", trade name, 10 mm thick soft type, unit weight per square 550 g/m², made by Howa Sensi K.K.) and needling was applied thereto in the state at 150 needles per square inches using needles of 15-18-32-3RB to provide a laminate mat having a thickness of about 13 mm and an apparent density of 0.062 g/cm³.

The laminate mat was coated and impregnated with 250 g/m² (solid component) of an aqueous emulsion of an acrylic resin ("Acronal YJ-7082D", trade name, made by Mitsubishi Yuka Badische Co., Ltd., T_g 120 °C, particles sizes 0.3 to 0.5 μm, solid component concentration 50%) at the side of the phenol felt (B) and compressed by means of a throttle rolls.

Then, a plain type needle punched carpet (D) composed of 300 g/m² of a fiber mat formed by randomly laminating cards of colored polyethylene terephthalate (melting point 264 °C) fibers of 6 deniers and from 85 to 120 mm in fiber lengths was placed on the surface of the fiber binder non-woven fabric (A) of the aforesaid laminate mat and after heating the laminate to 190 °C through a suction dryer to melt the polypropylene binder fibers and the particles of the acrylic resin, the laminate was immediately press-molded using a cold press mold at a pressure of 10 kg/cm² to provide a carpet for an internal decorating

material having a thickness of 6 mm.

A test piece of 150 mm x 50 mm was cut from the carpet of 6 mm thick and when the adhesive strength of the surface decorating material was measured using an Instron type test machine, the peeling strength was 5.5 kg/5 cm width.

5

Example 10 and Comparison Example 5

10 By following the same procedure as Example 9 except that the fiber binder non-woven fabric (A) was not used (Comparison Example 5) or a polyethylene non-woven fabric having a melting point of 119 °C ("Adomel", trade name, made by Mitsui Petrochemical Industries, Ltd., unit weight per square 100 g/m²) was used as the non-woven fabric (Example 10), fibrous laminates were obtained.

15

Example 11

20 By following the same procedure as Example 9 except that 650g/m² of a felt containing 20% by weight of fiber binder ("Fine Needle 650L", trade name, made by Aoyama Sangyo K.K.) was used in place of the fiber mat (B), a fibrous laminate was obtained.

25

Example 12

By following the same procedure as Example 9 except that a polyester series rough felt ("Needle Felt", trade name, made by Kansai Felt K.K., thickness 8 mm, 650 g/m² was used in place of fiber mat (B), a fibrous laminate was obtained.

30

Examples 13

35 By following the same procedure as Example 9 except that an aqueous emulsion of an acrylic resin (Acronal YJ-7082) was spray-coated on the assembly to impregnate the lower layer of the fiber mat layer (C) at 30% of the thickness thereof, a fibrous laminate was obtained.

40

Comparison Example 6

By following the same procedure as Example 9 except that Acronal YJ-1650D (Tg 30 °C) was used in place of Acronal YJ-7082D (Tg 120 °C), a fibrous laminate was obtained.

45 On each of the fibrous laminates thus obtained, various properties were evaluated as follows and the results obtained are shown in Table 3 below.

Bending Strength

50

The test piece (120 mm x 30 mm in area) was fixed at one end the bending resistance at the case of applying a deformation load to the test piece perpendicularly thereto at a portion of 100 mm apart from the fixed portion in the long length direction thereof at a rate of 50 cm/min was measured using an Instron type testing machine.

55

Rigidity

When both ends of the test piece (300 mm x 300 mm) were placed on a rack having the outside sizes of 300 mm x 300 mm and the inside sizes of 250 mm x 250 mm and pressure of 2.0 kg/cm² was applied to the center circle of 15 mm in diameter of the test piece, the sample showing the deformation within the thickness of the sample was defined as (○).

5

Cushioning Property

The fibrous laminate was layed and when the intial thickness thereof in the case of applying thereto a load of 50 g/cm² is defined as t_0 , the thickness thereof in the case of applying a load of 400 g/m² for one minute was defined as t_1 , and the thickness thereof in the case of removing the load and elapsing one minute was defined as t_2 , the compressibility, the compression elasticity, and the deformability were calculated by the following equations;

10

15

$$\text{Compressibility} = \frac{t_0 - t_1}{t_0} \times 100$$

20

$$\text{Compression elasticity} = \frac{t_2 - t_1}{t_0 - t_1} \times 100$$

25

$$\text{Deformability} = \left(1 - \frac{t_2}{t_0}\right) \times 100$$

A sample showing a low deformability and less changing ratio of thickness was evaluated to have good cushioning property.

30

Heat Set Property

A sample capable of easily controlling the thickness at forming the fibrous laminate was defined to be good (○) and a sample of not easily controlling the thickness was defined to be poor (X).

35

40

45

50

55

Table 3

5		Example					Comparison Example	
		9	10	11	12	13	5	6
	A	Fiber binder material*	PP	PE	PP	PP	PP	PP
10	B'	§ ν φ ο π π β ε θ μ α τ *** Ratio of emulsion impregnated layer Kind of emulsion	λ Π 100% Acronal YJ-7082D	λ Π 100% Acronal YJ-7082D	Π ~ 100% Acronal YJ-7082D	~ Π 100% Acronal YJ-7082D	λ Π 30% Acronal YJ-7082D	λ Π - Acronal YJ-1655D
15	A	Kind of surface decorating material****	PET	PET	PET	PET	PET	PET
		Adhesive property of surface decorating material (kg/5cm width)	5.5	6.5	5.5	5.5	5.5	5.5
20		Modability	⊙	⊙	⊙	⊙	○	○
		Bendig strength (kg/cm ²)	210	218	250	246	200	45
		Rigidity	⊙	⊙	⊙	⊙	○	Δ
25		Cushioning property	x	x	x	x	○	Δ
		Tape adhesion at back surface	○	○	○	○	Δ	○
		Heat set property	○	○	○	○	○	○

* Fiber binder material PP: Polypropylene (m.p. 163 °C)

PE: Polyethylene (m.p. 123 °C)

***Kind of fiber mat PF: Phenol Felt

FN: Fine Needle

NF: Needle Felt

****Kind of surface decorating material PET: Polyethylene terephthalate

Example 14

40

As the fiber binder non-woven fabric layer (A), a web formed by carding 250 g/m² of polypropylene (melting point 164 °C) fibers of 16 deniers and 50 mm in fiber length and having a thickness of 3 mm was used. Also, as the fiber binder non-woven fabric layer (A'), a web formed by using 50 g/m² of the same kind of fiber as above and having a thickness of 1 mm was used.

45

The fiber binder non-woven fabric layers (A) and (A') were placed on the front surface and back surface of a phenol felt layer (B) ("Feltop 10t"- trade name, made by Howa Seni K.K, 10 mm thick, soft type, 550 g/m²), respectively and needling was applied thereto at a ratio of 150 needles per square inches in the state to provide a laminate mat (C) having a thickness of about 13 mm and an apparent density of 0.065 g/cm³.

50

The laminate mat (C) thus obtained was immersed in a bath containing an aqueous emulsion of a ternary copolymer of 85% by weight of styrene, 12% by weight of methyl acrylate, and 3% by weight of acrylic acid (mean particle size of the resin 0.1 μm, solid components 50% by weight, glass transition point of the resin about 120 °C) and after withdrawing from the bath, the laminate mat (C) was squeezed so that the laminate mat (C) contained 30 parts by weight of the solid resin components of the emulsion (250 g/m² of solid resin components) per 100 parts by weight of the fibers in the laminate mat (C).

55

Then, a plain type needle punched carpet composed of 300 g/m² of fiber mat formed by randomly laminating cards of colored polyethylene terephthalate (melting point 264 °C) fibers of 16 deniers and from 85 to 120 mm in fiber lengths as a surface decorating material (D) was placed on the fiber binder non-

woven fabric layer (A) of the aforesaid laminate mat (C). Also, the laminate was heated to 190° C to dry the emulsion and melt the polypropylene fiber binder and thereafter press-molded using a cold press mold for 60 seconds at a pressure of 10 kg/cm² to provide a carpet for an internal decorating material having a thickness of 6 mm.

Furthermore, the laminate mat was also molded by the same manner as above while placing "Feltop 6t" of 6 mm thick in the mold at molding.

On each of the carpets, various properties were evaluated as follows. The results are shown in Table 4 below.

Adhesive Property to Other Material

The laminate mat was molded while placing "Feltop 6t" in the mold at molding and when the felt adhered to the thermoplastic fiber binder non-woven fabric layer (A') at the lower layer was peeled off by breaking at the Feltop layer, the case that the fibers of the felt remained on the non-woven fabric layer (A) was defined as ○ and the case of remaining no felt fibers thereon was as X.

Comparison Example 7

By following the same procedure as Example 14 except that the thermoplastic fiber binder non-woven fabric layers (A) and (A') were not used, a fibrous laminate was obtained.

Example 15

By following the same procedure as Example 14 except that the laminate mat (C) was not immersed in the bath of an aqueous emulsion of a ternary copolymer of styrene, methyl methacrylate, and acrylic acid, a fibrous laminate was obtained.

Example 16

By following the same procedure as Example 14 except that a polyethylene non-woven fabric having a melting point of 119° C ("Adomel", trade name, Mitsui Petrochemical Industries, Ltd., 100 g/m²) was used as the thermoplastic fiber binder non-woven fabric layers (A) and (A'), a fibrous laminate was obtained.

Example 17

By following the same procedure as Example 14 except that a felt containing 20% by weight fiber binder ("Fine Needle 650L", trade name, made by Aoyama Sangyo K.K., 650 g/m²) was used as the fiber mat (B), a fibrous laminate was obtained.

Example 18

By following the same procedure as Example 14 except that a polyester series rough felt ("Needle Felt", trade name, made by Kansai Felt K.K., 8 mm thick, 650 g/m²) was used as the fiber mat (B), a fibrous laminate was obtained.

Comparison Example 8

By following the same procedure as Example 14 except that a polyester fiber non-woven fabric was used in place of the polypropylene fiber binder non-woven fabric, a fibrous laminate was obtained.

5 The properties of these fiber laminates thus obtained are shown in Table 4.

Table 4

10		Example					Comparison Example	
		14	15	16	17	18	7	8
	Layers (A) (A') Fiber binder material*	PP	PE	PP	PP	PP	-	PET
15	Layer (B)	Kind of fiber mat**	PF	PF	FN	PF	PET	PF
		Content of solid resin components of Emulsion	30	40	30	0	30	30
20	Needling	Applied	Applied	Applied	Applied	Applied	Applied	Applied
	Layer (D)	Kind of surface decorating material***	PET	PET	PET	PET	PET	PET
25	Adhesive property of surface decorating material (kg/5 cm width)	5.5	6.5	5.5	5.5	5.5	0	0
	Heat set property	○	○	○	○	○	△	△
	Modability	◎	◎	◎	○	◎	○	○
30	Bending strength (kg/cm ²)	210	220	250	2.0	210	200	200
	Rigidity	Good	Good	Good	No Good	Good	Good	Good
	Adhesion to other material	◎	◎	◎	◎	◎	×	×
35	Tape adhesion strength at back surface	○	○	○	○	○	○	○

*Fiber binder material PP: Polypropylene (m.p. 163 °C) PE: Polyethylene (m.p. 123 °C)

**Kind of fiber mat PF: Phenol Felt FN: Fine Needle

***Kind of surface decorating material PET: Polyethylene terephthalate

Example 19

45 As the fiber binder non-woven fabric layer (A), a web formed by carding 250 g/m² of polypropylene (melting point 164 °C) fibers of 16 deniers and 50 mm in fiber length was used and also as the fiber binder non-woven fabric layer (A'), a web formed using 50 g/m² of the same kind of fibers as above was used.

50 These fiber binder non-woven fabric layers (A) and (A') were placed, respectively, on both surface of a phenol felt layer (B) ("Feltop 10t", trade name, made by Howa Seni K.K., 10 mm thick, soft type, unit weight per square 550 g/m²) and needling was applied thereto in the state at a ratio of 150 needles per square inches to provide a laminate mat (C) having a thickness of about 13 mm and an apparent density of 0.065 g/cm³.

55 On the laminate mat (C) obtained was placed a plain type needle punched carpet (D) composed of 300 g/m² of fiber mat formed by randomly laminating cards of colored polyethylene terephthalate (melting point 264 °C) fibers of 16 deniers and from 85 to 120 mm in fiber lengths as a surface decorating material and needling was applied to the laminate at a ratio of 150 needles per square inches to provide a laminate

having a thickness of about 15 mm and an apparent density of 0.077 g/cm³. Then, an aqueous emulsion of a ternary copolymer of 85% by weight of styrene, 12% by weight of methyl acrylate, and 3% by weight of acrylic acid (mean resin particle size 0.1 μm, solid components 50% by weight, glass transition point of resin about 120 °C) was sprayed onto the laminate at the side of the non-woven fabric layer (A) in an amount of 250 g/m² followed by compressing by rolls to impregnate the emulsion at a thickness of 6 mm.

Also, the laminate was heated to 190 °C to dry the emulsion thus impregnated and melt the polypropylene fiber binder and particles of resin of emulsion and then press-molded using a cold press mold for 60 seconds at a pressure of 10 kg/m² to provide a carpet for an internal decorating material having a thickness of 6 mm.

On the carpet obtained, various properties were evaluated and the results obtained are shown in Table 5 below.

Comaprison Example 9

By following the same procedure as Example 19 except that the fiber binder non-woven fabric layers (A) and (A') were not used, a fibrous laminate was obtained.

Example 20

The web formed by carding 50 g/m² of polypropylene (melting point 164 °C) fibers of 16 deniers and 50 mm in fiber length as used in Example 19 was also used as the fiber binder non-woven fabric layers (A) and (A'). These fiber binder non-woven fabric layers (A) and (A') were placed, respectively, on the front and back surfaces of the phenol felt (B) as used in Example 19 and needling was applied thereto in the state at a ratio of 150 needles per square inches to provide a laminate mat (C) having a thickness of about 13 mm and an apparent density of 0.065 g/cm³.

On an upper surface of fiber binder non-woven fabric layer (A) of the laminate mat (C) thus obtained was placed a plain type needle punched carpet, the surface decorating material (D) composed of 300 g/m² a fiber mat formed by randomly laminating cards of colored polyethylene terephthalate (melting point 264 °C) fibers of 16 deniers and from 85 to 120 mm in fiber lengths and the laminate was heated to 190 °C and pressed for 80 seconds at a pressure of 10 kg/cm² to melt the polypropylene fiber binder and weld the laminate mat (C) to the surface decorating material (D).

Furthermore, an aqueous emulsion of a ternary copolymer of 85% by weight of styrene, 12% by weight of methyl acrylate, and 3% by weight of acrylic acid was spray-coated on the back side of the laminate and then the laminate was heated to 120 °C to dry the emulsion to provide a carpet for an internal decorating material having a thickness of 6 mm.

Various properties of the carpet obtained were also evaluated and the results obtained are shown in Table 5.

Example 21

By following the same procedure as Example 19 except that the whole laminate mat (C) was impregnated with the aqueous emulsion of the ternary copolymer of styrene, methyl acrylate, and acrylic acid, a fibrous laminate was obtained.

Example 22

By following the same procedure as Example 19 except that the aqueous emulsion of the ternary copolymer of styrene, methyl acrylate, and acrylic acid was not applied on the laminate mat (C), a fibrous laminate was obtained.

The fibrous laminate according to the 5th embodiment of this invention has the following advantages.

In the fibrous laminate, the fiber mat layer (B) is composed of the resin-impregnated fiber mat layer (B₂) partially containing the solid resin components of the emulsion and the fiber mat layer (B₁) containing no solid resin components, by heating the fiber binder non-woven fabric layers (A) and (A') each disposed at both surfaces of the fiber mat layer (B), i.e., the surface of the fiber mat layer (B₁) and the surface of the fiber mat layer (B₂), the fiber mat layer (B) itself is easily heat-set, and also the fibrous laminate is imparted with the strength, hardness and form retentability as backing layer by the existence of the resin-impregnated fiber mat layer (B₂) and imparted with a cushioning property by the existence of the fiber mat layer (B₁) containing no resin component of the emulsion.

Also, since the fiber laminate has a layer mainly composed of the fiber binder non-woven fabric layer (A') as the lower layer, it can adhere to other materials.

Also, by laminating the fiber binder non-woven fabric layers (A) and (A'), respectively, on both surfaces of the fiber mat layer (B) and applying thereto needling to entangle the fibers of these layers, a step of uniformly mixing both fibers is unnecessary different from conventional techniques, whereby the production process can be simplified. Thus, the invention is very useful for industrial purposes.

Table 5

20				Example		Comparative Example	Example	
				19	20	9	21	22
	Layers (A) (A') Fiber Binder Material*			PP	PP	-	PP	PP
25	Layer (B)	Kind of Fiber Mat**		PF	PF	PF	PF	PF
		Thickness	Layer (B ₁) (mm)				0	10
			Layer (B ₂) (mm)				10	0
	Needling			Applied	Applied	Not Applied	Applied	Applied
30	Layer (D)	Kind of Surface Decorating Material***		PET	PET	PET	PET	PET
	Adhesive Property of Surface Decorating Material (kg/5cm width)			5.5	5.5	0	5.5	5.5
35	Heat Set Property			○	○	△	○	○
	Moldability			◎	◎	○	◎	○
	Bending Strength (kg/cm ²)			170	140	160	210	2.0
40	Rigidity			Good	Good	Good	Good	Not Good
	Cushoning Property			Good	Good	Good	Not Good	Good
	Adhesive Property to Other Material			◎	◎	×	◎	◎
	Tape Adhesive Strength at Back Surface			○	○	○	○	○

* Fiber Binder Material PP: Polypropylene (m.p. 163 °C)

PE: Polyethylene (m.p. 123 °C)

** Fiber Mat PP: Phenol Felt

***Surface Decorating Material PET: Polyethylene terephthalate

While the invention has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope thereof.

Claims

1. A process of producing a fibrous laminate which comprises laminating a thermoplastic resin fiber binder non-woven fabric (A) having a melting point of from 60 to 200 °C on the surface of a fiber mat (B) composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40 °C higher than the melting point of the aforesaid fiber binder non-woven fabric, applying needling to the laminate from the side of the thermoplastic resin fiber binder non-woven fabric (A), whereby the binder fibers of the non-woven fabric (A) and the fibers of the fiber mat (B) are entangled with each other to provide a laminate mat (C), placing a surface decorating material (D) on the surface of the non-woven fabric (A), and heating the laminate to a temperature of not melting the surface decorating material (D) and the fibers of the fiber mat (B) but melting the binder fibers of the non-woven fabric (A) to weld the surface decorating material (D) and the fiber mat (B) in a body.
2. The process as claimed in claim 1, wherein the amount of the thermoplastic resin binder non-woven fabric (A) is from 10 to 200% by weight of the weight of the fiber mat (B).
3. The process as claimed in claim 1, wherein the fiber binder of the non-woven fabric (A) is entangled with the fibers of the fiber mat (B) in an amount of from 5 to 100% by weight of the fiber mat (B).
4. A process of producing a fibrous laminate which comprises laminating thermoplastic resin fiber binder non-woven fabrics (A) and (A') having a melting point of from 60 to 200 °C, respectively, on both surfaces of a fiber mat (B) mainly composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40 °C higher than the melting point of the aforesaid fiber binder non-woven fabrics, applying needling to the laminate, whereby the fibers of the fiber binder non-woven fabric (A), (A') and the fibers of the fiber mat (B) are entangled with each other to provide a laminate mat (C), placing a surface decorating material (D) on the laminate mat (C), and heating under compression them to a temperature of higher than the melting point of the aforesaid fiber binder non-woven fabric (A), (A'), not melting the aforesaid surface decorating material (D) and not melting the fibers as the main component of the fiber mat (B) to adhere the aforesaid surface decorating material (D) to the laminate mat (C).
5. The process as claimed in claim 4, wherein the amount of the fiber binder non-woven fabric (A) is from 10 to 100% by weight of the fiber mat (B).
6. A fibrous laminate comprising a surface decorating material (D), a thermoplastic resin fiber binder non-woven fabric (A) having a melting point of from 60 to 200 °C, and a base material layer (B') formed by dispersing the resin particles of an aqueous resin emulsion in a fiber mat (B) composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40 °C higher than the melting point of the aforesaid fibers binder non-woven fabric (A), which are adhered to each other in this order (D/A/B') in a body.
7. The fibrous laminate as claimed in claim 6, wherein the resin particles are dispersed in the whole fiber mat (B).
8. The fibrous laminate as claimed in claim 6, wherein the resin particles are dispersed in the fiber mat (B') at the portion of the thickness of from 30 to 80% of the thickness of said mat from the lower side thereof.
9. The fibrous laminate as claimed in claim 6, wherein the resin particles of the aqueous resin emulsion have a glass transition point of at least 50 °C and at least 40 °C lower than the heatdeformation temperatures of the surface decorating material (D) and the fiber mat (B) of the backing material layer (B').
10. The fibrous laminate as claimed in claim 8, wherein the fiber mat (B) is composed of mixed fibers of from 50 to 85% by weight, based on the amount of the mixed fibers, of synthetic fibers or natural fibers each having a melting point of at least 200 °C and from 50 to 15% by weight, based on the amount of the mixed fibers, of the thermoplastic resin fiber binder having a melting point of at least 40 °C lower than the melting point of the aforesaid fibers.
11. A process of producing a fibrous laminate which comprises laminating a thermoplastic resin fiber binder non-woven fabric (A) having a melting point of from 60 to 200 °C on the surface of a fiber mat (B) composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40 °C higher than the melting point of the fiber binder non-woven fabric, applying needling to the laminate from the side of the thermoplastic resin binder non-woven fabric (A), whereby the binder fibers of the non-woven fabric (A) and the fibers of the fiber mat (B) are entangled with each other to provide a laminate mat (C), placing a surface decorating material (D) thereon at the side of the non-woven fabric (A), and after coating a resin emulsion on the side of the fiber mat (B) of the laminate mat (C) and impregnating the fiber mat (B) with the emulsion followed by drying, and heating the laminate to a temperature of not

melting the surface decorating material (D) and the fibers of the fiber mat (B) but melting the binder fibers of the non-woven fabric (A) and the resin particles of the emulsion to weld the surface decorating material (D) and the laminate mat (C) in a body.

12. A fibrous laminate comprising a laminate mat (C) and a surface decorating material (D) laminated thereon, said laminate mat (C) comprising a pair of outer non-woven fabric layers (A) and (A') composed of a thermoplastic resin fiber binder non-woven fabric having a melting point of from 60 to 200 °C and a fiber mat layer (B) mainly composed of synthetic fibers or natural fibers, said synthetic fibers having a melting point of at least 40 °C higher than the melting point of aforesaid thermoplastic fiber binder non-woven fabric, sandwiched in said outer non-woven fabric layers (A) and (A'), the fibers of the fiber binder non-woven fabric of said outer non-woven fabric layers (A) and (A') are entangled and joined with the synthetic fibers or natural fibers of the fiber mat layer (B), wherein the fiber mat layer (B) mainly composed of the synthetic fibers or natural fibers contains solid resin components of an emulsion of a resin having a glass transition point of at least 50 °C in an amount of from 10 to 100 parts by weight per 100 parts by weight of said fibers of fiber mat (B).

13. A process of producing a fibrous laminate which comprises laminating non-woven fabric layers (A) and (A') of a thermoplastic resin fiber binder non-woven fabric, respectively, on both surfaces of a fiber mat layer (B) mainly composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40 °C higher than the aforesaid thermoplastic resin fiber binder non-woven fabric, applying thereto needling to provide a laminate mat (C), immersing the laminate mat (C) in an emulsion of a resin having a glass transition point of at least 50 °C to impregnate the laminate mat with the emulsion, placing thereon a surface decorating material (D), and heating under compression the laminate, whereby the emulsion is dried and the fiber binders of the fiber binder non-woven fabric layers (A) and (A') and the resin particles of emulsion are melted to heat-weld the surface decorating material (D) to the fiber mat layer (B).

14. A fibrous laminate comprising a laminate mat (C) and a surface decorating material (D) laminated thereon, said laminate mat (C) comprising a pair of outer non-woven fabric layers (A) and (A') composed of a thermoplastic resin fiber binder non-woven fabric having a melting point of from 60 to 200 °C and a fiber mat (B) mainly composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40 °C higher than the melting point of the aforesaid thermoplastic fiber binder non-woven fabric, sandwiched in the non-woven fabric layers (A) and (A'), wherein the fiber mat layer (B) partially contains solid resin components of an emulsion of a resin having a glass transition point of at least 50 °C.

15. The fibrous laminate as claimed in claim 14, wherein from 5 to 80% of the thickness of the fiber mat (B) is a resin-impregnated fiber mat layer (B₂) containing solid resin components of an emulsion of a resin having a glass transition point of at least 50 °C.

16. The fibrous laminate as claimed in claim 15, wherein the resin-impregnated fiber mat layer (B₂) is a lower layer portion of the fiber mat (B).

17. The fibrous laminate as claimed in claim 14, wherein the laminating amount of each of the fiber binder non-woven fabric layers (A) and (A') is from 10 to 100% by weight of the fiber mat layer (B).

18. A process of producing a fibrous laminate which comprises laminating thermoplastic resin binder non-woven fabric layers (A) and (A'), respectively, on both surfaces of a fiber mat layer (B) mainly composed of synthetic fibers or natural fibers, said synthetic fibers or natural fibers having a melting point of at least 40 °C higher than the melting point of the thermoplastic fiber binder non-woven fabric layers (A) and (A'), applying thereto needling to provide a laminate mat (C), coating the back surface of the laminate mat (C) with an emulsion of a resin having a glass transition point of at least 50 °C to impregnate a part of the fiber mat (B) with the emulsion, placing a surface decorating material (D) on the front surface of the laminate mat (C), and heating under compression them to melt the fiber binder and the resin particles of emulsion, and heat-weld the surface decorating material (D) to the fiber mat layer (B).

19. A process of producing a fibrous laminate which comprises laminating thermoplastic resin fiber binder non-woven fabric layers (A) and (A'), respectively, on the front and back surfaces of a fiber mat (B) mainly composed of synthetic fibers or natural fibers, said synthetic fibers or natural fiber having a melting point of at least 40 °C higher than the melting point of the thermoplastic resin fiber binder non-woven fabric layers (A) and (A'), applying thereto needling to provide a laminate mat (C), placing a surface decorating material (D) on the laminate mat (C) followed by heating to heat-weld them, and coating an emulsion of a resin having a glass transition point of at least 50 °C on the back surface thereof followed by drying to incorporate the emulsion in a part of the fiber mat layer (B).

20. Use of the fibrous laminate as claimed in any one of the preceding claims as internal decorating material.

Fig. 1

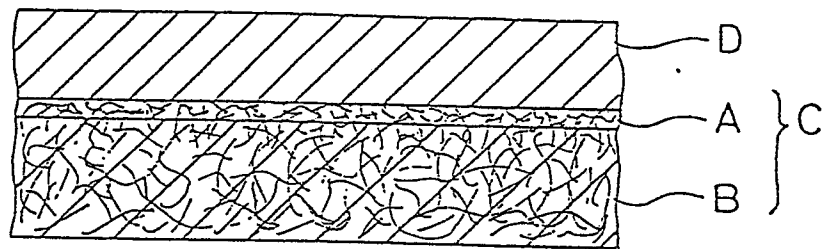


Fig. 2

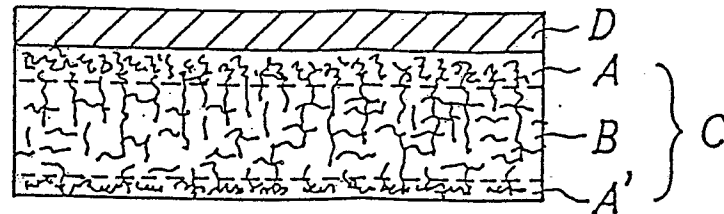


Fig. 3

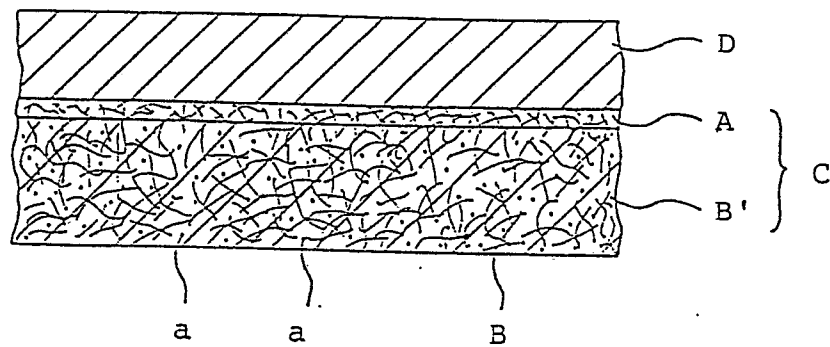


Fig. 4

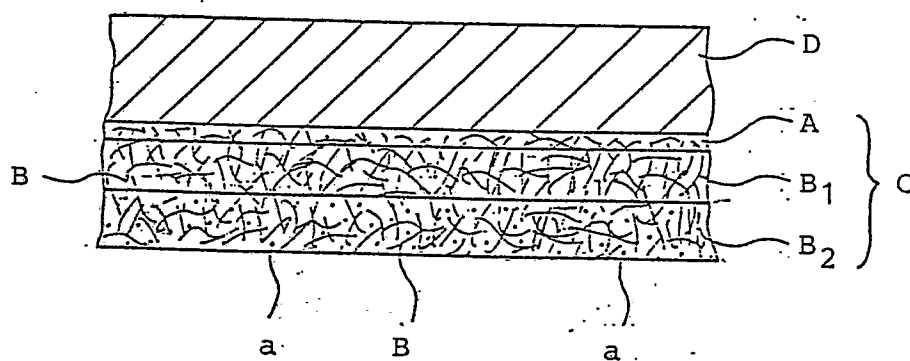


Fig. 5

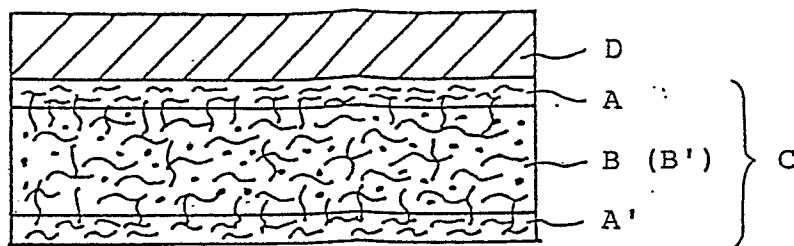


Fig. 6

