

DESCRIPTION

Title of Invention: CLEANING SHEET AND CLEANING METHOD IN WHICH SAME IS USED

Technical Field

5 [0001]

The present invention relates to a cleaning sheet and a cleaning method using the cleaning sheet.

Background Art

[0002]

10 The applicant of the present application previously proposed a cleaning sheet that is made of 10 to 90% by weight of thermoplastic fibers having a fiber length of 2 to 15 mm and a fineness of 10 to 150 dtex and 10 to 90% by weight of cellulosic fibers, and in which a large number of tip portions of the thermoplastic fibers are present on a surface of the cleaning sheet, the cleaning sheet having stain abrasive and scraping properties of
15 abrading and scraping a stain that is present on a surface to be cleaned (Patent Literature 1). The cleaning sheet has the feature of having sufficient stain abrasive and scraping properties.

[0003]

20 As another cleaning article having stain abrasive properties, Patent Literature 2 proposes an abrasive cleaning article made of a substrate in which a water soluble binder and a plurality of abrasive particles are detachably fixed to the substrate by the water soluble binder. The abrasive cleaning article is configured such that the abrasive particles detach from the substrate when the abrasive particles come into contact with a solvent.

25 Citation List

Patent Literatures

[0004]

Patent Literature 1: US 2002/0106478A1

Patent Literature 2: WO 2006/083570A2

Summary of Invention

[0005]

5 The cleaning sheet disclosed in Patent Literature 1 is configured to abrade and scrape a stain away by utilizing the rigidity of thick thermoplastic fibers. Accordingly, it may not be easy to completely remove a stubborn stain such as, for example, a stubbornly caked-on stain on a hard surface with a force that significantly exceeds the rigidity of the thick thermoplastic fibers.

[0006]

10 The abrasive cleaning article disclosed in Patent Literature 2 is configured such that when the article comes into contact with a solvent, the water soluble binder is dissolved in the solvent to cause the abrasive particles to detach from the article, and the hardness of the detached abrasive particles is used to remove a stain. Accordingly, when the article is dry, the abrasive particles are not released from the article. Also, the
15 abrasive particles do not detach until the water soluble binder has been dissolved in the solvent, and thus it takes time for the abrasive particles to detach from the article.

[0007]

The present invention provides a cleaning sheet in which a scraping layer and a water absorbing layer containing hydrophilic fibers are stacked, wherein the scraping
20 layer is made of an air-laid non-woven fabric in which fiber intersection points of large-diameter fibers are joined, a plurality of the large-diameter fibers stand upright, and tip portions of the large-diameter fibers are present on a surface of the scraping layer, the large-diameter fibers have a fineness of 10 dtex or more and 150 dtex or less, and are contained in the scraping layer in an amount of 10% by mass or more, the scraping layer
25 includes spaces between the large-diameter fibers, abrasive particles are detachably present in the spaces, and the abrasive particles are not substantially attached to tip regions including the tip portions of the large-diameter fibers that are present on the surface of the scraping layer.

Brief Description of Drawings

[0008]

[Fig. 1] Fig. 1 is a perspective view schematically showing a cleaning sheet according to an embodiment of the present invention.

[Fig. 2] Fig. 2 is a schematic view showing a cross-sectional structure of the clearing sheet shown in Fig. 1.

[Fig. 3] Fig. 3 is an enlarged schematic view of a relevant part of the cross-sectional structure shown in Fig. 2.

[Fig. 4] Fig. 4 is a schematic view showing a stain removing mechanism of the cleaning sheet shown in Fig. 1.

10 Description of Embodiments

[0009]

Hereinafter, the present invention will be described by way of a preferred embodiment with reference to the drawings. A cleaning sheet 1 according to an embodiment shown in Figs. 1 and 2 is preferably used to clean a hard surface. The cleaning sheet 1 is a dry-type cleaning sheet and contains substantially no liquid component such as a washing liquid. The expression "substantially no liquid component" as used herein means that the proportion of liquid component in the cleaning sheet 1 is 3% by mass or less. The cleaning sheet 1 includes a water absorbing layer 4 and a scraping layer 5. That is, the cleaning sheet 1 has a two-layer structure including the water absorbing layer 4 and the scraping layer 5. Accordingly, there is no other layer between the water absorbing layer 4 and the scraping layer 5. However, this does not exclude a configuration in which another layer is disposed between the water absorbing layer 4 and the scraping layer 5, and it is therefore possible to dispose another layer between the water absorbing layer 4 and the scraping layer 5 according to the specific usage or the like of the cleaning sheet 1. The water absorbing layer 4 and the scraping layer 5 are stacked to form an integrated structure. As a means for forming an integrated structure, various types of means can be used such as, for example, fusing, joining with an adhesive, and sewing.

[0010]

30 As a result of the cleaning sheet 1 having a two-layer structure including the water absorbing layer 4 and the scraping layer 5, one face of the cleaning sheet 1 is constituted by a surface of the water absorbing layer 4 and the other face is constituted by

a surface of the scraping layer 5. However, the structure of the cleaning sheet 1 is not limited thereto, and the cleaning sheet 1 may be formed of, for example, a three layer stack in which first and second scraping layers 5 are formed on respective faces of the water absorbing layer 4. In the cleaning sheet 1 having this structure, one surface of the
5 cleaning sheet 1 is constituted by a surface of the first scraping layer 5, and the other surface is constituted by a surface of the second scraping layer 5.

[0011]

In the cleaning sheet 1, elevations and depressions may be formed on the surface of the scraping layer 5. For example, as shown in Fig. 1, the surface of the scraping
10 layer 5 may be heat-embossed in a rhombic lattice pattern so as to form depressions 8 in the rhombic lattice pattern. Each region surrounded by the depressions 8 in the rhombic lattice pattern is a non-embossed region including an elevation 9. Through the application of heat and pressure by heat emboss processing, the depressions 8 are more compacted than the non-embossed regions including elevations 9. The heat emboss
15 processing can be used not only to form elevations and depressions on the surface of the scraping layer 5, but also to join the scraping layer 5 and the water absorbing layer 4.

[0012]

The pattern of the depressions 8 is not limited to the rhombic lattice pattern, and can be any specific pattern such as a linear pattern or a dotted pattern. The total area of
20 the depressions 8 is preferably 5% or more of the area of a cleaning surface of the cleaning sheet 1, and more preferably 10% or more. Also, the total area of the depressions 8 is preferably 50% or less, and more preferably 40% or less. To be specific, the total area of the depressions 8 is preferably 5% or more and 50% or less of the area of the cleaning surface of the cleaning sheet 1, and more preferably 10% or more
25 and 40% or less (hereinafter this value will be referred to as "the area ratio of depressions 8"). By setting the area ratio of depressions 8 within the above-described range, both surface strength and cleaning performance at the time of cleaning can be properly achieved.

[0013]

30 Perforations (not shown) may be formed in the cleaning sheet 1. By cutting the

cleaning sheet 1 along the perforations, the cleaning sheet 1 can be divided into pieces of a convenient size. There is no particular limitation on the pattern of perforations as long as the cleaning sheet 1 can be divided into pieces of a convenient size and shape.

[0014]

5 The scraping layer 5, which is one of the layers constituting the cleaning sheet 1, includes large-diameter fibers 2. In the present invention, the term "large-diameter fibers 2" refers to fibers having a fineness of 10 dtex or more and 150 dtex or less. Fibers having such a high fineness have high rigidity, and thus have sufficiently high stain
10 scraping properties. From this point of view, it is preferable that the large-diameter fibers 2 have a fineness of 10 dtex or more, more preferably 20 dtex or more, and even more preferably 30 dtex or more. Also, the large-diameter fibers 2 preferably have a fineness of 150 dtex or less, more preferably 130 dtex or less, and even more preferably 120 dtex or less. To be specific, as described above, the large-diameter fibers 2
15 preferably have a fineness of 10 dtex or more and 150 dtex or less, more preferably 20 dtex or more and 130 dtex or less, and even more preferably 30 dtex or more and 120 dtex or less. By using large-diameter fibers 2 having a fineness within the above-described range, the cleaning sheet 1 can have even more excellent scraping properties of scraping a caked-on stain sticking to, for example, a pot or a frying pan.

[0015]

20 It is also preferable that the large-diameter fibers 2 are short fibers. This configuration makes it difficult for the large-diameter fibers 2 to bend, as a result of which rigidity is also improved. In addition, by using short fibers as the large-diameter fibers 2, as will be described later, the scraping layer 5 can be properly formed using an air-lay method. From the above viewpoints, the large-diameter fibers 2 preferably have
25 a fiber length of 2 mm or more, more preferably 3 mm or more, and even more preferably 4 mm or more. Also, the large-diameter fibers 2 preferably have a fiber length of 15 mm or less, more preferably 8 mm or less, and even more preferably 6 mm or less. To be specific, the large-diameter fibers 2 preferably have a fiber length of 2 mm or more and 15 mm or less, more preferably 3 mm or more and 8 mm or less, and even more
30 preferably 4 mm or more and 6 mm or less. By using fibers having a fiber length within the above-described range, the rigidity of the large-diameter fibers 2 can be sufficiently increased. It is also possible to effectively prevent the large-diameter fibers 2 from

escaping from the scraping layer 5. Furthermore, the scraping layer 5 can be properly formed using an air-lay method.

[0016]

It is preferable that the large-diameter fibers 2 are contained in the scraping layer 5 in an amount of 10% by mass or more (the amount of large-diameter fibers in the fibers constituting the scraping layer 5 is 10% by mass or more), from the view point of exhibiting sufficient stain scraping performance. The scraping performance can be further increased by setting the proportion of the large-diameter fibers 2 in the scraping layer 5 to 30% by mass or more, and preferably 50% by mass or more. From this point of view, the proportion of the large-diameter fibers 2 in the scraping layer 5 may be 100% by mass. As will be described later, the scraping layer 5 may contain fibers other than the large-diameter fibers 2 depending on the case. In this case, the proportion of the large-diameter fibers 2 in the scraping layer 5 is preferably 90% by mass or less. To be specific, the proportion of the large-diameter fibers 2 in the scraping layer 5 is preferably 10% by mass or more and 100% by mass or less, more preferably 10% by mass or more and 90% by mass or less, even more preferably 30% by mass or more and 90% by mass or less, and even further more preferably 50% by mass or more and 90% by mass or less.

[0017]

As the large-diameter fibers 2, fibers made of, for example, the following materials can be used: polyolefin resins such as polyethylene and polypropylene; polyester resins such as polyethylene terephthalate; acrylic resins such as polyacrylic acid and polymethacrylic acid; vinyl resins such as polyvinyl chloride; polyamide resins such as nylon; and various types of metals and glass. In the case where the large-diameter fibers 2 are made of a resin, the resin preferably has a Rockwell hardness of R40 to R150. In particular, from the viewpoint of improving the stain scraping properties, it is preferable to use a resin having a Rockwell hardness of R80 to R150. It is also possible to use composite fibers made of a combination of two types of resins selected from the above-listed various types of materials (core-sheath configuration composite fibers or side-by-side configuration composite fibers). In particular, it is preferable to use, as the large-diameter fibers 2, acrylic fibers, polyester fibers, vinyl chloride fibers, polyamide fibers, and polyolefin fibers which do not damage a surface to be cleaned (made of stainless steel, tiles, porcelain enamel, artificial marble or the like) and have excellent

scraping properties. Furthermore, from the viewpoint of preventing fibers from escaping from the surface, it is also preferable to use heat-fusible fibers. As the heat-fusible fibers, it is preferable to use, for example, heat-fusible composite fibers that are made of a low-melting point resin and a high-melting point resin having different melting points and in which the low-melting point resin forms at least a part of the fiber surface. Examples of combinations of a low-melting point resin and a high-melting point resin include a combination of high density polyethylene and polypropylene, a combination of low density polyethylene and polypropylene, a combination of polypropylene and ethylene-butene-1 crystalline copolymer, a combination of high density polyethylene and polyethylene terephthalate, a combination of nylon-6 and nylon-66, a combination of low-melting point polyester and polyethylene terephthalate, and a combination of polypropylene and polyethylene terephthalate.

[0018]

The heat-fusible composite fibers may have, for example, a side-by-side configuration, a sheath-core configuration, an eccentric sheath-core configuration, a multilayer configuration including three layers or more, a hollow side-by-side configuration, a hollow sheath-core configuration, a hetero sheath-core configuration or an islands-in-sea configuration, and may have a structure in which the low-melting point resin forms at least a part of the fiber surface. Among the above-listed heat-fusible composite fibers, it is preferable to use side-by-side, sheath-core or eccentric sheath core configuration composite fibers that are made by using a thermoplastic resin selected from a high density polyethylene, a linear low density polyethylene, an ethylene-butylene-1 crystalline copolymer and a low-melting point polyester such as a polyester copolymer of polyethylene terephthalate and polyethylene isophthalate as the low-melting point resin, and polypropylene or polyethylene terephthalate as the high-melting point resin. In particular, it is preferable to use composite fibers made of a low-melting point polyester and a polyethylene terephthalate because good stain scraping properties can be obtained.

[0019]

As the large-diameter fibers 2, crimpable fibers may be used. By doing so, the thick fullness (bulkiness) of the cleaning sheet 1 can be improved, and good wiping properties can be obtained. The form of crimping of the crimpable fibers can be spiral, zigzag or U shaped, and any one of them is preferably used.

[0020]

The large-diameter fibers 2 may be formed of one or two types of fibers. In the case where the cleaning sheet 1 is formed of two types of fibers, it is preferable that large-diameter fibers having a fiber length and a fineness that satisfy the above-described ranges are included in an amount that satisfies the above-described range in total.

[0021]

In the case where the scraping layer 5 contains fibers other than the large-diameter fibers 2, small-diameter fibers having a smaller fineness than that of the large-diameter fibers 2 can be used as the other fibers. As the small-diameter fibers, it is preferable to use fibers having a fineness of 0.5 dtex or more, and more preferably 1 dtex or more, provided that the small-diameter fibers have a smaller fineness than that of the large-diameter fibers 2. Also, it is preferable to use fibers having a fineness of 5 dtex or less, and more preferably 3 dtex or less. To be specific, it is preferable to use, as the small-diameter fibers, fibers having a fineness of 0.5 dtex or more and 5 dtex or less, and more preferably 1 dtex or more and 3 dtex or less. In the case where the scraping layer 5 contains large-diameter fibers 2 and small-diameter fibers, the proportion of the small-diameter fibers in the scraping layer 5 is preferably 1% by mass or more and, more preferably 5% by mass or more, and preferably 50% by mass or less, and more preferably 30% by mass or less. To be specific, the proportion of the small-diameter fibers in the scraping layer 5 is preferably 1% by mass or more and 50% by mass or less, and more preferably 5% by mass or more and 30% by mass or less. As a result of the small-diameter fibers being contained in the scraping layer 5 in addition to the large-diameter fibers 2, the basis weight of the scraping layer 5 can be reduced, with the abrasive properties and scraping properties of the scraping layer 5 being maintained.

[0022]

The small-diameter fibers are preferably short fibers as is the case with the large-diameter fibers 2. In this case, the small-diameter fibers preferably have a fiber length of 2 mm or more, more preferably 3 mm or more, and even more preferably 4 mm or more. Also, the small-diameter fibers preferably have a fiber length of 15 mm or less, more preferably 8 mm or less, and even more preferably 6 mm or less. To be specific, the small-diameter fibers preferably have a fiber length of 2 mm or more and 15 mm or less, more preferably 3 mm or more and 8 mm or less, and even more preferably 4 mm or

more and 6 mm or less. Also, the small-diameter fibers are preferably made of a thermoplastic resin that is the same as or different from that of the large-diameter fibers 2. In particular, it is preferable that the small-diameter fibers are constituted by heat-fusible fibers.

5 [0023]

In the scraping layer 5, the large-diameter fibers 2 are joined at their fiber intersection points. A plurality of the large-diameter fibers 2 stand upright, and tip portions of the large-diameter fibers 2 are present on the surface of the scraping layer 5. As used herein, the expression "the large-diameter fibers 2 stand upright" means that a longitudinal direction of the large-diameter fibers 2 (the direction perpendicular to the cross section of the fibers) is inclined so as to form an angle between an in-plane direction of the scraping layer 5 and the longitudinal direction of the large-diameter fibers 2 of preferably 30 degrees or more, and more preferably 45 degrees or more, where the in-plane direction of the scraping layer 5 is set to zero degrees (fibers extend horizontally without inclination). As a result of the large-diameter fibers 2 standing upright, one end of the large-diameter fibers 2 can be viewed in the surface of the scraping layer 5 as viewed in plan view from the surface side. Among the large-diameter fibers 2 of the scraping layer 5, it is preferable that 50% or more of the number of the large-diameter fibers 2 stand upright, and more preferably 80% or more of the number of the large-diameter fibers 2 stand upright. As a result of the large-diameter fibers 2 being joined at their fiber intersection points and the tip portions of the large-diameter fibers 2 being present on the surface of the scraping layer 5, sufficient abrasive properties and scraping properties are imparted to the scraping layer 5. In this case, it is unnecessary that the tip portions of all of the large-diameter fibers 2 constituting the scraping layer 5 be present on the surface of the scraping layer 5, and the number of tip portions of the large-diameter fibers 2 present on the surface of the scraping layer 5 may be any number as long as it is sufficient for exhibiting the target scraping performance.

[0024]

It is advantageous to form the scraping layer 5 using an air-lay method in order to cause the tip portions of large-diameter fibers 2 to be present on the surface of the scraping layer 5. To be specific, the large-diameter fibers 2 made of short fibers are deposited by an air-lay method to form a web, and the large-diameter fibers 2 of the web

are joined at their intersection points, as a result of which the tip portions of the large-diameter fibers 2 are likely to be present on the surface of the scraping layer 5, or in other words, on the surface of an air-laid non-woven fabric. As a means for joining the large-diameter fibers 2 at their intersection points, for example, joining using an adhesive, or heat fusing can be used.

[0025]

The scraping layer 5 preferably has a basis weight of 20 g/m² or more and more preferably 30 g/m² or more, and preferably 200 g/m² or less and more preferably 150 g/m² or less. To be specific, the scraping layer 5 preferably has a basis weight of 20 g/m² or more and 200 g/m² or less, and more preferably 30 g/m² or more and 150 g/m² or less. It is preferable to set the basis weight of the scraping layer 5 within the above-described range, because by doing so, the cleaning sheet 1 has even higher stain removing properties of removing a caked-on stain in the kitchen and other places where water is used.

[0026]

The scraping layer 5 includes spaces between the large-diameter fibers 2 constituting the scraping layers 5. Because the large-diameter fibers 2 stand upright in the scraping layer 5 and are fixed at their fiber intersection points, the spaces are easily formed between the large-diameter fibers 2. As shown in Fig. 3, there are a plurality of abrasive particles 6 in the spaces. The abrasive particles 6 are present in the spaces such that although the abrasive particles 6 are in contact with the fibers, they are not fixed to the fibers by an adhesive or the like. In Fig. 3, reference numeral 7 indicates an adhesive or a fused portion that joins intersection points of the large-diameter fibers 2. The abrasive particles 6 are used for the purpose of improving the abrasive performance of the scraping layer 5 due to a synergetic effect with the scraping performance of the large-diameter fibers 2. The abrasive particles 6 are detachably present in the spaces so as to be capable of being detached from the scraping layer 5. As used herein, the expression "the abrasive particles 6 are detachably present" means that the abrasive particles 6 are present in the scraping layer 5 such that at least part of the abrasive particles 6 escape from the scraping layer 5 of the cleaning sheet 1 upon application of an external force caused by vibrations, bending or the like to the cleaning sheet 1 when the cleaning sheet 1 is unwet. Accordingly, unlike the technology disclosed in, for example,

Patent Literature 2 described above in Background Art, the abrasive particles 6 are not fixedly attached to the fibers by a binder. The present invention is different from the technology of Patent Literature 2 in that the abrasive particles easily escape due to an external force such as vibrations when the cleaning sheet is dry, rather than the abrasive
5 particles escaping after they come in contact with, in particular, water or an aqueous solution. A specific means for causing the abrasive particles 6 to be present in the scraping layer 5 in such a configuration will be described later.

[0027]

Amount of Escaped Abrasive Particles

10 The amount of abrasive particles 6 that have escaped from the scraping layer 5 can be measured using the following method. A dry cleaning sheet 1 that is unwet is cut into a square test piece having a size of 10 cm × 10 cm. In an environment of 20°C ± 5°C, the test piece is looped, with the scraping layer facing outward. The test piece is looped such that the center of the test piece substantially forms an arc and opposite ends
15 are brought together to form a holding portion. The loop is oscillated up and down, with the holding portion being on the upper side and the loop being on the lower side, the holding portion being positioned on the vertically upper side. The stroke of the up-down movement is set to 1 cm, and the rate is set to 3 times per second. The up-down movement is performed for one minute. The matter that has fallen due to the up-down
20 movement is collected and the mass (g) of the collected matter is measured. The measured value of the mass is multiplied by 100, and the obtained result is defined as the amount of escaped abrasive particles 6 (g/m²).

[0028]

It is preferable that the abrasive particles 6 are present uniformly throughout the
25 thickness of the scraping layer 5. However, it is advantageous that substantially no abrasive particles 6 are present in a surface region 5A including an outermost surface of the scraping layer 5. The surface region 5A is a region in the thickness direction of the surface constituted by the aggregate of tip portions 2A of a plurality of large-diameter fibers 2 constituting the scraping layer 5. In particular, it is advantageous that
30 substantially no abrasive particles 6 are attached to the tip regions 2A including the tip portions of the large-diameter fibers 2 whose tip portions are present on the surface of the scraping layer 5 among the large-diameter fibers 2 constituting the scraping layer 5. As

used herein, the expression "substantially no abrasive particles 6 are attached" and similar expressions mean that the number of abrasive particles 6 observed at the tip portions of five large-diameter fibers selected in a magnified image of the tip regions of the large-diameter fibers 2 (with a magnification of 50 ± 5) is 10% or less of the number of
5 observed abrasive particles 6 that are present on and around the selected large-diameter fibers 2 in the central portion in the thickness direction of the scraping layer 5. Also, the expression "the central portion in the thickness direction" refers to a portion located at the center among three portions obtained by dividing the scraping layer 5 equally into three parts in the thickness direction. Due to the abrasive particles 6 present in the manner as
10 described above, when removing a stain on the surface to be cleaned by using the scraping layer 5, the abrasive particles 6 are released onto the surface to be cleaned quickly and in a large amount. As a result, it is possible to easily remove the stain quickly and reliably. If the abrasive particles 6 are present on the outermost surface of the scraping layer 5, in the case where the surface to be cleaned is a wet surface, the
15 abrasive particles 6 present on the outermost surface of the scraping layer 5 are wet, which makes it difficult for the abrasive particles 6 to escape from the scraping layer 5. As a result, the abrasive particles 6 are not quickly supplied to the surface to be cleaned. As used herein, the term "tip region" refers to a region extending from the tip portion of a large-diameter fiber 2 to a depth corresponding to a length less than or equal to five times
20 the diameter of the large-diameter fiber 2.

[0029]

It is preferable that the abrasive particles 6 are present in an amount of 150% by mass or more of the mass of the scraping layer 5, and more preferably 200% by mass or more. Also, it is preferable that the abrasive particles 6 are present in an amount of
25 900% by mass or less of the mass of the scraping layer 5, and more preferably 750% by mass or less. To be specific, the abrasive particles 6 are present preferably in an amount of 150% by mass or more and 900% by mass or less of the mass of the scraping layer 5, and more preferably 200% by mass or more and 750% by mass or less. As a result of the abrasive particles 6 being present in the scraping layer 5 at a proportion within the
30 above-described range, the abrasive performance of the scraping layer 5 can be improved even more by a synergetic effect with the scraping properties of the large-diameter fibers 2.

[0030]

As the abrasive particles 6, it is preferable to use water-insoluble particles. The abrasive particles 6 preferably have a Mohs hardness of 3 or more and 7 or less from the viewpoint of abrasive properties. Examples of such particles that can be used as the abrasive particles 6 include particles made of calcium carbonate, zeolite, silica and the like. The particles made of these materials can be used alone or in a combination of two or more as the abrasive particles 6. The abrasive particles 6 preferably have an average particle size of 5 μm or more, and more preferably 10 μm or more. Also, the abrasive particles 6 preferably have an average particle size of 30 μm or less, and more preferably 20 μm or less. To be specific, the abrasive particles 6 preferably have an average particle size of 5 μm or more and 30 μm or less. It is preferable that the abrasive particles have an average particle size and a particle size distribution as described above. By using abrasive particles 6 having a hardness and an average particle size within the above-described ranges, it is possible to obtain sufficient abrasive effects while effectively preventing damage to the surface to be cleaned.

[0031]

The average particle size of the abrasive particles 6 is measured using an electrical resistance test method (Coulter counter method).

[0032]

The scraping layer 5 may contain, in addition to the abrasive particles 6 described above, other cleaning components. For example, for the purpose of enhancing the cleaning effect of cleaning a stain, various types of surfactant can be used. To be specific, it is possible to use an anionic surfactant such as alkyl benzene sulfonate and a nonionic surfactant such as polyoxyethylene alkyl ether. Furthermore, for the purpose of enhancing the rinsing effect, it is possible to use, for example, polymers of acrylic acid, methacrylic acid and maleic acid or salts thereof and copolymers of maleic acid and other vinyl monomers or salts thereof.

[0033]

The abrasive particles 6 can be caused to be present in the scraping layer 5 using, for example, the method described below. First, according to an ordinary method, a

cleaning sheet is prepared before the abrasive particles are attached. As used herein, the term "attach" refers to applying abrasive particles such that the abrasive particles are present in the scraping layer. A specific method for producing the cleaning sheet 1 is disclosed in, for example, US 2002/0106478A1. Apart from the preparation of the sheet, a slurry containing the abrasive particles 6 is prepared. It is convenient to use water as a liquid medium for the slurry. Specific examples of the slurry are disclosed in, for example, JP 2006-104264A1 and JP 2006-104265A1. From the viewpoint of dispersibility of the abrasive particles 6, the slurry may contain a trace amount of surfactant. In this case, the surfactant is preferably contained in an amount of 20% by mass or less of the mass of the slurry, and more preferably 10% by mass or less. The surfactant may be contained in the slurry, but it is more preferable that the surfactant is not contained in the slurry. With a trace or no amount of surfactant being contained in the slurry, after the slurry has been applied and dried, the abrasive particles 6 are detachably held between the fibers constituting the scraping layer 5 without being fixedly attached to the fibers. As used herein, the expression "without being fixedly attached" means that the abrasive particles 6 are not fixed to the fibers by bonding or fusing, and all or part of the abrasive particles 6 escape from the scraping layer 5 upon application of vibrations or the like without using a solvent such as an aqueous solution.

[0034]

The slurry is applied to the scraping layer 5 of the cleaning sheet before the abrasive particles 6 are attached. The slurry can be applied by using, for example, a die coater or a gravure roll coater. Through the application of the slurry, a wet coating containing the abrasive particles 6 is formed on the scraping layer 5. While the coating is wet, a member having a smooth surface is pressed against the scraping layer 5. Due to the scraping layer 5 being pressed, a part of the slurry fills up the spaces formed by the large-diameter fibers 2 constituting the scraping layer 5, and another part of the slurry is removed from the surface region 5A of the scraping layer 5. As a result, substantially no abrasive particles 6 are present in the surface region 5A including the outermost surface of the scraping layer 5. Accordingly, substantially no abrasive particles 6 are attached to the tip regions 2A including the tip portions of the large-diameter fibers 2 whose tip portions are present on the surface of the scraping layer 5. In the present invention, as described above, the term "tip regions" refers to regions extending from the tip portions of large-diameter fibers to a depth corresponding to a length less than or equal to five times

the diameter of the large-diameter fibers (the regions indicated by reference numeral 2A in Fig. 3).

[0035]

As the member that is pressed against the scraping layer, for example, a synthetic resin film, a metal plate, natural fiber threads or synthetic fiber threads can be used. Among them, in particular, it is preferable to use a synthetic resin film.

[0036]

After it has been made that substantially no abrasive particles 6 are present in the surface region 5A including the outermost surface of the scraping layer 5 by the pressing, the coating is dried. After the coating has been dried, the surface of the scraping layer 5 is wiped with a wiping member. As a result of wiping the surface in this way, virtually no abrasive particles 6 are present in the surface region 5A including the outermost surface of the scraping layer 5. As the wiping member, for example, a fiber sheet such as any non-woven or woven fabric, a brush made with synthetic resin fibers, or a brush made with natural fibers can be used.

[0037]

Next, the water absorbing layer 4 of the cleaning sheet 1 will be described. The water absorbing layer 4 is a layer capable of absorbing and retaining water. For this purpose, the water absorbing layer 4 preferably contains hydrophilic fibers 3. As the hydrophilic fibers, for example, cellulosic fibers are preferably used. Examples thereof include pulp fibers, cotton fibers and rayon fibers, and in particular, it is preferable to use pulp fibers. It is preferable to use pulp fibers derived from a conifer as the cellulosic fibers from the viewpoint of preventing the escape of the fibers 3 and providing an appropriate sheet strength.

[0038]

As the fiber length of the hydrophilic fibers 3 contained in the water absorbing layer 4, an appropriate length can be selected according to the method for producing the water absorbing layer 4. For example, in the case where the water absorbing layer 4 is produced using a wet-laid method, the hydrophilic fibers 3 preferably have a fiber length

of 0.1 mm or more and 20 mm or less, and more preferably 0.2 mm or more and 15 mm or less. In the case where the water absorbing layer 4 is produced using an air-lay method, the hydrophilic fibers 3 preferably have a fiber length of 0.1 mm or more and 15 mm or less, and more preferably 0.3 mm or more and 10 mm or less. In the case of the
 5 air-lay method, the intersection points of the fibers are joined by fusing or adhesion. In the case of adhesion, any binder can be used. A specific example of the binder is an acrylonitrile-butadiene rubber.

[0039]

The proportion of the hydrophilic fibers 3 in the water absorbing layer 4 is
 10 preferably 10% by mass or more and 100% by mass or less, and more preferably 20% by mass or more and 100% by mass or less from the viewpoint of dirty liquid absorbency. In the case where the water absorbing layer 4 contains fibers other than the hydrophilic fibers 3, it is possible to use, as the other fibers, heat-fusible fibers having a fineness of 0.5 dtex or more and 5 dtex or less, and preferably 1 dtex or more and 3 dtex or less, and a
 15 fiber length of 2 mm or more and 15 mm or less, and preferably 3 mm or more and 8 mm or less. The other fibers are preferably contained in the water absorbing layer 4 in an amount of 5% by mass or more and 90% by mass or less, and more preferably 10% by mass or more and 80% by mass or less. Particularly when the scraping layer 5 contains heat-fusible fibers, from the viewpoint of reliably joining the scraping layer 5 and the
 20 water absorbing layer 4 to form an integrated structure, it is preferable to use the heat-fusible fibers described above. As the heat-fusible fibers, it is possible to use, for example, polyolefin fibers having a low melting point, polyester fibers, and composite fibers as described above that are made of a low-melting point resin and a high-melting point resin and in which the low-melting point resin forms a part of the fiber surface.

25 [0040]

The water absorbing layer 4 preferably has a basis weight of 30 g/m² or more, and more preferably 40 g/m² or more, and preferably 100 g/m² or less, and more preferably 80 g/m² or less. To be specific, the water absorbing layer 4 preferably has a
 30 basis weight of 30 g/m² or more and 100 g/m² or less, and more preferably 40 g/m² or more and 80 g/m² or less. By setting the basis weight of the water absorbing layer 4 within the above-described range, a dirty liquid can be sufficiently absorbed and retained. Also, the total basis weight of the cleaning sheet 1 including the scraping layer 5 and the

water absorbing layer 4 is preferably 50 g/m^2 or more and 300 g/m^2 or less.

[0041]

As described above, the cleaning sheet 1 is a dry-type cleaning sheet before use. The cleaning sheet 1 may be used in a dry state or may be wetted before use. In the case
 5 where the cleaning sheet 1 is used wetted, cleaning can be performed in the following procedure: a surface to be cleaned such as, for example, a hard surface, is wetted with water, the wet hard surface is wiped with the scraping layer 5, and then the moisture on the wet hard surface, or in other words, a dirty liquid including the stain is wiped with the water absorbing layer 4.

10 [0042]

The stain removing mechanism of the cleaning sheet 1 when it is used wetted is as follows, for example. A hard surface is wetted with water, and a surface of the cleaning sheet 1 on which the scraping layer 5 is provided is pressed against and rubbed over the wet hard surface. By doing so, as shown in Fig. 4, the abrasive particles 6 are
 15 released from the scraping layer 5 and supplied to a surface C to be cleaned. The released abrasive particles 6 and the tip portions of a large number of large-diameter fibers 2 that are present on the surface of the scraping layer 5 abrade and scrape away a stain D that is present on the surface C to be cleaned. Due to the action of the particles and the fibers, the stain D is removed from the surface C to be cleaned. The removed
 20 stain D is dissolved or dispersed in water and absorbed into the water absorbing layer 4 together with water. In this way, the surface C to be cleaned is cleaned.

[0043]

In the cleaning sheet 1, it is preferable that air permeability T_{VD} in a perpendicular thickness direction is smaller than air permeability T_{MD} in an in-plane
 25 direction. Also, it is preferable that the air permeability T_{VD} in the perpendicular thickness direction of the water absorbing layer 4 is smaller than the air permeability T_{VD} in the perpendicular thickness direction of the scraping layer 5. With this configuration, the abrasive particles 6 are held between the fibers of the scraping layer 5, and the abrasive particles 6 are retained in the scraping layer 5 without striking through the water
 30 absorbing layer 4. Accordingly, the abrasive particles 6 are likely to be released onto the

surface to be cleaned without the addition of a liquid medium such as water at the time of cleaning. It is preferable to control the air permeability as described above so as to prevent the striking through of the abrasive particles 6 such that the abrasive particles 6 are present in a relatively large amount at a position close to the back side (the water absorbing layer 4) of the scraping layer 5 in the thickness direction of the cleaning sheet 1 and in a relatively small amount or not at all on the surface side (cleaning surface side). The ratio between the air permeability in the perpendicular direction and the air permeability in the in-plane direction can be controlled by controlling, for example, the degree at which the constituent fibers stand upright. As a result of causing the constituent fibers to stand upright, the air permeability in the perpendicular direction increases and the air permeability in the in-plane direction decreases.

[0044]

In order to set the value of the T_{MD}/T_{VD} ratio within the above-described range, for example, the degree at which the large-diameter fibers 2 stand upright and the density of the large-diameter fibers 2 that are present in the scraping layer 5 may be controlled to be within the above-described ranges by appropriately adjusting the air-laid conditions when the scraping layer 5 is formed using an air-lay method, the length and fineness of the large-diameter fibers 2 used, and the like.

[0045]

For example, a plurality of the cleaning sheets 1 may be regularly stacked to form a stack, and the stack may be stored in a packaging material so as to form a cleaning sheet package. The packaging material preferably includes an opening portion through which a cleaning sheet 1 can be taken out from the inside of the packaging material and a re-sealable closing member for closing the opening portion. In the above-described stack, for example, the plurality of cleaning sheets 1 are regularly stacked, with the water absorbing layers 4 of the cleaning sheets 1 facing upward. It is preferable that the stack in this state is stored in the packaging material, with the water absorbing layers 4 facing toward the opening portion. Storing the stack in the manner as described above is preferable because a stinging sensation felt in the fingers (a sensation where the fingers are stung by the tips of the large-diameter fibers 2 standing upright) can be reduced when a cleaning sheet 1 is pinched with the fingers so as to be taken out from the inside of the packaging material. The reason is that when a cleaning sheet 1 is pinched with fingers

so as to be taken out from the inside of the packaging material, the pads of the fingers come into contact only with the water absorbing layer 4, and it is difficult for the pads of the fingers to come into contact with the scraping layer 5, which may provide a stinging sensation. It is preferable to attach a label or a mark indicating "scraping side" such that
5 the water absorbing layer side is easily recognized.

[0046]

The packaging material is preferably a separate package enclosed in a separate packaging material having a hole or a hook provided in its peripheral portion from the viewpoint of protecting the content in the package. The hole or the hook of the separate
10 package is provided for the purpose of allowing the separate package to be suspended. This separate package is advantageous in that it can be easily suspended by using the hole or the hook when it is displayed in shops. Also, the separate package may be configured to be re-sealable.

[0047]

15 With the packaging material, a hole or a hook may be provided directly at the peripheral portion thereof, without using the separate packaging material. Also, the packaging material may be configured to be re-sealable.

[0048]

Another form of packaging of the cleaning sheet 1 is an individual cleaning sheet
20 package in which one cleaning sheet 1 is individually stored in the packaging material. A cut line or perforations may be provided in the individual package so as to be easily opened. It is preferable that a hole or a hook is provided in the peripheral portion of the individual package. The hole or the hook of the individual package is provided for the purpose of allowing the individual package to be suspended. This individual package is
25 advantageous in that it can be easily suspended by using the hole or the hook when it is displayed in shops. Furthermore, a configuration is also possible in which a plurality of (for example, five or ten) individual packages are aligned in a row, with the first individual package being configured to be capable of being suspended by using a hole or a hook provided in the first individual package and the subsequent individual packages
30 being configured to be capable of being separated by a cut line or perforations provided in

the subsequent individual packages. This configuration allows the individual packages aligned in a row to be displayed in a suspended manner in shops and being cut off etc. to be sold.

[0049]

5 Up to here, the present invention has been described by way of a preferred embodiment, but the present invention is not limited to the embodiment given above. For example, the cleaning sheet 1 described above is configured as a dry-type cleaning sheet, but instead the cleaning sheet 1 may be configured as a wet-type cleaning sheet by impregnating the cleaning sheet 1 with water or an aqueous detergent containing water
10 and a surfactant.

[0050]

Also, in the embodiment described above, in order to cause the abrasive particles 6 to be present in the scraping layer 5, a member having a smooth surface is pressed against the coating made of slurry containing the abrasive particles 6, and thereafter, the
15 dried coating is wiped with a fiber sheet. However, the operation of wiping the coating with a fiber sheet may be omitted.

[0051]

With respect to the embodiment described above, the present invention further discloses a cleaning sheet as described below.

20 <1>

A cleaning sheet in which a scraping layer and a water absorbing layer containing hydrophilic fibers are stacked,

wherein the scraping layer is made of an air-laid non-woven fabric in which fiber intersection points of large-diameter fibers are joined, a plurality of the large-diameter
25 fibers stand upright, and tip portions of the large-diameter fibers are present on a surface of the scraping layer,

the large-diameter fibers have a fineness of 10 dtex or more and 150 dtex or less, and are contained in the scraping layer in an amount of 10% by mass or more,

the scraping layer includes spaces between the large-diameter fibers,
30 abrasive particles are detachably present in the spaces, and

the abrasive particles are not substantially attached to tip regions including the tip portions of the large-diameter fibers that are present on the surface of the scraping layer.

[0052]

5 <2>

The cleaning sheet as set forth in clause <1> described above,
wherein the scraping layer contains the large-diameter fibers and small-diameter fibers having a smaller fineness than that of the large-diameter fibers.

<3>

10 The cleaning sheet as set forth in clause <1> or <2> described above,
wherein the large-diameter fibers of the scraping layer are heat-fusible fibers.

<4>

The cleaning sheet as set forth in any one of clauses <1> to <3> described above,
wherein elevations and depressions are formed on the surface of the scraping
15 layer.

<5>

The cleaning sheet as set forth in clause <4> described above,
wherein a total area of the depressions is 5% or more of an area of a cleaning
surface of the cleaning sheet.

20 <6>

The cleaning sheet as set forth in any one of clauses <1> to <5> described above,
wherein perforations are formed.

[0053]

<7>

25 The cleaning sheet as set forth in any one of clauses <1> to <6> described above,
wherein the cleaning sheet is for cleaning a hard surface, and the cleaning sheet
is a dry-type cleaning sheet and does not contain a liquid component such as a washing
liquid.

<8>

30 The cleaning sheet as set forth in clause <7> described above,
wherein a proportion of the liquid component in the cleaning sheet is 3% by
mass or less.

<9>

The cleaning sheet as set forth in any one of clauses <1> to <8> described above, wherein the surface of the scraping layer is heat-embossed in a rhombic lattice pattern.

5 <10>

The cleaning sheet as set forth in any one of clauses <1> to <9> described above, wherein the large-diameter fibers have a fineness of 20 dtex or more.

<11>

10 The cleaning sheet as set forth in any one of clauses <1> to <10> described above, wherein the large-diameter fibers are short fibers and have a fiber length of 2 mm or more.

[0054]

<12>

15 The cleaning sheet as set forth in any one of clauses <1> to <11> described above, wherein a proportion of the large-diameter fibers is 30% by mass or more, and when fibers other than the large-diameter fibers are contained, the proportion of the large-diameter fibers is 90% by mass or less.

20 <13>

The cleaning sheet as set forth in any one of clauses <1> to <12> described above, wherein crimpable fibers are used as the large-diameter fibers, and a form of crimping of the crimpable fibers is spiral, zigzag or U shaped.

25 <14>

The cleaning sheet as set forth in any one of clauses <1> to <13> described above, wherein when fibers other than the large-diameter fibers are contained in the scraping layer, small-diameter fibers having a smaller fineness than that of the large-diameter fibers are used as the other fibers, fibers having a smaller fineness than that of the large-diameter fibers, namely, a fineness of 0.5 dtex or more, preferably a fineness of 5 dtex or less, and more preferably 3 dtex or less are used as the small-diameter fibers, and

30

a proportion of the small-diameter fibers in the scraping layer is 1% by mass or more.

<15>

The cleaning sheet as set forth in any one of clauses <1> to <14> described
5 above,

wherein when fibers other than the large-diameter fibers are contained in the scraping layer, small-diameter fibers having a smaller fineness than that of the large-diameter fibers are used as the other fibers,

the small-diameter fibers are short fibers and have a fiber length of 2 mm or
10 more, and

the small-diameter fibers are heat-fusible fibers.

<16>

The cleaning sheet as set forth in any one of clauses <1> to <15> described
above,

15 wherein the scraping layer has a basis weight of 20 g/m² or more.

[0055]

<17>

The cleaning sheet as set forth in any one of clauses <1> to <16> described
above,

20 wherein the abrasive particles are not substantially attached to tip regions including the tip portions of those of the large-diameter fibers whose tip portions are present on the surface of the scraping layer, and

the number of abrasive particles observed when the tip regions of the large-diameter fibers are magnified is 10% or less of the number of abrasive particles
25 observed in the large-diameter fibers in a central portion in a thickness direction of the scraping layer.

<18>

The cleaning sheet as set forth in any one of clauses <1> to <17> described
above,

30 wherein the abrasive particles are present in an amount of 150% by mass or more of a mass of the scraping layer, and 900% by mass or less of the mass of the scraping layer.

<19>

The cleaning sheet as set forth in any one of clauses <1> to <18> described above,

wherein water-insoluble particles are used as the abrasive particles,

the particles have a Mohs hardness of 3 or more and 7 or less,

5 the abrasive particles are made of one or a combination of two or more of calcium carbonate, zeolite and silica, and

the abrasive particles have an average particle size of 5 μm or more.

<20>

10 The cleaning sheet as set forth in any one of clauses <1> to <19> described above,

wherein the water absorbing layer contains hydrophilic fibers, and

the hydrophilic fibers have a fiber length of 0.1 mm or more and 20 mm or less when the water absorbing layer is produced using a wet-laid method, or

15 the hydrophilic fibers have a fiber length of preferably 0.1 mm or more and 15 mm or less, and more preferably 0.3 mm or more and 10 mm or less when the water absorbing layer is produced using an air-lay method.

<21>

The cleaning sheet as set forth in any one of clauses <1> to <20> described above,

20 wherein the water absorbing layer contains hydrophilic fibers, a proportion of the hydrophilic fibers in the water absorbing layer is 10% by mass or more and 100% by mass or less, when fibers other than the hydrophilic fibers are contained in the water absorbing layer, heat-fusible fibers having a fineness of 0.5 dtex or more and 5 dtex or less and a fiber length of 2 mm or more and 15 mm or less are used as the other fibers,

25 and the other fibers are contained in the water absorbing layer in an amount of 5% by mass or more and 90% by mass or less.

[0056]

<22>

30 The cleaning sheet as set forth in any one of clauses <1> to <21> described above,

wherein the water absorbing layer has a basis weight of 30 g/m^2 or more.

<23>

The cleaning sheet as set forth in any one of clauses <1> to <22> described

above,

wherein a total basis weight of the cleaning sheet including the scraping layer and the water absorbing layer is 50 g/m^2 or more and 300 g/m^2 or less.

<24>

5 The cleaning sheet as set forth in any one of clauses <1> to <23> described above,

wherein air permeability T_{VD} in a perpendicular thickness direction is smaller than air permeability T_{MD} in an in-plane direction, and

10 the air permeability T_{VD} in the perpendicular thickness direction of the water absorbing layer is smaller than the air permeability T_{VD} in the perpendicular thickness direction of the scraping layer.

<25>

The cleaning sheet as set forth in any one of clauses <1> to <24> described above,

15 wherein in a thickness direction of the cleaning sheet, the abrasive particles are present in a relatively large amount at a position close to a back side (the water absorbing layer) of the scraping layer and in a relatively small amount or not at all on a surface side (the cleaning surface side).

<26>

20 A cleaning method including:

when the cleaning sheet as set forth in any one of clauses <1> to <25> described above, which is a dry-type cleaning sheet before use and is used in a dry state or wetted before use, is used wetted,

25 cleaning a wet surface to be cleaned that has been wetted with water, with the scraping layer; and then

wiping a dirty liquid containing a stain including moisture on the wet surface to be cleaned, with the water absorbing layer.

[0057]

<27>

30 The cleaning method as set forth in clause <26> described above,

wherein a scraping layer-side surface of the cleaning sheet as set forth in any one of clauses <1> to <25> described above is pressed against and rubbed over a wet hard surface, which is a hard surface to be cleaned and has been wetted with water, so as to

release the abrasive particles from the scraping layer to supply the abrasive particles to the surface C to be cleaned,

a stain that is present on the surface to be cleaned is abraded and scraped away by the released abrasive particles and the tip portions of the plurality of large-diameter
 5 fibers present on the surface of the scraping layer, so as to remove the stain from the surface to be cleaned, and

the removed stain is dissolved or dispersed in water and absorbed into the water absorbing layer together with the water, so as to make the surface to be cleaned clean.

<28>

10 A cleaning sheet package in which a plurality of the cleaning sheets as set forth in any one of clauses <1> to <25> described above are stacked and stored in a packaging material,

wherein the packaging material includes an opening portion through which each of the cleaning sheets is taken out and a re-sealable closing member for closing the
 15 opening portion, and

the cleaning sheets are stacked in the packaging material, with the water absorbing layers thereof facing toward the opening portion.

<29>

The cleaning sheet package as set forth in clause <28> described above,
 20 wherein the packaging material is a separate package enclosed in a separate packaging material having a hole or a hook provided in a peripheral portion thereof.

<30>

A cleaning sheet package in which the cleaning sheets as set forth in any one of clauses <1> to <25> described above are individually packaged, each cleaning sheet
 25 being stored in a packaging material,

wherein a hole or a hook is provided in a peripheral portion of the packaging material, and

the packaging material is configured to be capable of being suspended by the hole or the hook.

30 <31>

A cleaning sheet production method for producing the cleaning sheet as set forth in any one of clauses <1> to <25> described above, the method including:

forming a coating on the scraping layer of the cleaning sheet before the abrasive particles are attached by applying a slurry containing the abrasive particles onto the

scraping layer; and

removing the slurry from a surface region of the scraping layer by pressing a member having a smooth surface against the scraping layer while the coating is wet.

<32>

5 The cleaning sheet production method as set forth in clause <31> described above, further including:

wiping the surface region of the scraping layer with a wiping member made of fibers after the coating has been dried.

Example

10 [0058]

Hereinafter, the present invention will be described in further detail by way of examples. It is to be understood, however, that the scope of the present invention is not limited to the examples given below. Unless otherwise stated, "%" means "% by mass".

[0059]

15 Example 1

(1) Production of Scraping Layer

A raw material was prepared by mixing large-diameter fibers (45 g/m²) and small-diameter fibers (15 g/m²). As the large-diameter fibers, heat-fusible composite fibers (hereinafter represented by "PET · PET") having a core-sheath structure in which
20 the core was made of polyethylene terephthalate (PET) and the sheath was made of low-melting point polyethylene terephthalate (PET) was used. The large-diameter fibers had a fineness of 56 dtex and a fiber length of 5 mm. As the small-diameter fibers, heat-fusible composite fibers (hereinafter represented by " PET · PET ") having a core-sheath structure in which the core was made of polyethylene terephthalate (PET) and
25 the sheath was made of low-melting point polyethylene terephthalate (PET) were used. The small-diameter fibers had a fineness of 2.2 dtex and a fiber length of 5 mm. A web having a basis weight of 45 g/m² was formed using the obtained fibrous raw material by an air-lay method. Heat fusing was performed to join the intersection points of the constituent fibers in the web, and an air-laid non-woven fabric for use as a scraping layer
30 was obtained.

[0060]

(2) Production of Water Absorbing Layer

A raw material was prepared by mixing pulp fibers (having a length-weighted average fiber length of 2.5 mm) having a basis weight of 20 g/m² and PET · PET composite fibers having a basis weight of 40 g/m² as heat-fusible fibers. The PET · PET composite fibers had a fineness of 2.2 dtex and a fiber length of 5 mm. A web was formed using the obtained raw material by an air-lay method.

[0061]

(3) Production of Cleaning Sheet

The web containing fibers for a scraping layer formed using an air-lay method was stacked on one side of the web containing fibers for a water absorbing layer formed using an air-lay method, and the two webs and the intersection points of the fibers constituting the webs were joined by fusing or a binder so as to form an air-laid non-woven fabric for a water absorbing layer and an air-laid non-woven fabric for a scraping layer and to form the air-laid non-woven fabric for a water absorbing layer and the air-laid non-woven for a scraping layer into an integrated structure. As a means for forming an integrated structure, heat emboss processing was used. The pattern for heat emboss processing was as shown in Fig. 1. The area ratio of depressions was 12%. There were a large number of tip portions of the large-diameter fibers on the surface of the scraping layer. A slurry containing abrasive particles was applied to the scraping layer of the thus-obtained stacked sheet. The slurry was, in mass ratio, 50% abrasive particles (calcium carbonate) and 10% surfactant, and the remainder was water. The amount of slurry applied was set such that the solid content after drying was the value shown in Table 1 given below. The abrasive particles had an average particle size of 20 μm. The surface of the scraping layer was scraped with a polyethylene terephthalate film while the coating formed by the application of the slurry was wet. After the coating was dried, the surface of the scraping layer was wiped with a non-woven pulp fabric having a basis weight of 40 g/m². In this way, an intended cleaning sheet was obtained. As a result of microscopy, it was found that, in the cleaning sheet, substantially no abrasive particles were present in the surface region of the scraping layer.

[0062]

Examples 2 to 4 and Comparative Examples 1 to 3

Cleaning sheets were obtained in the same manner as in Example 1 except that the conditions shown in Table 1 given below were used. Note that, however, in Comparative Example 3 a slurry containing, in mass ratio, 30% of abrasive particles (calcium carbonate, with an average particle size of 20 μm), 30% of surfactant 30% and a remainder of water was used.

[0063]

Evaluation

With respect to each of the obtained cleaning sheets, the amount of escaped abrasive particles was measured using the above-described method. Also, water scale stain detergency and a sense of scraping were evaluated using the following methods. The results are shown in Table 1 given below.

[0064]

Water Scale Stain Detergency

An aqueous solution of Si (with a concentration of 160 ppm) was applied to a stainless steel plate (SUS 304) in an amount of 90 g/m^2 , which was then air-dried at room temperature for 24 hours and thereafter heated at 180°C for 90 minutes so as to create a model water stain. The model water stain was subjected to wiping by moving each sheet back and forth 5 to 20 times over the model water stain, and the stain was visually observed and the state of the stain before and after wiping was evaluated based on the following criteria:

- : no stain was left;
- △: stain was vaguely observed when the plate was held up to a light;
- △: stain was clearly observed when the plate was held up to a light; and
- ×: stain was easily seen.

25 [0065]

Sense of Scraping

A stainless steel plate (SUS 304) was wiped with each sheet so as to perform sensory evaluation of wiping properties based on the following criteria:

○: the wiping surface was in point contact with the plate, and there was a strong sense of crispness;

○△: the wiping surface was in slightly wide point contact with the plate, and there was a slightly strong sense of crispness;

5 △: the wiping surface was in wide point contact with the plate, and there was a slightly weak sense of crispness; and

×: the wiping surface was in plane contact with the plate, and there was a weak sense of crispness and a strong sense of grip.

[0066]

[Table 1]

	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Comp. Ex. 1	Comp. Ex. 2	Comp. Ex. 3
Scraping layer (g/m ²)	PET · PET 56 dtex	45					45
	PP · PE 20 dtex		40				
	PP · PE 16.7 dtex			40			
	PP · PE 11 dtex						
	PET · PE 6.6 dtex				40		
	PET · PET 2.2 dtex	15				40	15
Proportion of large-diameter fibers in scraping layer (%)							
Water absorbing layer (g/m ²)	Pulp	20	20	20	20	20	20
	PET · PET 2.2 dtex	40	40	40	40	40	40
Total basis weight (g/m ²)							
Applied solid content (g/m ²)	270	270	270	270	270	270	270
Amount of escaped abrasive particles (g/m ²)	0.7	0.7	0.65	0.7	0.5	0.5	0
Water scale stain detergency	○	○	○	○	△	△	×
Sense of scraping	○	○	△	○△	×	×	×

[0067]

As is clear from the results shown in Table 1, the cleaning sheets obtained in the examples have a higher stain detergency and a superior sense of scraping a stain as compared with the cleaning sheets obtained in the comparative examples. In Comparative Example 3, the abrasive particles did not escape from the obtained sheet, and the performance was low. The reason is that in Comparative Example 3, the proportion of surfactant in the slurry used to cause the abrasive particles to be attached to the fibers was increased, and as a result, the abrasive particles were firmly attached to the fibers.

10 [0068]

Example 5 to 10 and Comparative Example 4

Cleaning sheets were obtained in the same manner as in Example 1 except that the conditions shown in Table 2 given below were used. In Comparative Example 4, no slurry was applied (no abrasive particles were contained). With respect to each of the obtained cleaning sheets, the amount of escaped abrasive particles was measured using the above-described method. Also, water scale stain detergency and a sense of scraping were evaluated using the above-described method. The results are shown in Table 2 given below.

[0069]

[Table 2]

		Ex. 5	Ex. 6	Ex. 7	Ex. 8	Ex. 9	Ex. 10	Comp. Ex. 4
Scraping layer (g/m ²)	PET · PET 56 dtex	45	45	45	45	45	45	45
	PET · PET 2.2 dtex	15	15	15	15	15	15	15
Proportion of large-diameter fibers in scraping layer (%)		75	75	75	75	75	75	75
Water absorbing layer (g/m ²)	Pulp	20	20	20	20	20	20	20
	PET · PET 2.2 dtex	40	40	40	40	40	40	40
Total basis weight (g/m ²)		120	120	120	120	120	120	120
Applied solid content (g/m ²)		285	225	190	145	85	67	0
Water scale stain detergency		○	○	○	○	○	○△	△
Amount of escaped abrasive particles (g/m ²)		0.75	0.34	0.62	1	1.1	2	-
Sense of scraping		○	○	○	○	○△	○△	△
Foaming properties		○	○	○	○	△	△×	×

[0070]

As is clear from the results shown in Table 2, compared with the cleaning sheets of the comparative examples, the cleaning sheets obtained in the examples have a higher stain detergency, a superior sense of scraping a stain, and good foaming properties.

5 Industrial Applicability

[0071]

As described in detail above, with the cleaning sheet of the present invention, the abrasive particles are released to the surface to be cleaned quickly and in a large amount. Accordingly, it is possible to facilitate quick and reliable removal of a stain. Also, with
10 the cleaning sheet of the present invention, the abrasive particles can be released even when the surface to be cleaned is dry.

CLAIMS

1. A cleaning sheet in which a scraping layer and a water absorbing layer containing hydrophilic fibers are stacked,
wherein the scraping layer is made of an air-laid non-woven fabric in which fiber
5 intersection points of large-diameter fibers are joined, a plurality of the large-diameter fibers stand upright, and tip portions of the large-diameter fibers are present on a surface of the scraping layer,
the large-diameter fibers have a fineness of 10 dtex or more and 150 dtex or less, and are contained in the scraping layer in an amount of 10% by mass or more,
10 the scraping layer includes spaces between the large-diameter fibers, abrasive particles are detachably present in the spaces, and the abrasive particles are not substantially attached to tip regions including the tip portions of the large-diameter fibers that are present on the surface of the scraping layer.
- 15 2. The cleaning sheet according to claim 1,
wherein the scraping layer contains the large-diameter fibers and small-diameter fibers having a smaller fineness than that of the large-diameter fibers.
3. The cleaning sheet according to claim 1 or 2,
wherein the large-diameter fibers of the scraping layer are heat-fusible fibers.
- 20 4. The cleaning sheet according to claim 2,
wherein the small-diameter fibers of the scraping layer are heat-fusible fibers.
5. The cleaning sheet according to any one of claims 1 to 4,
wherein elevations and depressions are formed on the surface of the scraping layer.
- 25 6. The cleaning sheet according to claim 5,
wherein a total area of the depressions is 5% or more of an area of a cleaning surface of the cleaning sheet.

7. The cleaning sheet according to any one of claims 1 to 6,
wherein perforations are formed.
8. The cleaning sheet according to any one of claims 1 to 7,
wherein the cleaning sheet is for cleaning a hard surface, and the cleaning sheet
5 is a dry-type cleaning sheet and does not contain a liquid component.
9. The cleaning sheet according to claim 7,
wherein a proportion of the liquid component in the cleaning sheet is 3% by
mass or less.
10. The cleaning sheet according to any one of claims 1 to 9,
10 wherein the large-diameter fibers have a fineness of 20 dtex or more.
11. The cleaning sheet according to any one of claims 1 to 10,
wherein crimpable fibers are used as the large-diameter fibers, and a form of
crimping of the crimpable fibers is spiral, zigzag or U shaped.
12. The cleaning sheet according to any one of claims 1 to 11,
15 wherein when fibers other than the large-diameter fibers are contained in the
scraping layer, small-diameter fibers having a smaller fineness than that of the
large-diameter fibers are used as the other fibers,
the small-diameter fibers have a smaller fineness than that of the large-diameter
fibers, and have a fineness of 0.5 dtex or more, and
20 a proportion of the small-diameter fibers in the scraping layer is 1% by mass or
more.
13. The cleaning sheet according to any one of claims 1 to 12,
wherein the abrasive particles are not substantially attached to tip regions
including the tip portions of those of the large-diameter fibers whose tip portions are
25 present on the surface of the scraping layer.

14. The cleaning sheet according to any one of claims 1 to 13,
wherein the abrasive particles are not substantially attached to tip regions
including the tip portions of those of the large-diameter fibers whose tip portions are
present on the surface of the scraping layer,
- 5 the number of abrasive particles observed when the tip regions of the
large-diameter fibers are magnified is 10% or less of the number of abrasive particles
observed in the large-diameter fibers in a central portion in a thickness direction of the
scraping layer.
15. The cleaning sheet according to any one of claims 1 to 14,
- 10 wherein water-insoluble particles are used as the abrasive particles,
such water-insoluble abrasive particles having a Mohs hardness of 3 or more and
7 or less,
the abrasive water-insoluble abrasive particles are made of one or a combination
of two or more of calcium carbonate, zeolite and silica, and
- 15 the abrasive water-insoluble abrasive particles have an average particle size of 5
 μm or more.
16. The cleaning sheet according to any one of claims 1 to 15,
wherein, in a thickness direction of the cleaning sheet, the abrasive particles are
present in a relatively large amount at a position close to a back side of the scraping layer
20 and in a relatively small amount or not at all on a surface side.
17. A cleaning method including:
when the cleaning sheet according to any one of claims 1 to 16, which is a
dry-type cleaning sheet before use and is used in a dry state or wetted before use, is used
wetted,
- 25 cleaning a wet surface to be cleaned that has been wetted with water, with the
scraping layer; and then
wiping a dirty liquid containing a stain including moisture on the wet surface to
be cleaned, with the water absorbing layer.

18. The cleaning method according to claim 17,
wherein a scraping layer-side face of the cleaning sheet according to any one of
claims 1 to 8 is pressed against and rubbed over a wet hard surface, which is a hard
surface to be cleaned and has been wetted with water, so as to release the abrasive
5 particles from the scraping layer to supply the abrasive particles to the surface to be
cleaned,
a stain that is present on the surface to be cleaned is abraded and scraped away
by the released abrasive particles and the tip portions of the plurality of large-diameter
fibers present on the surface of the scraping layer to remove the stain from the surface to
10 be cleaned, and
the removed stain is dissolved or dispersed in water and absorbed into the water
absorbing layer together with the water, so as to make the surface to be cleaned clean.
19. A cleaning sheet package in which a plurality of the cleaning sheets according to
any one of claims 1 to 16 are stacked and stored in a packaging material,
15 wherein the packaging material includes an opening portion through which each
of the cleaning sheets is taken out, and
the cleaning sheets are stacked in the packaging material, with the water
absorbing layers thereof facing toward the opening portion.
20. The cleaning sheet package according to claim 19,
20 wherein the packaging material is a separate package enclosed in a separate
packaging material having a hole or a hook provided in a peripheral portion thereof.
21. A cleaning sheet package in which the cleaning sheets according to any one of
claims 1 to 16 are individually packaged, each cleaning sheet being stored in a packaging
material,
25 wherein a hole or a hook is provided in a peripheral portion of the packaging
material, and
the packaging material is configured to be capable of being suspended by the
hole or the hook.

22. A cleaning sheet production method for producing the cleaning sheet according to any one of claims 1 to 16, the method comprising:

forming a coating on the scraping layer of the cleaning sheet before the abrasive particles are attached by applying a slurry containing the abrasive particles onto the
5 scraping layer; and

removing the slurry from a surface region of the scraping layer by pressing a member having a smooth surface against the scraping layer while the coating is wet.

23. The cleaning sheet production method according to claim 22, further comprising:

wiping the surface region of the scraping layer with a wiping member made of
10 fibers after the coating has been dried.