

DESCRIPTION**CLEANING SHEET**

Technical Field

[0001]

5 The present invention relates to a cleaning sheet in which a continuous-filament aggregate formed by aggregating and orienting a multitude of continuous filaments in one direction is joined to a substrate sheet, the cleaning sheet being used with a cleaning tool that has a head and a handle connected to the head, the substrate sheet being utilized to attach the cleaning sheet to the head.

10 Background Art

[0002]

 There are cleaning sheets that are used by being attached to a head of a cleaning tool which further includes a handle connected to the head. One type of such heretofore-known cleaning sheets is structured such that a continuous-filament aggregate
15 formed by aggregating and orienting a multitude of continuous filaments in one direction is joined to a substrate sheet. (See, for example, Patent Documents 1 to 4 listed below.)

[0003]

Patent Document 1: JP 2000-254057A

Patent Document 2: JP 2000-254058A

20 Patent Document 3: JP 2000-254059A

Patent Document 4: US 6329308B1

[0004]

 The cleaning sheets disclosed in Patent Documents 1 to 4, however, have a low effective-soil-trapping-area ratio (a ratio, with respect to the entire cleaning surface, of an
25 area of a section to which soil actually adheres and which thus contributes to trapping of dirt), thus having poor trapping capabilities. This is because the continuous-filament aggregate (tow) is cut up into continuous filaments in an intermittent fashion and the cut-up filaments are then arranged intermittently. Further, none of Patent Documents 1 to 4 gives consideration whatsoever to improving the trapping capabilities of the cleaning
30 sheets by defining the height of crimp of the continuous filaments.

Disclosure of the Invention

[0005]

The present invention provides a cleaning sheet which includes a continuous-filament aggregate and a substrate sheet. On one side or both sides of the substrate sheet, one or a plurality of continuous-filament aggregates are joined to the substrate sheet per side. Each of the continuous-filament aggregates is formed by aggregating and orienting a plurality of continuous filaments in one direction. The cleaning sheet is used with a cleaning tool that has a head and a handle connected to the head. The substrate sheet is utilized to attach the cleaning sheet to the head. The continuous filaments in the continuous-filament aggregate are oriented in a cleaning direction of the cleaning tool. At least one continuous-filament aggregate formed by aggregating a plurality of continuous filaments crimped to have a height of crimp of 0.1 to 5.0 mm is provided per side of the substrate sheet.

[0006]

The present invention also provides a cleaning article which includes a cleaning tool that has a rectangular head having long sides and short sides, and a handle connected to the head. The above-mentioned cleaning sheet is attached to the head. The cleaning sheet is attached to the head in such a manner that a direction in which the continuous filaments are oriented in the continuous-filament aggregate matches a direction of the short sides of the head of the cleaning tool.

Brief Description of the Drawings

[0007]

[Fig. 1] Fig. 1 is a perspective illustrating a first embodiment of a cleaning sheet of the present invention.

[Fig. 2] Fig. 2 is a plan view of the cleaning sheet illustrated in Fig. 1.

[Fig. 3] Fig. 3 is a plan view illustrating positions for forming joining lines and sealing sections in the cleaning sheet illustrated in Fig. 1.

[Fig. 4] Fig. 4(a) is a cross-sectional view taken along line X-X illustrated in Fig. 3, and Fig. 4(b) is a cross-sectional view taken along line Y-Y illustrated in Fig. 3.

[Fig. 5] Fig. 5 is a photograph for explaining a method for measuring the number of crimps.

[Fig. 6] Fig. 6 is a photograph for explaining a method for measuring the height of

crimp of a crimped fiber.

[Fig. 7] Fig. 7 is a photograph for explaining a method for measuring the height of crimp of a crimped fiber.

5 [Fig. 8] Fig. 8 is a perspective illustrating a state in which the cleaning sheet of Fig. 1 is attached to a head of a cleaning tool.

[Fig. 9] Fig. 9 is a plan view (corresponding to Fig. 3) illustrating positions for forming joining lines and sealing sections in a cleaning sheet according to a second embodiment of the present invention.

10 [Fig. 10] Fig. 10 is a plan view (corresponding to Fig. 3) illustrating positions for forming joining lines and sealing sections in a comparative example of a cleaning sheet of the present invention.

Detailed Description of the Invention

[0008]

15 The present invention relates to a cleaning sheet in which a continuous-filament aggregate formed by aggregating and orienting a multitude of continuous filaments in one direction is joined to a substrate sheet and which is used by being attached, by utilizing the substrate sheet, to a head of a cleaning tool which further includes a handle connected to the head, wherein the continuous filaments exhibit high conformability especially to uneven sections and wherein the cleaning sheet exhibits good trapping capabilities and also
20 has a high effective-soil-trapping-area ratio (a ratio, with respect to the entire cleaning surface, of an area of a section to which soil actually adheres and which thus contributes to trapping of dirt).

[0009]

25 The following describes a home-use and business-use cleaning sheet of the present invention according to a first embodiment as one preferred embodiment of the invention with reference to the drawings.

30 Figs. 1 and 2 respectively illustrate a perspective and a plan view of a first embodiment of a cleaning sheet of the present invention. Fig. 3 is a plan view illustrating positions for forming joining lines and sealing sections in the cleaning sheet of the embodiment illustrated in Fig. 1. Note that Fig. 3 virtually omits illustration of continuous-filament aggregates 10 and instead illustrates their contours by alternate long-and-short dashed lines. Figs. 4(a) and 4(b) respectively illustrate cross-sectional views taken along line X-X and line Y-Y of Fig. 3.

[0010]

As illustrated in Figs. 1 to 3, the cleaning sheet 1 of the first embodiment is a cleaning sheet including, on one side of a substrate sheet 20, a plurality of continuous-filament aggregates 10 joined to the substrate sheet 20 per side, each of the continuous-filament aggregates 10 being formed by aggregating and orienting a multitude of continuous filaments 11 in one direction. Generally, the continuous filaments 11 are oriented in a direction in which the material therefor is carried during manufacturing. The expression “the continuous filaments 11 are oriented in one direction” used herein encompasses instances where the orientation direction of some of the continuous filaments 11 deviates from the orientation direction of the rest of the majority of the continuous filaments 11 due to manufacturing error, crimping of the continuous filaments 11, and so forth.

[0011]

The cleaning sheet 1 of the present embodiment is used on a cleaning tool 30 that has a head 31 and a handle 32 connected to the head 31, with the substrate sheet 20 being utilized to attach the cleaning sheet 1 to the head 31, as illustrated in Fig. 8. The head 31 has the shape of a rectangle having long sides and short sides. In a state where the continuous-filament aggregates 10 are attached to the head 31, the continuous filaments 11 are oriented in a cleaning direction D1 of the cleaning tool 30, i.e., in the direction of the short sides.

[0012]

The “cleaning direction D1 of the cleaning tool 30” is the direction in which the head 31 of the cleaning tool 30 is moved (particularly back and forth) along the direction orthogonal to the long sides of the head 31 when the cleaning tool 30 is used in its normal state, and in the present embodiment, it is the direction along the short sides of the head 31 which is rectangular as viewed from above. The expression “the continuous filaments 11 are oriented in the cleaning direction D1 of the cleaning tool 30” used herein encompasses instances where the orientation direction of some of the continuous filaments 11 deviates from the orientation direction of the rest of the majority of the continuous filaments 11.

[0013]

Viewed macroscopically from above, the continuous-filament aggregate 10 is rectangular in shape, and its lateral direction (the direction of the shorter sides) coincides

with the orientation direction of the continuous filaments 11.

In the present embodiment, the continuous-filament aggregate 10 is joined only to one side of the substrate sheet 20.

5 In the cleaning sheet of the present invention, it is preferable to arrange a plurality of continuous-filament aggregates 10, and more preferably three or four continuous-filament aggregates 10, per side of the substrate sheet 20 extending along the direction of the long sides of the substrate sheet 20 (along the longitudinal direction). In the present embodiment, three continuous-filament aggregates 10 are provided side-by-side per side of the substrate sheet 20, substantially without leaving a space therebetween. Of the three
10 continuous-filament aggregates 10, the central continuous-filament aggregate 10 with respect to the direction of the short sides of the substrate sheet 20 (the lateral direction thereof) is referred to as a “first continuous-filament aggregate 10A”, and the two outer continuous-filament aggregates 10 are referred to as “second continuous-filament aggregates 10B”. The description below uses the expression “continuous-filament
15 aggregates 10” collectively in cases where the first continuous-filament aggregate 10A and the second continuous-filament aggregates 10B share the same explanation.

[0014]

The substrate sheet 20 is rectangular, and its longitudinal direction coincides with the longitudinal direction of the continuous-filament aggregate 10--i.e., its lateral direction
20 coincides with the lateral direction of the continuous-filament aggregate 10. The substrate sheet 20 is described in detail further below.

[0015]

The continuous-filament aggregate 10 is formed by orienting a multitude of continuous filaments 11 so that they constitute a prescribed thickness. The continuous
25 filaments 11 are oriented in the lateral direction of the substrate sheet 20. Accordingly, each continuous-filament aggregate 10 is joined to the substrate sheet 20 in such a design that the orientation direction of the continuous filaments 11 is orthogonal to the longitudinal direction of the substrate sheet 20.

[0016]

30 The length of the continuous-filament aggregate 10 (the length in the direction orthogonal to the orientation direction of the continuous filaments 11) is preferably 200 to 800 mm, and more preferably 250 to 300 mm. The width of the continuous-filament

aggregate 10 (the length in the orientation direction of the continuous filaments 11) is preferably 20 to 150 mm, and more preferably 40 to 135 mm. The expression “width of the filament aggregate 10 (the length in the orientation direction of the continuous filaments 11)” used herein encompasses instances where the lengths of some of the continuous filaments 11 differ from the lengths of the rest of the majority of the continuous filaments 11 due to manufacturing error, crimping of the continuous filaments 11, and so forth.

The thickness (height) of the continuous-filament aggregate 10 is preferably 0.5 to 30 mm, and more preferably 1 to 10 mm. The thickness of the continuous-filament aggregate 10 is a value measured under a load of 0.3 kPa. The thickness of the continuous-filament aggregate 10 may be varied by, for example, using continuous filaments 11 having different heights of crimp (described below). The expression “the thickness (height) of the continuous-filament aggregate 10” used herein encompasses instances where the thickness (height) of the continuous-filament aggregate 10 in some portions differs from the thickness (height) of the continuous-filament aggregate 10 in the rest of the majority of portions due to manufacturing error, crimping of the continuous filaments 11, and so forth.

[0017]

In a state where the substrate sheet 20 is developed into a plane, it is preferable that the thickness of the central first continuous-filament aggregate 10A be 0.5 to 20 mm, and more preferably 1 to 10 mm, thicker than that of the outermost second continuous-filament aggregate 10B, from the standpoint of increasing the effective-soil-trapping-area ratio (the ratio, with respect to the entire cleaning surface, of an area of a section to which soil actually adheres and which thus contributes to trapping of dirt). The difference between the thickness of the aggregate 10A and the thickness of the aggregate 10B is preferably 0.5 to 20 mm, and more preferably 0.5 to 10 mm. In other words, it is preferable that the cleaning surface of the cleaning sheet 1 of the present embodiment has a shape bulging out at the first continuous-filament aggregate 10A.

[0018]

Further, it is preferable that, of the plurality of (and preferably three or four) continuous-filament aggregates 10, at least one of the outermost continuous-filament aggregates 10B is depressed in a thickness direction thereof with respect to the one or two central continuous-filament aggregates 10A in a state where the cleaning sheet 1 is

attached to the head 31 by utilizing the substrate sheet 20. In the present embodiment, it is preferable that the two outermost second continuous-filament aggregates 10B are depressed in the thickness direction thereof with respect to the single central first continuous-filament aggregate 10A. The difference in height is preferably 0.5 to 15 mm, and more preferably 1.5 to 5 mm. Note that the difference in height between the first continuous-filament aggregate 10A and the second continuous-filament aggregate 10B mainly results from the difference between the thickness of the first continuous-filament aggregate 10A (which is large) and the thickness of the second continuous-filament aggregate 10B (which is small), but also depends on the shape of the attachment surface (bottom surface) of the head 31.

[0019]

The mass of the continuous filaments 11 in the continuous-filament aggregate 10 (not including the mass of the joining line 12 and discontinuous sealing sections 14 described below) is preferably 0.5 to 15 g, and more preferably 1.5 to 5 g.

15 [0020]

As illustrated in Figs. 1 to 3 and 4(a), the continuous filaments 11 in the continuous-filament aggregate 10 are joined by a single joining line 12 extending continuously in a direction orthogonal to the orientation direction of the continuous filaments 11. It will suffice if the joining line 12, viewed macroscopically, extends in the direction orthogonal to the orientation direction of the continuous filaments 11.

In addition to the joining line 12, the continuous filaments 11 in the continuous-filament aggregate 10 are also joined by discontinuous sealing sections 14 provided in a discontinuous manner in the longitudinal direction, as illustrated in Figs. 1 to 3 and 4(b). The discontinuous sealing sections 14 may be arranged according to a regular pattern, or may be provided irregularly (randomly). Examples of regular patterns include straight lines and staggered patterns.

[0021]

In the present embodiment, the discontinuous sealing sections 14 are arranged in a straight line on both laterally-outward sides of the joining line 12 in the first continuous-filament aggregate 10A; however, in each second continuous-filament aggregate 10B, the discontinuous sealing sections 14 are arranged in a straight line only on the laterally-inward side of the joining line 12. In all of the first continuous-filament

aggregate 10A and the second continuous-filament aggregates 10B, the discontinuous sealing sections 14 arranged in straight lines are provided at the same longitudinal positions at regular intervals.

5 The joining line 12 and the discontinuous sealing sections 14 will be described in detail further below.

Joining the continuous filaments 11 using the joining line 12 and the discontinuous sealing sections 14 keeps the continuous filaments 11 in the continuous-filament aggregate 10 in their aggregated state.

[0022]

10 In each continuous-filament aggregate 10, it is preferable to provide 2,000 to 40,000 pieces, and more preferably 5,000 to 20,000 pieces, of continuous filaments 11 per centimeter of the joining line 12 per side thereof.

[0023]

15 The length of the continuous filament 11 is preferably 30 to 150 mm, and more preferably 50 to 120 mm, from the standpoint of dust trapping capabilities. The “length of the continuous filament 11” refers to the length from the joining line 12 to the tip end of each continuous filament 11. In the present embodiment, continuous filaments 11 having such lengths are used in the form of a fiber bundle (tow). It is preferable to sufficiently open the fiber bundle with a known opening device beforehand.

20 While the thickness of the continuous filaments 11 is not particularly critical, the thickness is preferably 0.1 to 200 dtex, and more preferably 2 to 30 dtex, to secure dust trapping capabilities and prevent scratches from being created on a surface-to-be-cleaned.

[0024]

25 Crimped fibers may preferably be used for the continuous filaments 11 to further improve their dust trapping capabilities. Two-dimensionally or three-dimensionally crimped fibers can be used therefor. The percentage of crimp (JIS L0208) is preferably 5 to 50%, and more preferably 10 to 30%, to obtain improved dust trapping capabilities. The percentage of crimp is defined as a percentage of a difference between the length A of a crimped fiber in its straightened state and the natural length B of the crimped fiber with
30 respect to the length A, and is calculated from the following equation:

$$\text{Percentage of crimp (\%)} = (A - B)/A \times 100$$

[0025]

The term “natural length B” refers to the length of a straight line connecting the two ends of a crimped fiber in its natural state. The term “natural state” means a state of a crimped fiber hanging under its own weight with its one end fixed to a horizontal plate.

5 The term “length A of a crimped fiber in its straightened state” means the length of a crimped fiber stretched out until no crimp remains under a minimum load.

[0026]

The continuous filaments 11 in the cleaning sheet of the present invention are oriented in the direction of the short sides of the head 31 of the cleaning tool 30, which is a direction orthogonal to the long sides of the head 31. In a state where the cleaning sheet 1

10 is attached to the head 31 of the cleaning tool 30 by utilizing the substrate sheet 20, a plurality of continuous-filament aggregates 10 are arranged extending along the long sides of the head 31. At least one continuous-filament aggregate 10 formed by aggregating a multitude of continuous filaments 11 crimped to have a height of crimp (a difference in

15 height between the alternating peaks and troughs of a crimped continuous filament 11) of 0.1 to 5.0 mm is provided per side of the substrate sheet 20. Further, it is more preferable that the continuous filaments of the outside continuous-filament aggregate 10B are crimped to have a height of crimp that is lower than the height of crimp of the continuous filaments of the central continuous-filament aggregate 10A.

20 [0027]

More specifically, of the plurality of (and preferably three or four) continuous-filament aggregates 10 in the cleaning sheet of the present invention, it is preferable that the one or two central continuous-filament aggregate/s 10A is/are formed by aggregating a multitude of continuous filaments 11 crimped to have a height of crimp of

25 0.2 to 5.0 mm, and at least one outermost continuous-filament aggregate 10B is formed by aggregating a multitude of continuous filaments 11 crimped to have a height of crimp that is lower than the height of crimp of the central continuous-filament aggregate/s 10A. In the present embodiment, three continuous-filament aggregates 10 are arranged in the cleaning direction D1 per side of the substrate sheet 20; of the three continuous-filament

30 aggregates 10, a single central first continuous-filament aggregate 10A is formed by aggregating a multitude of continuous filaments 11 crimped to have a height of crimp of 0.2 to 5.0 mm; and the two outermost second continuous-filament aggregates 10B are formed by aggregating a multitude of continuous filaments 11 crimped to have a height of

crimp that is lower than the height of crimp of the central first continuous-filament aggregate 10A.

[0028]

5 The height of crimp of the continuous filaments 11 in the second continuous-filament aggregate 10B may be within the above-mentioned range (0.2 to 5.0 mm) or may be below this range. It is, however, preferable that the height of crimp of the continuous filaments 11 in the second continuous-filament aggregate 10B is 0.05 to 4 mm lower, and more preferably 0.2 to 2 mm lower, than the height of crimp of the continuous filaments 11 in the first continuous-filament aggregate 10A. There are instances where
10 some of the continuous filaments 11 deviate from the height-of-crimp range due to an error (deviation) in crimping upon manufacturing the continuous filaments. The expression "height of crimp of the continuous filaments 11" used herein includes such instances where some of the continuous filaments 11 deviate from the height of crimp of the continuous filaments 11 falling within the prescribed range.

15 [0029]

The continuous filament 11 is crimped into a zigzag shape. For continuous filaments 11 crimped to have a height of crimp of 0.1 to 5.0 mm, the number of crimps per inch [the number of crimps (half of the total number of peaks and troughs) per inch] is preferably 3 to 80, and more preferably 5 to 50. The number of crimps per inch is found
20 by measuring the number of crimps according to JIS L1015 8.12.1 and then converting the number found to a per-inch value. For example, in the example illustrated in Fig. 5, there are a total of 18 peaks and troughs within the one-inch range indicated by the arrow, and therefore the number of crimps per inch is 9.

[0030]

25 The height of crimp of a zigzag-shaped continuous filament is more preferably 0.1 to 3.5 mm, and even more preferably 0.1 to 2.0 mm.

Setting the height of crimp within the above-mentioned range allows the continuous filaments 11 which constitute the continuous-filament aggregate 10 to assume a suitably opened state. This makes the shape of the spaces among the continuous filaments 11
30 suitable for trapping dirt so that soil can easily be trapped in the spaces among the continuous filaments 11, and also fluffs the continuous filaments 11 to provide a three-dimensional appearance thereto. Such a structure allows efficient cleaning not only

of objects-to-be-cleaned that are flat, but also objects-to-be-cleaned having narrow spaces or uneven contours. Further, it is possible to reduce the occurrence of aggregation caused by tangling of the filaments, which tends to occur after cleaning for a while, and to therefore use the cleaning sheet until the continuous-filament aggregate 10 becomes sufficiently soiled, without causing deterioration in trapping capabilities.

An example of an “object-to-be-cleaned having narrow spaces” may be a doorstep and vicinities thereof. An example of an “object-to-be-cleaned having an uneven contour” may be a rail of a sill or a sliding door.

[0031]

On the other hand, a height of crimp larger than 5.0 mm results in insufficient opening of the continuous filaments 11 constituting the continuous-filament aggregate 10, which results in the lack of creation of spaces between the filaments suitable for trapping dust and also in poor conformability to uneven contours. Even if the filaments are opened sufficiently using mechanical power etc., it is not possible to reduce the occurrence of aggregation caused by tangling of the filaments. Thus, the trapping capability will deteriorate while performing cleaning.

Further, a height of crimp smaller than 0.1 mm cannot achieve a bulky continuous-filament aggregate 10. In other words, although the continuous filaments 11 may be opened sufficiently, the continuous-filament aggregate 10 made thereof will not have a three-dimensional appearance nor sufficient comfort of use.

[0032]

It is even preferable that the height of crimp of the continuous filaments 11 is equal to or below 4 mm from the standpoint of allowing the continuous filaments 11 to easily enter into narrow spaces, easily creating inter-filament shapes suitable for trapping dust, and effectively preventing the occurrence of aggregation caused by tangling of the opened continuous filaments 11. On the other hand, it is even preferable that the height of crimp of the continuous filaments 11 is equal to or above 0.1 mm from the standpoint of achieving a bulky continuous-filament aggregate 10 to provide a three-dimensional appearance and sufficient comfort of use.

[0033]

The height of crimp in the cleaning sheet 1 is measured as follows.

Observing the continuous-filament aggregate 10, three or more sections that have the

strongest (highest) crimps and that are not adjacent to one another are located. Then, an assembly of continuous filaments 11 (and not just a single continuous filament 11) having substantially the same curved form is located in each of the sections, and each assembly is cut out so as not to break its form.

5 A cardboard or the like is laid down and fixed in a horizontal state, and the cut-out continuous filaments 11 are fixed at one longitudinal end thereof to the cardboard with a transparent tape in such a manner as not to place any load on the filaments other than their own weights and not to warp the cardboard etc. (see Fig. 6). In cases where the continuous filaments 11 include two-dimensional or three-dimensional crimps, the
10 continuous filaments 11 are fixed so that the difference in the peaks and troughs thereof appears most significantly. The continuous filaments 11 are photographed in a linear-as-possible state without the filaments rising up from the cardboard etc. A scale or the like is taken in the same photograph to allow confirmation of the actual size.

[0034]

15 The photograph is enlarged, preferably four or more times, with a device allowing enlargement such as a copier or a scanner, so that the continuous filaments 11 are clearly visible (see Fig. 7).

Of the enlarged continuous filaments 11, a linear-as-possible section having good crimping regularity is selected, and the vertical direction is determined with reference to an
20 area in which the continuous filaments 11 are less irregular or appear more clearly. Then, the vertices of the adjacent troughs are connected, while paying attention to the inner and outer sides of the assembly of continuous filaments 11.

[0035]

Then, as illustrated in Fig. 7, the substantially-perpendicular distance from each of
25 the five consecutive peaks to the above-mentioned line connecting the adjacent troughs is measured.

Here, the actual dimension is measured and determined for each of the five peaks while paying attention to magnification etc., and the average thereof is taken as the measurement value for this certain section (assembly). The other sections cut out from
30 the same sample are measured in the same way. The three largest measurement values of all of the sections (assemblies) in the sample are averaged, and this average is taken as the height of crimp of that certain sample.

[0036]

In some cases, the height of crimp of the continuous filaments 11 may differ among the various sections of the continuous-filament aggregate 10. In the cleaning sheet of the present invention, the height of crimp of the continuous filaments 11 is obtained by measuring sections that are considered to have the largest degree of crimps within the continuous-filament aggregate 10, and can therefore be regarded as defining the maximum value of the various heights of crimp of the continuous filaments 11.

[0037]

For the continuous filaments 11, it is possible to use, for example, synthetic fibers such as thermoplastic resins, natural fibers such as cotton or hemp, recycled fibers such as rayon, or semi-synthetic fibers such as acetate. These fibers may be used singly, or two or more may be used in combination. Considering the ease of joining with the substrate sheet 20, it is preferable to use, for the continuous filaments 11, a synthetic fiber made of a thermoplastic resin which is a material allowing easy heat-fusion bonding. Examples of thermoplastic resins that may be used include polyolefin-based resins such as polyethylene and polypropylene, polyester-based resins such as polyethylene terephthalate, acrylic resins, and vinyl resins. The synthetic fiber may consist of a single type of resin, or may be a conjugate fiber (such as a sheath/core conjugate fiber or a side-by-side conjugate fiber) including two or more types of resins in combination.

[0038]

Colors other than white (such as orange or light blue) may be used for the continuous filaments 11 in order, for example, to improve the product appearance and visibility of adhesion of soil.

[0039]

The continuous filaments 11 may have a chemical agent applied thereto for providing additional functions to the cleaning sheet 10. For example, in cases where the cleaning sheet 10 is to be used for dry-type cleaning purposes, it is preferable to apply a chemical agent capable of utilizing adsorption of dirt to improve trapping capabilities. Examples of such a chemical agent include various oil-solution components. Examples of oil-solution components that may be used include oil solutions such as mineral oils, synthetic oils, and silicone oil, and mixtures containing the above-mentioned oil-solution component(s) and agents such as surfactants, solvents, antioxidants, and perfumes. The

amount of chemical agent, such as the oil-solution component, to be applied may range from around 0.1 to 50% by weight with respect to the weight of the continuous filaments 11.

[0040]

5 In cases where the cleaning sheet 1 is to be used for wet cleaning purposes, it is preferable to apply a cleaning agent containing a chemical agent capable of dissolving stains and/or caked-on solid crud to improve cleaning capabilities. Usable cleaning agents may include a mixture containing surfactants, solvents, antimicrobial agents, antiseptics, perfumes, water, etc. The amount of cleaning agent to be impregnated may
10 range from around 20 to 500% by weight with respect to the weight of the continuous filaments 11.

[0041]

In addition to being used for dry-type and wet cleaning purposes, the cleaning sheet 1 of the present embodiment can also be used like a dustcloth or floorcloth--i.e., it may be
15 used to spread, wipe off, or be impregnated with, liquids such as water, commercially-available cleaning agents, or wax.

[0042]

From the standpoint of allowing easy joining of the continuous-filament aggregates 10, it is possible to use, for the substrate sheet 20 to which the continuous-filament aggregates 10 are fixed, various nonwoven fabrics made of synthetic resin, films, paper/paperboard made of pulp, paper/paperboard made by blending synthetic resin in pulp, or composite materials of the above. Suitable examples of usable nonwoven fabrics include air-through nonwovens, spun-bonded nonwovens, and air-laid nonwovens. From the standpoint of strength, firmness, and the like, it is preferable that the basis weight of the
25 nonwoven fabric be 3 to 200 g/m², and more preferably 10 to 100 g/m². Also, in cases where films are used, it is preferable that the basis weight thereof be 3 to 500 g/m², and more preferably 10 to 250 g/m², for the above-mentioned reason. In cases where paper/paperboard is used, the basis weight thereof is preferably 10 to 500 g/m², and more preferably 20 to 250 g/m². Examples of synthetic resins usable for the substrate sheet 20
30 include the same resins mentioned above as the synthetic resins constituting the continuous filaments 11.

[0043]

In place of the above-mentioned materials, a netted sheet may be used for the substrate sheet 20 to which the continuous-filament aggregates 10 are fixed. Forming the substrate sheet 20 out of a netted sheet is preferable because of the enhanced engagement
5 between the substrate sheet 20 and sheet retainers 34 of the cleaning tool 30.

[0044]

The length of the substrate sheet 20 in the longitudinal direction (the length in the direction D2 orthogonal to the orientation direction of the continuous filaments 11) is substantially the same as the length of the continuous-filament aggregate 10. The length
10 of the substrate sheet 20 in the short-side direction (the length in the orientation direction D1 of the continuous filaments 11) is longer than the total width of the three continuous-filament aggregates 10A, 10B. The regions of the substrate sheet 20 located laterally outward of the continuous-filament aggregates 10 (which are referred to hereinafter as “flaps 21”) are used to attach the cleaning sheet to the head 31 of the
15 cleaning tool 30 (described in detail further below). In the present embodiment, the “cleaning direction D1” mentioned above is the direction connecting the two flaps 21.

[0045]

The joining line 12 extends continuously in a direction orthogonal to the orientation direction of the continuous filaments 11, and only a single joining line 12 is provided for
20 each continuous-filament aggregate 10. The joining line 12 of the present embodiment is linear, but the joining line 12 may be, for example, a curved line, a zigzag line, or a wavy line. There are 10 to 30 discontinuous sealing sections 14 per row of continuous-filament aggregate 10. The discontinuous sealing section 14 may be, for example, circular, elliptical, rectangular, triangular, other polygonal shapes, or a shape made of a broken line.
25 The discontinuous sealing section 14 of the present embodiment is circular. The area of the discontinuous sealing section 14 is preferably 10 to 300 mm², and more preferably 30 to 150 mm².

[0046]

The distance W1 (see Fig. 3) between discontinuous sealing sections 14 adjacent to one another in the longitudinal direction of the continuous-filament aggregate 10 is preferably 3 to 50 mm, and more preferably 10 to 30 mm. The distance (in the lateral direction) W2 (see Fig. 3) between the joining line 12 and the discontinuous sealing section
30

14 is preferably 5 to 70 mm, and more preferably 10 to 30 mm.

The discontinuous sealing sections 14 are provided at positions set back in the laterally-inward direction from the tip ends of the continuous filaments 11 in the continuous-filament aggregate 10. Accordingly, the tip ends and vicinities thereof of the continuous filaments 11 in the continuous-filament aggregate 10 are not joined by the discontinuous sealing sections 14. The distance (in the lateral direction) W3 (see Fig. 3) between the tip end of the continuous filament 11 in the continuous-filament aggregate 10 and the discontinuous sealing section 14 is preferably 5 to 70 mm, and more preferably 10 to 30 mm.

The above-described distances W1 to W3 are determined by measuring the center-to-center distance between the portions concerned.

Note that depending on the length of the continuous filaments 11, the height of crimp, the number of filaments, the shape of the joining line 12, and so forth, the continuous filaments 11 can be kept in an aggregated state just by the linear seal of the joining line 12, without providing the discontinuous sealing sections 14.

[0047]

The joining line 12 and the discontinuous sealing sections 14 are formed of known joining means such as heat-sealing or adhesion with a hot-melt adhesive. The joining line 12 and the discontinuous sealing sections 14 may be formed by different joining means.

The joining line 12, as well as the discontinuous sealing sections 14, may be formed by combining a plurality of joining means. For example, the joining line 12 and the discontinuous sealing sections 14 may be formed of a two-layered structure having a heat-sealing line (upper layer) and a hot-melt adhesive (lower layer).

[0048]

The following describes in detail a method for forming a joining line 12 and discontinuous sealing sections 14 having a two-layered structure. First, in order to prevent the continuous filaments 11 from falling apart, a single heat-sealing line is applied, extending along the longitudinal direction of the continuous-filament aggregate 10 (the direction orthogonal to the orientation direction of the continuous filaments 11), to the laterally central portion of the continuous-filament aggregate 10, and also, a plurality of discontinuous heat-seals are applied in a straight row in the longitudinal direction on both laterally-outward sides of the heat-sealing line. The heat-sealing line extending along the longitudinal direction of the continuous-filament aggregate 10 and the discontinuous

heat-seals arranged in straight rows result in the continuous filaments 11 being kept in an aggregated state, even when the continuous-filament aggregate 10 is not joined to the substrate sheet 20.

[0049]

5 Then, three continuous-filament aggregates 10B, 10A, 10B are provided side-by-side on one side of the substrate sheet 20, substantially without leaving a space therebetween, and are joined to the substrate sheet 20 with a hot-melt adhesive. The hot-melt adhesive is applied on positions matching the heat-seals and vicinities thereof, as viewed from above. The above joining process achieves a joining line 12 and discontinuous sealing sections 14 having a two-layered structure consisting of a heat-sealing line and discontinuous heat-seals (upper layer) and a hot-melt adhesive (lower layer). Joining of the lower-layer portion may be achieved by using heat-sealing, ultrasonic sealing, etc., other than using a hot-melt adhesive. Further, these joining methods may be used in combination.

15 [0050]

As illustrated in Fig. 8, the cleaning sheet 1 of the present embodiment is used on a cleaning tool 30 that has a head 31 and a handle 32 connected to the head 31, with the substrate sheet 20 being utilized to attach the cleaning sheet 1 to the head 31. In the present invention, the assembly including a cleaning sheet 1 attached to a cleaning tool 30 is referred to as a "cleaning article". In the cleaning article, the direction in which the two flaps 21 of the substrate sheet 20 of the cleaning sheet 1 are connected--i.e., the orientation direction of the continuous filaments 11--is the cleaning direction. The cleaning direction coincides with the short-side direction of the head 31 of the cleaning tool 30.

25 The cleaning tool 30 illustrated in Fig. 8 includes a head 31 to which the cleaning sheet 1 of the present embodiment can be attached, and a rod-like handle 32 connected to the head 31 via a universal joint 33. The attachment surface (bottom surface) of the head 31 is rectangular as viewed from above. Normally, the cleaning tool 30 is used to perform cleaning by moving (particularly back and forth) the head 31 particularly along the short-side direction. In other words, the cleaning direction D1 of the cleaning tool 30 is along the short-side direction of the head 31, and thus the short-side direction of the cleaning sheet 1.

30 [0051]

The cleaning sheet 1 is attached to the head 31 so that the side of the substrate sheet 20 without the continuous-filament aggregates 10 faces the attachment surface (bottom surface) of the head 31. Then, the flaps 21 of the substrate sheet 20 are folded back toward the upper surface of the head 31. The flaps 21 are then pressed into a plurality of flexible sheet retainers 34 provided in the head 31, each having slits in a radial pattern. By utilizing the substrate sheet 20 in this way, the cleaning sheet 1 can be fixed to the head 31 of the cleaning tool 30. Accordingly, the continuous filaments 11 in the continuous-filament aggregate 10 are oriented in the direction D1 which is along the short-side direction of the cleaning tool 30.

10 [0052]

Further, the central continuous-filament aggregate 10A is different in thickness from the outermost continuous-filament aggregates 10B. Therefore, in a state where the cleaning sheet 1 is attached to the head 31 by utilizing the substrate sheet 20, the outermost second continuous-filament aggregates 10B are depressed in the thickness direction with respect to the central first continuous-filament aggregate 10A, thus creating a difference in height. Accordingly, a space is created between the surface-being-cleaned and each of the second continuous-filament aggregates 10B during cleaning. This space serves to temporarily hold dirt therein, thus improving the trapping capabilities.

[0053]

20 Further, the width of the head 31 is shorter than the total width of the continuous-filament aggregates 10 on the cleaning sheet 1. Therefore, as regards the two second continuous-filament aggregates 10B located at both the outermost positions (at the opposite ends), in the cleaning direction D1, of the substrate sheet 20, when the cleaning sheet 1 is attached to the head 31 of the cleaning tool 30 by utilizing the substrate sheet 20, the outer end sections of the continuous-filament aggregates 10 in the cleaning direction D1 (i.e., the tip ends of the continuous filaments 11) project outside the head 31, as illustrated in Fig. 8.

Note that the attachment surface of the head 31 may be flat or may be curved projecting downward. Further, the way in which the substrate sheet 20 is fixed to the head 31 is not limited to the above configuration using the flaps 21 and the sheet retainers 34.

[0054]

When attached to the head 31 of a cleaning tool 30, the cleaning sheet 1 of the present embodiment having the above-described structure is used for cleaning, such as sweeping (mopping) wooden-floored rooms, in the same way as ordinary mopping tools.

5 In a state where the cleaning sheet 1 is attached to the head 31 of the above-mentioned cleaning tool 30 by utilizing the substrate sheet 20, the continuous filaments 11 in the continuous-filament aggregates 10 of the cleaning sheet 1 are oriented in a direction orthogonal to the longitudinal direction of the head 31. In this attached state, a plurality of continuous-filament aggregates 10 are arranged extending along the longitudinal direction of the head 31. Further, at least one continuous-filament aggregate 10 formed by aggregating a multitude of continuous filaments 11 crimped to have a height of crimp of 0.1 to 5.0 mm is provided per side of the substrate sheet 20. As a result, the cleaning sheet 1 of the present embodiment allows the continuous filaments therein to exhibit high conformability to uneven sections and also achieves good trapping capabilities.

15 [0055]

Further, of the three continuous-filament aggregates in the cleaning sheet 1 of the present embodiment, the outer second continuous-filament aggregates 10B are crimped to have a height of crimp that is lower than that of the central first continuous-filament aggregate 10A. Accordingly, the thickness of each second continuous-filament aggregate 10B is smaller than that of the first continuous-filament aggregate 10A--i.e., the thickness of the first continuous-filament aggregate 10A is larger than that of the second continuous-filament aggregate 10B. Therefore, the cleaning surface of the cleaning sheet 1 of the first embodiment bulges out at the center with respect to the cleaning direction. Accordingly, the cleaning sheet 1 of the first embodiment having such a shape allows soil to adhere to the entire cleaning surface of the continuous-filament aggregates 10. This results in a high effective-soil-trapping-area ratio (the ratio, with respect to the entire cleaning surface, of an area of a section to which soil actually adheres and which thus contributes to trapping of dirt), thus increasing the amount of dirt trapped. Further, the present cleaning sheet also has a good visually-confirmable trapping capability (that is, a user considers that the trapping effects are high in cases where soil adheres to the entire cleaning surface).

[0056]

Further, in a state where the cleaning sheet 1 is attached to the head 31 by utilizing

the substrate sheet 20, the outer end sections, in the cleaning direction D1, of the second continuous-filament aggregates 10B which are provided at both the outermost positions (at the opposite ends) of the substrate sheet 20 in the cleaning direction D1 (i.e., the tip ends of the continuous filaments 11) project outside the head 31. Thus, the continuous filaments 11 projecting outside the head 31 conform, with their tip ends, to the corners and inner walls (side surfaces) of a room. Further, rotational wiping achieved by the universal joint 33 of the cleaning tool 30 allows the continuous filaments 11 to conform to doorstops and vicinities thereof and trap dirt.

[0057]

Next, another embodiment of the cleaning sheet according to the present invention is described. The following describes features of the other embodiment that are different from the first embodiment, and features in common are omitted from explanation. The explanation given in the first embodiment applies as appropriate to features that are not particularly explained below. The other embodiment also achieves the same effects as those of the first embodiment.

[0058]

As illustrated in Fig. 9, the cleaning sheet 1 of the second embodiment differs from the first embodiment in the following aspects: four continuous-filament aggregates 10 are arranged, per side of the substrate sheet 20, in the cleaning direction D1 which is along the short-side direction of the substrate sheet 20; of the four continuous-filament aggregates 10, two central first continuous-filament aggregates 10A are each formed by aggregating a multitude of continuous filaments 11 crimped to have a height of crimp of 0.2 to 5.0 mm; and each outermost continuous-filament aggregate 10B provided respectively at the opposing outermost positions of the substrate sheet 20 in the short-side direction thereof (i.e., a total of two second continuous-filament aggregates 10B) is formed by aggregating a multitude of continuous filaments 11 crimped to have a height of crimp that is lower than that of the first continuous-filament aggregates 10A.

That is, the main difference is that there are two first continuous-filament aggregates 10A per side of the substrate sheet 20, and there are a total of four continuous-filament aggregates 10 assembled on the sheet.

[0059]

Further, different from the first embodiment, the second continuous-filament

aggregates 10B of the second embodiment are provided with discontinuous sealing sections 14. Other than the above, the second embodiment has the same structure as the first embodiment.

5 The cleaning sheet 1 of the second embodiment achieves the same effects as those of the first embodiment.

[0060]

The cleaning sheet of the present invention is not limited to the foregoing embodiments and can be modified as appropriate without departing from the gist of the invention.

10 For example, the plurality of continuous-filament aggregates 10 may be configured so that the heights of crimp of the continuous filaments 11 are the same and the thicknesses thereof are also the same.

15 In a state where the cleaning sheet 1 is attached to the head 31 by utilizing the substrate sheet 20, the outermost second continuous-filament aggregates 10B do not have to be depressed in the thickness direction with respect to the central first continuous-filament aggregate(s) 10A.

[0061]

20 The plurality of continuous-filament aggregates 10 may be arranged spaced apart from one another in the direction along the short-side direction of the substrate sheet 20. Only one or two continuous-filament aggregates 10 may be provided per side of the substrate sheet 20, or instead, five or more may be provided. The continuous-filament aggregate(s) 10 may be provided on both sides of the substrate sheet 20.

25 Only one of the outermost continuous-filament aggregates 10B may be formed of continuous filaments 11 crimped to have a height of crimp that is lower than that of the central continuous-filament aggregate 10A.

The various configurations of the above-described cleaning sheet 1 may be combined as appropriate.

Examples

[0062]

30 The present invention is described in further detail below according to Examples thereof. The scope of the invention, however, is not to be limited by these Examples.

[0063]

Example 1

A cleaning sheet of the first embodiment as illustrated in Figs. 1 to 3 was produced. An air-through nonwoven fabric having a basis weight of 40 g/m^2 was used for the substrate sheet 20. The constituent fiber used was a sheath/core-type heat fusible conjugate fiber ($2.2 \text{ dtex} \times 38 \text{ mm}$) employing polyethylene terephthalate as the core and polyethylene as the sheath. The substrate sheet 20 was 285 mm long in the direction D2 orthogonal to the cleaning direction and 205 mm long (wide) in the cleaning direction D1. Each continuous-filament aggregate 10 (the first continuous-filament aggregate 10A and each second continuous-filament aggregate 10B) was 285 mm long in the direction D2 orthogonal to the cleaning direction and 45 mm long (wide) in the cleaning direction D1. A sheath/core-type heat fusible conjugate fiber having a thickness of 2.2 dtex and employing polyethylene terephthalate as the core and polyethylene as the sheath was used for the continuous filaments 11 constituting the continuous-filament aggregates 10.

[0064]

The joining line 12 of each continuous-filament aggregate 10 was formed by first forming a straight heat-sealing line 1.5 mm wide extending across the entire longitudinal region of the aggregate 10 at the center with respect to the short-side direction, and then joining the aggregate 10 to the substrate sheet 20 with a hot-melt adhesive. The discontinuous sealing sections 14 each consisted of a dot-like seal 5 mm in diameter created using a hot-melt adhesive. The longitudinal distance W1 between adjacent discontinuous sealing sections 14 was 20 mm, and fourteen sections (dots) were formed per row. The distance W2 between the joining line 12 and each discontinuous sealing section 14 was 20 mm.

[0065]

As for the first continuous-filament aggregate 10A, the thickness was 3.5 mm, the height of crimp of the continuous filaments 11 was 1.0 mm, and the number of crimps per inch of continuous filament 11 was sixteen. The mass of the continuous filaments 11 in the first continuous-filament aggregate 10A was 1.5 g. As for the second continuous-filament aggregate 10B, the thickness was 1.5 mm, the height of crimp of the continuous filaments 11 was 0.3 mm, and the number of crimps per inch of continuous filament 11 was twenty. The mass of the continuous filaments 11 in the second continuous-filament aggregate 10B was 1.5 g. As viewed from above, the single first

continuous-filament aggregate 10A and the two second continuous-filament aggregates 10B were provided to have line symmetry with respect to the lateral direction of the substrate sheet 20.

[0066]

5 Example 2

As for the first continuous-filament aggregate 10A, the thickness was 4 mm and the height of crimp of the continuous filaments 11 was 1.5 mm. The other features were the same as those in Example 1.

[0067]

10 Example 3

A cleaning sheet of the second embodiment as illustrated in Fig. 9 was produced. Features that are not particularly explained below were the same as those in Example 1.

15 The first continuous-filament aggregate 10A was 285 mm long, 40 mm wide, and 3.3 mm thick. In the first continuous-filament aggregate 10A, the height of crimp of the continuous filaments 11 was 1.0 mm and the number of crimps per inch of continuous filament 11 was sixteen. The mass of the continuous filaments 11 in the first continuous-filament aggregate 10A was 1.2 g. Two first continuous-filament aggregates 10A were arranged in the center.

20 In the first continuous-filament aggregate 10A, the joining line 12 was provided extending across the entire longitudinal region of the first continuous-filament aggregate 10A at the center thereof in the lateral direction, and the discontinuous sealing sections 14 were provided on both laterally-outward sides of the joining line 12.

[0068]

25 The second continuous-filament aggregate 10B was 285 mm long, 30 mm wide, and 1.3 mm thick. In the second continuous-filament aggregate 10B, the height of crimp of the continuous filaments 11 was 0.3 mm and the number of crimps per inch of continuous filament 11 was twenty. The mass of the continuous filaments 11 in the second continuous-filament aggregate 10B was 1 g.

30 In the second continuous-filament aggregate 10B, the joining line 12 was provided extending across the entire longitudinal region of the second continuous-filament aggregate 10B at a position 10 mm away from the inner edge thereof, but no discontinuous sealing section 14 was provided.

The two first continuous-filament aggregates 10A and the two second continuous-filament aggregates 10B are provided extending in a direction along the longitudinal direction of the substrate sheet 20 as viewed from above.

[0069]

5 Comparative Example 1

A cleaning sheet 1 structured as illustrated in Fig. 10 was produced. Features that are not particularly explained below were the same as those in Example 1.

10 The cleaning sheet 1 of Comparative Example 1 is structured such that the continuous filaments 11 are oriented in the direction D2 of Example 1 which is along the longitudinal direction of the substrate sheet 20 and four continuous-filament aggregates 10 are joined side-by-side extending in a direction along the short-side direction of the substrate sheet 20. Each continuous-filament aggregate 10 was 135 mm long and 70 mm wide.

15 The joining line 12 was provided as a straight line 1.5 mm wide, extending across the entire longitudinal region of the continuous-filament aggregate 10 at the center with respect to the lateral direction. The discontinuous sealing sections 14 each consisted of a dot-like seal 5 mm in diameter, and the distance W1 therebetween in the longitudinal direction of the continuous-filament aggregate 10 was 20 mm, and five sections (dots) were formed per row. The distance W2 between the joining line 12 and each
20 discontinuous sealing section 14 was 20 mm.

[0070]

25 In the continuous-filament aggregate 10, the thickness was 1.1 mm, the height of crimp of the continuous filaments 11 was 0.3 mm, and the number of crimps per inch of continuous filament 11 was twenty. The mass of the continuous filaments 11 in the continuous-filament aggregate 10 was 1.8 g. Four continuous-filament aggregates 10 were provided extending in a direction along the short-side direction D1 of the substrate sheet 20 as viewed from above.

[0071]

30 Comparative Example 2

The continuous-filament aggregate 10 was 2.4 mm thick. The other features were the same as those in Comparative Example 1.

[0072]

Trapping Rate and Effective-soil-trapping-area Ratio

The respective cleaning sheets of the above Examples and Comparative Examples were used by being attached to the head of a cleaning tool (“Quickle” (registered trademark) Wiper from Kao Corporation). 1.0 g of a model lint/dust (made by cutting 100% acrylic black yarn into 3-mm pieces) was measured, and the model lint/dust was scattered using a 300- μ m-mesh screen onto an uneven wooden-floor surface of a twelve-tatami-mat-sized wooden-floored room (having a size equal to twelve tatami mats, each mat being approximately 182 cm long and 91 cm wide). The cleaning article was used to clean the wooden-floored room. The trapping capabilities were evaluated after cleaning according to the following evaluation methods.

Trapping Rate

The mass ratio of the amount of lint/dust trapped with respect to the amount scattered is defined as the “trapping rate”.

A: The trapping rate is equal to or above 70%.

C: The trapping rate is equal to or above 50% and below 70%.

F: The trapping rate is below 50%.

[0073]

Effective-soil-trapping-area Ratio

The ratio of an area that actually contributes to trapping of the lint/dust (i.e., an area to which soil has adhered) with respect to the total area of the entire cleaning surface of the continuous-filament aggregate is determined through visual inspection, and this ratio is defined as the “effective-soil-trapping-area ratio”.

A: The effective-soil-trapping-area ratio is equal to or above 80%.

C: The effective-soil-trapping-area ratio is equal to or above 60% and below 80%.

F: The effective-soil-trapping-area ratio is below 60%.

[0074]

The evaluation results on “Trapping Rate” and “Effective-soil-trapping-area Ratio” for the Examples and Comparative Examples are shown in Table 1 below.

[0075]

Table 1

	Trapping Rate	Effective-soil-trapping-area Ratio
Example 1	A	A
Example 2	A	A
Example 3	A	A
Comparative Example 1	C	C
Comparative Example 2	C	C

[0076]

5 Conformability to Uneven Sections

Next, the respective cleaning sheets obtained in the above Examples and Comparative Examples were attached to the head of a “Quickle” (registered trademark) Wiper from Kao Corporation, and the conformability to various uneven surfaces-to-be-cleaned and the dirt trapping capabilities of the cleaning sheets were evaluated according to the following method. The results are shown in Table 2. The following surfaces-to-be-cleaned were used for the evaluation:

Wooden floor (“KER7UE” made by Panasonic Corporation, with V-shaped grooves 1 mm deep and 2 mm wide)

Tatami mat (the rush portion)

15 Inner wall (the indoor baseboard portion; “QPL113T39” made by Panasonic Corporation)

Sill (with a groove 4 mm deep and 21 mm wide)

Sliding door (barrier-free design, with a groove 2 mm deep and 5.3 mm wide)

Doorstop (“MJT107” of the hook-on type made by Panasonic Corporation)

20 0.02 g of model dust (cotton linters made by Iwamoto Mineral Co. Ltd., with a diameter of under 10 μm and a length of under 0.5 mm) was measured and scattered using a 300- μm -mesh screen onto the various uneven surfaces-to-be-cleaned. The cleaning sheet was attached to the head of the wiper and was moved back-and-forth twice to perform wiping so that the cleaning surface of the sheet conforms to the surface-to-be-cleaned. After wiping, determination was made by visually inspecting the model dust remaining in the uneven sections, and vicinities thereof, of the surfaces-to-be-cleaned.

The evaluation criteria are as follows.

Conformability:

A: No dust remains in the uneven sections.

B: About one-fourth or less of the scattered amount of dust remains in the uneven sections.

5 C: About half or less of the scattered amount of dust remains in the uneven sections.

F: Half or more of the scattered amount of dust remains in the uneven sections.

[0077]

Table 2

	Wooden Floor	Tatami Mat	Inner Wall	Sill	Sliding Door	Doorstop
Example 1	A	A	A	A	A	A
Example 2	A	A	A	A	A	A
Example 3	A	A	A	A	A	A
Comparative Example 1	A	A	A	B	B	B
Comparative Example 2	A	A	A	B	B	B

10 [0078]

The evaluation results of the Examples and the Comparative Examples indicate the following, for example.

According to Examples 1 to 3, the first continuous-filament aggregate/s 10A located in the center in the cleaning direction is/are thicker than the second continuous-filament aggregates 10B located toward the outside in the cleaning direction. Such a structure allows soil to enter inside the continuous-filament aggregates 10 and to adhere to the entire cleaning surface of the continuous-filament aggregates 10 (in other words, the effective-soil-trapping-area ratio is large). Further, the space created between the second continuous-filament aggregates 10B and the surface-being-cleaned (the floor surface) also works to increase the trapping rate. Furthermore, according to Examples 1 to 3, the tip ends of the continuous filaments 11 in the continuous-filament aggregates 10 (the tips thereof) conform easily to the uneven sections, thus resulting in high soil trapping capabilities.

[0079]

In Comparative Examples 1 and 2, the orientation direction of the continuous filaments 11 in the continuous-filament aggregates 10 is orthogonal to the cleaning direction. Therefore, it takes a larger number of times of wiping (or a longer time) for the stem of the continuous filament 11 (the main portion thereof between the tip end and the basal portion) to conform to the uneven section and trap dirt. Further, in the Comparative Examples 1 and 2, the thickness of the cleaning surface of the continuous-filament aggregates 10 is the same across the entire surface. Therefore, it is difficult for soil to enter inside the continuous-filament aggregates 10, resulting in a low trapping rate. The soil trapping capability is also poor especially in largely-uneven sections, such as grooves in sills, rails of sliding doors, and uneven contours of doorstops.

Industrial Applicability

[0080]

As described in detail above, according to the cleaning sheet of the present invention in which a continuous-filament aggregate formed by aggregating and orienting a multitude of continuous filaments in one direction is joined to a substrate sheet and which is used by being attached, by utilizing the substrate sheet, to a head of a cleaning tool which further includes a handle connected to the head, the continuous filaments exhibit high conformability to uneven sections and the cleaning sheet has a high effective-soil-trapping-area ratio (a ratio, with respect to the entire cleaning surface, of an area of a section to which soil actually adheres and which thus contributes to trapping of dirt) and also exhibits good trapping capabilities.

CLAIMS

1. A cleaning sheet comprising a continuous-filament aggregate and a substrate sheet, on one side or both sides of the substrate sheet, one or a plurality of the continuous-filament aggregates being joined to the substrate sheet per side, each of the continuous-filament aggregates being formed by aggregating and orienting a plurality of continuous filaments in one direction, the cleaning sheet being used with a cleaning tool that has a head and a handle connected to the head, the substrate sheet being utilized to attach the cleaning sheet to the head of the cleaning tool, wherein:

the continuous filaments in the continuous-filament aggregate are oriented in a cleaning direction of the cleaning tool; and

at least one continuous-filament aggregate formed by aggregating a plurality of continuous filaments crimped to have a height of crimp of 0.1 to 5.0 mm is provided per side of the substrate sheet.

2. The cleaning sheet according to claim 1, wherein:

a plurality of the continuous-filament aggregates are arranged in the cleaning direction per side of the substrate sheet;

of the plurality of the continuous-filament aggregates, a central continuous-filament aggregate is formed by aggregating a plurality of continuous filaments crimped to have a height of crimp of 0.2 to 5.0 mm; and

of the plurality of the continuous-filament aggregates, at least one outermost continuous-filament aggregate is formed by aggregating a plurality of continuous filaments crimped to have a height of crimp that is lower than the height of crimp of the central continuous-filament aggregate.

3. The cleaning sheet according to claim 2, wherein both of the outermost continuous-filament aggregates are formed by aggregating the continuous filaments crimped to have the height of crimp that is lower than the height of crimp of the central continuous-filament aggregate.

4. The cleaning sheet according to any one of claims 1 to 3, wherein:

a plurality of the continuous-filament aggregates are arranged in the cleaning direction per side of the substrate sheet; and

of the plurality of the continuous-filament aggregates, at least one outermost continuous-filament aggregate is depressed in a thickness direction thereof with respect to a central continuous-filament aggregate in a state where the cleaning sheet is attached to the head by utilizing the substrate sheet.

5 5. The cleaning sheet according to any one of claims 1 to 4, wherein a number of crimps of the continuous filaments crimped to have the height of crimp of 0.1 to 5.0 mm is 3 to 80 per inch.

10 6. The cleaning sheet according to any one of claims 1 to 5, wherein, in a state where the cleaning sheet is attached to the head by utilizing the substrate sheet, outer end sections, in the cleaning direction, of both of outermost continuous-filament aggregates which are provided at the outermost positions of the substrate sheet in the cleaning direction are located outside the head.

7. The cleaning sheet according to any one of claims 1 to 6, wherein the substrate sheet is made of a netted sheet.

15 8. The cleaning sheet according to any one of claims 1 to 7, wherein a chemical agent is applied to the continuous filaments.

9. A cleaning article comprising:

a cleaning tool that has a rectangular head having long sides and short sides, and a handle connected to the head; and

20 the cleaning sheet according to any one of claims 1 to 8 attached to the head;

wherein the cleaning sheet is attached to the head in such a manner that a direction in which the continuous filaments are oriented in the continuous-filament aggregate matches a direction of the short sides of the head of the cleaning tool.