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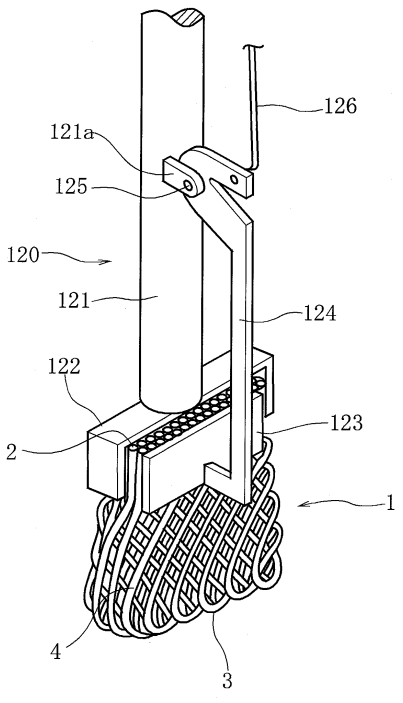
(54) **WATER SOLUBLE CLEANING TOOL**

(57) A water-disintegratable cleaning article (1, 22, 31, 41, 51, 61, 71, 81, 91, 101, 111) dispersible in water includes a compressed-fiber structure (11, 21, 4, 40, 70, 86, 90) in which a water-dispersible fiber is compressed.

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a water-disintegratable cleaning article which is used to remove the dirt in a place where water is used, such as in a flush toilet and which can be discarded into water after the use thereof.

BACKGROUND ART

[0002] Japanese Patent Application Laid-Open No. Showa 62(1987)-186833 (JP62-186833) discloses a disposable toilet cleaning brush used for cleaning the flush toilet.

[0003] The toilet cleaning brush is produced using a paper comprising: staple fibers of a ligneous pulp and a binder such as carboxyl methyl cellulose (CMC), by a method in which plural cuts are formed in the paper and the paper is wound to form a brush. The toilet cleaning brush is fixed to a head of a paper-made handhold of the brush. After a bedpan is wiped with the toilet cleaning brush, the cleaning brush and the handhold are discarded into a flush toilet and are disintegrated in water. It is also described that for controlling the time needed for the dissolution of the paper in water, the surface of the brush is subjected to a wax treatment.

DISCLOSURE OF THE INVENTION

[0004] The JP62-186833 describes that since the time needed for cleaning a bedpan is such a short time as between 10 seconds and 20 seconds, before the paper constituting the toilet cleaning brush is dissolved in water, the cleaning can be accomplished.

[0005] However, the toilet cleaning brush produced with the paper itself which is produced by fixing a ligneous pulp through a water-soluble carboxyl methyl cellulose (CMC) is swollen at the contact thereof with water during the cleaning of a bedpan and the strength thereof is extremely lowered, so that it becomes difficult to wipe off the dirt adhered to a bedpan by such a brush. With respect to the brush which has been subjected to a wax treatment, since a wax component may suppress the disintegration of the paper, it takes a long time until the brush has been disintegrated, for example, in a purification tank.

[0006] Further, since the toilet cleaning brush produced by winding the paper in which plural cuts are formed has a low stiffness, it is difficult to scrub a bedpan or the like by such a brush, and therefore the dirt adhered to a bedpan or the like cannot be effectively removed.

[0007] The present invention solves the above-noted problem accompanying the conventional art. It is therefore an object of the present invention to provide a water-disintegratable cleaning article which can effectively wipe off the dirt adhered to a bedpan of a flush toilet.

[0008] It is another object of the present invention to provide a water-disintegratable cleaning article which not only has high strength when the cleaning article scrubs a bedpan or the like, and can exhibit the effect of removing the dirt, but also can be dispersed in water within a relatively short time after the use thereof.

[0009] According to a first aspect of the present invention, there is provided a water-disintegratable cleaning article dispersible in water, comprising: a compressed-fiber structure in which a water-dispersible fiber is compressed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

[FIG 1] FIG 1 is a perspective view showing the water-disintegratable cleaning article which is held by the holder, under the present invention.

[FIG. 2] FIG 2A and FIG. 2B are perspective views showing a production method of a compressed-fiber structure constituting the water-disintegratable cleaning article, according to a first embodiment of the present invention.

[FIG. 3] FIG 3 is a perspective view showing the compressed-fiber structure constituting the water-disintegratable cleaning article, according to the first embodiment of the present invention.

[FIG. 4] FIG 4 is a perspective view showing the water-disintegratable cleaning article produced by cutting the compressed-fiber structure, according to the first embodiment of the present invention.

[FIG 5] FIG 5A is a perspective view showing a compressed-fiber structure constituting a water-disintegratable cleaning article, according to a second embodiment of the present invention, and FIG 5B is a perspective view showing the water-disintegratable cleaning article produced by cutting the compressed-fiber structure, according to the second embodiment of the present invention.

[FIG 6] FIG. 6 is a perspective view showing a water-disintegratable cleaning article, according to a third embodiment of the present invention.

[FIG 7] FIG 7 is a perspective view showing a water-disintegratable cleaning article, according to a fourth embodiment of the present invention.

[FIG. 8] FIG 8 is a perspective view showing a water-disintegratable cleaning article, according to a fifth embodiment of the present invention.

[FIG 9] FIG 9 is a perspective view showing a water-disintegratable cleaning article, according to a sixth embodiment of the present invention.

[FIG. 10] FIG. 10 is a perspective view showing a water-disintegratable cleaning article, according to a seventh embodiment of the present invention.

[FIG. 11] FIG 11A is a perspective view showing a water-disintegratable cleaning article, according to an eighth embodiment of the present invention, and

FIG 11B is a perspective view showing the water-disintegratable cleaning article in a developed form.
[FIG. 12] FIG 12 is a perspective view showing a water-disintegratable cleaning article, according to a ninth embodiment of the present invention.
[FIG 13] FIG 13 is a perspective view showing a water-disintegratable cleaning article, according to a tenth embodiment of the present invention.
[FIG 14] FIG 14 is a perspective view showing the water-disintegratable cleaning article, according to an eleventh embodiment of the present invention.
[FIG. 15] FIG 15A, FIG 15B and FIG 15C are explanatory drawings explaining three different forming methods of a string by twining only a water-disintegratable sheet or the water-disintegratable sheet and water-disintegratable paper together.

BEST MODE FOR CARRYING OUT THE INVENTION

[0011] FIG 1 is a perspective view showing a water-disintegratable cleaning article 1 which is held by a holder 120, under the present invention. FIG 2 to FIG 4 are perspective views showing sequentially production steps of the water-disintegratable cleaning article 1 which is held by the holder 120 as shown in FIG 1, according to a first embodiment of the present invention. FIG 5 to FIG 14 are perspective views showing the water-disintegratable cleaning articles, according to other embodiments of the present invention. FIG. 15A, FIG 15B and FIG 15C are explanatory drawings explaining, respectively, a twined string 4X, a twined string 4Y and a twined string 4Z.

<First embodiment>

[0012] FIG 4 shows the water-disintegratable cleaning article 1, according to the first embodiment of the present invention. The water-disintegratable cleaning article 1 comprises a holding side terminal 2 and a cleaning side terminal 3.

[0013] In FIG 1, the holder 120 has a structure where a terminal of a handhold part 121 made of a synthetic resin is integrated with a supporting part 122, and a pressing part 123 made of a synthetic resin is provided at the opposite side to the supporting part 122. The supporting part 122 has substantially a flat supporting inside face and the pressing part 123 also has substantially a flat inside face, so that the supporting part 122 and the pressing part 123 face parallel to each other. The pressing part 123 is integrated with a lever 124, and the lever 124 is rotatably supported by a bracket 121 a formed on the handhold part 121 through a pivot 125. An operating wire 126 is rotatably connected to the top of the lever 124.

[0014] A torsion spring (not illustrated) is attached to the pivot 125, and by the torsion spring, the lever 124 is biased in the clockwise direction around the pivot 125 as the fulcrum, so that the pressing part 123 is biased in the direction approaching the supporting part 122. A handle part (not illustrated) is provided in the upper part of the handhold part 121, and an operating lever (not illustrated) is provided in the handle part (not illustrated). The upper terminal of the operating wire 126 which is a thick wire is connected to the operating lever (not illustrated). When the operating lever (not illustrated) is pulled up, the lever 124 is rotated, and consequently, the pressing part 123 is spaced part from the supporting part 122. At this time, when the holding side terminal 2 of the cleaning article 1 is inserted between the supporting part 122 and the pressing part 123 and the operating lever (not illustrated) is released from the hand, by the bias force of the torsion spring (not illustrated), the holding side terminal 2 of the cleaning article 1 is supported between the supporting part 122 and the pressing part 123.

[0015] By scrubbing the part to be cleaned (such as a bedpan or the like) with the cleaning side terminal 3 of the cleaning article 1 while holding the cleaning article 1 with the holder 120, the dirt adhered to the surface of a bedpan or the like can be removed. At this time, it is also possible that the cleaning article 1 is wetted by the water standing in the bedpan and the bedpan is wiped by the wetted cleaning article 1. After the completion of the cleaning, by releasing the pressing force of the pressing part 123 through pulling up the operating lever (not illustrated), the cleaning article 1 can be discarded into the bedpan without touching the cleaning article 1 by the hand.

<Production method>

[0016] The cleaning article 1 shown in FIG 4 comprises a compressed-fiber structure 11 produced by compressing a bundle of plural strings 4 comprising water-dispersible fibers. Hereinbelow, with respect to the production method of the cleaning article 1, explanations are given referring to FIG 2 to FIG 4.

[0017] As shown in FIG 2A, a cylinder-shaped structure 10 is produced by winding one string 4 or a plurality of the strings 4. At this time, as shown in FIG 2B, when a hypothetical circle HC having a radius R and a center line O of the cylinder-shaped structure 10 cross each other at a right angle is assumed, the string is wound plural times along the winding direction α which is formed by inclining the clockwise radius direction of the hypothetical circle HC at an angle $\theta 1$ in the anti-clockwise direction from the radius R. Thereafter continuously, the string is wound plural times along the winding direction β which is formed by inclining the clockwise radius direction of the hypothetical circle HC at an angle $\theta 2$ in the clockwise direction from the radius R. By repeating alternately a plurality of the windings in the direction α and a plurality of the windings in the direction β, the cylinder-shaped structure 10 shown in FIG 2A can be obtained. The strings constituting the cylinder-shaped structure 10 are wound in such a manner that they cross each other.

[0018] By compressing the cylinder-shaped structure 10 shown in FIG. 2A through giving a collapsing force F to the cylinder-shaped structure 10 in the diameter direc-

tion using a pressing machine (not illustrated), the compressed-fiber structure 11 can be obtained. The pressure of the collapsing force F is in the range of from 2,000 kPa to 6,000 kPa, for example, 3,920 kPa (40 kgf/cm^2). The compressing time is in the range of from 1 sec to 5 sec. The compressing is performed in a normal temperature or may be performed during the heating. The compressed-fiber structure 11 after the compression can maintain the compressed state by means of the mechanical aggregation force and hydrogen bond force of the fibers constituting the string 4. For bonding the fibers to each other through the hydrogen bond force, it is preferred that natural fibers or regenerated cellulose fibers which have a hydroxyl group on the fiber surface thereof are used as the fibers constituting the string 4. Further, for enhancing the hydrogen bond force, the cylinder-shaped structure 10 may be subjected to the heating and the compressing after the cylinder-shaped structure 10 is wetted by spraying water thereto. It is also possible that the dry strength of the compressed-fiber structure 11 is enhanced by producing the cylinder-shaped structure 10 by adhering the strings to each other using a water-soluble binder, such as polyvinyl alcohol (PVA), polyacrylic acid (PAA), carboxyl methyl cellulose (CMC) and the like.

[0019] Since the compressed-fiber structure 11 shown in FIG 3 is produced by collapsing the cylinder-shaped structure 10 in the diameter direction, at the both terminals of the compressed-fiber structure 11, a loop part 4a of the string 4 is exposed in a collapsed state. Although the compressed-fiber structure 11 shown in FIG 3 can be used, as it is, as the water-disintegratable cleaning article 1, according to the first embodiment, by cutting the compressed-fiber structure 11 along the center line O thereof into halves, two pieces of the cleaning article 1 shown in FIG 4 are produced. In the cleaning article 1 shown in FIG 4, plural cut end faces 4b of the strings 4 are exposed at the holding side terminal 2, and plural loop parts 4a are exposed in a collapsed state at the cleaning side terminal 3.

[0020] By twisting and twining a water-disintegratable sheet 8 in one direction as shown in FIG 15A, the string 4 is so formed as to have a high density. The water-disintegratable sheet 8 comprises fibers having a fiber length of 20 mm or less. When the water-disintegratable sheet 8 contacts a lot of water in a flush toilet or in a purification tank, fibers constituting the water-disintegratable sheet 8 can be separately dispersed in water within a short time. The water-disintegratable sheet 8 either is produced by papermaking only pulp fibers so that the fibers are connected to each other through the hydrogen bond force, or is a water-disintegratable paper produced by papermaking pulp fibers and rayon fibers together so that the fibers are connected to each other through the hydrogen bond force. In addition, the water-disintegratable paper produced by adhering fibers to each other by a water-soluble binder, such as polyvinyl alcohol (PVA), polyacrylic acid (PAA), carboxyl methyl cellulose (CMC) and the like, can be also used as the water-disintegratable sheet 8.

[0021] By twining the water-disintegratable paper, the string 4 becomes able to maintain the form thereof by the hydrogen bond force. Otherwise, by adding the above-noted water-soluble binder to the twined water-disintegratable paper after the twining thereof, the string 4 becomes able to maintain the form thereof.

[0022] The water-disintegratable sheet 8, which is produced by a method in which pulp fibers are subjected to a water-resistant treatment to slightly lower the hydrophilicity of the pulp fibers and these treated pulp fibers are connected to each other by the water-soluble binder, can be also used. The string 4 comprising this water-disintegratable sheet 8 can easily maintain the form of the string, even when the string is wetted by water during the cleaning.

[0023] FIG. 15A, FIG 15B and FIG 15C show more preferred examples of the twined string 4X, the twined string 4Y and the twined string 4Z for forming the string 4 individually, according to the difference in structure. The string 4 used for producing the cleaning article 1 comprises any one of the twined string 4X, the twined string 4Y and the twined string 4Z. In addition, the string 4 used for producing the cleaning article 1 may comprise also a combination of two or more of the twined string 4X, the twined string 4Y and the twined string 4Z.

[0024] The twined string 4X shown in FIG 15A is formed by twisting in one direction the water-disintegratable sheet 8 in a belt which has a predetermined width (e.g., width is 20 mm to 100 mm), followed by the twining.

[0025] For maintaining the wet strength of the twined string 4X, the water-disintegratable sheet 8 comprises a water-disintegratable fiber-interlacing nonwoven fabric. The water-disintegratable fiber-interlacing nonwoven fabric can be produced in such a manner that the fibers having a fiber length of 20 mm or less are laminated, in the form of a mesh, on a conveyor of a porous plate and then the thus laminated fibers are subjected to a water jet treatment to interlace the fibers.

[0026] The fiber-interlacing nonwoven fabric comprises fibers having a fiber length, for example, 20 mm or less which fibers can be interlaced by the water jet treatment, and pulp fibers. When the nonwoven fabric comprises pulp fibers and other fibers having a fiber length of 20 mm or less, by a water-jet treatment, not only the other fibers are interlaced, but also pulp fibers each other and pulp fibers and the other fibers are hydrogen-bonded. This fiber-interlacing nonwoven fabric can maintain not only a high dry strength thereof but also the twined form thereof, by the hydrogen bond force of the pulp fibers. Further, when wetted, the fiber-interlacing nonwoven fabric can maintain a high surface strength thereof through the interlacing force between the other fibers. When the fiber-interlacing nonwoven fabric is discarded into water and contacts a lot of water, due to the separation of pulp fibers from each other, the twine of the string is loosened and the interlacing of the other fibers

is easily loosened, thereby the fibers are separated from each other into individual fibers within a relatively short time.

[0027] As the other fibers which have a fiber length of 20 mm or less and can be interlaced by the water-jet treatment, biodegradable fibers are preferably used. Preferred examples of the biodegradable fibers include regenerated cellulose fibers, such as viscose rayon fibers, solvent spinning rayon fibers, polynosic rayon fibers, copper-ammonia rayon fibers and alginate rayon fibers. Examples of the other fibers which have a fiber length of 20 mm or less and can be interlaced by a water-jet treatment include synthetic resin fibers, such as polyethylene terephthalate (PET) fibers, nylon fibers and polypropylene (PP) fibers.

[0028] Examples of the fibers which may be used either in combination with the pulp fibers or instead of the pulp fibers include natural fibers, such as hemp, cotton, bagasse, banana, pineapple and bamboo.

[0029] Further, fibers of polyvinyl alcohol (PVA) which is a water-soluble resin and water-soluble or water-swellable carboxyl methyl cellulose (CMC) may be added as a binder into the composition of the fiber-interlacing nonwoven fabric, for enhancing the dry strength of the nonwoven fabric or for rendering easier the maintaining of the twined form of the string. In addition, a fiber-interlacing nonwoven fabric produced by the following method can be also used: preparing a fibrillated rayon fiber having a surface where a lot of microfibers having a fiber length of 1 mm or less are peel-formed by beating rayon fibers having a fiber length of from 3 mm to 7 mm, papermaking in a wet system the fibers having a fiber length of 20 mm or less in combination with the thus fibrillated rayon fibers, and then subject the resultant fibers to a water-jet treatment. Since in this nonwoven fabric, not only the fibers having a fiber length of 20 mm or less are interlaced, but also the fibers are fixed through the hydrogen bond force of the fibrillated rayon fibers, the dry strength and the wet strength of this nonwoven fabric can be enhanced and since particularly the dry strength thereof is high, a strongly twisted string form can be easily maintained.

[0030] The fiber-interlacing nonwoven fabric constituting the twined string 4X comprises preferably 10 % by mass or more of natural fibers such as pulp fibers and 10 % by mass or more of the other fibers such as rayon fibers having a fiber length of 20 mm or less and interlaceable by a water-jet treatment. By comprising 10 % by mass or more of natural fibers, the hydrogen bond force in the string formed by strongly twisting and twining can be enhanced, and by comprising 10 % by mass or more of the fibers which can be interlaced, the wet strength of the fiber-interlacing nonwoven fabric can be enhanced.

[0031] The water-disintegratable sheet 8 comprising a fiber-interlacing nonwoven fabric has preferably a weight per square-meter of from 30 g/m^2 to 120 g/m^2 and a thickness of from 0.1 mm to 0.5 mm.

[0032] In FIG. 15A, the twined string 4X is formed using one water-disintegratable sheet 8 comprising a fiber-interlacing nonwoven fabric, however, the twined string 4X may be formed using the plural water-disintegratable sheets 8 which are superimposed. For enhancing the strength of the cleaning article 1 during the cleaning by thickening the individual strings 4 used for producing the cleaning article 1 shown in FIG 4, it is satisfactory to increase the weight per square-meter and the thickness of one water-disintegratable sheet 8. On the other hand, when the weight per square-meter and the thickness of one water-disintegratable sheet 8 are increased excessively, the water-disintegratable sheet 8 becomes difficult to be twined during the twisting step and the time needed for water-disintegrating the water-disintegratable sheet 8 becomes longer. Therefore, in this case, by forming the twined string 4X using the plural water-disintegratable sheets 8, the twined string which is thick and has a high stiffness can be formed, and moreover, at the contact of the string with a lot of water, which causes the loosening of the twine of the string, the string is separated into individual water-disintegratable sheets 8 and becomes easier to be water-disintegrated.

[0033] The twined string 4Y shown in FIG 15B is formed by a method in which the water-disintegratable sheet 8 (comprising a fiber-interlacing nonwoven fabric) and water-disintegratable paper 9 are superimposed and twisted together. The water-disintegratable paper 9 is produced by papermaking natural fibers such as pulp fibers or by papermaking natural fibers such as pulp fibers and regenerated cellulose fibers such as rayon fibers, so that the water-disintegratable paper 9 exhibits the strength thereof through the hydrogen bond force between fibers.

[0034] By twining together the water-disintegratable sheet 8 and the water-disintegratable paper 9 which are superimposed, the superimposed sheets can be strongly and tightly twisted and twined because of a high strength of the water-disintegratable sheet 8 comprising a fiber-interlacing nonwoven fabric. After the twining, the twined string can maintain the form thereof obtained through the twining in a dry state, where the above maintaining is achieved by the hydrogen bond force of the fibers constituting the water-disintegratable paper 9 and by the mechanical bond force between the fibers. Accordingly, the twined string 4Y having a high density can be easily processed and can maintain the form thereof. By forming the string 4 of the cleaning article 1 shown in FIG. 4 using the twined string 4Y having a high density, even when the string 4 contains a little water, the dirt adhered to the surface of a bedpan or the like can be scrubbed off by the string 4 having a high stiffness. When the cleaning article 1 is discarded into a flush toilet and contacts a lot of water, the fibers constituting the water-disintegratable paper 9 are loosened and the twine of the string 4 begins to be loosened, consequently the water-disintegratable sheet 8 is loosened.

[0035] By twining the water-disintegratable sheet 8 and the water-disintegratable paper 9 together, many un-

even parts can be formed on the surface of the twined string 4Y, so that the effect of removing the dirt can be enhanced. The twined string 4Y may comprise plural pieces of at least one of the water-disintegratable sheet 8 and the water-disintegratable paper 9.

[0036] In the twined string 4Y shown in FIG 15B, the water-disintegratable paper 9 is colored in a color other than white, such as blue and red. The water-disintegratable sheet 8 comprising a fiber-interlacing nonwoven fabric is formed with white fibers. By twining the water-disintegratable sheet 8 and the water-disintegratable paper 9 which are superimposed, a colored part and a white part are located alternately in the twined string 4Y, so that the appearance of the twined string 4Y becomes preferable.

[0037] In the forming of the twined string 4Y shown in FIG 15B, instead of the water-disintegratable paper 9, an air-laid nonwoven fabric may be used. The air-laid nonwoven fabric is produced by a method in which a fiber web is produced by laminating pulp fibers according to an air-laid method and the fibers in the fiber webs are adhered to each other through a water-soluble binder, such as polyvinyl alcohol (PVA). The air-laid nonwoven fabric has such a low density, as a fiber density of from 0.04 g/cm^3 to 0.07 g/cm^3 and is so bulky as having a thickness of from 0.3 mm to 5 mm. In addition, the air-laid nonwoven fabric can be disintegrated in water within a short time. Since the air-laid nonwoven fabric has cushion properties, by twining together the air-laid nonwoven fabric and the water-disintegratable sheet 8 which comprises a fiber-interlacing nonwoven fabric, the twined string 4Y which has elasticity can be obtained.

[0038] The twined string 4Z shown in FIG. 15C is formed by the following method: twining: one water-disintegratable paper 9, the plural water-disintegratable papers 9, the air-laid nonwoven fabric, or the water-disintegratable paper 9 and the air-laid nonwoven fabric which are superimposed, to thereby form the core of the string 4Z, winding around the core the water-disintegratable sheet 8 comprising a fiber-interlacing nonwoven fabric, and further twining the water-disintegratable sheet 8. Since the core of the twined string 4Z exhibits a strong hydrogen bond force and the twisted state can be maintained, the twined string 4Z has a high density. Since the water-disintegratable sheet 8 having a high wet strength is wound around the core, the surface strength of the string 4 can be enhanced and the form of the string 4 can be easily maintained when the wiping of the dirt is performed by the cleaning article 1 in a wet state. In addition, when the cleaning article 1 contacts a lot of water, the water-disintegratable paper 9 or the air-laid nonwoven fabric each of which constitutes the core is disintegrated and consequently, the twine of the water-disintegratable sheet 8 is loosened, so that the cleaning article 1 becomes able to be water-disintegrated within a short time.

[0039] The number of twining times for forming each of the twined string 4X, the twined string 4Y and the twined string 4Z is preferably from 4 to 30 per the length 250 mm of the water-disintegratable sheet 8 constituting the twined string. When the number of twining times is less than 4, the density of the string becomes too low, so that the string cannot bear a frictional force during the wiping of the dirt and is easily broken. On the other hand, when the number of twining times is more than 30, a load is charged to the water-disintegratable sheet 8 during the twining thereof, so that it is feared that the water-disintegratable sheet 8 is cut. The thickness of the twined string 4X, the twined string 4Y and the twined string 4Z is preferably in the range of from 1 mm to 10 mm. When the thickness is in this range; the wiping touch of the string 4 is preferable and when the cleaning article 1 is discarded into a flush toilet, the piping is not clogged by the cleaning article 1, so that the cleaning article 1 can be easily discarded.

[0040] When the cleaning article 1 is used, the holding side terminal 2 is held between the supporting part 122 and the pressing part 123 of the holder 120 shown in FIG 1. The cleaning article 1 comprises the compressed-fiber structure 11, so that when the cleaning article 1 is dry, the plural strings 4 are not separated from each other. When the cleaning article 1 is wetted by water after the cleaning article 1 has been held by the holder 120, at this time, the cleaning article 1 is supported between the supporting part 122 and the pressing part 123, so that the plural strings 4 are not separated from each other in the holding side terminal 2 during the cleaning. Since in the cleaning article 1 shown in FIG 4, the plural strings 4 run obliquely against the cut cross section along the center line O and are compressed in the state in which plural strings 4 cross each other, the cleaning article 1 has, as a whole, a high stiffness and the part to be cleaned of a bedpan or the like can be strongly scrubbed with the cleaning side terminal 3, so that the dirt adhered to the part to be cleaned can be removed by the cleaning side terminal 3.

[0041] In the cleaning side terminal 3 of the cleaning article 1, many loop parts 4a of the string 4 are present and no cut end face 4b is exposed, so that even when the cleaning side terminal 3 is wetted by water, it can be prevented that the string 4 is excessively loosened. When the cleaning article 1 contacts a relatively large quantity of water during the scrubbing of the part to be cleaned such as a bedpan or the like, the compressed state of the string 4 is relaxed and the plural loop parts 4a independently slide on the part to be cleaned, so that a wider range of the part to be cleaned can be cleaned by the individual loop parts 4a.

[0042] Since the cylinder-shaped structure 10 shown in FIG 2 is formed by winding the long string 4, it is unlikely that the twine of the string 4 is loosened during the production process of the cylinder-shaped structure 10. Further, since the compressed-fiber structure 11 is produced by compressing the cylinder-shaped structure 10 which has been formed, it can be prevented that the twine of the string 4 is loosened during the distribution and custody of the cleaning article 1 as a commercial article.

Since the individual cleaning articles 1 are produced by cutting into halves the compressed-fiber structure 11 shown in FIG. 3, the string 4 is cut into plural units in the cleaning article 1. The length of an individual unit of the string 4 is about two times the length between the holding side terminal 2 and the cleaning side terminal 3 in the cleaning article 1. Therefore, when the cleaning article 1 is discarded into a flush toilet after the use thereof, the compressed state of the string 4 is loosened by a lot of water, so that individual units of the string 4 can be further easily dispersed. And then, after the dispersion, the individual units of the string 4 are water-disintegrated.

[0043] The length between the holding side terminal 2 and the cleaning side terminal 3 in the cleaning article 1 is about in the range of from 20 mm to 100 mm, but is not limited by this range.

[0044] The time needed for the water-disintegration of the dispersed individual unit of the string 4 is preferably 700 sec or less, more preferably 600 sec or less, still more preferably 300 sec or less, in terms of the value measured according to JIS P4501 (relaxability test for the toilet paper), based on 100 mm of the length of one piece of the string 4. This is a measurement from a time when the string 4 is charged into 300 mL of an ion-exchanged water having a temperature of 20 $\pm$ 5 °C which is placed in a 300 mL beaker, and then the string 4 and the ion-exchanged water together are stirred by rotating a rotator at a speed of 600 rpm in the ion-exchanged water, to a time when the form of the string has disappeared and the form of the sheet has not remained, so that individual fibers have been dispersed.

<Second embodiment>

[0045] FIG 5A and FIG 5B are perspective views showing a production method of a water-disintegratable cleaning article 22, according to the second embodiment of the present invention.

[0046] The compressed-fiber structure 21 shown in FIG 5A is produced by compressing the cylinder-shaped structure 10 shown in FIG 2A with the force Fv in the direction along the center line O. The conditions for the compressing are the same as those in the production of the compressed-fiber structure 11 shown in FIG 3.

[0047] In FIG. 5A, the article produced by holding the compressed-fiber structure 21, as it is, with the holder 120 can be used as the cleaning article 22. However, the cleaning article 22 shown in FIG 5B is produced by cutting the compressed-fiber structure 21. At this time, the compressed-fiber structure 21 shown in FIG 5Amay be bisected or trisected. In the case of the trisection, the trisected compressed-fiber structure 21 which is in the range of 120 ° around the center line O becomes the individual cleaning article 22. Further, in the case of the tetrasection, the tetrasected compressed-fiber structure which is in the range of 90 ° around the center line O may be the individual cleaning article 22.

[0048] In the cleaning article 22, the part exposing the cut end face 4b of the string 4 is used as the holding side terminal 23 and the part exposing the loop part 4c of the string 4 along the perimeter of the cleaning article 22 is used as the cleaning side terminal 24.

[0049] Since the cleaning article 22 is produced also through a step of producing the cylinder-shaped structure 10 by winding the string 4 as shown in FIG 2A and a step of compressing the cylinder-shaped structure 10 as shown in FIG 5A, the twine of the string 4 is unlikely to be loosened during the production of the cleaning article 22 and also during the distribution and custody of the cleaning article 22 as a commercial article. Since the string 4 of the cleaning article 22 is cut into plural short units shown in FIG 5B, when the cleaning article 22 contacts a lot of water, for example, by discarding the cleaning article 22 into a flush toilet, the cleaning article 22 is separated into individual units of the string 4, and further the twine of individual units of the string 4 is loosened, so that the fibers are dispersed in water.

<Third embodiment>

[0050] FIG 6 is a perspective view showing a water-disintegratable cleaning article 31, according to the third embodiment of the present invention.

The cleaning article 31 is produced by a method comprising: folding the string 4 having a predetermined length at the center of the string 4 into halves; bundling up the plural strings 4 by turning folded parts 4d into one direction; and compressing the bundle of the strings 4. At this time, the conditions for the compressing are the same as those in the production of the compressed-fiber structure 11 shown in FIG 3 according to the first embodiment and the compressed-fiber structure 21 shown in FIG 5A according to the second embodiment.

[0051] In the cleaning article 31 shown in FIG 6, the side in which cut end faces 4g of the strings 4 are lined up is a holding side terminal 32 and the side in which the folded parts 4d of the strings 4 are lined up is a cleaning side terminal 33. In a range (including the holding side terminal 32) having a predetermined length, a compressed part 34 is formed by compressing the bundle of the strings 4. In a range (including the cleaning side terminal 33) having a predetermined length, there is provided a non-compressed part 35 in which the strings 4 are not compressed. The compressed part 34 is utilized as a holding part and is supported between the supporting part 122 and the pressing part 123 of the holder 120 shown in FIG 1.

[0052] Since the individual strings 4 are compressed and fixed in the compressed part 34, the cleaning article 31 in a dry state is not disintegrated into pieces and can constantly maintain the form thereof during the custody and the transportation thereof. Since the compressed part 34 is held between the supporting part 122 and the pressing part 123, even when the cleaning article 31 contacts water during the use thereof and the compression of the compressed part 34 is loosened, the cleaning ar-

ticle 31 can maintain the form thereof. In the cleaning side terminal 33, the folded parts 4d of individual strings 4 are in a free state and consequently, the folded parts 4d can independently move freely, so that a wider range of the part to be cleaned can be effectively cleaned.

[0053] When the cleaning article 31 is discarded into a flush toilet and contacts a lot of water after the use thereof, the cleaning article 31 is disintegrated into individual strings 4 and further, the twine of the string 4 is loosened, so that the cleaning article 31 is further disintegrated into individual fibers.

The whole part of the cleaning article 31 in FIG 6 may be compressed to be the compressed part 34.

<First embodiment>

[0054] Moreover, in the cleaning article 1 shown in FIG 4 according to the first embodiment, a range (including the holding side terminal 2) having a predetermined length may be made to a compressed part, while the cleaning terminal 3 may be made to a non-compressed part.

<Second embodiment>

[0055] Moreover likewise, in the cleaning article 22 shown in FIG 5B according to the second embodiment, a range (including the holding side terminal 23) having a predetermined length may be made to a compressed part, while the cleaning terminal 24 may be made to a non-compressed part.

<First embodiment, Second embodiment and Third embodiment>

[0056] In each of the first embodiment, the second embodiment and the third embodiment, the holding part may be formed by winding a part of the cleaning article 1, the cleaning article 22 and the cleaning article 31, respectively (which part has a predetermined range including the holding side terminal 2, the holding side terminal 23 and the holding side terminal 32, respectively) with a water-disintegratable paper or a water-soluble film.

<Fourth embodiment, Fifth embodiment and Six embodiment>

[0057] FIG. 7, Fig. 8 and FIG. 9 show, respectively a water-disintegratable cleaning article 41, a water-disintegratable cleaning article 51 and a water-disintegratable cleaning article 61, respectively, according to a fourth embodiment, a fifth embodiment and a sixth embodiment. The cleaning article 41, the cleaning article 51 and the cleaning article 61 each comprise a compressed-fiber structure 40 in a block form which has a predetermined volume. The compressed-fiber structure 40 is produced by compressing an aggregate of water-dispersible fibers having a fiber length of 20 mm or less, so that the density of the compressed-fiber structure 40 is enhanced. Examples of the fibers constituting the compressed-fiber structure 40 include natural fibers such as pulp fibers and regenerated cellulose fibers such as rayon fibers. By compressing the above fibers, the block form of the compressed-fiber structure 40 can be maintained in a dry state through the mechanical bond force and hydrogen bond force between compressed fibers. Otherwise, fibers may be fixed to each other through a water-soluble adhesive. In this case, the compressed-fiber structure 40 can comprise synthetic fibers, such as PET fibers, PP fibers, PE fibers and nylon fibers. Preferably, the compressed-fiber structure 40 comprises only biodegradable fibers.

[0058] For example, the compressed-fiber structure 40 is produced in a block form using only pulp fibers. The production method thereof comprises: a step of dispersing pulp fibers in water to prepare a dispersion of pulp fibers; a step of molding by feeding the dispersion of pulp fibers into a concave-shaped mold for molding a article in a cylindrical form, where the concave-shaped mold has at the bottom thereof a porous part for draining; a step of dehydrating the molded article; and a step of drying the molded article by the heating. Alternatively, the following production method is allowed comprising: a step of molding by feeding the dispersion of pulp fibers into the above-noted mold or into a different-shaped mold for the pressurization, a step of compressing the molded article by the pressurization using a pressing machine after or while dehydrating the molded article, and drying.

[0059] A still another production method of the compressed-fiber structure 40 comprises: a step of molding by extruding, with a screw extruder, a raw material in a sludge form which is prepared by mixing pulp fibers, a thickener and a water-soluble adhesive; a step of dehydrating the molded article; and a step of drying the molded article by the heating. By this extrusion-molding, the compressed-fiber structure in a columnar form is produced. By an injection-molding in which a raw material in a sludge form is extruded, with a screw extruder, into a mold having a cavity in a predetermined form, the compressed-fiber structure in any three-dimensional form can be obtained.

[0060] In the case of the production of the compressed-fiber structure 40 by the compressing using a pressing machine, the conditions for the compressing are the same as those in the production of the compressed-fiber structure 11 in FIG 3.

[0061] Since the compressed-fiber structure 40 comprises fibers having a fiber length of 20 mm or less, preferably pulp fibers, when the cleaning article 41, the cleaning article 51 and the cleaning article 61 each are discarded into a flush toilet or the like, the compressed-fiber structure 40 can be disintegrated into individual fibers within a relatively short time. Therefore, the size of the compressed-fiber structure 40 can be set optionally according to the form of the cleaning article. However, for disintegrating the compressed-fiber structure 40 in water

within a short time, it is preferred that when the compressed-fiber structure 40 contains water having a weight which is 300 % of the own weight of the compressed-fiber structure 40, the compressed-fiber structure 40 is swollen to a volume which is two times or more the volume of the compressed-fiber structure 40 before the swelling. The time needed for the water-disintegration of one compressed-fiber structure 40 (a measuring method thereof is noted above) is preferably 700 sec or less, more preferably 600 sec or less, still more preferably 300 sec or less. The mass of the compressed-fiber structure 40 is preferably 20 g or less. 20 g corresponds to the mass of a toilet paper having a length of 9 m and is in the range where the clogging of the piping is unlikely to be caused in a normal flush toilet.

[0062] Further, by producing the compressed-fiber structure 40 in a cylindrical form, i.e., a form in which a hollow part is formed in the block by forming a penetration hole along the center line, the disintegration of the compressed-fiber structure 40 can be accelerated when the cleaning article 41, the cleaning article 51 and the cleaning article 61 each are discarded into a flush toilet.

[0063] By adding a cleaning agent, an abrasive, an antimicrobial agent or a perfume into the inside of the compressed-fiber structure 40 in a block form, the cleaning effect of the cleaning article 41, the cleaning article 51 and the cleaning article 61 each comprising the above compressed-fiber structure 40 can be enhanced.

[0064] The cleaning article 41, the cleaning article 51 and The cleaning article 61 shown, respectively, in FIG. 7 to FIG. 9 comprise the compressed-fiber structure 40 and the string 4. The string 4 comprises either any one of the twined string 4X, the twined string 4Y and the twined string 4Z shown in FIG. 15A, FIG 15B and FIG 15C respectively or a combination of two or more thereof. As the string 4, each of the twined string 4X, the twined string 4Y and the twined string 4Z is not compressed. However, according to the fourth embodiment, the fifth embodiment and the sixth embodiment shown, respectively, in FIG 7 to FIG 9, as the string 4, a compressed-fiber structure produced by compressing the twined string may be used.

<Fourth embodiment>

[0065] In the water-disintegratable cleaning article 41 according to the fourth embodiment shown in FIG. 7, the plural strings 4 which are cut into a predetermined size are arranged around the compressed-fiber structure 40 in a columnar block form and the base parts of these strings 4 are adhered onto the peripheral surface of the compressed-fiber structure 40 through a water-soluble adhesive. Further, a holding material 44 comprising a water-disintegratable sheet is wound around the base parts of the strings 4 and is adhered thereto through a water-soluble adhesive.

[0066] In the cleaning article 41, the part wound by the holding material 44 is the holding part 42 and the other part (head) is the cleaning part 43. While in the holder 120 for the cleaning article 1 shown in FIG. 1, the inside surfaces of the supporting part 122 and the pressing part 123 are both flat; in the holder 120 for the cleaning article 41 shown in FIG 7, the inside surface of the supporting part 122 is in the form of a half part of a concave-curved cylindrical surface and the inside surface of the pressing part 123 is in the form of a half part of a concave-curved cylindrical surface, so that these inside surfaces form together a concave-curved cylindrical surface. Therefore, the holding part 42 of the cleaning article 41 shown in FIG 7 is supported between the inside surface in the form of a half part of a concave-curved cylindrical surface of the supporting part 122 and the inside surface in the form of a half part of a concave-curved cylindrical surface of the pressing part 123. It is satisfactory that the holding part 42 of the cleaning article 41 can exhibit such a level of the strength that the holding part 42 can maintain a cylindrical form thereof until it is held by the holder 120. Even when the holding force of the holding material 44 is weakened by water after the cleaning article 41 has been held by the holder 120, since the cleaning article 41 is held between the supporting part 122 and the pressing part 123, the cleaning article 41 doesn't loose its shape during the cleaning.

[0067] When the cleaning article 41 is discarded into water after the use thereof, first, the holding part 42 comprising the holding material 44 looses its shape and the compressed-fiber structure 40 and the string 4 are separated from each other in water. Thereafter, the isolated compressed-fiber structure 40 and the isolated string 4 are water-disintegrated separately. Within an extremely short time after the discard of the cleaning article 41 into water, the compressed-fiber structure 40 and the string 4 are separated from each other and are flushed away with a flush water of a flush toilet, so that the clogging in the piping is unlikely to be caused.

[0068] In the core part of the cleaning part 43, the compressed-fiber structure 40 is located and around the compressed-fiber structure 40, the strings 4 are arranged, wherein the cut end faces 4e of the strings 4 are turned to the head of the cleaning part 43. When the part to be cleaned, such as a bedpan or the like is scrubbed by the compressed-fiber structure 40, even if the compressed-fiber structure 40 is swollen by water, the compressed-fiber structure 40 maintains the block form thereof, and further the compressed-fiber structure 40 which has absorbed water becomes softened and can exhibit the cushion properties. Therefore, the dirt adhered to the part to be cleaned can be effectively removed and the compressed-fiber structure 40 softly contacts the part to be cleaned. In addition, the strings 4 arranged around the compressed-fiber structure 40 spread to a wider range around the compressed-fiber structure 40, so that a wider range of the part to be cleaned can be cleaned to every corner.

<Fifth embodiment>

[0069] In the water-disintegratable cleaning article 51 according to the fifth embodiment shown in FIG 8, the strings 4 are arranged around the compressed-fiber structure 40 in a cleaning part 53 and folded parts 4f of the strings 4 are turned to the head of the cleaning part 53. In a holding part 52, the base parts of the strings 4 are adhered onto the peripheral surface of the compressed-fiber structure 40 through a water-soluble adhesive and the holding material 44 is wound around the peripheral surface of the compressed-fiber structure 40 and is adhered thereto. Since the folded parts 4f of the strings 4 are turned to the head of the cleaning part 53 and the cut end faces 4e are not turned to the head of the cleaning part 53, unlike the cleaning part 43 shown in FIG 7 having the cut end faces 4e turned to the head of the cleaning part 43, the twines of the strings 4 in FIG 8 are unlikely to be loosened, even when the folded parts 4f absorb water. In the holder 120 holding the cleaning article 51, the inside surfaces of the supporting part 122 and the pressing part 123 shown in FIG 1 are both unflat but in the form of a half part of a concave-curved cylindrical surface, so that the holding part 52 is supported between these inside surfaces in the form of a half part of a concave-curved cylindrical surface of the supporting part 122 and the pressing part 123.

<Sixth embodiment>

[0070] In the water-disintegratable cleaning article 61 according to the sixth embodiment shown in FIG. 9, a loop part 4h is formed with plural strings 4 and plural cut end faces 4g of the strings 4 are lined up. In the holding part 62, the strings 4 are adhered to each other through a water-soluble adhesive and further, the holding material 44 is wound around the strings 4 and is adhered thereto through a water-soluble adhesive. The water-disintegratable compressed-fiber structure 40 in a columnar form or cylindrical form is inserted into a bundle of the strings 4, and the compressed-fiber structure 40 and the bundle of the strings 4 are adhered and fixed to each other through a water-soluble adhesive.

[0071] With respect to the cleaning article 61, when the cleaning is performed, the compressed-fiber structure 40 supports the bundle of the strings 4 as the core. Thereby, the dirt can be removed by strongly pressing the loop part 4h of the bundle of the strings 4 to the part to be cleaned. Further, since when the compressed-fiber structure 40 absorbs water, the compressed-fiber structure 40 is swollen and becomes an elastic body, the loop part 4h becomes able to slide on the part to be cleaned with an appropriate pressure.

<Seventh embodiment>

[0072] FIG 10 is a perspective view showing a water-disintegratable cleaning article 71, according to the seventh embodiment of the present invention.

A compressed-fiber structure 70 constituting the cleaning article 71 is produced by the above-noted injection-molding method or the like, and a triangular-prism part having the slope 70a and the slope 70a which face each other and the holding part 70b having a predetermined size which is located on the triangular-prism part are integrally produced. To the slope 70a and the slope 70a respectively, the plural strings 4 are adhered through a water-soluble adhesive. The plural strings 4 are lined up with the cut end faces 4g turned upwards and with the folded parts 4f turned downwards. The plural folded parts 4f extend to a position lower than the bottom surface of the compressed-fiber structure 70 and are in a free state independently from each other.

[0073] The cleaning article 71 is held in such a manner that the holding part 70b of the cleaning article 71 is supported between the holding part 122 and the pressing part 123 of the holder 120 shown in FIG 1. By pressing a bottom surface 70c of the compressed-fiber structure 70 on the part to be cleaned, such as a bedpan or the like and scrubbing the part to be cleaned, the dirt adhered to the part to be cleaned can be removed, and further since the folded parts 4f of the strings 4 spread along the part to be cleaned, a wider range of the part to be cleaned can be cleaned to every corner.

<Eighth embodiment>

[0074] FIG 11A is a perspective view showing a water-disintegratable cleaning article 81 according to the eighth embodiment of the present invention, and FIG 11B is a developed perspective view explaining the fundamental structure of the cleaning article 81.

[0075] The water-disintegratable cleaning article 81 comprises a holding part 82 and a cleaning part 83. The cleaning article 81 comprises at least one cleaning unit 88. According to the eighth embodiment shown in FIG 11A and FIG 11B, two overlapped cleaning units 88 are adhered to each other at the upper terminals of the two cleaning units 88 through a water-soluble adhesive, and a holding material 84 such as a water-disintegratable paper covers a part of the two cleaning units 88 respectively over the above-adhered terminals and is adhered to the two cleaning units respectively through a water-soluble adhesive. In the cleaning part 83, the two cleaning units 88 can independently move freely.

[0076] FIG 11B shows a developed structure of the cleaning unit 88. The cleaning unit 88 comprises a water-disintegratable outer sheet 85 and a compressed-fiber structure 86 held in the outer sheet 85. The outer sheet 85 comprises the same fiber-interlacing nonwoven fabric as that which the water-disintegratable sheet 8 comprises, wherein the water-disintegratable sheet 8 constitutes the twined string 4X shown in FIG 15A. The formulation of the fiber-interlacing nonwoven fabric constituting the outer sheet 85 and the preferable range of the composition of the fiber used in the fiber-interlacing nonwoven

fabric are the same as those in the case of the water-disintegratable sheet 8.

[0077] The compressed-fiber structure 86 is in the form of a sheet (a plate) and plural sheets thereof which are piled up are held in the outer sheet 85. The compressed-fiber structure 86 is produced by laminating water-dispersible fibers having a fiber length of 20 mm or less and by compressing the thus laminated fibers. Examples of the fibers include natural fibers, such as pulp fibers, and regenerated cellulose fibers, such as rayon fibers. The compressed-fiber structure 86 in a compressed state can maintain the sheet form thereof through the hydrogen bond force of the cellulose fibers and through the mechanical bond force between the fibers which force is generated by the compression. It is also possible that the fibers are connected to each other through a water-soluble adhesive. In this case, the compressed-fiber structure 86 may comprise synthetic resin fibers, such as PET fibers, PP fibers, PE fibers and nylon fibers. However, the compressed-fiber structure 86 comprises preferably only biodegradable fibers.

[0078] For example, the compressed-fiber structure 86 comprises only pulp fibers. The pressure used for the compression by which the compressed-fiber structure 86 is produced is the same as that which is used for the production of the compressed-fiber structure 11 shown in FIG 3 and for the production of the compressed-fiber structure 21 shown in FIG. 5A, and the time for the compression is from 1 sec to 5 sec. The compression is performed at normal temperature and may be performed during the heating. By compressing the string with water sprayed thereto and with heating it, the hydrogen bond force between the fibers can be further enhanced.

[0079] Since the compressed-fiber structure 86 comprises fibers, preferably pulp fibers having a fiber length of 20 mm or less, when the cleaning article 81 is discarded into a flush toilet or the like, the compressed-fiber structure 86 can be disintegrated into individual fibers within a relatively short time. Therefore, the size of the compressed-fiber structure 86 can be set optionally according to the form of the cleaning article 81. However, for disintegrating the compressed-fiber structure 86 in water within a short time, it is preferred that when the compressed-fiber structure 86 contains water having a weight which is 300 % of the own weight of the compressed-fiber structure 86, the compressed-fiber structure 86 is swollen to a volume which is two times or more the volume of the compressed-fiber structure 86 before the swelling. The time needed for the water-disintegration of one compressed-fiber structure 86 (a measuring method thereof is noted above) is preferably 700 sec or less, more preferably 600 sec or less, still more preferably 300 sec or less. The mass of the compressed-fiber structure 86 used for one cleaning article 81 is preferably 20 g or less in total. 20 g corresponds to the mass of a toilet paper having a length of 9 m and is in the range where the clogging of the piping is unlikely to be caused in a normal flush toilet.

[0080] The compressed-fiber structure 86 may comprise a cleaning agent, an abrasive, an antimicrobial agent or a perfume.

[0081] As shown in FIG. 11B, the plural compressed-fiber structures 86 are piled up on the developed outer sheet 85 having a rectangle form and the outer sheet 85 is folded along a hypothetical line L. Thereafter, an edge part 85a in a longer side of the outer sheet 85 and another edge part 85a in a longer side of the outer sheet 85 as well as an edge part 85a in another longer side of the outer sheet 85 and another edge part 85a in another longer side of the outer sheet 85, are adhered to each other through a water-soluble adhesive, without adhering the edge parts 85a to the compressed-fiber structure 86. Further, an edge part 85b in a shorter side of the outer sheet 85 and an edge part 85b in another shorter side of the outer sheet 85 are adhered to each other through a water-soluble adhesive. Instead of the adhesion using a water-soluble adhesive or as in combination with the adhesion using a water-soluble adhesive, an edge part 85a in a longer side, an edge part 85a in another longer side and an edge part 85b in a shorter side are superimposed on respectively another edge part 85a in a longer side, another edge part 85a in another longer side and another edge part 85b in a shorter side, and the folded outer sheet 85 is pressed, or heated and pressed, so that the above-noted edge parts 85a in a longer side, edge parts 85a in another longer side and edge parts 85b in a shorter side respectively can be adhered to each other through the hydrogen bond force and the mechanical bond force of the outer sheet 85.

[0082] The cleaning article 81 shown in FIG 11A is produced comprising two cleaning units 88 which are adhered to each other through a water-soluble adhesive in the range of the cleaning unit 88 from the edge part 85b to a line which is downwards distant along the outer surface of the cleaning unit 88 in parallel from the edge part 85b with a predetermined length, with a folded part 85c (which is caused by folding the outer sheet 85 along the hypothetical line L) turned downwards, and comprising the holding material 84 adhered and fixed to the adhered cleaning units 88 covering the above-noted adhered range of the adhered cleaning units 88.

[0083] The cleaning article 81 is held in such a manner that the holding part 82 of the cleaning article 81 is supported between the supporting part 122 and the pressing part 123 of the holder 120 shown in FIG 1. By sliding the cleaning part 83 of the cleaning article 81 on the part to be cleaned, such as a bedpan or the like, the dirt can be removed by the outer sheet 85. Since the cleaning part 83 has a flat side surface, by sliding the flat side surface of the cleaning part 83 on the part to be cleaned, a wider area of the part to be cleaned can be cleaned. Since the outer sheet 85 comprises a fiber-interlacing nonwoven fabric, the outer sheet 85 is unlikely to be broken during the scrubbing of the part to be cleaned. When the cleaning article 81 contacts water during the cleaning, the compressed-fiber structure 86 in the outer sheet 85 is swollen

and exhibits elasticity, so that the part to be cleaned can be scrubbed by the outer sheet 85 with an appropriate pressure.

[0084] Since the holding material 84 comprises a water-disintegratable paper produced by papermaking pulp fibers or by papermaking pulp fibers and adhering fibers to each other through a water-soluble adhesive, when the cleaning article 81 is discarded into water after the use thereof, the holding force of the holding material 84 is immediately discharged and the adhered cleaning units 88 are separated into two cleaning units 88. Further, in water, the adhesion between the edge parts 85a of the outer sheet 85 and between the edge parts 85b of the outer sheet 85 is discharged, and the outer sheet 85 and the compressed-fiber structure 86 are separated from each other, so that the outer sheet 85 and the compressed-fiber structure 86 are independently disintegrated into individual fibers.

<Ninth embodiment, Tenth embodiment and Eleventh embodiment>

[0085] In a ninth embodiment, a tenth embodiment and an eleventh embodiment shown, respectively, in FIG 12 to FIG 14, the cleaning part comprises a compressed-fiber structure 90 in a sheet form and the string 4.

[0086] Like the compressed-fiber structure 86 shown in FIG 11 according to the eighth embodiment, the compressed-fiber structure 90 in a sheet form is produced by laminating fibers having a fiber length of 20 mm or less and by compressing the laminated fibers into a sheet form, and preferably comprises only pulp fibers. The compressed-fiber structure 90 in a sheet form has such a fairly large fiber-weight per square-meter as from 500 g/m^2 to 1,000 g/m^2, in comparison with that of the water-disintegratable paper 9 shown in FIG 15B (from 10 g/m^2 to 30 g/m^2). Since the compressed-fiber structure 90 in a sheet form has a large weight per square-meter, a high density and a high stiffness, when the compressed-fiber structure 90 is arranged together with the string 4 in the cleaning part, the dirt adhered to the surface of the part to be cleaned, such as a bedpan or the like can be easily removed by the compressed-fiber structure 90 in a sheet form which has a high stiffness, and further the string 4 is transformed relatively freely, so that a wider range of the part to be cleaned can be wiped. In addition, by the string 4, the cleaning of a corner of a bedpan becomes easier.

[0087] When the cleaning article (91, 101, 111 - to be described afterward) is discarded into a flush toilet after the use thereof, the compressed-fiber structure 90 in a sheet form is disintegrated into individual pulp fibers within a relatively short time.

<Ninth embodiment>

[0088] In a water-disintegratable cleaning article 91 according to the ninth embodiment shown in FIG 12, plural sheets (e.g., five sheets to twenty sheets) of the compressed-fiber structure 90 are piled up, and the plural strings 4 are arranged around the sheets. The compressed-fiber structures 90 and the strings 4 are adhered to each other through a water-soluble adhesive in a holding part 92 and around the layer of the strings 4, and the holding material 44 comprising a water-disintegratable paper or the like is wound and adhered thereto. In a cleaning part 93, the individual compressed-fiber structures 90 in a sheet form are independent from each other and individual strings 4 are independent. The cut end faces 4e of the strings 4 are turned to the head of the cleaning part 93. In the holder 120 holding the cleaning article 91, the inside surfaces of the supporting part 122 and the pressing part 123 shown in FIG. 1 are both unflat but in the form of a half part of a concave-curved cylindrical surface, so that the holding part 92 is supported between these inside surfaces in the form of a half part of a concave-curved cylindrical surface of the supporting part 122 and the pressing part 123.

[0089] In the cleaning article 91, by pressing and sliding the top of the cleaning part 93 on the part to be cleaned, the part to be cleaned is scrubbed by the edge surfaces of the compressed-fiber structures 90, and further, the individual strings 4 spread, so that a wider range of the part to be cleaned can be cleaned and the corner part of a bedpan or the like can be cleaned by the strings 4. In the cleaning article 91, the cut end faces 4e of the strings 4 in the cleaning part 93 can be replaced by the folded parts 4f of the strings 4 shown in FIG 8 according to the fifth embodiment.

<Tenth embodiment>

[0090] A water-disintegratable cleaning article 101 according to the tenth embodiment shown in FIG 13 comprises one or plural water-disintegratable compressed-fiber structure(s) 90 (which are superimposed) having substantially the same size as that of the cleaning article 101. Plural strings 4 are formed in a loop form and the loop parts 4h are arranged surrounding lower sides 90a of the compressed-fiber structures 90 in a sheet form. The cut end faces 4g of the plural strings 4 are lined up in such a manner that the vertical level of the cut end faces 4g becomes the same as that of upper sides 90b of the compressed-fiber structures 90 in a sheet form, and the parts of plural strings 4 in the near of the cut end faces 4g are adhered to the both surfaces of the compressed-fiber structure 90. Further, around the parts of plural strings 4 which are adhered to the both surfaces of the compressed-fiber structure 90 in a sheet form, the holding material 44 is wound and adhered thereto, so that the holding part 102 in a flat form is formed. In a cleaning part 103, the individual strings 4 can move independently and also the compressed-fiber structures 90 in a sheet form can move independently.

[0091] With respect to the cleaning article 101, by sliding the cleaning part 103 on the part to be cleaned in the

Y direction shown in FIG 13, the part to be cleaned can be scrubbed by the lower sides 90a of the compressed-fiber structures 90 in a sheet form. Further, by sliding the cleaning part 103 on the part to be cleaned in the X direction which crosses the Y direction orthogonally, the part to be cleaned can be cleaned by the loop parts 4h of the strings 4.

<Eleventh embodiment>

[0092] A water-disintegratable cleaning article 111 according to the eleventh embodiment shown in FIG 14 is produced by a method comprising plural steps: a step of putting two pieces of the block which is formed by superimposing plural water-disintegratable compressed-fiber structures 90 having a rectangular sheet form in a vertically standing state, beside each other; a step of arranging two pieces of the block of the plural strings 4 respectively beside the both sides of the above-noted two pieces of the block of the plural compressed-fiber structures 90; and a step of winding the holding material 44 around the top side parts of the two blocks of the plural compressed-fiber structures 90 and the two blocks of the plural strings 4 and adhering the holding material 44 thereto, thereby forming the holding part 112 in a flat form. In the cleaning part 113, the plural strings 4 in which the cut end faces 4e are turned downwards, and plural compressed-fiber structures 90 are positioned independently.

[0093] With respect to the cleaning article 111, the wiping can be performed by the compressed-fiber structures 90 in a sheet form and the strings 4. The strings 4 in the above-noted two blocks which are arranged respectively beside the both sides of the two blocks of the compressed-fiber structures 90 in a sheet form, may be replaced by either the strings 4 having the folded parts 4f shown in FIG. 8 which are turned downwards or the strings 4 having the loop parts 4h shown in FIG 9 which are turned downwards.

[0094] The entire contents of Patent Application No. 2005-141361 with its filing date of May 13, 2005 in Japan are incorporated herein by reference.

[0095] Although the present invention has been described above by reference to eleven embodiments, the present invention is not limited to the eleven embodiments described above. Modifications and variations of the embodiments described above will occur to those skilled in the art, in light of the above teachings.

INDUSTRIAL APPLICABILITY

[0096] Since the water-disintegratable cleaning article under the present invention comprises a compressed-fiber structure having a high strength, when a bedpan or the like is scrubbed by the cleaning article, the cleaning article will not be broken or deformed and can effectively scrub off the dirt. Moreover, when the cleaning article is discarded into water after the use thereof, fibers in the compressed-fiber structure is loosened, so that the cleaning article can be easily water-disintegrated within a relatively short time.

Claims

1. A water-disintegratable cleaning article dispersible in water, comprising:

   a compressed-fiber structure in which a water-dispersible fiber is compressed.

2. The water-disintegratable cleaning article as claimed in claim 1, wherein
   the water-dispersible fibers of the compressed-fiber structure are connected to each other through at least one of the followings:

   a hydrogen bond,
   an adherence through a water-soluble adhesive and
   a fiber-interlacing.

3. The water-disintegratable cleaning article as claimed in claim 1 or 2, further comprising a holder for holding the compressed-fiber structure in an attachable and-detachable manner.

4. The water-disintegratable cleaning article as claimed in claim 3, wherein
   the compressed-fiber structure comprises:

   a first part as a compressed part and
   a second part as a non-compressed part, and

   the compressed part is held by the holder.

5. The water-disintegratable cleaning article as claimed in any of claims 1 to 4, wherein
   a string is formed by twining a water-disintegratable sheet, and
   the compressed-fiber structure is formed by compressing the plural strings.

6. The water-disintegratable cleaning article as claimed in claim 5, wherein the compressed-fiber structure is formed by the following sequential operations:

   winding the plural strings, and
   compressing the plural strings.

7. The water-disintegratable cleaning article as claimed in any of claims 1 to 4, wherein
   the compressed-fiber structure is formed by the following sequential operations:

   laminating the water-dispersible fibers, and

compressing the laminated fibers into a form of one of a sheet and a block.

8. The water-disintegratable cleaning article as claimed in claim 7, wherein a string formed by twining a water-disintegratable sheet is used for the compressed-fiber structure in the form of the one of the sheet and the block.

9. The water-disintegratable cleaning article as claimed in any of claims 5, 6 and 8, wherein the string of the water-disintegratable sheet is a fiber-interlacing nonwoven fabric in which fibers each having a length of 20 mm or less are interlaced.

10. The water-disintegratable cleaning article as claimed in any of claims 5, 6, 8 and 9, wherein the string comprises:

a fiber-interlacing nonwoven fabric in which fibers each having a length of 20 mm or less are interlaced, and
a water-disintegratable paper including cellulose fibers.

11. The water-disintegratable cleaning article as claimed in claim 8, wherein the compressed-fiber structure in the form of the one of the sheet and the block is wrapped with a water-disintegratable outer sheet.

12. The water-disintegratable cleaning article as claimed in claim 11, wherein the water-disintegratable outer sheet is a fiber-interlacing nonwoven fabric in which fibers each having a length of 20 mm or less are interlaced.

13. The water-disintegratable cleaning article as claimed in any of claims 9, 10 and 12, wherein the fiber-interlacing nonwoven fabric includes:

pulp fibers, and
other fibers each having a length of 20 mm or less.

FIG. 1

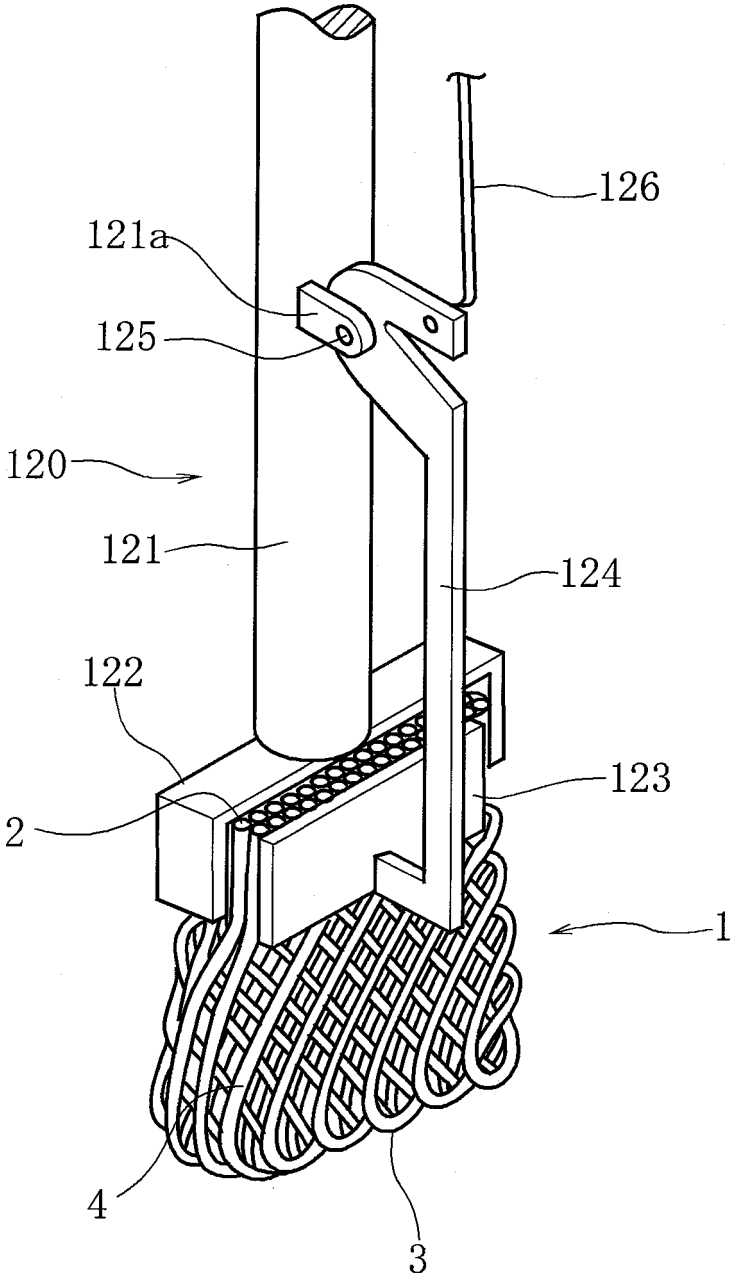


FIG. 2

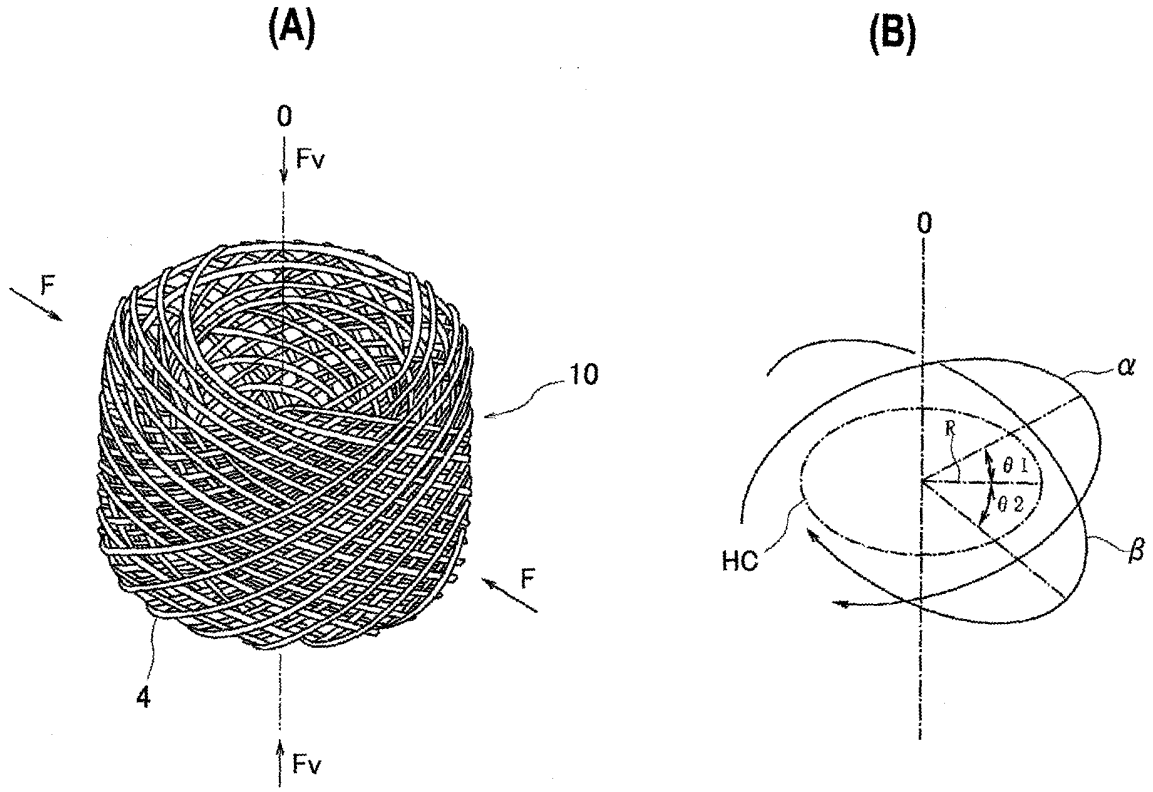


FIG. 3

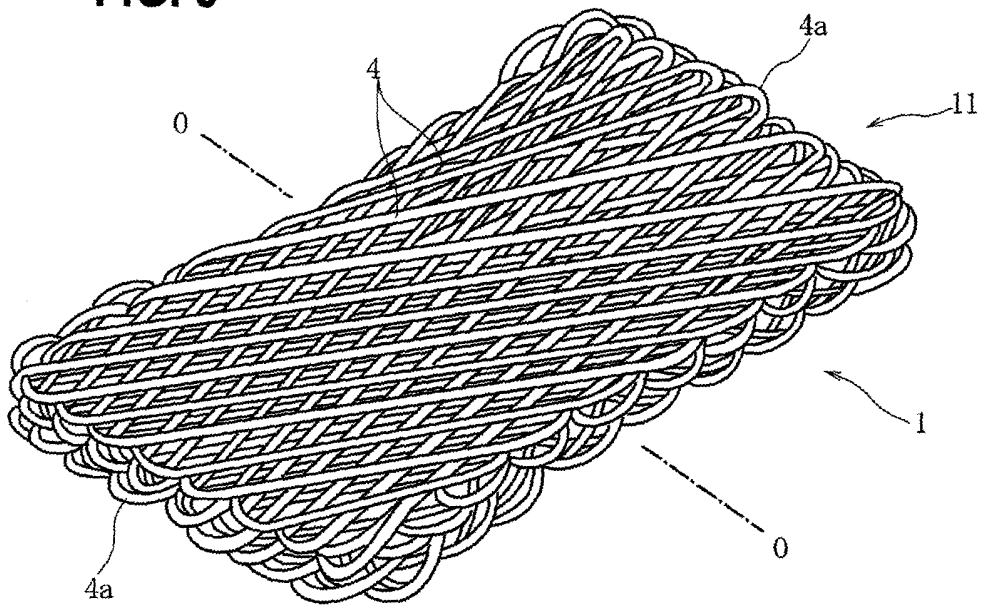


FIG. 4

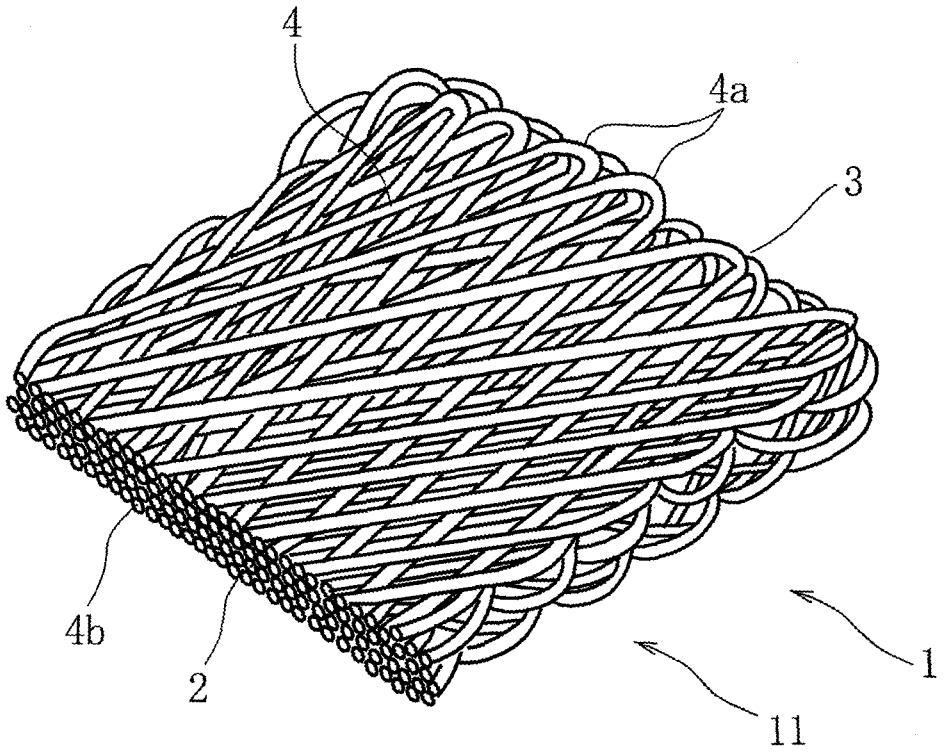
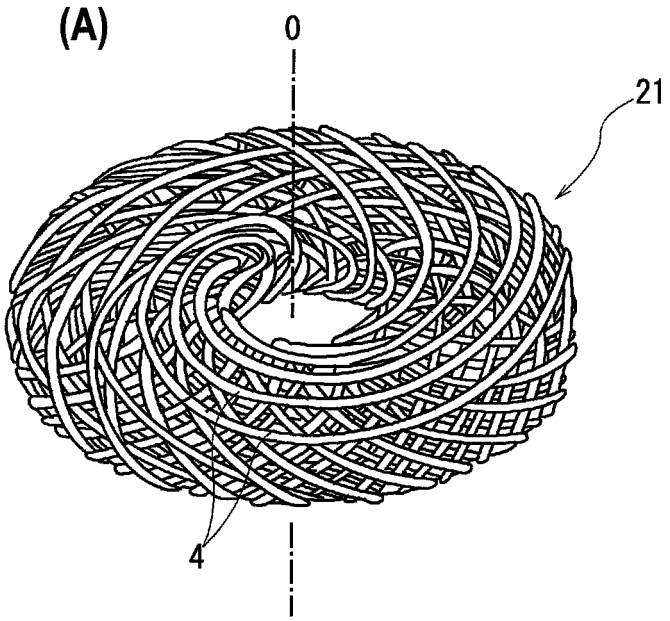


FIG. 5



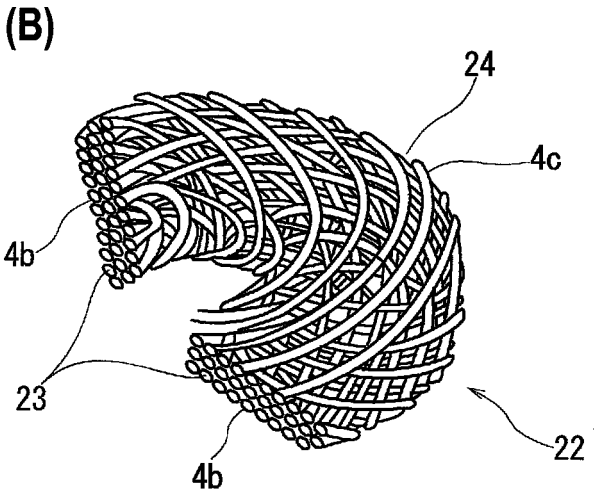


FIG. 6

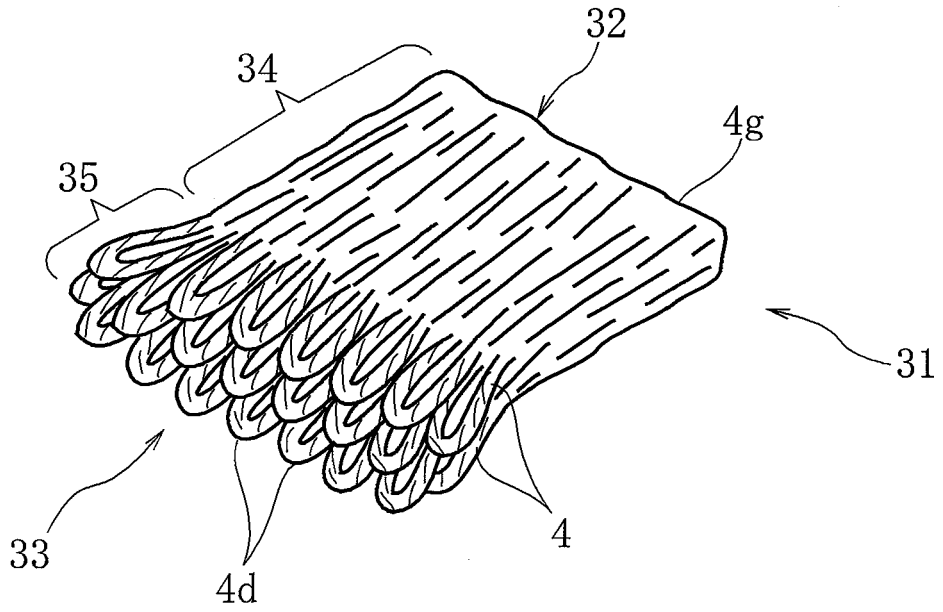


FIG. 7

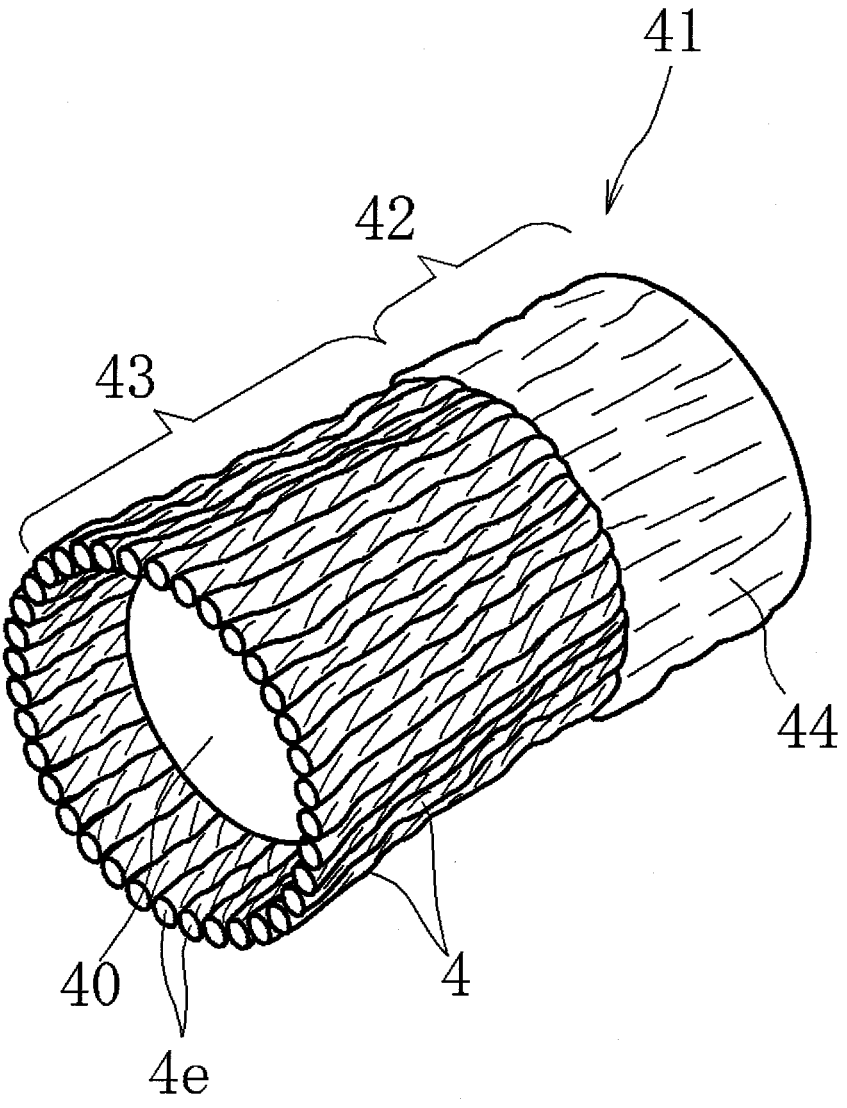


FIG. 8

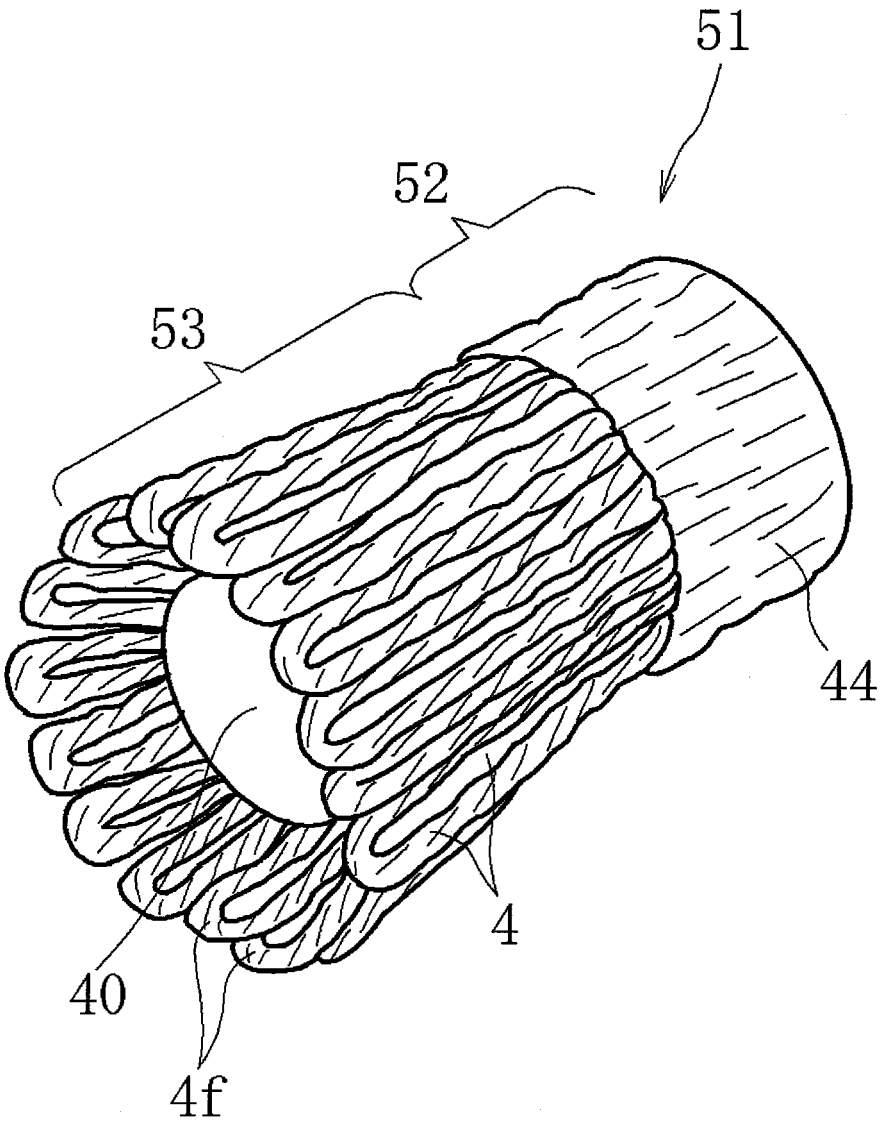


FIG. 9

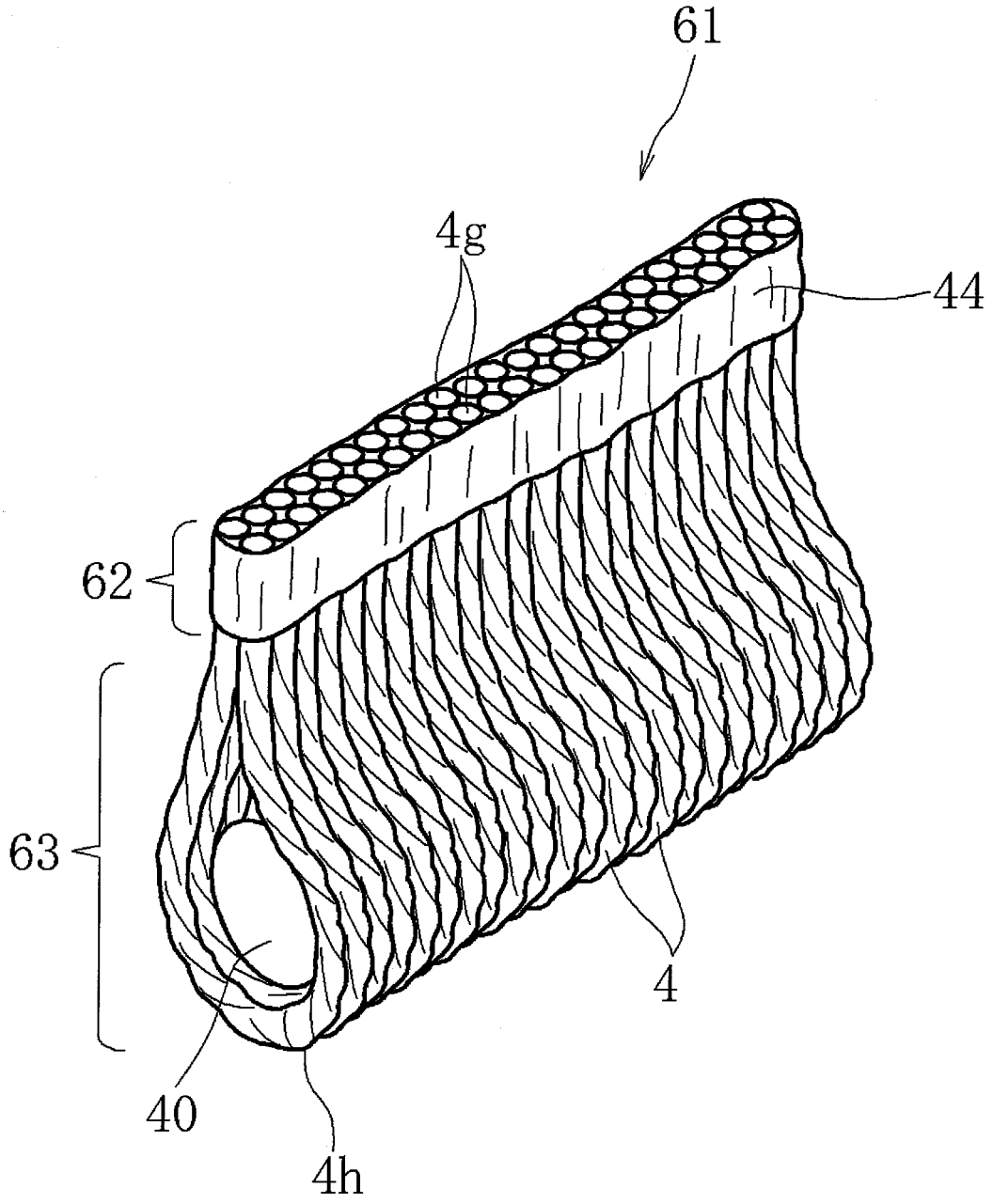


FIG. 10

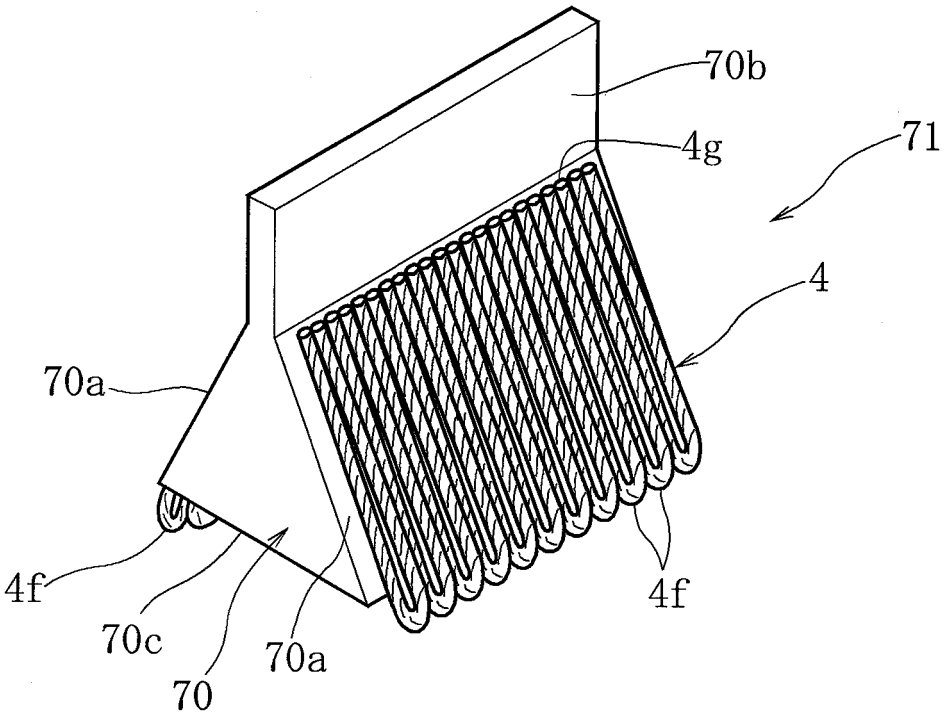


FIG. 11

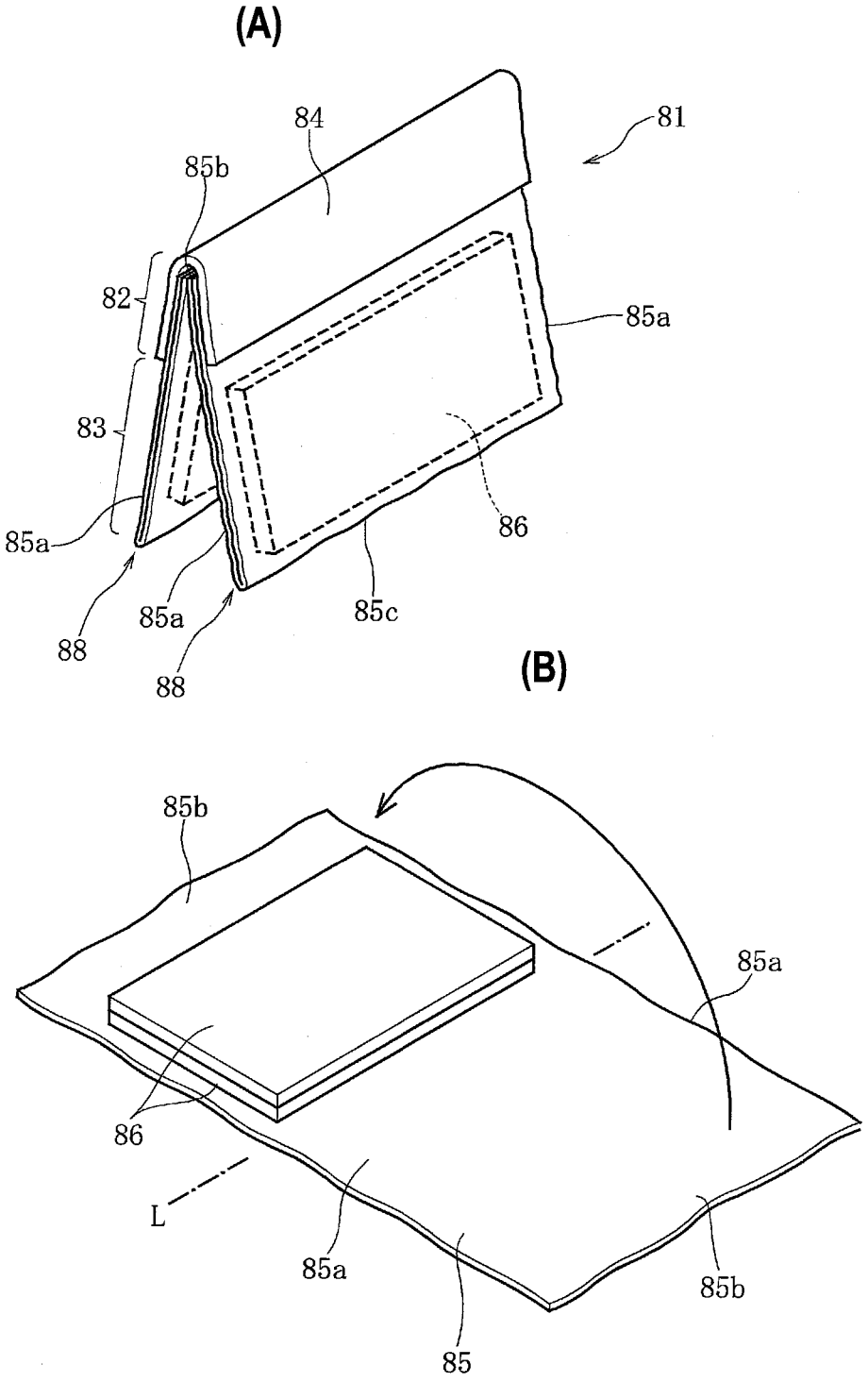


FIG. 12

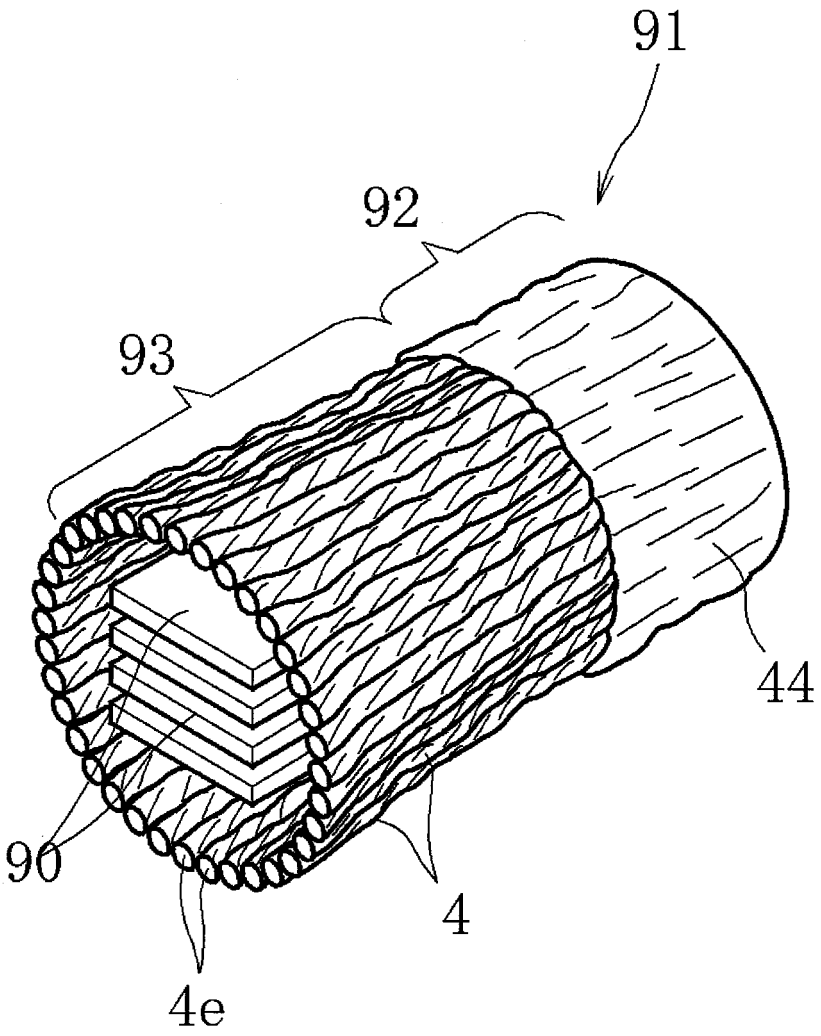


FIG. 13

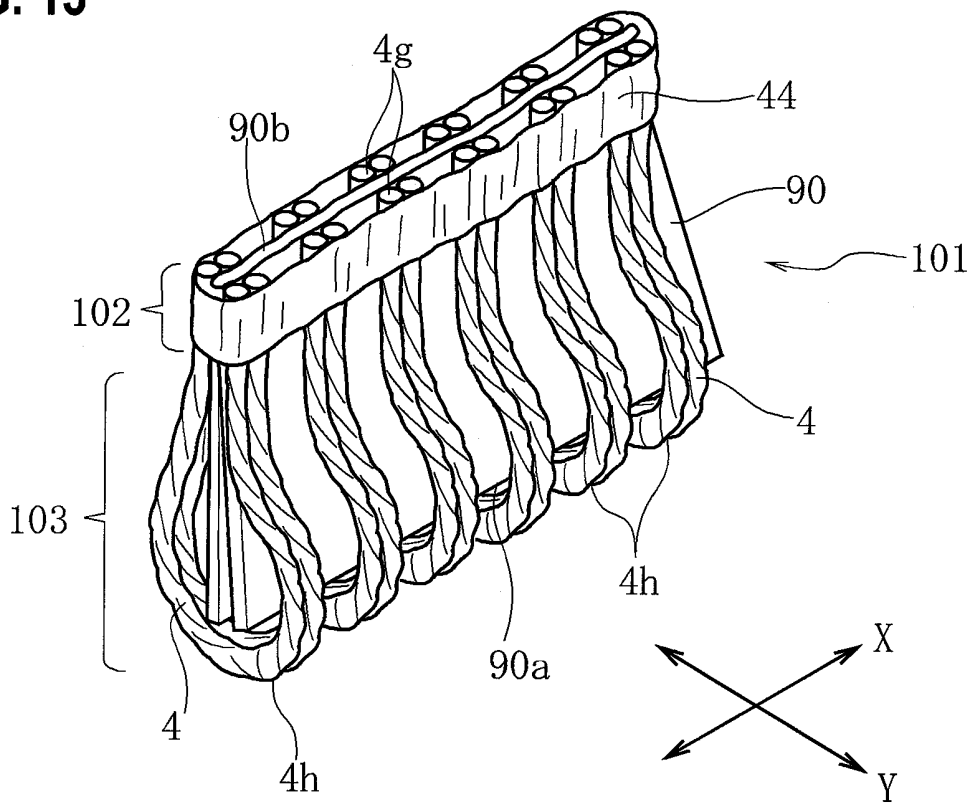


FIG. 14

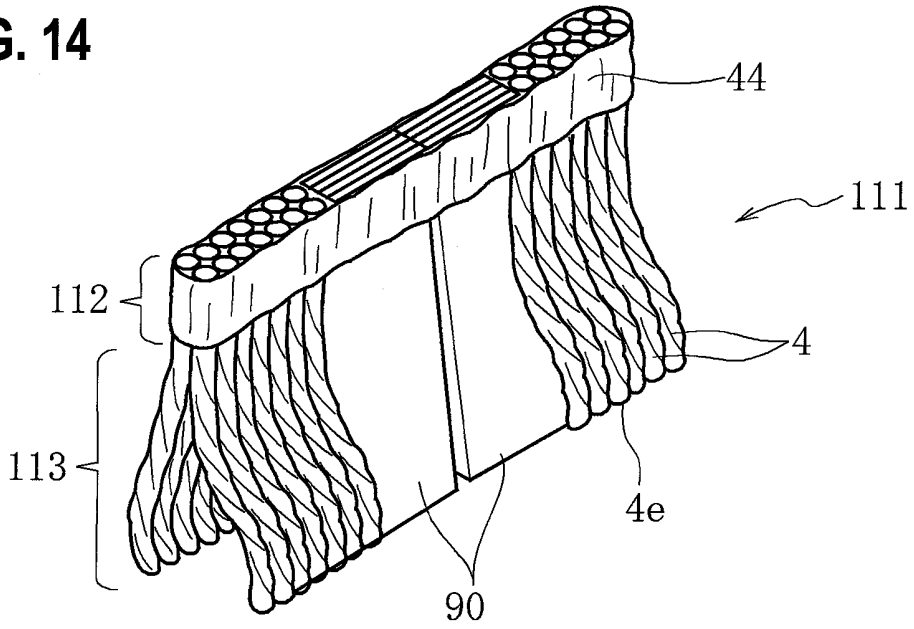
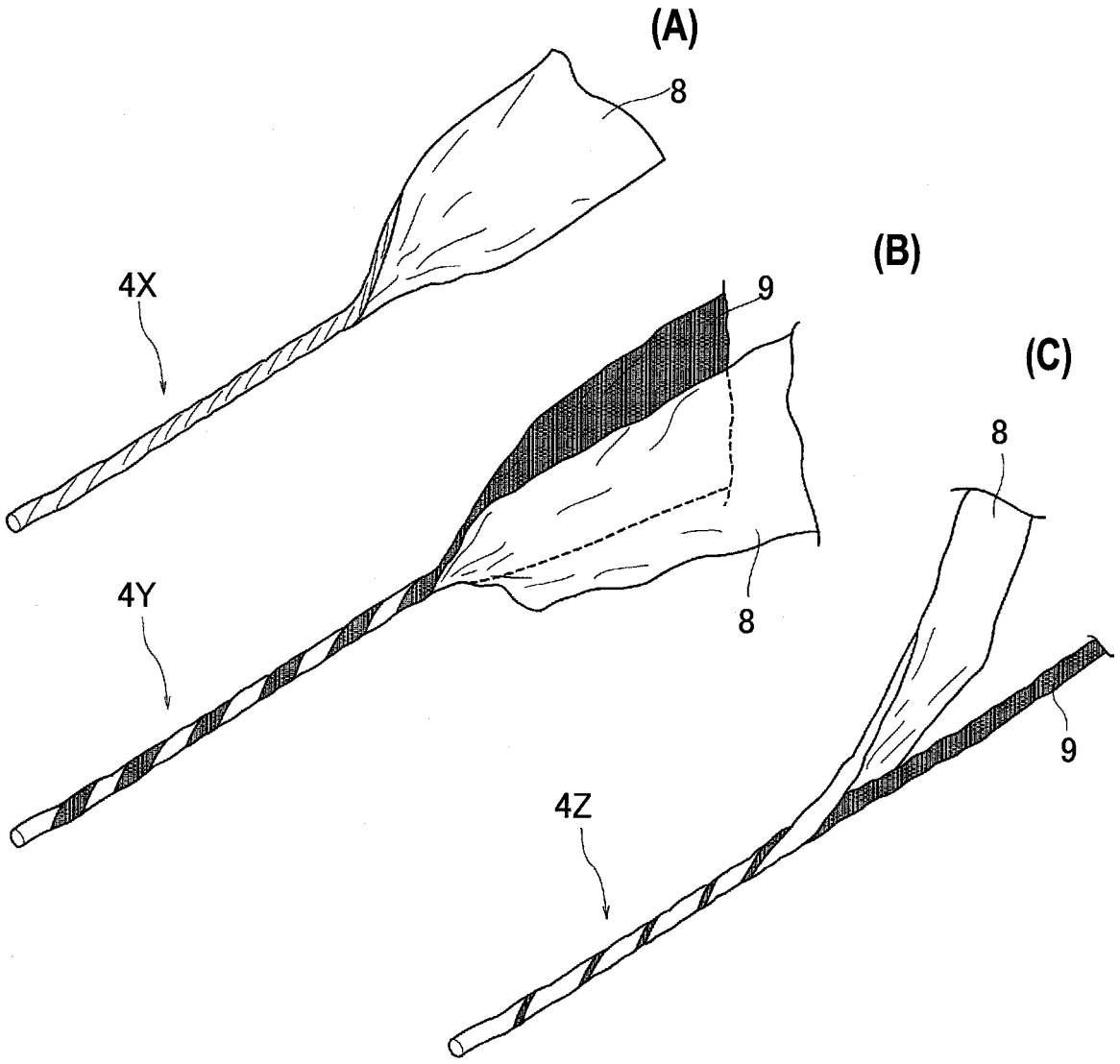


FIG. 15



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/309243

A. CLASSIFICATION OF SUBJECT MATTER
A47K11/10(2006.01), ***A46D1/00***(2006.01), ***A47L13/10***(2006.01), ***A47L13/16***(2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47K11/10(2006.01), ***A46D1/00***(2006.01), ***A47L13/10***(2006.01), ***A47L13/16***(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2006
Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	EP 1024225 A1 (Uni-Charm Corp.), 02 August, 2000 (02.08.00), Claim 1; Par. Nos. [0002], [0010], [0057], [0060] & JP 2001-172851 A & US 6602386 B1	1,2,7 3 4-6,8-13
Y A	JP 3105217 U (Yasumitsu NODA), 21 October, 2004 (21.10.04), Claims 1, 8; Par. Nos. [0063], [0064]; Figs. 1, 5 (Family: none)	3 4-6,8-13

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
08 June, 2006 (08.06.06)	20 June, 2006 (20.06.06)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/309243

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 45524/1993(Laid-open No. 13758/1995) (Sekisui Plastics Co., Ltd.), 20 March, 1995 (20.03.95), Par. Nos. [0009], [0010] (Family: none)	11

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Patent documents cited in the description

- JP 62186833 A **[0002] [0002] [0004]**