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(54) Title: CLEANING INSTRUMENT

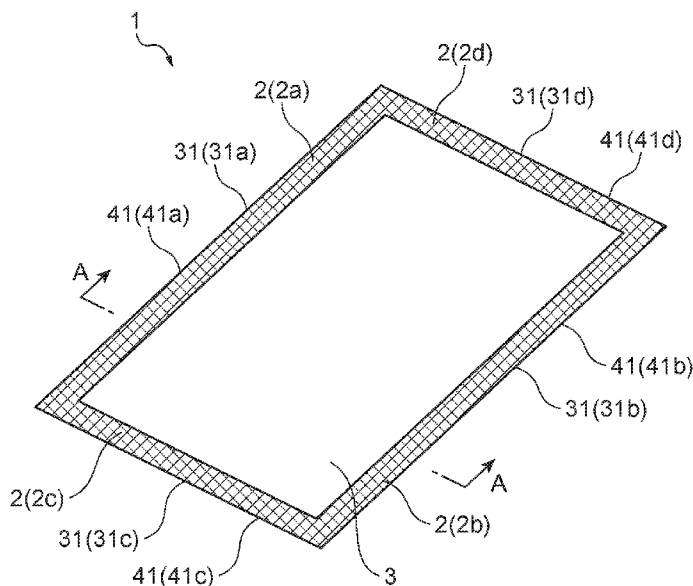


FIG. 1

[Continued on next page]



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(57) Abstract: The invention concerns a cleaning instrument 1 which comprises a knitted fabric 3, 4 that includes a first resin yarn and a second resin yarn. The first resin yarn is flat and the second resin yarn has a fiber fineness of between about 55 denier and about 100 denier. The second resin yarn includes between about 16 and about 80 individual fibers and the knitted fabric has a bulk density of between about 15 cm³/g and 35 cm³/g.

CLEANING INSTRUMENT

TECHNICAL FIELD

The present disclosure relates to a cleaning instrument, and in particular relates
5 to a cleaning instrument that is used around water, such as in a kitchen or the like, for
cleaning applications such as dishware and kettleware and the like, as well as bathtubs and
sinks in bathrooms and the like.

BACKGROUND

10 Conventionally, sponges, or in other words resin foam bodies made of
polyurethane foam or the like, materials where a nonwoven material is applied to the resin
foam body, and materials that are contained in a net material are used as cleaning
instrument that are used around water, such as in a kitchen or the like.
These materials have favorable foaming properties and cleaning agent retention because of
15 the use of a sponge, but water removal after cleaning and water shedding are inferior, so
there is a hygienic problem in that bacteria easily proliferates. Furthermore, there is a
problem that these materials cannot enter narrow places such as in a groove part of a lid of
a sealing container.

Furthermore, cleaning instruments made of a flat knit material are also used as
20 cleaning instruments with improved drying properties such as water removal and water
shedding, but the foaming properties and cleaning agent retention are inferior, so the
cleaning effect is poor.

One prior art attempt to address at least some of these concerns is described in
Japanese Unexamined Patent Application H2009-247789 (the '789 patent application").
25 However, with the cleaner disclosed in the '789 patent application, the foaming properties
and foam retention are insufficient, and steps for continually adding cleaning agent during
the cleaning operation are increased, the amount of cleaning agent that is used is increased,
economics are inferior, and soil removing properties were not enhanced. Furthermore, a
strong force must be repeatedly applied in order to remove grime that has tightly adhered
30 to the cleaning target such as dishware or the like, and this cannot be considered effective.

SUMMARY OF THE DISCLOSURE

Therefore, in order to resolve at least some of these problems, the inventors of the present disclosure invented a material that can be used in a cleaning instrument. In some embodiments, two sheets of knitted or woven fabric are connected by a connecting thread to form a three-dimensional knitted fabric and a peripheral edge part is integrally attached, as disclosed in patent document 1 for example. The cleaning instruments described herein provide strong removal performance toward tightly adhered grime on the cleaning target, and that have favorable drying properties, foaming properties, and/or foam retention. The present disclosure is a cleaning instrument, including a knitted fabric including first resin yarn and a second (flat) yarn made. The first resin yarn can be, for example, twisted. The second (flat) resin yarn is not twisted. In some embodiments, it consists of a flat resin film. In some embodiments, the first resin yarn has a fiber fineness of between about 55 denier and about 100 denier. In some embodiments, the first resin yarn is , made from between about 16 and about 80 individual fibers. In some embodiments, the knitted fabric has a bulk density of between about 15 cm³/g and about 35 cm³/g.

The cleaning instrument of the present disclosure can wipe or scrape off grime that is tightly adhered to the cleaning target by providing a knitted fabric that was knitted from resin yarn and flat yarn made of a resin film. In some embodiments, the cleaning instrument can demonstrate favorable foaming properties and foam retention while having excellent drying properties and tracking properties. In some embodiments, the cleaning instrument has excellent compressing and releasing properties because the bulk density is 15 cm³/g or higher and 35 cm³/g or lower.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of the cleaning instrument according to the present embodiment.

Fig. 2 is a perspective view of the cross-section AA in Fig. 1 of the cleaning instrument according to the present embodiment.

Fig. 3 is a perspective view of a cross-section of a cleaning instrument according to another embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

5 An embodiment of the disclosure is described below while referring to the figures.

Fig. 1 is a perspective view of a cleaning instrument 1, and Fig. 2 is a cross-section perspective view of the cleaning instrument 1 of Fig. 1, when cut at section AA. The cleaning instrument 1 of the present embodiment disclosed in Fig. 1 and Fig. 2 is configured such that a knitted fabric 3 that forms a first surface and a knitted fabric 4 that forms a second surface are joined together such that corresponding end edge parts 31, 41 are mutually joined through a joining part 2, and a void part 5 is formed between the knitted fabrics 3, 4 that are mutually joined. This is one exemplary embodiment. The knitted fabric 3 that forms the first surface and the knitted fabric 4 that forms the second surface retain water and air, both of which assist in foaming of the cleaning agent (where present) when the cleaning instrument 1 is used.

The knitted fabric 3 is a knitted fabric that was knitted from a first resin yarn and a second (flat) resin yarn. The knitted fabric 3 can be knitted using one strand or a plurality of strands of resin yarn. In some embodiments, the knitted fabric 3 includes 2 strands, 3 strands, 4 strands, or 5 strands, with regard to 1 strand or a plurality of strands of flat yarn, such as 2 strands, 3 strands, 4 strands, or 5 strands. The second (flat) resin yarn assists in providing scrape off properties, and the first resin yarn assists in wipe off properties. The desired cleaning performance can be achieved by changing the number and type/combination of strands of second (flat) resin yarn and first resin yarn.

25 In some embodiments, the width of the second (flat) resin yarn that forms the knitted fabric 3 is 0.5 mm or wider or 0.7 or wider. In some embodiments, the width of the second (flat) resin yarn that forms the knitted fabric 3 is 1 mm or narrower or 0.8 mm or narrower. In some embodiments, the thickness of the second (flat) resin yarn can be 30 μm or thicker or 35 μm or thicker. In some embodiments, the thickness of the second (flat) resin yarn is 50 μm or thinner, or 40 μm or thinner. The second (flat) resin yarn can be produced by slitting a resin film sheet to a predetermined width. Alternatively, a film-like flat yarn with a predetermined width and thickness can be directly formed. Any

desired method of fabrication can be used; the fabrication method is not restricted to these methods.

The second (flat) resin yarn, or in other words the resin film material, can include a hydrophobic resin such as polyester, polyethylene terephthalate, polypropylene, polystyrene, and the like. These materials can assist with water removal (drying properties).

The first resin yarn in the knitted fabric 3 can have a fiber fineness of, for example, 55 denier or higher, 100 denier or lower, 60 denier or higher, 90 denier or lower, 70 denier or higher, or 80 denier or lower. Fiber fineness affects, for example, feel on the user's hands and water removal (drying properties). Furthermore, in some embodiments, the first resin yarn is a multifilament yarn made from a plurality of single fibers, and the number of individual fibers in one strand of resin yarn can be 16 or more, 80 or less, 25 strands or more, 75 strands or less, 24 strands or more, or 72 strands or less. The number of individual fibers can affect or provide enhanced water removal (drying properties).

The first resin yarn, or in other words the material of the individual fibers that form the resin yarn, can include a hydrophobic resin such as polyester, polyethylene terephthalate, nylon, polyolefin, polypropylene, and the like. These materials can assist in providing foaming properties.

In some embodiments, the knitted material 4 of the second surface has substantially the same configuration as the aforementioned knitted fabric 3. The knitted fabric 3 and the knitted fabric 4 may be made of the same fabric, or fabrics with different configurations within the aforementioned range of configurations can be used. For example, the knitted fabric 3 that forms the first surface can be a knitted fabric made from a single strand of flat yarn and a single strand of resin yarn, with a focus on the scrape off performance, and the knitted fabric 4 that forms the second surface can be a knitted fabric made from a single strand of flat yarn and 4 strands of resin yarn, with a focus on the wipe off performance.

The cleaning instrument 1 can be made by joining the end edge part 31 of the knitted fabric 3 that forms the first surface and the end edge part 41 of the knitted fabric 4 that forms the second surface, through the joining part 2. The joining part 2 can be formed by overlaying knitted fabric 3 and 4 which are fabrics with the same size, and then sewing together the end edge parts 31, 41. As illustrated in Fig. 1, if the shape of the cleaning

instrument 1 is a rectangle, the joining part 2a can be formed by sewing together the end edge parts 31a, 41a, joining part 2b can be formed by sewing together end edge parts 31b, 41b, joining part 2c can be formed by sewing together end edge parts 31c, 41c, and joining part 2d can be formed by sewing together end edge parts 31d, 41d. The shape and size of the cleaning instrument can be any desired shape or size.

Because of the void part 5 that is formed between the knitted fabrics 3, 4 and the appropriate amount of cleaning agent and water retained by the knitted fabrics 3, 4, when using the cleaning instrument 1, if a user massages the cleaning instrument 1 by hand, or in other words, repeatedly compresses and releases, the cleaning agent, water, and air will mix together favorably, foaming will easily occur, and the foam retention will be favorable.

The bulk density of the cleaning instrument 1 is between about $15 \text{ cm}^3/\text{g}$ and about $35 \text{ cm}^3/\text{g}$. If the bulk density is less than $15 \text{ cm}^3/\text{g}$, the amount of air that is held by the knitted fabric itself will be reduced, and the foaming properties may be inferior. On the other hand, if the bulk density exceeds $35 \text{ cm}^3/\text{g}$, the ability to retain cleaning agent and water maybe reduced, foaming properties may be inferior, and/or the foam retention may be poor.

The method of knitting the knitted fabric of the present embodiment can be a conventionally known method such as a circular knitting machine, flat knitting machine, and the like. Furthermore, the knitting method of the knit fabric can be a conventionally known knitting method, such as flat knitting, rib stitch knitting, purl stitch knitting, and the like.

Example 1:

Cleaning instruments were fabricated by producing weft knitted fabric with the configuration shown in Table 1 for examples 1 to 9 and comparative examples 1 to 8, overlaying two sheets of identical knitted fabric, and sewing the end edge parts together. Furthermore, comparative example 9 was a "NEX™ Foaming Net Cloth", sold by Kikulon Co., Ltd., and comparative example 10 was a "Zubizuba (registered trademark) Sarasshu™ Three-Dimensional Type Wash Every Corner Mesh Scrubbing Brush" (Asahi Kasei Home Products Co., Ltd.).

[Table 1]

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Example 8	Example 9
Size (width/length/thickness) (mm)	130/190/9	130/190/9	130/190/8	130/190/9	120/170/8	120/170/9	120/170/8	130/190/8	120/170/8
Resin yarn (material/fineness (denier)/fiber count (strands)/yarn strands in fabric (strands))	PET/75/36/2	PET/75/36/3 and PET/75/72/1 mixture	PET/75/36/3 and PET/75/72/1 mixture	PET/75/36/3 and PET/75/72/1 mixture	PET/60/30/2	PET/100/36/2	Polypropylene/75/30/2	PET/75/36/1 and PET/75/24/3 mixture	Nylon/75/36/2
Flat yarn thickness (μm)/width (mm) /No. of strands in fabric (strands)	38/0.76/1	38/0.76/1	38/0.76/1	38/0.76/1	38/0.76/1	38/0.76/1	38/0.76/1	38/0.76/1	38/0.76/1
Bulk density (cm ³ /g)	22.95	24.16	23.58	26.88	24.51	20.64	20.13	22.22	17.31
Urethane foam	None	None	None	None	None	None	None	None	None

	Comparative example 1	Comparative example 2	Comparative example 3	Comparative example 4	Comparative example 5	Comparative example 6	Comparative example 7	Comparative example 8	Comparative example 9	Comparative example 10
Size (width/length/thickness) (mm)	80/130/4	180/180/9	180/180/9	120/170/9	120/170/12	80/150/20	80/130/4	80/130/7	260/260/5	200/230/4
Resin yarn (material/fineness (denier)/fiber count (strands)/yarn strands in fabric (strands))	PET/100/36/1	PET/150/48/1 and PET/100/36/1 mixture	PET/150/36/1 and nylon/75/36/1 mixture	PET/150/36/2	PET/250/mo no-filament/1	PET/100/36/1	PET/100/36/1 and acrylic/48/dual thread/1 mixture	Polypropylene/295/10/1 and polypropylene/75/300/1 mixture	--	--
Flat yarn thickness (μm)/width (mm) /No. of strands in fabric (strands)	38/0.76/1	38/0.76/1	38/0.76/1	38/0.76/1	38/0.76/1	38/0.76/1	38/0.76/1	38/0.76/1	None	None
Bulk density (cm ³ /g)	13.33	19.18	18.55	18.06	30.33	--	9.91	18.71	26.24	16.2
Urethane foam	None	None	None	None	None	Yes	None	None	None	None

The cleaning instruments of the aforementioned examples and comparative examples were evaluated, and the results are summarized in Table 2.

Tracking Performance

A test sample was pressed by hand at a force of 0.5 to 0.8 kgf into a groove part (width 2 mm, depth 3 mm) of a lid of a sealing container for foods made of polyethylene, and the ability to fit in the groove was visually evaluated.

Pass: sample fit in the groove

Fail: sample did not fit in the groove

Foaming Properties

The test sample was immersed in water and after sufficient water was absorbed, the sample was squeezed by hand, 3 mL of dish soap (Frosch (registered trademark) Dish Soap Aloe Vera, Asahi Kasei Home Products Co., Ltd.) was applied to the test sample, and the foaming condition after massaging 10 times by hand was visually evaluated.

Pass: sufficient foaming

Fail: foaming was not sufficient

Drying Properties

The test sample was immersed in water and after sufficient water was absorbed, the sample was squeezed by hand and allowed to sit for 16 hours, and then the presence of wetness was confirmed by the touch of hand.

Pass: wetness was not felt

Fail: wetness was felt

Feel on hands

The test sample was directly touched by hand, and the presence or absence of scratchy irritation from the test sample was confirmed.

Pass: irritation was not felt

Fail: irritation was felt

Scrape Off Properties

The test sample was immersed in water and after sufficient water was absorbed, the sample was squeezed by hand, a 0.5 kg weight with a length of 5 cm and a width of 2 cm was placed on the center of the test sample, and when the test sample was moved back and forth for 1 cycle on a polyvinyl chloride sheet to which lipstick was applied, the ability to remove the lipstick in the weighted region was evaluated.

- 1: removal ratio was less than 40%
- 2: removal ratio was 40% or higher and less than 80%
- 3: removal ratio was 80% or higher.

Wipe Off Properties

The test sample was immersed in water and after sufficient water was absorbed , the sample was squeezed by hand, the test sample was rubbed 1 time on a stainless steel plate to which soap grime was adhered, and the ability to remove the soap grime was evaluated. Note that the soap grime was made by uniformly applying calcium fatty acid powder dispersed in alcohol onto a stainless steel plate (SUS 304), allowing the alcohol to evaporate off, and then heating and drying using a heated hotplate for 30 seconds.

- 1: removal ratio was less than 40%
- 2: removal ratio was 40% or higher and less than 80%
- 3: removal ratio was 80% or higher.

The knitted fabrics for cleaning of the present disclosure has suitable scrape off performance and wipe off performance for removing grime that has tightly adhered to dishware as well as sinks and tubs or the like. The knitted fabrics for cleaning of the present disclosure provides a comfortable feel on the hands, tracking properties that can wash a groove or the like of a lid of a sealing container, or in other words flexibility, foaming properties, foam retention, and drying properties are excellent, and thus the fabric can be suitably used in fields with cleaning operations. For example, the fabric can be suitably used for cleaning dishware, as well as bathtubs and sinks or the like in bathrooms.

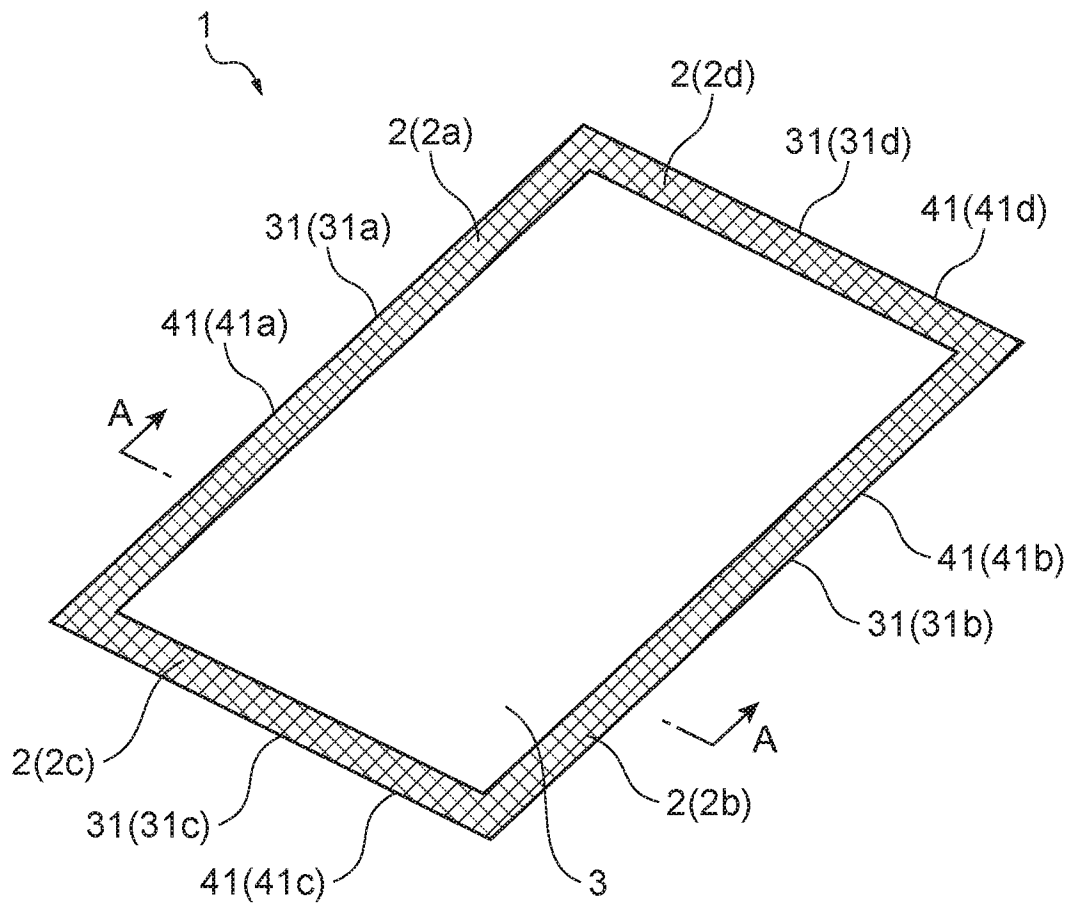
The present disclosure is not restricted to the aforementioned embodiments, and various alternatives are possible within the scope of the present disclosure.

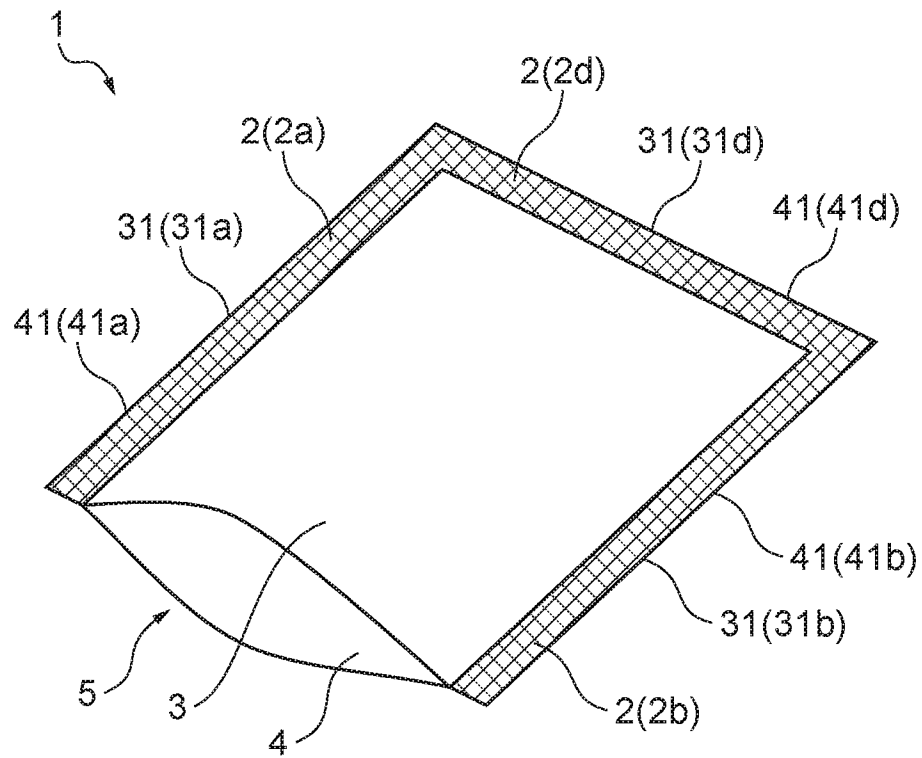
In the aforementioned embodiment, the joining part 2 was formed by sewing together the end edges of the knitted fabrics 3, 4. However, other forms can be used, such as adhering or fusing. Furthermore, with the cleaning instrument 1, the joining part 2 was exposed on the outer circumferential part. But it is also possible to fold inward, and is illustrated in Fig.3, a knitted fabric formed in a tubular shape can be used as the knitted fabric 3, 4, and the cleaning instrument 100 can be formed by closing the ends by sewing both end parts, or the like. In this case, the joining parts 102a, 102b are made from folded over parts of the tubular knitted fabric to form end edge parts 31a, 31b, 41a, 41b of the knitted fabrics 3, 4, and joining parts 102c, 102d are formed by the sewn parts at both ends.

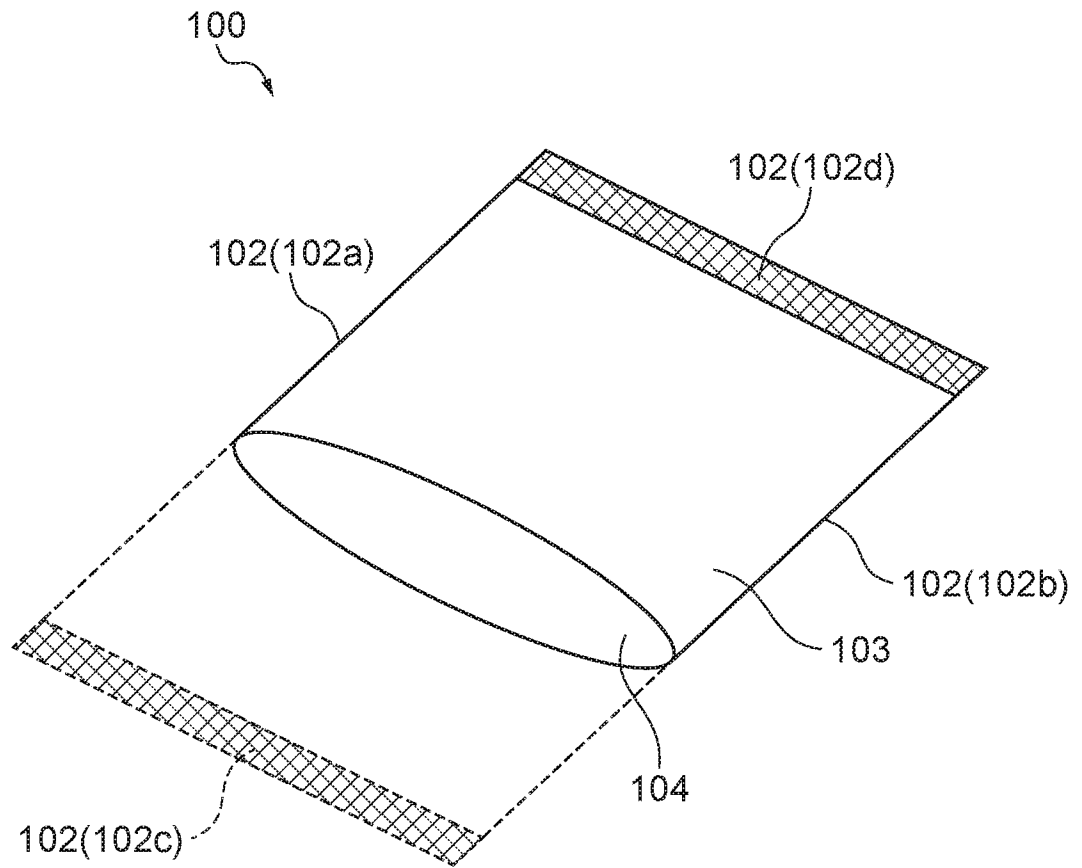
Furthermore, in the aforementioned embodiment, the cleaning instrument 1 was a rectangular cleaning instrument, but the shape is not restricted to a rectangle, and round, oval, triangular, trapezoidal, diamond shaped, leaf shaped, or other shapes are possible.

What Is Claimed Is:

1. A cleaning instrument, comprising:
a knitted fabric that includes a first resin yarn and a second resin yarn, wherein the first resin yarn is flat;
wherein the second resin yarn has a fiber fineness of between about 55 denier and about 100 denier;
wherein the second resin yarn includes between about 16 and about 80 individual fibers; and
wherein the knitted fabric has a bulk density of between about 15 cm³/g and 35 cm³/g.
2. The cleaning instrument according to claim 1, wherein the cleaning instrument includes two sheets of the knitted fabric sewn together along an end edge of each of the two sheets of knitted fabric.
3. The cleaning instrument according to claim 1 or 2, wherein the first and second resin yarns are made of a hydrophilic resin.

*FIG. 1*

*FIG. 2*

*FIG. 3*

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/046267

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47L13/16
ADD.

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)
A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 103 029 A (VALLES FRED G) 10 September 1963 (1963-09-10) column 1, line 32 - line 39; figures -----	1-3
A	US 2010/257685 A1 (TUMAN SCOTT J [US]) 14 October 2010 (2010-10-14) paragraph [0032] - paragraph [0033]; figure 6 -----	1-3
A	US 2012/017937 A1 (SABADE MILIND B [US]) 26 January 2012 (2012-01-26) paragraph [0007] - paragraph [0010] -----	1-3
A	JP 2009 247789 A (ASAHI KASEI HOME PRODUCTS KK; ASAHI KASEI FIBERS CORP) 29 October 2009 (2009-10-29) cited in the application paragraph [0002] - paragraph [0005]; figures -----	1-3



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

7 November 2016

Date of mailing of the international search report

05/12/2016

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2016/046267

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3103029	A	10-09-1963	NONE

US 2010257685	A1	14-10-2010	EP 2416693 A2 15-02-2012
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US 2012017937	A1	26-01-2012	NONE

JP 2009247789	A	29-10-2009	NONE
