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(54) Title: DUSTING ARTICLES CONSISTING OF EASYTRAP AND INTERIOR SCRIM

(57) Abstract: The present disclosure includes a dusting article comprising a first material comprising a lofty nonwoven web, the first material forming a continuous loop with an interior surface and an exterior surface, and a first end and a second end. An adhesive layer is on at least the exterior surface of the first material. A second material comprising a barrier layer is disposed on the interior surface of the first material. And the first end comprises an opening.

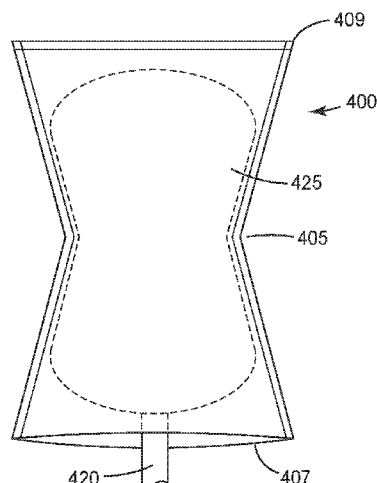


FIG. 4

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- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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DUSTING ARTICLES CONSISTING OF EASYTRAP AND INTERIOR SCRIM

Field of the Invention

The present invention relates to dusting articles. More specifically, the present invention relates to dusting articles with an adhesive layer on the exterior surface and barrier layer on the interior surface.

Background

Private or commercial buildings alike require dusting as part of a maintenance and cleaning schedule. Dusting tools and materials are made from a variety of different constructions. For example, some dusting tools are designed to reach high or low areas. Such tools may include an extended handle with a dusting material on one end. Such dusting materials may range from feathers, to a non-woven material with fringes. In many instances, such dusters result in dislocating dust, but not in actually capturing the dust.

Some dusting materials using adhesive are known. For example, United States Patent 7,560,398 describes a cleaning wipe including a fiber web and a tacky material. The fiber web defines opposing surfaces and an intermediate region between the opposing surfaces. The tacky material is applied to the web such that a level of tacky material is greater in the intermediate region than at a working surface. However, in some instances the tacky material on the opposing surfaces may adhere to the hand of a user. Improvements to cleaning and dusting tools and materials would be welcomed.

Summary

The present disclosure provides several advantages over existing dusting tools, materials and articles. For example a dusting article consistent with the present disclosure can be fitted over an existing dusting tool without damaging or leaving adhesive residue on the surface of the dusting tool. A dusting article consistent with the present disclosure can be worn on a hand, and can be used to collect (instead of simply moving) dust and particles while keeping the hand of a user clean and free of dirt or other residue. In some embodiments, edges of the dusting article can be used to clean dust in corners or crevices of furniture or other surfaces. In some embodiments, the shape of the dusting article can allow for the dusting article to be easily fitted over a dusting tool, but yet be secured and

not prone to sliding off the dusting tool unintentionally. The present invention can also provide the advantage of being disposable (unlike a dusting tool designed for multiple uses). In some embodiments, the present invention has no side bias, in other words, both sides of the dusting article are usable for dusting.

5 In one instance, the present disclosure includes a dusting article. The dusting article comprises a first material comprising a lofty nonwoven web, the first material forming a continuous loop with an interior surface and an exterior surface, and a first end and a second end. The dusting article further comprises an adhesive layer on at least the exterior surface of the first material. The dusting article further comprises a second
10 material comprising a barrier layer disposed on the interior surface of the first material. The first end comprises an opening.

 In another instance, the present disclosure includes a dusting article comprising a first material comprising a lofty nonwoven web, the first material forming a continuous loop with an interior surface and an exterior surface, and a first end and a second end. The
15 exterior surface is treated and the exterior surface attracts particles or collects particles when it comes into contact with the particles; and the interior surface is untreated.

 In some instances, the adhesive layer comprises a pressure sensitive adhesive or a mineral oil tackifying agent.

 In some instances, the first material forming a continuous loop comprises a seam
20 running from the first end to the second end.

 In some instances, the seam is bonded using adhesive, lamination, stitching, thermal, laser or sonic techniques.

 In some instances, the second end is bonded using adhesive, lamination, stitching, thermal, laser or sonic techniques.

25 In some instances, the bonded second end forms a stiff surface.

 In some instances, the first material forms an hourglass shape.

 In some instances, the wherein the first material forms a bowtie shape.

 In some instances, the first material forms a mitt or a mitten shape.

 In some instances, the second material is one of hydrophobic or hydrophilic.

30 In some instances, the article further comprises a hook and loop material to close the first end.

In some instances, the first material extends beyond the second material at the first end.

In some instances, the exterior surface of the first material has a drag value of 0.60 kg or less.

5 In some instances, the first material is impregnated with adhesive.

In some instances, the second end comprises a fringe.

In some instances, the barrier layer is deposited on the interior surface by spraying or coating.

Brief Description of the Drawings

10 The invention may be more completely understood in consideration of the following detailed description of various embodiments of the invention in connection with the accompanying drawings, in which:

FIGs. 1A and 1B show a dusting article consistent with the present disclosure.

15 FIG. 2 is a cross section of a dusting article consistent with the present disclosure.

FIG. 3 is a dusting article with a fringe.

FIG. 4 is a dusting article with a bow-tie shape.

FIGs. 5A and 5B show a dusting article where the first material extends beyond the second material at the first end.

20 FIGs. 6A – 6C show a dusting article comprising hook and loop material to close the first end

FIG. 7 shows a method of assembly for a dusting article consistent with the present disclosure.

25 FIG. 8 shows a method of assembly for a dusting article consistent with the present disclosure.

FIG. 9 shows a schematic of a test track as used in the Examples.

FIG. 10 shows results of the barrier efficacy test as discussed in the Examples.

30 It is to be understood that the embodiments may be utilized and structural changes may be made without departing from the scope of the invention. The figures are not necessarily to scale. Like numbers used in the figures refer to like components.

However, it will be understood that the use of a number to refer to a component in a given figure is not intended to limit the component in another figure labeled with the same number.

Detailed Description

5 FIGs. 1A and 1B show a dusting article 100 consistent with the present disclosure. In FIG. 1A, dusting article 100 is fitted over the head of dusting tool 110. Dusting article includes a first material 102 comprising a lofty nonwoven web and a second material 104. Second material 104 is located near or adjacent to the interior surface of first material 102.

10 In some embodiments, first material 102 has an adhesive layer on its exterior surface. An adhesive layer may be disposed on the exterior surface through any method, such as spraying, coating, and use of a solvent. An adhesive layer may also be distributed throughout first material 102. For example, this may be achieved by using the manufacturing methods described in United States Patent 7,560,398 to Zillig et al., incorporated herein by reference. Adhesive may also be distributed throughout first
15 material 102 using a solvent, roll coating, or other method as will be apparent to one of skill in the art upon reading the present disclosure. A wide variety of adhesives may be used, such as a pressure sensitive adhesive, a moisture activated adhesive, or a tackifying agent (such as a mineral oil tackifying agent). In some instances, adhesives that are designed to retain adhesive properties when wet, hot, cold or under undesirable conditions
20 may be used consistent with the present disclosure. First material 102 may have a basis weight of, for example, 20gsm, 30gsm, 40 gsm, 50 gsm, 75 gsm, 100 gsm, 125 gsm, 150 gsm or 200 gsm or may be within a range formed by any of the preceding values.

 Second material 104 may be made of a variety of materials. In some instances, second material 104 may be a woven or nonwoven scrim or a plastic film. Second
25 material 104 could be knit, and/or could be made of a detackifier material such as silicone, a rubber, latex or plasticized material. Second material 104 may have a basis weight of, for example, 7 grams per square meter (gsm), 15 gsm, 33 gsm, 40 gsm, 50 gsm, 60 gsm, or in a range between any of these values. In some instances, second material 104 is a barrier material. Second material 104 may have hydrophilic or hydrophobic properties. In some
30 instances, second material 104 may be or comprise a barrier layer deposited directly on an interior surface of first material 102.

As shown in FIG. 1A, first material forms a continuous loop with first end 120 and second end 122. In the embodiment shown, first end 120 is open and second end 122 is closed.

Dusting article 100 includes several seams. Seams 124 and 125 join the sides of two pieces of each of first material 102 and second material 104 so that first material 102 and second material 104 form a continuous loop. Seam 126 closes second end 122. In the embodiment shown in FIG. 1A, each of seams 124, 125 and 126 are formed using ultrasonic welding and each include two separate and parallel weld lines (124A and 124B, 125A and 125B, 126A and 126B). While seams 124, 125 and 126 are formed using ultrasonic welding in FIG. 1A, they may be formed using a variety of techniques including adhesive, lamination, stitching, thermal, laser or sonic techniques. While the continuous loop formed by the dusting article 100 in FIG. 1A includes two seams 124 and 125, in some instances the continuous loop includes one or even zero seams.

FIG. 1B shows dusting article 100 over a user's hand 130. Dusting article 100 may take any size or shape consistent with the present disclosure. For example, the width or length of dusting article 100 may be varied. Dusting article 100 may have a varying circumference, such as the shape of an hourglass or a bowtie, or an irregular shape, such as the shape of a mitten to fit the hand of a user. Dusting article 100 may also have a decorative shape, such as a shape intended to appear like an animal (such as a turkey), a geometric or patterned shape or a shape intended to look like an object.

In some instances the dusting article 100 may include a bond line that extends partway between the second end and the first end to allow a user to grip the dusting article 100 between their thumb and index finger. Some configurations may include two such bond lines, mirrored from each other, to allow equal usage of both sides of the dusting article.

FIG. 2 is a cross section of a dusting article 100 consistent with the present disclosure. The cross section shows first material 102 and second material 104 disposed on, near or adjacent to the interior surface of first material 102. First material 102 and second material 104 may have varying thicknesses. A dusting tool, hand or other device for reaching or cleaning may be inserted into the interior 105 of dusting article 100. Second material 104 may serve as a barrier layer between material 102 and a dusting tool. This prevents any adhesive, oil, residue or particles coated on, impregnated in or collected

by first material 102 from coming into contact with a dusting tool or user's hand. Seams 124, 125 and 126 (shown in FIG. 1A) can also form a stiff surface to allow a user to reach into crevices, cracks or narrow places, such as between grates on a vent to collect dust in hard-to-reach areas.

5 FIG. 3 is a dusting article 300 with a fringe 310. As discussed throughout, dusting article 300 includes a first material and second material. In some instances, fringe is formed by creating seam 302 along a horizontal cross section of a continuous loop of first material and second material. The material below seam 302 is used as the major surface of the dusting article, and a dusting tool 320 or hand can be inserted into the opening
10 below seam 302. The material above seam 302 can be sliced vertical in increments to form a fringe 310 at the top of dusting article 300. Fringe 310 is comprised on smaller pieces of material, such as segments 310A, 310B, 310C, 310D, 310E and 310F. Fringe 310 may include both a first material and a second material. In another embodiment, fringe 310 may only include a first material. Fringe 310 provides for multiple flexible
15 surfaces created by segments 310A-310F to collect dust and particles. Segments 310A-310F may provide an ability to reach into small crevices.

 FIG. 4 is a dusting article 400 with a bow-tie shape. Dusting article 400, as shown in FIG. 4 has a bowtie shape where both of first end 407 and second end 409 have a larger circumference than a middle cross section 405. The bow tie shape of dusting article 400
20 allows the dusting article to be easily placed over the head 425 of dusting tool 420 because of the wider opening at first end 407, but also keeps the dusting article 400 in place during use of dusting tool 420 because the narrower section 405 cinches the head 425 of dusting tool 420.

 FIGs. 5A and 5B show a dusting article where the first material extends beyond the second material at the first end. FIG. 5A shows a front view of dusting article 510 with
25 flaps 502 and 504 of first material extending beyond second material, and not adhered to each other on the bottom edge. As shown by dusting article 520, when dusting article 520 is placed over dusting tool 530, flaps 502 and 504 can be used to create a decreased opening side on the first end of dusting article 520 by folding the corners of flap 502
30 around the corners of flap 504, and relying on an adhesive coating on the exterior surface of (or impregnated throughout) the first material to secure the corners of flaps 502 and 504 to each other.

FIG. 5B shows a side view of the dusting articles in FIG. 5A. Dusting article 510 shows flaps 502 and 504 at the first end of dusting article 510 in an open position. Dusting article 520 shows flaps 502 and 504 at the first end of dusting article 510 in a closed position.

5 FIGs. 6A – 6C show a dusting article comprising hook and loop material to close the first end of the dusting article. FIG. 6A shows dusting article 610 placed over cleaning tool 650, with hook material 602 disposed on the interior of at least one side of the first end of dusting article 610. In some instances, hook material is on the interior of one side of the first end of dusting article 610 and loop material is on the interior of the other side of the first end of dusting article 610. In other instances, hook material is on the interior of one side of the first end of dusting article 610, and the first material or second material comprising dusting article 610 acts as loop material to mate with hook material 602. Dusting article 630 shows hook material 602 either mated with a piece of loop material or with the interior of one of the first or second materials of dusting article 620 to secure the dusting article 620 to dusting tool 650.

10 FIGs. 6B and 6C show a front view and side view, respectively, of a dusting article 630 with hook material 606 on each side of the first opening of the dusting article 630, on either side of dusting tool 650. In some instances, hook material 606 is on the interior of one side of the first end of dusting article 630 and loop material 607 is on the interior of the other side of the first end of dusting article 630. In other instances, hook material is on the interior of one side of the first end of dusting article 630, and the first material or second material comprising dusting article 630 acts as loop material to mate with hook material 606. Dusting article 630 shows the first end in an open position, and dusting article 640 shows the first end in a closed position, with hook material 606 connected to loop material 607.

25 While hook and loop material are one method for securing a dusting article consistent with the present disclosure to a dusting tool, other methods may be used, such as cinching, compression, elastic, gathers or ties (like a drawstring), loop closure, tape with release liner, friction to the dusting tool, any other mechanical fastener.

30 FIG. 7 shows a method of assembly for a dusting article consistent with the present disclosure. Assembly 710 shows how a dusting article can be made from four separate pieces of materials, two pieces of first material 712 and two pieces of second material 714.

The four pieces can be bonded together to form dusting article 730 by sealing seams at second end 733 and sides 734 and 735. Seams 733, 734 and 735 can be secured by any fitting manufacturing method, such as adhesive, lamination, stitching, thermal, laser or sonic techniques.

5 Assembly 720 shows how a dusting article can be made from two separate pieces of material, first material 722 and second material 724. First material and second material can be stacked on each other the folded along seam 725, to create dusting article 730. In this instance, seam 733 is formed by the fold and seams 734 and 735 are bonded as discussed herein.

10 FIG. 8 shows a method of assembly for a dusting article consistent with the present disclosure. Assembly 810 shows two pieces of material that are joined to create assembly 820. Specifically, first material 812 and second material 814 are stacked, then edges 815 and 816 are bonded to create dusting article 820. In the embodiment shown in FIG. 8, both first end 824 and second end 822 of dusting article 820 are open, and edge 823 is
15 bonded using any method discussed herein.

Variations on the present invention will be apparent upon reading the present disclosure, and are within the scope of the present invention. For example, the first or second material may be a woven or knitted lofty fabric, or may be any other suitable type of material. Additionally, a bond line may have a different shape than either a first
20 material or a second material. In one instance, a bond line may be used to create a cinch point in the dusting article to ensure the dusting article stays on a dusting tool. Further, an adhesive may be very broadly anything that attracts particles or captures particles upon contact. Other variations will be apparent to one of skill in the art upon reading the present disclosure.

25 **Examples**

Dusting media examples were prepared and tested for debris pickup and drag. Functionality was shown by adequate blocking of adhesive transfer relative to control and increased removal relative to control. These examples are merely for illustrative purposes only and are not meant to be limiting on the scope of the appended claims.

Test Methods:**Dry Debris Pickup**

Each Example used this test. The Example article was weighed before testing to obtain the pre-test weight. A debris mixture was used to execute the test, the mixture was
5 as follows:

5g Medium Test Dust (available from Powder Technologies, Inc, Arden Hills, MN as ISO 12103-1 A3 Medium Test Dust)

The Example article was attached to a 30.5 cm mop head (available from 3M Company, St. Paul MN as 3M EASY SCRUB FLAT MOP). A test track as shown in FIG.
10 9 was prepared on vinyl composite tile flooring secured to a benchtop. The track 90 was 1' x 8' (0.3m x 2.4m) with $\frac{1}{4}$ of the debris mixture 92 poured at one foot (0.3 m) intervals (Figure 1).

To execute the test, the mop head was pulled from the start of the track to the end, reversing the leading edge of the mop before the third debris pile. At the end of the track,
15 the mop was carefully removed and weighed to get the post-test weight.

The pre-test weight was subtracted from the post-test weight to get the amount of debris picked up. The test was done 3 times for each Example and the amounts were averaged. Debris pickup results are reported in grams (g). After each test, the track was cleaned with four passes of clean duster (available from 3M Company St. Paul MN as 3M
20 EASY TRAP DUSTER).

Drag

A Model 100 Force Gauge (available from Chatillon Ametek Company, Brooklyn, N.Y.) was attached to the Example being tested. Upon each article, a 1.36 kg weight (12.7 x 15.2 cm x 2.5 cm block of aluminum) was placed. The Example article was then pulled
25 by the Force Gauge across a vinyl composite tile track (vide supra) for 1.83 meters. The highest value measured after 0.3 meters was recorded. The test was performed three times on each Example article and the results were averaged. The Drag results are reported in kilograms (kg).

Removal

Each Example was placed over the tool for which they were designed: a standard
30 25.4 cm duster (available from Impact Products, Toledo, OH as Lambswool Duster 3106-90), a Swiffer 15.2 duster (available from Proctor & Gamble, Cincinnati, Ohio as

SWIFFER 360° DUSTER EXTENDER), and an Unger 61 cm duster (available from Unger Global, Bridgeport, Conn. as Unger ProFlat Duster 75). The tool was fixed by a clamp so that the length of the handle was parallel to the ground. A DFE Ametek Force Gauge (available from Chatillon Ametek Company, Brooklyn, N.Y.) was attached to the top end of the Example, opposite the handle. The Force Gauge was pulled horizontally, in a line parallel with the ground, along the axis of the handle of the tool, away from the tool. The maximum force (in kg) to pull the Example off of the tool was recorded on the DFE Ametek Force Gauge. The maximum force so-recorded was designated as the Removal Value of the embodiment and was recorded in kilograms (kg). The data reported are an average of at least three tests.

Barrier Efficacy

Two 10.2 cm diameter scouring pads (available from 3M Company, St. Paul, MN as 3M SCOTCH-BRITE 96 General Purpose Scouring Pad) were prepared. The first was wrapped in dusting media (available from 3M Company, St. Paul, MN as 3M EASY TRAP DUSTER) and the second wrapped in the same dusting media and then a nonwoven scrim (available from PGI, Charlotte, NC as HYDROPHOBIC 0.50 OSY COVERWEB WHITE). In turn, these were attached to the top holder of a Frazier Schiefer Uniform Abrasion Tester (available from Frazier Company, Hagerstown, MD). To the bottom holder a clear, acrylic disc (available from Crown Plastics, Inc as Clear Acrylic GP Discs 1/8" x 4" Dia) was attached. A 2.27 kg weight was placed on top of the column and the Tester was run for 100 cycles. After each run, the acrylic disc was removed and the side in contact with the pad was sprinkled with 5 g of crushed quartz (available from Powder Technologies, Inc, Arden Hills, MN as MIL-AV-E-8593F Crushed Quartz). The disc was then shaken off and percussed against the interior of a garbage can to rid any non-adhered quartz. Test classified as a failure if there was quartz adhered to the surface. The results are shown in FIG. 10. Disc 100 on the left shows adhesion of quartz to the surface of the disc, illustrating the amount of adhesive transfer occurring without a barrier. Disc 102 on the right shows the surface of the disc in a scenario where a barrier layer is used.

Example Preparation:

All Examples were prepared in the same fashion, just welded into different sizes, see Table 1 for dimensions. A four layer stack of dusting media (available from 3M Company, St. Paul, MN as 3M EASY TRAP DUSTER), two layers of scrim (available from PGI, Charlotte, NC as HYDROPHOBIC 0.50 OSY COVERWEB WHITE), and another layer of dusting media was created and then heat welded into the Example article using a heat sealer (available from ULINE, Hudson, Wisc, as H-86 Foot-Operated Impulse Sealer- 24"). All of the Example articles were double-sealed along three edges for strength and durability. The Example articles were left with one open edge to insert a tool or hand. The Comparative Example was created in the same fashion as the Examples, with only two layers of dusting media (3M EASY TRAP DUSTER) bonded together.

Table 1 Example Specifications

Example	Overall width (cm)	Overall Length (cm)	Narrow Width (cm)	Length at Narrowest (cm)	Weld Depth from Edge (cm)	Opening Size (cm)	Scrim
Example 1	22.2	31.1	14	15.55	1.3	19.6	Yes
Example 2	20.3	20.3	12.1	10.15	1.3	18.7	Yes
Example 3	14.3	64.8	N/A*	N/A*	1.3	11.7	Yes
Example 4	17.8	20.3	N/A*	N/A*	1.3	15.2	Yes
Example 5	22.2	31.1	N/A*	N/A*	1.3	19.6	Yes
Comparative Example 1	22.2	31.1	N/A*	N/A*	1.3	19.6	No

*No narrow segment

The articles were tested for Debris Pickup, Drag Value, Removal Value, and Barrier Efficacy according to the Test Methods listed above. Results are shown in Table 2 below.

Table 2 Example Test Results

Example	Debris Pickup (g)	Drag Value (kg)	Removal Value (kg)	Barrier Efficacy
Example 1	3.87	0.50	0.32	Pass
Example 2	3.27	0.27	0.36	Pass
Example 3	4.07	0.59	0.36	Pass
Example 4	3.39	0.36	N/A*	Pass
Example 5	3.67	0.45	0.14	Pass
Comparative Example 1	N/A†	N/A†	0.63	Fail

* Example 4 does not fit over a separate tool, so was not tested for Removal Value.

† Comparative Example 1 was only to compare Removal Value and Barrier Efficacy; Debris Pickup and Drag Value tests were not performed.

What is claimed is:

1. A dusting article comprising:
a first material comprising a lofty nonwoven web, the first material forming a
5 continuous loop with an interior surface and an exterior surface, and a first end and a
second end;
an adhesive layer on at least the exterior surface of the first material;
a second material comprising a barrier layer disposed on the interior surface of the first
material;
10 wherein the first end comprises an opening.
2. The article of claim 1, wherein the adhesive layer comprises a pressure sensitive
adhesive or a mineral oil tackifying agent.
- 15 3. The article of claim 1, wherein the first material forming a continuous loop
comprises a seam running from the first end to the second end.
4. The article of claim 3, wherein the seam is bonded using adhesive, lamination,
stitching, thermal, laser or sonic techniques.
- 20 5. The article of claim 1, wherein the second end is bonded using adhesive,
lamination, stitching, thermal, laser or sonic techniques.
6. The article of claim 5, wherein the bonded second end forms a stiff surface.
- 25 7. The article of claim 1, wherein the first material forms an hourglass shape.
8. The article of claim 1, wherein the wherein the first material forms a bowtie shape.
- 30 9. The article of claim 1, wherein the first material forms a mitt shape.
10. The article of claim 1, wherein the second material is one of hydrophobic or
hydrophilic.

11. The article of claim 1, further comprising a hook and loop material to close the first end.

5 12. The article of claim 1, wherein the first material extends beyond the second material at the first end.

13. The article of claim 1, wherein the exterior surface of the first material has a drag value of 0.60 kg or less.

10

14. The article of claim 1, wherein at least one of a bond line or the first material forms a decorative shape.

15. The article of claim 1, wherein the first material is impregnated with adhesive.

15

16. The article of claim 1, wherein the second end comprises a fringe.

17. The article of claim 1, wherein the barrier layer is deposited on the interior surface by spraying or coating.

20

18. The article of claim 1, further comprising a bond line that extends partway between the second end and the first end to allow a user to grip the dusting article between their thumb and index finger.

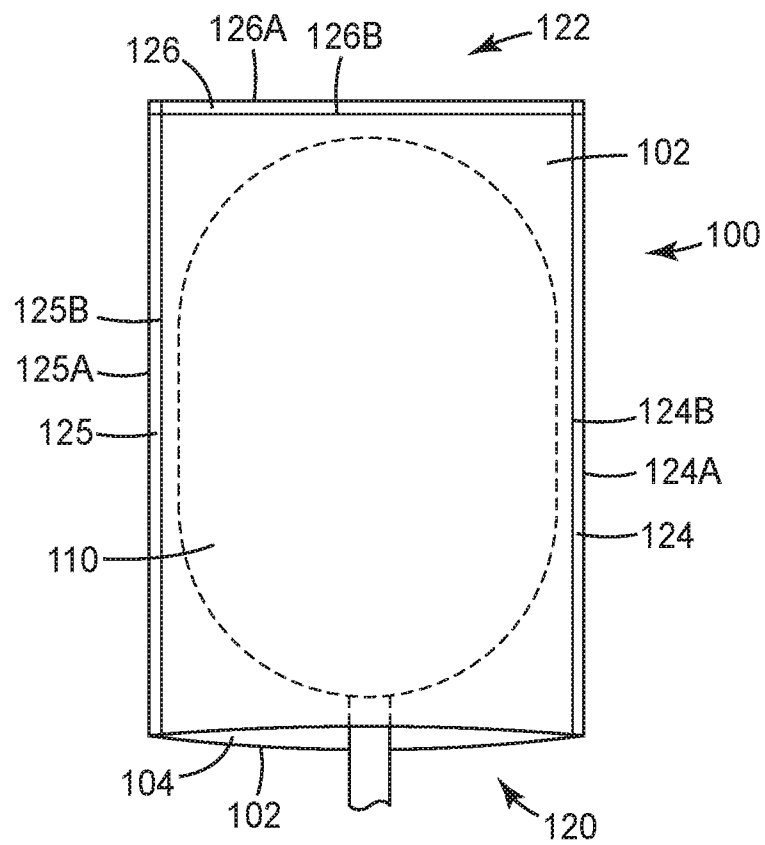
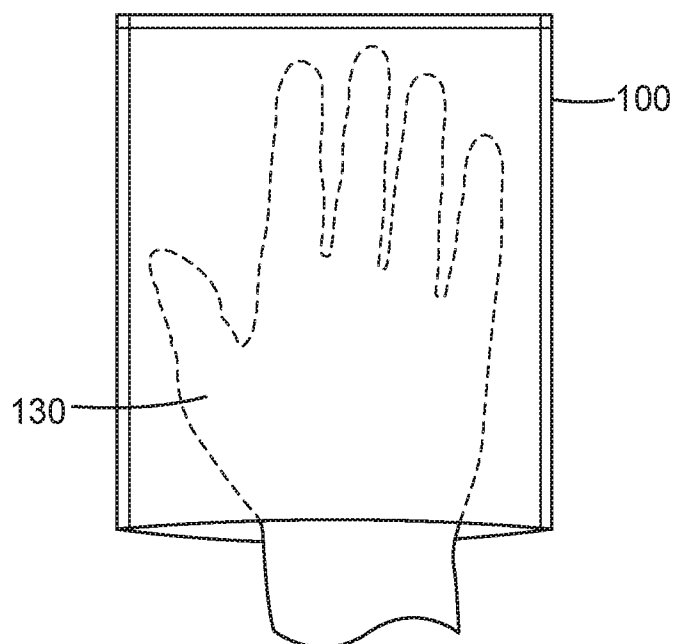
25

19. A dusting article comprising:

a first material comprising a lofty nonwoven web, the first material forming a continuous loop with an interior surface and an exterior surface, and a first end and a second end;

wherein the exterior surface is treated and wherein the exterior surface attracts particles or collects particles when it comes into contact with the particles; and
30 wherein the interior surface is untreated.

1/7

*FIG. 1A**FIG. 1B*

2/7

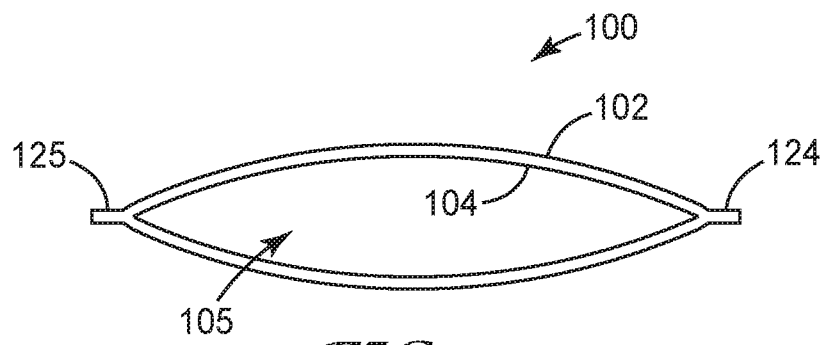


FIG. 2

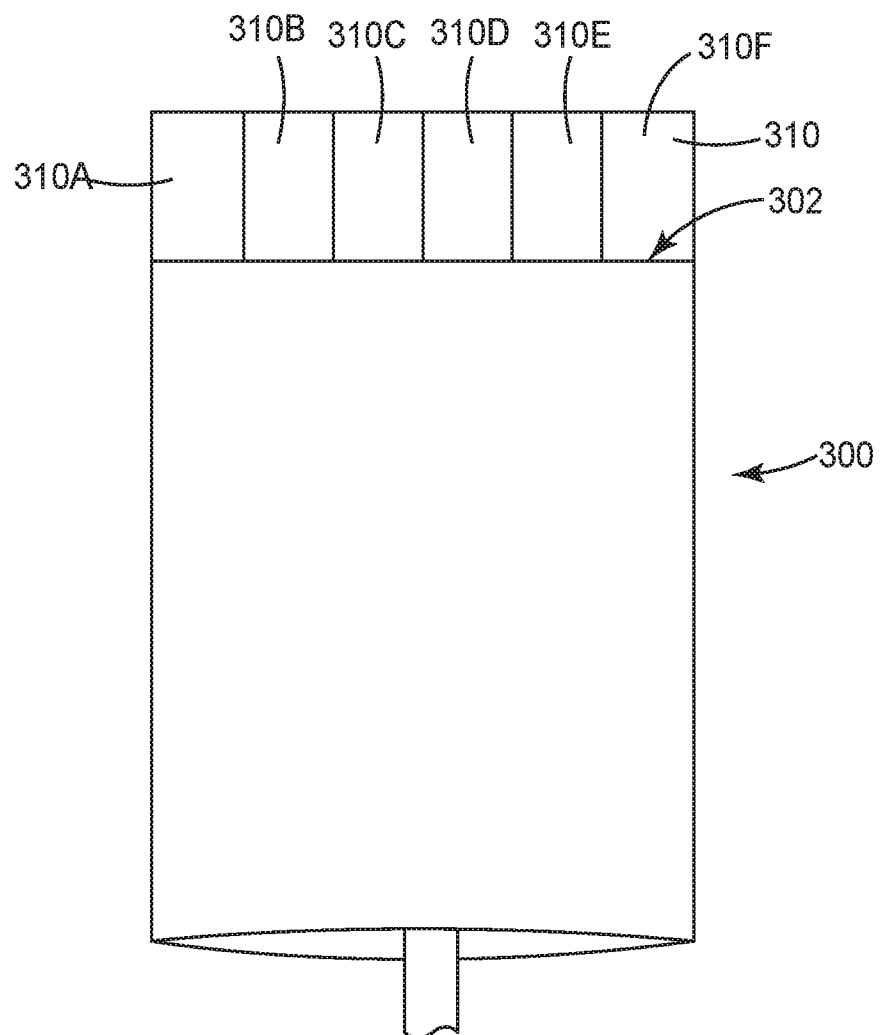
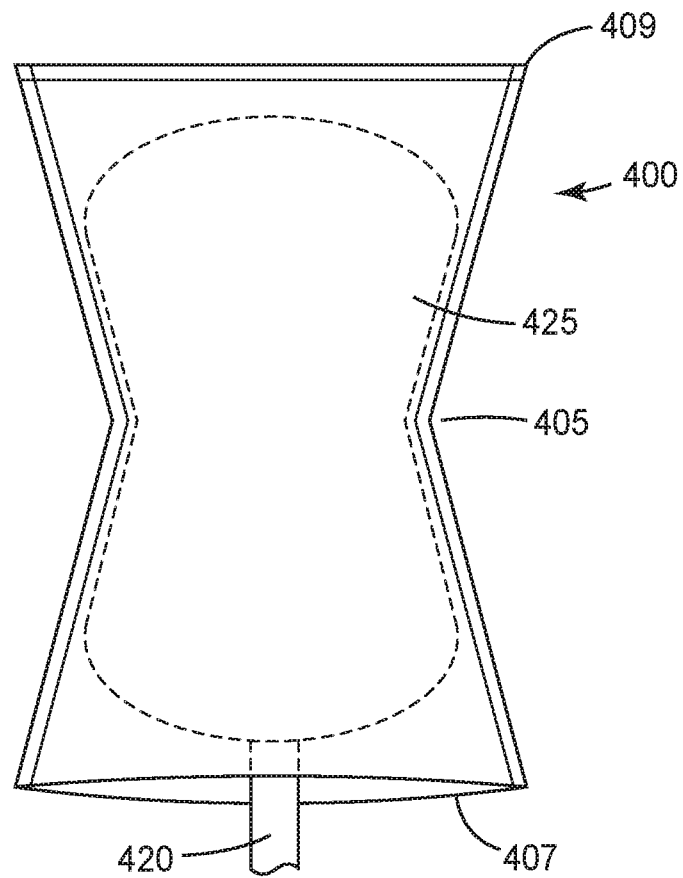
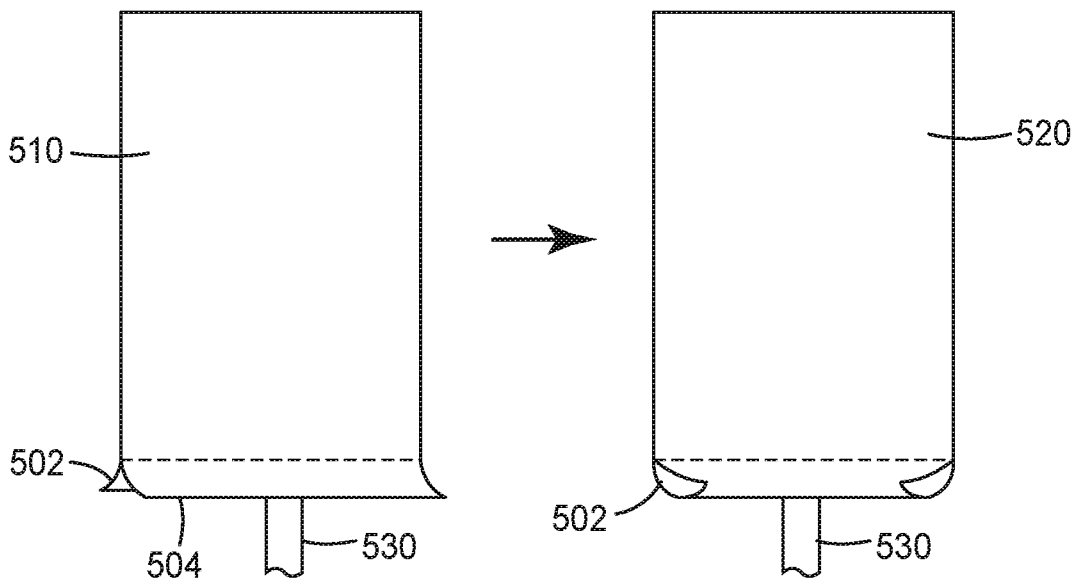
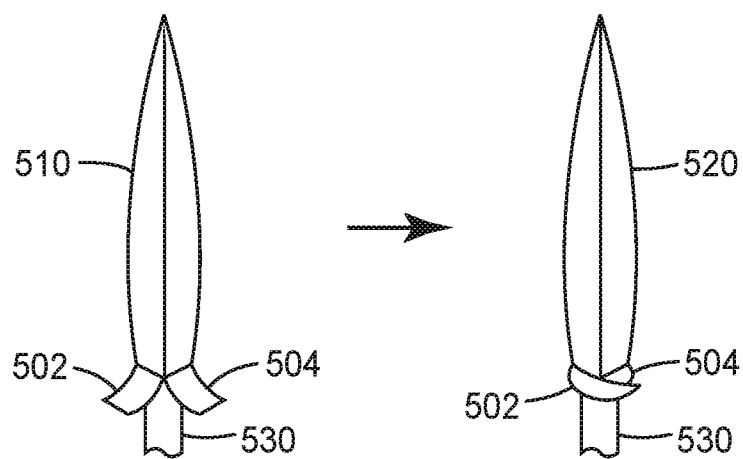


FIG. 3

*FIG. 4*

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*FIG. 5A**FIG. 5B*

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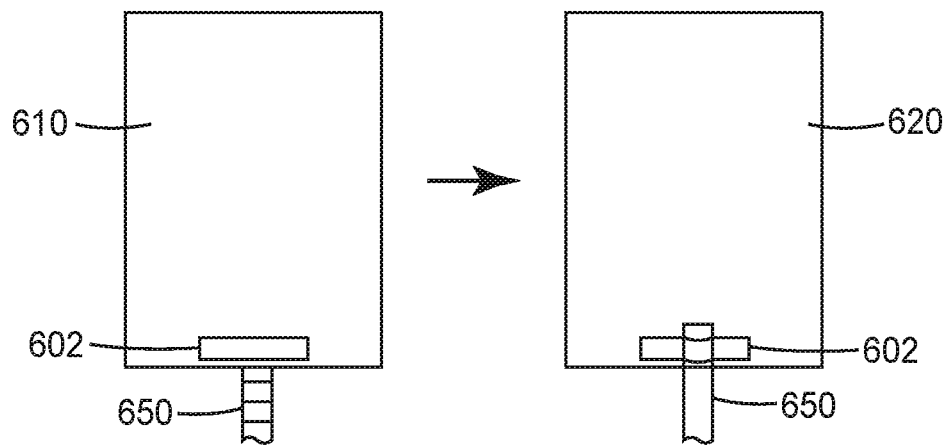


FIG. 6A

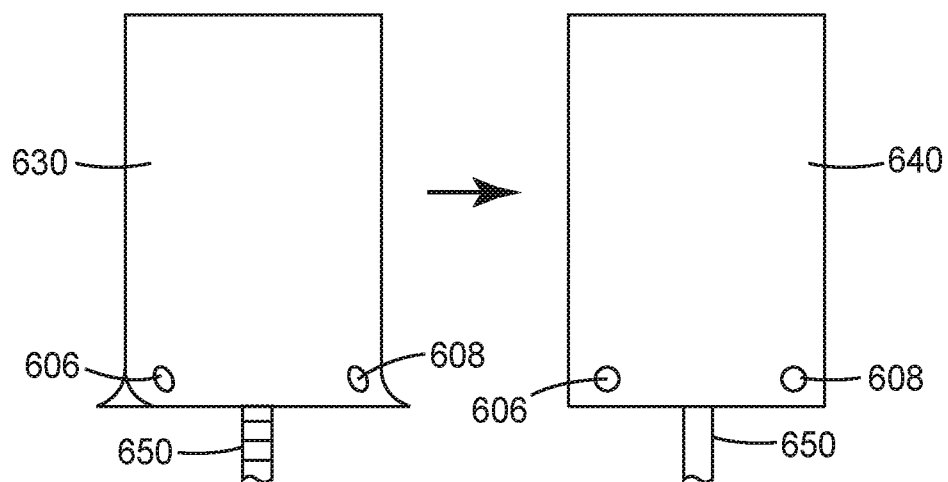


FIG. 6B

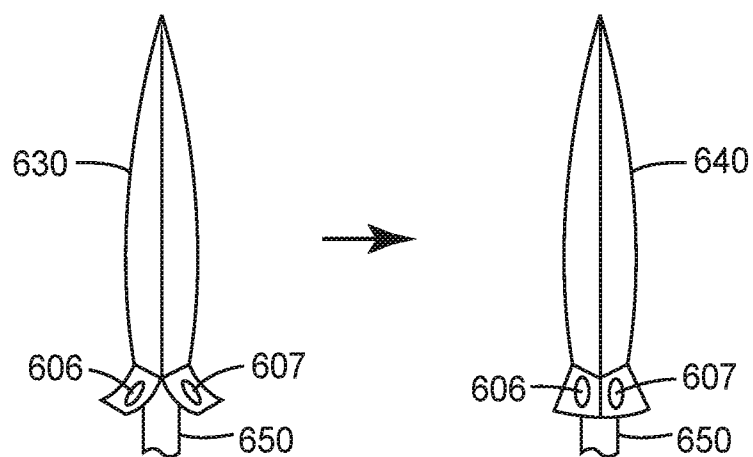


FIG. 6C

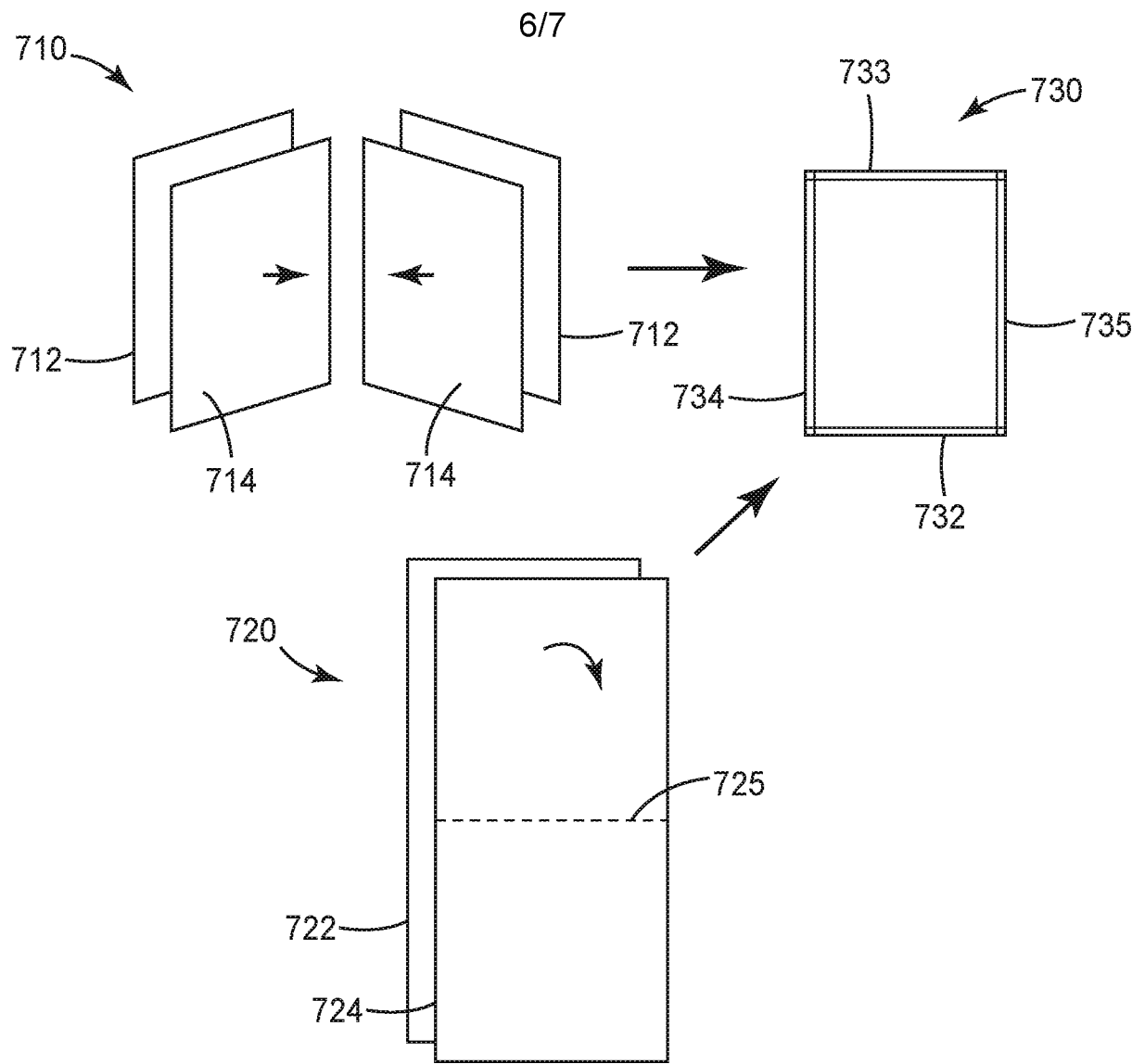


FIG. 7

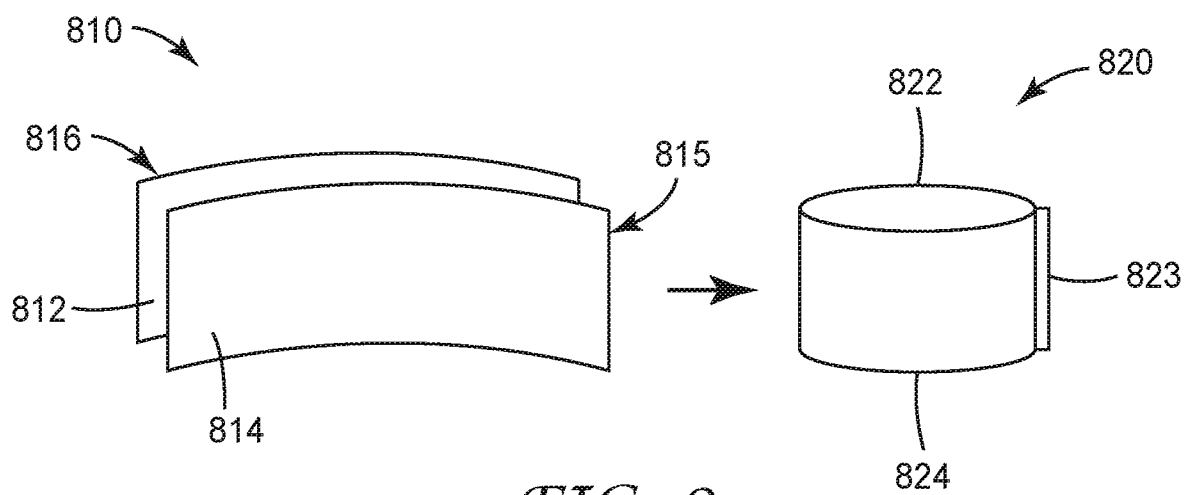
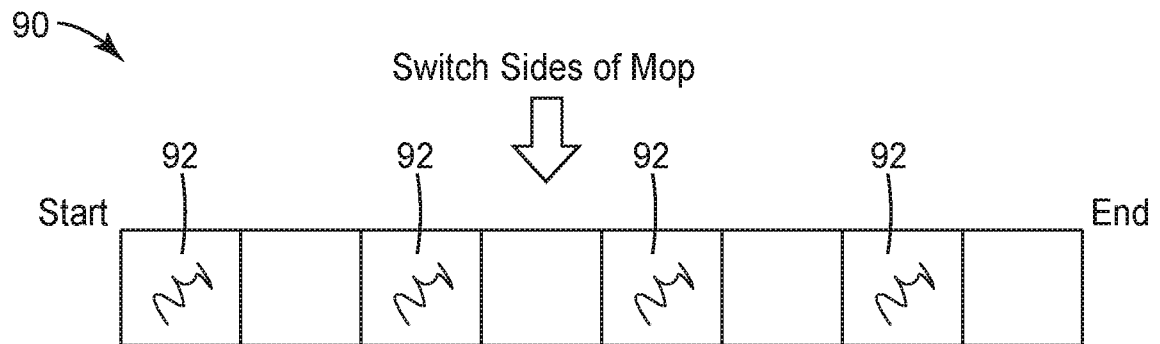
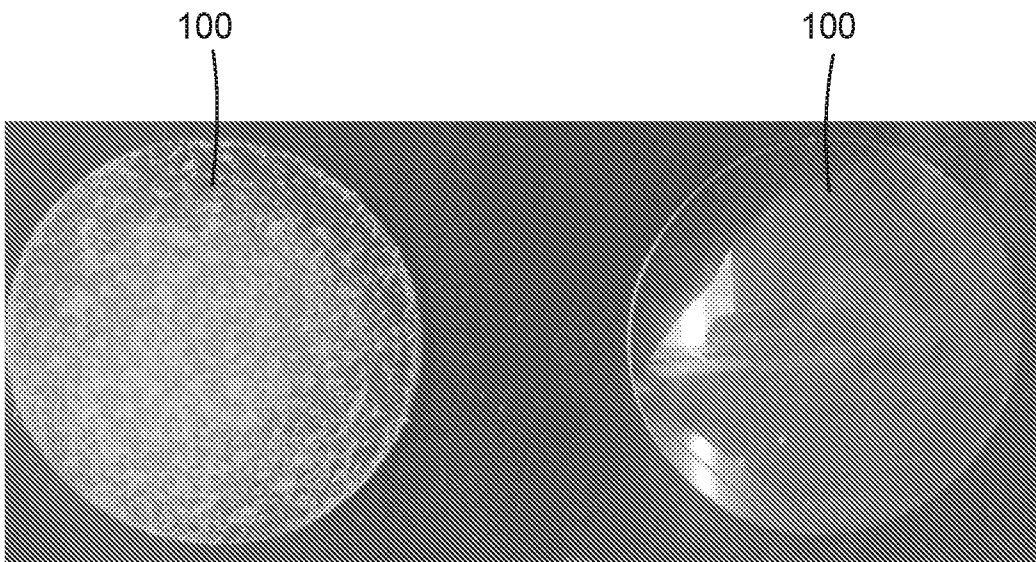


FIG. 8

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*FIG. 9**FIG. 10*

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2018/050379

A. CLASSIFICATION OF SUBJECT MATTER

INV. A47L13/16 A47L13/18 A47L25/00
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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 8 813 302 B1 (CAPITO RITA [US]) 26 August 2014 (2014-08-26) column 4, line 4 - column 6, line 44; figures 1-3 -----	1-19
A	WO 89/02717 A1 (KLOTZ MANFRED [DE]) 6 April 1989 (1989-04-06) page 5, line 1 - page 8, line 22; figures 1-5 -----	1-19
A	US 4 510 640 A (OMORI SHOGO [JP]) 16 April 1985 (1985-04-16) column 2, line 16 - column 3, line 20; figures 1-4 -----	1-19
A	US 7 021 848 B1 (GRUENBACHER DANA PAUL [US] ET AL) 4 April 2006 (2006-04-04) column 12, line 6 - column 15, line 39; figures 2,11,14,17,18,22,23 -----	1-19



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

20 March 2018

Date of mailing of the international search report

29/03/2018

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2018/050379

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 4510640	A	16-04-1985	AU 567465 B2 19-11-1987 US 4510640 A 16-04-1985
US 7021848	B1	04-04-2006	NONE