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(54) **Title:** URINAL SCREEN

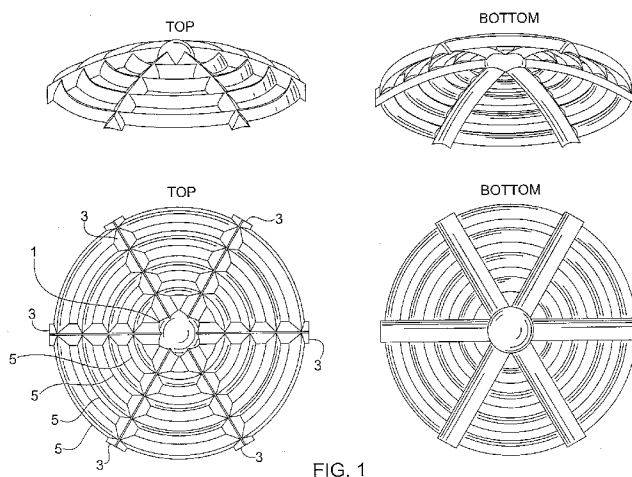


FIG. 1

(57) **Abstract:** Embodiments of the invention provide domed urinal screens. In preferred embodiments the screens include a hub, a plurality of spokes radiating downward from the hub, and a plurality of concentric rings supported by the spokes. Compositions deterring accumulation of fluids on urinal screens are also disclosed.

URINAL SCREEN

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of priority United States Utility Patent Application No. 13/836,788, filed on March 15, 2013, and of United States Provisional Application No. 61/736,201, filed on December 12, 2012. Both of the foregoing applications are incorporated by reference herein.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] Embodiments relate to the field of urinal mats and screens. In some embodiments the mats and screens may be scented. Additional embodiments relate to compositions used in the formation of urinal mats and screens.

2. Background of the Related Art

[0003] Urinals are commonly used in lavatories. Although flushing urinals have been ubiquitous in men's lavatories for some time, non-flushing (or "waterless") urinals are growing increasingly popular for their savings in water and energy.

[0004] Unfortunately, urinals have a number of drawbacks. Deposit of materials into a urinal other than urine or water, such as chewing gum or cigarette butts, may clog the drain or lead to an unsightly appearance until the urinal is able to be cleaned. This is particularly troublesome in a non-flushing urinal, where the drain may lead immediately to a holding and treatment area. Accumulation of non-urine waste in this area could impair the function of the urinal and require more frequent cleaning of the urinal, the holding and treatment area, and any associated plumbing.

[0005] Urinals also suffer from issues of potential “splashback” of urine on a user. This may have many causes, including the hard surface and angle of the urinal. The retention of water in the urinal drain at a level that is visible to a user may also contribute to splashback when the urine strikes the standing pool of water.

[0006] Many solutions for these and other issues have been proposed. The most common solution is the use of a “urinal screen,” also known as a “urinal mat” or simply a “screen.” In its most simple form a urinal screen is a flat polymer sheet, typically circular or approximately circular, that includes one or more holes large enough to allow the flow of urine through the screen and into the drain but small enough to block the passage of other waste. In some instances the sheet includes a central housing that includes a deodorant block. This deodorant block may include surfactants or chelating agents. The urinal screen extends over the drain area of most urinals, though normally it is placed next to the drain if the drain has a cover.

[0007] One example of a urinal screen is shown in United States Patent No. 8,007,707. The '707 patent reports a flat polymer sheet of ethylvinyl acetate. The '707 patent further reports that the sheet has been loaded with a fragrance material. The screen of the '707 patent also includes a plurality of vertical protrusions from the screen. According to the '707 patent, these protrusions increase the surface area of the screen and break up a urinal stream, preventing or decreasing splashback. Unfortunately, as indicated in the '707 patent, these kinds of screens have tendency to float. These kinds of screens are therefore unsatisfactory for use in urinals in which there is a standing water, because the screen may be lifted or washed out of position, allowing debris to enter the drain. Furthermore, the alleged benefits offered by the protrusions are not conclusively proven, and given the large, flat surface area splashback remains a significant possibility.

[0008] Screens shown in the '707 patent and screens like them are also typically unsatisfactory because they do not shed urine. To the contrary, urine may reside on the flat surface between the holes in the screen, or it may be retained in a meniscus created by the holes. The slowly-evaporating urine generates an offensive odor and may leave deposits that gradually build up and clog the holes, interfering with proper urine flow and further exacerbating the problem. Bacterial and fungal growth may also be encouraged by the urine remaining in the meniscus or on the screen. This issue is particularly troublesome with waterless urinals, because the lack of a flushing action means that any urine that is retained remains indefinitely until evaporation.

[0009] Another example of a urinal screen is shown in United States Patent No. 6,920,648. The '648 patent reports a screen that includes a flexible segmented supporting base with a central opening and a central raised housing including a deodorant block. This screen includes a number of slots that also retain urine in a meniscus. Furthermore, the flat top surface of the '648 patent's screen may contribute to rather than discourage splashback.

[0010] It would be desirable to provide an economical urinal screen without one or more of the above-discussed disadvantages. Of course, the ability to eliminate one or more of the above disadvantages is not a requirement for a device to be within the scope of the claims.

BRIEF SUMMARY OF THE INVENTION

[0011] Embodiments of the invention provide urinal screens. In a preferred embodiment the screen is a dome-shaped screen including a central hub, a plurality of spokes radiating out and down from the central hub, and a plurality of concentric rings supported by the spokes. It should be noted that although the common term that will be used herein is "dome," typical

urinal screens of the invention lack a flat bottom surface and are therefore more precisely referred to in a mathematical sense as a “spherical cap.”

[0012] In some embodiments the top surface of the spokes and/or rings may be flat. In other embodiments the top surface may be contoured. In still further embodiments the spokes and/or rings may come to an angular point.

[0013] Further embodiments of the invention provide compositions that are useful for making urinal screens of the design disclosed herein as well as other designs. These compositions include materials that increase the hydrophobicity of the polymer screen, thereby reducing the retention of urine by the screen.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The accompanying drawings incorporated in and forming a part of the specification illustrate several aspects of the present invention and, together with the description, serve to explain the principles of the invention. In the drawings:

[0015] FIG. 1 shows top, bottom, angled top, and angled bottom views of a first embodiment of the invention.

[0016] FIG. 2 shows top, angled top, and side views of a preferred embodiment of the invention. This embodiment includes serrated rings, curved but continuous spokes with concave undersides extending beyond the outer ring, and a rounded hub.

[0017] FIG. 3 shows side, bottom, and top views of another embodiment of the invention. In this embodiment the spokes are discontinuous, and the central hub is smaller than that shown in the embodiment of FIG. 2.

[0018] FIG. 4 shows top, angled, and side views of three similar embodiments that differ in the ratio of height to diameter. The measurements given in FIG. 4 are exemplary only and are

not meant to limit the invention. In each case the diameter of the screen is about 150 mm, though this is also exemplary only.

[0019] FIG. 5 shows top and angled side views of three different embodiments. Each of the embodiments in FIG. 5 have different hub designs. They also have spokes that end at the outer ring.

[0020] FIG. 6 shows a detail of a drip line at the bottom center of a rib.

[0021] FIG. 7 shows a number of embodiments of the invention, each with a different addition to the outermost ring to assist in the flow of urine from the screen. These include, from left to right, multiple separate protrusions arrayed about the outside and bottom of the outermost ring, an outermost ring with a contoured, irregular bottom, and large, regular serrations on the bottom of the outermost ring.

[0022] FIG. 8 shows an angled top view of a preferred embodiment of the invention.

[0023] FIG. 9 shows a bottom view of the embodiment shown in FIG. 8.

[0024] FIG. 10 shows a side view of the embodiment shown in FIG. 8.

[0025] FIGs. 11-14 show additional embodiments and features of screens of the invention.

[0026] While the invention will be described in connection with certain preferred embodiments, there is no intent to limit it to those embodiments. On the contrary, the intent is to cover all alternatives, modifications and equivalents as included within the spirit and scope of the invention as defined by the appended claims.

DETAILED DESCRIPTION OF THE INVENTION

[0027] Embodiments of the invention provide a urinal screen. The urinal screen may have one or more beneficial aspects relating to shape and/or composition, as set forth more fully below.

[0028] I. Composition

[0029] Embodiments of the invention are typically made from a polymer or polymers, including but not limited to high density polyethylene, low density polyethylene, polystyrene, acrylic polymers, polycarbonates, polyurethanes, nylons, ethylene-vinyl acetate (EVA), polyvinyl chloride (PVC), and mixtures or copolymers of the foregoing. In a preferred embodiment a urinal screen is made from EVA, which is a copolymer of ethylene and vinyl acetate.

[0030] EVA used in the invention may have a molecular weight in the range of, for example, 10,000 Daltons to 100,000 Daltons, more preferably 22,000 to 87,000 Daltons. This provides durability as well as the potential for the screen to be loaded with a fragrance that will be released over time. EVA screens are typically formed by press molding, though the method of formation of the screen is typically not material to the properties of the final screen.

[0031] In some embodiments the EVA is infused with a fragrance. This is accomplished, for example, by heating EVA beads with a quantity of fragrance, then allowing the beads and fragrance to cool. The beads, fragrance, and other additives are combined through agitation via a rotary drum mixer, with the application of heat. Fragrance may be introduced into the polymer at weight percents varying from 5 to 40%, from 20 to 40% from 30 to 40%, from 5 to 10%, from 5 to 20%, from 5 to 30%, and from 5 to 35%. In further embodiments, fragrance is introduced into the polymer at a weight percent of about 1%, about 10%, about 20%, about 25%, about 30%, about 35%, or about 40%.

[0032] Those skilled in the art will recognize that one or more fragrances may be used in embodiments of the invention; however, given the other advancements that are discussed herein, some embodiments of the invention do not need to include any fragrance. If addition of

fragrance is desired, suitable fragrances may be selected from those compiled by the U.S. Food and Drug Administration in Title 21 of the Code of Federal Regulations, Sections 172.510 and 172.515, incorporated by reference herein. Fragrance components selected from benzaldehydes, phenols, cinnamic aldehydes and esters, octadienes, dienes, cyclohexadienes, and terpenes may be used in the invention. Fragrance oils are also suitable for use alone or in combination with other fragrance chemicals. Suitable fragrance oils are, for example spice oil, flower oil, and fruit oil.

[0033] Other suitable fragrances include but are not limited to benzyl alcohol, ethyl maltol, furaneol, 1-hexanol, cis-3-hexen-1-ol, menthol, benzaldehyde, hexanal, cinnamaldehyde, citral, cis-3-hexenal, furfural, neral, vanillin, ethyl acetate, ethyl butanoate, ethyl decanoate, ethyl hexanoate, ethyl octanoate, hexyl acetate, isoamyl acetate, methyl butanoate, methyl salicylate, pentyl butanoate, pentyl pentanoate, sotolon, strawberry aldehyde, fructose, anethole, anisole, eugenol, dihydrojasmonone, 2-acetyl-1-pyrroline, 6-acetyl-2,3,4,5-tetrahydropyridine, gamma-decalactone, gamma-nonolactone, delta-octalactone, jasmine lactone, massoia lactone, camphor, citronellol, linalool, nerol, nerolidol, alpha-terpineol, thujone, and thymol.

[0034] Embodiments may also include ingredients directed to odor neutralization. These may be intended to mask, neutralize, and/or prevent the perception of malodors. Examples of suitable odor-neutralizing additives include, for example, but are not limited to activated carbon, activated anthracite, zeolite, silica gel, and baking soda.

[0035] Embodiments of the invention may include additional non-fragrance additives. For example, in preferred embodiments of the invention the screen includes one or more additives that are designed to reduce hydrophilicity and increase hydrophobicity of the screen. Altering

these properties increases the tendency of urine to move away from and off of the screen, because the urine forms “beads” that reduce the amount of urine retained and allow the urine to run off more easily when the surface of the screen is sloping or angled. Although this is beneficial when applied to a typical flush urinal, it is especially helpful when a screen is used with a waterless urinal because the urine will flow off of the screen and into the drain without further action. Decrease in urine residence decreases the unpleasant odors and other effects associated with urine retention.

[0036] We have found that a number of additives are suitable for reducing the hydrophilicity of the EVA or other polymer used in the screen. These include, for example, but are not limited to silicone, silicon waxes, alkylmethylsiloxane, and dimethicone. Inclusion of these additives in the body of the screen itself is superior to surfactant-containing blocks for a number of reasons. For example, they have a greater expected useful lifespan, as the incorporated hydrophilicity-reducing agent is unlikely to be consumed and exhausted as one would expect from a disposable urinal block or cake. Second, the screen is able to shed water (and therefore urine) without the need to release potentially troublesome surfactants or chelating agents into the environment, which is done with a conventional block or cake.

[0037] Various other additives such as color additives may be added in different embodiments depending on desired characteristics of a particular screen. Plasticizers may also be added to polymeric materials that are used in embodiments of the invention. These may include, for example, diethyl phthalate and tri-acetic acid ester of glycerin.

[0038] II. Shape

[0039] Embodiments of the invention may be shaped in one or more ways that offer many beneficial aspects. A particularly preferred embodiment of the invention may be appreciated

with reference to FIG. 1. Although FIG. 1 includes multiple beneficial aspects in a single screen, those of skill in the art are likely to recognize that many of the advances disclosed herein will be useful alone or in combination with less than all of the other aspects.

[0040] FIG. 1 shows a urinal screen including a central hub 1 from which a plurality of spokes 3 depend. The spokes support a plurality of concentric rings 5. Because the spokes shown in this embodiment curve downward from the hub, the rings are at different elevations relative to the hub. The combination of rings and spokes forms a plurality of voids through which urine may travel. This is done without the formation of a meniscus, substantially aiding in flow of the urine to the drain.

[0041] The domed shape of the urinal screen shown in FIG. 1 offers a number of advantages. First, elevation of a substantial portion of the screen helps prevent the screen from floating on the surface of any water retained in the urinal drain. This is different from other screens, particularly other EVA screens, which may float on the surface of water retained in the drain if it is high enough. This can allow debris to flow under the screen and into the drain.

[0042] The ability of the screen to resist floating is also assisted by the weight provided by the polymer in the hub. Furthermore, the tendency of the hub to stay above all but the deepest standing drain water (which would likely result only through a malfunction of the urinal) provides a consistent evaporative route for any fragrance that has been included in the screen.

[0043] The domed screen offers other significant advantages. For example, the domed shape provides space for the screen to be placed over a urinal drain that has a protruding drain cover. This is significantly different from a conventional flat screen, which is usually placed haphazardly in the urinal and fails to function in any but an ornamental sense.

[0044] We have surprisingly found that when the screen is constructed of EVA the screen is able to maintain the domed shape despite the relative flexibility of the EVA. This allows the screen to have a relatively rigid shape that prevents deformation that would allow debris to enter the urinal drain. Although the screen may be deformable, it typically returns to its pre-deformed shape with little effort. This may be referred to as “semi-rigid” and is in marked contrast to existing conventional screens, which typically freely bend to roughly adopt the shape of the bottom of the urinal into which they are placed, and which are unable to maintain a domed shape.

[0045] The domed screen also significantly deters splashback. This is the result of a number of elements working in unexpectedly beneficial combination. First, the dome creates a significant void into which urine may flow before striking a standing urine pool. This creates more open area than a conventional screen without compromising the ability of the screen to protect the drain. If by chance the stream is reflected, it is most likely to hit a component of the dome and be retained rather than splashing back. Second, the curved dome is markedly different from a conventional screen, which creates a flat, reflective surface normal to the typical urine flow and encourages splashback. Flat screens sometimes use a multitude of hair- or pin- like elements to suppress the splashback; unfortunately, these collect debris, making them look dirty. They also significantly collect urine, adding to the odor issue.

[0046] The height and curvature of the dome may vary. Typically the ratio of the height of the dome to the diameter of the dome is about 1:4, though significant variations in that range are possible. For example, in some embodiments the ratio of the height of the dome to the diameter of the dome is between 1:2-1:8, 1:2-1:6, 1:2-1:4, 1:4-1:6, 1:4-1:8, or 1:6-1:8. FIG. 4 shows three different embodiments of the invention, each varying from the other in ratio of

height to diameter. These may have different applications depending, for example, on the size of the urinal or the presence of a metal urinal drain.

[0047] The spoke and ring design of the screen also offers significant advantages in avoiding the formation of a meniscus. The varying height of the concentric rings creates voids that are angled and that do not tend toward meniscus formation. To the extent that any meniscus may be present, the angled voids render it short-lived.

[0048] The formation of a meniscus is further deterred by the use of angles or curvature on the spokes and the rings. In some embodiments the spokes have a peaked top. In other embodiments the rings have peaked or contoured tops, either in addition to or in the alternative to the peaks or contours of the spokes. Both the top and bottom of the spokes and rings may be peaked or contoured.

[0049] When the top of a spoke or ring is peaked, the more narrow peak angles tend to be more effective at shedding urine; however, too great of an angle decreases the anti-splashback advantages of the screen. A more acute angle encourages more efficient flow of urine through the screen; typically the angle is balanced between draining and presenting a flat surface which will splash-back.

[0050] In addition to a top angle or curvature, spokes may have one or more ridges on the bottom of the spoke, running parallel or approximately parallel to the direct of the spoke. These ridges help direct urine away from the bottom of the screen and into the drain. Edges of the spokes and/or rings, preferably the terminal edges, may be scalloped or serrated. This may further decrease the amount of urine that is retained on the screen. These serrations are not required to extend any particular length into each spoke or ring, though having them extend between 1% to 25% into the ring is typical. They may be located on one or both sides of each

ring or spoke. Sample serrations are shown in FIG. 2. As shown, for example, in FIG. 1, the underside of each spoke may be concave, either along the entire length or along part of the length of the spoke.

[0051] Spokes may end on the outermost ring, as shown in embodiments of FIG. 5. In some embodiments, and as shown for example in FIGs. 1 and 2 and elsewhere, the spokes may also extend beyond the circumference of the outermost ring. This may aid in urine flow and prevent the bottom ring from resting directly on the bottom of the urinal, potentially managing urine flow between the bottom of the screen and the urinal surface.

[0052] Additional features may be included on the underside of one or more of the rings to enhance flow. Typically these are on the underside of the last ring. FIG. 7 shows multiple additional options for the ring bottoms. The leftmost column in FIG. 7 shows multiple separate protrusions arrayed about the outside and bottom of the outermost ring. The central column in FIG. 7 shows an outermost ring with a contoured, irregular bottom. The rightmost column in FIG. 7 shows large, regular serrations on the bottom of the outermost ring.

[0053] Spokes may include further features that enhance the removal of urine from the screen and hasten its deposit in a drain. For example, the bottom of one or more of the spokes may include a “drip line.” This line, typically located in the bottom center of each rib, helps guide urine away from the center of the screen. A detail showing such an element is in FIG. 6.

[0054] Although shown and described as a “central hub” in FIG. 1, this is not the only possible structure for the central element of embodiments of the invention. Alternatives are shown in FIG. 5, including a central hub with a hole for urine flow, a rounded central hub, and a flat central hub.

[0055] The many advancements provided by the inventive screens allow a significant decrease in the amount of urine that is retained on the screen, offering a significant advantage to both flushing and non-flushing urinals. For example, embodiments of the invention may retain urine relative to their original weight in the amounts of 1-10%, 1-5%, 2-4%, or about 4%.

[0056] Although embodiments of the invention have been described as having a dome or spherical cap shape, it should be understood that the rings may be elliptical if the spokes do not have equal lengths. A cone shape may also be formed. Although some embodiments do form a right circular cone, there is no requirement that this be the only permitted shape. The rings need not be concentric in all embodiments of the invention. In some embodiments the rings are circular on one side and flat on the other, allowing the screen to be properly seated in a urinal that has a flat back and short drain area.

[0057] Although the spokes in FIG. 1 are linear and continuous from the central hub, it will be appreciated that in some embodiments the spokes are not linear. In some they are not continuous. In some embodiments they are neither. For example, FIG. 2 shows spokes that are continuous but that, at their ends, are not linear.

[0058] FIG. 3 shows an embodiment in which the spokes do not continuously radiate from the central hub to the end of the final ring. Instead, each ring is connected by a series of smaller spokes to the next ring. In this embodiment the ability to stagger the spokes relative to each other prevents the alignment of the voids between the rings, allowing increased urine flow and further decreasing the likelihood of urine retention.

[0059] Examples

[0060] The following example is given to help those skilled in the art appreciate the invention. It should not be construed to limit the scope of the claims.

[0061] A preferred embodiment of a screen of the invention is shown in FIGs. 8-10. FIG. 8 shows an angled top view of a screen having a central hub, rounded rings, and discontinuous spokes. The width of each ring varies along the ring, allowing creation of non-uniformly-shaped voids between the rings and the spokes. As shown in FIG. 9, the underside of each ring is concave. FIG. 10, which is a side view, shows that the outermost ring includes long, regular serrations at its bottom edge, assisting with the transport and removal of urine. After trials, we found that the prior art urinal screens lacking the components and shape of the inventive screen retained an average of 24% of their original weight in fluid, while the inventive screens retained only 4%.

[0062] Of course, those skilled in the art will, with the advantage of this disclosure, recognize variations and alternatives to the subject matter that is disclosed herein. To the extent possible the claims encompass material within the scope and spirit of the claims.

We claim:

1. A urinal screen comprising:
a central hub;
a plurality of spokes depending outward and downward away from said central hub; and
a plurality of concentric rings, wherein the rings are centered about the central hub, and
wherein the rings are supported by the plurality of spokes, and wherein the spokes and rings
define a semi-rigid domed shape.
2. The urinal screen of claim 1, wherein said central hub is circular, spherical, annular,
square, rhomboidal, or hemispherical.
3. The urinal screen of claim 1, wherein said urinal screen comprises ethylene-vinyl
acetate (EVA).
4. The urinal screen of claim 3, wherein said urinal screen further comprises at least
one member of the group consisting of dimethicone and silicone.
5. The urinal screen of claim 4, further comprising at least one fragrance.
6. The urinal screen of claim 3, further comprising at least one fragrance.
7. The urinal screen of claim 1, wherein said plurality of spokes and said plurality of
concentric rings form a framework of a cone.
8. The urinal screen of claim 1, wherein said plurality of spokes and said plurality of
concentric rings form a framework of a spherical cap.
9. The urinal screen of claim 1, wherein said spokes have equal lengths.
10. The urinal screen of claim 1, wherein each of said spokes has a top surface, and
wherein the top surface of at least one spoke is peaked.

11. The urinal screen of claim 1, wherein each of said spokes has a top surface, and wherein said the top surface of at least one spoke is contoured.

12. The urinal screen of claim 1, wherein each of said spokes has a bottom surface, and wherein the bottom surface of at least one spoke is contoured.

13. The urinal screen of claim 1, wherein each of said rings has a top surface, and wherein the top surface of at least one ring is peaked.

14. The urinal screen of claim 1, wherein each of said rings has a bottom surface, and wherein the bottom surface of at least one ring is contoured, serrated, or arrayed with a plurality of vertical protrusions.

15. The urinal screen of claim 1, wherein each of said rings has a circular cross-section.

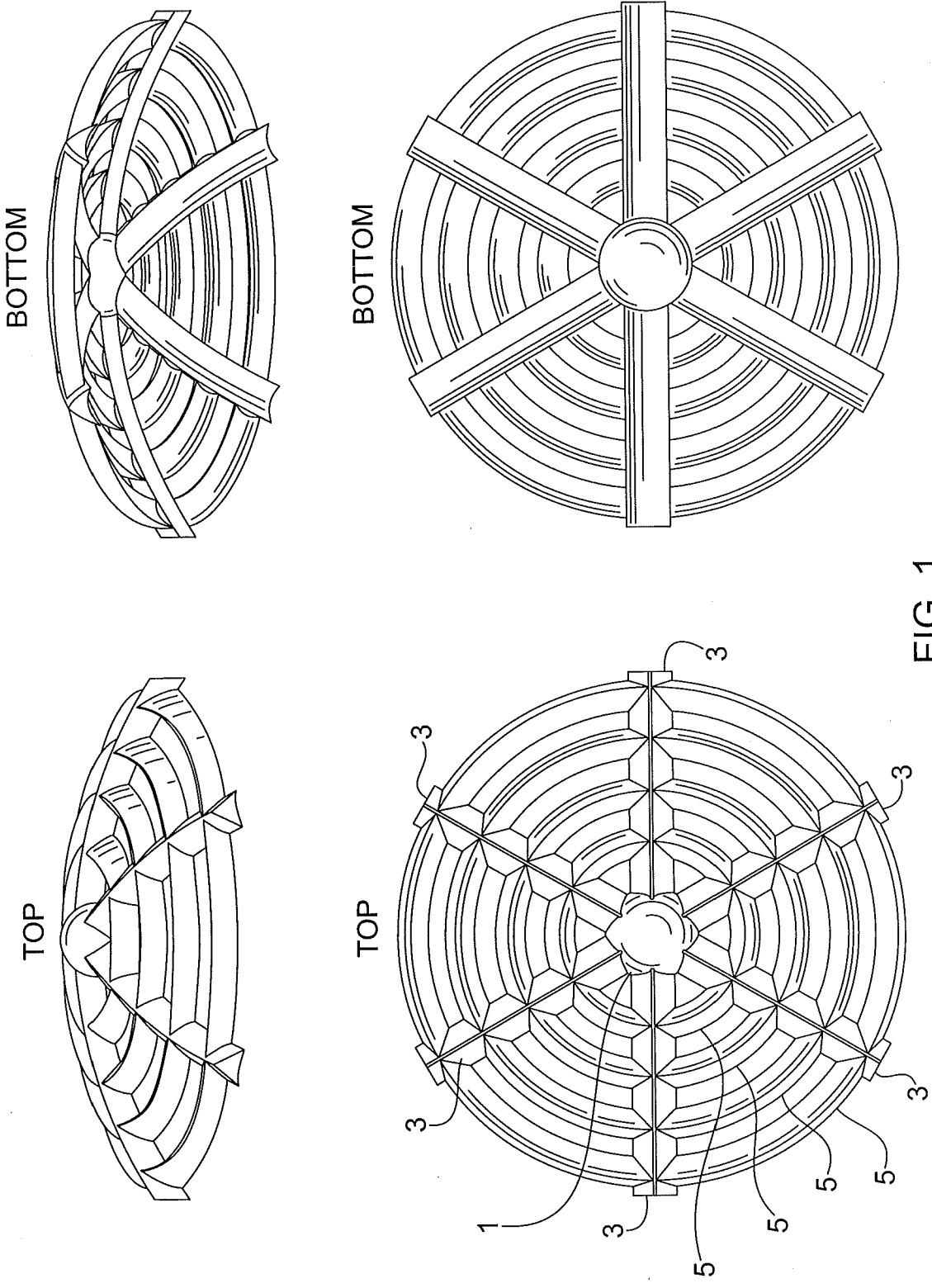
16. The urinal screen of claim 1, wherein each of said spokes has a bottom surface, and wherein the bottom surface of at least one of said spokes includes a linear protrusion along the length of said spoke.

17. The urinal screen of claim 1, wherein at least one of said spokes and said rings is serrated on at least one edge.

18. A urinal screen comprising EVA and at least one member of the group consisting of dimethicone, alkylmethylsiloxane, and silicone.

19. The urinal screen of claim 18, further comprising at least one fragrance.

20. A urinal screen comprising at least one member of the group consisting of dimethicone, alkylmethylsiloxane, and silicone.



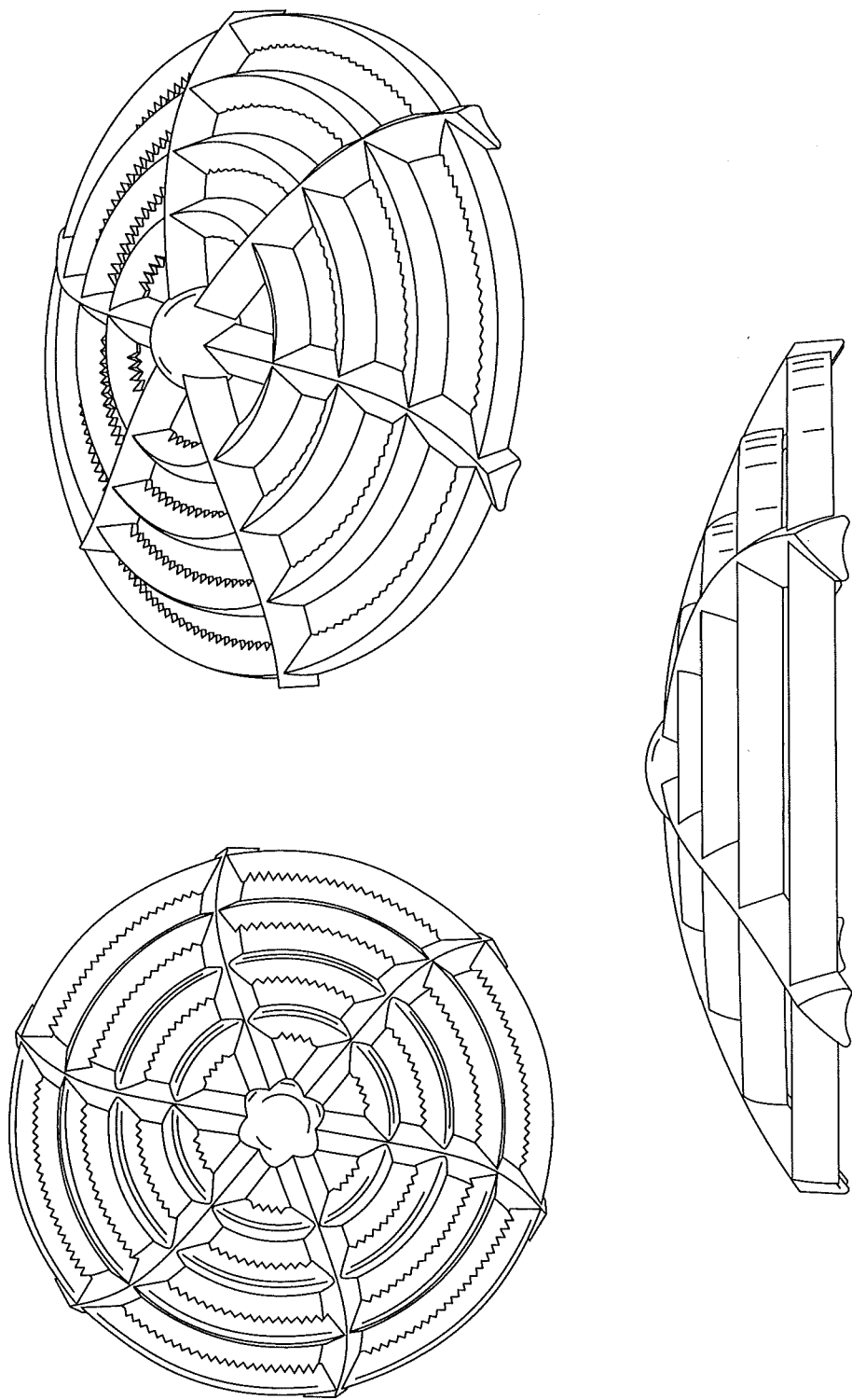


FIG. 2

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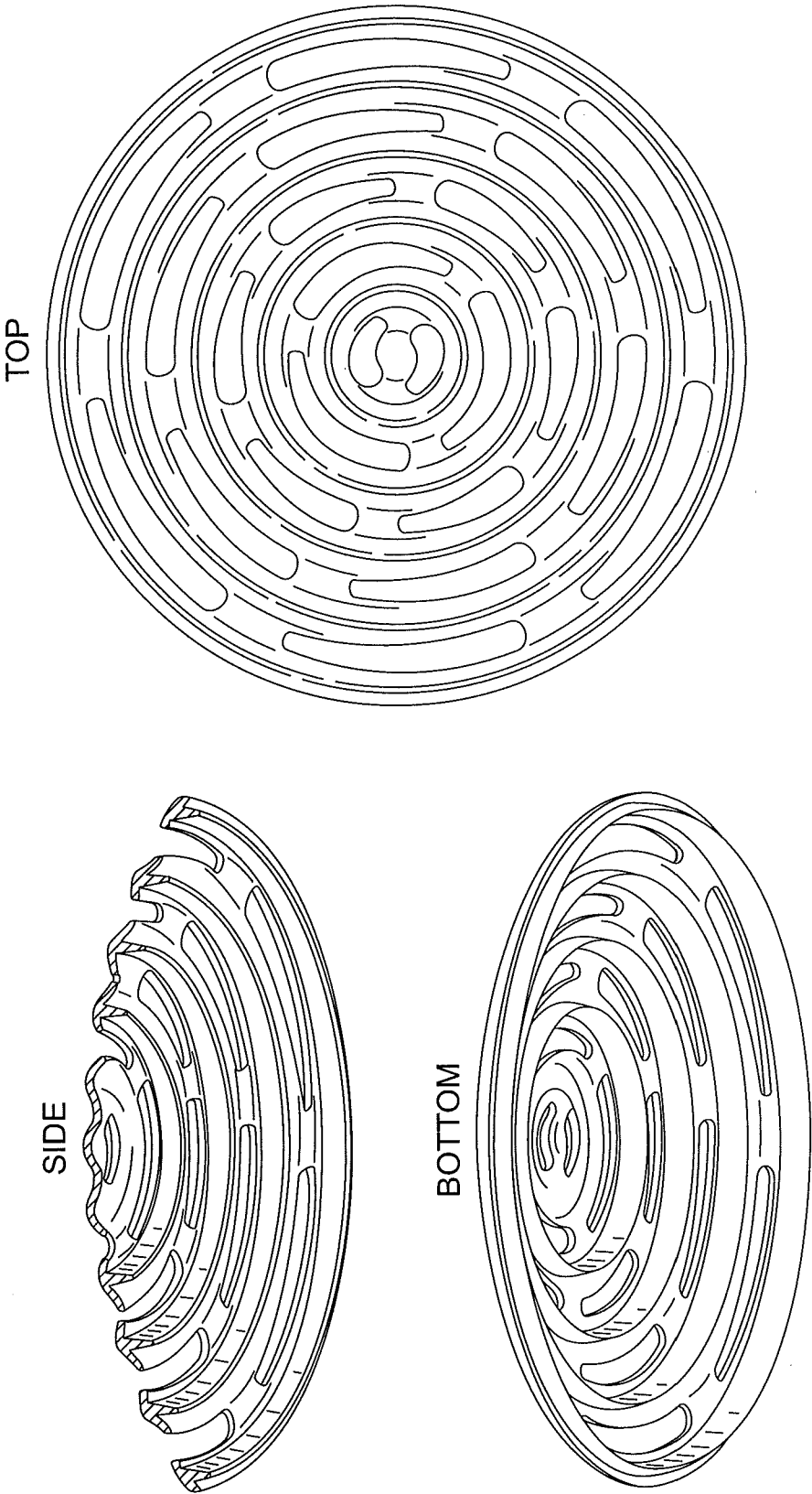
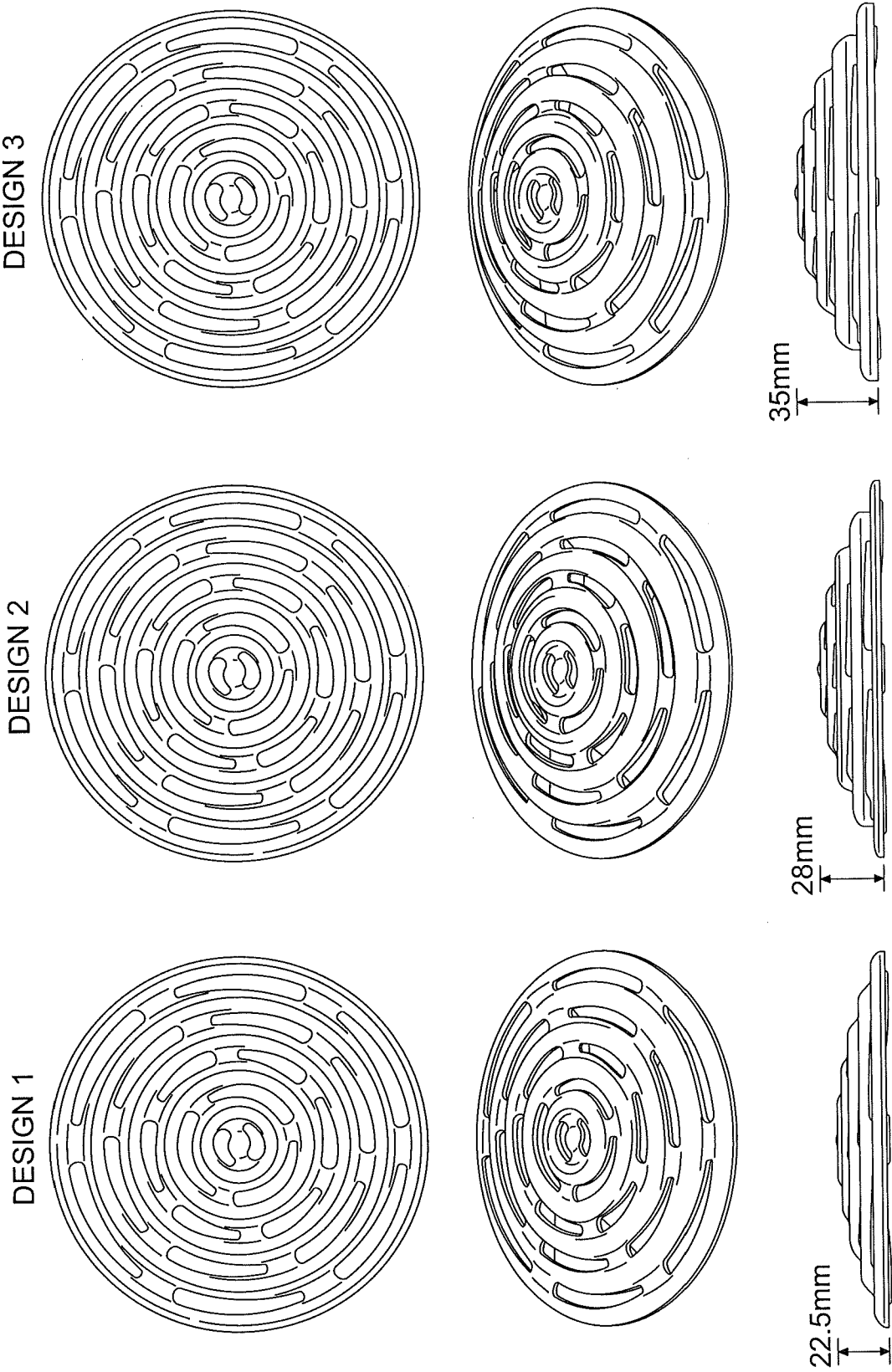
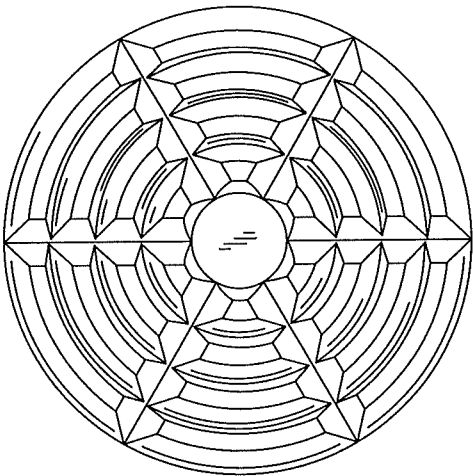


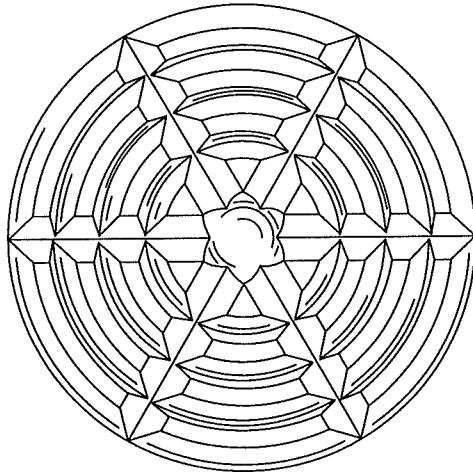
FIG. 3



DESIGN 3



DESIGN 2



DESIGN 1

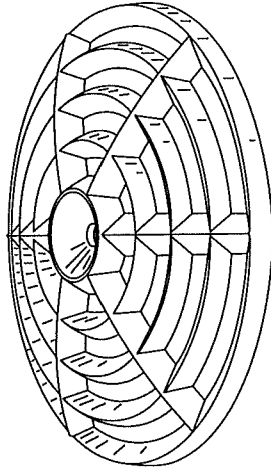
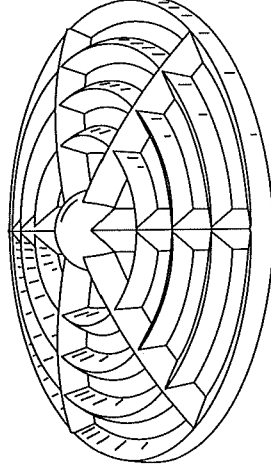
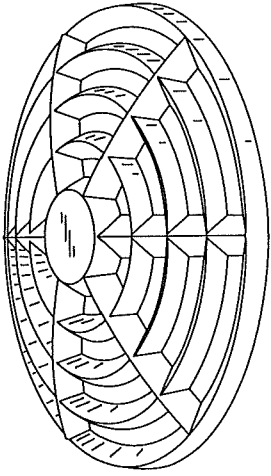
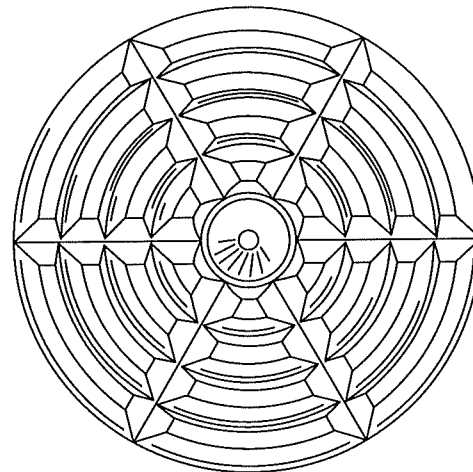


FIG. 5

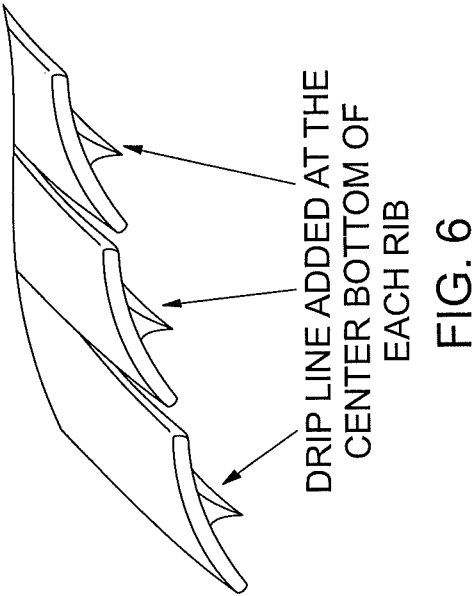
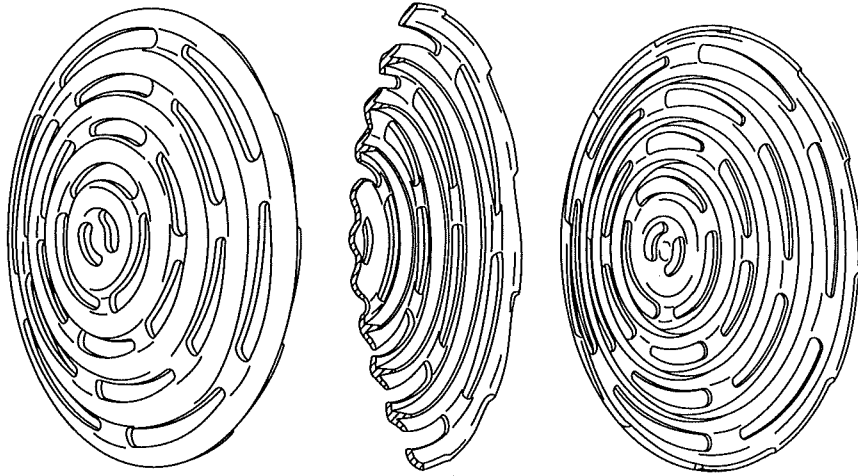


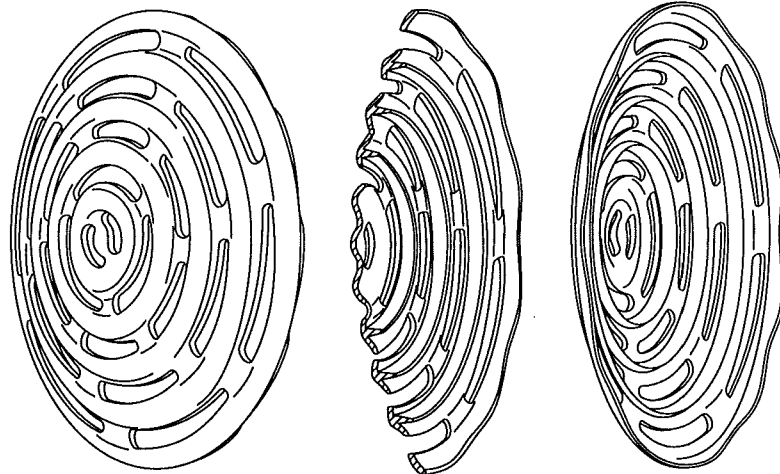
FIG. 6

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DESIGN 5



DESIGN 4



DESIGN 3

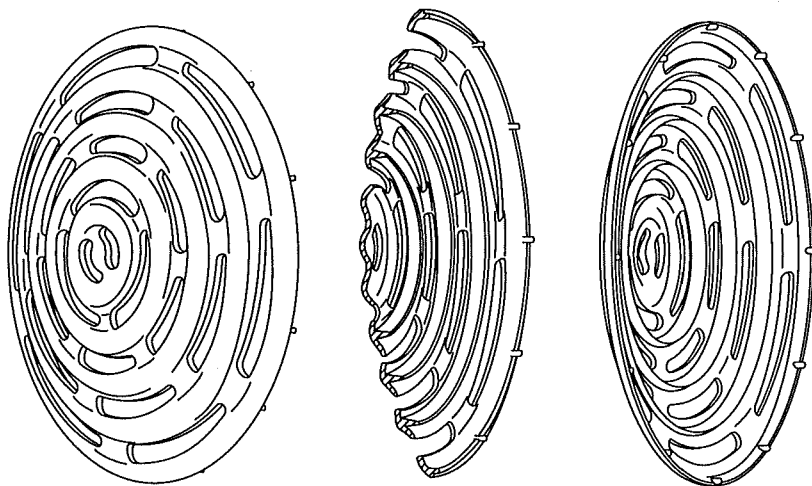


FIG. 7

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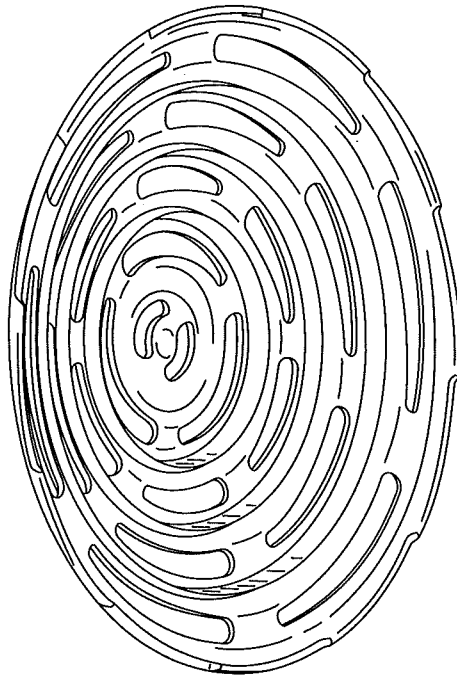


FIG. 9

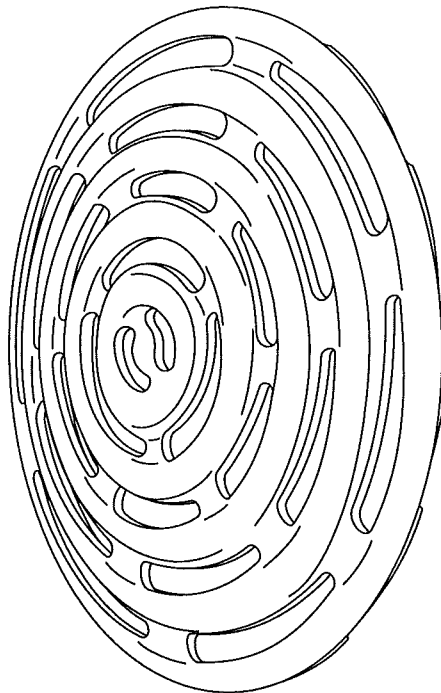


FIG. 8

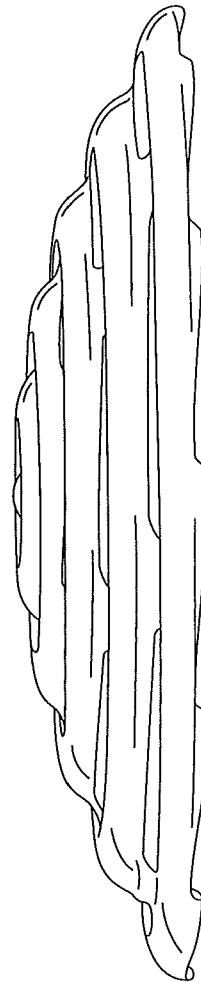
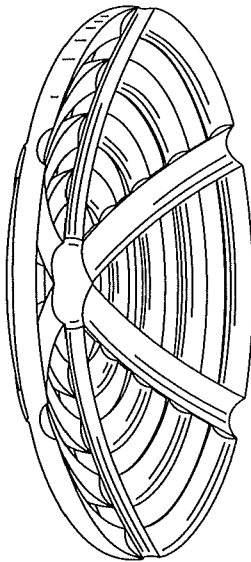
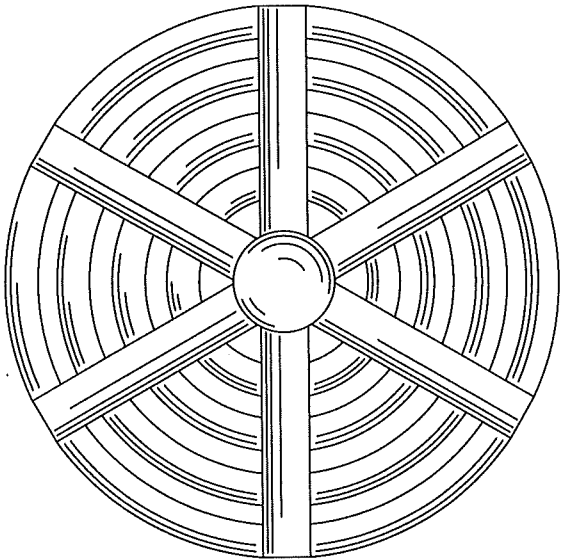


FIG. 10

BOTTOM VIEW



TOP VIEW

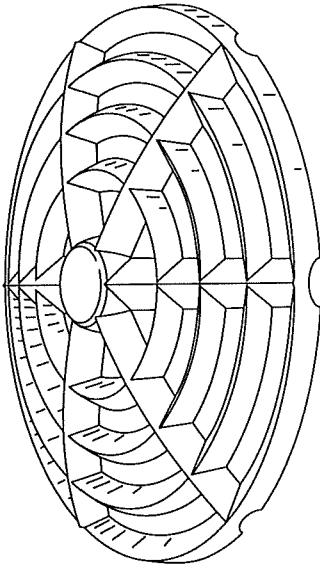
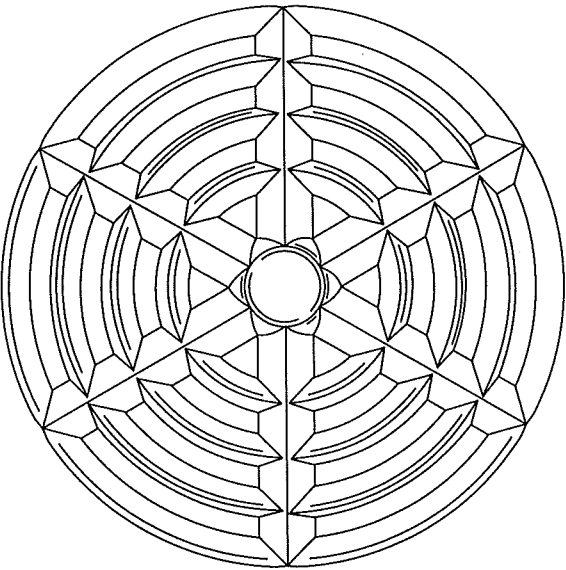


FIG. 11

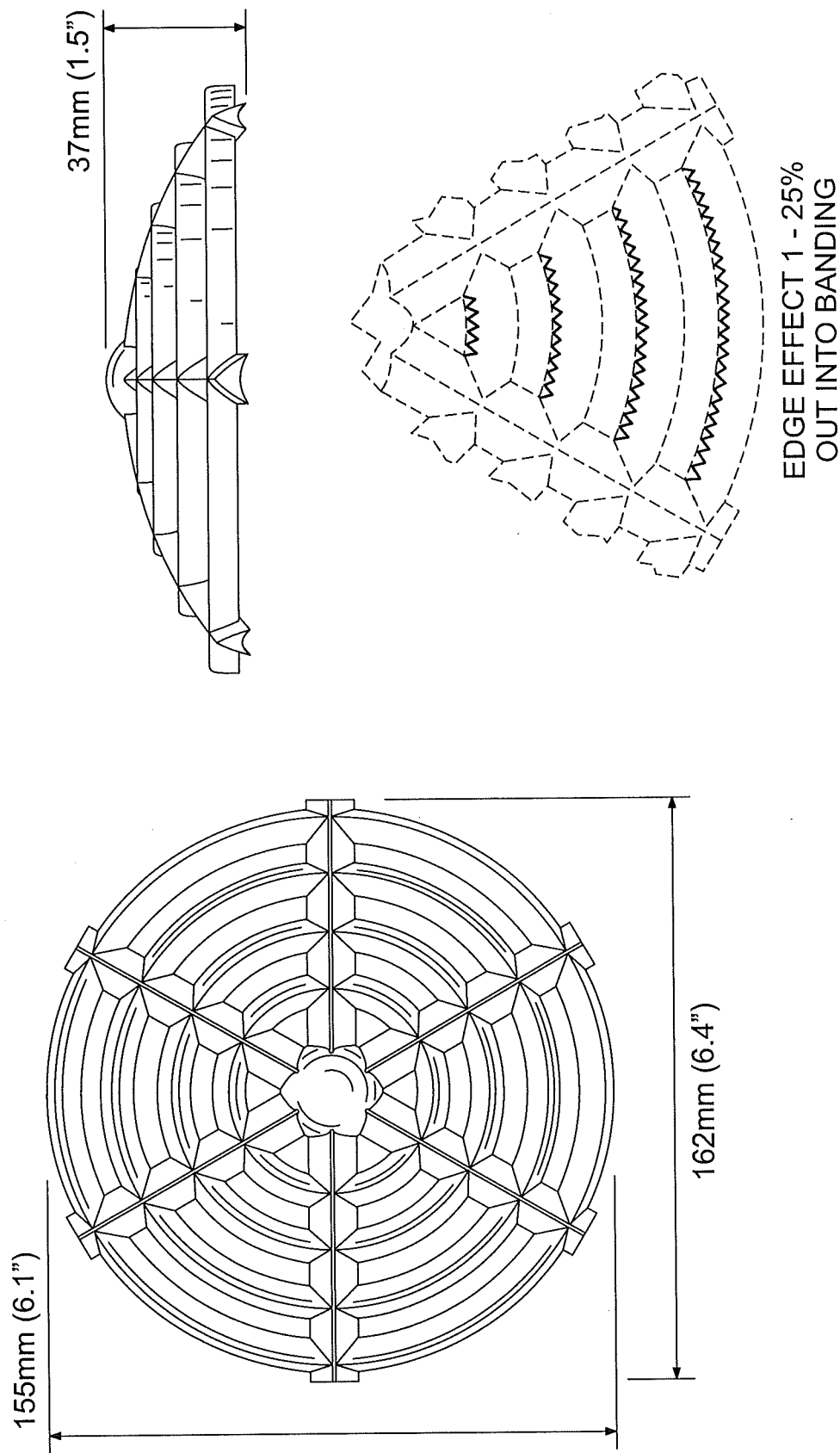
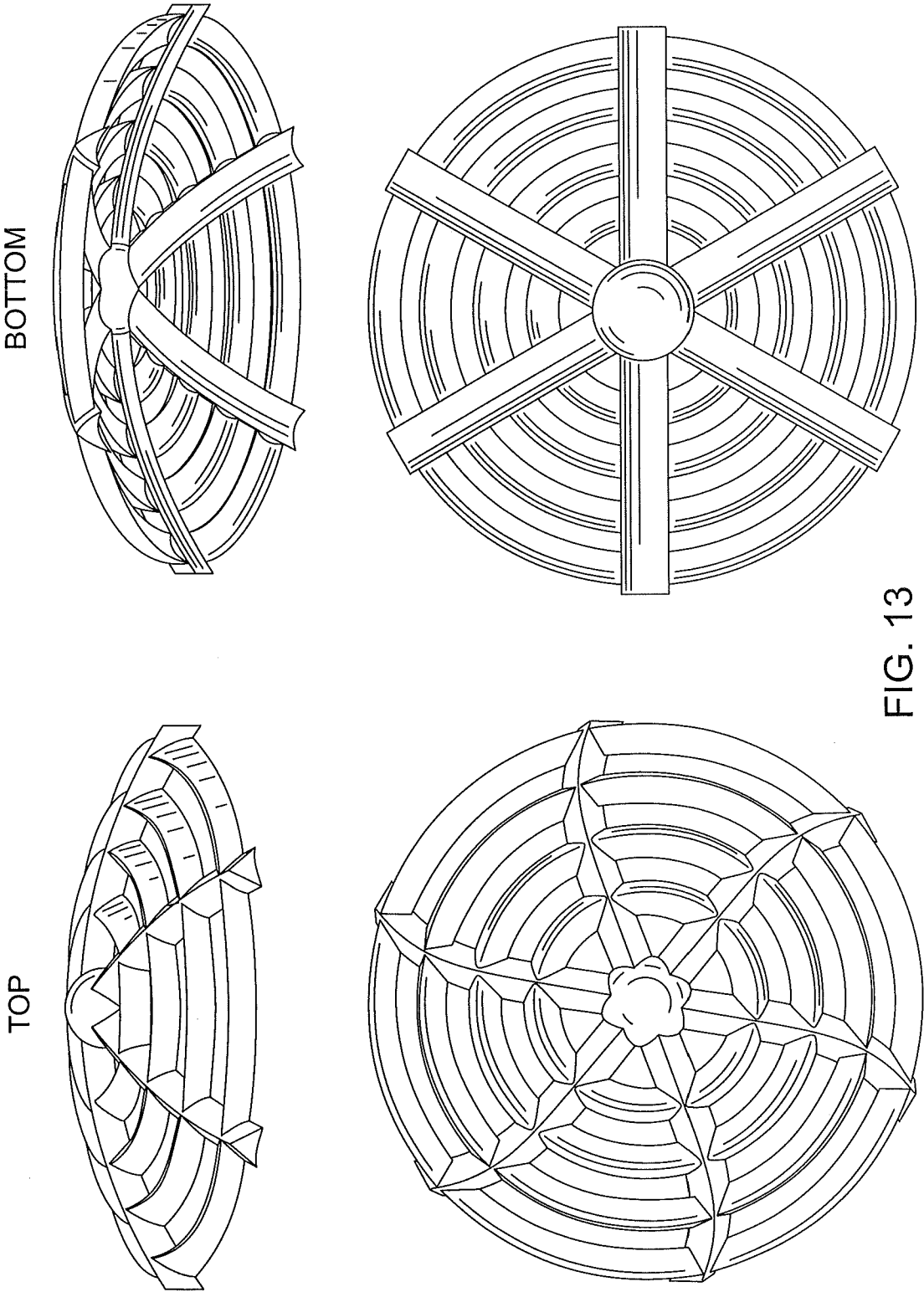


FIG. 12

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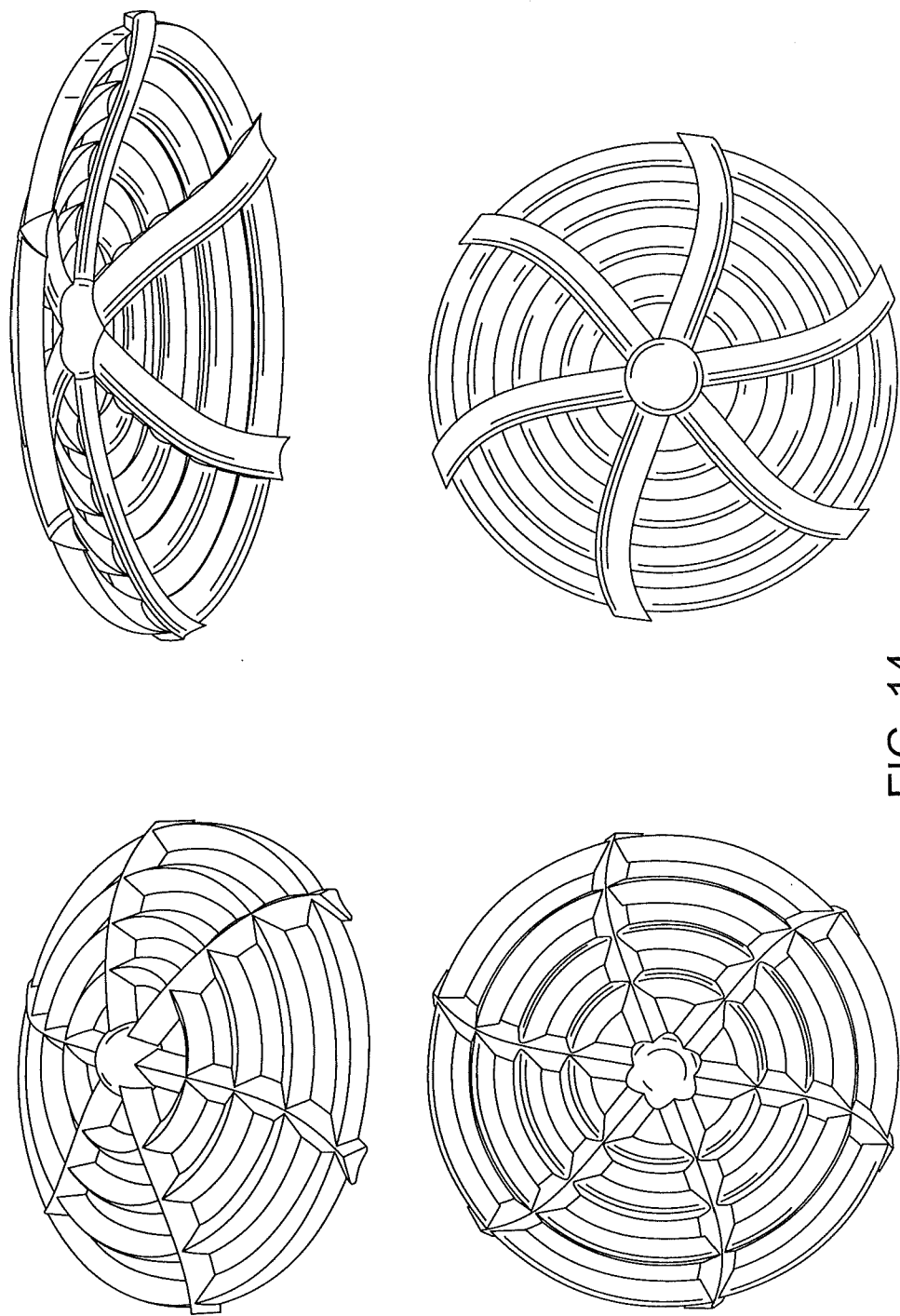


FIG. 14

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2013/074608

A. CLASSIFICATION OF SUBJECT MATTER		
<i>E03D 13/00 (2006.01)</i> <i>E03D 9/02 (2006.01)</i>		
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)		
E03D 13/00, 9/00-9/16, A47G 19/22, A47J 31/06, A47K 11/12		
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)		
PatSearch (RUPTO internal), USPTO, PAJ, Esp@cenet, DWPI, EAPATIS, PATENTSCOPE, Information Retrieval System of FIPS		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/0257664 A1 (TODD KENER) 14.10.2010,	1, 2, 7-17
Y	[0003], [0007], [0030], P0033[, fig. 1, 2, claims 11, 12	3-6
X	CN 202095955 U (SHANGHAI MARITIME UNIVERSITY) 04.01.2012, abstract,	1, 2, 7-17
	fig. 1, 2	
Y	US 8007707 B1 (FREESH PRODUCTS, INC.) 30.08.2011, claims, fig. 1, 2, col. 3	3-6, 18-20
Y	US 2004/0166068 A1 (THE PROCTER & GAMBLE COMPANY) 26.08.2004,	4, 18-20
	[0001], [0032], [0039]	
A	US 2007/0186337 A1 (EMR DANIEL J) 16.08.2007	1-20
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
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"A" document defining the general state of the art which is not considered to be of particular relevance		
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"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		
Date of the actual completion of the international search	Date of mailing of the international search report	
27 February 2014 (27.02.2014)	20 March 2014 (20.03.2014)	
Name and mailing address of the ISA/ FIPS Russia, 123995, Moscow, G-59, GSP-5, Berezhkovskaya nab., 30-1	Authorized officer M. Saperova	
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