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(54) **OPTIMIZED HONING BRUSH**

(57) A honing brush is provided comprising a brush hub having a face wherein the face has at least one or a plurality of two or more outwardly projecting bristles having a length that is from about 15 millimeters to about 25 millimeters, a grit size of about or greater than 240 grit

to about 800 grit, a diameter of from about 0.2 millimeter to about 0.8 millimeter, and wherein the plurality of bristles are arranged in either a non-tufted bristle arrangement or a tufted bristle arrangement, and wherein each of said bristles is made of a polymer material.

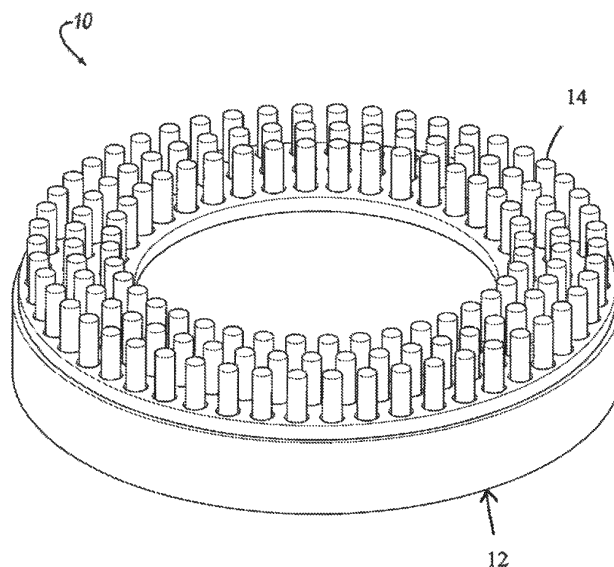


FIG. 1 :

DescriptionCROSS-REFERENCE TO RELATED APPLICATION

[0001] Not applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0003] The present invention relates to a honing brush that is optimized for wear and utility. The optimized honing brush has a bristle length of from about 15-25 millimeters (mm) and in certain embodiments a length of about 21mm, and wherein each of said bristles has a grit size of about or greater than 240 grit, wherein each of said bristles has a diameter of from about 0.2 millimeter to about 0.8 millimeter, and wherein a plurality of bristles of the honing brush are arranged in either (1) a non-tufted bristle arrangement, or (2) a tufted bristle arrangement, and wherein each of said bristles is made of a polymer material.

2. Description of the Background Art

[0004] The background art discloses honing brushes that are useful for a variety of applications including to improve the surface finish of, for example but not limited to a cutting tool, or a bore of a cylinder. Honing brushes are generally known to have abrasive bristles or bristles made of flexible filaments, for example, nylon.

[0005] One use of a honing brush is as a surface finishing tool. The honing brush is applied to a work surface to reduce the rough peaks of a work surfaces micro-structure. Typically, a small amount of material is removed from a work pieces surface. The work piece may be for example, but not limited to, a cutting edge of a cutting insert. For example, but not limited to, a honing brush application of from ten to fifty strokes or revolutions upon a surface of a work piece may remove for example but not limited to 0.0001 inch of material from the surface of the work piece. The bristles of a honing brush may be made of, for example but not limited to, abrasive material such as aluminum oxide or silicon carbide or a polymer material, and have a bristle shaft length from about 5 to 30 millimeters (mm), or greater than about 30 millimeters in some applications, and may be for example from 5 inches to 15 inches, and have a grit ranging from 80 to 320, and a bristle stem diameter of from about 0.02 inches or greater, and may be from 0.02 inches to about 0.3 inches.

[0006] Another known use of a honing brush is as a deburring tool, or for edge blending.

[0007] It is well known that use of a honing brush causes wear of the bristles of the honing brush. Honing brush performance changes as the bristles of the brushes wear over time and the bristles become shorter. Longer bristled brushes have been tested but are often not stiff enough at the initial length. Brushes having inadequate stiffness is problematic in the use of a honing brush.

[0008] This invention addresses the above disadvantages of the background art when honing a 0.5 inch IC (inscribed circle) insert by providing a honing brush having an improved cutting property wherein said honing brush, in certain embodiments, has a specified bristle shaft length of about 21 millimeters and a bristle diameter from about 0.25 millimeter to about 0.6 millimeter, in combination with a specified grit size of from about 240 to about 800 grit, in a non-tufted bristle arrangement.

SUMMARY OF THE INVENTION

[0009] An optimized honing brush is provided comprising a brush hub having a face wherein the face of the brush hub has at least one or a plurality of two or more outwardly projecting bristles wherein each bristle has a shaft having a length, and wherein the shaft of the bristle is positioned generally perpendicular to the face of the brush hub, and wherein the bristle has a shaft length from about 15 millimeters to about 25 millimeters, a grit size of about or greater than about 240 to about 800 grit, and greater than about 800 grit, wherein each of said bristles has a diameter of from about 0.2 millimeter to about 0.8 millimeter, and wherein said bristles are arranged in a non-tufted bristle arrangement, and wherein said bristle is made of a polymer material.

[0010] In certain embodiments, the honing brush of this invention include wherein the bristles have a percent diamond loading of about 20% to about 23%. In certain embodiments of this invention, the bristles are selected from an arrangement selected from the group consisting of crimped bristles and straight bristles. In certain embodiments of this invention, the bristles have a diameter selected from the group of 0.20 millimeters, 0.25 millimeters, 0.4 millimeters, 0.6 millimeters, and 0.8 millimeters. In certain embodiments of this invention, the bristles have a grit size selected from the group consisting of about 240, 400, 600, and 800 grit. In certain embodiments of this invention, the bristles have a shaft length from about 15 millimeters to about 25 millimeters. In certain embodiments of this invention, the bristles have an optimal shaft length of about 21 millimeters.

[0011] In one embodiment of this invention, the honing brush, as described herein, includes wherein the bristles are self-sharpening through the use in the honing process thus providing a bristle that is not in the need for redressing after use in the honing process.

[0012] In another embodiment of this invention, a honing brush is provided, as described herein, for use in honing a 0.5 inch IC (inscribed circle) insert up to 65 micrometers (65 μ m).

[0013] In another embodiment, an optimized honing brush is provided comprising a brush hub having a face wherein the face of the brush hub has at least one or a plurality of two or more outwardly projecting bristles wherein each bristle has a shaft having a length, and wherein the shaft of the bristle is positioned generally perpendicular to the face of the brush hub, and wherein the bristle has a shaft length from about 15 millimeters to about 25 millimeters, a grit size of about or greater than about 240 grit to greater than about 800 grit, wherein each of said bristles has a diameter of from about 0.2 millimeter to about 0.8 millimeter, and wherein said bristles are arranged in a tufted bristle arrangement, and wherein said bristle is made of a polymer material.

[0014] These and other embodiments of this invention shall be described in more detail herein and in the drawings that show certain embodiments of this invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] While various embodiments of this invention are illustrated in the drawings, the particular embodiments shown should not be construed to limit the claims. Various modifications and changes may be made without departing from the scope of the invention.

FIG. 1 shows a top view of the honing brush of this invention.

FIG. 2 shows a side view of the honing brush of this invention.

FIG. 3 shows a side view of the honing brush of this invention of Example 1.

FIG. 4 shows a top view of the honing brush of this invention of Example 1.

FIG. 5 shows a top view of the honing brush of this invention of Example 2.

FIG. 6 shows a top view of the honing brush of this invention of Example 3.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Referring to FIG. 1 and 2, an optimized honing brush (10) is provided comprising a brush hub (12) wherein the brush hub (12) has a face (13) wherein the face (13) has at least one or a plurality of two or more outwardly projecting bristles (14) wherein each bristle (14) has a shaft (16) having a length (18), and wherein the shaft (16) of the bristle (14) is positioned generally perpendicular to the face (13) of the brush hub (12), and wherein the length (18) of the shaft (16) of each bristle (14) is from about 15 millimeters to about 25 millimeters, wherein each of said bristles (14) has a grit size of about or greater than about 240 grit to about 800 grit, and great-

er than about 800 grit, wherein each of said bristles (14) has a bristle diameter (17) of from about 0.2 millimeter to about 0.8 millimeter, and wherein said plurality of bristles (14) are arranged in a non-tufted bristle arrangement, and wherein each of said bristles (14) is made of a polymer material. In certain embodiments of this invention, the bristles have a grit size of about 400. In certain embodiments of this invention, the bristles have a bristle diameter of about 0.6 millimeter.

[0017] In certain embodiments, the honing brush of this invention include wherein the bristles have a percent diamond loading of about 20% to about 23%. In certain embodiments of this invention, the bristles are selected from an arrangement selected from the group consisting of crimped bristles and straight bristles. In certain embodiments of this invention, the bristles have a diameter selected from the group of 0.20 millimeters, 0.25 millimeters, 0.4 millimeters, 0.6 millimeters, and 0.8 millimeters. In certain embodiments of this invention, the bristles have a grit size selected from the group consisting of 240, 400, 600, and 800 grit. In certain embodiments of this invention, the bristles have a shaft length from about 20 millimeters to about 25 millimeters. In certain embodiments of this invention, the bristles have an optimal shaft length of about 21 millimeters.

[0018] In certain embodiments of this invention, the bristles of the honing brush are made from a polymer material, such as for example, but not limited to a flexible plastic material. The flexible plastic material may be a thermosetting resin or a thermoplastic resin, all well known by those persons of ordinary skill in the art. In certain embodiments of this invention, the bristles are made from a polymer material that is selected from the group of nylon, polyethylene, acrylic polymers, acetals, polycarbonates, acrylonitrile-butadiene-styrene copolymer (ABS), and polystyrene.

[0019] In one embodiment of this invention, the honing brush, as described herein, includes wherein the bristles are self-sharpening through the use in the honing process thus providing a bristle that is not in the need for redressing after use in the honing process.

[0020] In another embodiment of this invention, a honing brush is provided, as described herein, for use in honing a 0.5 inch IC insert up to 65 micrometers (65 μ m).

[0021] In another embodiment of this invention, an optimized honing brush is provided comprising a brush hub having a face wherein the face of the brush hub has at least one or a plurality of two or more outwardly projecting bristles wherein each bristle has a shaft having a length, and wherein the shaft of the bristle is positioned generally perpendicular to the face of the brush hub, and wherein the bristle has a shaft length from about 15 millimeters to about 25 millimeters, a grit size of about or greater than about 240 grit to about 800 grit, and greater than about 800 grit, wherein each of said bristles has a diameter of from about 0.2 millimeter to about 0.8 millimeter, and wherein said bristles are arranged in a tufted bristle arrangement, and wherein said bristle is made of a pol-

polymer material.

[0022] These and other embodiments of this invention shall be described in more detail herein.

Honing Brush Examples

Example 1:

[0023]

- Base polymer = Nylon 6
- Bristle diameter = 0.6mm
- Bristle length = 21mm
- Grit size = 400
- % diamond loading = 20%
- Crimped bristles

Example 2:

[0024]

- Base polymer = flexible plastic
- Bristle diameter = 0.25mm
- Bristle length = 25mm
- Grit size = 800
- Straight bristles

Example 3:

[0025]

- Base polymer = flexible plastic
- Bristle diameter = 0.4mm
- Bristle length = 25mm
- Grit size = 600
- Straight bristles

Example 4:

[0026]

- Base polymer = flexible plastic
- Bristle diameter = 0.8mm
- Bristle length = 21mm
- Grit size = 240
- % diamond loading = 23%
- Crimped bristles

Example 5:

[0027]

- Base polymer = flexible plastic
- Bristle diameter = 0.8mm
- Bristle length = 15mm
- Grit size = 240
- Crimped bristles

Example 6:

[0028]

- Base polymer = flexible plastic
- Bristle diameter = 0.2mm
- Bristle length = 21mm
- Grit size = 600
- Crimped bristles

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[0029] As used herein, "including," "containing" and like terms are understood in the context of this application to be synonymous with "comprising" and are therefore open-ended and do not exclude the presence of additional undescribed or unrecited elements, materials, phases or method steps. As used herein, "consisting of" is understood in the context of this application to exclude the presence of any unspecified element, material, phase or method step. As used herein, "consisting essentially of" is understood in the context of this application to include the specified elements, materials, phases, or method steps, where applicable, and to also include any unspecified elements, materials, phases, or method steps that do not materially affect the basic or novel characteristics of the invention.

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[0030] For purposes of the description above, it is to be understood that the invention may assume various alternative variations and step sequences except where expressly specified to the contrary. Moreover, all numbers expressing, for example, quantities of ingredients used in the specification and claims, are to be understood as being modified in all instances by the term "about". Accordingly, unless indicated to the contrary, the numerical parameters set forth are approximations that may vary depending upon the desired properties to be obtained by the present invention. At the very least, and not as an attempt to limit the application of the doctrine of equivalents, each numerical parameter should at least be construed in light of the number of reported significant digits and by applying ordinary rounding techniques.

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[0031] It should be understood that any numerical range recited herein is intended to include all sub-ranges subsumed therein. For example, a range of "1 to 10" is intended to include all sub-ranges between (and including) the recited minimum value of 1 and the recited maximum value of 10, that is, having a minimum value equal to or greater than 1 and a maximum value of equal to or less than 10.

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[0032] In this application, the use of the singular includes the plural and plural encompasses singular, unless specifically stated otherwise. In addition, in this application, the use of "or" means "and/or" unless specifically stated otherwise, even though "and/or" may be explicitly used in certain instances. In this application, the articles "a," "an," and "the" include plural referents unless expressly and unequivocally limited to one referent.

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[0033] Whereas particular embodiments of this invention have been described above for purposes of illustration

tion, it will be evident to those skilled in the art that numerous variations of the details of the present invention may be made without departing from the invention as defined in the appended claims.

Claims

1. A honing brush comprising a brush hub wherein said brush hub has a face wherein said face has at least one or a plurality of two or more outwardly projecting bristles wherein each of said bristles has a shaft wherein said shaft has a length, and wherein said shaft of said bristle is positioned generally perpendicular to said face of said brush hub, and wherein said shaft of said bristle has said length that is from about 15 millimeters to about 25 millimeters, wherein each of said bristles has a grit size of about or greater than 240 grit to about 800 grit, wherein each of said bristles has a diameter of from about 0.2 millimeter to about 0.8 millimeter, and wherein said plurality of bristles are arranged in a non-tufted bristle arrangement, and wherein each of said bristles is made of a polymer material.
2. The honing brush of claim 1 wherein said length of said bristle is 21 millimeters.
3. The honing brush of claim 1 or claim 2 wherein said wherein said bristle has a percent diamond loading of about 20% to about 23%.
4. The honing brush of any one of the preceding claims wherein said bristles are selected from an arrangement selected from the group consisting of crimped bristles and straight bristles.
5. The honing brush of any one of the preceding claims wherein said bristles have a diameter selected from the group of about 0.20 millimeter, 0.25 millimeter, 0.4 millimeter, 0.6 millimeter, and 0.8 millimeter.
6. The honing brush of any one of the preceding claims wherein said bristles have a grit size selected from the group consisting of about 240, 400, 600, and 800 grit.
7. The honing brush of any one of the preceding claims wherein the honing brush, wherein each of said bristles is self-sharpening through the use in a honing process.
8. The honing brush of claim 7 wherein said bristle requires no redressing after use in said honing process.
9. The honing brush of any one of the preceding claims wherein said polymer material is selected from the

group of flexible plastic, nylon, polyethylene, acrylic polymers, acetals, polycarbonates, acrylonitrile-butadiene-styrene copolymer, and polystyrene.

10. The honing brush of any one of the preceding claims wherein said bristle has a length of about 21 millimeters, a grit size of about 400 grit, a diameter of about 0.6 millimeter, and wherein said bristles are crimped, and made of a nylon material.
11. The honing brush of any one of claims 1 to 9 wherein said bristle has a length of about 25 millimeters, a grit size of about 800 grit, a diameter of about 0.25 millimeter, and wherein said bristles are straight, and made of a flexible plastic material.
12. The honing brush of any one of claims 1 to 9 wherein said bristle has a length of about 25 millimeters, a grit size of about 600 grit, a diameter of about 0.4 millimeter, and wherein said bristles are straight, and made of a flexible plastic material.
13. The honing brush of any one of claims 1 to 9 wherein said bristles have a grit size of about or greater than 800 grit.
14. A honing brush comprising a brush hub wherein said brush hub has a face wherein said face has at least one or a plurality of two or more outwardly projecting bristles wherein each of said bristles has a shaft wherein said shaft has a length, and wherein said shaft of said bristle is positioned generally perpendicular to said face of said brush hub, and wherein said shaft of said bristle has said length that is from about 15 millimeters to about 25 millimeters, wherein each of said bristles has a grit size of about or greater than 240 grit to about 800 grit, wherein each of said bristles has a diameter of from about 0.2 millimeter to about 0.8 millimeter, and wherein said plurality of bristles are arranged in a tufted bristle arrangement, and wherein each of said bristles is made of a polymer material.
15. The honing brush of claim 14 wherein said bristles have a grit size of about or greater than 800 grit.

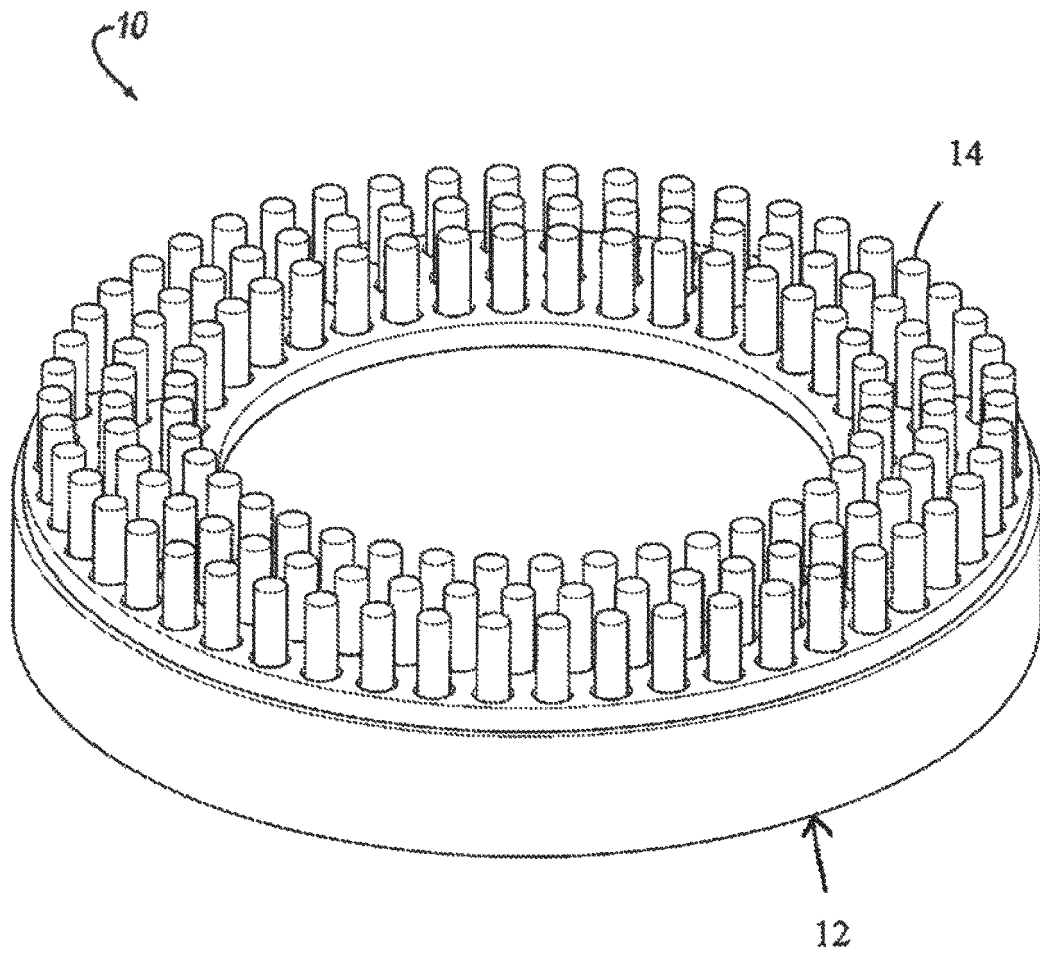


FIG. 1 :

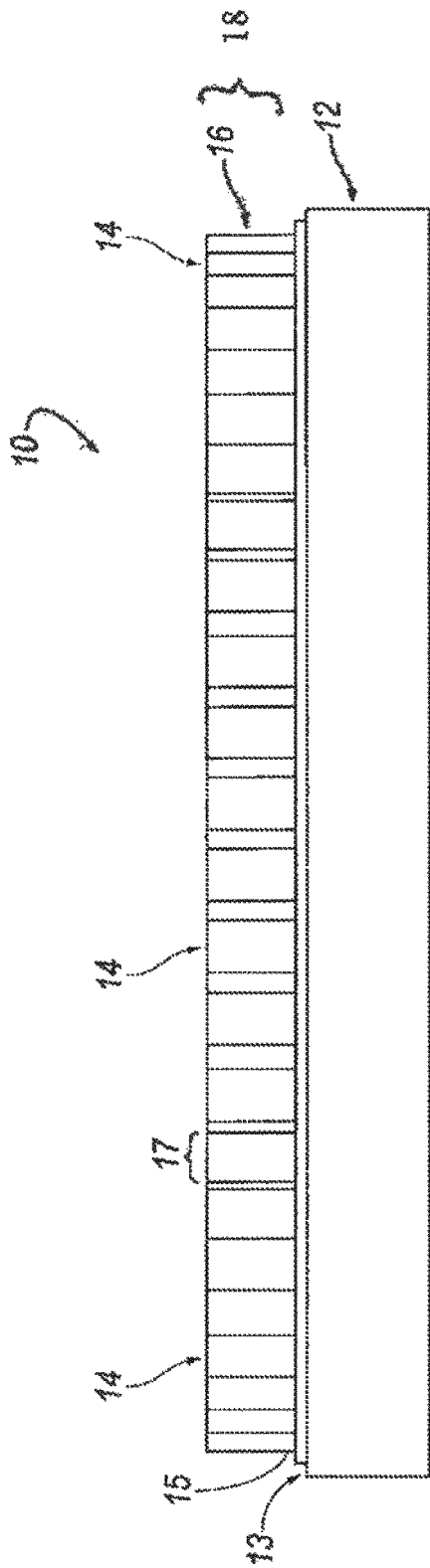


FIG. 2

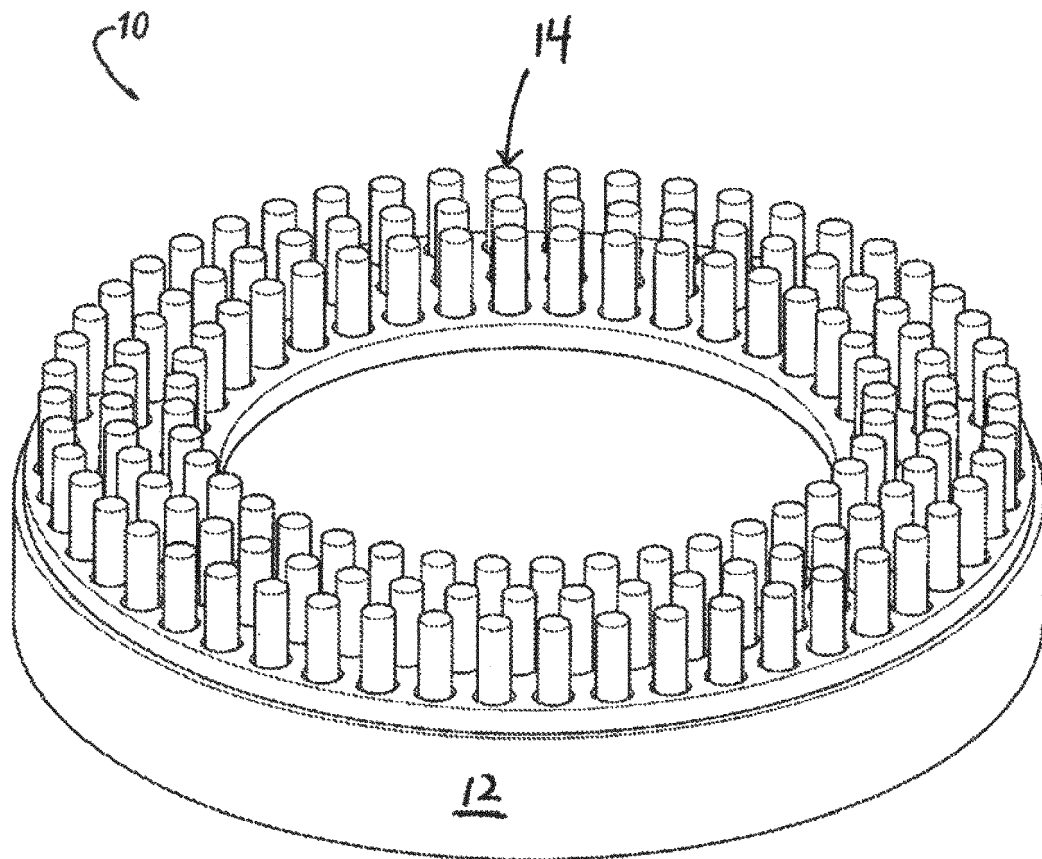


FIG. 3

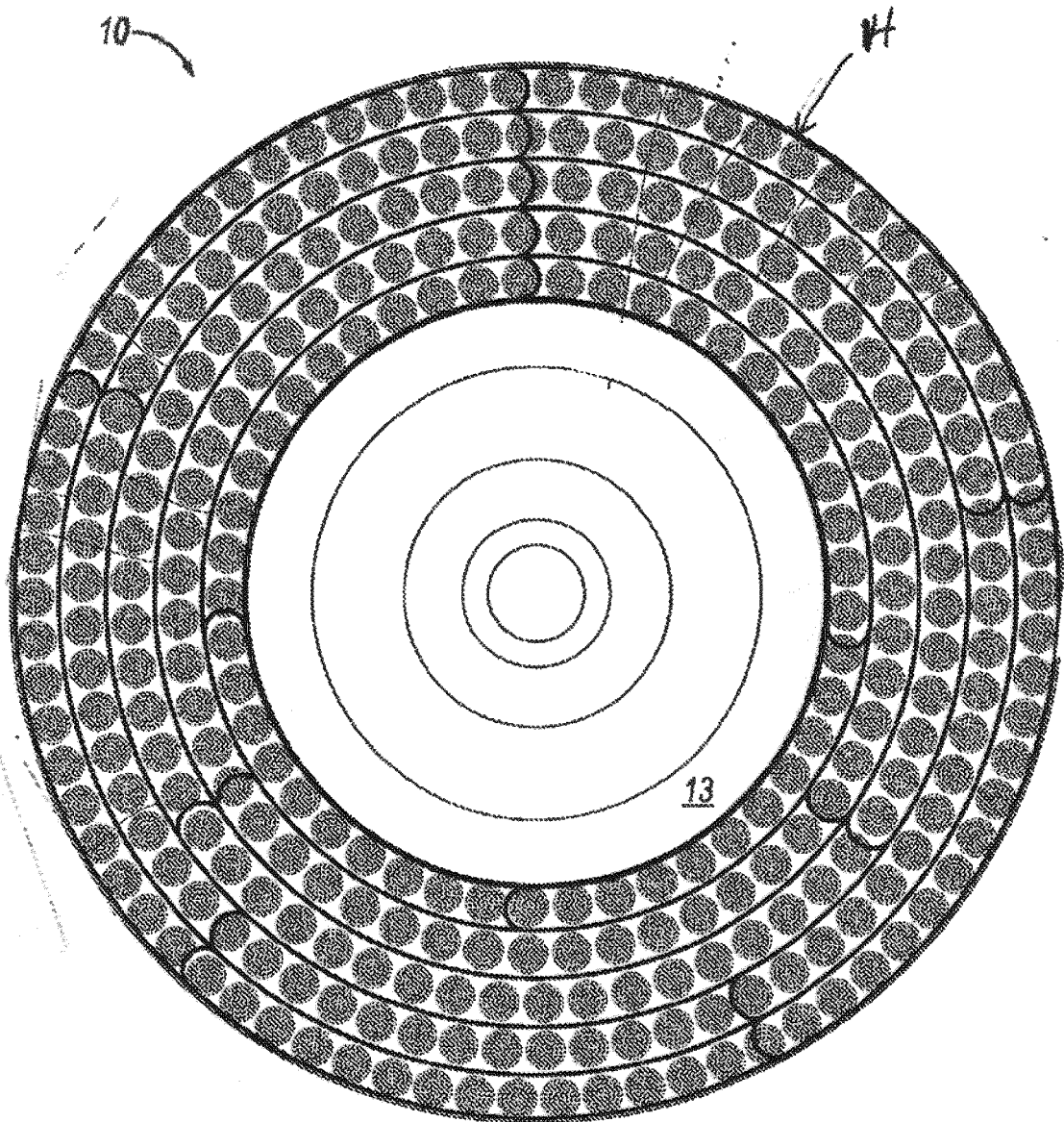


FIG. 4

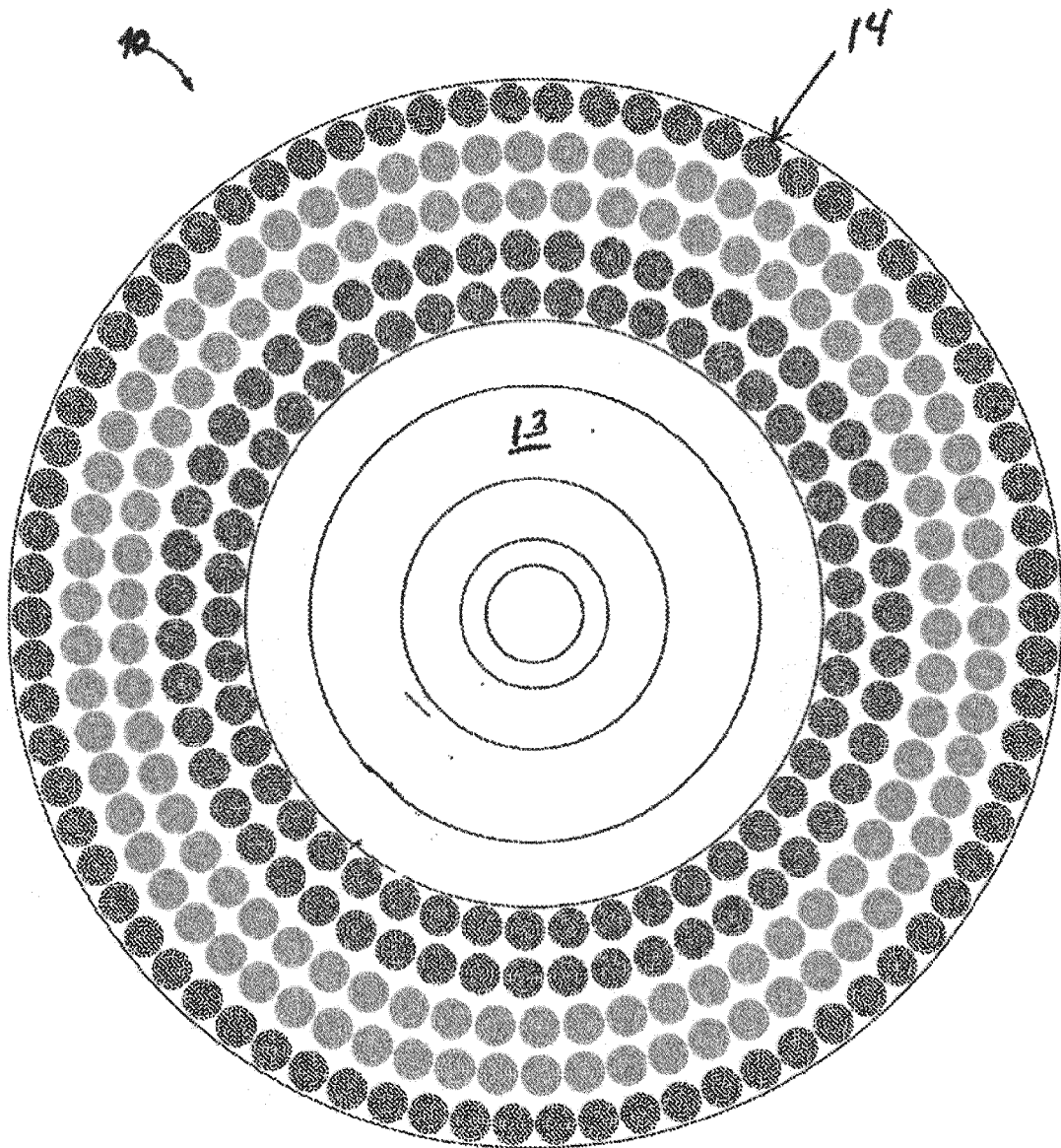


FIG. 5

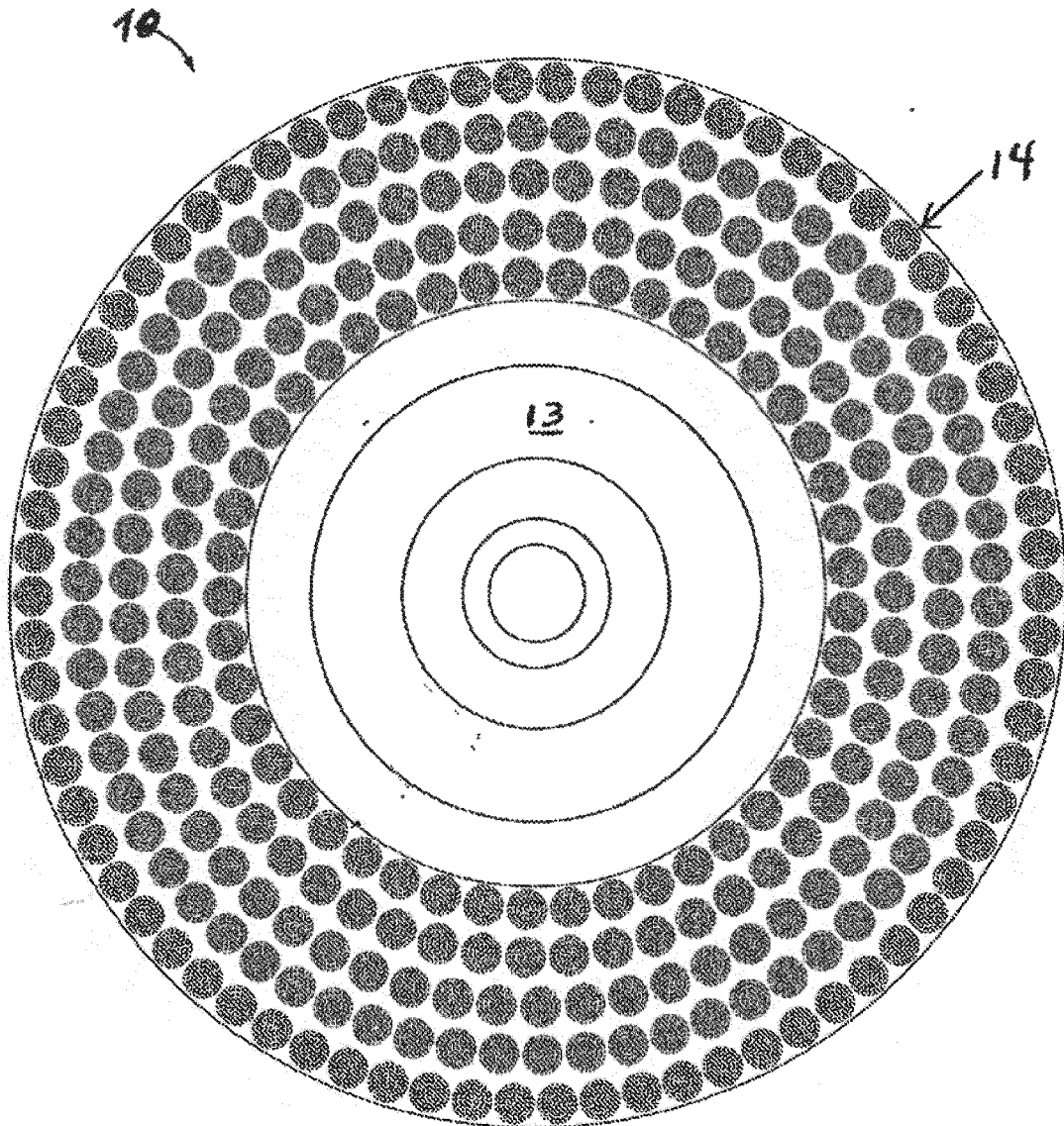


FIG. 6



EUROPEAN SEARCH REPORT

Application Number

EP 23 20 8353

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2019/138324 A1 (3M INNOVATIVE PROPERTIES CO [US]) 18 July 2019 (2019-07-18) * figures 1-3, 5A-7 * * paragraphs [0007], [0025] * -----	1-15	INV. A46B13/00 A46B13/02 B24B33/00
A	CA 3 154 926 A1 (WEBER BURSTENSYSTEME GMBH [DE]) 29 April 2021 (2021-04-29) * claim 1; figures 5-20 * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			A46B B24D B24B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 22 February 2024	Examiner Raybould, Bruce
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 23 20 8353

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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22-02-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2019138324 A1	18-07-2019	NONE	
CA 3154926 A1	29-04-2021	CA 3154926 A1	29-04-2021
		EP 4048118 A1	31-08-2022
		US 2022361661 A1	17-11-2022
		WO 2021078728 A1	29-04-2021