



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
26.06.2013 Bulletin 2013/26

(51) Int Cl.:
A62B 7/10 (2006.01)
A62B 23/02 (2006.01) **A62B 18/02 (2006.01)**

(21) Application number: **11818313.6**

(86) International application number:
PCT/KR2011/005572

(22) Date of filing: **28.07.2011**

(87) International publication number:
WO 2012/023713 (23.02.2012 Gazette 2012/08)

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(30) Priority: **19.08.2010 KR 20100080392**

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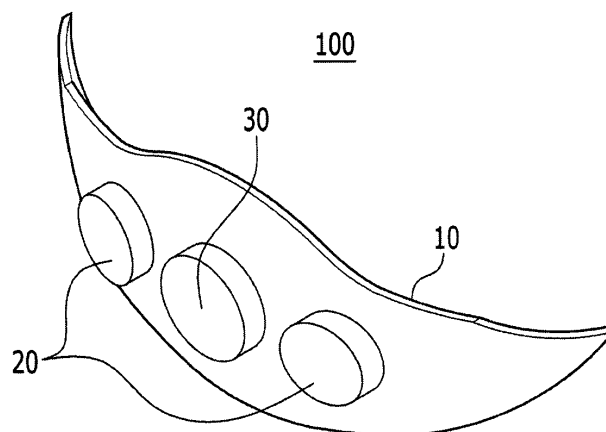
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(54) **MASK AND A PRODUCTION METHOD THEREFOR**

(57) A mask and a method of manufacturing the same that intercept a virus are provided. The mask includes: a mask body; an exhalation module that is formed

at one surface of the mask body; and an inhalation module that is formed at the one surface of the mask body and that includes an inhalation filter. The inhalation filter includes an anodized aluminum oxide film.

FIG. 1



Description

Field of the Invention

[0001] The present invention relates to a mask and a method of manufacturing the same. More particularly, the present invention relates to a mask and a method of manufacturing the same that intercept a virus.

Description of the Related Art

[0002] A mask is a stuff for covering respiratory organs such as a nose and a mouth in order to intercept a scattering material such as a dust and a virus, and a general mask is formed in a simple structure having a filter of a simple structure in order to conveniently carry, unlike an antigas mask.

[0003] Generation of an environment contamination material continuously increases according to industrialization, and as a threat of various viruses rises, a hygiene equipment of a higher level is requested. Particularly, nowadays, as a new type virus such as a corona virus of severe acute respiratory syndrome (SARS), swine influenza (SI), and avian influenza (AI) occurs, a demand of a mask for preventing infection thereof increases.

[0004] Most viruses have a size of about 10nm to about 300nm, and particularly, a corona virus of SARS has a size of about 100nm, and SI has a size of about 80nm to about 120nm.

[0005] However, a size of a particle that can be intercepted by an N95 mask that is encouraged by World Health Organization (WHO) is merely about 300nm. Further, an existing widely used dust-proof mask filters by an adsorption method using permanent electrostatic fiber and activated carbon, and by such a method, a material of about 300nm or more can be intercepted and thus perfect interception of a virus including a new type virus is impossible.

[0006] The above information disclosed in this Background section is only for enhancement of understanding of the background of the invention and therefore it may contain information that does not form the prior art that is already known in this country to a person of ordinary skill in the art.

DESCRIPTION OF THE INVENTION

TECHNICAL OBJECT

[0007] The present invention has been made in an effort to provide a mask having advantages of intercepting a virus of a micro size.

[0008] The present invention further provides a mask that can intercept a virus by a simple method.

TECHNICAL SOLUTION

[0009] An exemplary embodiment of the present in-

vention provides a mask including: a mask body; an exhalation module that is formed at one surface of the mask body; and an inhalation module that is formed at the one surface of the mask body and that includes an inhalation filter. The inhalation filter includes an anodized aluminum oxide film.

[0010] A plurality of holes may be formed in the aluminum oxide film, and the plurality of holes each may have a diameter of 18nm to 40nm.

[0011] The aluminum oxide film may be formed in a honeycomb structure.

[0012] The inhalation filter may further include a fiber that is disposed at both surfaces of the aluminum oxide film; and a net-shaped partition that is disposed between the aluminum oxide film and the fiber.

[0013] The inhalation module may include an inhalation housing that houses the inhalation filter. The exhalation module may include an opening and closing film; a net-shaped partition that is disposed at one surface of the opening and closing film; and an exhalation housing that houses the opening and closing film and the partition.

[0014] The mask may further include an adhesive module that is formed along an edge of the mask body at the other one surface of the mask body in which the inhalation module and the exhalation module are not formed.

[0015] The adhesive module may be a double-sided adhesive tape.

[0016] The exhalation module may be formed in a central portion of the mask body, and the inhalation module may be formed in a pair in symmetry about the exhalation module.

[0017] Another embodiment of the present invention provides a method of manufacturing a mask, the method including: preparing a mask body; forming an inhalation module inserting port and an exhalation module inserting port in the mask body; and mounting an inhalation module including an inhalation filter and an exhalation module in the inhalation module inserting port and the exhalation module inserting port, respectively. The inhalation filter may be formed by forming an aluminum oxide film by forming a hole by anodizing aluminum and by disposing a net-shaped partition and fiber at both surfaces of the aluminum oxide film.

[0018] The method may further include forming the aluminum oxide film and performing an etching process in order to adjust a size of a hole that is formed in the aluminum oxide film.

[0019] The method may further include anodizing the aluminum and removing an unoxidized aluminum layer.

[0020] The method may further include forming a double-sided adhesive tape along an edge of the other one surface of the mask body in which the inhalation module and the exhalation module are not formed.

[0021] The exhalation module may be formed in a central portion of the mask body, and the inhalation module may be formed in a pair in symmetry about the exhalation module.

[0022] According to an exemplary embodiment of the

present invention, a virus of several ten nm sizes can be effectively intercepted.

[0023] Further, by manufacturing a mask having a high virus interception effect by a simple method, a production cost is reduced, and productivity can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 is a perspective view illustrating a mask according to an exemplary embodiment of the present invention.

FIG. 2 is a schematic diagram illustrating a mask body according to an exemplary embodiment of the present invention.

FIG. 3 is a schematic diagram illustrating an inhalation module of a mask according to an exemplary embodiment of the present invention.

FIGS. 4A and 4B are schematic diagrams illustrating operation of an exhalation module of a mask according to an exemplary embodiment of the present invention.

FIG. 5 is a diagram sequentially illustrating a method of manufacturing an inhalation filter of a mask according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0025] The present invention will be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown.

[0026] FIG. 1 is a perspective view illustrating a mask according to an exemplary embodiment of the present invention, and FIG. 2 is a schematic diagram illustrating a mask body according to an exemplary embodiment of the present invention.

[0027] Referring to FIG. 1, a mask 100 according to the present exemplary embodiment includes a mask body 10, an inhalation module 20, and an exhalation module 30.

[0028] The inhalation module 20 performs a function of an inflow passage in which outside air is injected when inhaling upon using the mask 100, and the exhalation module 30 performs a function of a discharge passage in which air is discharged to the outside when exhaling. Further, the mask body 10 performs a function of supporting the inhalation module 20 and the exhalation module 30, and the mask body 10 is formed to have a predetermined curvature to close contact with a face when using the mask 100, thereby enabling outside air not to be injected to a periphery of the mask 100.

[0029] According to the present exemplary embodiment, the exhalation module 30 is formed in a central portion of the mask 100, and the inhalation module 20 is formed in symmetry at both sides of the mask 100 based

on the exhalation module 30. By such a configuration, when a user wears the mask 100, the exhalation module 30 is disposed adjacent to respiratory organs, i.e., a nose and a mouth, when the user exhales, discharge air does not stay for a long time period within the mask 100 and is rapidly discharged to the outside of the mask 100.

[0030] Referring to FIG. 2, in the mask body 10 according to the present exemplary embodiment, an inhalation module inserting port 12 and an exhalation module inserting port 13 for inserting the inhalation module 20 and the exhalation module 30, respectively, are formed. Diameters of the inhalation module inserting port 12 and the exhalation module inserting port 13 are formed identical to exterior diameters of the inhalation module 20 and the exhalation module 30, and thus the inhalation module inserting port 12 and the exhalation module inserting port 13 are inserted by forced insertion. Alternatively, after diameters of the inhalation module inserting port 12 and the exhalation module inserting port 13 are formed larger than exterior diameters of the inhalation module 20 and the exhalation module 30, respectively, when the inhalation module 20 and the exhalation module 30 are inserted, the remaining space may be filled with an adhesive member and thus the inhalation module 20 and the exhalation module 30 may be fixed to the mask body 10.

[0031] By such a structure, after the inhalation module 20 and the exhalation module 30 are inserted into the inhalation module inserting port 12 and the exhalation module inserting port 13, respectively, the inhalation module 20 and the exhalation module 30 are stably fixed. After the inhalation module 20 and the exhalation module 30 are inserted into the inhalation module inserting port 12 and the exhalation module inserting port 13 and are fixed to the inhalation module inserting port 12 and the exhalation module inserting port 13, respectively, a sealing member may be additionally formed to fill a micro gap that may occur by a tolerance of the inhalation module 20, the exhalation module 30, or each of the inserting ports 12 and 13 thereof.

[0032] In the mask body 10, in order not to inject or discharge air as well as a virus of a micro size, a pore is not formed. For this purpose, the mask body 10 is made of a material such as plastic and rubber. That is, when the user wear the mask 100 and breathes, inhalation and exhalation are injected and discharged through the inhalation module 20 and the exhalation module 30, respectively, and air is not injected and ejected through the mask body 10 and thus a virus can be effectively intercepted.

[0033] The mask body 10 includes an adhesive module 11 that is formed along an edge of the mask body 10. The adhesive module 11 is formed with a double-sided adhesive tape that may be easily attached to and removed from a skin, and the mask 100 close contacts with a face through the adhesive module 11. Because outside air is not injected into or ejected from the periphery of the mask 100 due to a configuration of the adhesive module 11, air is injected and discharged through the inhalation module 20 and the exhalation module 30. A string that

may be hooked to ears instead of the adhesive module 11 of the present exemplary embodiment is connected to both sides of the mask body 10 to enable the mask 100 to close contact with a face. Alternatively, the adhesive module 11 may be formed in the mask body 10, and at both sides of the mask body 10, a string may be simultaneously additionally formed.

[0034] FIG. 3 is a schematic diagram illustrating an inhalation module of a mask according to an exemplary embodiment of the present invention, and a configuration of the inhalation module 20 according to the present exemplary embodiment will be described with reference to FIG. 3.

[0035] The inhalation module 20 according to the present exemplary embodiment includes an inhalation filter 21 and an inhalation housing 23. The inhalation filter 21 is formed to intercept a virus of a micro size of a nano scale, and the inhalation housing 23 is inserted into the inhalation module inserting port 12 of the mask body 10 to be fixed to the inhalation module inserting port 12 while housing the inhalation filter 21.

[0036] The inhalation module 20 according to the present exemplary embodiment performs a function of filtering injected air when generally inhaling, but performs a function of a discharge passage of exhalation when exhaling together with the exhalation module 30, thereby enabling breathing to be smoothly performed.

[0037] A configuration of the inhalation filter 21 will be specifically described with reference to a right portion of FIG. 3. The inhalation filter 21 according to the present exemplary embodiment includes an aluminum oxide film 21a, dust-free fibers 21c that are disposed at both surfaces of the aluminum oxide film 21a, and partitions 21b that are disposed between the aluminum oxide film 21a and the dust-free fiber 21c.

[0038] The aluminum oxide film 21a is formed by anodizing aluminum, and a plurality of holes of a nano scale are formed in the aluminum oxide film 21a according to the present exemplary embodiment. In order to prevent a virus such as a corona virus of SARS and SI from passing through, each hole that is formed in the aluminum oxide film 21a has a diameter of about 18nm to about 40nm. In this case, the aluminum oxide film 21a is formed in a honeycomb form that is formed in a plurality of hexagonal pillars having the hollow center. A specific method of manufacturing such an aluminum oxide film 21a will be described later.

[0039] At both surfaces of the aluminum oxide film 21a, the dust-free fibers 21c are disposed. The dust-free fiber 21c is made of fabric, knitwear, and non-woven fabric, and may be formed using the fabric, the knitwear, and the non-woven fabric as a single material or may be formed in a structure in which a non-woven fabric layer is disposed between the fabric or the knitwear. In this way, the dust-free fiber 21c that is made of fabric, knitwear, and non-woven fabric is disposed at an inlet and an outlet of the aluminum oxide film 21a to perform a function of filtering a dust that may be included in inflow

air and discharge air.

[0040] The partitions 21b are each disposed between the aluminum oxide film 21a and the dust-free fibers 21c that are disposed at both surfaces of the aluminum oxide film 21a. The partition 21b prevents damage from occurring when the aluminum oxide film 21a contacts with the dust-free fiber 21c and is made of plastic in consideration of protection and strength security of the aluminum oxide film 21a. Further, in order to prevent inflow air or discharge air, having passed through the dust-free fiber 21c and the aluminum oxide film 21a from being intercepted, the partition 21b is formed in a net-shaped partition having a void of an enough size.

[0041] As described above, the inhalation filter 21 including the aluminum oxide film 21a, the dust-free fiber 21c, and the partition 21b is housed in and is fixed to the inhalation housing 23. The inhalation housing 23 is made of plastic to have enough strength to protect the inhalation filter 21.

[0042] When the user wears the mask 100 and breaths according to the present exemplary embodiment, inhalation is injected through the inhalation module 20 of the above-described configuration, and thus a virus of a micro size, specifically, about 50nm as well as a dust can be effectively intercepted.

[0043] FIGS. 4A and 4B are schematic diagrams illustrating operation of an exhalation module of a mask according to an exemplary embodiment of the present invention, and a configuration of the exhalation module 30 according to an exemplary embodiment of the present invention will be described with reference to FIGS. 4A and 4B.

[0044] The exhalation module 30 according to the present exemplary embodiment includes an opening and closing film 31, a partition 32, and an exhalation housing 33 that houses the opening and closing film 31 and the partition 32.

[0045] In the opening and closing film 31, a pore is not formed and thus in a breathing process, the opening and closing film 31 is formed not to penetrate air. For this purpose, the opening and closing film 31 is made of a material such as rubber. The partition 32 supports the opening and closing film 31 and is formed to enable air to penetrate the opening and closing film 31 in a breathing process, particularly, an exhaling process. For this purpose, the partition 32 is formed in a net shape using a material such as plastic. The exhalation housing 33 houses the opening and closing film 31 and the partition 32, and in order to protect the opening and closing film 31 and the partition 32, the exhalation housing 33 is made of plastic to have enough strength, and the exhalation housing 33 is inserted into and is fixed to the exhalation module inserting port 13 of the mask body 10.

[0046] One end of the opening and closing film 31 is fixed to the housing 33, and the other end of the opening and closing film 31 that is not fixed to the housing 33 is formed to move in a vertical direction (see FIG. 4A). Further, the partition 32 is fixed within the housing 33 along

a circumference thereof to support the opening and closing film 31.

[0047] FIG. 4A is a diagram illustrating operation of an exhalation module in an inhaling process, and referring to FIG. 4A, as an inhaling force is applied in a mask direction (a direction A), the opening and closing film 31 moves in a mask direction (a direction A). Because the partition 32 is fixed within the housing 33, the opening and closing film 31 close contacts with the partition 32, and by the opening and closing film 31 in which a pore is not formed, air is not injected in the mask direction (the direction A) through the exhalation module 30.

[0048] Accordingly, when the user wears the mask 100 and inhales, air is not injected by the exhalation module 30 but is injected only by the inhalation module 20 and thus a virus of a micro size as well as a dust can be effectively intercepted.

[0049] FIG. 4B is a diagram illustrating operation of an exhalation module in an exhaling process, and referring to FIG. 4B, as a pressure is applied in a direction opposite to the mask direction (the direction A), the other end of the opening and closing film 31 that is not fixed to the housing 33 moves in a direction opposite to the mask direction (the direction A). That is, the other end of the opening and closing film 31 that is not fixed to the housing 33 is separated from the partition 32 and moves to an upper part (see FIG. 4B) within the housing 33.

[0050] Accordingly, when the user wears the mask 100 and exhales, exhalation is discharged to a gap that is formed when the net-shaped partition 32 and the opening and closing film 31 move to an upper part within the housing 33.

[0051] Air may be discharged through a configuration of such an exhalation module 30, and particularly, as the exhalation module 30 is formed in a central portion of the mask 100, the exhalation module 30 enables the air to be smoothly discharged to the outside of the mask 100. Further, because air may be discharged through the inhalation module 20, air is rapidly discharged.

[0052] As described above, the mask 100 according to an exemplary embodiment of the present invention can effectively intercept a virus of a micro size of about 50nm and thus secures safe activity of the user without a limitation to an outside environment.

[0053] FIG. 5 is a diagram sequentially illustrating a method of manufacturing an inhalation filter of a mask according to an exemplary embodiment of the present invention, and hereinafter, a method of manufacturing a mask according to an exemplary embodiment of the present invention will be described with reference to FIGS. 1 to 5.

[0054] The method of manufacturing the mask 100 according to the present exemplary embodiment includes steps of preparing the mask body 10, forming the inhalation module inserting port 12 and the exhalation module inserting port 13 in the mask body 10, and mounting the inhalation module 20 and the exhalation module 30 in the inhalation module inserting port 12 and the exhalation

module inserting port 13, respectively.

[0055] The mask body 10 is made of a material such as plastic and rubber in which a pore is not formed, and the inhalation module 20 and the exhalation module 30 are mounted in the inhalation module inserting port 12 and the exhalation module inserting port 13, respectively, by a forced insertion method, or are mounted using an adhesive member. In this case, in order to fill a micro gap that may occur by a tolerance between the inhalation module 20 and the exhalation module 30 and between the inhalation module inserting port 12 and the exhalation module inserting port 13, a sealant may be additionally applied.

[0056] The inhalation module 20 is formed to house the inhalation filter 21 within the inhalation housing 23 that is made of a plastic material. The inhalation filter 21 is formed by sequentially stacking the partition 21 b and the dust-free fiber 21 c at both surfaces of the aluminum oxide film 21 a, and by fixing them within the inhalation housing 23, the inhalation module 20 is formed.

[0057] Referring to FIG. 5, a method of forming an aluminum oxide film according to the present exemplary embodiment will be described in detail. In order to form the aluminum oxide film 21 a, an aluminum substrate 50 is prepared, and by anodizing the aluminum substrate 50, an aluminum oxide layer 51 and an unoxidized aluminum layer 52 are formed.

[0058] Anodization is technology that makes metal oxide by electrochemically oxidizing a metal, and when generally anodizing aluminum, aligned porous aluminum oxide is obtained. In the present exemplary embodiment, the aluminum oxide layer 51 that is formed through anodization has a porous structure in which a plurality of holes are regularly formed, and the aluminum oxide layer 51 is formed in a honeycomb structure, which is an aggregate of a hexagonal pillar having the hollow center.

[0059] In this way, after the aluminum oxide layer 51 is formed through anodization, in order to adjust a size of a hole that is formed in the aluminum oxide layer 51, an etching process is performed. When a portion of the aluminum oxide layer 51 is etched, an aluminum oxide pillar 51 a and an aluminum oxide lower layer 51 b are formed, and thus a hole of an appropriate size is formed according to use of the mask 100.

[0060] Thereafter, by selectively etching the aluminum layer 52 that is formed in a lower portion of the aluminum oxide lower layer 51 b, the aluminum layer 52 is removed, and by removing the aluminum oxide lower layer 51 b through etching, the aluminum oxide film 21 a having opened both sides is formed.

[0061] The aluminum oxide film 21 a that is used for the inhalation filter 21 is formed by a simple method through such a process. Further, because a size of a hole that is formed in the aluminum oxide film 21 a may be adjusted in a process, the mask 100 that can intercept dusts or virus of various sizes according to a use purpose and a use environment is produced.

[0062] The exhalation module 30 is formed by housing

the opening and closing film 31 and the partition 32 in the exhalation housing 33 that is made of a plastic material. In this case, the partition 32 is formed in a net shape of a plastic material and is fixed to the housing 33 not to move within the housing 33. Further, the opening and closing film 31 is made of rubber in which a pore is not formed, one end thereof is fixed to the housing 33, and in a breathing process, the other end that is not fixed to the housing 33 may be moved.

[0063] In this way, by a method of manufacturing the mask 100 according to the present exemplary embodiment, the mask 100 that can effectively intercept a virus of a micro size as well as a dust can be produced by a simple method and thus a production cost can be reduced, and productivity can be improved.

[0064] While this invention has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

Claims

1. A mask, comprising:

a mask body;
an exhalation module that is formed at one surface of the mask body; and
an inhalation module that is formed at the one surface of the mask body and that comprises an inhalation filter,
wherein the inhalation filter comprises an anodized aluminum oxide film.

2. The mask of claim 1, wherein a plurality of holes are formed in the aluminum oxide film, and the plurality of holes each have a diameter of 18nm to 40nm.

3. The mask of claim 1, wherein the aluminum oxide film is formed in a honeycomb structure.

4. The mask of claim 1, wherein the inhalation filter further comprises
a dust-proof fiber that is disposed at both surfaces of the aluminum oxide film; and
a net-shaped partition that is disposed between the aluminum oxide film and the fiber.

5. The mask of claim 1, wherein the inhalation module comprises an inhalation housing that houses the inhalation filter.

6. The mask of claim 1, wherein the exhalation module comprises
an opening and closing film;

a net-shaped partition that is disposed at one surface of the opening and closing film; and
an exhalation housing that houses the opening and closing film and the partition.

7. The mask of claim 1, further comprising an adhesive module that is formed along an edge of the mask body at the other one surface of the mask body in which the inhalation module and the exhalation module are not formed.

8. The mask of claim 7, wherein the adhesive module is a double-sided adhesive tape.

9. The mask of any of claims 1 to 8, wherein the exhalation module is formed in a central portion of the mask body, and the inhalation module is formed in a pair in symmetry about the exhalation module.

10. A method of manufacturing a mask, the method comprising:

preparing a mask body;
forming an inhalation module inserting port and an exhalation module inserting port in the mask body; and
mounting an inhalation module and an exhalation module comprising an inhalation filter in the inhalation module inserting port and the exhalation module inserting port, respectively,
wherein the inhalation filter is formed by forming an aluminum oxide film by forming a hole by anodizing aluminum and by disposing a net-shaped partition and fiber at both surfaces of the aluminum oxide film.

11. The method of claim 10, further comprising forming the aluminum oxide film and performing an etching process in order to adjust a size of a hole that is formed in the aluminum oxide film.

12. The method of claim 10, further comprising anodizing the aluminum and removing an unoxidized aluminum layer.

13. The method of claim 10, further comprising forming a double-sided adhesive tape along an edge of the other one surface of the mask body in which the inhalation module and the exhalation module are not formed.

14. The method of any of claims 10 to 13, wherein the exhalation module is formed in a central portion of the mask body, and the inhalation module is formed in a pair in symmetry about the exhalation module.

FIG. 1

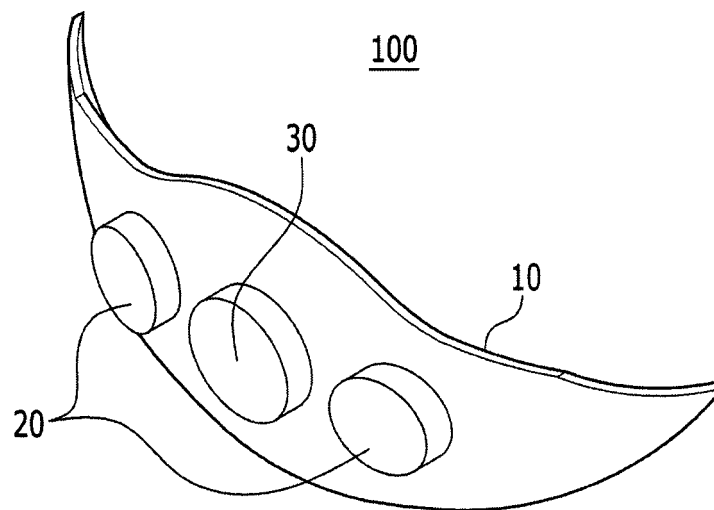


FIG. 2

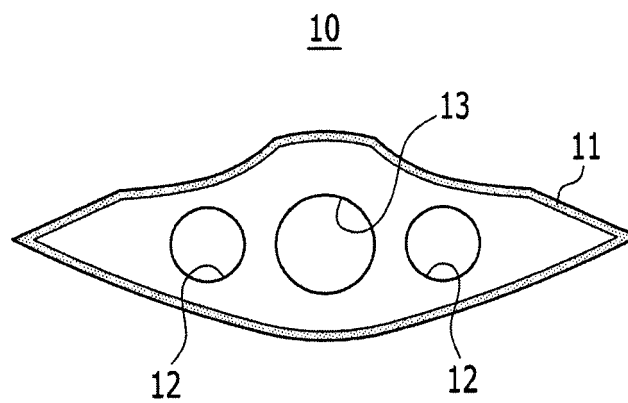


FIG. 3

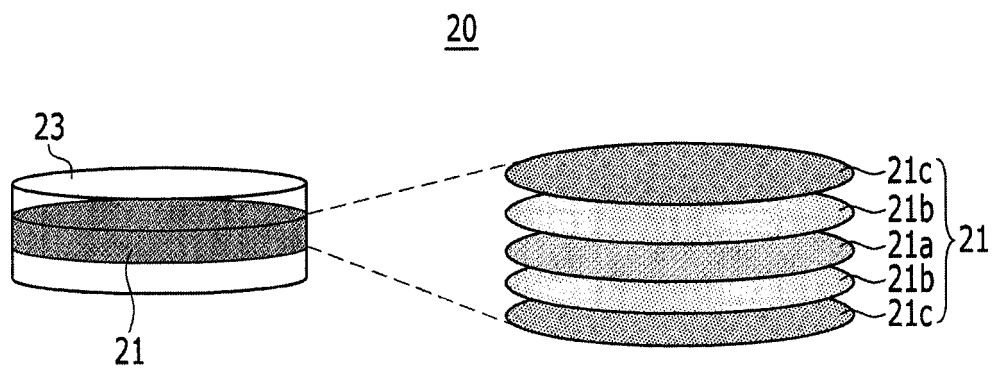


FIG. 4A

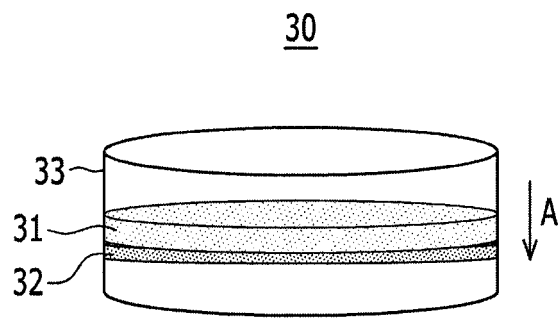


FIG. 4B

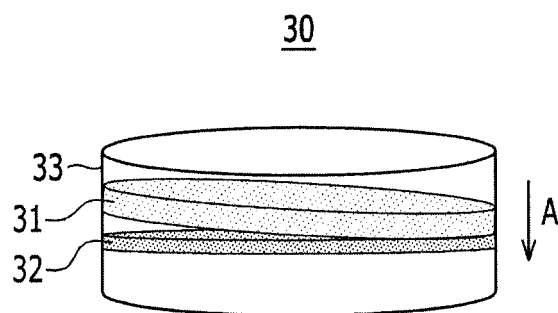


FIG. 5

