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(71) Applicant: **Oriken Co., Ltd.**
Nagano 396-0021 (JP)

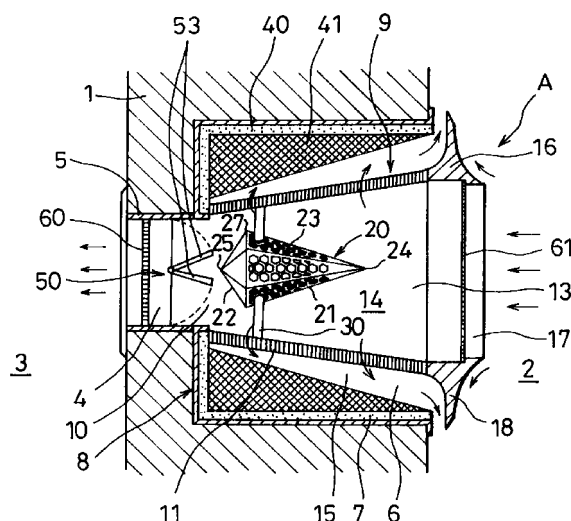
(72) Inventor: **Orii, Tsunekazu**
1526-8, Oaza Ina, Ina Nagano 396-0021 (JP)

(74) Representative:
Gesthuysen, von Rohr & Eggert
Patentanwälte
Postfach 10 13 54
45013 Essen (DE)

(54) **Ventilating system**

(57) A ventilating system is proposed which comprises an air passage communicating between an outdoor side and an indoor side. In order to prevent noise entering from the outdoor side and sound escaping from the indoor side and to prevent outdoor air invading at wind speed over a specific value, a part of the air passage is defined by a hexagonal frame main body whose cross section is reduced gradually from outdoor side to indoor side. Further, it is provided a sound deadening member which is a hexagonal sound absorbing cone member comprising an outside sound deadening portion which is a first hexagonal cone whose apex is directed to the outdoor side and an inside sound deadening portion which is a second hexagonal cone whose apex is directed to the indoor side, so that the cross section of the air passage is reduced gradually from the apex of the first hexagonal cone to a bottom surface portion thereof and increased gradually from the bottom surface portion thereof to the apex of the second hexagonal cone. Furthermore, an opening and shutting mechanism is provided in the air passage to close the air passage when wind speed of the outdoor side exceeds a specific value.

FIG. 1



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Description

[0001] This invention relates to a natural ventilating system for ventilating indoor side by convecting air in an architecture such as housing naturally, which prevents noise invading from the outside or sound escaping from the inside and further the air outside invading too much. In particular, the present invention relates to a ventilating system according to the preamble of claim 1 or 7.

[0002] JP 2,938,861 A discloses a natural ventilating method and a ventilating system for the purpose of natural ventilation of an architecture such as housing.

[0003] JP 2,938,861 A discloses a ventilation method for an architecture such as housing, which shows that a hexagonal ventilation portion formed in honeycomb shape is mounted on a wall surface of the architecture, showing a natural ventilating method characterized by changing indoor air to outdoor air by making natural ventilation. To put it concretely, air discharged from honeycomb-shaped holes formed around the hexagonal ventilation portion to outdoor side joins air which can not enter in an outside entrance, and negative pressure phenomenon by the joined air vacuums air flown out of the indoor side and discharge the indoor air to the outdoor.

[0004] Furthermore, JP 2,938,861 A discloses a ventilating system mounted on the wall surface of the architecture such as housing comprises a hexagonal frame main body whose one end is larger than another end thereof and all around of which hexagonal ventilation holes in honeycomb shape are formed, and an outer frame member in cylindrical shape which is larger than the hexagonal frame main body. The hexagonal frame main body is mounted in the outer frame and a heat insulating material is mounted on an inner surface of the outer frame. Furthermore, JP 2,938,861 A shows that the hexagonal frame main body comprises a plastic holding material in which an expanded polystyrene material is mounted, a sound-absorbing material mat which is mounted on the expanded polystyrene material, a water-proofing corrugated cardboard which is mounted in the sound-absorbing material and an outer cap of the hexagonal frame main body in which each material is mounted.

[0005] The system is further provided with a dust net stretched on one end of the hexagonal frame main body and a sound absorbing net stretched on another end thereof.

[0006] Furthermore, this system is provided with a hexagonal air course formed outside of the hexagonal ventilation holes, a sound absorbing net stretched on an outer surface of the hexagonal air course and an heat insulating material mounted on an outer surface of the sound absorbing net.

[0007] In JP 2,938,861 A, though a sound insulation effect can be gained by using the sound absorbing material mat or the sound absorbing net, it is desired to prevent noise invading with sucked outside air further.

[0008] Moreover, in the natural ventilating system, since quantity of ventilation depends on a wind speed in the outdoor, quantity of outside air entered into the indoor is too much when the wind speed is large, so that there is a case that we feel bad.

[0009] Object of the present invention is to offer a ventilating system which can prevent or minimize noise of the outdoor invading, sound of the indoor escaping and outside air entering when a wind speed exceeds over a specific value.

[0010] The above object is achieved by a ventilating system according to claim 1 or 7. Preferred embodiments are subject of the subclaims.

[0011] In particular, a ventilating system is provided on a wall portion of an architecture such as housing and having an air passage communicating between an indoor side and an outdoor side through the wall portion, characterized in that: a sound deadening member comprising an outside sound deadening portion which makes the air passage gradually narrower from the outdoor side against the indoor side and an inside sound deadening portion which makes the air passage gradually narrower from the indoor side against the outdoor side.

[0012] Therefore, the sound deadening member comprising the outside sound deadening portion which makes the air passage gradually narrower from the outdoor side against the indoor side and an inside sound deadening portion which makes the air passage gradually narrower from the indoor side against the outdoor side is provided in the air passage communicating between the indoor side and the outdoor side, so that noise entering from the outdoor side is compressed during passing through a side of the outside sound deadening portion and then the noise passes to a side of the inside sound deadening portion to reduce the pressure thereof and be attenuated, and so that sound escaping from the indoor side is compressed during passing through the side of the inside sound deadening portion and then the sound passes to a side of the outside sound deadening portion to reduce the pressure thereof and be attenuated. As a result, according to thus sound deadening effect, comings and goings of noise and sound can be prevented.

[0013] Preferably, there is provided with an open and shut mechanism which makes the air passage close when air pressure of the outdoor side is more than a specific value is provided in the air passage. Thus, when wind speed of the outdoor side is over a specific value, the open and shut mechanism makes the air passage close to prevent unnatural ventilation into the indoor side.

[0014] Also, it is preferred that the ventilating system is a natural ventilating system comprising: a mounting outer frame, which is constituted of a first cylindrical portion whose one end opens to the indoor side of the wall portion and a second cylindrical portion whose one end is communicated with another end of the first cylin-

dricl portion and whose another end opens to the outdoor side of the wall portion, a diameter of the second cylindrical portion being larger than a diameter of the first cylindrical portion; a hexagonal frame main body mounted into the second cylindrical portion, which is provided with a hexagonal inside opening portion communicating with the another end of the first cylindrical portion, a hexagonal outside opening portion communicating with the outdoor side, a hexagonal frame side surface portion formed in a hexagonal prismoid shape such that a cross section thereof enlarges gradually from the hexagonal inside opening portion to the hexagonal outside opening portion and a plurality of honeycomb-shaped holes formed in the hexagonal frame side surface portion; an air vent passage defined between the mounting outer frame and the hexagonal frame main body and communicating with an inner space of the hexagonal frame main body via the honeycomb-shaped holes; and an outer cap mounted on the hexagonal outside opening portion and having an outdoor opening portion communicating with the hexagonal outside opening portion and a guide flange extending along the wall portion; wherein said air passage is constituted of the first cylindrical portion and said inner space of said hexagonal frame main body.

[0015] Accompanying thus constitution, the sound deadening member is a hexagonal sound absorbing cone member, which comprises a first hexagonal cone whose apex is directed to the outdoor side and a second hexagonal cone whose apex is directed to the indoor side.

[0016] Accordingly, the hexagonal sound absorbing cone member comprising the first hexagonal cone whose apex is directed to the outdoor side and the second hexagonal cone whose apex is directed to the indoor side is provided in the air passage formed in the hexagonal frame main body in which cross section thereof is gradually decreased from the outdoor side to the indoor side, so that cross section of the air passage from the apex of the first hexagonal cone to a bottom surface of the first hexagonal cone is made decrease gradually and the cross section of the air passage from the bottom surface to the apex of the second hexagonal cone is made increase gradually, as a result, the above-mentioned sound deadening effect prevents noise entering into the indoor side.

[0017] Also in sound from the indoor side, cross section of the air passage from the apex of the second hexagonal cone to a bottom surface of the second hexagonal cone is decreased gradually and the cross section of the air passage from the bottom surface to the apex of the first hexagonal cone is increased gradually, as a result, the above-mentioned sound deadening effect prevents sound from the indoor side escaping to the outdoor side.

[0018] Furthermore, the hexagonal sound absorbing cone member is provided with a plurality of honeycomb-shaped holes formed in a side surface thereof,

and a sound absorbing material is provided therein. Also, it is preferred that the sound absorbing material is a sponge.

[0019] Thus, as the plurality of the honeycomb-shaped holes are formed in a side surface of the hexagonal sound absorbing cone member and the sound absorbing material is provided therein, noise is attenuated during passing by the hexagonal sound absorbing cone member.

[0020] Furthermore, it is desired that the open and shut mechanism comprises: a cylindrical cap portion mounted on one end of the first cylindrical portion, which has an opening provided with a plurality of small holes; a pair of blades for opening and shutting the opening, each of which is formed in a semicircular shape; and a spring portion for urging the pair of the blades by a specific power so as to open the opening. Also, it is preferred that a knob is provided in a center of the cylindrical cap portion and the knob pushes the blades so as to open the opening.

[0021] Further features, aspects, advantages and details of the present invention are described in the following with respect to preferred embodiments shown in the drawings. It shows:

Fig. 1 a cross section view of a natural ventilating system according to the present invention;

Fig. 2 a plan view of the natural ventilating system according to the present invention;

Fig. 3 a perspective view of a hexagonal sound absorbing cone member of the natural ventilating system according to the present invention;

Fig. 4 an explanatory drawing of the natural ventilating system according to the present invention;

Fig. 5 a perspective view of the natural ventilating system according to the present invention;

Fig. 6 a perspective view of an opening and shutting mechanism; and

Fig. 7 a cross section view illustrating another embodiment of this invention.

[0022] Fig. 1 shows a ventilating system A in architecture such as housing according to the present invention.

[0023] The ventilating system A is provided on a wall portion 1 of the architecture such as housing and is a natural ventilating system which can ventilate air of an indoor side 3 naturally by convecting the air of the indoor side 3 and air of an outdoor side 2, which is provided with a mounting outer frame 8 constituted of a first

cylindrical portion 5 whose one end defines a first hole 4 opening to the indoor side 3 of the wall portion 1 and a second cylindrical portion 7 whose one end is communicated with the first hole 4 and whose another end defines a second hole 6 opening to the outdoor side 2 of the wall portion 1 and having a larger diameter than one of the first hole 4.

[0024] Also, as shown in Figs. 1 through 3, a hexagonal frame main body 9 mounted in the mounting outer frame 8 is constituted of an inner opening portion 10 communicating with another end of the first hole 4, an outer opening portion 13 opening to the outdoor side 2, a hexagonal frame side surface portion 11 formed in a hexagonal prismoid shape such that a cross section thereof enlarges gradually from the inner opening portion 10 to the outer opening portion 13, and a plurality of honeycomb-shaped holes 12 formed in the hexagonal frame side surface portion 11. Note that an air passage 14 is constituted of an inner space defined in the hexagonal frame side surface portion 11 and the first hole 4 in the first cylindrical portion 5.

[0025] An exhaust air passage 15 is defined between the hexagonal frame main body 9 and the mounting outer frame 8.

[0026] A heat insulating material 40 is provided around an inner surface of the second cylindrical portion 7 of the mounting outer frame 8 and a sound absorbing net 41 is provided around the heat insulating material 40.

[0027] Furthermore, an outer cap 16 is mounted on the outer opening portion 13 of the hexagonal frame main body 9, an outside opening portion 17 communicating between the outer opening portion 13 and the outdoor side 2 is provided in a center thereof, and a guide flange 18 for guiding air discharged from the exhaust air passage 15 to a direction along the wall portion 1 is extended in a radial direction thereof. An insect screen 61 is stretched on the outside opening portion 17.

[0028] A hexagonal sound absorbing cone member 20 as shown in Fig. 4 is positioned at a center of the air passage 14 by supporting member 30 such as bolts. The hexagonal sound absorbing cone member 20 is constituted of a first hexagonal cone 21 (as an outside sound deadening portion) with an apex 24 directed to the outer opening portion 13 and a second hexagonal cone 22 (as an inside sound deadening portion) with an apex 25 directed to the inner opening portion 10. Note that the first hexagonal cone 21 and the second hexagonal cone 22 have a common bottom surface portion 27.

[0029] Thus, as shown in Fig. 5, cross section of the air passage 14 can be formed so as to be reduced gradually from the apex 24 of the first hexagonal cone 21 to the bottom surface portion 27, and further, so as to increased gradually from the bottom surface portion 27 to the apex 25 of the second hexagonal cone 22. Furthermore, in this embodiment, a plurality of honeycomb-

shaped noise absorbing holes 23 are formed in six side surfaces 28 of the first hexagonal cone 21, a sound absorbing material such as natural sponges, synthetic sponges and foaming materials is mounted inside thereof.

[0030] Accordingly, noise from the outdoor side 2 is compressed during passing from the apex 24 to the bottom surface portion 27 and after passing through the bottom surface portion 27, pressure of the noise is reduced and attenuated (a sound deadening effect). Furthermore, some part of the noise is absorbed by the sound absorbing material in the hexagonal sound absorbing cone member 20 and some part of the noise is reflected in the side surfaces 28 of the first hexagonal cone 21 and absorbed by the sound absorbing net 41.

[0031] Similarly, sound from the indoor side 3 is compressed during passing from the apex 25 to the bottom surface portion 27 and after passing through the bottom surface portion 27, pressure of the sound is reduced and attenuated (a sound deadening effect). Furthermore, some part of the sound is absorbed by the sound absorbing material in the hexagonal sound absorbing cone member 20 and some part of the sound is reflected in side surfaces of the second hexagonal cone 22 and preventing the sound escaping to the outdoor side 2.

[0032] Furthermore, another embodiment as shown in Fig. 7 shows that a plurality of honeycomb-shaped noise absorbing holes 23 are formed in six side surfaces of the second hexagonal cone 22. Thus, as sound from the indoor side 3 can be absorbed by the sound absorbing material housed inside of the hexagonal sound absorbing cone member 20, sound escaping from the indoor side 3 can be prevented surely.

[0033] An opening and shutting mechanism 50 to close the first hole 4 when wind speed in the outdoor side 2 is over a specific value is provided in the first hole 4. Note that reference number 60 is a dust cover.

[0034] The opening and shutting mechanism 50 is, as shown in Fig. 6, provided with a cylindrical cap portion 51 mounted on one end of the first cylindrical portion 5 defining the first hole 4 and a pair of blades 53 provided on the cap portion 51. Each of the blades 53 formed in a semicircular shape, so that an opening 52 formed in the cap portion 51 can be closed by both semicircular blades 53 in a condition that the blades 53 are spread. The opening 52 is provided with a plurality of small holes formed in honeycomb shape.

[0035] In each of the semicircular blades 53, both ends of a chord portion 53A are fixed on the cap portion 51 rotatably, and each chord portion 53A is provided with an opening and shutting piece 54 is formed integrally at an approximately center of the chord 53A. The pair of the blades 53 can close the opening 52 by spreading and open the opening 52 by being put together. A spring portion 56 is provided on the chords 53 of the pair of the blades 53 to urge the blades 53 at a specific power so as for the blades 53 to be put together.

Note that the specific power of the spring portion 56 is set corresponding to the specific value of the wind speed in the outdoor side 2.

[0036] Furthermore, a closing knob piece 57 for pushing the opening and shutting pieces 54 to close the opening 52 manually is provided at an approximately center of the cap portion 51, and the closing knob piece 57 is connected with a manual knob 58 projecting from the cap portion 51 to the indoor side 3.

[0037] Thus, when the wind speed in the outdoor side 2 exceeds the specific value, ventilating pressure corresponding to the wind speed is superior to power of the spring portion 56, so that the blades 53 is spread to close the opening 52 and prevent the outdoor air entering. When the ventilating pressure is lower than the specific value, the power of the spring portion 56 is superior to the ventilating pressure, so that the blades 56 are put together to open the opening 52 and revive the natural ventilation.

Claims

1. Ventilating system (A) for provision on a wall portion (1) of an architecture such as housing, wherein the ventilating system (A) comprises an air passage (14) communicating between an indoor side (2) and an outdoor side (3) through said wall portion (1),
characterized in

that the ventilating system (A) comprises a sound deadening member comprising an outside sound deadening portion which makes said air passage (14) gradually narrower from said outdoor side (3) against said indoor side (2) and an inside sound deadening portion which makes said air passage (14) gradually narrower from said indoor side (2) against said outdoor side (3).

2. Ventilating system according to claim 1, characterized in that an open and shut mechanism (50) which makes said air passage (14) close when air pressure of said outdoor side (3) is more than a specific value is provided in said air passage (14).
3. Ventilating system according to claim 1 or 2, characterized in that the ventilating system (A) further comprises:

a mounting outer frame (8), which is constituted of a first cylindrical portion (5) whose one end opens to said indoor side (2) of said wall portion (1) and a second cylindrical portion (7) whose one end is communicated with another end of said first cylindrical portion (5) and whose another end opens to said outdoor side (3) of said wall portion, a diameter of said second cylindrical portion (7) being larger than a

diameter of said first cylindrical portion (5);
a hexagonal frame main body (9) mounted into said second cylindrical portion (7), which is provided with a hexagonal inside opening portion (10) communicating with said another end of said first cylindrical portion (5), a hexagonal outside opening portion (13) communicating with said outdoor side (3), a hexagonal frame side surface portion (11) formed in a hexagonal prismoid shape such that a cross section thereof enlarges gradually from said hexagonal inside opening portion (10) to said hexagonal outside opening portion (13) and a plurality of honeycomb-shaped holes (12) formed in said hexagonal frame side surface portion (11);
an air vent passage (15) defined between said mounting outer frame (8) and said hexagonal frame main body (9) and communicating with an inner space of said hexagonal frame main body (9) via said honeycomb-shaped holes (12); and
an outer cap (16) mounted on said hexagonal outside opening portion (13) and having an outdoor opening portion (17) communicating with said hexagonal outside opening portion (13) and a guide flange (18) extending along said wall portion (1);
wherein said air passage (14) is constituted of said first cylindrical portion (5) and said inner space of said hexagonal frame main body (9).

4. Ventilating system according to claim 3, characterized in that said sound deadening member is a hexagonal sound absorbing cone member (20), which comprises a first hexagonal cone (21) whose apex is directed to said outdoor side (3) and a second hexagonal cone (22) whose apex is directed to said indoor side (2)
5. Ventilating system according to claim 4, characterized in that said hexagonal sound absorbing cone member (20) is provided with a plurality of honeycomb-shaped sound absorbing holes (23) in a side surface thereof and a sound absorbing material therein.
6. Ventilating system according to claim 5, characterized in that said sound absorbing material is a sponge.
7. Ventilating system (A) for provision on a wall portion (1) of an architecture such as housing, wherein the ventilating system (A) comprises an air passage (14) communicating between an indoor side (2) and an outdoor side (3) through said wall portion (1), preferably according to any one of the preceding claims,
characterized in

that the ventilating system (A) comprises an open and shut mechanism (50) which makes said air passage (14) close when air pressure of said outdoor side (3) is more than a specific value, and which is provided in said air pas-
sage (14).

8. Ventilating system according to claim 7, characterized in that the ventilating system (A) further comprises:

a mounting outer frame (8), which is constituted of a first cylindrical portion (5) whose one end opens to said indoor side (2) of said wall portion (1) and a second cylindrical portion (7) whose one end is communicated with another end of said first cylindrical portion (5) and whose another end opens to said outdoor side (3) of said wall portion, a diameter of said second cylindrical portion (7) being larger than a diameter of said first cylindrical portion (5);
a hexagonal frame main body (9) mounted into said second cylindrical portion (7), which is provided with a hexagonal inside opening portion (9) communicating with said another end of said first cylindrical portion (5), a hexagonal outside opening portion (13) communicating with said outdoor side (3), a hexagonal frame side surface portion (11) formed in a hexagonal prismoid shape such that a cross section thereof enlarges gradually from said hexagonal inside opening portion (9) to said hexagonal outside opening portion (13) and a plurality of honeycomb-shaped holes (12) formed in said hexagonal frame side surface portion (11);
an air vent passage (15) defined between said mounting outer frame (8) and said hexagonal frame main body (9) and communicating with an inner space of said hexagonal frame main body (9) via said honeycomb-shaped holes (12); and
an outer cap (16) mounted on said hexagonal outside opening portion (13) and having an outdoor opening portion (17) communicating with said hexagonal outside opening portion (13) and a guide flange (18) extending along said wall portion (1);
wherein said air passage (14) is constituted of said first cylindrical portion (5) and said inner space of said hexagonal frame main body (9).

9. Ventilating system according to any one of claims 2 to 6, or 8, characterized in that said open and shut mechanism (50) comprises:

a cylindrical cap portion (51) mounted on one end of said first cylindrical portion (5), which has an opening (52) provided with a plurality of

small holes;

a pair of blades (53) for opening and shutting said opening, each of which is formed in a semicircular shape; and
a spring portion (56) for urging said pair of said blades (53) with a specific power so as to open said opening (52).

10. Ventilating system according to claim 9, characterized in that a knob (58) is provided in a center of said cylindrical cap portion (51), said knob (58) pushing said blades (58) so as to open said opening (52).

11. Ventilating system according to any one of claims 3 to 6 or 8 to 10, characterized in that a heat insulating material (40) is provided on an inner surface of said second cylindrical portion (7).

12. Ventilating system according to claim 11, characterized in that a sound absorbing net (41) is provided between said hexagonal frame side surface portion (11) and said heat insulating material (40).

13. Ventilating system according to any one of the preceding claims, characterized in that said air passage (14) is provided with a dust resistant net (60).

14. Ventilating system according to any one of the preceding claims, characterized in that said air passage (14) is provided with an insect net (61).

15. Ventilating system according to any one of the preceding claims, characterized in that a plurality of said ventilating systems are provided in said wall portion (1) of an architecture such as a housing.

FIG. 1

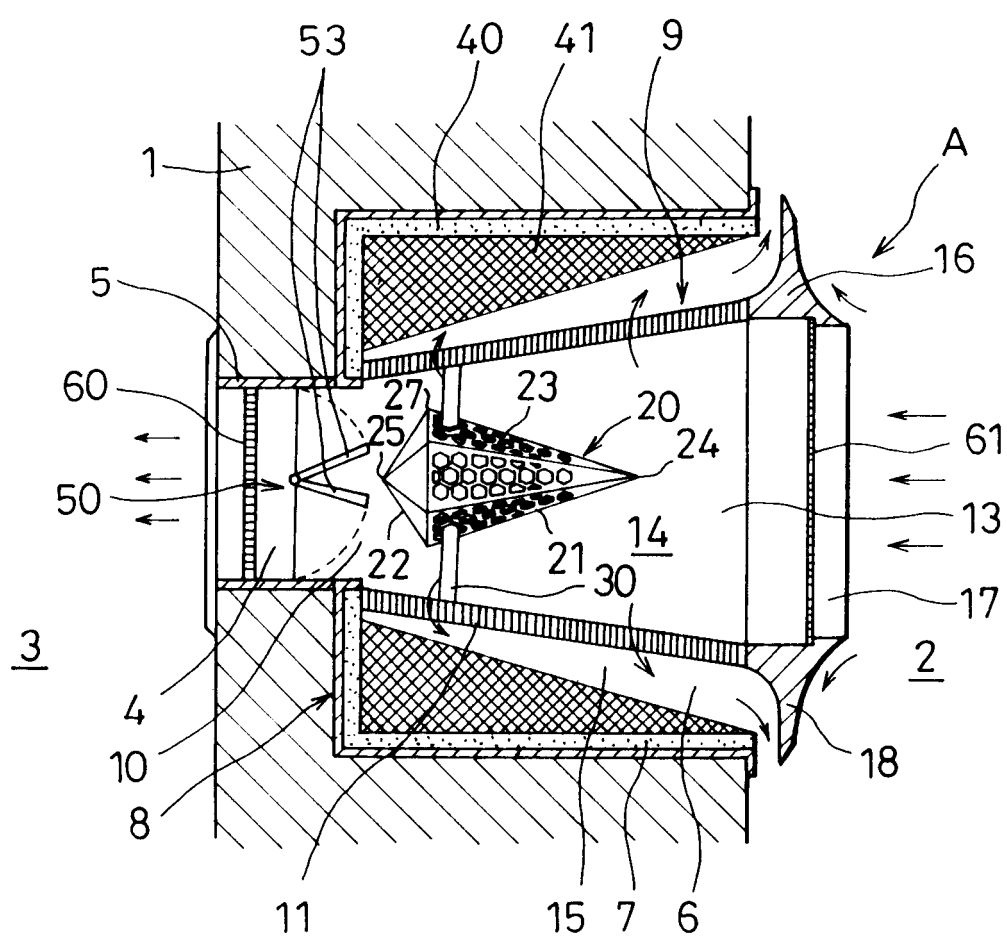


FIG. 2

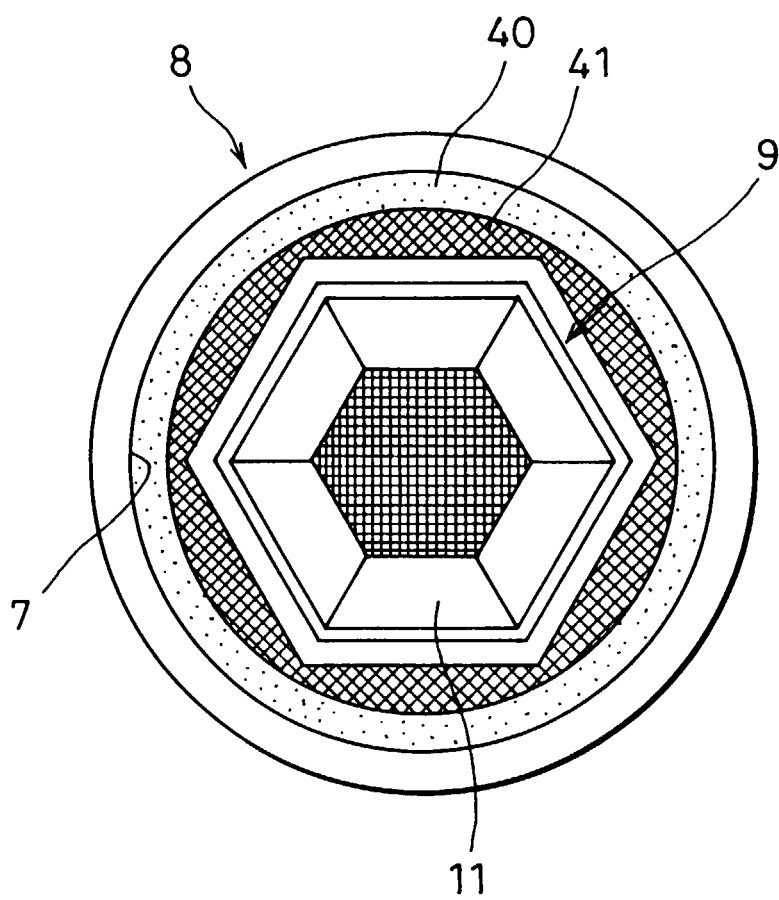


FIG. 3

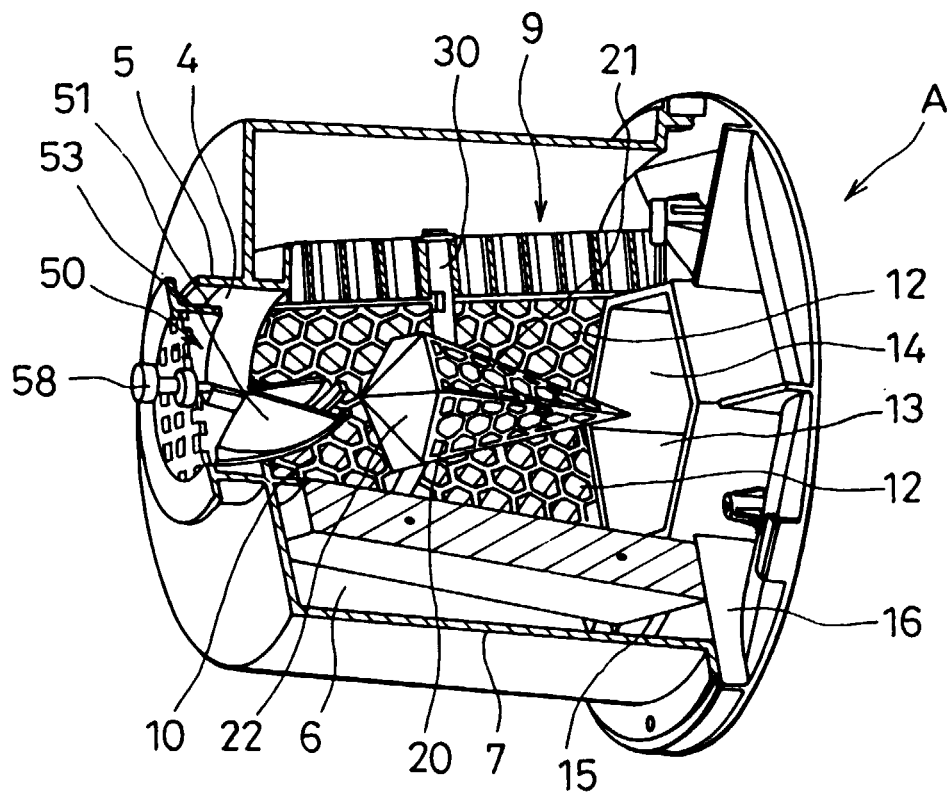


FIG. 4

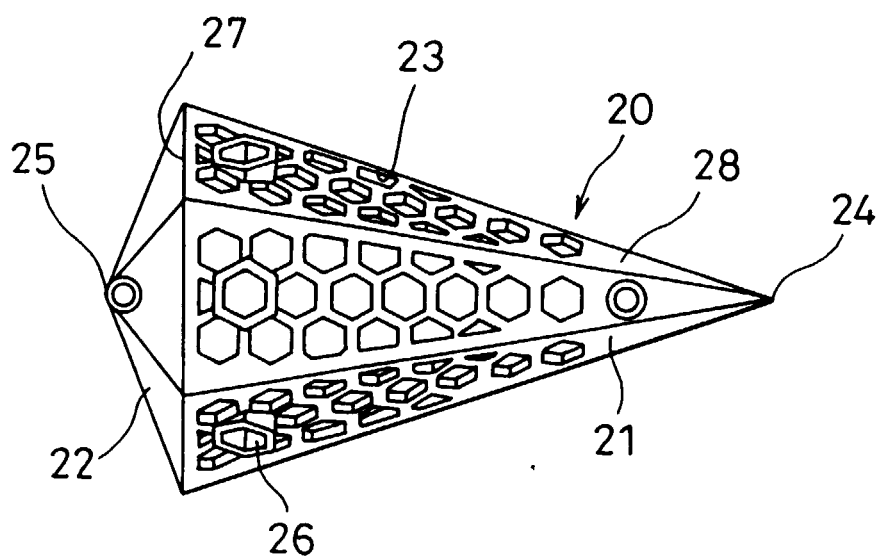


FIG. 5

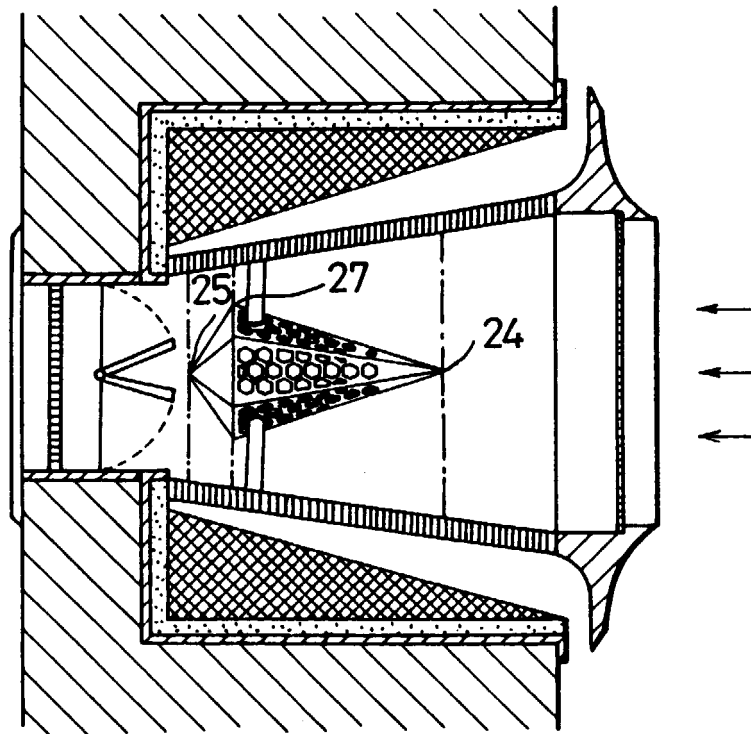


FIG. 6

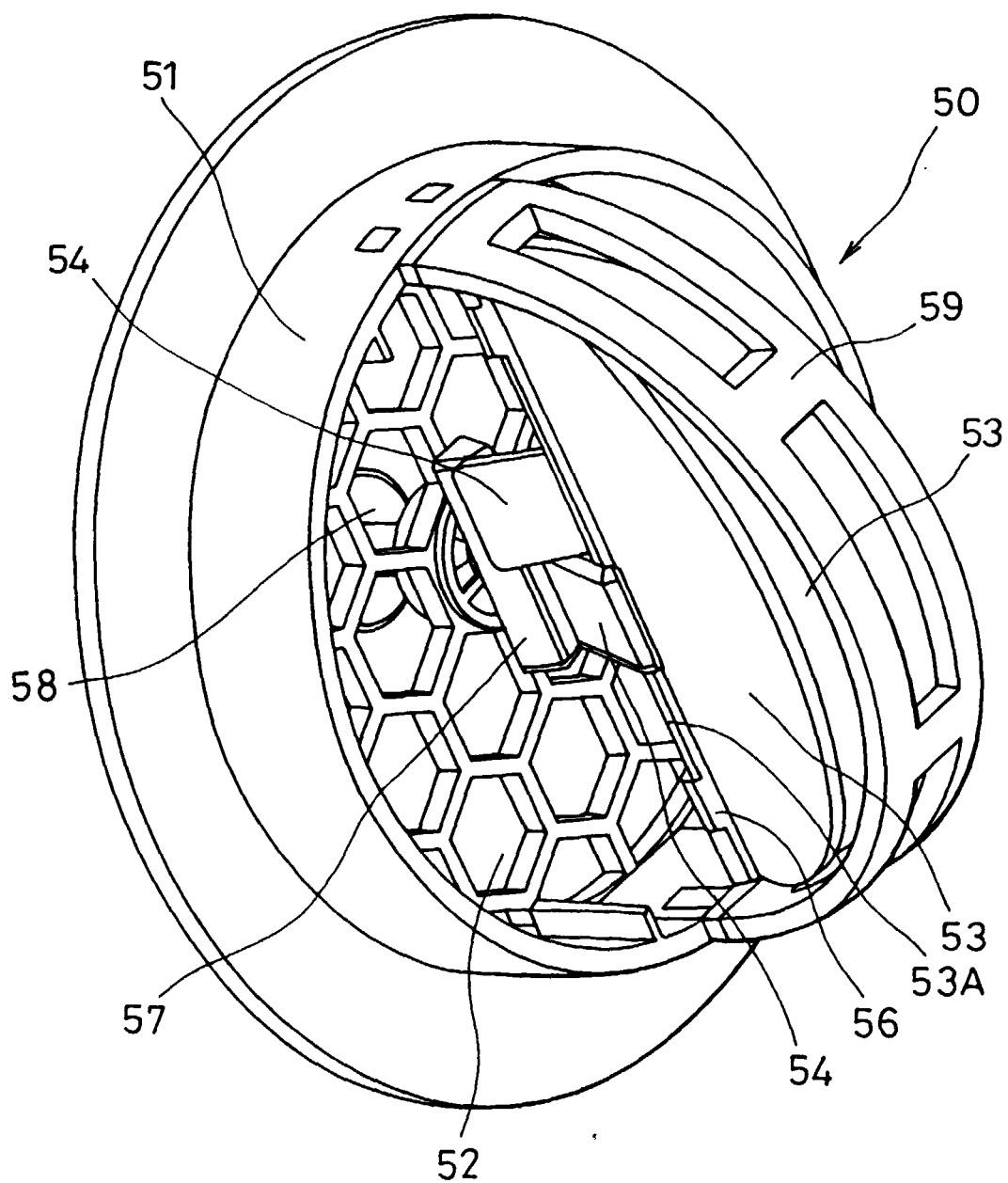


FIG. 7

