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(54) **AIR OUTLET WITH ADJUSTABLE ELEMENT**

(57) The outlet (1) has a body (4) with a plate (2) with openings whose covering or uncovering sets the flow rate and/or the flow direction of the air. The moving covering screen (3) connected to the controller available on the outer side of the body (4) serves this purpose. The plate (2) is from ferromagnetic material and the covering screen (3) is from a permanent magnetic foil which is at least partially flexible, semisolid and adherent to the plate (2). The adherence of the magnetic foil produces tight connection of the covering screen (3) with the plate (2) without gap through which the air could flow and cause noise or vibrations. The outlet (1) is characterized by a very simple and flat construction with small number of moving components; it uses reliable and stable pressure and it is simply mounted and demounted during production, assembly and subsequent maintenance.

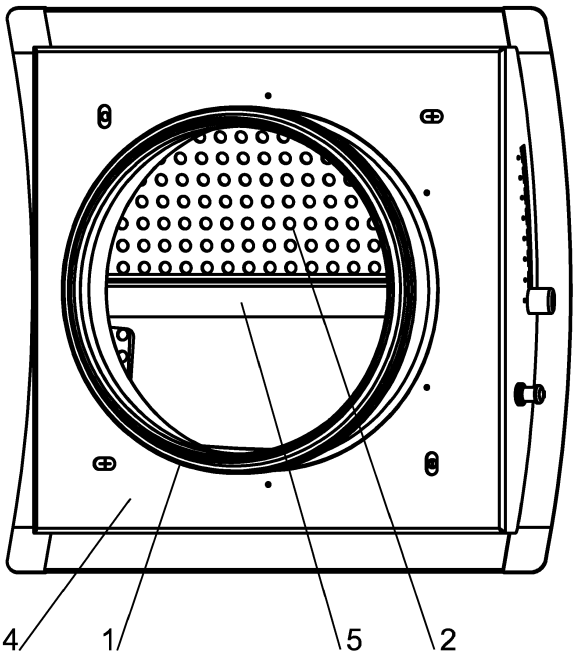

Fig. 3

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Description

Field of technology

[0001] Technological solution concerns an air outlet, whereby an air flows through the outlet to the outside environment, whereby the outlet has an adjustable element for setting of the flow rate and/or the flow direction. The outlet is exemplified by low noise level and it has simple and long-term reliable construction.

Prior state of the art

[0002] Various air outlets containing an adjustable element for setting of the flow rate and/or the flow direction, whereby the adjustable element is by its shape and control designed in such a way that it lowers the level of noise which is produced by the circumflowing of the air. The suitable shape of the adjustable element, such as a shape of the vane or valve, which shields the cross-section of the flow, is a subject matter of the aerodynamic design, which usually leads to technologically difficult construction.

[0003] Publication CN201327163Y discloses a use of the silencer in the body of the outlet, which requires larger space and dimensions of the body. The silencing elements are used by the outlet according to CN202835614U, too. Publication DE3644567A1 discloses elastically deformable adjustable element, which, however, leads to complication construction.

[0004] Silencing materials are used by other known solutions, too, such as JP2014122738A, KR20130112235A, US4102357A. Such solutions are complicated and they usually require difficult maintenance.

[0005] The outlet according to KR20100008702A tries to remedy the problem with small leakage of the air, but it does not address the precision of the adjustable element itself. The outlet according to KR20110132807A shields the source of the noise by shaped diffusers, which - however - requires a lot of space and does not lead to satisfactory results.

[0006] Patent SE510594C2 discloses an outlet with magnetic board, which covers the chosen openings in the outlet plate - that is, in the front grid. The solution is supposed to substitute the use of the duct tape (adhesive tape), which is otherwise the cheapest treatment of the flow geometry according to that patent file. The magnetic board according to this file lacks the features to limit the noise and after the placement it cannot be regulated from outside. The board is not adjusted and designed for the control also because its eventual movement does not change the flow cross-section and therefore it would have been useless. The magnetic board is solid and has to be produced with high precision so it leans onto the plate sufficiently.

[0007] Solution according to GB2415248A uses valves at the outflow of the air, whereby the valves are closed by magnetic strips. The use of multiple strips complicates the construction as well as control and it does not solve the issue of noise level in the marginal gap between the strip and the grid with the openings. The small available flow cross-section is another disadvantage; the strips are in the open position placed with the spare space outside the openings; the sum of this spare space with all strips leads to large dimensions of the outlet. The magnetic strips therefore have to have high solidity so that they can be controlled, which increases the precision requirements. Magnetic strips are lifted during sliding, which complicates their control.

[0008] Such solution is desired and not known which will lower the noise level at outlets with adjustable element by simple method, and its construction and control will be simple, too.

Essence of the invention

[0009] Abovementioned deficiencies are greatly remedied by the air outlet with the adjustable element according to claims 1 to 15. The outlet has a body which is on the outer side adjusted for connection to the air distribution system; the body has a plate with the series of openings whose covering or uncovering sets the flow rate and/or the flow direction. The outlet has a moving covering screen designed for covering of the openings, whereby the covering screen is connected with the controller according to this technical solution which essence lies in the fact that the plate with the openings is from ferromagnetic material, the covering screen is from a permanent magnetic foil which is at least partially flexible and adheres to the plate with the openings.

[0010] The plate can have various shape and curvature. Usually, it will have rectangular, square, circular or elliptical shape and it can be straight or with cylindrical or spherical curvature. The openings can have various arrangements; it is important that the covering screen is capable to cover at least part of them and therefore prevent the flow of the air through the respective openings. Covering screens which have copied the surface of the plate with openings has been used hitherto with varying margin of error based on the used technology. In order to achieve smooth course of the change of the setting, there is always some gap between the plate with openings and movably placed covering screen. It is this gap which causes whizzing, the vibration of the air between the covering screen and the plate with openings. This phenomenon has small effect on the regulated aspect, for example, flow rate or flow direction, but the noise hereby produced is audible. The diminishing of the gap, for example, by the mechanical pressing of the covering screen to the plate with the openings, does diminish this noise, but it makes the adjustment and control more difficult.

[0011] The term "outlet" in this file means any outlet device, end component, or element which is designed for outflow of the air or other gas to the outside environ-

ment.

[0012] The crucial part of the proposed technical invention is the use of the magnetic foil which adheres on the plate with the openings, whereby the foil is at least partially flexible. Thanks to this the foil exactly adjusts to the surface and shape of the plate with the openings. The pressing of the covering screen to the plate with the openings is not formed by a punctual element - for example, by a spring - but it is led by the continuous load from the magnetic force which is effective in every place of the foil. This brings about the advantage of the total adhesion of the covering screen to the plate on the whole surface and without the gap through which the air - pressed in the outlet from the air distribution system - could flow. The pressing of the covering screen to the plate with the openings can be regulated by the choice of the magnetic foil with the required remanence (or retentivity) value, which at the given thickness creates a required magnetic force for the unit of surface. Common magnetic foils used in the advertisement industry have a magnetic adhesion of 0,6 N/cm^2 and width starting from 0,17 mm. It will be preferable to use the foil with width at least 0,4 mm. The remanence of the magnetic foil is supposed to be at least at 0,15 T (Tesla), preferably at 0,2 T. The pressure force of the magnetic foil on iron or steel should for the purposes of this technical solution be at least 0,4 N/cm^2.

[0013] The magnetic foil is flexible, it follows the shape of the plate and - as opposed to the prior state of the art - it is designed to slide on the plate, so during the adjustment of their position by means of a controller the magnetic foil still adheres to the surface of the plate; it does not lift or moves to new position, but even during the adjusting move it remains adhered to the surface of the plate. This simplifies the kinematics of the controller; it is not necessary to realize the move releasing the magnetic foil from the plate.

[0014] From the point of view of simple control of the covering screen it is preferable if the coefficient of friction between the surface of the plate with the openings and the covering screen is low; this achieves its adjustment for sliding on the surface of the plate. This is achieved for example by low abrasiveness of the plate, whereby its surface is glazed, etc. Magnetic foil in the common realization in this technical solution has smooth surface with abrasiveness below Ra 0,8μm (N6). The abrasiveness of the plate as well as magnetic foil in the places of their mutual contact will usually be below Ra 3,2μm, preferably below Ra 1,6μm. The magnetic flexible foil will from the point of view of its width, flexibility and magnetic pressure force design in such a way that it is ensured that not even a turbulence at high air flow speed in the body of the outlet will cause the unstucking - peeling off - of the magnetic foil from the surface of the grid. It is preferable if the covering screen covers multiple openings in different lines - that is, at least in two different lines - which achieves that at given circumference of the edge of the covering screen we get relatively larger surface on which it is drawn to the plate. The lifting of the magnetic foil at marginal turbulence begins at the edge. The strip shapes which at given surface have large circumference of the edge are not advantageous, preferable are square and related shapes, for example, rectangular shapes with sides' ratio 1:4, preferably close to 1:2.

[0015] The advantage of the use of magnetic, semi-solid, partially flexible foil lies also in the fact that the control power is not increased at the beginning of the adjustment movement because of the increase of the static friction relative to the dynamic friction. Usually the body which stops to move acts as larger friction force at the rest than it is the case when it moves. The higher friction force at the beginning of the movement causes the irregular movement during opening and this creates a feeling of complicated control. The movement of the magnetic foil is continuous and smooth, with the stable resistance to movement.

[0016] The covering screen can adhere to the outer surface of the plate with the openings, but an arrangement will be preferable where the covering screen is placed inside the body of the outlet and adheres to the inner surface of the plate with the openings. In such arrangement the controller runs through the opening in the cover of the body and it is approachable from the outer side of the body.

[0017] If the openings on the plate are on the total available surface, the movement of the covering screen on the surface does not change the actual flow cross-section, it only changes the direction of flowing of the air from the outlet. A solution is preferable where the plate has functional openings only on part of the available surface; the surface without openings - or with blinded openings - then forms a position for the covering screen in the default position with the maximal flow of the air. The move of the covering screen from this position means lowering of the actual flow cross-section. A solution is very effective and aesthetically preferable in which the plate is perforated on whole available surface and it therefore gives uniform impression from the outer side, but part of its openings is blinded by the sticker from the inner side. It can be a self-adhesive foil which is cut or plotted into a necessary shape and then stuck from the inside onto the plate with the openings. In order to ensure correct position a template can be used during sticking, or some other similar tool.

[0018] The blinding of the openings on the plate by means of the foil is preferable also in connection with the use of the magnetic flexible foil which is capable of copying the width of the stuck blinding foil, whereby a sufficient magnetic pressing of the magnetic foil to the plate with the openings is on the surface covered with the blinding foil, too. In the basic position at maximal opening of the adjusting element the covering screen will adhere to the blinding foil. During the change of the adjustment the magnetic foil will move, slide on the blinding foil and gradually it will move to the zone with the functioning openings. The advantage of the use of the blinding foil is its

high flexibility and simple application. Various sizes and shapes of the blinding foil can be used to scale the flow cross-sections of the outlets in the same plate with the openings.

[0019] The controller and its construction details are dependent on the shape and curvature of the plate with the openings. The controller can be connected to magnetic foil by various means: riveting, gluing, and so on.

[0020] In case the plate with the openings is angular, the controller can have a form of a transversal ledge which is connected to the magnetic foil and runs on the two opposite sides of the casing of the body through the longitudinal openings to the outer side of the body of the outlet. The transversal ledge is led slidingly in the longitudinal openings. The rounded endings - suitable for being clutched by fingers - are mounted onto the protruding ends of the transversal ledge.

[0021] In case of the circular shape of the outlet the magnetic foil can have a shape of the circular section or of multiple connected circular sections which are led in the rotational deposition with the axis of the rotation in the middle of the circular distribution of the openings in the plate. If the magnetic foil is placed on the inner side of the plate with the openings, the controller will be led to the outer side of the body of the outlet.

[0022] It will be preferable if the perforated plate will be attached to the body by means of a click-clack system, for example by means of an elasticized (sprung) element which falls into the opposite element. This simplifies the assembly and dismantling of the plate, whereby an ability of the covering screen - according to this technical invention - to draw itself to the surface of the plate even in case the covering screen is distanced from the necessary exact position during assembly. The technical solution therefore offers simple solution from the point of view of assembly, non-responsible to the eventual imprecisions, but one which rules out the gap between the surface of the covering screen and the plate with openings.

[0023] The outlet with the magnetic foil in function of the covering screen will be preferable used in the standard construction of the air distribution systems where the outlet will serve as an end outlet element on the ceiling or the wall, whereby it can be integrated part in the wall air conditioning unit, or part of the dashboard in the automobile.

[0024] The technical solution brings a very simple constructing with low level of noise. The construction of the outlet has minimal amount of moving components, high efficacy and reliability, and simple control. Aside from the lowering of noise, its advantage is higher freedom during the designing of the plates which can have various shapes and curvatures; the magnetic foil can during its sliding copy a changing course of the plate and the plate can be wavy or it can have various semi-diameters of curvature in various zones.

Description of drawings

[0025] The technical solution is further disclosed by means of figures 1 to 14. The used scale of depiction and ratio of sizes of individual elements, as well as the depicted width of the covering screen, do not have to correspond to the description in the examples, and these scales and ratios of sizes cannot be interpreted as limiting the scope of protection. The particular shape of the body of an outlet is illustrative, too.

Figures 1 to 8 concern the outlet with approximately square shape of the perforated plate; figures 9 to 14 concern the outlets with circular shape.

Figure 1 is a view of the outlet on the side of the plate with openings, which are distributed into square group. The plate has cylindrical curvature. The dashed line delimits the edge of the covering screen, which is placed from the inner side.

Figure 2 is a side view of the body of the outlet, where the longitudinal axis where the ends of the transversal ledge of the controller are seen.

Figure 3 is an axonometric view of the inside of the outlet from the side of its connection to the air distribution system.

Figure 4 depicts a covering screen placed on the inner side of the plate with openings. This pair is subsequently spatially depicted on figure 5.

[0026] Curvature and cross-section of the plate with openings is on the figure 6.

[0027] View of the covering screen after removal of the plate with openings is on figures 7 and 8. Figure 7 is a view of the front side towards the air distribution pipe system; figure 8 is a side section where a shape of the transversal ledge is visible.

[0028] Figure 9 is a side view of the outlet with the circular shape, whereby the openings in the plate are distributed within the circular annulus. The plate has spherical curvature.

[0029] Figure 10 is a view of the plate from the inner side, with the covering screen from two pieces of the magnetic foil placed on the plate.

[0030] Figure 11 is a cross-section through the body of the outlet with a view of the rotational partition with the covering screen. Figure 12 subsequently depicts a detail of a stop of rotational partition with the controlling element on the outer side of the body.

[0031] Figure 13 is a view from inside of the plate with the circular shape; dashed line depicts a ground plan of the connecting circular pipe. Dotted line depicts the blinding foil. Figure 14 is a transversal cross-section of the circular plate.

[0032] Figure 15 depicts a wavy profile of the plate.

Figure 16 depicts a plate equipped by the orientation sign in the non-perforated part.

Examples of realization

Example 1

[0033] In this example according to figure 1 to 8, the outlet 1 has a body 4 with circular entry, which is adjusted to connection to the circular air distribution with the respective diameter.

[0034] The body 4 in this example is formed by plastic pressing, whereby a steel plate 2 with openings is inserted in it. The plate 2 with openings has cylindrical curvature which corresponds to the edges of the sidepieces of the body 4. The metal plate of the plate 2 is perforated in such a way that part of the openings is delimited by the square; the edges of the plate 2 with openings are without perforation. The metal plate is bent and molded on the rounded edges of the plate 2, which creates two elasticized elements 9 as attachment strips designed for clicking inside the body 4. In this example one strip of the elasticized element 2 has a dividing groove and the opposite strip has two dividing grooves, which ensures the correct orientation of the plate 2 with openings during its assembly into the body 4 of the outlet 1. In the body 4 the two opposite protrusions are created, which in correct position fall into the grooves in the attachment strips. The elasticized elements 9 of the strip are sloped which ensures permanent but demountable connection of the plate 2 with openings on the edge of the body 4 of the outlet 1. Their correction is therefore sufficiently tight.

[0035] On the inner surface of the plate 2 with openings there is glued a blinding foil 8, in this example of black matt color. The edges of the blinding foil 8 run between openings in such a way that there is no partial covering of the opening at the edge. The shape of the blinding foil 8 corresponds to the shape of the covering screen 3. In the position with maximal opening of the outlet 1 the covering screen 3 covers together with the blinding foil 8.

[0036] The covering screen 3 is cut from the magnetic foil with the magnetic pressure force to the steel basis ranging from 0,5 to 0,8 N/cm2. A transversal ledge 5 is attached to one edge of the covering screen 3; the ledge 5 is led in two longitudinal openings. The course of the openings is curved according to the curvature of the plate 2 with openings. One edge of the longitudinal openings has repeated shoulders into which the transversal ledge 5 falls in the respective position, which produces its stop. At the ends of the transversal ledge 5 there are rounded plastic endings 7.

[0037] The moving of the ends of the transversal ledge 5 sets the position of the covering screen 3. The magnetic foil copies the curvature of the plate 2 with openings and also its eventual irregularities. In every position the magnetic foil adheres to the plate 2 without gap. Thanks to this the openings are reliably protected against the flow of the air, which would otherwise cause whizzing or other undesired sound, and vibrations.

[0038] The nature of the covering screen 3 allows for assembly of the outlet 1 into final set. The magnetic foil is attached and led by means of the transversal ledge 5 which is during the assembly inserted into longitudinal openings on the opposite sides of the body 4. Subsequent insertion of the plate 2 by means of the attaching strips to the body 4 is followed by adherence of the covering screen 3 to the surface of the plate 2. Such solution is technologically effective, simple and it delimits all the eventual gaps. Thanks to the described construction the dimension of that part of the outlet 1 which protrudes from the wall is small. The metal plate 2 has glazed surface on its inner side; the surface from the outer side corresponds to the design of choice.

[0039] The body 4 can have various entry connections for various types and shapes of the air distribution pipes. The outlets 1 can be produced in various dimensions. The dimensions and number of the openings in plate 2 will correspond to the flow cross-section of choice.

Example 2

[0040] In this example according to figures 9 to 14 the outlet 1 has circular plate 2 with openings. The plate 2 with openings is pressed from the metal sheet, it has approximately spherical curvature and openings are distributed in the circular annulus. From the outer side the plate 2 has attachment points for the connection to the body 4 of the outlet. In this example the attachment points are produced as click pins.

[0041] The body 4 has a rubber seal on its side, whereby the plate 2 is pressed to it. At the side of the body 4 there is a longitudinal groove through which runs the ending 7 of the rotational partition 6. The rotational partition 6 is rotationally placed in the middle of the body 4. The endings 7 are pressed into the grip of the arresting notches by the spring. The rotational partition 6 is connected to the covering screen 3 which is produced from flexible, semi-solid magnetic foil with width 1,5 mm. The magnetic foil has a neodymium (NdFe) powder distributed in the plastic, flexible carrier.

[0042] From the inside of the plate 2 the blinding foil 8 is glued to its surface; the foil 8 has a shape of the circular cuts and it covers a surface which approximately corresponds to the covering screen 3. In the position with the maximal flow the covering screen 3 is lined up with the blinded openings. The blinding foil 8 is glued in such a way that its edge runs tightly between the openings, which means that its edge does not interfere into the part of the opening, which could produce wobbling of the protruding piece of the foil. The rotation of the rotational partition 6 moves the covering screen from the position of line-up behind the blinded openings, and further openings in the plate 2 are covered, which lowers the available flow cross-section.

[0043] The blinding foil 8 can be used for eventual flow balancing of the set, whereby the increase of the surface

used by blinding foil 8 lowers the maximal flow of the outlet 1. The plate 2 can be removed without tools, it suffices to release the click pins and the magnetic foil will remain in the body 4 held by the rotational partition 6.

Example 3

[0044] In this example the steel plate 2 with openings is bent into a wave according to figure 15. The plate 2 with the openings has rectangular shape which allows moving the covering screen 3 into a non-perforated zone. Thanks to this the whole perforated surface of the plate 2 will be available during total opening of the outlet 1. The non-perforated part of the plate 2 can be designed as lighting device, as a carrier of the orientation sign (figure 16) and so on. The surface of the plate 2 which is not perforated and which can be considered "dead" from the point of view of air distribution can be therefore used for additional purposes.

Example 4

[0045] In this example without figure the outlet 1 is used in construction of the wall air conditioning unit. Low spatial demands of the covering screen 3 are used.

Example 5

[0046] The outlet 1 is placed in the motor vehicle, built-in in the construction of dashboard.

Industrial applicability

[0047] Industrial applicability is obvious. According to this technical solution it is possible to industrially and repeatedly produce and use air distribution outlet with adjustable element, which limits the production of noise and vibrations.

List of related symbols

[0048]

1- outlet
2- plate with openings
3- covering screen
4- body
5- transversal ledge
6- rotational partition
7- ending
8- blinding foil
9- elasticized element

Claims

1. An air distribution outlet with an adjustable element, where the outlet (1) has a body (4) which is on an outer side connected to a connection to an air distribution system;
on its output side the body (4) has a plate (2) with a group of openings, whose covering and uncovering sets a flow rate and/or a flow direction of a flow of the air;
a moving covering screen (3) is placed adjacently to the plate (2) for the purposes of the covering or uncovering of the openings;
the plate (2) with the openings is from the ferromagnetic material;
whereby the covering screen (3) is connected to a controller which is available on the outer side of the body (4)
is characterized by the fact, that
the covering screen (3) is from a permanent magnetic foil which is flexible and adheres to the plate (2), whereby the magnetic foil is adjusted for a sliding on the plate (2) pursuant to a movement of the controller.

2. The air distribution outlet with the adjustable element according to the claim 1 **is characterized by the fact,** that the plate (2) with the openings is from a steel metal plate or at least contains a steel metal plate.

3. The air distribution outlet with the adjustable element according to the claim 1 or 2 **is characterized by the fact,** that an abrasiveness of the plate (2) and the magnetic foil in a place of their mutual contact is equal to or less than Ra 3,2μm, preferably equal to or less than Ra 1,6μm, especially preferably equal to or less than Ra 0,8μm.

4. The air distribution outlet with the adjustable element according to any of the claims 1 to 3 **is characterized by the fact,** that the magnetic foil has a width at least 0,4 mm, preferably at least 1 mm.

5. The air distribution outlet with the adjustable element according to any of the claims 1 to 4 **is characterized by the fact,** that a remanence of the magnetic foil is at least 0,15 T, preferably at least 0,2 T.

6. The air distribution outlet with the adjustable element according to any of the claims 1 to 5 **is characterized by the fact,** that the magnetic foil's pressure force to the plate (2) is at least 0,4 N/cm^2.

7. The air distribution outlet with the adjustable element according to any of the claims 1 to 6 **is characterized by the fact,** that the magnetic foil includes a neodymium powder distributed in a plastic, flexible carrier.

8. The air distribution outlet with the adjustable element according to any of the claims 1 to 7 **is characterized**

by the fact, that the magnetic foil is on the inner side of the plate (2).

9. The air distribution outlet with the adjustable element according to any of the claims 1 to 8 **is characterized by the fact,** that it includes a transversal ledge (5) which is slidably led in the body (4), or it includes a rotational partition (6) which is rotationally placed in the body (4); the transversal ledge (5) or the rotational partition (6) is connected with the magnetic foil and it has at least one ending (7) for a control, whereby the ending (7) is approachable on the outer side of the body (4).

10. The air distribution outlet with the adjustable element according to the claim 9 **is characterized by the fact,** that the transversal ledge (5) or the rotational partition (6) has a stop of a position, preferably by means of notches in a longitudinal opening through which their control is made available on the outer side of the body (4).

11. The air distribution outlet with the adjustable element according to any of the claims 1 to 10 **is characterized by the fact,** that the plate (2) has a zone without the openings which is designed for a placement of the covering screen (3) in a position for the maximal flow.

12. The air distribution outlet with the adjustable element according to any of the claims 1 to 11 **is characterized by the fact,** that the plate (2) has some of its openings on the inner side covered by a blinding foil (8) and the magnetic foil is adjusted for the sliding on the plated (2) through the edge of the blinding foil (8); preferably the blinding foil (8) is a self-adhesive foil in a shape which corresponds to a shape of the covering screen.

13. The air distribution outlet with the adjustable element according to any of the claims 1 to 12 **is characterized by the fact,** that the plate (2) is attached to the body (4) by a falling of at least one elasticized element (9) into an opposite receiving element and an edge of the body (4) to which the plate (2) adheres is equipped by a flexible seal.

14. The air distribution outlet with the adjustable element according to any of the claims 1 to 13 **is characterized by the fact,** that the plate (2) has a rectangular shape and a cylindrical curvature, whereby the openings are regularly distributed into a rectangular groundplan or into a circular groundplan and the covering screen (3) and/or the blinding foil (8) has a basically rectangular shape.

15.

16. The air distribution outlet with the adjustable element according to any of the claims 1 to 13 **is characterized by the fact,** that the plate (2) has a circular shape and at least partially spherical curvature, whereby the openings are regularly distributed into a circular groundplan or into an annulus-shaped groundplan and the covering screen (3) and/or the blinding foil (8) involve a shape of a circular section.

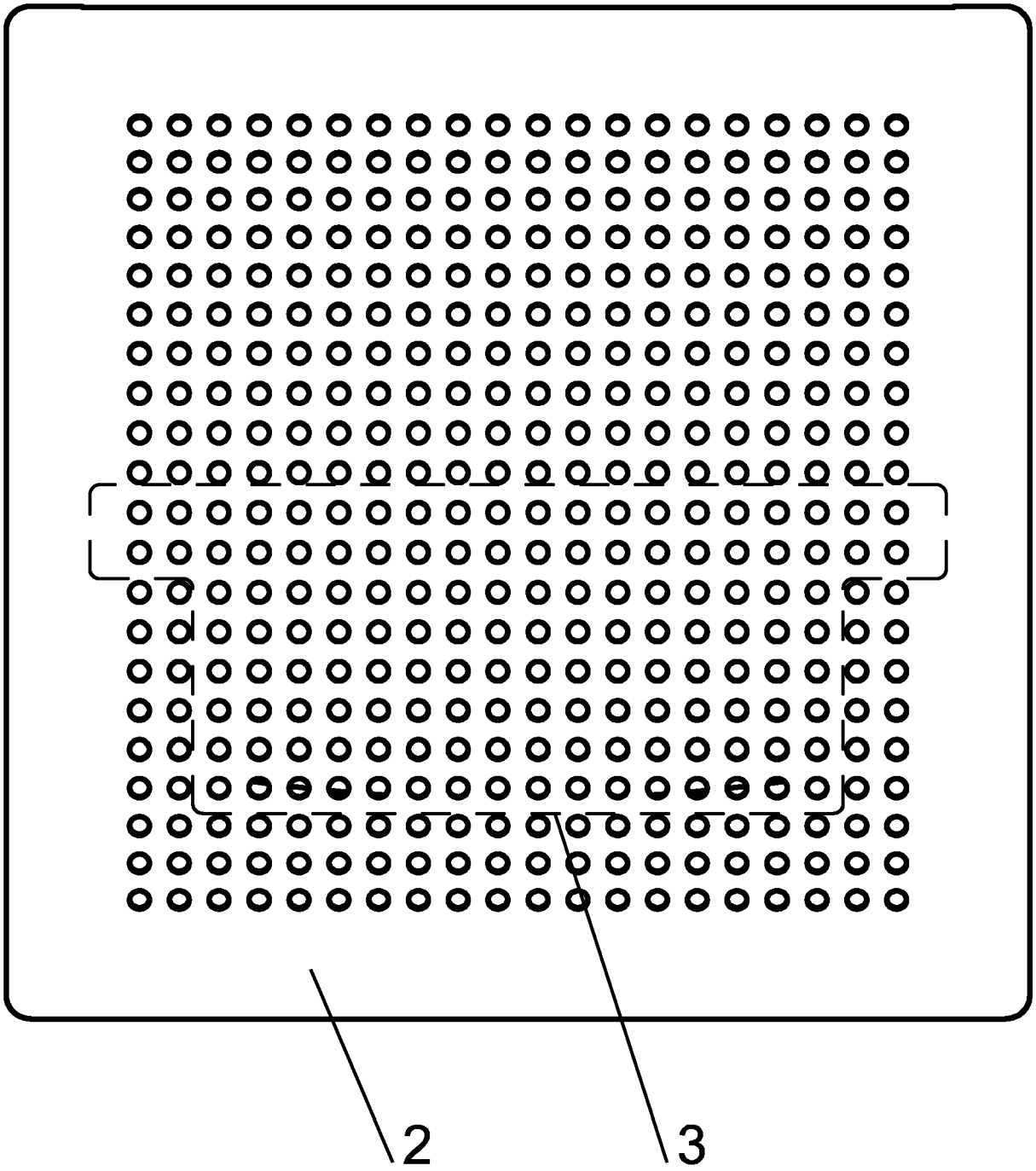


Fig. 1

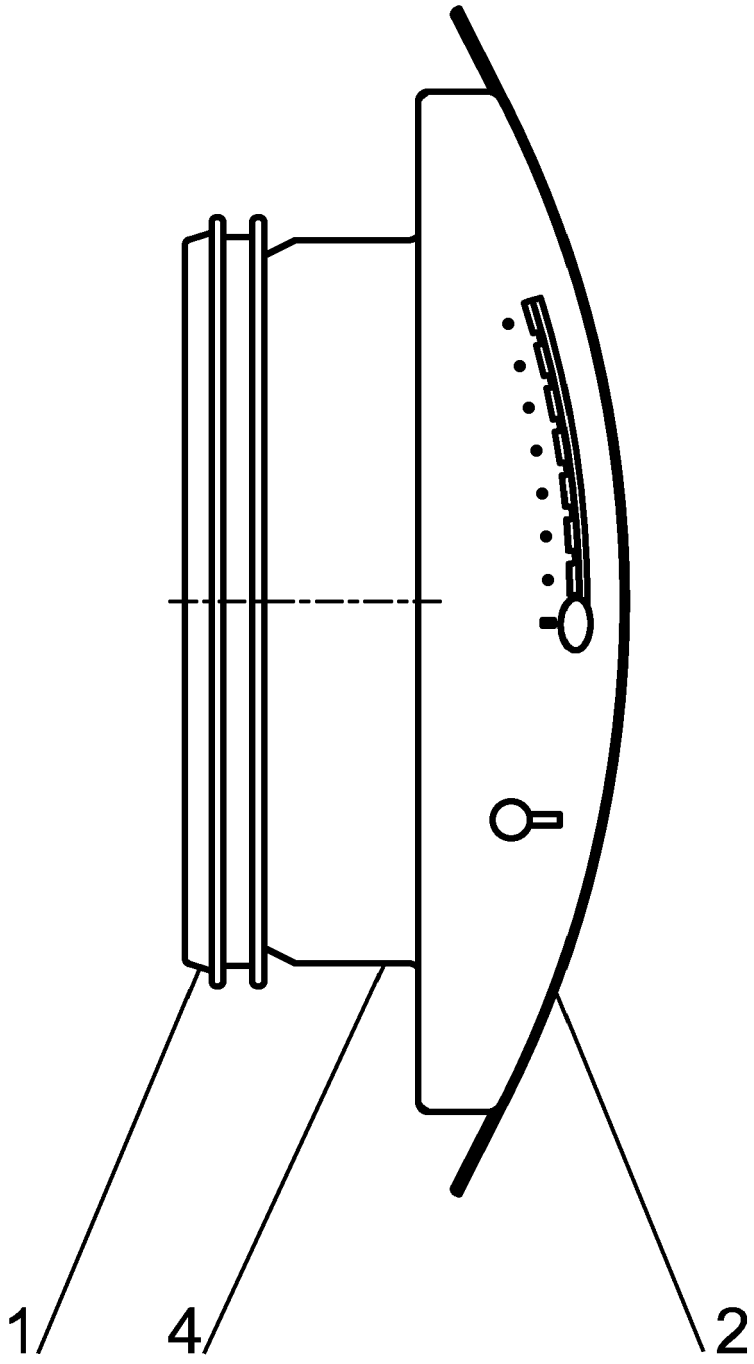


Fig. 2

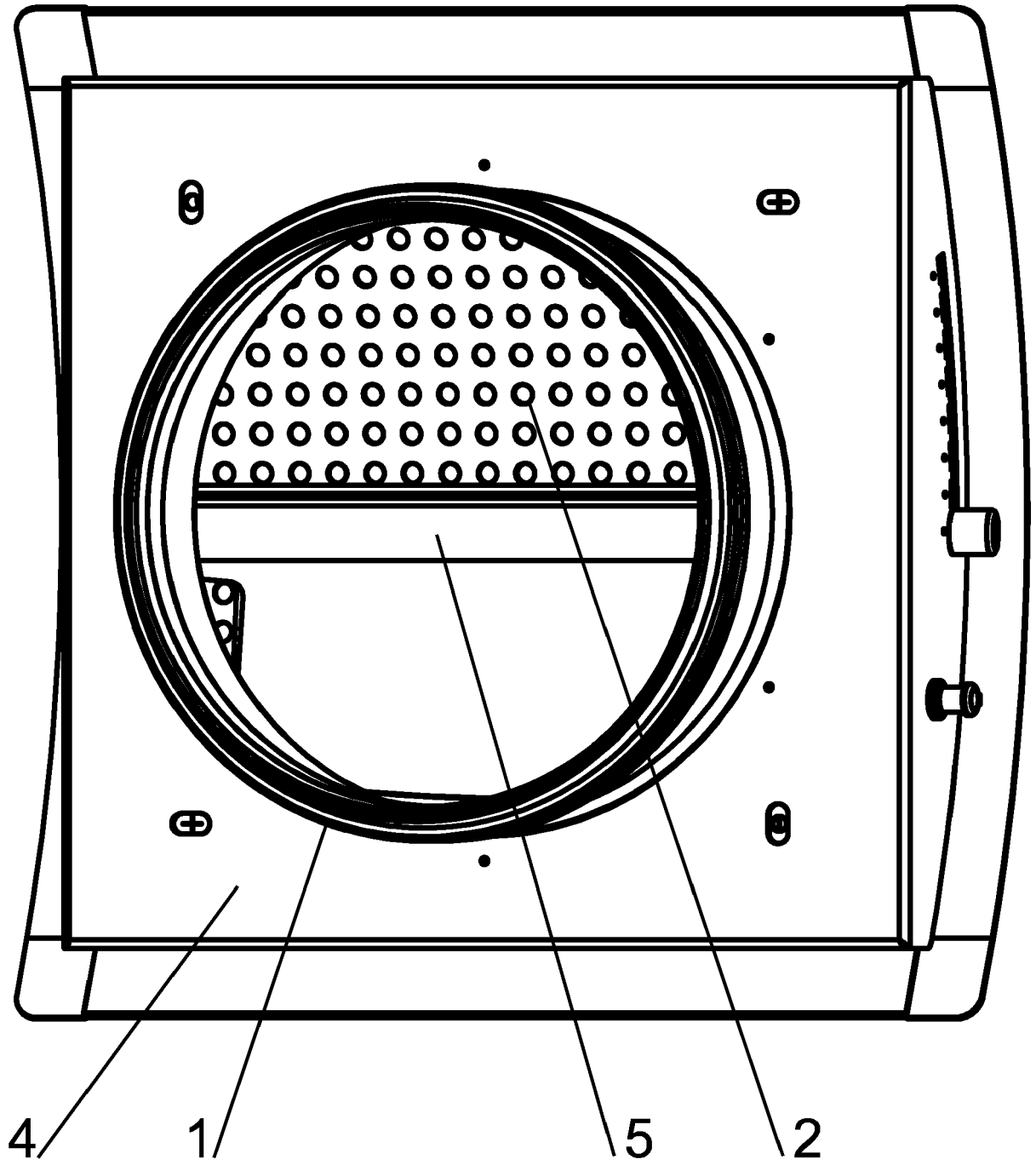


Fig. 3

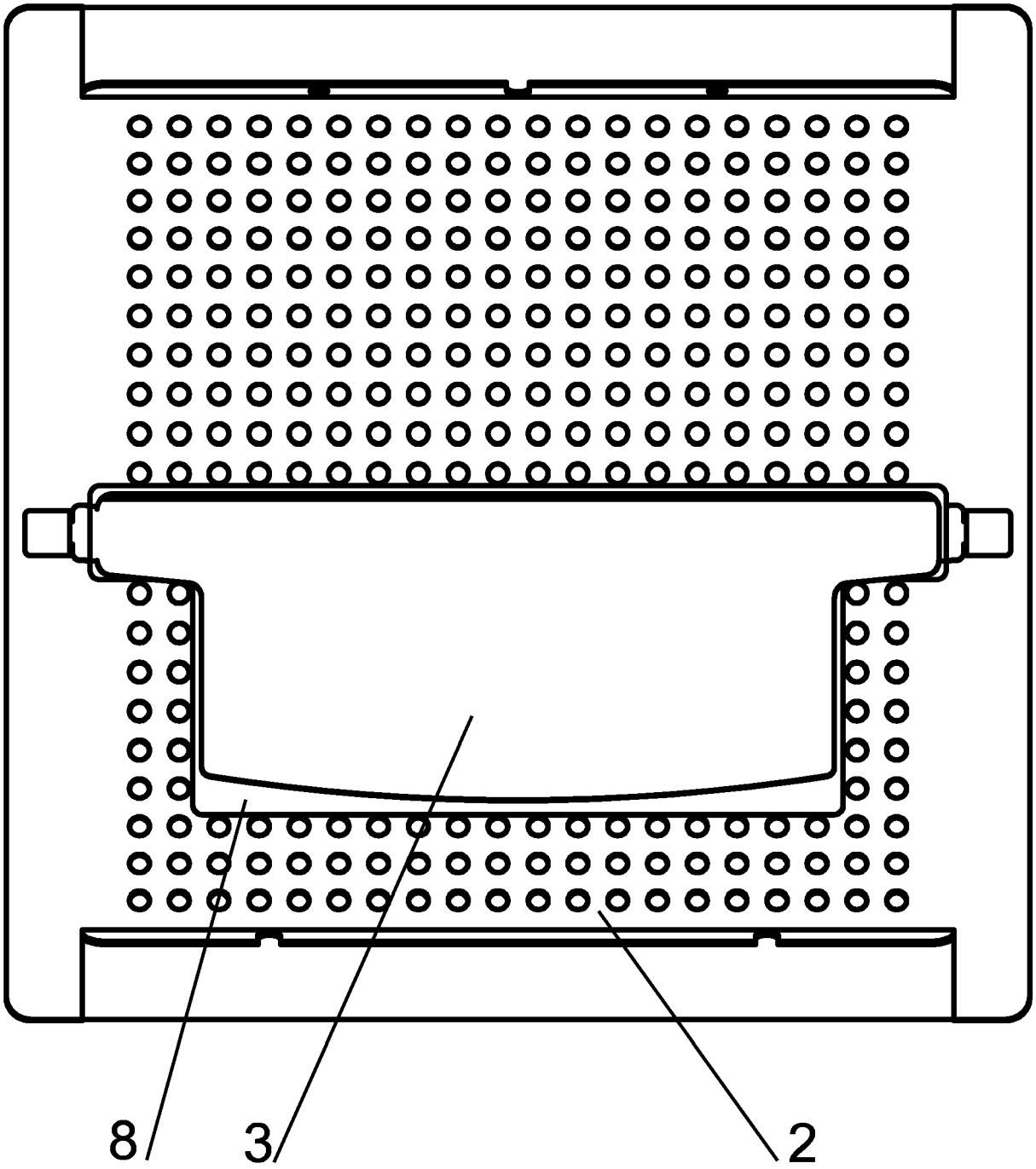


Fig. 4

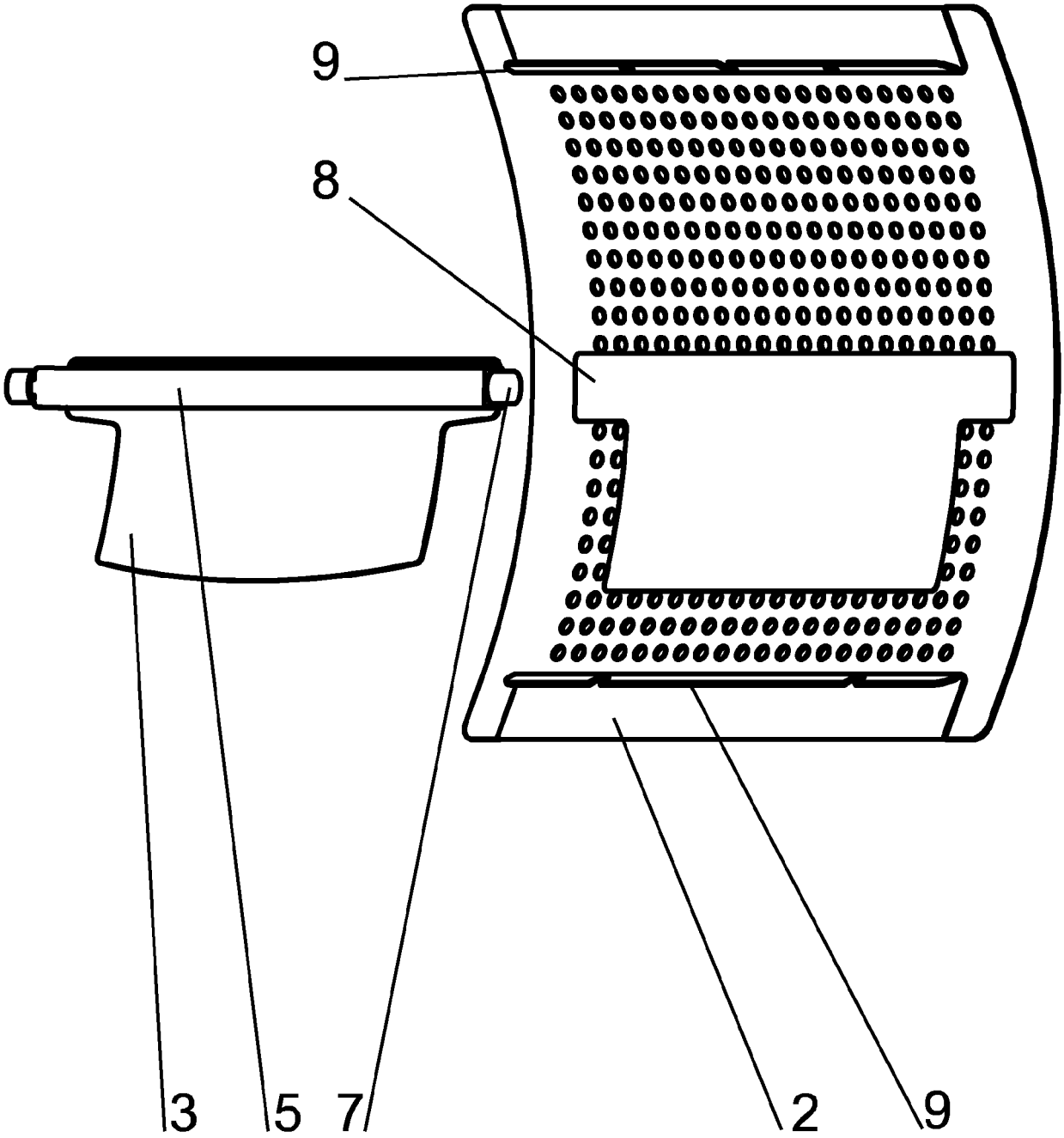


Fig. 5

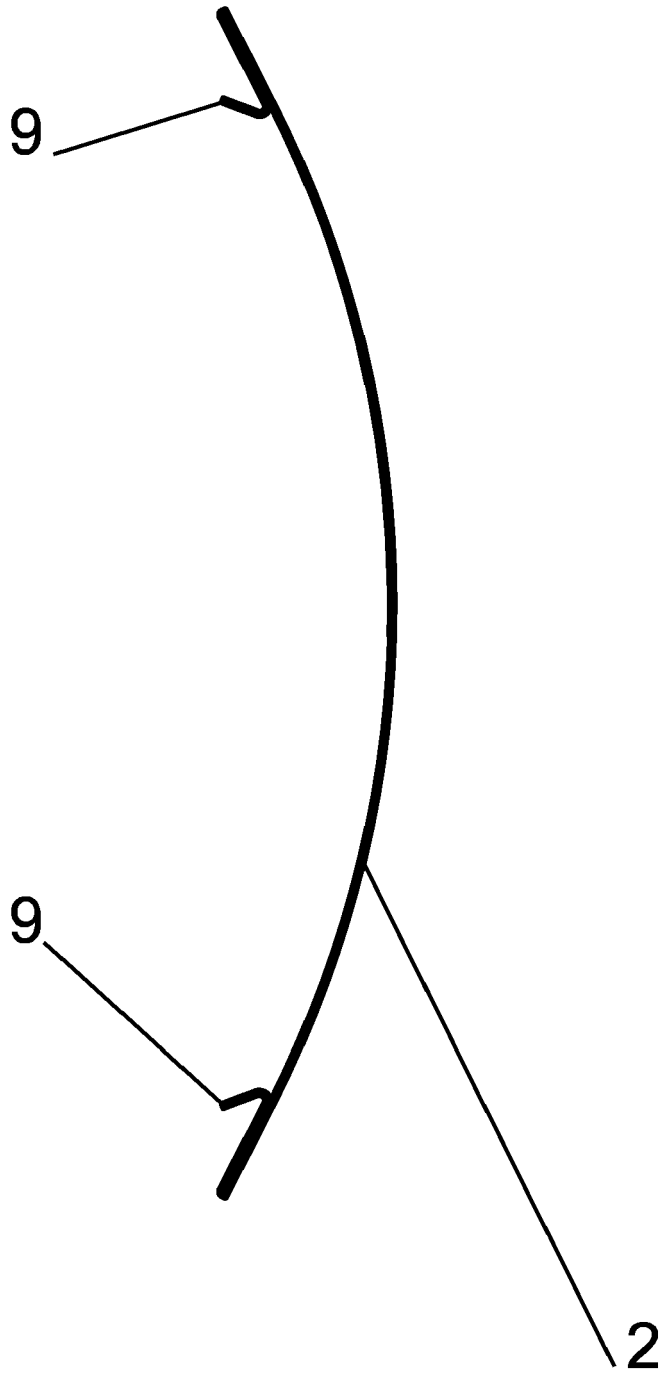


Fig. 6

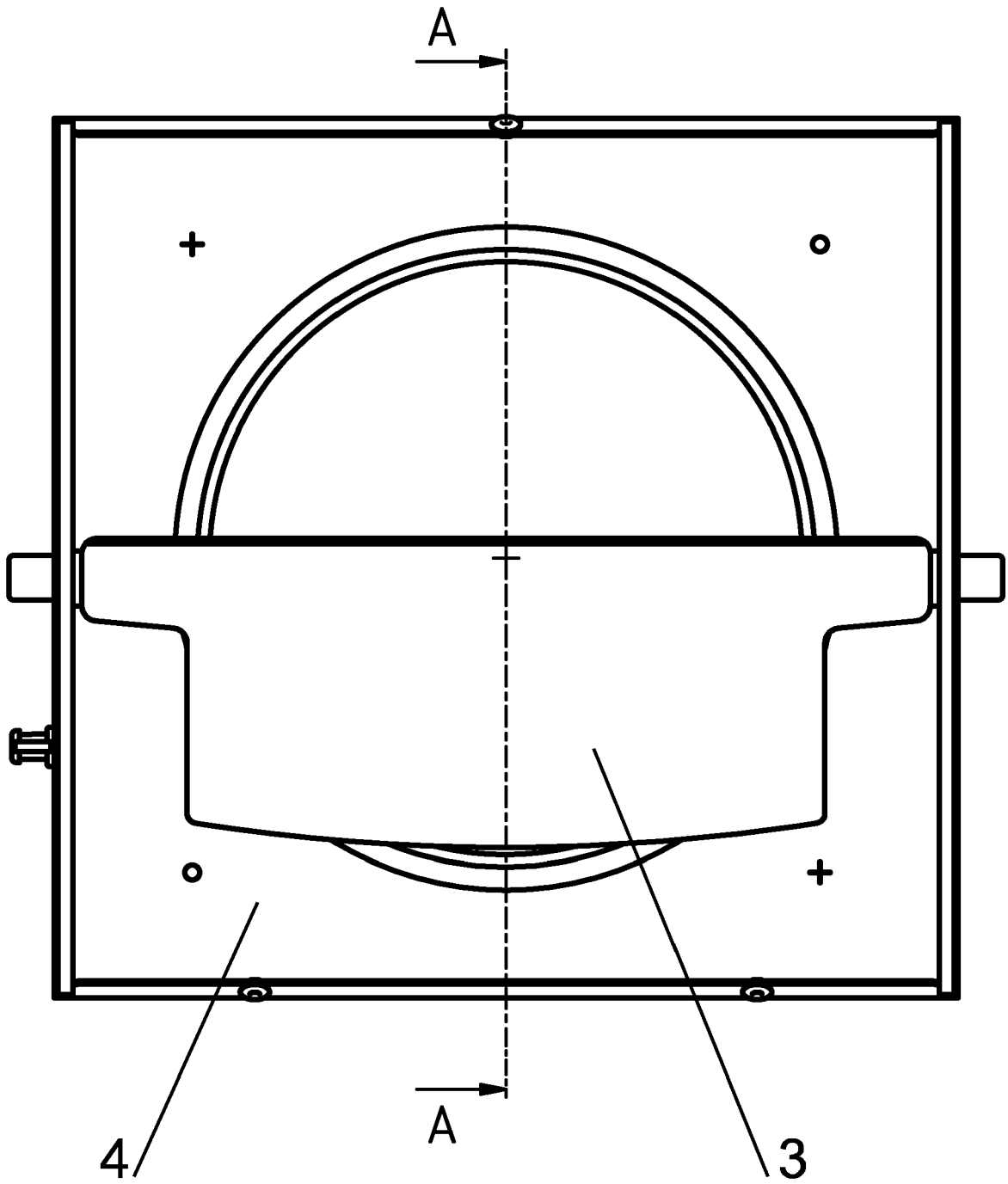


Fig. 7

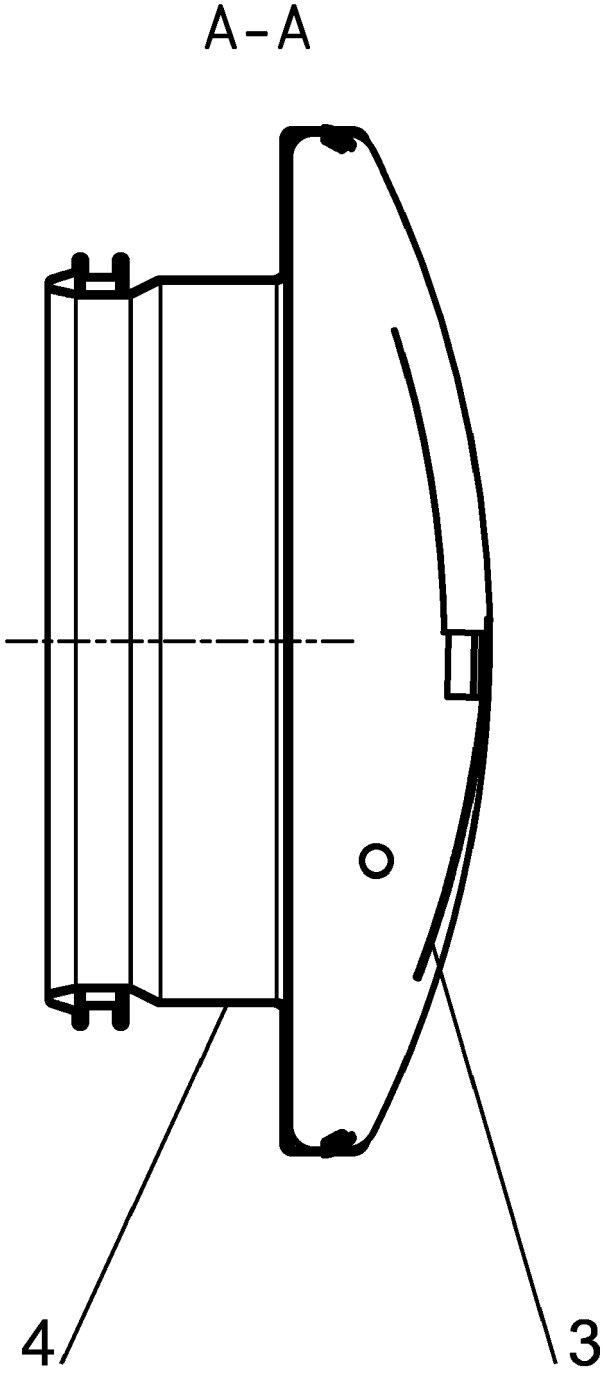
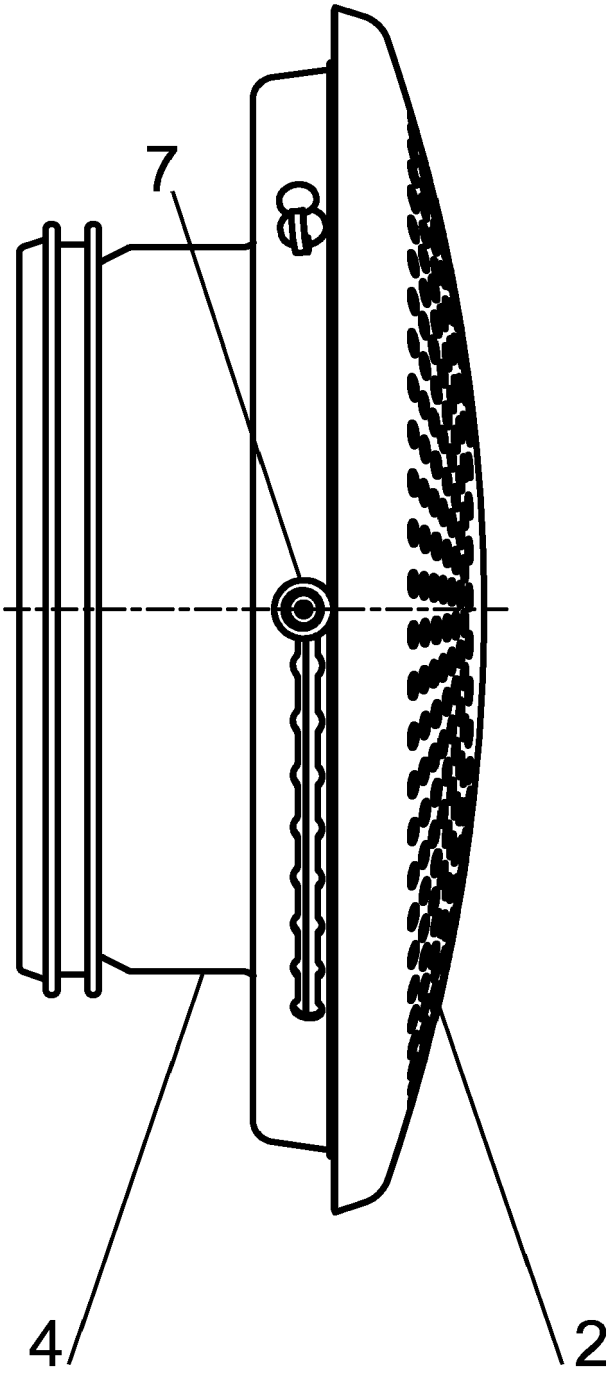


Fig. 8



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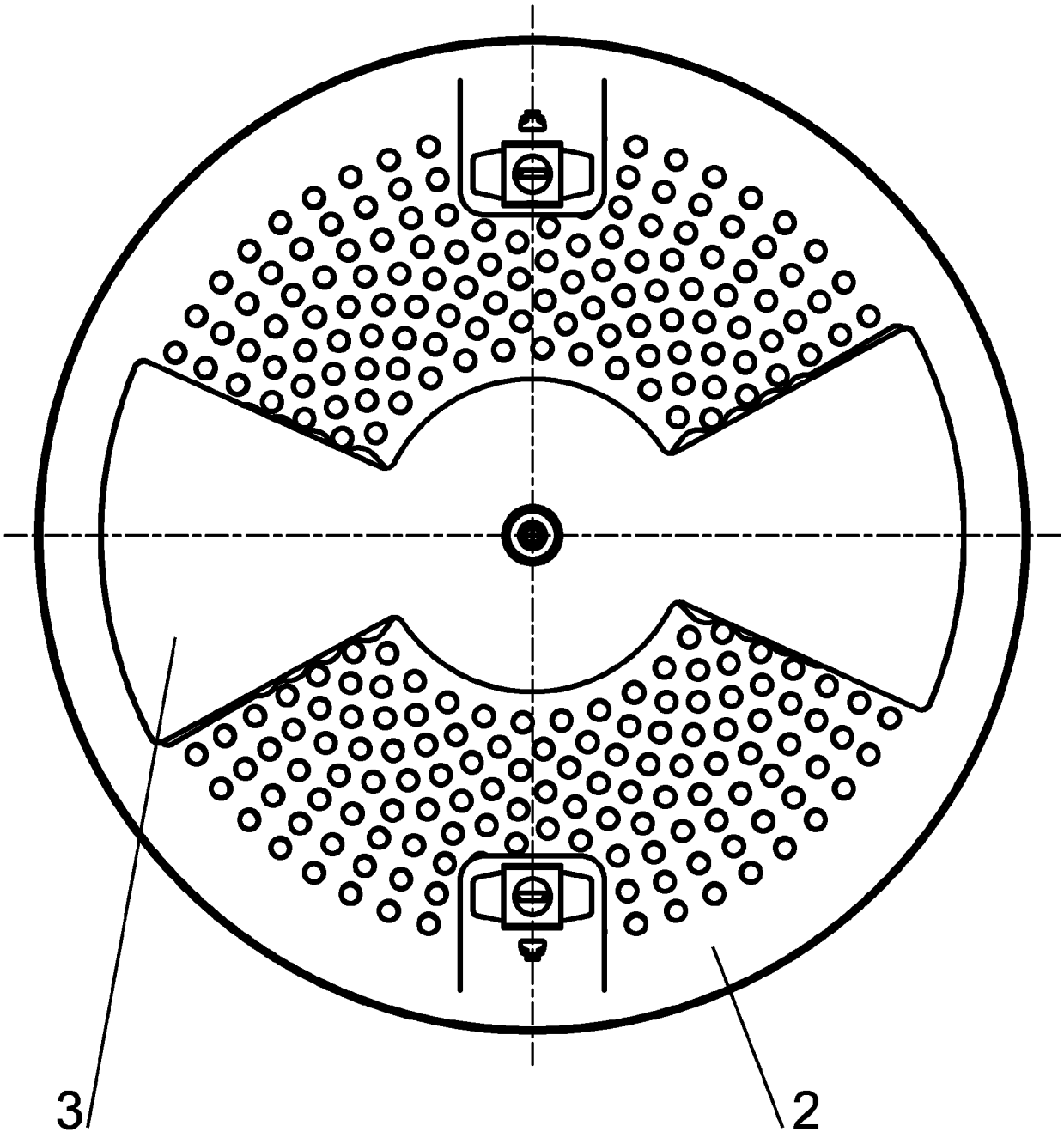

Fig. 10

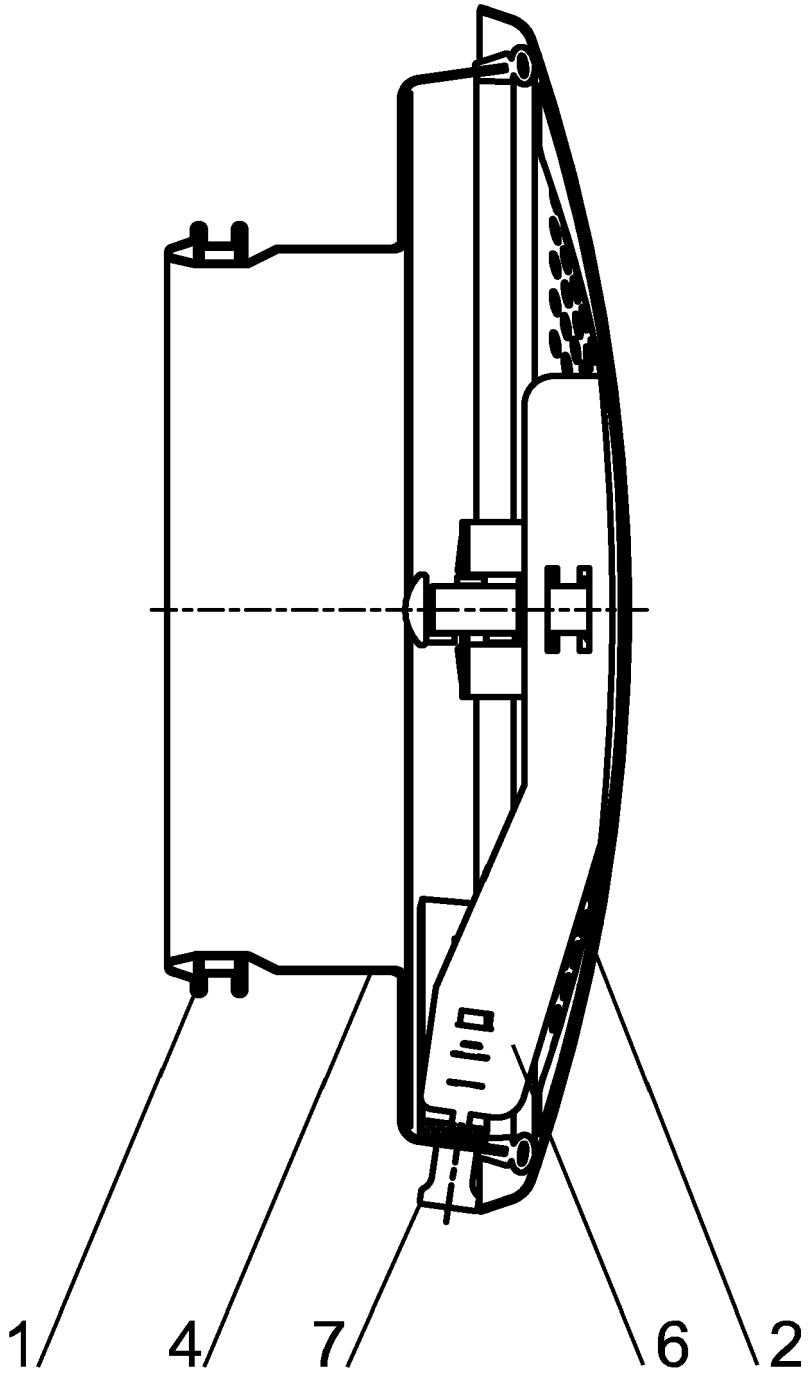

Fig. 11

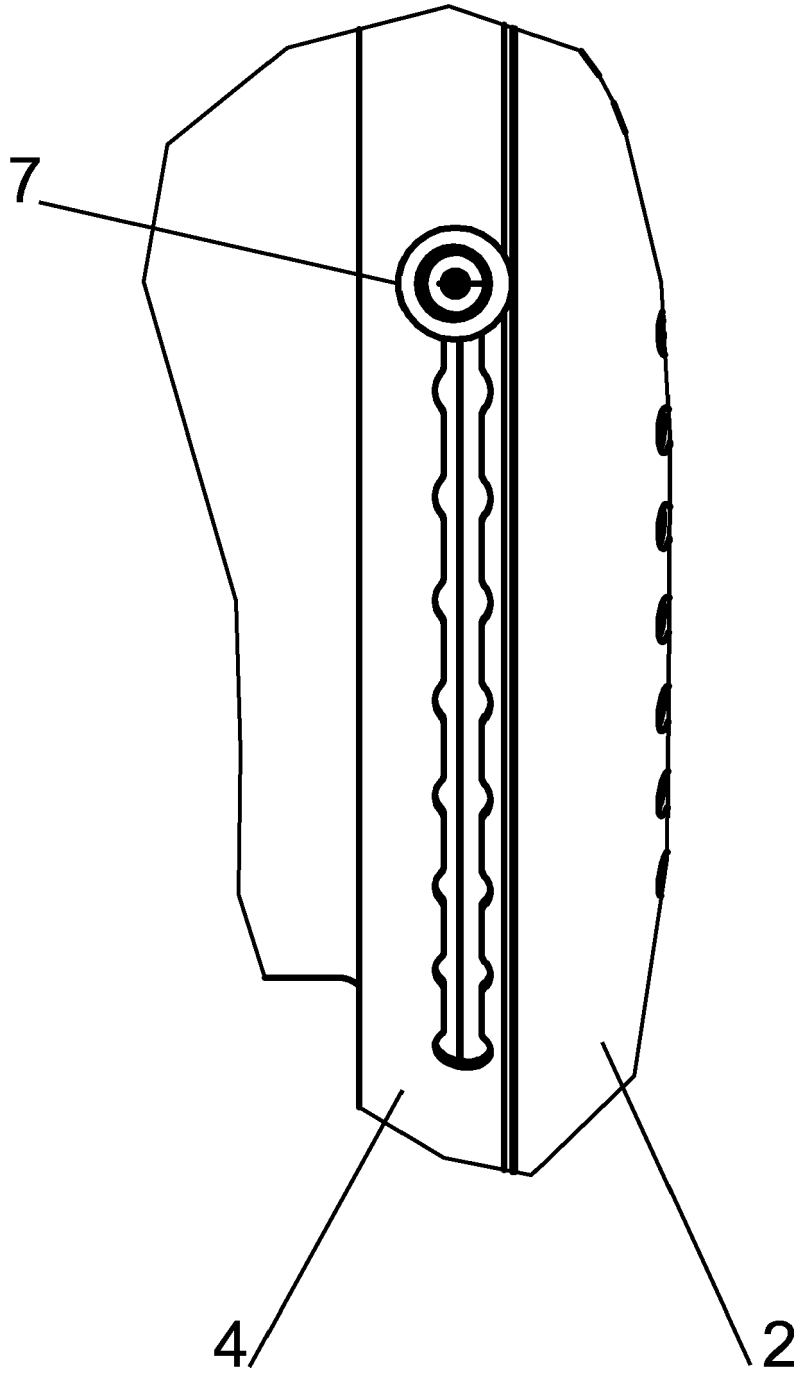

Fig. 12

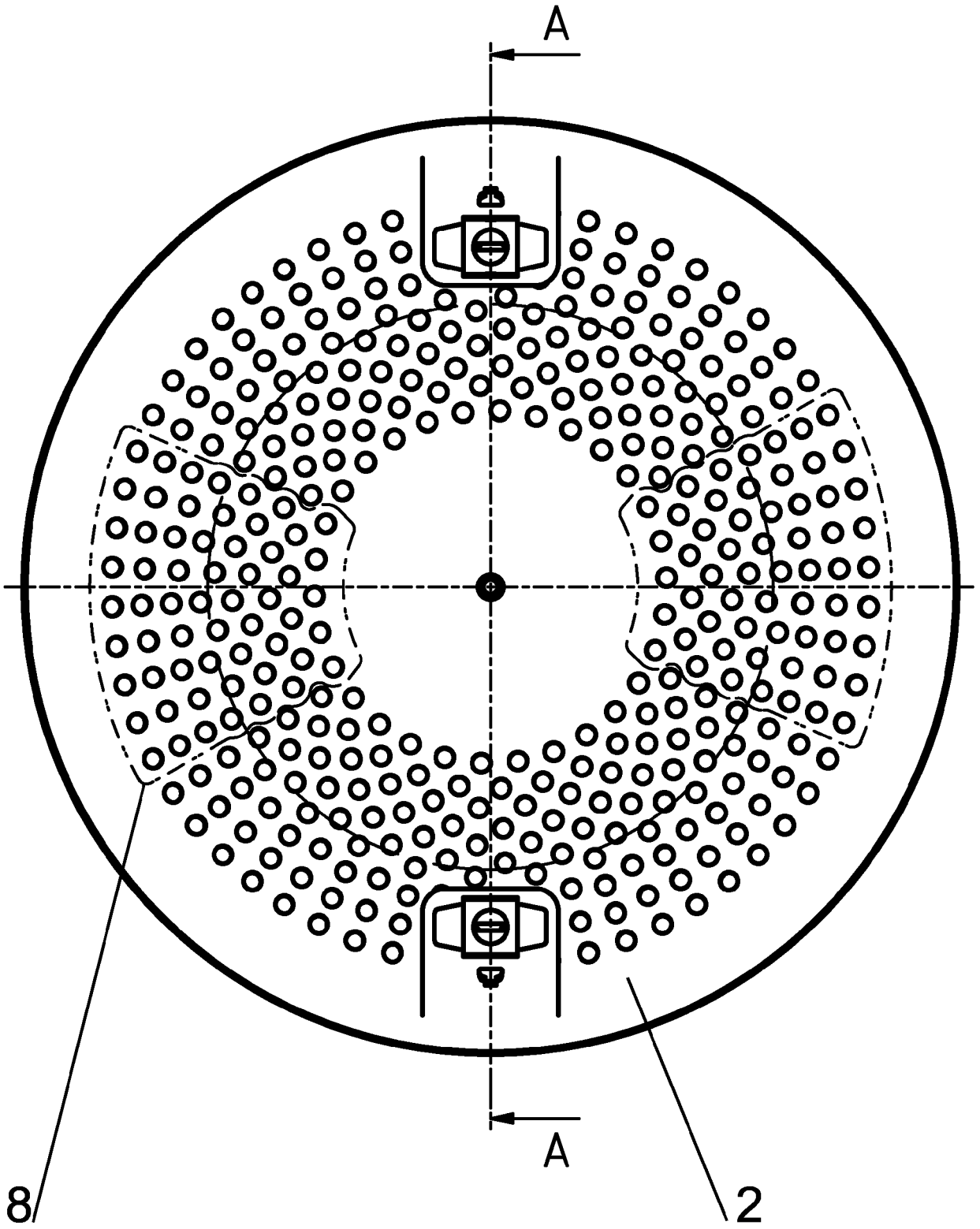

Fig. 13

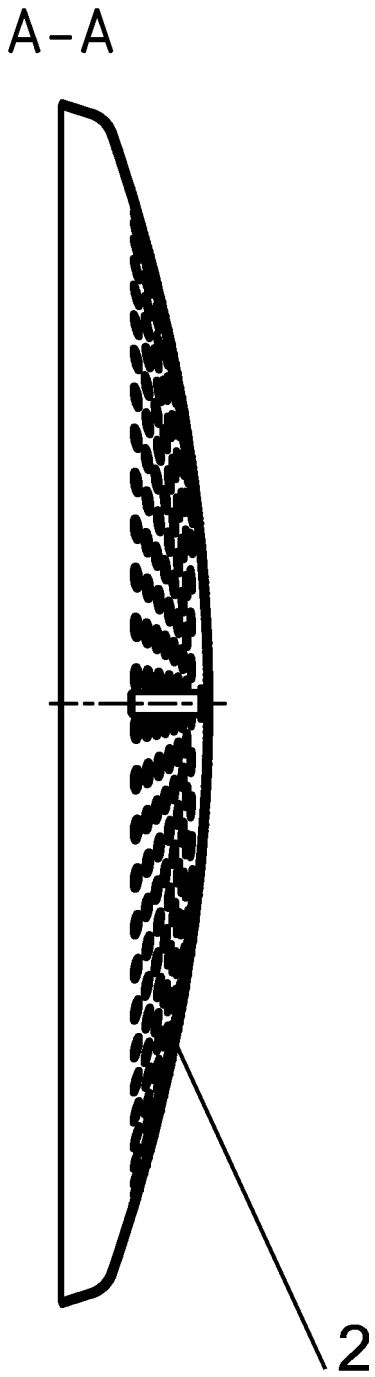

Fig. 14

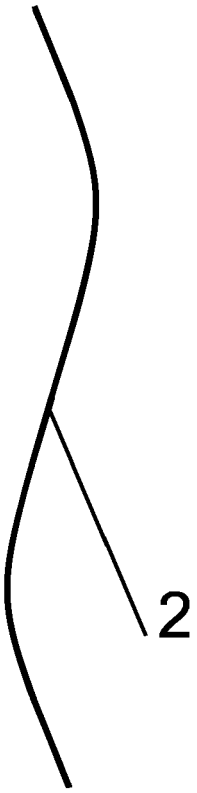

Fig. 15

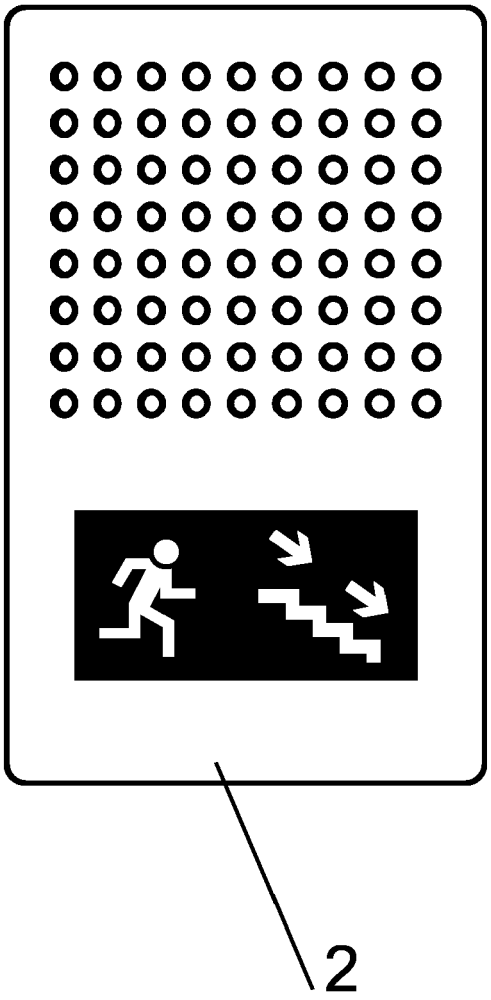

Fig. 16

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EUROPEAN SEARCH REPORT

Application Number
EP 17 16 2093

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	SE 510 594 C2 (RC LINJA KY [FI]) 7 June 1999 (1999-06-07) * the whole document *	1-15	INV. F24F13/12 F24F13/24 F24F13/06
A	DE 20 2005 009299 U1 (NIJBURG INVEST B V [NL]) 13 October 2005 (2005-10-13) * page 3; figures 1-6 *	1	
A	US 5 479 984 A (EASTERBROOK DAVID [CA] ET AL) 2 January 1996 (1996-01-02) * columns 2-3; figures 1,2 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 September 2017	Blot, Pierre-Edouard

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01-09-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SE 510594 C2	07-06-1999	NONE	
DE 202005009299 U1	13-10-2005	BE 1016642 A3	06-03-2007
		DE 202005009299 U1	13-10-2005
		GB 2415248 A	21-12-2005
		NL 1026436 C2	20-12-2005
US 5479984 A	02-01-1996	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201327163 Y **[0003]**
- CN 202835614 U **[0003]**
- DE 3644567 A1 **[0003]**
- JP 2014122738 A **[0004]**
- KR 20130112235 A **[0004]**
- US 4102357 A **[0004]**
- KR 20100008702 A **[0005]**
- KR 20110132807 A **[0005]**
- SE 510594 C2 **[0006]**
- GB 2415248 A **[0007]**