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(54) **HEAT EXCHANGER**

WÄRMETAUSCHER

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(73) Proprietor: **VALEO TERMICO, S.A.**
50011 Zaragoza (ES)

(72) Inventors:
- **DE LA FUENTE ROMERO, José Antonio**
  50011 ZARAGOZA (ES)
- **TOMAS HERRERO, Eva**
  50011 ZARAGOZA (ES)
- **CONTE OLIVEROS, Teresa**
  50011 ZARAGOZA (ES)

(74) Representative: **Valeo Systèmes Thermiques**
Service Propriété Intellectuelle
8, rue Louis Lormand
La Verrière
78320 Le Mesnil Saint Denis (FR)

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Description

[0001] The present invention relates to a heat exchanger, particularly to a thermal management system for an Exhaust Gas Re-circulation (EGR) cooler.

[0002] An Exhaust Gas Re-circulation (EGR) cooler receives exhaust gases from an engine and cools the exhaust gases before the exhaust gases are re-circulated back to the engine's cylinder. By re-circulating the engine's exhaust gas back to the engine's cylinder, the peak in-cylinder temperatures are regulated, specifically lowered to reduce formation of NOx gases. The EGR cooler further reduces the combustion chamber temperature, thereby preventing valve clatter, detonation and further reduces NO_x formation. As a result, the exhaust gas re-circulation (EGR) system substantially reduces vehicle emissions to enable meeting stringent vehicular exhaust emission norms prevalent in most parts of the world.

[0003] In an EGR cooler, exhaust gas is received in a tank and from the tank the exhaust gas pass through heat exchange tubes received inside the housing, coolant is delivered by a coolant inlet pipe around the heat exchange tubes to cause heat exchange between the exhaust gas and the coolant, thereby resulting in cooling of the exhaust gas and reducing the temperature of the exhaust gas. The coolant inlet pipe is disposed at sidewall of the EGR cooler. The EGR cooler handles high temperature exhaust gases in the temperature range of 400 to 900 °C. Accordingly, temperatures at certain regions inside the EGR cooler, particularly, a gas inlet area of the heat exchange tubes that first comes into contact with the exhaust gas, exceeds acceptable limits and cause formation of hot spots. The hot spots at the gas inlet area cause problems such as boiling of the coolant, durability issues and excessive thermo-dynamical stresses at the gas inlet area. To avoid such problems, the coolant from the coolant inlet pipe is directed to the gas inlet area of the heat exchange tubes by using a baffle disposed inside the coolant inlet pipe to avoid high temperatures at the gas inlet area. However, such baffle extends inside the housing of the EGR cooler and interferes with the other components, particularly, components such as for example, heat exchange tubes disposed inside the housing of the EGR cooler. Further, packaging of the baffle within limited space inside the coolant inlet pipe is a concern and such configuration of the baffle inside the coolant inlet pipe may restrict coolant flow through the coolant inlet pipe. Further, conventional method of providing baffle for directing coolant to the gas inlet area through an inlet configured on the housing fails to effectively regulate distribution and velocity of coolant directed to the gas inlet area. Still further, the conventional baffle is a dedicated component and as such there are product costs, inventory costs and process costs associated with configuring the baffle.

[0004] In the prior art WO2013022072A1, it is known to provide an heat exchanger with the features of the preamble of claim 1.

[0005] Accordingly, there is need for an EGR cooler configured with a baffle that effectively directs coolant to the gas inlet area of the EGR cooler, thereby preventing high temperature hot spots at the gas inlet area and that is capable of addressing issues such as boiling of coolant, durability issues and excessive thermo-dynamical stresses arising due to hot spots at the gas inlet area of the EGR cooler. Further, there is a need for an EGR cooler configured with a baffle that does not interfere with the other components, particularly, components such as for example heat exchange tubes disposed inside the housing of the EGR cooler. Further, there is a need for an EGR cooler configured with a baffle that effectively directs coolant to the gas inlet area, thereby preventing excessive temperatures and the problems associated with the excessive temperatures at the gas inlet area. Further, there is a need for an EGR cooler configured with a baffle that is configured by modifying an existing part of the EGR cooler, thereby reducing product and process costs associated with configuring the baffle. Still further there is a need for an EGR cooler configured with a baffle inside a diverging tank secured to a side of housing of the EGR cooler, wherein the baffle can be conveniently packaged without disrupting coolant flow to heat exchange tubes received inside the housing, particularly, the gas inlet area. Further, there is a need for an EGR cooler that exhibits extended service life, improved reliability and efficiency.

[0006] An object of the present invention is to provide an EGR cooler that obviates the drawbacks associated with conventional methods for cooling a gas inlet area for an EGR cooler that fails to effectively regulate distribution and velocity of coolant directed to the gas inlet area.

[0007] Another object of the present invention is to provide an EGR cooler configured with a baffle that effectively directs coolant to a gas inlet area of an EGR cooler to achieve efficient cooling of the gas inlet area thereby addressing issues such as boiling of coolant, durability issues and excessive thermo-dynamical stresses arising due to hot spots at the gas inlet area of the EGR cooler.

[0008] Still another object of the present invention is to provide an EGR cooler configured with a baffle that does not interfere with the other components, particularly, components such as for example, heat exchange tubes disposed inside the housing of the EGR cooler.

[0009] Yet another object of the present invention is to provide an EGR cooler that can be easily packaged and that do not interfere with the flow of coolant through the coolant inlet pipe.

[0010] Still another object of the present invention is to provide an EGR cooler configured with a baffle that is configured by modifying an existing part of the EGR cooler, thereby reducing product, process and inventory costs associated with configuring the baffle.

[0011] Yet another objective of the present invention is to provide an EGR cooler that exhibits extended service life, improved reliability and efficiency.

[0012] In the present description, some elements or parameters may be indexed, such as a first element and a second element. In this case, unless stated otherwise, this indexation is only meant to differentiate and name elements which are similar but not identical. No idea of priority should be inferred from such indexation, as these terms may be switched without betraying the invention. Additionally, this indexation does not imply any order in mounting or use of the elements of the invention.

[0013] A heat exchanger according to the present invention is disclosed in accordance with claim 1. The heat exchanger includes housing, a heat exchanger core, a diverging tank and at least one baffle. The heat exchanger core is received in the housing and includes heat exchange tubes that receive hot gas. The coolant is received in the housing and around the heat exchange tubes. The diverging tank is disposed at a side of the housing and is diverging towards the housing. The diverging tank connects a coolant inlet with the housing to enable fluid communication between the coolant inlet and an interior of the housing. At least a portion of the at least one baffle is disposed inside the diverging tank and divides an interior of the diverging tank into at least two volumes, wherein at least one volume is in fluid communication with the interior of the housing and the at least one baffle directs coolant flow to a gas inlet area inside the housing. The housing includes at least one inlet formed thereon for enabling fluid communication between the at least one volume of the diverging tank and the interior of the housing. The at least one baffle is integrally formed with the housing. The at least one baffle as well as the at least one inlet is formed by deforming a cut out portion of the housing that is integrally connected to the housing.

[0014] Particularly, the diverging tank includes a first opening connected to the coolant inlet and a second opening larger than the first opening and connected to the first opening, the second opening is so disposed with respect to said at least one inlet that said diverging tank covers said at least one inlet.

[0015] Generally, the at least one inlet and the at least one baffle is at least half the dimension of the second opening.

[0016] In accordance with an embodiment of the present invention, a base of the at least one baffle is disposed along at least a portion of a periphery of the at least one inlet.

[0017] Specifically, the at least one baffle forms an angle in the range of 20 to 70 degrees with respect to the side wall of the housing configured with the at least one inlet.

[0018] In accordance with an embodiment, the at least one baffle includes a plurality of tabs configured thereon to secure the at least one baffle inside the diverging tank.

[0019] Alternatively, the at least one baffle includes lips configured along at least a portion of a periphery thereof to secure the at least one baffle inside the diverging tank.

[0020] Further, the at least one baffle includes a plurality of apertures formed thereon.

[0021] Preferably, the at least one baffle is of a shape selected from group of shapes comprising of rectangular, semi-circular and trapezoidal shape.

[0022] Generally, the heat exchange tubes are axially extending along the housing and the gas inlet area is near a tank delivering hot gases to the heat exchange tubes, the at least one inlet is disposed upstream of gas inlet area in direction of coolant flow and the at least one baffle directs coolant to the gas inlet area via the at least one inlet.

[0023] Other characteristics, details and advantages of the invention can be inferred from the description of the invention hereunder. A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying figures, wherein:

FIG. 1a and **FIG. 1b** illustrate an EGR cooler in accordance with an embodiment of the present invention, particularly, a sectional view depicting internal details of a diverging tank disposed at a side wall of a housing of the EGR cooler;

FIG. 2a illustrates the baffle configured with tabs for securing the baffle to inner walls of the diverging tank of **FIG. 1a** and **FIG. 1b;**

FIG. 2b - 2c illustrate different views of the diverging tank with the baffle of **FIG. 2a** received and secured inside the diverging tank;

FIGS. 2d- 2e illustrate different configurations of the baffle received inside the diverging tank, wherein the baffle is illustrated in different orientations with respect to an inlet configuring fluid communication between an interior of the diverging tank and an interior of the housing;

FIG. 2f illustrates the baffle received inside the diverging tank and in between two inlets configuring fluid communication between the interior of the diverging tank and the interior of the housing;

FIG. 3a illustrates the diverging tank of **FIG.1** without the baffle received there inside;

FIG. 3b illustrates a sectional view of the diverging tank along the section line A-A of **FIG 3a;**

FIG. 4a illustrates a baffle with a plurality of tabs formed thereon for securing the baffle inside the diverging tank;

FIG. 4b illustrates a baffle in accordance with another embodiment with apertures formed thereon; and

FIG 4c illustrates a baffle with lips formed thereon for securing the baffle inside the diverging tank.

[0024] It must be noted that the figures disclose the invention in a detailed enough way to be implemented, said figures helping to better define the invention if needs be. The invention should however not be limited to the embodiment disclosed in the description.

[0025] The present invention relates to a thermal management system for an Exhaust Gas Re-circulation (EGR) cooler, specifically to at least one baffle, hereafter simply referred to as a baffle disposed inside a diverging tank. Wherein a diverging tank is disposed at a side wall of a housing of the EGR cooler and is in addition to tanks disposed at ends of the housing for delivering hot gases to and collecting hot gases from heat exchange tubes received inside the housing. The baffle acts as a partition and divides an interior of the diverging tank into at least two volumes, wherein at least one volume is in fluid communication with an interior of the housing and the baffle directs coolant to a gas inlet area of the heat exchange tubes received inside the housing of the EGR cooler. Such configuration of the baffle, addresses issues such as boiling of coolant, durability issues and excessive thermo-dynamical stresses, arising due to hot spots forming at the gas inlet area of the EGR cooler. Although, the baffle of the present invention is used for directing coolant directly to the gas inlet area of the EGR cooler. However, the baffle of the present invention is also applicable for any other applications, where coolant or any other fluid is required to be directed at a particular region inside any other system such as for example a region that is exposed to hot fluid and that is required to be cooled to address issues arising due to formation of hot spots.

[0026] **FIG. 1a** and **FIG. 1b** illustrate a heat exchanger particularly, an EGR cooler 100 in accordance with an embodiment of the present invention. The EGR cooler 100 is configured with a diverging tank **30** disposed at a side wall **10a** of a housing **10** of the EGR cooler **100,** wherein the housing **10** receives a heat exchanger core **20.** The diverging tank **30** is in addition to tanks (not illustrated) disposed at ends of the housing **10** for delivering hot gases to and collecting hot gases from a plurality of heat exchange tubes **22** received inside the housing **10.** The diverging tank **30** is in fluid communication with a coolant inlet **12** at one end and the housing **10** at the other end, thereby enabling fluid communication between the coolant inlet **12** and an interior of the housing **10.** The diverging tank **30** includes a baffle **14** that is at least partially received therein for directing coolant directly to a gas inlet area **16,** such as for example portions of the heat exchange tubes **22** near inlet of the heat exchange tubes **22** and received inside the housing **10.** The baffle **14** may also direct coolant to the areas adjacent to the gas inlet area **16** to prevent drawbacks associated with over-heating. The gas inlet area **16** is for example the portion of the heat exchange tubes **22** of the heat exchanger core **20** that first receive the exhaust gas and are first to come in contact with high temperature exhaust gases and as such is prone issues such as boiling of coolant, durability issues and excessive thermo-dynamical stresses arising due to formation of hot spots. With the baffle **14** directing coolant to the gas inlet area **16** disposed inside the housing **10** of the EGR cooler **100,** the formation of hot spots at the gas inlet area **16** of the EGR cooler **100** is prevented and issues arising due to hot spots forming at the gas inlet area **16** of the EGR cooler **100** are also avoided. The baffle **14** may extend sideways out of the diverging tank **30** but do not extend into the housing **10** and as such do not interfere with the heat exchanger core **20** disposed inside the housing **10.** The heat exchange tubes **22** are axially extending along the housing **10** and the gas inlet area **16** is near the tank delivering hot gases to the heat exchange tubes **22,** the at least one inlet **18** is disposed upstream of gas inlet area **16** in direction of coolant flow and the at least one baffle **14** directs coolant to the gas inlet area **16** via the at least one inlet **18.**

[0027] The housing **10** receives the heat exchanger core **20** connected to and disposed between a pair of headers disposed at the opposite ends of the housing **10.** The heat exchanger core **20** includes the plurality of heat exchange tubes **22** that receive hot gas from the tank and through which the hot gas pass. The housing **10** further receives coolant around the heat exchange tubes **22** through the coolant inlet **12.** Such an arrangement enables heat exchange between the hot gas flowing through the heat exchange tubes **22** and the coolant around the heat exchange tubes **22.** The portion of the heat exchange tubes **22** that receives the exhaust gases and as such that first comes in contact with high temperature exhaust gases is the gas inlet area **16** that is prone to issues due to formation of hot spots.

[0028] The diverging tank **30** is disposed at side of the housing **10** and is diverging towards the housing **10.** The diverging tank **30** receives at least a portion of the baffle **14** as illustrated in **FIG. 2a.** Referring to the **FIG. 2b,** the diverging tank 30 includes a first opening **30a** connected to the coolant inlet **12** and a second opening **30b** opposite to the first opening **30a,** larger than the first opening **30a** and connected to the first opening **30a** by side walls of the diverging tank **30.** The second opening **30b** is further connected to the housing **10** along a flange **30c** radially extending along the second opening **30b** and as such the diverging tank **30** is diverging towards the housing **10.** More specifically, the diverging tank **30** is disposed between the coolant inlet **12** and the housing **10,** the second opening **30b** of the diverging tank **30** is so disposed with respect to at least one inlet **18** formed on the housing **10** for configuring fluid communication between the diverging tank **30** and the interior of the housing 10, that the diverging tank **30** covers the at least one inlet **18.** The diverging tank **30** is in fluid communication with the coolant inlet **12** and the housing **10,** thereby enabling fluid communication between the coolant inlet **12** and the interior of the housing **10.** Such configuration of the diverg-

ing tank **30** provides enough space for receiving the baffle **14.** Accordingly, such configuration of the diverging tank **30** receiving the baffle **14** enables the baffle **14** to direct the coolant from the coolant inlet **12** to the gas inlet area **16** without disrupting coolant flow to the gas inlet area **16.**

[0029] The baffle **14** is disposed inside the diverging tank **30** and acts as a partition to divide an interior of the diverging tank **30** into at least two volumes, wherein at least one volume is in fluid communication with the interior of the housing **10.** The at least one baffle **14** forms an angle in the range of 20 to 70 degrees with respect to the side wall **10a** of the housing **10** configured with the at least one inlet **18. FIG. 2a** illustrates the baffle **14** configured with a plurality of tabs **14b** for securing the baffle **14** to inner walls of the diverging tank **30.** The baffle 14 can also be secured to the inner walls of the diverging tank **30** by using a plurality of lips **14d** configured along at least a portion of periphery of the baffle **14** as illustrated in **FIG. 4c.** However, the present invention is not directed to any particular configuration of attachment means and method for securing the baffle **14** to inner walls of the diverging tank **30. FIGS. 2b - 2c** illustrate different views of the diverging tank **30** with the baffle **14** received and secured inside the diverging tank **30.**

[0030] In accordance with an embodiment as illustrated in **FIGS. 2d** and **2e,** the two volumes are separated and isolated from each other by the baffle **14** and one of the two volumes is in fluid communication with the interior of the housing **10** via the inlet **18** formed on the housing **10.** Specifically, **FIGS. 2d- 2e** illustrate different configurations of the baffle **14** received and secured inside the diverging tank **30,** wherein the baffle **14** is illustrated in different orientations with respect to the inlet **18** configuring fluid communication between the interior of the diverging tank **30** and the interior of the housing **10.** More specifically, a base **14a** of the baffle **14** is disposed along at least a periphery of the at least one inlet **18** and the baffle **14** can be at any angle, for example, angle "α" with the outside wall or the side wall **10a** of the housing **10.** Preferably, the baffle **14** is at an acute angle with respect to the side wall **10a** of the housing **10.** Further, the inlet **18** formed on the housing **10** can be of different dimensions "D1" and "D2". In accordance with an embodiment, the inlet **18** and the baffle **14** is at least half the dimension of the second opening **30b.** The orientation of the baffle **14** and the dimension of the inlet **18** formed on the housing **10** are based on the position of the gas inlet area **16** with respect to the inlet **18,** and particularly, based on the direction in which the coolant is to be directed to reach the gas inlet area **16** and amount of coolant to be supplied to the gas inlet area **16** for effective cooling of the gas inlet area **16.**

[0031] In accordance with another embodiment as illustrated in **FIG. 2f,** the two volumes are in fluid communication with each other. Further at least one of the two volumes are in fluid communication with the interior of the housing **10** via at least one of the inlets **18.** Specifically, both volumes are in fluid communication with the interior of the housing **10** via inlets **18** formed on the housing **10** and illustrated in **FIG. 2f,** wherein one inlet supplies coolant to the gas inlet area **16,** such as for example portions of the heat exchange tubes **22** near the inlet of the heat exchange tubes **22,** whereas the other inlet **18** supplies coolant to the remaining portion of the heat exchange tubes **22.** The baffle **14** directs coolant to the gas inlet area **16** inside the housing **10** via one of the inlets **18.**

[0032] In one embodiment of the present invention, the baffle **14** is of a planar configuration. In accordance with this invention, the baffle **14** is an integral part of the housing **10,** particularly, integral part of the side wall **10a** of the housing **10.** More specifically, the at least one baffle **14** as well as the at least one inlet **18** is formed by deforming a cut out portion of the housing **10** that is still connected to the housing **10.** The cut out portion of the housing **10** is cut along a profile and is configured by stamping operation such that the cut out portion is still connected to the side wall **10a** of the housing **10** along at least one edge of the cut out portion, wherein when the cut out portion is lifted away from the side **wall 10a** to form the inlet **18** on the side wall **10a,** the lifted cutout portion acts as the baffle **14.** More specifically, the baffle **14** can have different shapes such as rectangular, semi-circular and trapezoid shape, with at least one edge connected to the housing **10.** However, the present invention is not limited to any particular shape of the cut out portion or the baffle **14** formed thereby and any particular method for forming the cut out portion until the cut out portion is capable of being deformed for forming the at least one baffle **14** as well as the at least one inlet **18** simultaneously. With such configuration the at least one baffle **14** and the at least one inlet **18** are formed by a single step, thereby reducing the number of manufacturing steps required for configuring the diverging tank **30** secured to the housing **10** and with the at least one baffle **14** and the at least one inlet **18** received there inside.

[0033] As the baffle **14** in accordance of the present invention is formed by modifying an existing part of the EGR cooler, particularly, by modifying the housing **10,** product, process and inventory costs associated with configuring the baffle as a dedicated element are eliminated. Further, with such configuration of the baffle **14,** the baffle **14** is disposed inside the diverging tank **30** and does not interfere with the other components, particularly, components such as heat exchange tubes disposed inside the housing **10** of the EGR cooler **100.** In accordance with another embodiment, the baffle **14** includes a plurality of apertures **14c** configured thereon. The present invention is not limited to any particular placement of the apertures **14c** on the baffle **14.** The baffle **14** is formed by deforming the cut out portion of the housing **10,** particularly, the cut out portion from the side wall **10a** of the housing **10,** such that the periphery of the cut out portion snugly fits with respect to inner walls of the diverging tank **30.** However, the present invention is not limited to any particular shape, configuration and orientation of the baffle **14** inside the diverging tank **30** and

method of forming the baffle **14** as far as the baffle **14** is capable of effectively directing coolant to the gas inlet area **16** disposed inside the housing **10. FIG. 3a** illustrates the diverging tank **30** without the baffle **14** received there inside. **FIG. 3b** illustrates a sectional view of the diverging tank **30** along the section line A-A of **FIG. 3a.**

[0034] Several modifications and improvement might be applied by the person skilled in the art to the heat exchanger and such modifications and improvements will still be considered within the scope and ambit of the present invention, as long the heat exchanger includes housing, a diverging tank and a baffle. The housing receives a heat exchanger core that includes heat exchange tubes that receives hot gas. The diverging tank is disposed at a side of the housing and is diverging towards the housing. The diverging tank connects a coolant inlet with the housing to enable fluid communication between the coolant inlet and an interior of the housing. The baffle is disposed inside the diverging tank and divides interior of the diverging tank into at least two volumes, wherein at least one volume is in fluid communication with the interior of the housing and the baffle directs coolant flow to a gas inlet area inside the housing.

[0035] In any case, the invention cannot and should not be limited to the embodiments specifically described in this document, as other embodiments might exist. The invention shall spread to any equivalent means and any technically operating combination of means.

Claims

1. A heat exchanger (100) comprising:

- a housing (10);
- a heat exchanger core (20) adapted to be received in said housing (10) and comprising heat exchange tubes (22) that are adapted to receive hot gas, coolant is received in said housing (10) and around said heat exchange tubes (22);
- a diverging tank (30) disposed at a side of said housing (10) and diverging towards said housing (10), said diverging tank (30) adapted to connect a coolant inlet (12) with said housing (10) to enable fluid communication between said coolant inlet (12) and an interior of said housing (10); and
- at least a portion of at least one baffle (14) disposed inside said diverging tank (30) and adapted to divide an interior of said diverging tank (30) into at least two volumes, wherein at least one volume is in fluid communication with said interior of said housing (10) and said at least one baffle (14) is adapted to direct coolant flow to a gas inlet area (16) inside said housing (10);

characterized in that said at least one baffle (14) is integrally formed with said housing (10) and wherein said at least one baffle (14) as well as the at least one inlet is formed by deforming a cut out portion of said housing (10) that is integrally connected to said housing (10).

2. The heat exchanger (100) as claimed in previous claim, wherein said housing (10) comprises at least one inlet (18) formed thereon for enabling fluid communication between said at least one volume of said diverging tank (30) and said interior of said housing (10).

3. The heat exchanger (100) as claimed in the claim 2, wherein said diverging tank (30) comprises a first opening (30a) connected to said coolant inlet (12) and a second opening (30b) larger than said first opening (30a) and connected to the first opening (30a), said second opening (30b) is so disposed with respect to said at least one inlet (18) that said diverging tank (30) covers said at least one inlet (18).

4. The heat exchanger (100) as claimed in the claim 2, wherein said at least one inlet (18) and said at least one baffle (14) is at least half the dimension of said second opening (30b).

5. The heat exchanger (100) as claimed in the claim 2, wherein a base (14a) of said at least one baffle (14) is disposed along at least a portion of a periphery of said at least one inlet (18).

6. The heat exchanger (100) as claimed in the previous claim, wherein said at least one baffle (14) forms an angle "α" in the range of 20 to 70 degrees with respect to a side wall (10a) of said housing (10) configured with said at least one inlet (18).

7. The heat exchanger (100) as claimed in any of the preceding claims, wherein said at least one baffle (14) comprises a plurality of tabs (14b) configured thereon and adapted to secure said at least one baffle (14) inside said diverging tank (30).

8. The heat exchanger (100) as claimed in any of the preceding claims 1-6, wherein said at least one baffle (14) comprises lips (14d) configured along at least a portion of a periphery thereof and adapted to secure said baffle (14) inside said diverging tank (30).

9. The heat exchanger (100) as claimed in any of the preceding claims, wherein said at least one baffle (14) further comprises a plurality of apertures (14c) formed thereon.

10. The heat exchanger (100) as claimed in any of the preceding claims, wherein said at least one baffle (14) is of a shape selected from group of shapes comprising rectangular, semi-circular and trapezoi-

dal shape.

11. The heat exchanger (100) as claimed in any of the claim 2, wherein said heat exchange tubes (12) are axially extending along said housing (10) and said gas inlet area (16) is near a tank delivering hot gases to said heat exchange tubes (22), said at least one inlet (18) is disposed upstream of gas inlet area (16) in direction of coolant flow and said at least one baffle (14) is adapted to direct coolant to said gas inlet area (16) via said at least one inlet (18).

Patentansprüche

1. Wärmetauscher (100), umfassend:

- ein Gehäuse (10);
- einen Wärmetauscherkern (20), dazu angepasst, in dem Gehäuse (10) aufgenommen zu werden, und Wärmeaustauschrohre (22) umfassend, die dazu angepasst sind, heißes Gas aufzunehmen, wobei Kühlmittel in dem Gehäuse (10) und rund um die Wärmeaustauschrohre (22) aufgenommen ist;
- einen auseinandergehenden Tank (30), angeordnet an einer Seite des Gehäuses (10) und in Richtung des Gehäuses (10) auseinandergehend, wobei der auseinandergehende Tank (30) dazu angepasst ist, einen Kühlmitteleinlass (12) mit dem Gehäuse (10) zu verbinden, um Fluidverbindung zwischen dem Kühlmitteleinlass (12) und einem Inneren des Gehäuses (10) zu ermöglichen; und
- zumindest einen Teil zumindest eines Leitblechs (14), angeordnet im Inneren des auseinandergehenden Tanks (30) und dazu angepasst, ein Inneres des auseinandergehenden Tanks (30) in mindestens zwei Volumen zu teilen, wobei zumindest ein Volumen in Fluidverbindung mit dem Inneren des Gehäuses (10) ist und das zumindest eine Leitblech (14) dazu angepasst ist, Kühlmittelstrom zu einem Gaseinlassbereich (16) im Inneren des Gehäuses (10) zu leiten;

dadurch gekennzeichnet, dass das zumindest eine Leitblech (14) integral mit dem Gehäuse (10) ausgebildet ist und wobei das zumindest eine Leitblech (14) sowie der zumindest eine Einlass durch Verformen eines Ausschnittteils des Gehäuses (10) gebildet sind, der integral mit dem Gehäuse (10) verbunden ist.

2. Wärmetauscher (100) nach dem vorhergehenden Anspruch, wobei das Gehäuse (10) zumindest einen daran gebildeten Einlass (18) zum Ermöglichen von Fluidverbindung zwischen dem zumindest einen Volumen des auseinandergehenden Tanks (30) und dem Inneren des Gehäuses (10) umfasst.

3. Wärmetauscher (100) nach Anspruch 2, wobei der auseinandergehende Tank (30) eine erste Öffnung (30a), die mit dem Kühlmitteleinlass (12) verbunden ist, und eine zweite Öffnung (30b), die größer als die erste Öffnung (30a) ist und mit der ersten Öffnung (30a) verbunden ist, umfasst, wobei die zweite Öffnung (30b) bezüglich des zumindest einen Einlasses (18) so angeordnet ist, dass der auseinandergehende Tank (30) den zumindest einen Einlass (18) abdeckt.

4. Wärmetauscher (100) nach Anspruch 2, wobei der zumindest eine Einlass (18) und das zumindest eine Leitblech (14) zumindest die Hälfte der Abmessung der zweiten Öffnung (30b) aufweisen.

5. Wärmetauscher (100) nach Anspruch 2, wobei eine Basis (14a) des zumindest einen Leitblechs (14) entlang zumindest eines Teils eines Umfangs des zumindest einen Einlasses (18) angeordnet ist.

6. Wärmetauscher (100) nach dem vorhergehenden Anspruch, wobei das zumindest eine Leitblech (14) einen Winkel "α" im Bereich von 20 bis 70 Grad bezüglich einer Seitenwand (10a) des Gehäuses (10) bildet, die mit dem zumindest einen Einlass (18) ausgelegt ist.

7. Wärmetauscher (100) nach einem der vorhergehenden Ansprüche, wobei das zumindest eine Leitblech (14) mehrere Nasen (14b) umfasst, die daran ausgelegt und dazu angepasst sind, das zumindest eine Leitblech (14) im Inneren des auseinandergehenden Tanks (30) zu sichern.

8. Wärmetauscher (100) nach einem der vorhergehenden Ansprüche 1-6, wobei das zumindest eine Leitblech (14) Lippen (14d) umfasst, die entlang zumindest eines Teils eines Umfangs davon ausgebildet und dazu angepasst sind, das Leitblech (14) im Inneren des auseinandergehenden Tanks (30) zu sichern.

9. Wärmetauscher (100) nach einem der vorhergehenden Ansprüche, wobei das zumindest eine Leitblech (14) ferner mehrere daran ausgebildete Öffnungen (14c) umfasst.

10. Wärmetauscher (100) nach einem der vorhergehenden Ansprüche, wobei das zumindest eine Leitblech (14) eine Form aufweist, die aus einer Gruppe von Formen ausgewählt wird, die eine rechteckige, eine halbkreisförmige und eine trapezförmige Form umfasst.

11. Wärmetauscher (100) nach einem des Anspruchs 2, wobei sich die Wärmeaustauschrohre (12) axial entlang des Gehäuses (10) erstrecken und der Gaseinlassbereich (16) nahe einem Tank ist, der heiße Gase zu den Wärmeaustauschrohren (22) zuführt, wobei der zumindest eine Einlass (18) dem Gaseinlassbereich (16) in Richtung des Kühlmittelflusses vorgelagert angeordnet ist und das zumindest eine Leitblech (14) dazu angepasst ist, Kühlmittel über den zumindest einen Einlass (18) zu dem Gaseinlassbereich (16) zu leiten.

Revendications

1. Échangeur de chaleur (100), comprenant :

- un logement (10) ;
- un faisceau d'échangeur de chaleur (20) adapté pour être reçu dans ledit logement (10) et comprenant des tubes d'échange de chaleur (22) qui sont adaptés pour recevoir un gaz chaud, un fluide de refroidissement est reçu dans ledit logement (10) et autour desdits tubes d'échange de chaleur (22) ;
- un réservoir divergeant (30) disposé sur un côté dudit logement (10) et divergeant vers ledit logement (10), ledit réservoir divergeant (30) étant adapté pour raccorder une entrée de fluide de refroidissement (12) audit logement (10) pour permettre une communication fluidique entre ladite entrée de fluide de refroidissement (12) et un intérieur dudit logement (10) ; et
- au moins une partie d'au moins un déflecteur (14) disposé à l'intérieur dudit réservoir divergeant (30) et adapté pour diviser un intérieur dudit réservoir divergeant (30) en au moins deux volumes, dans lequel au moins un volume est en communication fluidique avec ledit intérieur dudit logement (10) et ledit au moins un déflecteur (14) est adapté pour diriger un écoulement de fluide de refroidissement jusqu'à une zone d'entrée de gaz (16) à l'intérieur dudit logement (10) ;

caractérisé en ce que ledit au moins un déflecteur (14) est formé de façon monobloc avec ledit logement (10) et dans lequel ledit au moins un déflecteur (14), ainsi que l'au moins une entrée, est formé en déformant une partie de découpe dudit logement (10) qui est raccordée de façon monobloc audit logement (10).

2. Échangeur de chaleur (100) selon la revendication précédente, dans lequel ledit logement (10) comprend au moins une entrée (18) formée sur celui-ci pour permettre une communication fluidique entre ledit au moins un volume dudit réservoir divergeant (30) et ledit intérieur dudit logement (10).

3. Échangeur de chaleur (100) selon la revendication 2, dans lequel ledit réservoir divergeant (30) comprend une première ouverture (30a) raccordée à ladite entrée de fluide de refroidissement (12) et une seconde ouverture (30b) plus grande que ladite première ouverture (30a) et raccordée à la première ouverture (30a), ladite seconde ouverture (30b) est disposée par rapport à ladite au moins une entrée (18) de telle façon que ledit réservoir divergeant (30) couvre ladite au moins une entrée (18).

4. Échangeur de chaleur (100) selon la revendication 2, dans lequel ladite au moins une entrée (18) et ledit au moins un déflecteur (14) sont au moins la moitié de la dimension de ladite seconde ouverture (30b).

5. Échangeur de chaleur (100) selon la revendication 2, dans lequel une base (14a) dudit au moins un déflecteur (14) est disposée le long d'au moins une partie d'une périphérie de ladite au moins une entrée (18).

6. Échangeur de chaleur (100) selon la revendication précédente, dans lequel ledit au moins un déflecteur (14) forme un angle « α » dans la plage de 20 à 70 degrés par rapport à une paroi latérale (10a) dudit logement (10) configurée avec ladite au moins une entrée (18).

7. Échangeur de chaleur (100) selon l'une quelconque des revendications précédentes, dans lequel ledit au moins un déflecteur (14) comprend une pluralité de pattes (14b) configurées sur celui-ci et adaptées pour fixer ledit au moins un déflecteur (14) à l'intérieur dudit réservoir divergeant (30).

8. Échangeur de chaleur (100) selon l'une quelconque des revendications précédentes 1 à 6, dans lequel ledit au moins un déflecteur (14) comprend des lèvres (14d) configurées le long d'au moins une partie d'une périphérie de celui-ci et adaptées pour fixer ledit déflecteur (14) à l'intérieur dudit réservoir divergeant (30).

9. Échangeur de chaleur (100) selon l'une quelconque des revendications précédentes, dans lequel ledit au moins un déflecteur (14) comprend en outre une pluralité d'orifices (14c) formés sur celui-ci.

10. Échangeur de chaleur (100) selon l'une quelconque des revendications précédentes, dans lequel ledit au moins un déflecteur (14) est d'une forme sélectionnée parmi le groupe de formes comprenant une forme rectangulaire, semi-circulaire et trapézoïdale.

11. Échangeur de chaleur (100) selon l'une quelconque

de la revendication 2, dans lequel lesdits tubes d'échange de chaleur (12) s'étendent axialement le long dudit logement (10) et ladite zone d'entrée de gaz (16) est près d'un réservoir distribuant des gaz chauds auxdits tubes d'échange de chaleur (22), ladite au moins une entrée (18) est disposée en amont de la zone d'entrée de gaz (16) dans la direction d'écoulement de fluide de refroidissement et ledit au moins un déflecteur (14) est adapté pour diriger le liquide de refroidissement jusqu'à ladite zone d'entrée de gaz (16) par l'intermédiaire de ladite au moins une entrée (18).

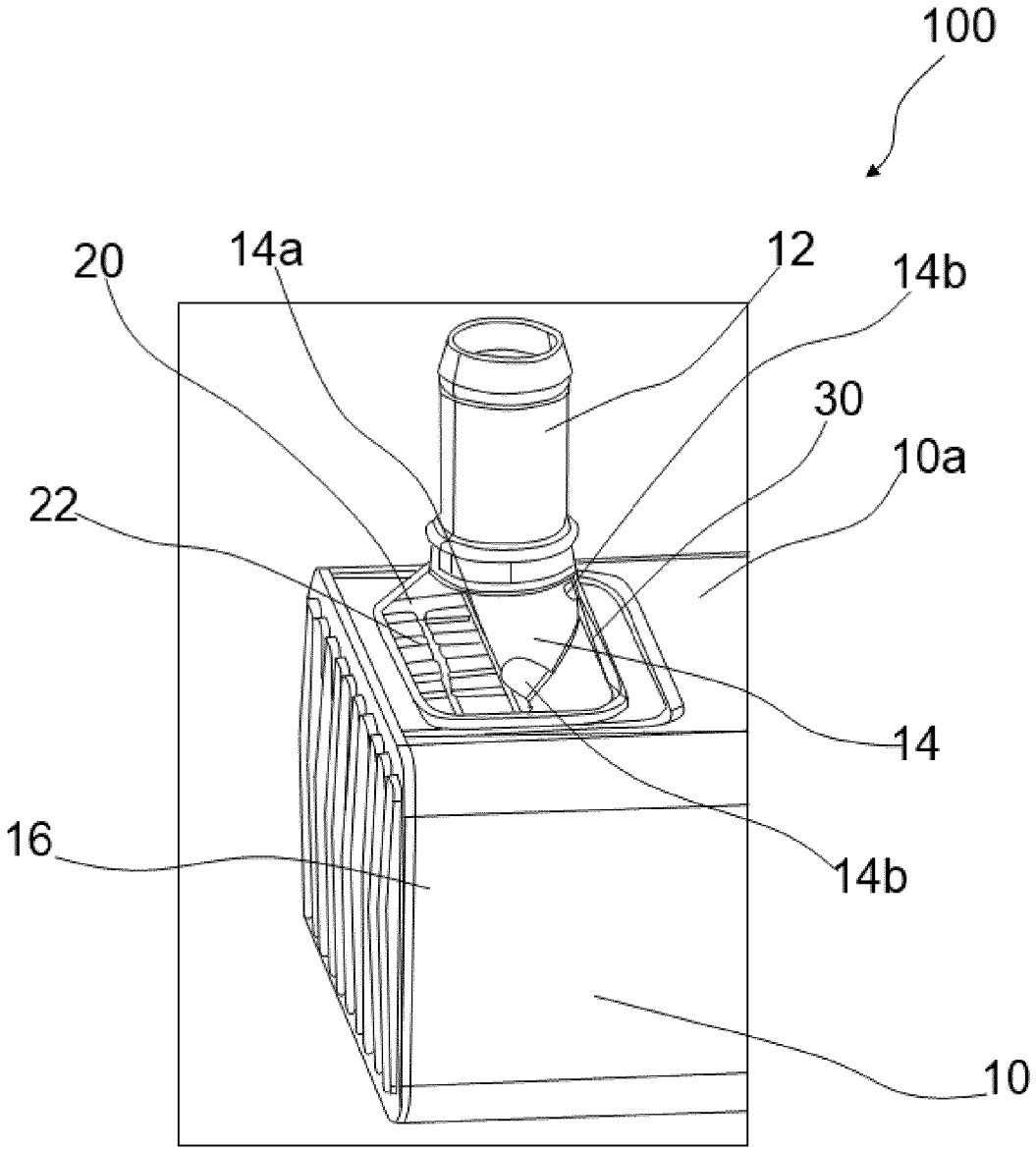

FIG. 1a

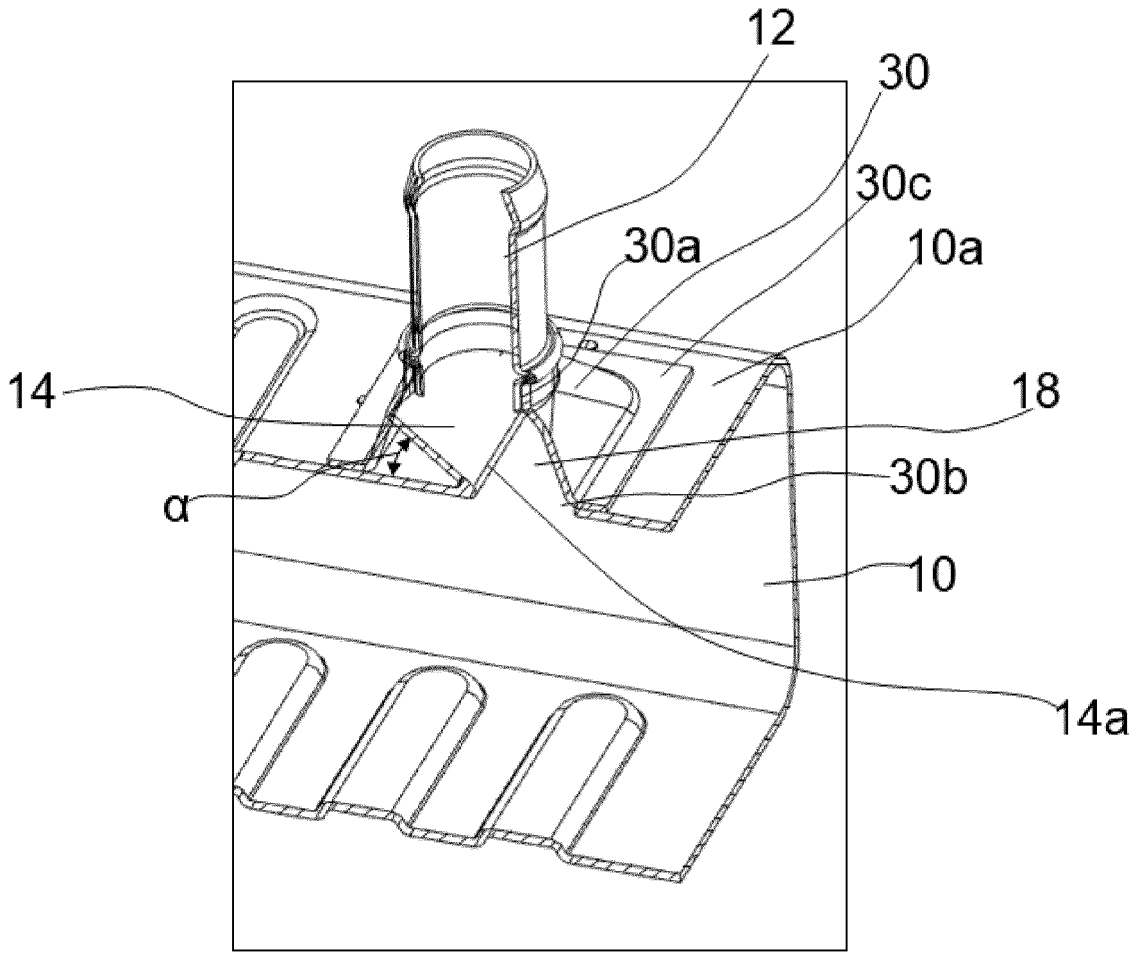

FIG. 1b

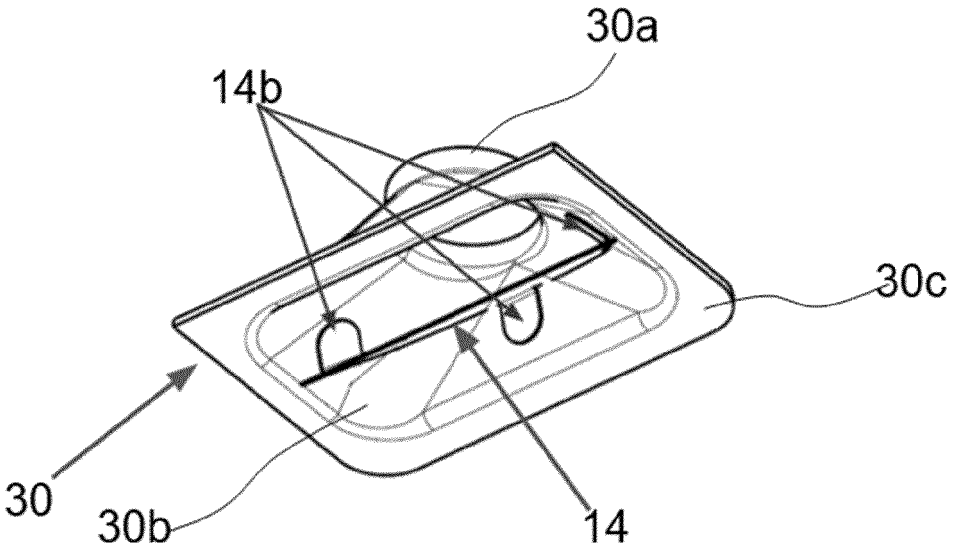

FIG. 2a

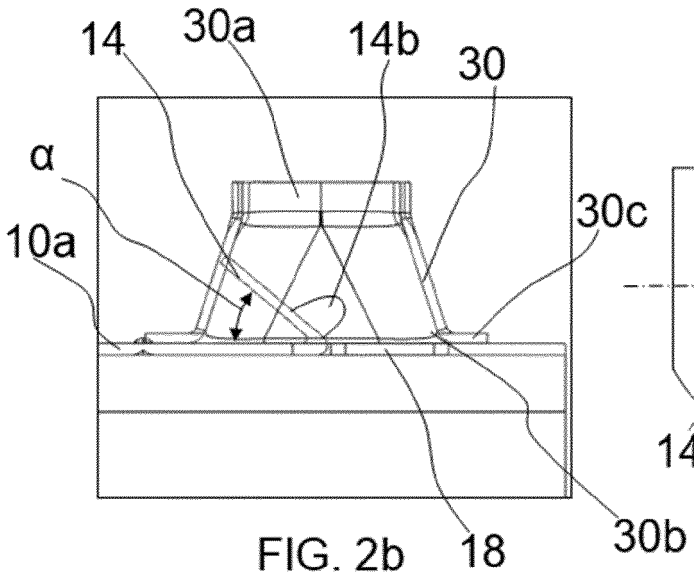

FIG. 2b

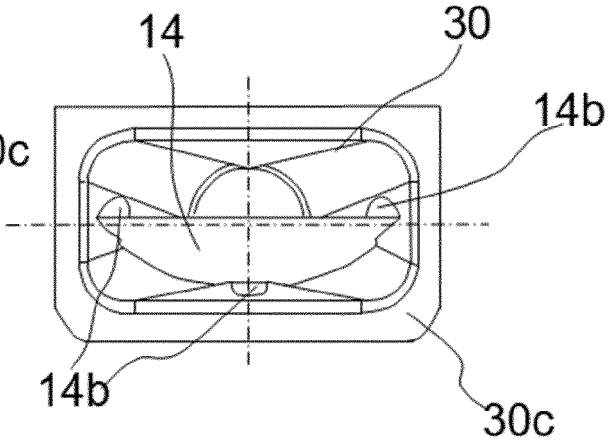

FIG. 2c

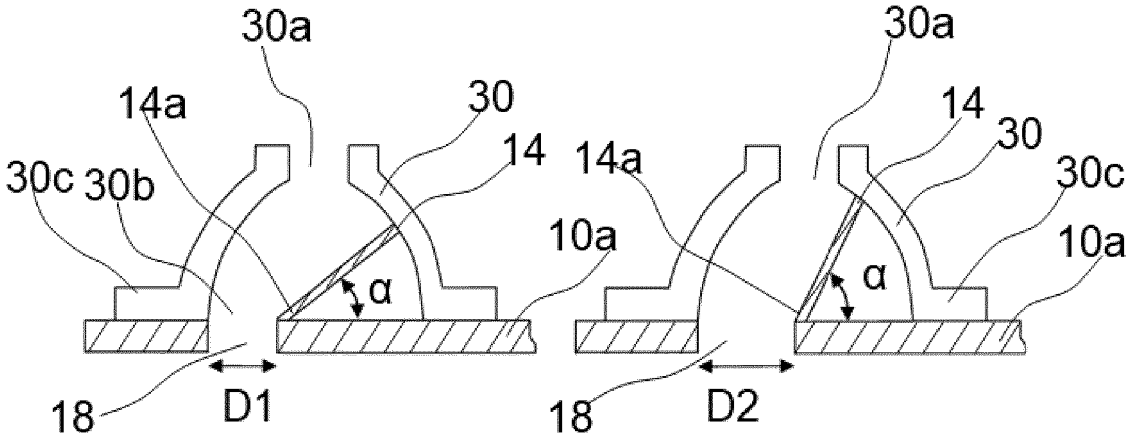

FIG. 2d

FIG. 2e

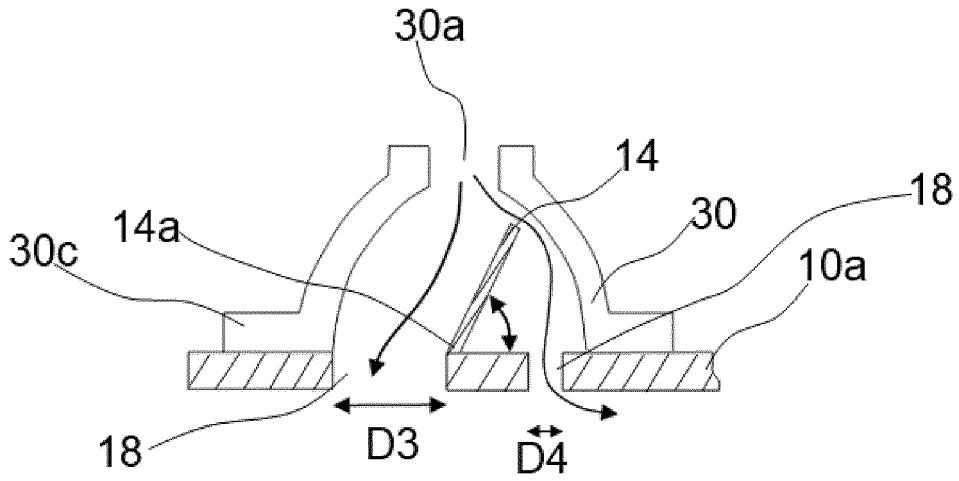

FIG. 2f

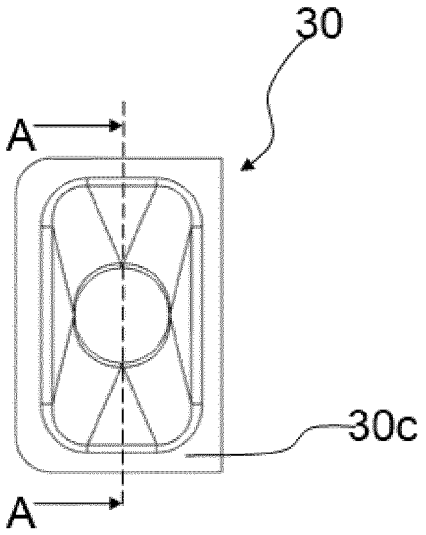

FIG. 3a

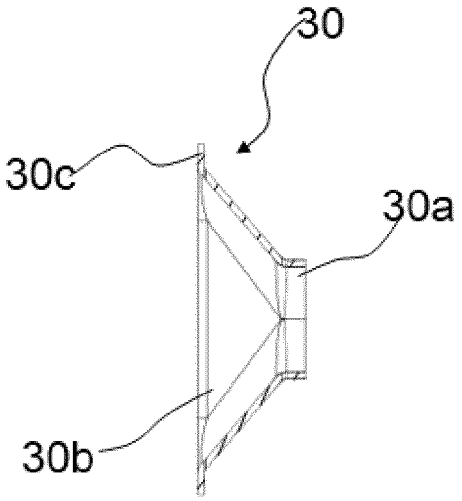

FIG. 3b

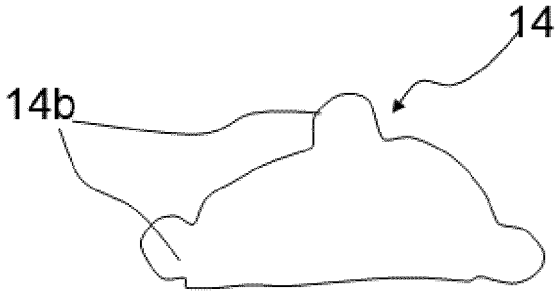

FIG. 4a

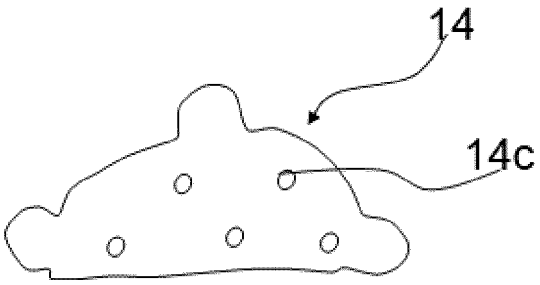

FIG. 4b

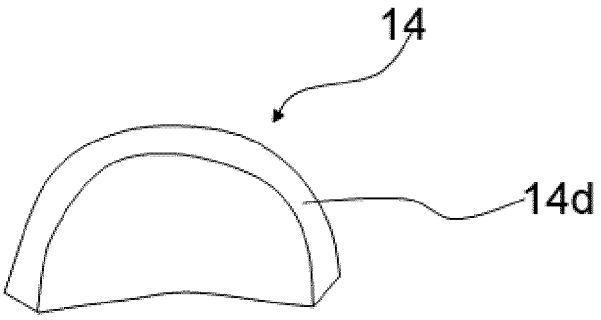

FIG. 4c

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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