(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 561 427 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
15.12.2021 Bulletin 2021/50

(51) Int Cl.:
F28D 9/00 *(2006.01)* ***F28F 9/00*** *(2006.01)*

(21) Application number: **18461553.2**

(22) Date of filing: **27.04.2018**

(54) HEAT EXCHANGER ASSEMBLY

WÄRMETAUSCHERBAUGRUPPE

ENSEMBLE ÉCHANGEUR THERMIQUE

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

(43) Date of publication of application:
30.10.2019 Bulletin 2019/44

(73) Proprietor: **Valeo Autosystemy SP. Z.O.O.**
32-050 Skawina (PL)

(72) Inventors:
- **BELZOWSKI, Michal**
  PL 32-050 Skawina (PL)
- **POKRYWINSKI, Karol**
  PL 32-050 Skawina (PL)
- **SZOSTEK, Dawid**
  PL 32-050 Skawina (PL)
- **AUGUSTYN, Milosz**
  PL 32-050 Skawina (PL)

(74) Representative: **Valeo Systèmes Thermiques**
Service Propriété Intellectuelle
ZA l'Agiot, 8 rue Louis Lormand
CS 80517
La Verrière
78322 Le Mesnil-Saint-Denis Cedex (FR)

(56) References cited:
EP-A1- 0 740 949
CN-A- 106 546 115
DE-A1-102011 007 701
GB-A- 2 215 451
US-A1- 2016 223 266
US-A1- 2018 093 545

EP 3 561 427 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present invention relates to heat exchangers. Particularly, the present invention relates to a plate condenser assembly for an air conditioning system of a vehicle.

[0002] A plate heat exchanger according to the preamble of claim 1 is disclosed in document US 2016/223266 A1.

[0003] In case of vehicle air conditioning systems, heat exchangers, and particularly water condensers and chillers, facilitate circulation of refrigerant fluid and coolant in adjacent yet separated spaces, to allow heat exchange between heat exchanging fluids. The chiller facilitates extraction of heat from a battery pack. Particularly, the heat exchanger, i.e. the chiller facilitates heat exchange between coolant and refrigerant fluid. The coolant after extracting heat from the battery pack is cooled by the refrigerant from the air conditioning loop for ensuring a regular supply of cool coolant to the battery pack. The regular cooling of the battery pack prevents damage thereof due to over-heating and also ensures efficient operation thereof. In case of a condenser, refrigerant gas loses heat energy by heat exchange, gets cooled, and condenses into liquid phase. Thereafter, the high pressure, liquid refrigerant passes through an expansion valve, which further cools the liquid refrigerant due to lowering of the refrigerant pressure. The low pressure refrigerant liquid and flash gas leaving the expansion valve flows at proper rate through various elements disposed along the air conditioning loop such as the evaporator and compressor to complete the air conditioning cycle.

[0004] The heat exchangers, specifically the condensers, may be equipped with additional elements such as a receiver drier designed to separate liquid portion of refrigerant fluid from gaseous portion. Similarly, the heat exchangers, specifically the chillers, are equipped with thermal expansion valves. The heat exchangers along with the additional auxiliary elements form a heat exchanger module or a heat exchanger assembly. There are various ways for mounting the various elements of the heat exchanger assembly on a vehicle body. For example, in certain cases, attachment means are directly brazed on the heat exchanger core for facilitating direct mounting of the heat exchanger core on the vehicle body. Alternatively, the elements of the heat exchanger assembly are supported on different type of supporting and mounting elements such as racks and housing, which in turn are mounted on the vehicle body. Sometimes, other additional or auxiliary elements associated with the heat exchanger assembly, such as expansion valves for chillers, receiver driers for condensers, water heaters for increasing temperature of coolant and facilitating de-icing modes of associated equipment, solenoid valves and even electrical compressors are all mounted on the supporting and mounting elements such as racks and/or the housing of the heat exchanger assembly. All these additional elements have significant weight and as such increase loading on the housing of the heat exchanger assembly of the air conditioning system. Also, the air conditioning systems in case of electrical vehicles may need to handle comparatively higher volumes of refrigerant than handled by the air conditioning systems of the vehicles operating on internal combustion engine, as regions to be cooled i.e. battery packs incase of the electrical vehicle are in some instances placed farther away from the heat exchanger assembly than the region to be cooled i.e. engine in case of vehicles operated by internal combustion engines. Further, the refrigerant loop in case of the air conditioning system of electrical vehicle is usually more complicated than refrigerant loops for the air conditioning system of vehicle operating on internal combustion engine. Still further, the refrigerant loop in case of the air conditioning system of electrical vehicle may involve additional elements such as for example, additional valves and pipes for reversing direction of refrigerant flow in case of heat pump mode operation and also involve many connection points, thereby resulting in comparatively higher leakage rate. At the same time, there is a constant need to prolong operation time of the heat exchanger assembly without servicing.

[0005] Accordingly many auxiliary elements of the air conditioning system can be preferably disposed in a localized manner and close to each other, specifically the auxiliary elements can be mounted on the housing of the heat exchanger assembly, and hence there is a need for housing for heat exchanger assembly that exhibits substantial mechanical strength and rigidity for withstanding higher loads and dynamic loading conditions but still is inexpensive and light in weight.

[0006] In view of above mentioned issues, there is demand for heat exchanger assembly, particularly for air conditioning system for electric vehicles, which would facilitate secure mounting and supporting heavier and bulkier heat exchanger cores and auxiliary elements on the vehicle body.

[0007] Accordingly, there is a need for a plate condenser assembly provided with housing exhibiting substantial mechanical strength and rigidity for supporting and mounting the various elements of the plate condenser assembly on a vehicle body, while still using thinner walls and less material, thereby resulting in substantial cost and material saving.

[0008] An object of the present invention is to provide a plate condenser assembly for an air conditioning system that obviates the drawbacks associated with conventional plate condenser assembly involving a housing having variable wall thickness for supporting and mounting elements of the plate condenser assembly.

[0009] Another object of the present invention is to provide a plate condenser assembly for an air conditioning system that exhibits substantial mechanical strength and rigidity, while still using constant wall thickness, thereby resulting in substantial cost and material saving.

[0010] The present invention envisages a plate con-

denser assembly in accordance with an embodiment of the present invention. The plate condenser assembly includes a plate condenser core, a housing, and a rigid material. The housing encloses the plate condenser core. The housing further includes an internal housing that encloses and firmly holds the plate condenser core and an external housing that encloses and firmly holds the internal housing. The spacing means is disposed between the internal housing and the external housing and defines volumes between the internal and the external housings. The rigid material is disposed in the defined volumes forming rigid connection between the internal housing and the external housing.

[0011] The spacing means can be constituted by first spacing means located on an interior wall of the external housing and by second spacing means located on an exterior wall of the internal housing, wherein the first and second spacing means form a shaped connection.

[0012] In accordance with an embodiment of the present invention, at least one volume with rigid material is defined inside the shaped connection between the first spacing means and the second spacing means.

[0013] Alternatively, at least one volume with rigid material is defined between two neighboring shaped connections.

[0014] In accordance with an embodiment of the present invention, the first spacing means is a rib, while the second spacing means is a channel that receives the rib.

[0015] Alternatively, the second spacing means is a rib, while the first spacing means is a channel that receives the rib.

[0016] Generally, the interior walls of the internal housing can include spacing elements configured to maintain the interior walls of the internal housing and the plate condenser core in spaced apart configuration.

[0017] In accordance with an embodiment of the present invention, the rigid material fills a volume defined by two neighboring spacing elements.

[0018] Further, the housing encloses at least one auxiliary element along with the plate condenser core.

[0019] Specifically, the internal housing encloses at least one auxiliary element along with the plate condenser core.

[0020] Typically, the rigid material is selected from a group consisting of Polyurethane (PU) foam, Polyvinyl chloride (PVC) foam and Polyethylene Terephthalate (PET) foam.

[0021] In accordance with an embodiment of the present invention, the rigid material is an adhesive material selected from a group consisting of cyano acrylic, epoxy, methacrylic, silicone and polyurethane adhesives.

[0022] 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:

FIGURE 1a illustrates a plate condenser assembly in accordance with an embodiment of the present invention;

FIGURE 1b illustrates an enlarged view depicting a shaped connection formed by engagement between a channel and a rib respectively configured on an internal housing and an external housing of the plate condenser assembly of **FIGURE 1a;**

FIGURE 2a illustrates a plate condenser assembly in accordance with yet another embodiment of the present invention; and

FIGURE 2b illustrates an enlarged view depicting a shaped connection formed by engagement between a channel and a rib configured on an internal housing and an external housing of the plate condenser assembly of **FIGURE 2a.**

[0023] 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.

[0024] Referring to Figures 1a to 2b, the Figures depict different views of a plate condenser assembly in accordance with different embodiments of the present invention.

[0025] Referring to **Figure 1a,** a plate condenser assembly 100 in accordance with an embodiment of the present invention is illustrated. The plate condenser assembly 100 includes a plate condenser core 120, a housing 113 that in turn includes an internal housing 101 and an external housing 110, spacing means and a rigid material 140a such as foam, particularly rigid foam.

[0026] The internal housing 101 encloses and firmly holds the plate condenser core 120 within the internal housing 101, such that movement of the plate condenser core 120 within the internal housing 101 is substantially prevented. Similarly, the external housing 110 encloses and firmly holds the internal housing 101 within the external housing 110, such that movement of the internal housing 101 within the external housing 110 is substantially prevented. The external and the internal housing 110 and 101 respectively protect the elements of the plate condenser assembly 100 such as for example an auxiliary element 130 and the plate condenser core 120 against unfavorable external environment conditions such as corrosion, dust, moisture and stone impact. Generally, the external housing 110 is of plastic material and has relatively thin walls. Also, the internal housing 101 is of plastic material and has relatively thin walls. Generally, the external housing 110 includes a plurality of first mounting members for facilitating mounting of the external housing 110 on a main body, particularly, a vehicle body (not illustrated in Figures). Specifically, the external housing 110 includes flanges 110a with holes

112 formed thereon, also referred to as the holed flanges 110a. The holes 112 formed on the flanges 110a of the external housing 110 match with corresponding holes formed on vehicle body or flanges extending from the vehicle body to facilitate mounting of the external housing 110 on the vehicle body by using fasteners such as nut and bolt arrangement. However, the present invention is not limited to a particular type and configuration of mounting arrangement for securely mounting the external housing 110 on the vehicle body. In accordance with an embodiment, the external housing 110 further includes a plurality of second mounting members for facilitating mounting of additional elements, such as expansion valves for chillers, receiver driers for condensers, water heaters, and solenoid valves on the external housing 110.

[0027] Between the internal housing 101 and the external housing 110, there are disposed a plurality of spacing means that form volumes 105 between the internal housing 101 and the external housing 110. Generally, the spacing means are constituted by first spacing means 114, such as for example ribs located on an interior wall 116 of the external housing 110 and by second spacing means 104, such as for example channels located on an exterior wall 102 of the internal housing 101, wherein the first and second spacing means 114, 104 form a shaped connection 107a. According to different embodiments, the spacing means can for example be a plurality of ribs formed on at least one of the interior walls 116 of the external housing 110 and the exterior walls 102 of the internal housing 101 for forming volumes there between. Still different variations of the spacing means are possible, for example, the ribs formed on the interior walls 116 of the external housing 110 can alone form the volumes/ spaces between the internal housing 101 and the external housing 110. Alternatively, the ribs formed on the exterior walls 102 of the internal housing 101 can alone form the volumes/ spaces between the internal housing 101 and the external housing 110. In some cases, for example, the ribs formed on the interior walls 116 of the external housing 110 and the exterior walls 102 of the internal housing 101 can collectively form the volumes/ spaces between the internal housing 101 and the external housing 110. In some cases, for example, at least a portion of the ribs are formed on the exterior walls 102 of the internal housing 101 and remaining portion of the ribs are formed on interior or inside walls 116 of the external housing 110, such that in an assembled configuration of the external housing 110 and the internal housing 101, the corresponding portions forming the ribs engage with each other to form volumes. In case of the spacing means, for example as illustrated in Figure 1a and Figure 1b, at least one of the first spacing means 114, for example ribs extending from the interior walls 116 of the external housing 110 engage with the corresponding second spacing means 104, for example channel formed on the exterior walls 102 of the internal housing 101 at pre-determined locations for forming the volumes 105. The volumes can be formed between adjacent ribs or corresponding portions forming the ribs, in case the ribs are formed in portions. In some cases, the shaped connection 107a formed by the engaging ribs 114 and the channels 104 also act as reinforcing elements for imparting further mechanical strength to the external housing 110.

[0028] The rigid material 140a, for example rigid foam, can be disposed at predetermined location or locations, for example in at least one of the volumes 105 formed between the internal housing 101 and the external housing 110, for example, at least one of the volumes 105 formed by at least one of the ribs 114 and channels 104, thereby forming rigid connection between the internal housing 101 and the external housing 110. Interior walls 108 of the internal housing 101 include spacing elements 109 configured to maintain the interior walls 108 of the internal housing 101 and the plate condenser core 120 in spaced apart configuration and form volumes 111. The rigid material 140a also fills the volume 111 defined by two neighboring spacing elements 109 and form connection between the internal housing 101 and the plate condenser core 120. As a consequence, the rigid material 140a forms a connection between the plate condenser core 120 and the external housing 110 in conjunction with the spacing means, particularly, the ribs 114, the channels 104 and the internal housing 101. The connection so formed facilitates imparting rigidity and mechanical strength of the plate condenser core 120 to the overall plate condenser assembly 100, and particularly, to the external housing 110. Specifically, the external housing 110 while still having relatively thin walls and being formed from inexpensive and light weight material, exhibits improved load carrying capacity, mechanical strength and rigidity. With such configuration, the external housing 110 of the plate condenser assembly 100 of the present invention is capable of withstanding higher loads and dynamic loading conditions that are prevalent in case of plate condenser assembly in case of air conditioning system of electric vehicles, for example due to larger and heavier receiver drier and auxiliary elements mounted on the external housing 110.

[0029] The rigid material 140a can be for example rigid foam. In some cases, the rigid material 140a, particularly rigid foam is glued between the plate condenser core 120 and the internal housing 101, and also in the volumes formed between the external housing 110 and the internal housing 101, thereby forming a strong structure and imparting mechanical strength and rigidity of the plate condenser core 120 to the overall plate condenser assembly 100 and particularly, the external housing 110. The rigid foam glued in the volumes formed between the external housing 110 and the internal housing 101 is selected from a group consisting of polyurethane foam, Polyethylene Terephthalate (PET) foam and Polyvinyl Chloride (PVC) foam. Further, additional rigid material 140a, particularly foam is applied locally at regions of the external housing 110 requiring higher mechanical strength

and rigidity. The adhesive used for securely holding foam in the volumes formed between the external housing 110 and the internal housing 101 is selected from a group consisting of cyano acrylic, epoxy, mathacrylic, silicone and polyurethane adhesives. The rigid material 140a can be also disposed inside the internal housing 101 between the plate condenser core 120 and the internal housing 101 for forming connection between the between the plate condenser core 120 and the internal housing 101. The rigid material 140a forms better connection between the internal housing 101 and exterior walls 122 of the plate condenser core 120, as the inherently rough outside surface of the plate condenser core 120 (due to plurality of plates connected with each other forming corrugations there-between) provide a better connection with the foam or glue injected between the internal housing 101 and the plate condenser core 120.

[0030] The thermal and mechanical properties of the rigid material 140a are appropriately selected for achieving the desired results, namely to rigidly connect the elements to minimize or preferably prevent their relative movement, and by consequence to enhance the rigidity of the assembly in the vicinity of placement of the rigid material. Foam can be used as the rigid material 140a disposed in the volumes 105 and 111, however, the present invention is not limited to a particular type or configuration of the rigid material 140a. Also, inexpensive, recycled material exhibiting lower mechanical properties can also be used as the rigid material 140a. As injection is simple and cost effective process, generally, molten foam is injected in the volumes 105 created by the ribs 114 and the channels 104 disposed between the external housing 110 and the internal housing 101 and later cured. However, expansion of the foam in some instances can be difficult to control and additional tools for supporting the external housing 110 from external side may be necessary for better control of the process. Further, for better control of the process, injection process parameters and the properties of the foam are to be appropriately selected. Alternatively, the pre-fabricated foam can be pressed in the volumes 105 created by the ribs 114 and the channels 104 disposed between the external housing 110 and the internal housing 101. Also, with such configuration, the cycle time is substantially reduced. However, any method for disposing the foam in the volumes 105 created by the ribs 114 and the channels 104 disposed between the external housing 110 and the internal housing 101 can be used. In some cases, the opposing faces 116 and 102 of the external housing 110 and the internal housing 101 respectively are surface conditioned before injecting the foam between the opposing faces 116 and 102 for forming better connection between the foam 140a and the opposing faces 116 and 102 of the external housing 110 and the internal housing 101 respectively. Particularly, graining of the opposing faces 116 and 102 is performed to achieve better connection between the foam 140a injected and the opposing faces 116 and 102 of the external housing 110 and the internal housing 101 respectively. However, the present invention is not limited to any particular surface treatment performed on the opposing faces 116 and 102 of the external housing 110 and the internal housing 101 respectively. Also, similar methods can be used for disposing the foam 140a in the volumes 111 defined by two neighboring spacing elements 109 disposed between the plate condenser core 120 and the internal housing 101.

[0031] The configuration and placement of the rigid material 140a, the ribs 114 and the channels 104 between the external housing 110 and the internal housing 101 enclosing and firmly holding the plate condenser core 120 is based on mechanical strength and rigidity requirement at different regions of the plate condenser assembly 100.

[0032] The internal housing 101 can further enclose at least one auxiliary element 130 along with the plate condenser core 120 and in some cases, the rigid material 140a such as foam is disposed only in the volumes 105 formed by the ribs 114 and the channels 104 disposed between the internal housing 101 and the external housing 110. With such configuration, easy serviceability of the plate condenser core 120 and at least one auxiliary element 130 is possible. In accordance with still another embodiment, the rigid material 140a such as foam is also disposed between the plate condenser core 120 and the interior walls 108 of an internal housing portion 101a enclosing the plate condenser core 120. Also, the rigid material 140a such as foam is also disposed between the at least one auxiliary element 130 and an internal housing portion 101b enclosing the at least one auxiliary element 130. However, disposing rigid material 140a between the plate condenser core 120 and the internal housing portion 101a and between at least one auxiliary element such as receiver drier 130 and the internal housing portion 101b is advantageously used where critical elements such as receiver driers 130 are not desired to be serviceable.

[0033] Referring to the Figure 2a and Figure 2b, in an assembled configuration of the internal housing 101 and the external housing 110, at least one of the ribs 114 extending from the interior or inside walls 116 of the external housing 110 engages with the corresponding channel 104 extending from the exterior walls 102 of the internal housing 101 at pre-determined locations to form a shaped connection 107b. At least one volume 106 with a rigid material 140b is defined inside the shaped connection 107b between the first spacing means 114, such as for example ribs and the second spacing means 104, such as for example channels. Specifically, the rigid material, for example, adhesive material 140b, such as glue is disposed between the channel 104 and the rib 114 formed on the internal housing 101 and the external housing 110 respectively for forming small multi-point connections between the internal housing 101 enclosing and firmly holding the plate condenser core 120 and the external housing 110, when the adhesive material 140b is cured. The adhesive material 140b is selected from a

group consisting of cyano-acrylic, epoxy, mathacrylic, silicone and polyurethane adhesives.

[0034] At least one of the channels 104 extending from exterior walls 102 of the internal housing 101 receives at least one corresponding rib 114 extending from the interior walls 116 of the external housing 110 at pre-determined locations for forming volumes 106 between the corresponding channels 104 and the ribs 114. Alternatively, the interior walls 116 of the external housing 110 includes at least one channel 114 configured thereon that receives at least one corresponding rib 104 extending from the exterior walls 102 of the internal housing 101 at pre-determined locations for forming volumes between the corresponding ribs 104 and the channel 114. The adhesive material 140b, specifically, glue is disposed at pre-determined locations in at least one of the volumes formed by the channels and the ribs 104 and 114 respectively, the cured adhesive material is capable of forming multi point connection between the external housing 110 and the plate condenser core 120 in conjunction with at least one of the ribs 114, the channels 104 and the internal housing 101. The volumes formed between the ribs 114 and the channels 104 are ideal for the application of glue for forming multi-point connections, as capillary action assists in receiving the glue in the volumes 106. The selection of viscosity and the quantity of glue ensures that glue creates strong multi-point connections wherever required. With such configuration, small amount of glue is required for forming multi point connection between the external housing 110 and the plate condenser core 120.

[0035] The multi-point connections so formed facilitates the plate condenser core 120 to impart rigidity and mechanical strength to the overall plate condenser assembly 200, and particularly, to the external housing 110 while using a small amount of the adhesive material 140b. Also, the external housing 110 while still having relatively thin walls and being formed from inexpensive and light weight material exhibits improved load carrying capacity, mechanical strength and rigidity.

[0036] 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 within the scope of the appended claims.

Claims

1. A plate condenser assembly (100, 200) comprising:

a plate condenser core (120);
a housing (113) enclosing the plate condenser core (120);
wherein the housing (113) further comprises an internal housing (101) adapted to enclose and firmly hold the plate condenser core (120), an external housing (110) adapted to enclose and firmly hold the internal housing (101), spacing means disposed between the internal housing (101) and the external housing (110) and defining volumes (105, 106) between these housings (101, 110);
characterised in that
a rigid material (140a, 140b) is disposed in the defined volumes (105, 106), forming rigid connection between the internal housing (101) and the external housing (110).

2. The condenser assembly (100, 200) according to claim 1, wherein the spacing means are constituted by first spacing means (114) located on an interior wall (116) of the external housing (110) and by second spacing means (104) located on an exterior wall (102) of the internal housing 101), wherein the first and second spacing means (114, 104) form a shaped connection (107a, 107b).

3. The condenser assembly (200) according to claim 2, wherein at least one volume (106) with said rigid material (140b) is defined inside the shaped connection (107b) between the first spacing means (114) and the second spacing means (104) .

4. The condenser assembly (100) according to claim 2, wherein at least one volume (105) with the rigid material (140a) is defined between two neighboring shaped connections (107a).

5. The condenser assembly (100, 200) according to any preceding claim, wherein the first spacing means (114) is a rib, while the second spacing means (104) is a channel adapted for receiving the rib.

6. The condenser assembly (100, 200) according to any of claims 1-5, wherein the second spacing means (104) is a rib, while the first spacing means (114) is a channel adapted for receiving the rib.

7. The plate condenser assembly (100, 200) as claimed in one of the preceding claims, wherein interior walls (108) of the internal housing (101) comprises spacing elements (109) configured to maintain the interior walls (108) of the internal housing (101) and the plate condenser core (120) in spaced apart configuration.

8. The plate condenser assembly (100, 200) according to claim 7, wherein the rigid material 140c fills a volume 111 defined by two neighboring spacing elements 109.

9. The plate condenser assembly (100, 200) according to any preceding claims, wherein said housing (113) is further adapted to enclose at least one auxiliary element (130) along with said plate condenser core

(120).

10. The plate condenser assembly (100, 200) as claimed in claim 9, wherein the internal housing (101) further adapted to enclose at least one auxiliary element (130) along with said plate condenser core (120).

11. The plate condenser assembly (100, 200) according to any of claims 1-10, wherein said rigid material (140a, 140b) is selected from a group consisting of Polyurethane (PU) foam, Polyvinyl chloride (PVC) foam and Polyethylene Terephthalate (PET) foam.

12. The plate condenser assembly (200) according to claim 3, wherein said rigid material (140b) is an adhesive material and is selected from a group consisting of cyano acrylic, epoxy, methacrylic, silicone and polyurethane adhesives.

Patentansprüche

1. Plattenkondensatoranordnung (100, 200), umfassend:

einen Plattenkondensatorkern (120);
ein Gehäuse (113), das den Plattenkondensatorkern (120) umschließt;
wobei das Gehäuse (113) ferner ein inneres Gehäuse (101), das ausgebildet ist, den Plattenkondensatorkern (120) zu umschließen und fest zu halten, ein äußeres Gehäuse (110), das ausgebildet ist, das innere Gehäuse (101) zu umschließen und fest zu halten, Abstandsmittel, die zwischen dem inneren Gehäuse (101) und dem äußeren Gehäuse (110) angeordnet sind und Volumen (105, 106) zwischen diesen Gehäusen (101, 110) definieren, umfasst;
dadurch gekennzeichnet, dass
ein starres Material (140a, 140b) in den definierten Volumen (105, 106) angeordnet ist, das eine starre Verbindung zwischen dem inneren Gehäuse (101) und dem äußeren Gehäuse (110) bildet.

2. Kondensatoranordnung (100, 200) nach Anspruch 1, wobei die Abstandsmittel aus einem ersten Abstandsmittel (114), das sich an einer Innenwand (116) des äußeren Gehäuses (110) befindet, und aus einem zweiten Abstandsmittel (104), das sich an einer Außenwand (102) des inneren Gehäuses (101) befindet, bestehen, wobei die ersten und zweiten Abstandsmittel (114, 104) eine geformte Verbindung (107a, 107b) bilden.

3. Kondensatoranordnung (200) nach Anspruch 2, wobei mindestens ein Volumen (106) mit dem starren Material (140b) innerhalb der geformten Verbindung (107b) zwischen dem ersten Abstandsmittel (114) und dem zweiten Abstandsmittel (104) definiert ist.

4. Kondensatoranordnung (100) nach Anspruch 2, wobei mindestens ein Volumen (105) mit dem starren Material (140a) zwischen zwei benachbarten geformten Verbindungen (107a) definiert ist.

5. Kondensatoranordnung (100, 200) nach einem der vorausgehenden Ansprüche, wobei das erste Abstandsmittel (114) eine Rippe ist, während das zweite Abstandsmittel (104) ein Kanal ist, der ausgebildet ist, die Rippe aufzunehmen.

6. Kondensatoranordnung (100, 200) nach einem der Ansprüche 1-5, wobei das zweite Abstandsmittel (104) eine Rippe ist, während das erste Abstandsmittel (114) ein Kanal ist, der ausgebildet ist, die Rippe aufzunehmen.

7. Plattenkondensatoranordnung (100, 200) nach einem der vorausgehenden Ansprüche, wobei Innenwände (108) des inneren Gehäuses (101) Abstandsmerkmale (109) umfassen, die ausgelegt sind, die Innenwände (108) des inneren Gehäuses (101) und den Plattenkondensatorkern (120) in einer beabstandeten Auslegung zu halten.

8. Plattenkondensatoranordnung (100, 200) nach Anspruch 7, wobei das starre Material 140c ein Volumen 111 füllt, das durch zwei benachbarte Abstandsmerkmale 109 definiert ist.

9. Plattenkondensatoranordnung (100, 200) nach einem der vorausgehenden Ansprüche, wobei das Gehäuse (113) ferner ausgebildet ist, mindestens ein zusätzliches Merkmal (130) zusammen mit dem Plattenkondensatorkern (120) zu umschließen.

10. Plattenkondensatoranordnung (100, 200) nach Anspruch 9, wobei das innere Gehäuse (101) ferner ausgebildet ist, mindestens ein zusätzliches Merkmal (130) zusammen mit dem Plattenkondensatorkern (120) zu umschließen.

11. Plattenkondensatoranordnung (100, 200) nach einem der Ansprüche 1-10, wobei das starre Material (140a, 140b) ausgewählt ist aus einer Gruppe bestehend aus Polyurethan(PU)-Schaum, Polyvinylchlorid(PVC)-Schaum und Polyethylenterephthalat(PET)-Schaum.

12. Plattenkondensatoranordnung (200) nach Anspruch 3, wobei das starre Material (140b) ein Klebstoffmaterial ist und ausgewählt ist aus einer Gruppe bestehend aus Cyanoacryl-, Epoxid-, Methacryl-, Silikon- und Polyurethan-Klebern.

Revendications

1. Ensemble condenseur à plaques (100, 200) comprenant :

   un noyau de condenseur à plaques (120) ;
   un boîtier (113) renfermant le noyau de condenseur à plaques (120) ;
   le boîtier (113) comprenant en outre un boîtier interne (101) conçu pour renfermer et maintenir fermement le noyau de condenseur à plaques (120), un boîtier externe (110) conçu pour renfermer et maintenir fermement le boîtier interne (101), des moyens d'espacement disposés entre le boîtier interne (101) et le boîtier externe (110) et définissant des volumes (105, 106) entre ces boîtiers (101, 110) ;
   caractérisé en ce qu'un matériau rigide (140a, 140b) est disposé dans les volumes définis (105, 106), formant une liaison rigide entre le boîtier interne (101) et le boîtier externe (110).

2. Ensemble condenseur (100, 200) selon la revendication 1, les moyens d'espacement étant constitués par des premiers moyens d'espacement (114) situés sur une paroi intérieure (116) du boîtier externe (110) et par des seconds moyens d'espacement (104) situés sur une paroi extérieure (102) du boîtier interne (101), les premiers et seconds moyens d'espacement (114, 104) formant une liaison formée (107a, 107b).

3. Ensemble condenseur (200) selon la revendication 2, au moins un volume (106) avec ledit matériau rigide (140b) étant défini à l'intérieur de la liaison formée (107b) entre le premier moyen d'espacement (114) et le second moyen d'espacement (104).

4. Ensemble condenseur (100) selon la revendication 2, au moins un volume (105) avec le matériau rigide (140a) étant défini entre deux liaisons formées (107a) voisines.

5. Ensemble condenseur (100, 200) selon l'une quelconque des revendications précédentes, les premiers moyens d'espacement (114) étant une nervure, tandis que les seconds moyens d'espacement (104) sont un canal conçu pour recevoir la nervure.

6. Ensemble condenseur (100, 200) selon l'une quelconque des revendications 1 à 5, les seconds moyens d'espacement (104) étant une nervure, tandis que les premiers moyens d'espacement (114) sont un canal conçu pour recevoir la nervure.

7. Ensemble condenseur à plaques (100, 200) selon l'une des revendications précédentes, les parois intérieures (108) du boîtier interne (101) comprenant des éléments d'espacement (109) conçus pour maintenir les parois intérieures (108) du boîtier interne (101) et le noyau de condenseur à plaques (120) dans une configuration espacée.

8. Ensemble condenseur à plaques (100, 200) selon la revendication 7, le matériau rigide 140c remplissant un volume 111 défini par deux éléments d'espacement 109 voisins.

9. Ensemble condenseur à plaques (100, 200) selon l'une quelconque des revendications précédentes, ledit boîtier (113) étant en outre conçu pour renfermer au moins un élément auxiliaire (130) avec ledit noyau de condenseur à plaques (120).

10. Ensemble condenseur à plaques (100, 200) selon la revendication 9, le boîtier interne (101) étant en outre conçu pour renfermer au moins un élément auxiliaire (130) avec ledit noyau de condenseur à plaques (120).

11. Ensemble condenseur à plaques (100, 200) selon l'une quelconque des revendications 1 à 10, ledit matériau rigide (140a, 140b) étant choisi dans un groupe constitué par une mousse de polyuréthane (PU), une mousse de chlorure de polyvinyle (PVC) et une mousse de polyéthylène téréphtalate (PET).

12. Ensemble condenseur à plaques (200) selon la revendication 3, ledit matériau rigide (140b) étant un matériau adhésif et étant choisi dans un groupe constitué d'adhésifs cyano acryliques, époxy, méthacryliques, silicone et polyuréthane.

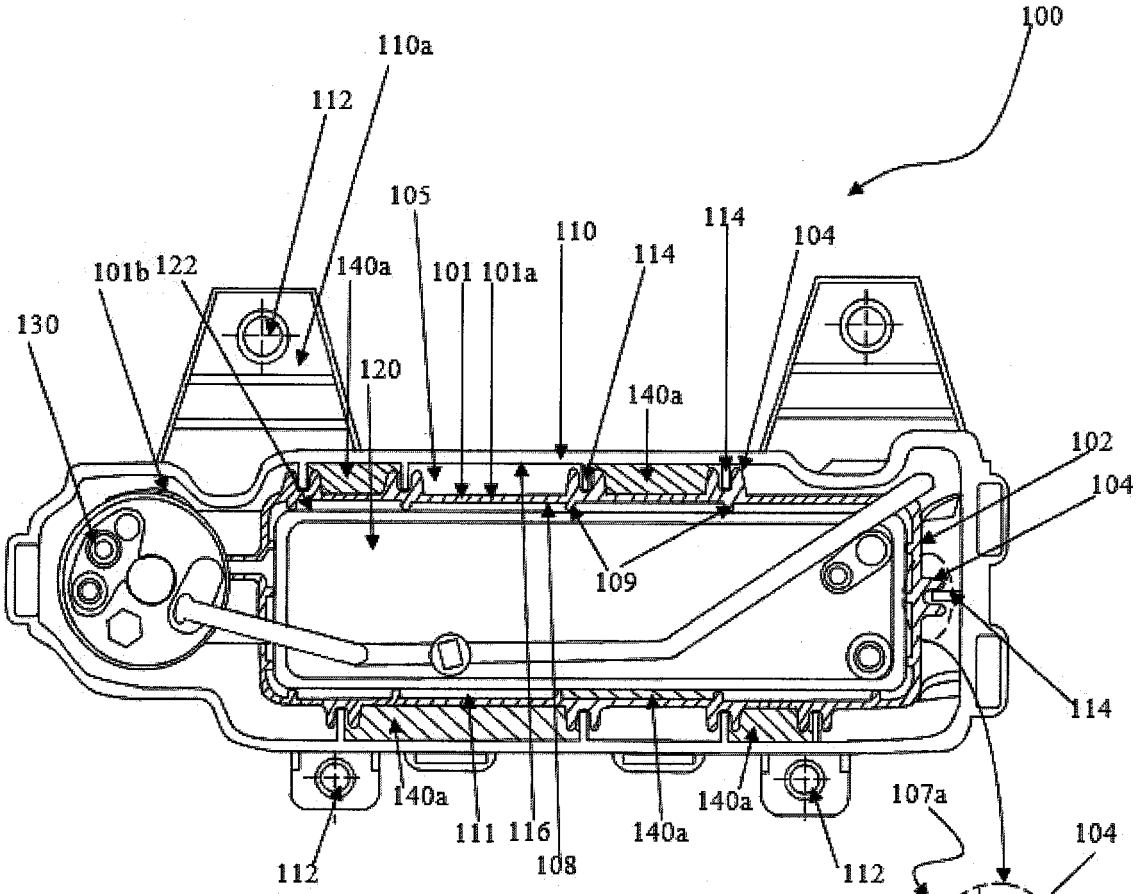

FIGURE 1a

FIGURE 1b

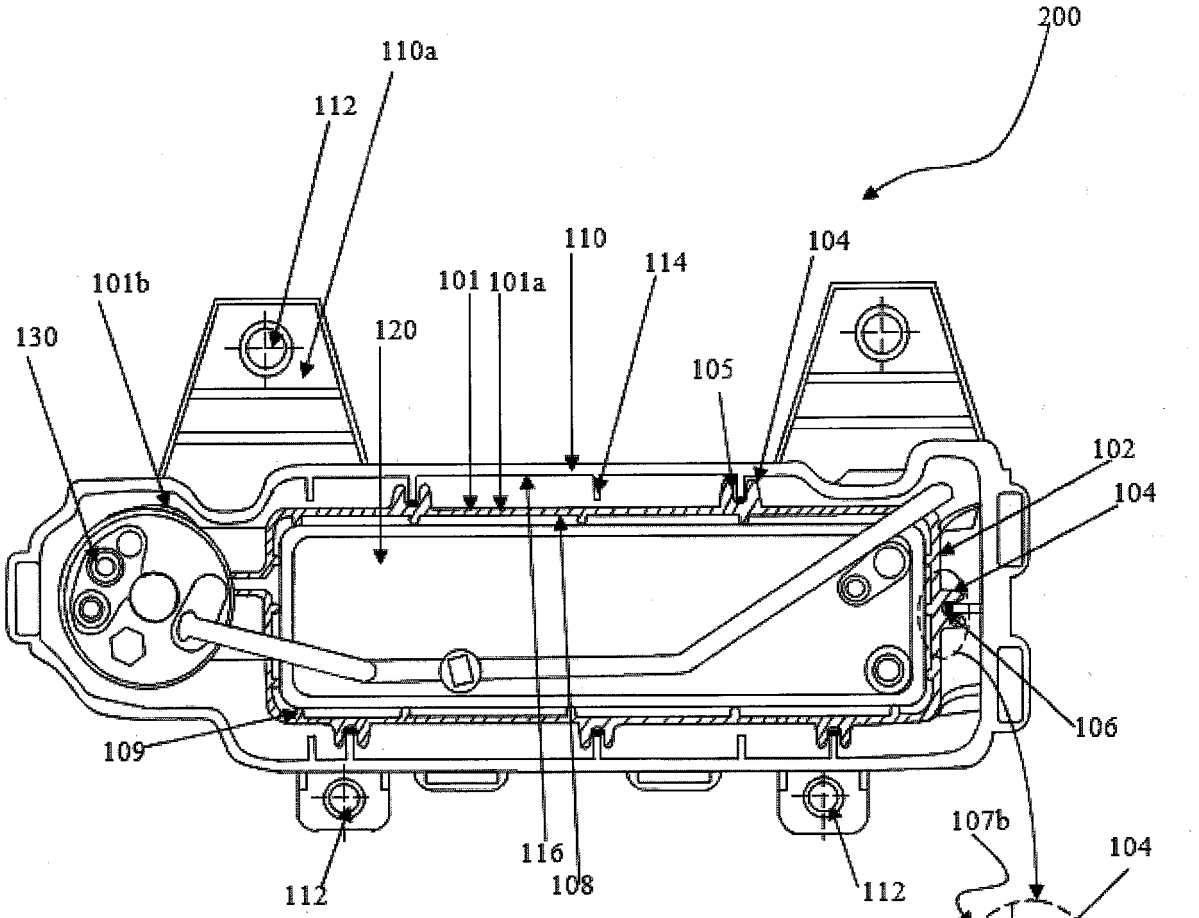

FIGURE 2a

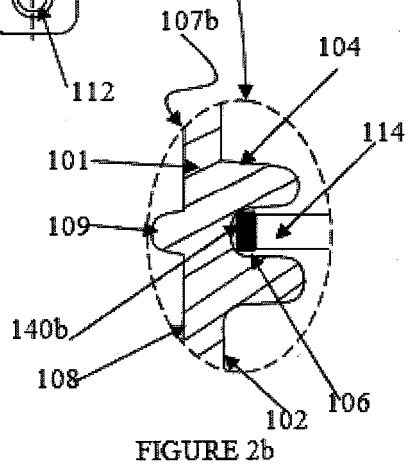

FIGURE 2b

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 2016223266 A1 **[0002]**