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(54) **Valve housing attachable to a vehicle cooling module, vehicle cooling module and combinaison thereof**

An ein Fahrzeugkühlmodul anfügbares Ventilgehäuse, Fahrzeugkühlmodul und Kombination dafür

Boîtier de clapet pouvant être fixé sur un module de refroidissement de véhicule et combinaison correspondante

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Description

[0001] The invention relates to a valve housing which is attachable to a vehicle cooling module. The invention further relates to a vehicle cooling module and a combination thereof.

[0002] All kind of vehicles, for example automotives, cars and trucks comprise cooling components for a cooling system. A vehicle cooling module may be realized as a stacked plate heat exchanger. Fluids to be cooled in a vehicle comprise for example the transmission oil. A stacked plate heat exchanger has flow channels for the oil to be cooled as well as flow channels for a coolant used to cool the oil. Depending on the application in which the heat exchanger is used, the oil is not only cooled but it may need to be warmed up in the start phase of a vehicle. The temperature of the oil is thus not only cooled but it is regulated to be maintained in a specified temperature range.

[0003] For regulating the temperature, the temperature of the oil is sensed and the flow of the coolant is controlled according to the temperature detected. It is well-known in the state of the art to provide the heat exchanger with a valve unit comprising a thermostatic operating element which is arranged in the oil flow of the heat exchanger. A work piston of the thermostatic operating element actuates one or more valves controlling the flow of the coolant. The valve unit is accommodated in a valve housing which is attached to the vehicle heat exchanger or vehicle cooling module. The valve housing must be adapted to the vehicle cooling module in such a way that the temperature measuring element has access to the fluid the temperature of which is to be regulated, while the valve which is controlled by the thermostatic element is in the coolant flow. In the state of the art coolant ports and oil ports of heat exchangers are usually situated in different corners or at different sides of the heat exchanger so that the valve housing must be large enough to cover both ports and must comprise an oil or coolant channel. FR 2 870 589 shows an example of cooler and valve assembly

[0004] Of course, the fluidic connection must be leak proved, therefore a sealing is provided between the vehicle cooling module and the valve housing and the fixation of the valve housing to the heat exchanger must assure a sufficient pressure on the sealing. Thus, in the state of the art the valve housings are attached with a number of screws, i.e. six or more screws are usually used. Attaching the valve housing to the cooling module by screws is time consuming and leads to high work costs. Additionally with a high copper price the needed brass screws are also expensive. Because of the high pressure of the oil inside the heat exchanger, which can be as high as 20 bar, the attachment must be of high strength.

[0005] There is a need for a valve housing for accommodating a valve unit which can be attached to a vehicle cooling module in a faster and less expensive way without compromising the tightness of the seal.

[0006] The invention provides a valve housing attachable to a vehicle cooling module with the features according to claim 1. The valve housing comprises a connection surface with an oil channel port for fluidic connection to an oil channel of the vehicle cooling module and a cooling channel port for fluidic connection to a coolant channel of the vehicle cooling module when the valve housing is attached. The valve housing further comprises at least one first interlocking attachment member which is adapted to engage a second interlocking attachment member provided on the vehicle cooling module to provide a clamping connection between the valve housing and the vehicle cooling module. The first and second interlocking attachment members are adapted to let the connection surface of the valve housing move into contact with the vehicle cooling module. The stacked plate oil cooler has an oil inlet and the coolant outlet on the same side of the oil cooler. The distance between oil inlet and coolant outlet is as small as 32 mm. Thus, in addition to the first interlocking attachment member providing a clamp connection only one or two screwing points are necessary to complete fixation of the valve housing on the module. Of course with other cooling modules and another housing form, more screwing points may still be needed. The at least one first interlocking attachment member is preferably provided for the coolant side, i.e. near the coolant outlet from the oil cooler.

[0007] Preferably, the first and second interlocking members define a pivot axis and are adapted to interact to clamp the valve housing and the vehicle cooling module together by a swiveling movement of the valve housing relative to the vehicle cooling module. Thus, the first interlocking member must only engage the second interlocking member and then the valve housing is simply turned around the pivot axis into its assembled position, housing and module being automatically clamped together. Assembly is finished by one or two screws.

[0008] In a preferred embodiment, two first interlocking attachment members are provided on opposite sides of the valve housing, so that only one screw is necessary for securely attaching the valve housing to the heat exchanger. In a preferred embodiment the first interlocking attachment member is a protrusion which is insertable into a second interlocking attachment member provided on the vehicle cooling module.

[0009] Preferably, the protrusion has a cross section with a first dimension in a direction basically perpendicular to the connection surface and a second dimension which is greater than the first dimension in a direction basically parallel to the connection surface. Thus, when the second interlocking attachment member of the vehicle cooling module is provided with an aperture having a dimension between the first dimension value and the second dimension value, insertion of the first interlocking attachment member is possible when oriented in a first direction, and the first interlocking attachment member is locked when the first interlocking attachment member

is turned into a second direction.

[0010] For facilitating insertion of a first interlocking attachment member into the second interlocking attachment member and thus further reducing the assembly time, the protrusion is provided with at least one guiding surface. In this case the vehicle cooling module has preferably a second interlocking attachment member which is provided with a guiding ramp which is adapted to cooperate with the guiding surface of the protrusion.

[0011] The clamping connection as described necessitates a swiveling movement in the assembly phase. During the swiveling movement it must be assured, that the sealing between the valve housing and the cooling module is not displaced. Therefore, the first interlocking attachment member is preferably formed near one end surface of the housing, and an edge of the one end surface of the housing which is directed to the vehicle cooling module is rounded.

[0012] In a preferred embodiment, the valve housing is adapted to be turned along the rounded edge when mounted onto the vehicle cooling module, and the rounded edge is provided with at least two beads which extend in a direction basically perpendicular to the edge. Thus, during the swiveling movement, only the two beads are in direct contact with the surface of the cooling module thus decreasing the frictional forces between the valve housing and the cooling module during assembly. The rounded edge controls the distance between the connection surface and a counter surface of the vehicle cooling module during assembly thus assuring that the sealing means are not displaced or pressed irregularly.

[0013] The invention further provides a vehicle cooling module with the features according to claim 14. The vehicle cooling module comprises at least one second interlocking attachment member which is adapted to engage a first interlocking attachment member of a valve housing and to interact with the first interlocking attachment member to clamp the vehicle cooling module and the valve housing together.

[0014] In a preferred embodiment, the at least one second interlocking attachment member is arranged at a cover of the vehicle cooling module. Advantageously, the cover is formed integrally with the second interlocking attachment member out of a metal, which could be for example aluminum.

[0015] Finally, the invention relates to a combination of a valve housing and a vehicle cooling module as claimed.

[0016] Further details and advantages of the invention will ensue from the following description of a preferred embodiment with reference to the accompanying drawings in which:

Fig. 1 shows in a three-dimensional view a valve housing according to the invention;

Fig. 2 shows the valve housing seen from above with part of the valve housing cut away;

Fig. 3 shows in a three-dimensional view the valve housing attached to a vehicle cooling module;

Fig. 4 shows in a three-dimensional view the valve housing attached to the vehicle cooling module seen from another side;

Fig. 5 shows in a side view a valve housing during attachment to the vehicle cooling module;

Fig. 6 shows a detail of the valve housing attached to the vehicle cooling module in a side view showing the first and second attachment members; and

Fig. 7 shows in a three-dimensional view the valve housing attached to the vehicle cooling module showing the rounded edge of the valve housing.

[0017] Fig. 1 shows a valve housing 10 according to a preferred embodiment of the invention. The valve housing 10 comprises a first part 12 formed to accommodate a valve unit and a second, flange-like part 14 for attaching the valve housing 10 to a vehicle cooling module which is not shown in Fig. 1. The valve unit is adapted to measure the temperature of a first fluid, the temperature of which is to be regulated, and to control a flow rate of a second fluid which is used to cool down or heat up the first fluid depending on the temperature measured. The valve housing 10 further comprises a first connecting pipe 16 for the first fluid and a second connecting pipe 18 for the second fluid.

[0018] In the preferred embodiment, the first connecting pipe 16 is an oil inlet for a transmission oil of a vehicle, and connecting pipe 18 is a coolant outlet from the vehicle cooling module which is in the preferred embodiment an oil cooler. Connecting pipe 16 could also be an oil outlet and connecting pipe 18 a coolant inlet. Of course, other kinds of fluids are possible in other applications.

[0019] The flange-like part 14 of valve housing 10 has in the preferred embodiment a thickness of about 10 mm. Valve housing 10 is provided with two first interlocking attachment members 20 formed as protrusions.

[0020] Fig. 2 shows the valve housing 10 from the upper side with part 12, which accommodates the valve unit, cut through. Thus, the regulating valve unit is visible. The valve housing 10 is mounted to a vehicle cooling module 22 of which only a small part is shown. The oil which flows into the connecting pipe 16 passes a thermostatic operation element 24 which is adapted to sense the oil temperature. The oil then passes through an oil port 26 into the vehicle cooling module 22 which is preferably a stacked plate heat exchanger. A work piston of the thermostatic operating element 24 is connected to a valve 28 which controls the flow rate of the coolant which enters the valve housing by a coolant channel port 30 from vehicle cooling module 22, passes the valve 28 and then passes through connecting pipe 18. Oil channel port 26 and coolant channel port 30 are realized as openings,

preferably as holes in the flange-like part 14 of the valve housing. The distance between oil channel port 26 and coolant channel port 30 is about 32 mm. A distance comprised between 30 and 35 mm is preferred, as this allows a small valve housing 10. Of course, corresponding openings are provided in vehicle cooling module 22 or more precisely in cover 21 giving access to the oil and coolant channel of the cooling module 22. Thus, there is a fluidic connection to an oil channel of vehicle cooling module 22 and to a coolant channel of vehicle cooling module 22, respectively.

[0021] Sealing means are provided around the oil channel port 26 and the coolant channel port 30 between valve housing 10 and vehicle cooling module 22.

[0022] First interlocking attachment members 20 are inserted into second interlocking attachment members 32 of the vehicle cooling module 22. A screw 33 further attaches the valve housing 10 to the vehicle cooling module 22 near the two connecting pipes.

[0023] Fig. 3 shows the valve housing 10 attached to the vehicle cooling module 22. Vehicle cooling module 22 is shown schematically. Vehicle cooling module 22 is in the preferred embodiment closed by a cover 21. Cover 21 is preferably made out of metal and soldered to vehicle cooling module 22. The vehicle cooling module 22 has an oil inlet next to a coolant outlet with a distance of about 32 mm. Thus, the valve housing 10 which must have an access to the oil circulating in the vehicle cooling module 22 for the thermostatic operating element of the valve unit and which must have an access to the coolant circulating in the vehicle cooling module 22 for regulating its flow, can be very small in relation to the cooling module. Three fixation points, i.e. first interlocking attachment members 20 together with second interlocking attachment members 32 and screw 33, between valve housing 10 and vehicle cooling module 22 are sufficient for attaching securely the valve housing. It should be understood that the fluids are under pressure with the oil pressure going up to 20 bars.

[0024] Fig. 4 shows valve housing 10 and vehicle cooling module 22 from another side. Two connection pipes 35 and 37 are provided for vehicle cooling module 22 forming an oil outlet from the cooling module 22 and a coolant inlet, respectively. Second interlocking attachment members 32 are attached to cover 21 or formed in one piece with cover 21.

[0025] Now interaction of first interlocking attachment member 20 of valve housing 10 and second interlocking attachment member 32 of vehicle cooling module 22 will be explained in more detail with reference to Figs. 5 and 6. Fig. 5 shows in a side view part of vehicle cooling module 22 with second interlocking attachment member 32 as well as valve housing 10 with flange-like part 14, the valve unit accommodating part 12 and first interlocking attachment member 20.

[0026] The first interlocking attachment member 20 is a protrusion or pin projecting form flange-like part 14 of valve housing 10. The flange-like part 14 has a connection surface 34 which in the mounted position is next to a counter surface of the vehicle cooling module 22 with cover 21. First interlocking attachment member or protrusion 20 has a cross section with a first dimension between a face A and a face B in a direction basically perpendicular to the connection surface and a second dimension between a face C and a face D in a direction basically parallel to the connection surface. As is clearly visible in Fig. 5, the first dimension is smaller than the second dimension.

[0027] Second, block-like shaped interlocking attachment member 32 has an aperture which allows insertion of protrusion 20 when oriented in a way that it passes the aperture with the first dimension AB. The aperture of second interlocking attachment member 32 is only slightly greater than the first dimension AB and smaller than the second dimension CD.

[0028] To facilitate insertion of first interlocking attachment member 20 it is provided with two guiding surfaces 36. During the assembly phase as shown in Fig. 5, the guiding surfaces 36 glide along a guiding ramp 38 of second interlocking attachment member 32. First interlocking attachment member 20 is inserted into second interlocking attachment member 32 by moving valve housing 10 in a direction defined by an angle of about 45° between connection surface 34 of valve housing 10 and the counter surface of vehicle cooling module 22, i.e. in the embodiment shown a surface of cover 21. Angles between 25° and 90° are possible depending on the exact form of the interlocking attachment members 20, 32. A too small angle increases the risk to displace the sealing rings necessary between valve housing 10 and vehicle cooling module 22.

[0029] Once first interlocking attachment member 20 is inserted into the second interlocking attachment member 32, the valve housing 10 is turned around a pivot axis defined by first and second interlocking attachment members 20, 32 in a swiveling movement until flange-like part 14 contacts with its connection surface 34 a counter surface of cooling vehicle module 22 which is formed by a surface of cover 21. Thus, the first and second interlocking attachment members 20, 32 interact to let the connection surface 34 move into contact with the vehicle cooling module. In this position a locking surface 40 on the first interlocking attachment member 20 is in contact with a securing surface 42 of second interlocking attachment member 32. Assembly is finished by screwing screw 33.

[0030] As already explained, there is a fluidic connection between the oil channel port 26 of valve housing 10 to an oil channel of vehicle cooling module 22 and a fluidic connection between the coolant channel port 30 of valve housing 10 and a coolant channel in the vehicle cooling module 22. As well-known in the state of the art, a sealing is necessary between the two interfaces. The sealing is usually provided by sealing rings. It is important to make sure that the swiveling movement will not displace the sealing rings and/or unequally press the sealing rings.

Therefore, at one end surface of flange-like part 14 which is next to the first interlocking attachment members 20 an edge to the connection surface is rounded. The rounded edge 44 is shown in Fig. 7. In the swiveling movement during attachment valve housing 10 will turn around the pivot axis defined by first and second interlocking attachment members and valve housing 10 will glide with its rounded edge 44 on vehicle cooling module 22. In order to minimize frictional forces while turning valve housing 10, the rounded edge 44 is preferably provided with two beads 46. The two beads extend in a direction basically perpendicular to the edge 44. Thus, valve housing 10 will glide on the two beads 46 which contact an upper surface of cover 21.

[0031] A further measure to have the seals not displaced during swiveling is to arrange the pivot axis distanced from the seal and at an edge of part 14.

[0032] As to the materials used, valve housing 10 is preferably a molded plastic part and thus very easy to manufacture. Suitable plastic materials comprise PPS (polyvinylenesulfide), PPA (polyphthalamide) and PA6.6 (polyamide). Depending on the material used, the form of first interlocking attachment members 20 can slightly differ from the form shown for the preferred embodiment for taking into account the molding characteristics of the plastic material and the strength of the material.

[0033] Second interlocking attachment member 32 is preferably integral to cover 21 of vehicle cooling module 22. In a preferred embodiment, cover and receiving parts are a stamping part out of aluminum with the receiving parts bent into the desired position as shown in the figures. Cover 21 with second interlocking attachment member 32 may also be cut out by a laser beam.

[0034] Although two first interlocking attachment members are shown for the preferred embodiment, it should be clear that a valve housing 10 with only one first interlocking attachment member is also covered by the invention. It is possible, that depending on the material used and the pressure present in the fluid channels, a connection as described using first and second interlocking attachment members may only be possible for example on the coolant side, i.e. the side of connecting pipe 18, where the pressure is less important. In this case, the oil side near connecting pipe 16 must still be fixed by a screw.

[0035] The combination of the vehicle cooling module 22 with the valve housing 10 can be assembled in a shorter time and requires less space in the vehicle because of the smaller valve housing. A connection as described using first and second interlocking attachment members can be adapted to different housing forms. The number of first and second interlocking attachment members may also vary.

Claims

1. Valve housing (10) attachable to a vehicle cooling module (22) and for accommodating a valve unit, the valve housing (10) comprising
a connection surface (34) with an oil channel port (26) for fluidic connection to an oil channel of the vehicle cooling module (22) and a coolant channel port (30) for fluidic connection to a coolant channel of the vehicle cooling module (22), and
at least one first interlocking attachment member (20) for attaching the valve housing to the vehicle cooling module, whereby the first interlocking attachment member (20) is adapted to engage a second interlocking attachment member (32) provided on the vehicle cooling module (22), so that the first and second interlocking attachment numbers are adapted to interact to clamp the valve housing and the vehicle cooling module together and to let the connection surface (34) of the valve housing (10) move into contact with the vehicle cooling module (22).

2. The valve housing (10) of claim 1, whereby the first and second interlocking attachment member define a pivot axis and are adapted to interact to clamp the valve housing and the vehicle cooling module together by a swiveling movement of the valve housing relative to the vehicle cooling module.

3. The valve housing (10) or claim 1 or claim 2, wherein the first attachment member (20) is at least one protrusion which is insertable into the second interlocking attachment member (32) of the vehicle cooling module and wherein the protrusion (20) has a cross section with a first dimension in a direction basically perpendicular to the connection surface (34) and a second dimension which is greater than the first dimension in a direction basically parallel to the connection surface (34).

4. The valve housing (10) of any of claims 2 to 3, wherein the protrusion (20) is provided with at least one locking surface (40).

5. The valve housing (10) of any of claims 2 to 4, wherein the protrusion (20) is provided with at least one guiding surface (36).

6. The valve housing (10) of claim 5 referring to claim 4, wherein the at least one guiding surface (36) extends in a basically perpendicular direction to the at least one locking surface (40).

7. The valve housing (10) of any of claims 1 to 6, wherein two first interlocking attachment members (20) of the valve housing (10) are arranged opposite each other to define a pivot axis and extending in opposite directions for being engaged into two second interlocking attachment members (32) of the vehicle cooling module (22).

8. The valve housing (10) of any of the proceeding

claims, wherein the first interlocking attachment member (20) is formed near one end surface of the housing and an edge (44) of the one end surface of the housing (10) directed to the vehicle cooling module (22) is provided with a rounded surface and wherein the valve housing (10) is adapted to be turned along the rounded edge (44) during mounting onto the vehicle cooling module (22) and wherein the rounded edge (44) is provided with at least two beads (46) which extend in a direction basically perpendicular to the edge (44).

9. The valve housing (10) of any of the preceding claims wherein the housing is a molded plastic housing and wherein the material used is PPS, PPA or PA6.6.

10. The valve housing (10) of any of the preceding claims wherein the distance between the oil channel port (26) and the coolant channel port (30) is comprised between 30 mm and 35 mm.

11. Vehicle cooling module (22) comprising at least a second interlocking attachment member (32) adapted to engage a first interlocking attachment member (20) of a valve housing (10) so that the first and second attachment member are adapted to interact to clamp the valve housing and the vehicle cooling module together and whereby the first and second interlocking attachment member define a pivot axis and are adapted to interact to clamp the valve housing and the vehicle cooling module together by a swiveling movement of the valve housing relative to the vehicle cooling module.

12. The vehicle cooling module (22) of claim 11, wherein: the at least one second interlocking attachment member (32) is arranged at a cover (21) of the vehicle cooling module (22) and wherein the cover (21) is formed integrally with the second interlocking attachment member (32) out of a metal.

13. The vehicle cooling module (22) of any of claims 11 to 12, wherein the at least one second interlocking attachment member (32) comprises at least one guiding ramp (38) adapted to cooperate with a guiding surface (36) of the first interlocking attachment member (20) of a valve housing (10) for facilitating insertion of the first interlocking attachment member (20) into the second interlocking attachment member (32).

14. The vehicle cooling module (22) of any of claims 11 to 13, wherein the at least one second interlocking attachment member (32) further comprises a securing surface (42) adapted to cooperate with a locking surface (40) of the first interlocking attachment member (20) of a valve housing (10) for clamping the first interlocking attachment member (20) in the second interlocking attachment member (32).

15. A combination of a vehicle cooling module (22) according to any of claims 11 to 14 and a valve housing (10) according to any of claims 1 to 10, wherein the valve housing (10) is attached to the cooling module, wherein the valve housing (10) and the vehicle cooling module (22) are attached to one another by moving the valve housing (10) in a direction defined by an angle between about 25° and about 90° of the connection surface (34) to a counter surface of the vehicle cooling module (22) to engage the first and second attachment members (20, 32) and subsequently swiveling the valve housing (10) relative to the vehicle cooling module (22) to bring the connection surface (34) into contact with the vehicle cooling module (22) in such a way that the first and second attachment members (20, 32) clamp together the valve housing (10) and the vehicle cooling module (22) and wherein the at least one second interlocking attachment member (32) has an aperture which allows insertion of the first interlocking attachment member (20) oriented in a first direction and is adapted to clamp the first interlocking attachment member (20) when the first interlocking attachment member (20) is turned into a second direction.

Patentansprüche

1. Ventilgehäuse (10), das an einem Fahrzeugkühlmodul (22) angebracht werden kann und zum Aufnehmen einer Ventileinheit dient, wobei das Ventilgehäuse (10) Folgendes umfasst:

eine Verbindungsoberfläche (34) mit einem Ölkanalanschluss (26) für eine Fluidverbindung zu einem Ölkanal des Fahrzeugkühlmoduls (22) und einem Kühlmittelkanalanschluss (30) für eine Fluidverbindung zu einem Kühlmittelkanal des Fahrzeugkühlmoduls (22), und
wenigstens ein erstes Verriegelungsanbringungselement (20) zum Anbringen des Ventilgehäuses an dem Fahrzeugkühlmodul, wobei das erste Verriegelungsanbringungselement (20) dazu ausgelegt ist, an einem zweiten Verriegelungsanbringungselement (32), das an dem Fahrzeugkühlmodul (22) vorgesehen ist, in Eingriff zu gelangen, so dass das erste und das zweite Verriegelungsanbringungselement für eine Zusammenwirkung dazu ausgelegt sind zusammenzuwirken, um das Ventilgehäuse und das Fahrzeugkühlmodul aneinander zu klemmen und die Verbindungsoberfläche (34) des Ventilgehäuses (10) in einen Kontakt mit dem Fahrzeugkühlmodul (22) zu bewegen.

2. Ventilgehäuse (10) nach Anspruch 1, wobei das er-

ste und das zweite Verriegelungsanbringungselement eine Schwenkachse definieren und dazu ausgelegt sind zusammenzuwirken, um das Ventilgehäuse und das Fahrzeugkühlmodul durch eine Schwenkbewegung des Ventilgehäuses relativ zu dem Fahrzeugkühlmodul aneinander zu klemmen.

3. Ventilgehäuse (10) nach Anspruch 1 oder 2, wobei das erste Anbringungselement (20) wenigstens ein Vorsprung ist, der in das zweite Verriegelungsanbringungselement (32) des Fahrzeugkühlmoduls eingesetzt werden kann und wobei der Vorsprung (20) einen Querschnitt mit einer ersten Abmessung in einer Richtung im Wesentlichen senkrecht zu der Verbindungsoberfläche (34) und einer zweiten Abmessung, die größer ist als die erste Abmessung, in einer Richtung im Wesentlichen parallel zu der Verbindungsoberfläche (34) aufweist.

4. Ventilgehäuse (10) nach einem der Ansprüche 2 bis 3, wobei der Vorsprung (20) mit wenigstens einer Verriegelungsoberfläche (40) versehen ist.

5. Ventilgehäuse (10) nach einem der Ansprüche 2 bis 4, wobei der Vorsprung (20) mit wenigstens einer Führungsoberfläche (36) versehen ist.

6. Ventilgehäuse (10) nach Anspruch 5, wenn abhängig von Anspruch 4, wobei die wenigstens eine Führungsoberfläche (36) sich in einer im Wesentlichen senkrechten Richtung zu der wenigstens einen Verriegelungsoberfläche (40) erstreckt.

7. Ventilgehäuse (10) nach einem der Ansprüche 1 bis 6, wobei zwei erste Verriegelungsanbringungselemente (20) des Ventilgehäuses (10) einander gegenüberliegend angeordnet sind, um eine Schwenkachse zu definieren, und sich in entgegengesetzte Richtungen erstrecken, damit sie an zwei zweiten Verriegelungsanbringungselementen (32) des Fahrzeugkühlmoduls (22) in Eingriff sind.

8. Ventilgehäuse (10) nach einem vorhergehenden Anspruch, wobei das erste Verriegelungsanbringungselement (20) nahe bei einer Stirnfläche des Gehäuses gebildet ist und eine Kante (44) der einen Stirnfläche des Gehäuses (10), die zu dem Fahrzeugkühlmodul (22) gerichtet ist, mit einer gerundeten Oberfläche versehen ist, und wobei das Ventilgehäuse (10) dazu ausgelegt ist, während der Anbringung an dem Fahrzeugkühlmodul (22) längs der gerundeten Kante (44) gedreht zu werden, und wobei die gerundete Kante (44) mit wenigstens zwei Rippen (46), die in einer Richtung im Wesentlichen senkrecht zu der Kante (44) verlaufen, versehen ist.

9. Ventilgehäuse (10) nach einem vorhergehenden Anspruch, wobei das Gehäuse ein gegossenes Kunststoffgehäuse ist und der verwendete Werkstoff PPS, PPA oder PA6.6 ist.

10. Ventilgehäuse (10) nach einem vorhergehenden Anspruch, wobei der Abstand zwischen dem Ölkanalanschluss (26) und dem Kühlmittelkanalanschluss (30) zwischen 30 mm und 35 mm beträgt.

11. Fahrzeugkühlmodul (22), das wenigstens ein zweites Verriegelungsanbringungselement (32) umfasst, das dazu ausgelegt ist, an einem ersten Verriegelungsanbringungselement (20) des Ventilgehäuses (10) in Eingriff zu gelangen, so dass das erste und das zweite Verriegelungsanbringungselement dazu ausgelegt sind zusammenzuwirken, um das Ventilgehäuse und das Fahrzeugkühlmodul aneinander zu klemmen, und wobei das erste und das zweite Verriegelungsanbringungselement eine Schwenkachse definieren und dazu ausgelegt sind zusammenzuwirken, um das Ventilgehäuse und das Fahrzeugkühlmodul durch eine Schwenkbewegung des Ventilgehäuses relativ zu dem Fahrzeugkühlmodul aneinander zu klemmen.

12. Fahrzeugkühlmodul (22) nach Anspruch 11, wobei das wenigstens eine zweite Verriegelungsanbringungselement (32) an einer Abdeckung (21) des Fahrzeugkühlmoduls (22) angeordnet ist und wobei die Abdekkung (21) einteilig mit dem zweiten Verriegelungsanbringungselement (32) aus einem Metall gebildet ist.

13. Fahrzeugkühlmodul (22) nach einem der Ansprüche 11 bis 12, wobei das wenigstens eine zweite Verriegelungsanbringungselement (32) wenigstens eine Führungsrampe (38) umfasst, die dazu ausgelegt ist, mit einer Führungsoberfläche (36) des ersten Verriegelungsanbringungselements (20) des Ventilgehäuses (10) zusammenzuwirken, um ein Einsetzen des ersten Verriegelungsanbringungselements (20) in das zweite Verriegelungsanbringungselement (32) zu ermöglichen.

14. Fahrzeugkühlmodul (22) nach einem der Ansprüche 11 bis 13, wobei das wenigstens eine zweite Verriegelungsanbringungselement (32) des Weiteren eine Befestigungsoberfläche (42) umfasst, die dazu ausgelegt ist, mit einer Verriegelungsoberfläche (40) des ersten Verriegelungsanbringungselements (20) eines Ventilgehäuses (10) zum Klemmen des ersten Verriegelungsanbringungselements (20) in das zweite Verriegelungsanbringungselement (32) zusammenzuwirken.

15. Kombination aus einem Fahrzeugkühlmodul (22) nach einem der Ansprüche 11 bis 14 und einem Ventilgehäuse (10) nach einem der Ansprüche 1 bis 10, wobei das Ventilgehäuse (10) an dem Kühlmodul

angebracht ist, wobei das Ventilgehäuse (10) und das Fahrzeugkühlmodul (22) aneinander angebracht werden, indem das Ventilgehäuse (10) in einer Richtung, die durch einen Winkel zwischen etwa 25° und etwa 90° zwischen der Verbindungsoberfläche (34) und einer Gegenoberfläche des Fahrzeugkühlmoduls (22) definiert ist, bewegt wird, um das erste und das zweite Verriegelungsanbringungselement (20, 32) in Eingriff zu bringen, und anschließend das Ventilgehäuse (10) relativ zu dem Fahrzeugkühlmodul (22) geschwenkt wird, um die Verbindungsoberfläche (34) in Kontakt mit dem Fahrzeugkühlmodul (22) zu bringen, derart, dass das erste und das zweite Anbringungselement (20, 32) das Ventilgehäuse (10) und das Fahrzeugkühlmodul (22) zusammenklemmen, und wobei das wenigstens eine zweite Verriegelungsanbringungselement (32) eine Öffnung aufweist, die das Einsetzen des ersten Verriegelungsanbringungselements (20) ermöglicht, das in einer ersten Richtung ausgerichtet ist und dazu ausgelegt ist, das erste Verriegelungsanbringungselement (20) zu klemmen, wenn das erste Verriegelungsanbringungselement (20) in eine zweite Richtung gedreht wird.

Revendications

1. Boîtier de soupape (10) pouvant être attaché à un module de refroidissement de véhicule (22) et destiné à recevoir une unité de soupape, le boîtier de soupape (10) comprenant :

une surface de connexion (34) avec un orifice de conduit d'huile (26) pour la connexion fluidique à un conduit d'huile du module de refroidissement de véhicule (22) et un orifice de conduit de réfrigérant (30) pour la connexion fluidique à un conduit de réfrigérant du module de refroidissement de véhicule (22), et
au moins un premier organe de fixation par emboîtement (20) pour attacher le boîtier de soupape au module de refroidissement de véhicule, le premier organe de fixation par emboîtement (20) étant prévu pour s'engager avec un deuxième organe de fixation par emboîtement (32) prévu sur le module de refroidissement de véhicule (22), de telle sorte que le premier et le deuxième organe de fixation par emboîtement soient adaptés pour coopérer de manière à serrer le boîtier de soupape et le module de refroidissement de véhicule ensemble et à permettre à la surface de connexion (34) du boîtier de soupape (10) de venir en contact avec le module de refroidissement de véhicule (22).

2. Boîtier de soupape (10) selon la revendication 1, dans lequel le premier et le deuxième organe de fixation par emboîtement définissent un axe de pivotement et sont adaptés pour coopérer de manière à serrer le boîtier de soupape et le module de refroidissement de véhicule ensemble par un mouvement de pivotement du boîtier de soupape par rapport au module de refroidissement de véhicule.

3. Boîtier de soupape (10) selon la revendication 1 ou 2, dans lequel le premier organe de fixation (20) est au moins une saillie qui peut être insérée dans le deuxième organe de fixation par emboîtement (32) du module de refroidissement de véhicule et dans lequel la saillie (20) a une section transversale avec une première dimension dans une direction essentiellement perpendiculaire à la surface de connexion (34) et une deuxième dimension qui est supérieure à la première dimension dans une direction essentiellement parallèle à la surface de connexion (34).

4. Boîtier de soupape (10) selon l'une quelconque des revendications 2 et 3, dans lequel la saillie (20) est pourvue d'au moins une surface de verrouillage (40).

5. Boîtier de soupape (10) selon l'une quelconque des revendications 2 à 4, dans lequel la saillie (20) est pourvue d'au moins une surface de guidage (36).

6. Boîtier de soupape (10) selon la revendication 5, lorsqu'elle se réfère à la revendication 4, dans lequel l'au moins une surface de guidage (36) s'étend dans une direction essentiellement perpendiculaire à l'au moins une surface de verrouillage (40).

7. Boîtier de soupape (10) selon l'une quelconque des revendications 1 à 6, dans lequel deux premiers organes de fixation par emboîtement (20) du boîtier de soupape (10) sont agencés en face l'un de l'autre pour définir un axe de pivotement et s'étendent dans des directions opposées de manière à s'engager dans deux deuxièmes organes de fixation par emboîtement (32) du module de refroidissement de véhicule (22).

8. Boîtier de soupape (10) selon l'une quelconque des revendications précédentes, dans lequel le premier organe de fixation par emboîtement (20) est formé à proximité d'une surface d'extrémité du boîtier et un bord (44) de l'une des surfaces d'extrémité du boîtier (10) orienté vers le module de refroidissement de véhicule (22) est pourvu d'une surface arrondie et dans lequel le boîtier de soupape (10) est prévu pour être tourné le long du bord arrondi (44) au cours du montage sur le module de refroidissement de véhicule (22) et le bord arrondi (44) est pourvu d'au moins deux bourrelets (46) qui s'étendent dans une direction essentiellement perpendiculaire au bord (44).

9. Boîtier de soupape (10) selon l'une quelconque des revendications précédentes, dans lequel le boîtier est un boîtier en plastique moulé et dans lequel le matériau utilisé est du PPS, du PPA ou du PA6.6.

10. Boîtier de soupape (10) selon l'une quelconque des revendications précédentes, dans lequel la distance entre l'orifice de conduit d'huile (26) et l'orifice de conduit de réfrigérant (30) est comprise entre 30 mm et 35 mm.

11. Module de refroidissement de véhicule (22) comprenant au moins un deuxième organe de fixation par emboîtement (32) prévu pour s'engager avec un premier organe de fixation par emboîtement (20) d'un boîtier de soupape (10), de telle sorte que le premier et le deuxième organe de fixation soient adaptés pour coopérer de manière à serrer le boîtier de soupape et le module de refroidissement de véhicule ensemble, et dans lequel le premier et le deuxième organe de fixation par emboîtement définissent un axe de pivotement et sont adaptés pour coopérer de manière à serrer le boîtier de soupape et le module de refroidissement de véhicule ensemble par un mouvement de pivotement du boîtier de soupape par rapport au module de refroidissement de véhicule.

12. Module de refroidissement de véhicule (22) selon la revendication 11, dans lequel l'au moins un deuxième organe de fixation par emboîtement (32) est agencé au niveau d'un couvercle (21) du module de refroidissement de véhicule (22) et dans lequel le couvercle (21) est formé intégralement avec le deuxième organe de fixation par emboîtement (32) en métal.

13. Module de refroidissement de véhicule (22) selon l'une quelconque des revendications 11 et 12, dans lequel l'au moins un deuxième organe de fixation par emboîtement (32) comprend au moins une rampe de guidage (38) prévue pour coopérer avec une surface de guidage (36) du premier organe de fixation par emboîtement (20) d'un boîtier de soupape (10) pour faciliter l'insertion du premier organe de fixation par emboîtement (20) dans le deuxième organe de fixation par emboîtement (32).

14. Module de refroidissement de véhicule (22) selon l'une quelconque des revendications 11 à 13, dans lequel l'au moins un deuxième organe de fixation par emboîtement (32) comprend en outre une surface de fixation (42) prévue pour coopérer avec une surface de verrouillage (40) du premier organe de fixation par emboîtement (20) d'un boîtier de soupape (10) pour serrer le premier organe de fixation par emboîtement (20) dans le deuxième organe de fixation par emboîtement (32).

15. Combinaison d'un module de refroidissement de véhicule (22) selon l'une quelconque des revendications 11 à 14 et d'un boîtier de soupape (10) selon l'une quelconque des revendications 1 à 10, dans laquelle le boîtier de soupape (10) est fixé au module de refroidissement, le boîtier de soupape (10) et le module de refroidissement de véhicule (22) étant fixés l'un à l'autre en déplaçant le boîtier de soupape (10) dans une direction définie par un angle compris entre environ 25° et environ 90° de la surface de connexion (34) à une surface opposée du module de refroidissement de véhicule (22) pour engager les premier et deuxième organes de fixation (20, 32) et faire ensuite pivoter le boîtier de soupape (10) par rapport au module de refroidissement de véhicule (22) pour amener la surface de connexion (34) en contact avec le module de refroidissement de véhicule (22) de manière telle que les premier et deuxième organes de fixation (20, 32) amortissent ensemble le boîtier de soupape (10) et le module de refroidissement de véhicule (22), l'au moins un deuxième organe de fixation par emboîtement (32) ayant une ouverture qui permet l'insertion du premier organe de fixation par emboîtement (20) orienté dans une première direction et étant adapté pour serrer le premier organe de fixation par emboîtement (20) lorsque le premier organe de fixation par emboîtement (20) est tourné dans une deuxième direction.

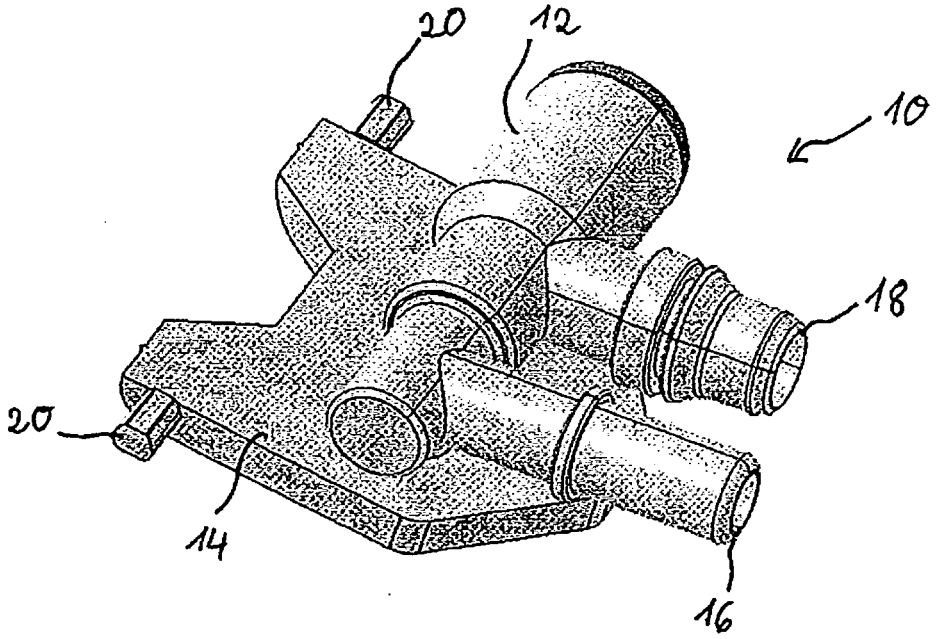


Fig.1

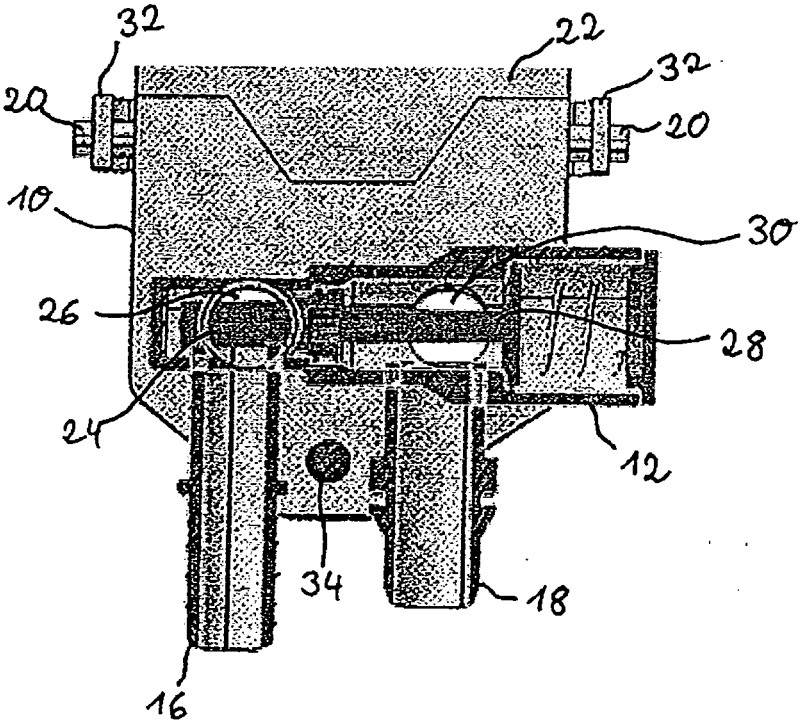


Fig.2

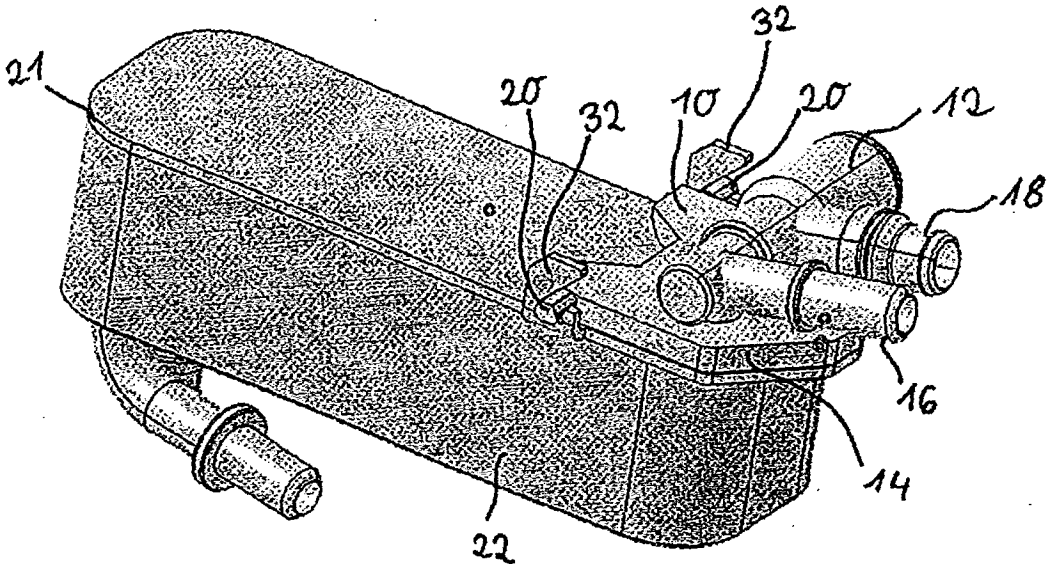


Fig. 3

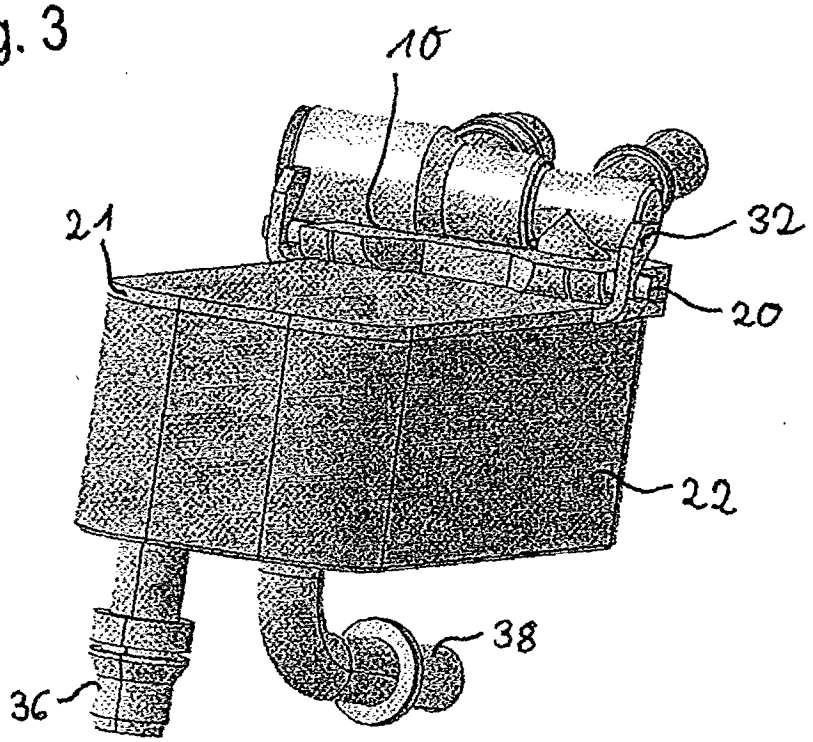


Fig. 4

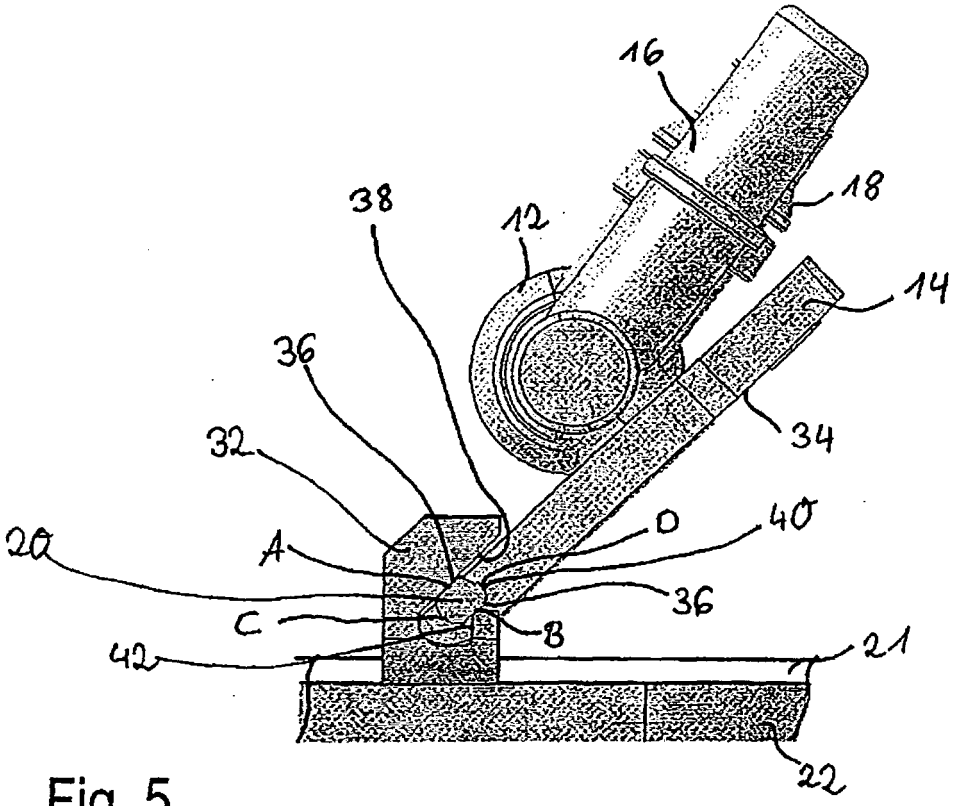

16
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38
12
14
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34
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A
D
40
36
C
B
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22

Fig. 5

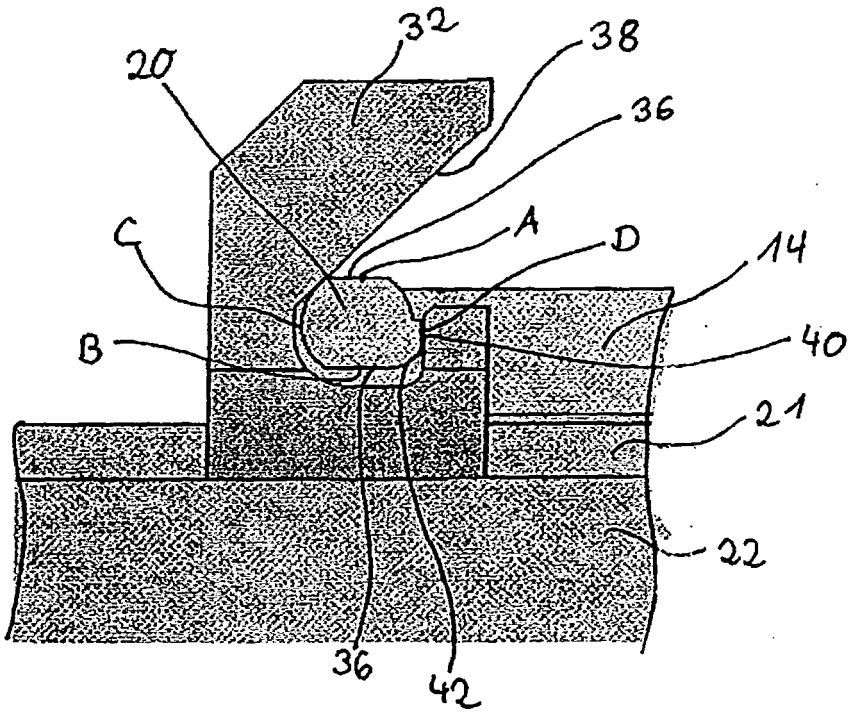

32
38
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36
C
A
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Fig. 6

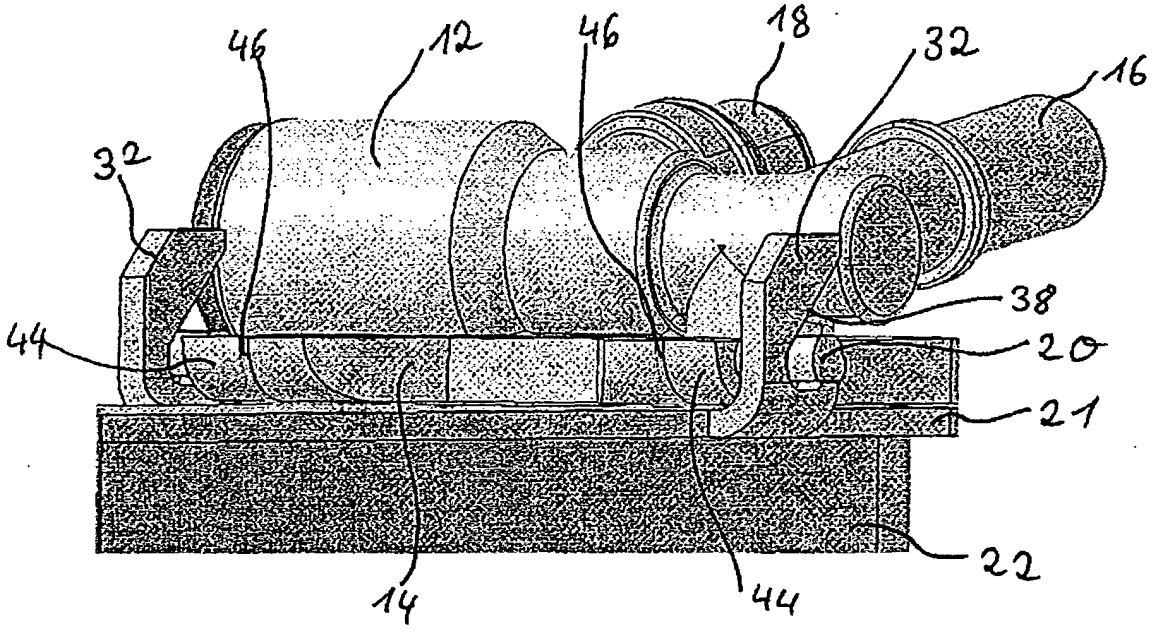


Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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