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(54) **A BRACKET ARRANGEMENT FOR SUPPORTING A VEHICLE COMPONENT**

(57) The present invention relates to a bracket arrangement for supporting a vehicle component, said bracket arrangement comprising an elongated bracket comprising a bracket surface, said bracket surface extending in a first, axial direction and in an second, at least partially circumferential direction, wherein said bracket surface comprises an inner surface arranged to face and at least partially enclose said vehicle component; a flexible heating layer connected to the inner surface of the elongated bracket, said flexible heating layer comprising integrated electrical heating means for heating the vehicle component; and a heat insulating layer sandwiched between the inner surface of the elongated bracket and the flexible heating layer.

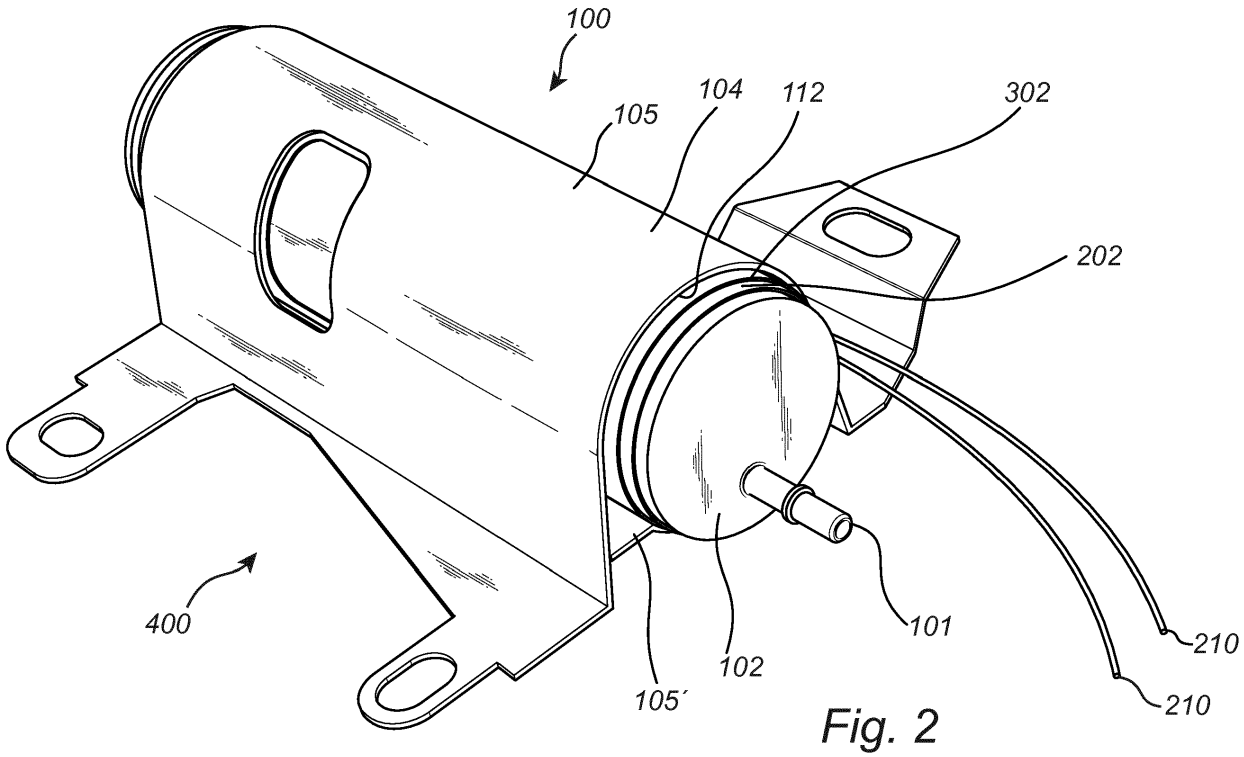

Fig. 2

EP 3 392 499 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a bracket arrangement for supporting a vehicle component. The invention also relates to a vehicle fuel filter arrangement comprising such a bracket arrangement.

BACKGROUND

[0002] Vehicle components, in particular vehicle components arranged to lead through fuel during operation of the vehicle are commonly used. Such components may, for example, relate to fuel filters, etc. These vehicle components need to properly transport fuel there through and further to e.g. an internal combustion engine of the vehicle for combustion therein. It is thus important that the fuel is able to be directed through the vehicle component without too much effort, i.e. the friction within the vehicle component should preferably not prevent the vehicle fuel to properly arrive at the inlet of the internal combustion engine.

[0003] In the specific example of a fuel filter, the ambient conditions are an important aspect affecting the fuel guidance within the filter. For example, if the ambient temperature of the fuel filter is below a predetermined limit, the inherent grease within the fuel of the filter will solidify. Hereby, the there is, for example, a risk that the oil filter will be clogged.

[0004] US 4,596,224 describes a fuel filter heater aiming to solve the above described problem. As described in US 4,596,224, the fuel filter heater is arranged at the inlet of the fuel filter in order to heat fuel delivered therein.

[0005] Although the fuel filter heater in US 4,596,224 heats the fuel before it is delivered to the fuel filter, the heater is still in need of further improvements in terms of e.g. functionality and heating performance, etc.

SUMMARY

[0006] It is an object of the present invention to provide a bracket arrangement which at least partially overcomes the above described deficiencies. This is achieved by a bracket arrangement according to claim 1.

[0007] According to a first aspect of the present invention, there is provided a bracket arrangement for supporting a vehicle component, the bracket arrangement comprising an elongated bracket comprising a bracket surface, the bracket surface extending in a first, axial direction and in an second, at least partially circumferential direction, wherein the bracket surface comprises an inner surface arranged to face and at least partially enclose the vehicle component; a flexible heating layer connected to the inner surface of the elongated bracket, the flexible heating layer comprising integrated electrical heating means for heating the vehicle component; and a heat insulating layer sandwiched between the inner surface of the elongated bracket and the flexible heating layer.

[0008] The wording "at least partially circumferential direction" should be understood to mean that the bracket surface does not have to be defined as a complete tube or circle. Hence, the bracket surface can be arranged to extend axially and have a circumferential extension of less than 360 degrees. Hereby, and as described above, a vehicle component can be at least partially enclosed within the inner surface of the bracket surface.

[0009] Furthermore, the flexible heating layer should be understood to mean a layer which is able to be formed in accordance with the bracket surface it is connected to. The layer is thus flexible and form-adjustable. Material configurations for achieving such flexibility are given below.

[0010] An advantage is that the bracket will provide heat to the connected vehicle component, while at the same time insulate the bracket surface as well as its environment within the vehicle. By means of the heat insulating layer, a reduced amount of heat will dissipate to the environment which will improve the heating of the vehicle component. The power consumption of the flexible heating layer can thus also be reduced. Furthermore, the bracket arrangement is advantageous as it is able to provide heat around substantially the full circumferential surface of the vehicle component, thus making it suitable to e.g. fuel filters and oil filters etc. having a circular cross-sectional area. A continuous heating of the vehicle component will thus be achieved. Accordingly, according to an example, the bracket arrangement may be a fuel filter bracket arrangement. The invention may also be particularly suitable for urea pump modules, urea filters, etc. which may be in need of heating.

[0011] According to an example embodiment, the flexible heating layer may comprise at least one electrical heating wire, the electrical heating wire being arranged in the circumferential direction of the bracket arrangement for at least partially enclosing the vehicle component. Hereby, the heating wire will provide heat to the vehicle component around substantially the entire surface of the vehicle component.

[0012] According to an example embodiment, the flexible heating layer may cover substantially the entire inner surface of the elongated bracket. Hereby, an area corresponding to the area of the bracket is used for heating the vehicle component.

[0013] According to an example embodiment, the flexible heating layer may be a silicone based heater element layer comprising heating wires and electrical wiring for supply of electrical current to the heating wires. Silicone is a suitable material providing the flexible properties to the heating element. Silicone also comprises beneficial thermal conductivity properties. According to a non-limiting example, the thermal conductivity may be at least 0.2 watts per meter-Kelvin, preferably between 0.2 -1.3 watts per meter-Kelvin.

[0014] According to an example embodiment, the flexible heating layer may comprise a thermostat for control-

ling the temperature of the flexible heating layer. Hereby, the temperature levels of the flexible heating layer can be controlled.

[0015] According to an example embodiment, the heat insulating layer may comprise a polymeric material. The insulating properties of a polymeric material may be sufficient for preventing heat from the flexible heating layer to be directed away from the bracket arrangement. Also, a polymeric material is flexible and can adapt its shape relative to the inner surface of the bracket.

[0016] According to an example embodiment, the polymeric material may comprise a heat resistive polymeric foam. The heat resistive polymeric foam may reduce the risk of melting or burning the heat insulating material, thus providing for the use of a higher temperature. The foam may also increase the interconnection to the inner surface of the elongated bracket and the flexible heating layer.

[0017] According to an example embodiment, the heat insulating layer may be adhesively sandwiched between the inner surface of the elongated bracket and the flexible heating layer. Hereby, the heat insulating layer can be well attached to the bracket to form a bracket having an integrated heat insulating layer and flexible heating layer.

[0018] According to an example embodiment, the vehicle component may be a fuel flow-through component of the vehicle.

[0019] A fuel flow-through component should be understood to mean a component through which fuel is supplied during operation of the vehicle. According to an example embodiment, the fuel flow-through component may be a fuel filter. Other fuel flow-through components are also conceivable, such as e.g. fuel hoses, urea pump modules, urea filters, thermostat housings, etc.

[0020] According to a second aspect of the present invention, there is provided a vehicle fuel filter arrangement comprising a fuel filter and a bracket arrangement for supporting the fuel filter, wherein the bracket arrangement comprises an elongated bracket comprising a bracket surface, the bracket surface extending in a first, axial direction and in an second, at least partially circumferential direction, wherein the bracket surface comprises an inner surface facing and at least partially enclosing the fuel filter; a flexible heating layer connected to the inner surface of the elongated bracket, the flexible heating layer comprising integrated electrical heating means for heating the fuel filter; and a heat insulating layer sandwiched between the inner surface of the elongated bracket and the flexible heating layer.

[0021] By means of heating the fuel filter using the bracket arrangement with integrated heating, the fuel contained in the filter can be heated during e.g. cold starts which will e.g. reduce filter clogging. Heating around substantially the entire external surface of the fuel filter will provide a uniform heating of the fuel filter and the fuel therein. Also, the heating element will not have direct contact with the fuel within the fuel filter and does hence not need to be replaced when changing the fuel filter. Accordingly, a cheaper fuel filter is provided.

[0022] Further effects and features of the second aspect are largely analogous to those described above in relation to the first aspect.

[0023] Accordingly, according to a still further aspect, there is provided a vehicle fuel filter arrangement comprising a fuel filter and a bracket arrangement according to any of the example embodiments described above in relation to the first aspect of the present invention.

[0024] Further features of, and advantages with, the present invention will become apparent when studying the appended claims and the following description. The skilled person will realize that different features of the present invention may be combined to create embodiments other than those described in the following, without departing from the scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The above, as well as additional objects, features and advantages of the present invention, will be better understood through the following illustrative and non-limiting detailed description of exemplary embodiments of the present invention, wherein:

Fig. 1 is an exploded perspective view of a bracket arrangement according to an example embodiment; and

Fig. 2 is a perspective view of the bracket arrangement in Fig. 1 connected to a vehicle fuel filter.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS OF THE INVENTION

[0026] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. The invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided for thoroughness and completeness. Like reference character refer to like elements throughout the description.

[0027] With reference to Fig. 1, which is an exploded perspective view of a bracket arrangement 100 and a vehicle component 102 in the form of a fuel filter 102, according to an example embodiment of the present invention. The fuel filter 102 comprises an inlet 101 for supply of fuel into the fuel filter 102, and an outlet (not shown) for delivery of fuel out from the fuel filter 102. The bracket arrangement 100 comprises an elongated bracket 104. The elongated bracket 104 depicted in Fig. 1 comprises a first 105 and a second 105' bracket component which are connectable to each other by e.g. a bolt connection or the like (not shown) via bolt holes 103 of the bracket 104. Other bracket configurations are of course also conceivable, such as e.g. the use of only the first

bracket component 105 connected to, for example, a frame of a vehicle for fully enclosing the vehicle component 102, or a bracket arranged in a fully circular, tube shape for enclosing the vehicle component 102, etc. As can be seen in Fig. 1, the bracket 104 is elongated and has an extension in a first direction indicated as an arrow by numeral 106. The bracket 104, or more particular the first bracket component 105 also has an extension in a second direction which is indicated by an arrow with numeral 108. The second direction is thus a circumferential direction thereof. As can be seen, the bracket 104 extends in an at least partially circumferential direction in order to at least partially enclose the vehicle component 102. By means of the extension in the first and second directions, the bracket 104 forms a bracket surface 110 having an inner surface 112 facing the vehicle component 102 when connected thereto.

[0028] The bracket arrangement 100 further comprises a flexible heating layer 202 and a heat insulating layer 302. The flexible heating layer 202 and the heat insulating layer 302 are both elongated and extend in the first, axial direction 106 and in the second, circumferential direction 108. Hence, the flexible heating layer 202 and the heat insulating layer 302 are, together with the bracket 104 arranged to at least partially enclose the vehicle component 102. Furthermore, the flexible heating layer 202 and the heat insulating layer 302 may both be provided from sheets which are formed to form-fit the bracket 104. The sheet-like arrangement is illustrated by means of the depicted edges 203, 204, 303, 304 of the flexible heating layer 202 and the heat insulating layer 302. Still further, the bracket 104, the flexible heating layer 202 and the heat insulating layer 302 comprise a respective opening 111, 206, 306 for gaining visually access to the vehicle component 102. The openings 111, 206, 306 should not be construed as limiting the scope of protection. The openings are merely a design option for gaining visual access.

[0029] Moreover, the flexible heating layer 202 comprises electrical heating means 208 in the form of an electrical heating wire. The electrical heating wire 208 preferably extends in the axial 106 and circumferential 108 direction of the flexible heating layer 202. Hereby, substantially the entire surface of the flexible heating layer 202 is provided with the electrical heating wire 208, thus providing uniform heating of the vehicle component 102 when connected thereto. Furthermore, the flexible heating layer 202 comprises electrical wiring 210 for supply of electrical current to the electrical heating wire 208. The electrical wiring 210 is preferably connected to a suitable power supply source (not shown) of the vehicle.

[0030] According to an example, and as depicted in Fig. 1, the flexible heating layer 202 comprises a thermostat 212. Hereby, the temperature level of the flexible heating layer 202 can be controlled.

[0031] As described above, the bracket arrangement 100 also comprises a heat insulating layer 302. The heat insulating layer 302 is preferably arranged to enclose the flexible heating layer 202 for reducing the transfer of heat in the radial outward direction of the bracket arrangement 100. The heat insulating layer 302 is thus preferably made of a heat insulating material comprising the above described flexible properties for being able to form-fit the bracket 104. According to an example, the material may comprise a polymeric material. The polymeric material preferably comprises a heat resistive polymeric foam.

[0032] Reference is now made to Fig. 2 which illustrates the bracket arrangement 100 in its assembled configuration connected to the vehicle component 102. The depicted arrangement in Fig. 2, including the fuel filter 102, can also be referred to as a vehicle fuel filter arrangement 400. As depicted in Fig. 2, the bracket 104, and in particular the first 105 and second 105' bracket components enclose the vehicle component 102. The flexible heating layer 202 encloses the vehicle component 102 and the heat insulating layer 302 is sandwiched between the flexible heating layer 202 and the inner surface 112 of the bracket 104. The heat insulating layer 302 is preferably adhesively attached to the inner surface 112 of the bracket 104 as well as to the flexible heating layer 202.

[0033] During operation, electrical current is supplied to the electrical heating wire via the electrical wiring 210. Hereby, the fuel filter 102 is uniformly heated and the heat is substantially prevented from being directed through the bracket 104 due to the provision of the heat insulating layer 302. Hereby, fuel present in the fuel filter 102 as well as fuel supplied into the fuel filter 102 via the inlet 101 will be heated to, for example, reduce the risk of filter clogging, etc.

[0034] It is to be understood that the present invention is not limited to the embodiments described above and illustrated in the drawings; rather, the skilled person will recognize that many changes and modifications may be made within the scope of the appended claims.

Claims

1. A bracket arrangement (100) for supporting a vehicle component (102), said bracket arrangement comprising an elongated bracket (104) comprising a bracket surface (110), said bracket surface extending in a first (106), axial direction and in a second (108), at least partially circumferential direction, wherein said bracket surface comprises an inner surface (112) arranged to face and at least partially enclose said vehicle component; a flexible heating layer (202) connected to the inner surface of the elongated bracket, said flexible heating layer comprising integrated electrical heating means (208) for heating the vehicle component; and a heat insulating layer (302) sandwiched between the inner surface of the elongated bracket and the flexible heating layer.

2. The bracket arrangement (100) according to claim

1, wherein the flexible heating layer (202) comprises at least one electrical heating wire (208), said electrical heating wire being arranged in the circumferential direction of the bracket arrangement for at least partially enclosing the vehicle component.

3. The bracket arrangement (100) according to claims 1 or 2, wherein the flexible heating layer covers substantially the entire inner surface of the elongated bracket.

4. The bracket arrangement (100) according to any one of the preceding claims, wherein the flexible heating layer (202) is a silicone based heater element layer comprising heating wires and electrical wiring (210) for supply of electrical current to said heating wires.

5. The bracket arrangement (100) according to any one of the preceding claims, wherein the flexible heating layer comprises a thermostat (212) for controlling the temperature of the flexible heating layer.

6. The bracket arrangement (100) according to any one of the preceding claims, wherein the heat insulating layer (302) comprises a polymeric material.

7. The bracket arrangement (100) according to claim 6, wherein the polymeric material comprises a heat resistive polymeric foam.

8. The bracket arrangement (100) according to any one of the preceding claims, wherein the heat insulating layer (302) is adhesively sandwiched between the inner surface of the elongated bracket and the flexible heating layer.

9. The bracket arrangement (100) according to any one of the preceding claims, wherein the vehicle component is a fuel flow-through component of the vehicle.

10. The bracket arrangement (100) according to claim 9, wherein the fuel flow-through component is a fuel filter.

11. A vehicle fuel filter arrangement (400) comprising a fuel filter (102) and a bracket arrangement (100) for supporting said fuel filter, wherein the bracket arrangement comprises an elongated bracket (104) comprising a bracket surface, said bracket surface extending in a first, axial direction and in an second, at least partially circumferential direction, wherein said bracket surface comprises an inner surface facing and at least partially enclosing said fuel filter; a flexible heating layer (202) connected to the inner surface of the elongated bracket, said flexible heating layer comprising integrated electrical heating means for heating the fuel filter; and a heat insulating layer (302) sandwiched between the inner surface of the elongated bracket and the flexible heating layer.

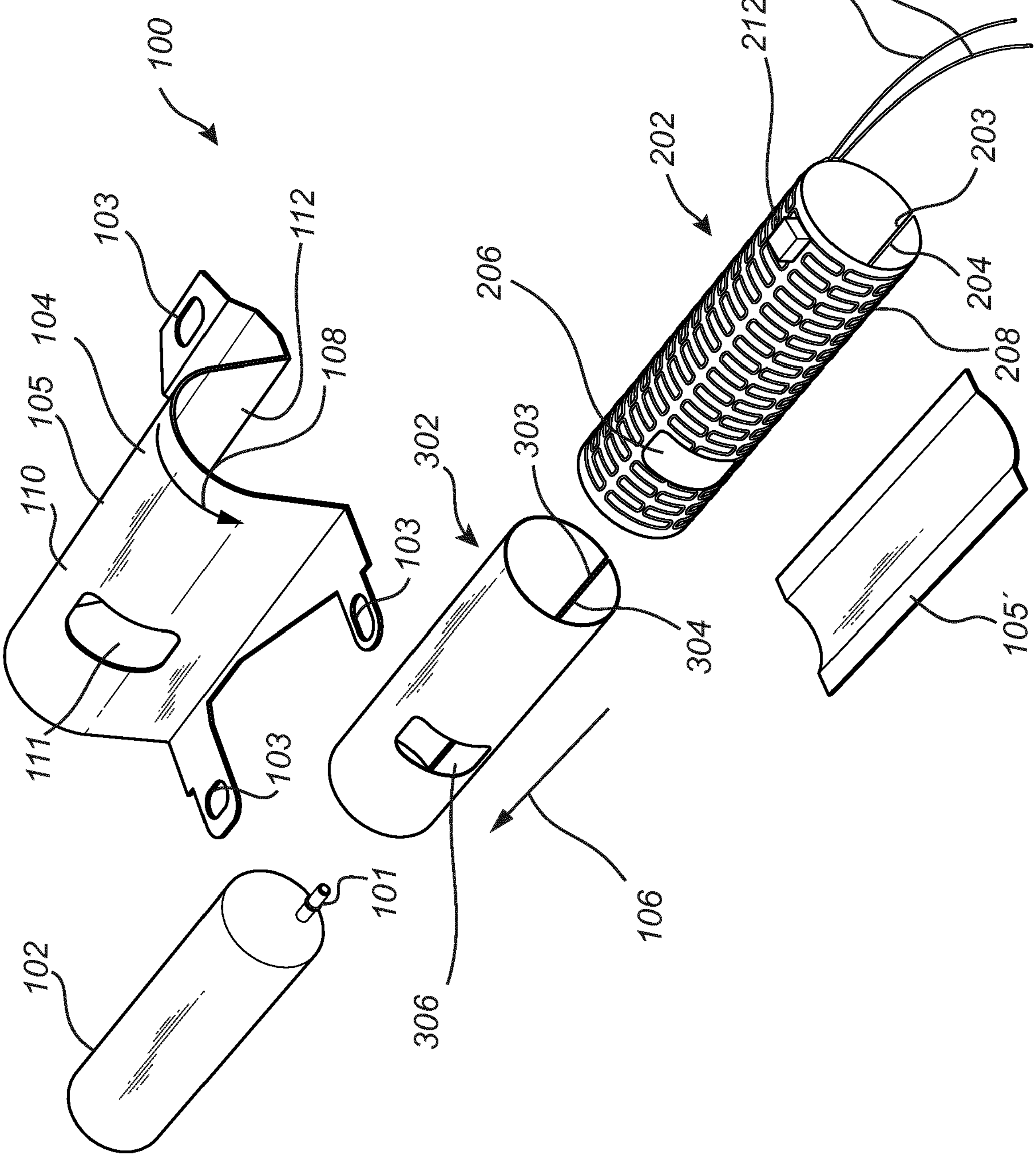
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Fig. 1

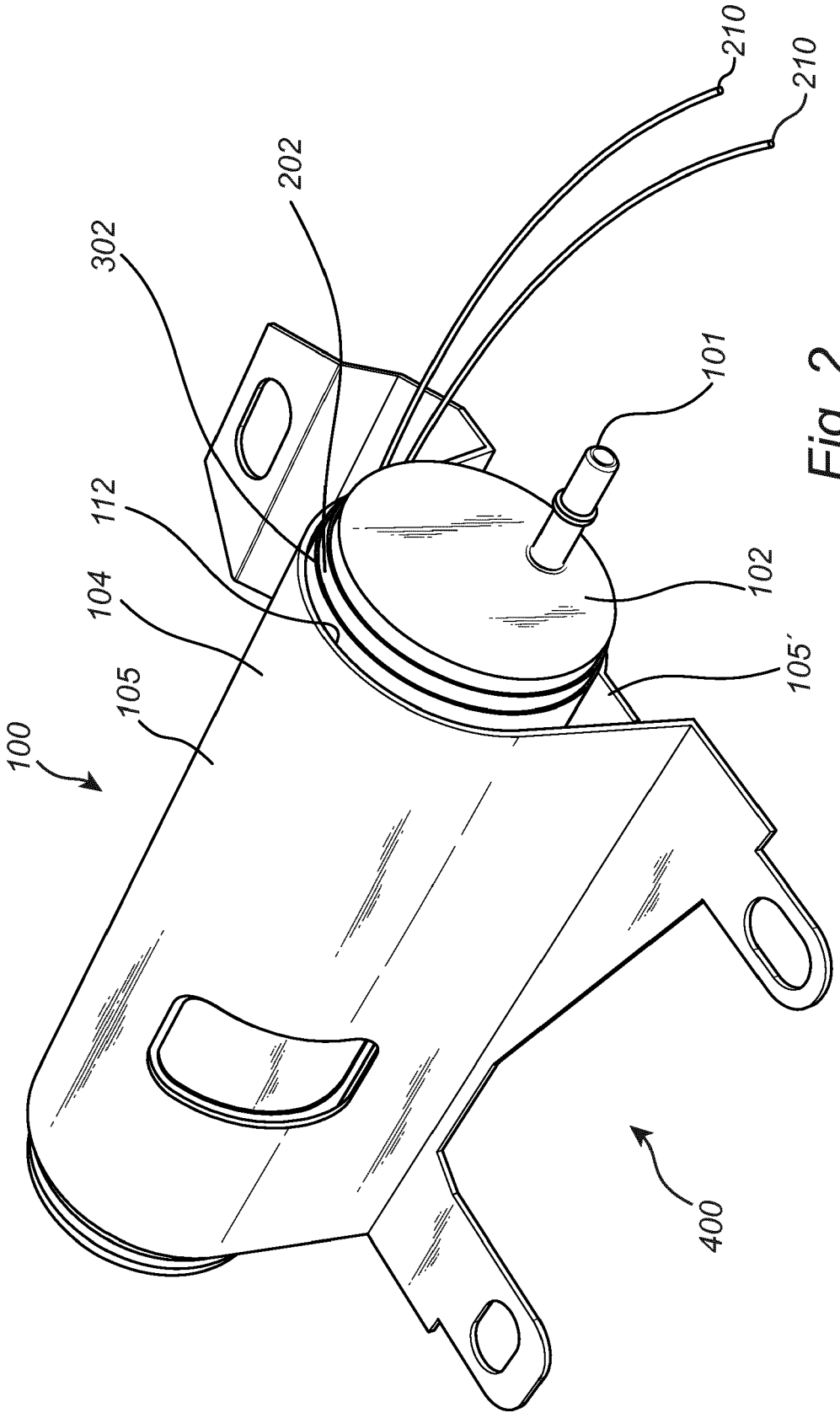

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 17 16 7559

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 675 503 A (TOIVIO ILKKA [FI] ET AL) 23 June 1987 (1987-06-23)	1-11	INV. F02M37/22
Y	* column 2, line 49 - column 3, line 45; figures 2, 3A * * column 4, line 66 - column 5, line 2 *	1-11	
X	DE 32 30 421 A1 (HEIDENREICH ULRICH; SCHINDLER GERT) 16 February 1984 (1984-02-16)	1-11	
Y	* page 5, line 13 - page 6, line 3; figures 1, 3 * * page 6, line 22 - page 8, line 15 *	1-11	
X	US 4 718 392 A (PASBRIG MAX [CH]) 12 January 1988 (1988-01-12)	1-11	
Y	* column 2, lines 11-51; figures 1, 2 * * column 3, line 1 - column 5, line 15 *	1-11	
X	US 4 603 244 A (GENZ MARLIN J [US]) 29 July 1986 (1986-07-29)	1-11	
Y	* column 1, lines 29-46; figures 2, 4 * * column 2, line 6 - column 3, line 24 *	1-11	TECHNICAL FIELDS SEARCHED (IPC) F02M
Y	KR 2014 0069435 A (HYUNDAI MOTOR CO LTD [KR]) 10 June 2014 (2014-06-10) * paragraphs [0001], [0014]; figure 1 *	1-11	
Y	US 5 921 520 A (WISNIEWSKI DAVID M [US]) 13 July 1999 (1999-07-13) * abstract; figure 1 *	1-11	
A	GB 2 072 469 A (SCIASCIA F) 30 September 1981 (1981-09-30) * page 1, line 1 - line 94; figure 1 * * page 2, lines 19-22 *	1-11	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	25 July 2017	Karstens, Thede

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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25-07-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4675503 A	23-06-1987	NONE	
DE 3230421 A1	16-02-1984	NONE	
US 4718392 A	12-01-1988	CA 1265005 A	30-01-1990
		CH 663082 A5	13-11-1987
		CN 86106081 A	11-03-1987
		DE 3532243 A1	19-03-1987
		DK 429286 A	11-03-1987
		EP 0214646 A2	18-03-1987
		ES 2001952 A6	01-07-1988
		FI 863596 A	11-03-1987
		JP S63161352 A	05-07-1988
		US 4718392 A	12-01-1988
US 4603244 A	29-07-1986	NONE	
KR 20140069435 A	10-06-2014	NONE	
US 5921520 A	13-07-1999	NONE	
GB 2072469 A	30-09-1981	BE 887862 A1	01-07-1981
		DE 3107980 A1	14-01-1982
		DK 100481 A	18-09-1981
		FR 2478204 A1	18-09-1981
		GB 2072469 A	30-09-1981
		JP S573861 U	09-01-1982
		LU 83203 A1	24-06-1981
		NL 8101140 A	16-10-1981
		NO 810890 A	18-09-1981
		YU 68581 A	30-06-1983

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 4596224 A **[0004] [0005]**