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(54) Title: SPIN-ON FILTER GASKET PROTECTION DEVICE

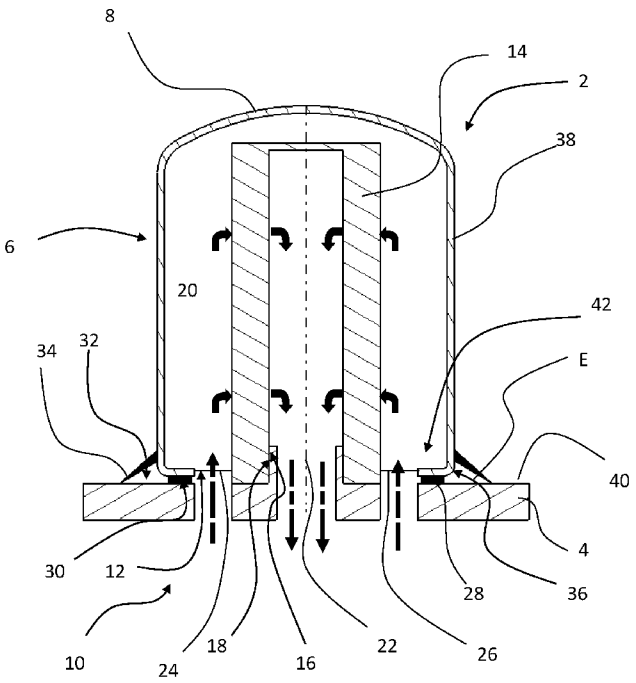

Fig. 1

(57) Abstract: The invention relates to a spin-on filter gasket protection device for a spin-on filter (2), the spin- on filter (2) having at least one gasket (28) arranged between a corresponding filter mount (4) and the spin-on filter housing (6) at respective gasket contact surfaces (32, 36) when the spin-on filter (2) is mounted on the filter mount (4), where the spin-on filter gasket protection device (34) is arranged to be mounted on the spin-on filter housing (6) where the spin-on filter gasket protection device (34) is arranged to extend between an outer surface (38) of the spin-on filter housing (6) and an outer surface (40) of the corresponding filter mount (4) outside (E) of the respective gasket contact surface (32, 36) for the outermost spin-on filter gasket (28). The invention also relates to a spin-on filter (2) comprising a spin-on filter gasket protection device (34), and a spin-on filter gasket protection arrangement, and an engine (50) and a vehicle (48) comprising a spin-on filter gasket protection arrangement.

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SPIN-ON FILTER GASKET PROTECTION DEVICE

FIELD OF THE INVENTION

The present invention relates to a spin-on filter gasket protection device and a spin-on filter comprising a spin-on filter gasket protection device and to a spin-on filter gasket protection arrangement, and an engine and a vehicle comprising a spin-on filter gasket protection arrangement.

BACKGROUND OF THE INVENTION AND RELATED ART

Spin-on filters comprising a filter body defining a mouth, a filter element disposed in the filter body, and a cover covering the mouth are widely used in e.g. engines and gearboxes as e.g. oil filters or fuel filters etc. due to their simple yet reliable design and their easy attachment, removal and replacement. The cover comprises at least one inlet opening and at least one outlet opening for the fluid to be filtered by the filter, where the fluid to be filtered is arranged to pass through the filter element on its way from the inlet to the outlet. The spin-on filter further comprises means for attaching the filter to a filter mount on the device utilizing the filter, which means comprise a thread on the filter which thread is arranged to be brought into engagement with a corresponding thread on the filter mount. Usually, the spin-on filter comprises a first central opening in the cover, the opening having an internal thread to be brought into engagement with a corresponding external thread on the filter mount. The corresponding filter mount thus usually comprises a corresponding central tubular member comprising said external thread on its outer periphery. The cover further comprises at least one further opening, usually a number of further openings, arranged on the cover between the central opening and the radial periphery of the cover. The filter mount comprises corresponding members, e.g. at least one opening and a possible cavity connecting said opening to the further openings in the cover when the spin-on filter is mounted onto the filter mount. If the central opening is the outlet opening from the spin-on filter, the further openings are inlet openings. The above threads together form a seal preventing fluid from passing therethrough. To prevent fluid from leaking out between the filter mount and the filter, at least one gasket is arranged between the filter and the filter mount radially outside of said further holes. Said gasket is usually arranged fixed to the filter, but may also be a part separate therefrom.

It is very important that the surface on the filter mount arranged to abut against the filter gasket is free from particles such as e.g. dirt etc. in order to avoid leaks between the gasket and the filter mount, this leading to fall in pressure in the fluid system in question and to pollution of the environment and surrounding components e.g. on a vehicle chassis. This problem is especially relevant in applications where the spin-on filter in use is exposed to a environment containing dirt such as e.g. in the area surrounding the chassis of a vehicle when the filter is to be replaced after having been exposed to dirt etc., and is traditionally addressed by carefully cleaning the surface on the filter mount after removal of the old filter but before mounting of a replacement filter thereon.

US 5,817,232 A shows a spin-on filter.

SUMMARY OF THE INVENTION

The primary object of the present invention is to provide a spin-on filter gasket protection device.

The above mentioned object of providing a spin-on filter gasket protection device is achieved for a spin-on filter gasket protection device for a spin-on filter, the spin-on filter having at least one gasket arranged between a corresponding filter mount and the spin-on filter housing at respective gasket contact surfaces when the spin-on filter is mounted on the filter where the spin-on filter gasket protection device is further arranged to be mounted on the spin-on filter housing and is arranged to extend between an outer surface of the spin-on filter housing and an outer surface of the corresponding filter mount outside of the respective gasket contact surface for the outermost spin-on filter gasket, the spin-on filter gasket protection device thus being able to keep the filter gasket and the area surrounding the filter gasket clean between replacements. A further advantage is achieved when the filter is used in applications where the device carrying the filter mount is to be painted after mounting of the filter to the filter mount, thus avoiding the paint to reach the filter gasket and avoiding a “bonding by paint” of the filter gasket outer edge to the filter mount which then would require removal of paint from the filter mount near the filter gasket at filter replacement.

Further, the objects of providing a spin-on filter comprising a spin-on filter gasket protection device, and a spin-on filter gasket protection arrangement, and an engine and a vehicle comprising a spin-on filter gasket protection arrangement are achieved for a spin-on filter, a spin-on filter gasket protection arrangement, and an engine and a vehicle.

In accordance with one embodiment, a spin-on filter gasket protection device for a spin-on filter is provided. The spin-on filter has at least one gasket arranged to seal between a filter mount and the spin-on filter housing at respective gasket contact surfaces. The spin-on filter gasket protection device is further arranged on the spin-on filter housing and is arranged to extend between an outer surface of the spin-on filter housing and an outer surface of a filter mount outside of the respective gasket contact surface for the outermost spin-on filter gasket.

According to one embodiment, the spin-on filter gasket protection device is arranged integrated with the outermost spin-on filter gasket to one unit.

According to one embodiment, the spin-on filter gasket protection device has the shape of a truncated hollow cone, which is rotationally symmetrical about the centre axis thereof.

According to one embodiment, the spin-on filter gasket protection device is flexible and has a central inner opening having an inner diameter smaller than the outer diameter of the spin-on filter housing.

According to one embodiment, the spin-on filter gasket protection device has a hollow substantially cylindrical intermediate body which is rotationally symmetrical about the centre axis thereof, and further has respectively integrally with the intermediate hollow body arranged a truncated hollow cone at an open end of the filter gasket protection device and a dome-shaped hollow end closure at the closed end of the filter gasket protection device.

According to one embodiment, the spin-on filter gasket protection device is flexible and has a central inner cavity having an inner mouth opening having an inner diameter smaller than the outer diameter of the spin-on filter housing.

According to one embodiment, the spin-on filter gasket protection arrangement comprises a spin-on filter gasket protection device, and further comprises a spin-on filter and a filter mount.

According to one embodiment, the spin-on filter gasket protection device is arranged to be pressed against the filter mount while undergoing flexible deformation when the spin-on filter is mounted on a corresponding filter mount.

In accordance with some embodiments the protection device is provided as a separate item that can be mounted on a spin-on filter on the filter housing thereof.

In accordance with one embodiment, a protection device for a spin-on filter with a filter housing is provided. The protection device can comprise an essentially rotationally symmetrical flexible main part having a central inner opening with a diameter smaller than the filter housing for which the protection device is adapted to fit on and further comprising a lip portion extending at least partly in a lateral direction out from the symmetrical part.

In accordance with one embodiment, the lip is tilted in a direction deviating from a direction perpendicular to the outer sidewall of the filter housing.

In accordance with one embodiment, the spin-on filter gasket protection device has the shape of a truncated hollow cone, which is rotationally symmetrical about the centre axis thereof. In accordance with one embodiment the protection device has a hollow substantially cylindrical intermediate body which is rotationally symmetrical about the centre axis thereof, and further has respectively integrally with the intermediate hollow body arranged a truncated hollow cone at an open end of the filter gasket protection device and a dome-shaped hollow end closure at the closed end of the filter gasket protection device.

These and other advantageous features will be apparent from the detailed description below.

The invention will now be described in more detail below with reference to the appended drawings, which illustrate preferred embodiments of the device according to the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows schematically a cross-section of a spin-on filter and a corresponding filter mount and a first embodiment of a spin-on filter gasket protection device according to the invention,

Figure 2 shows schematically a cross-section of a spin-on filter and a corresponding filter mount and a second embodiment of a spin-on filter gasket protection device according to the invention,

Figure 3 shows schematically a cross-section of a spin-on filter and a corresponding filter mount and a third embodiment of a spin-on filter gasket protection device according to the invention, and

Figure 4 shows a view of a chassis for a vehicle, e.g. a commercial vehicle, e.g. a truck or a bus, comprising an engine, comprising a spin-on filter gasket protection device for a spin-on filter.

DESCRIPTION OF PREFERRED EMBODIMENTS

The same reference numerals are being used for similar features in the different drawings.

Figure 1 shows schematically a cross-section of a spin-on filter 2 and a corresponding filter mount 4 arranged on a device to which the spin-on filter 2 is to be attached during operation of the system containing the fluid 20 to be filtered by the spin-on filter, where the spin-on filter 2 comprises a spin-on filter housing 6, the latter comprising a filter body 8 defining a mouth 10 and further possibly comprising a cover 12, where the spin-on filter 2 further comprises a filter element 14 disposed in the spin-on filter housing 6. The spin-on filter 2 is mounted on the corresponding filter mount 4 during operation, in this embodiment by that the spin-on filter 2 comprises an internal thread 16, arranged to be brought into engagement with a corresponding external thread 18 on the filter mount 4.

In this embodiment, the cover 12 comprises at least one inlet opening and at least one outlet

opening for the fluid 20 to be filtered by the spin-on filter 2, but it is possible to arrange some or all of these openings on the filter body 8 instead if the mouth 10 is of such narrow dimensions that a cover 12 is not present. In this embodiment, the central opening is the outlet opening 22 of the spin-on filter 2, and a number of inlet openings 24, 26 are arranged in the cover 12 radially outside of the central opening 22 in the cover 12.

In operation, when fluid 20 is carried through the spin-on filter 2, the fluid 20 is usually under a pressure higher than the ambient pressure outside of the filter mount 4 and the spin-on filter 2. The above corresponding threads 16, 18 of the spin-on filter 2 and the filter mount 4 together form a seal preventing fluid from passing therethrough, thus forcing all of the fluid 20 flowing (see dashed arrows in figure 1) through the spin-on filter 2 to pass through the filter element 14. At least one gasket 28 is arranged between the spin-on filter housing 6 and the filter mount 4 in order to prevent fluid 20 from leaking out therebetween during operation. The gasket 28 is preferably fastened to the spin-on filter 2, preferably already at manufacture, and the spin-on filter 2 is then surrounded by a wrapping (not shown) thus allowing for keeping it clean until the wrapping is removed just prior to the mounting of the spin-on filter 2 to the filter mount 4, to facilitate ease of mounting. The gasket 28 could optionally be arranged separate from the spin-on filter 2. In this embodiment, the surface 30 on the gasket 28 which surface 30 is arranged to abut against a gasket contact surface 32 on the filter mount 4 is preferably "moistened" by oil prior to the mounting to further enhance the sealing properties of the gasket 28.

A spin-on filter 2 may comprise one gasket 28 or multiple, preferably coaxially arranged, gaskets. Here is shown one gasket 28 only. In case of multiple gaskets (not shown), the gasket 28 is arranged as the outermost gasket 28.

Figure 1 further shows a first embodiment of a spin-on filter gasket protection device 34 for a spin-on filter 2 according to the invention, wherein the spin-on filter gasket protection device 34 is to be arranged on a spin-on filter housing 6, and when the spin-on filter 2 is mounted to a corresponding filter mount 4, and when at least one gasket 28 is arranged between the filter mount 4 and the spin-on filter housing 6 at respective gasket contact surfaces 32, 36, is arranged to extend between an outer surface 38 of the spin-on filter housing 6 and an outer surface 40 of

the filter mount 4 outside E of the respective gasket contact surface 32, 36 for the outermost spin-on filter gasket 28.

In this embodiment, the spin-on filter gasket protection device 34 is arranged to the spin-on filter 2 in a manner of a "skirt", i.e. the spin-on filter gasket protection device 34 has the shape of a truncated hollow cone, which is rotationally symmetrical about the centre axis thereof, as can be seen in the figure. The spin-on filter gasket protection device 34 is preferably, at least somewhat, flexible and preferably has a central inner opening 42 having an inner diameter, at least somewhat, smaller than the outer diameter of the spin-on filter housing 6, the rim of the inner opening 42 of the spin-on filter gasket protection device 34 thus being pressed against the outer surface 38 of the spin-on filter housing 6 thus effecting an effective seal between these. The preferred flexibility of the spin-on filter gasket protection device 34 also allows for similar press and seal against the outer surface 40 of the filter mount 4 when the spin-on filter gasket protection device 34 arranged on the housing 6 is pressed against the filter mount 4 while undergoing flexible deformation.

Figure 2 shows a second embodiment of a spin-on filter gasket protection device 34 for a spin-on filter 2 according to the invention, wherein the spin-on filter gasket protection device 34 is to be arranged on a spin-on filter housing 6, and when the spin-on filter 2 is mounted to a corresponding filter mount 4, and when at least one gasket 28 is arranged between the filter mount 4 and the spin-on filter housing 6 at respective gasket contact surfaces 32, 36, is arranged to extend between an outer surface 38 of the spin-on filter housing 6 and an outer surface 40 of the filter mount 4 outside E of the respective gasket contact surface 32, 36 for the outermost spin-on filter gasket 28.

In this embodiment, the spin-on filter gasket protection device 34 is arranged to the spin-on filter 2 in a manner of a "hat", i.e. the spin-on filter gasket protection device 34 has a hollow substantially cylindrical intermediate body which is rotationally symmetrical about the centre axis thereof, and further has respectively integrally with the intermediate hollow body arranged a truncated hollow cone at an open end of the filter gasket protection device 34 and a dome-shaped hollow end closure at the closed end of the filter gasket protection device 34, as can be seen in

the figure. The spin-on filter gasket protection device 34 is preferably, at least somewhat, flexible and preferably has a central inner cavity 44 having an inner mouth opening 46 having an inner diameter, at least somewhat, smaller than the outer diameter of the spin-on filter housing 6, the rim of the inner mouth opening 46 of the spin-on filter gasket protection device 34 thus being pressed against the outer surface 38 of the spin-on filter housing 6 thus effecting an effective seal between these. The preferred flexibility of the spin-on filter gasket protection device 34 also allows for similar press and seal against the outer surface 40 of the filter mount 4 when the spin-on filter gasket protection device 34 arranged on the housing 6 is pressed against the filter mount 4 while undergoing flexible deformation.

Figure 3 shows a third embodiment of a spin-on filter gasket protection device 34 for a spin-on filter 2 according to the invention, wherein the spin-on filter gasket protection device 34 is to be arranged on a spin-on filter housing 6, and when the spin-on filter 2 is mounted to a corresponding filter mount 4, and when at least one gasket 28 is arranged between the filter mount 4 and the spin-on filter housing 6 at respective gasket contact surfaces 32, 36, is arranged to extend between an outer surface 38 of the spin-on filter housing 6 and an outer surface 40 of the filter mount 4 outside E of the respective gasket contact surface 32, 36 for the outermost spin-on filter gasket 28.

In this embodiment, the spin-on filter gasket protection device 34 is arranged to the spin-on filter 2 in a manner of a “skirt”, i.e. as shown in the embodiment shown in Figure 1, which is integrated with the outermost spin-on filter gasket 28 to one unit, the parts of which unit can be of the same material or differing materials depending e.g. on the flexibility and other properties desired for the different parts thereof. The spin-on filter gasket protection device 34 is preferably, at least somewhat, flexible and preferably has a central inner opening 42 having an inner diameter, at least somewhat, smaller than the outer diameter of the spin-on filter housing 6, the rim of the inner opening 42 of the spin-on filter gasket protection device 34 thus being pressed against the outer surface 38 of the spin-on filter housing 6 thus effecting an effective seal between these. The preferred flexibility of the spin-on filter gasket protection device 34 also allows for similar press and seal against the outer surface 40 of the filter mount 4 when the spin-on filter gasket protection device 34 arranged on the housing 6 is pressed against the filter mount

4 while undergoing flexible deformation.

In a similar manner (not shown), the spin-on filter gasket protection device 34 of figure 2 could be integrated with the outermost spin-on filter gasket 28 to one unit.

As can be seen in figures 1 to 3, the invention relates to a spin-on filter gasket protection device 34 for a spin-on filter 2, the spin-on filter 2 having at least one gasket 28 arranged between a corresponding filter mount 4 and the spin-on filter housing 6 at respective gasket contact surfaces 32, 36 when the spin-on filter 2 is mounted on the filter mount 4, where further the spin-on filter gasket protection device 34 is arranged to be mounted on the spin-on filter housing 6 and is arranged to extend between an outer surface 38 of the spin-on filter housing 6 and an outer surface 40 of the corresponding filter mount 4 outside E of the respective gasket contact surface 32, 36 for the outermost spin-on filter gasket 28. The invention also relates to a spin-on filter gasket protection arrangement, the spin-on filter gasket protection arrangement comprising a spin-on filter gasket protection device 34 and further comprising a spin-on filter 2 and a filter mount 4. The invention further also relates to a vehicle 48 comprising a spin-on filter gasket protection arrangement, an engine 50 comprising a spin-on filter gasket protection arrangement, and a spin-on filter 2 comprising a spin-on filter gasket protection device 34 for a spin-on filter 2.

The protection device 34 can thus comprise a lip extending in a direction out from the sidewall of the filter housing 6. The lip can preferably be of the same material as the main body of the protection device 34, but can also be of a different material. For example, different materials as set out below can be used or combined in the protection device. The lip acts to form a seal between the outer side surface of the spin-on filter and a surface, in particular a top surface, of a filter mount 4 on which the spin-on filter is to be mounted. The lip can in some embodiments extend in a direction out from the sidewall of the filter housing, i.e. out from the centre of the rotationally symmetrical protection device 34. The lip can preferably project at an angle, such as about 45 degrees, out from the centre line of the protection device in a direction towards the surface of a mount 4 to which the protection device is to seal.

Figure 4 shows a view of a chassis for a vehicle 48, e.g. a commercial vehicle, e.g. a truck or a

bus, comprising an engine 50, the vehicle 48 comprising a spin-on filter gasket protection device 34 for a spin-on filter 2, e.g. by that the engine 50 or some other part of the vehicle such as e.g. a gear box or an axle, etc., comprises a spin-on filter gasket protection device 34 for a spin-on filter 2 according to one embodiment mentioned above. The body of the vehicle 48 is not shown for reasons of clarity regarding the examples of possible uses of the spin-on filter gasket protection device 34.

The material for the spin-on filter gasket protection device 34 may e.g. be natural rubber, synthetic rubber, foamed rubber, metal, etc. other materials having the preferred flexibility. The spin-on filter gasket protection device 34 has to show some stiffness in order to maintain its desired shape, but is not exposed to high pressures in normal use. The gasket 28 can e.g. be made of nitrile rubber, etc.

The spin-on filter gasket protection device 34 may be a reusable part or a disposable article.

The features of the embodiments discussed above may be combined in further ways than those explicitly described in the embodiments above.

CLAIMS:

1. Spin-on filter gasket protection device for a spin-on filter (2), the spin-on filter (2) having at least one gasket (28) arranged to seal between a filter mount (4) and the spin-on filter housing (6) at respective gasket contact surfaces (32, 36), **characterized in,** that the spin-on filter gasket protection device (34) is further arranged to be mounted on the spin-on filter housing (6) and is arranged to extend between an outer surface (38) of the spin-on filter housing (6) and an outer surface (40) of the corresponding filter mount (4) outside (E) of the respective gasket contact surface (32, 36) for the outermost spin-on filter gasket (28).

2. Spin-on filter gasket protection device according to claim 1, **characterized in,** that the spin-on filter gasket protection device (34) is arranged integrated with the outermost spin-on filter gasket (28) to one unit.

3. Spin-on filter gasket protection device according to claim 1 or 2, **characterized in,** that the spin-on filter gasket protection device (34) has the shape of a truncated hollow cone which is rotationally symmetrical about the centre axis thereof.

4. Spin-on filter gasket protection device according to claim 1 or 2 or 3, **characterized in,** that the spin-on filter gasket protection device (34) is flexible and has a central inner opening (42) having an inner diameter smaller than the outer diameter of the spin-on filter housing (6).

5. Spin-on filter gasket protection device according to claim 1 or 2, **characterized in,** that the spin-on filter gasket protection device (34) has a hollow substantially cylindrical intermediate body which is rotationally symmetrical about the centre axis thereof, and further has respectively integrally with the intermediate hollow body arranged a truncated hollow cone at an open end of the filter gasket protection device (34) and a dome-shaped hollow end closure at the closed end of the filter gasket protection device (34).

6. Spin-on filter gasket protection device according to claim 1 or 2 or 5, **characterized in,** that the spin-on filter gasket protection device (34) is flexible and has a central inner cavity (44) having an inner mouth opening (46) having an inner diameter smaller than the outer diameter

of the spin-on filter housing (6).

7. Spin-on filter, **characterized in,** that it comprises a spin-on filter gasket protection device (34) for a spin-on filter (2) according to one of claims 1 to 6.

8. Spin-on filter gasket protection arrangement for a spin-on filter (2), **characterized in,** that it comprises a spin-on filter gasket protection device (34) according to one of claims 1 to 6, and further comprises a spin-on filter (2) and a filter mount (4).

9. Spin-on filter gasket protection arrangement according to claim 8, **characterized in,** that the spin-on filter housing (6) comprises a filter body (8) defining a mouth (10), and that the spin-on filter (2) further comprises a filter element (14) disposed in the spin-on filter housing (6).

10. Spin-on filter gasket protection arrangement according to claim 9, **characterized in,** that the spin-on filter housing (6) further comprises a cover (12).

11. Spin-on filter gasket protection arrangement according to claim 10, **characterized in,** that the cover (12) comprises at least one inlet opening (24, 26) and at least one outlet opening (22) for the fluid (20) to be filtered by the spin-on filter (2).

12. Spin-on filter gasket protection arrangement according to one of claims 8 to 11, **characterized in,** that the spin-on filter (2) is arranged to be mounted on the corresponding filter mount (4) by that the spin-on filter (2) comprises an internal thread (16) arranged to be brought into engagement with a corresponding external thread (18) on the filter mount (4).

13. Spin-on filter gasket protection arrangement according to one of claims 8 to 12, **characterized in,** that the spin-on filter gasket protection device (34) is arranged to be pressed against the filter mount (4) while undergoing flexible deformation when the spin-on filter (2) is mounted on the corresponding filter mount (4).

14. Engine, **characterized in,** that it comprises a spin-on filter gasket protection arrangement for a spin-on filter (2) according to one of claims 8 to 12.

15. Vehicle, **characterized in,** that it comprises an engine according to claim 14.

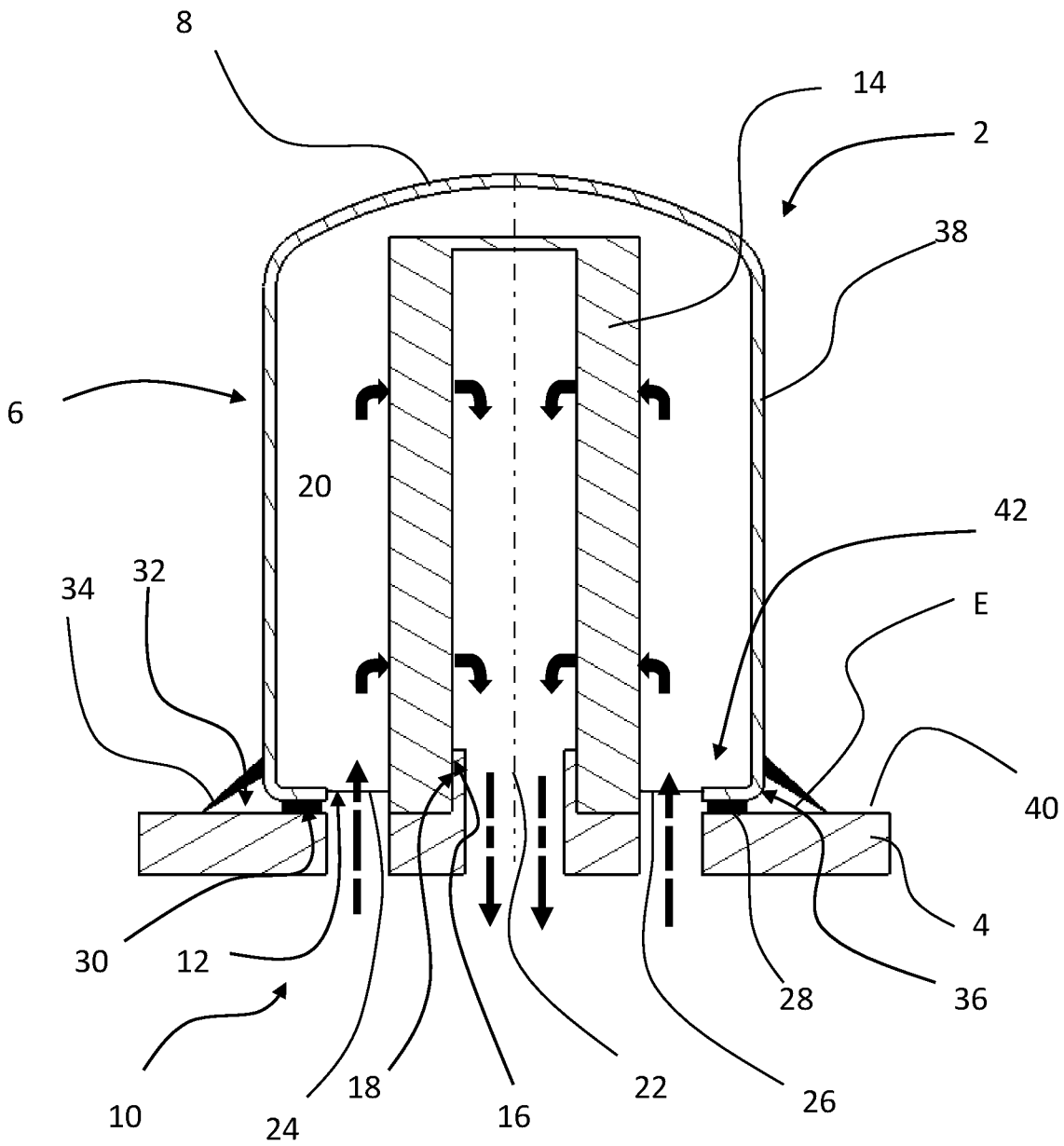

Fig. 1

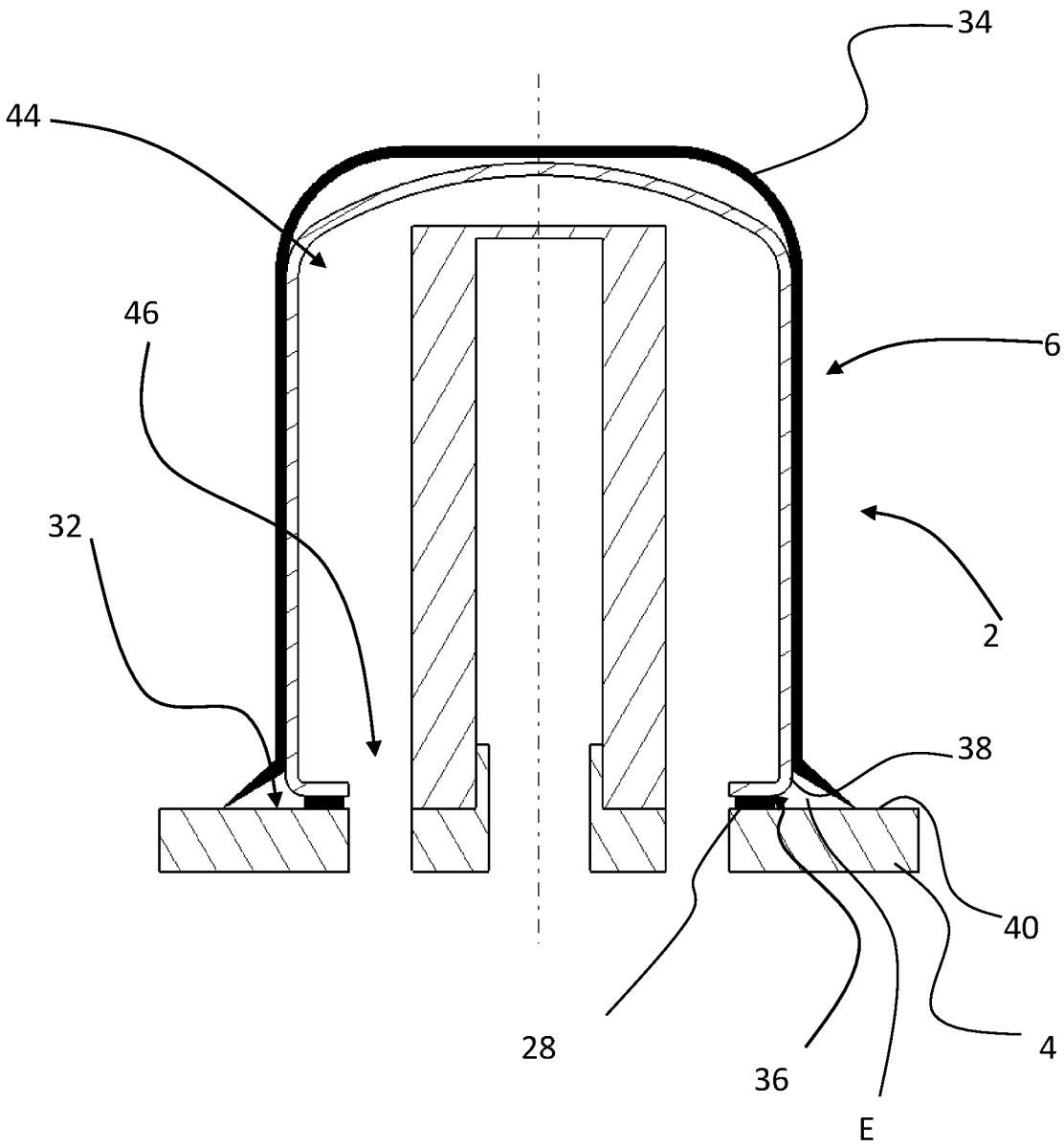

Fig. 2

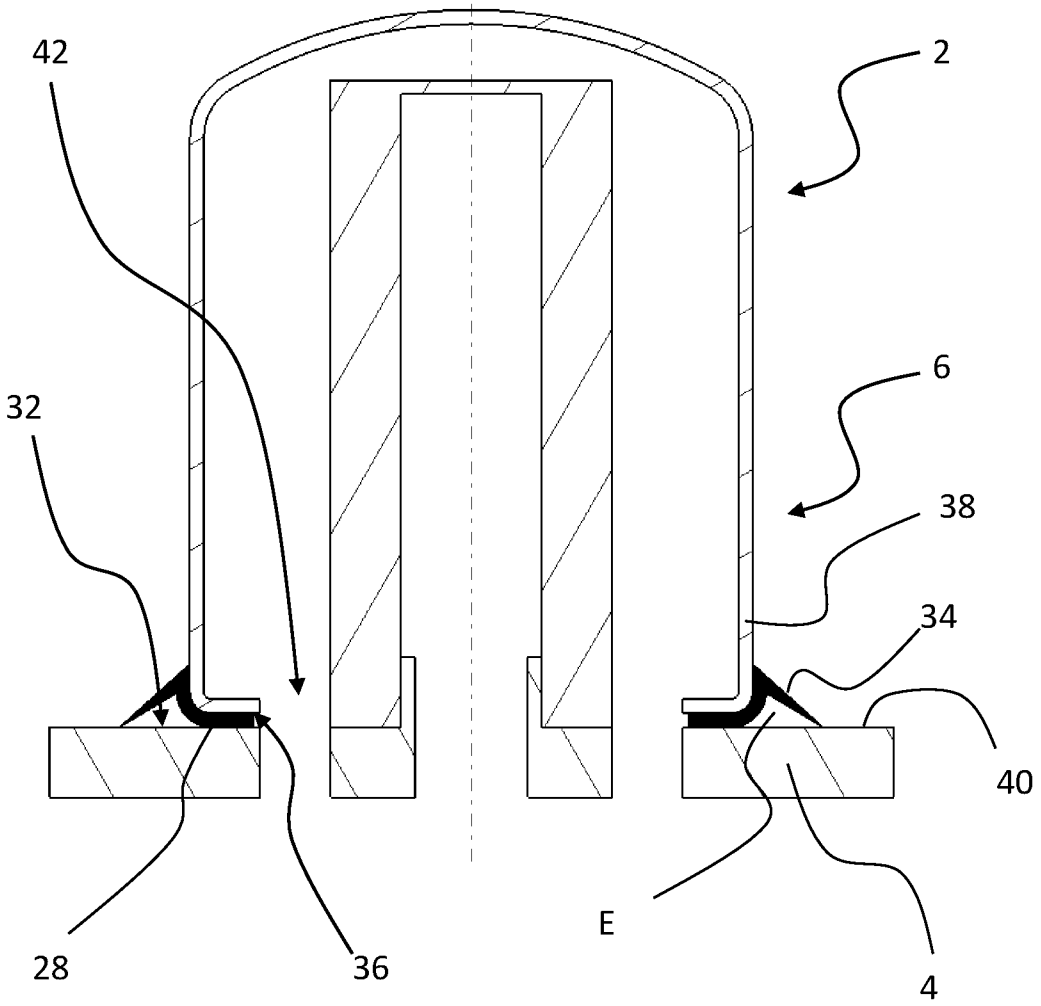

Fig. 3

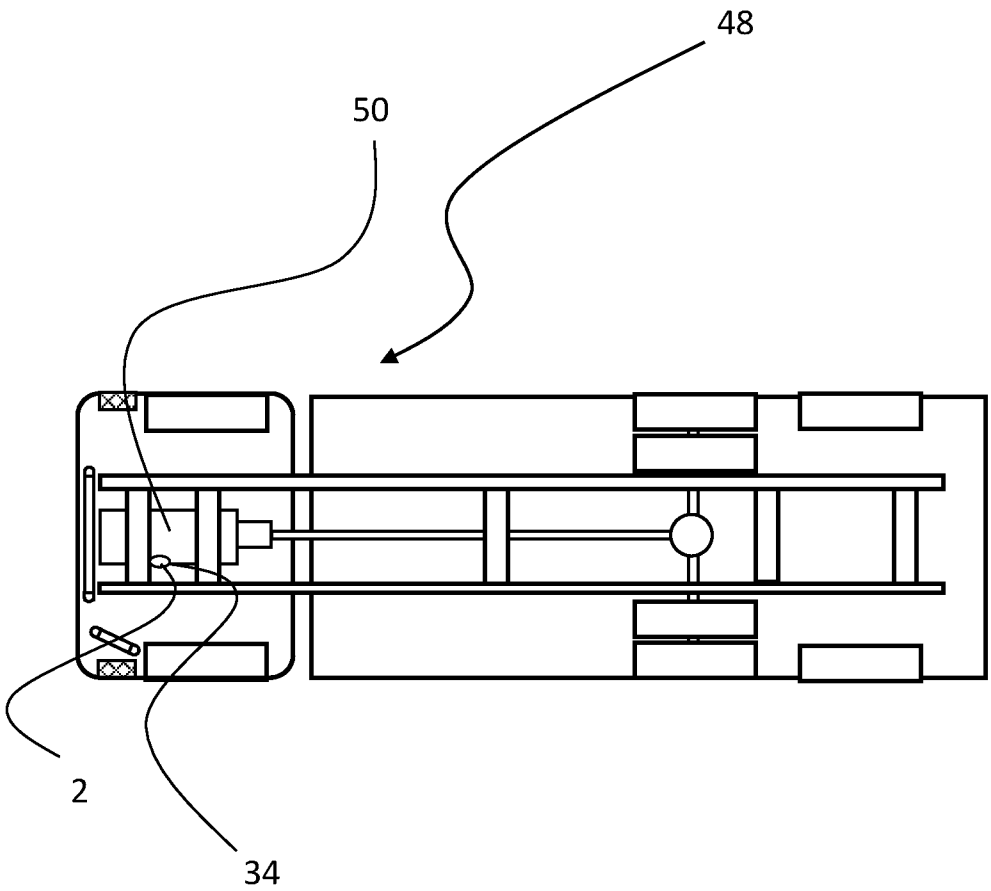

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2016/050412

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B01D, F01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20130220914 A1 (HAWKINS CHARLES W ET AL), 29 August 2013 (2013-08-29)	1-15
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A	US 20110303604 A1 (MCKENZIE DARRELL T), 15 December 2011 (2011-12-15)	1-15
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A	US 20070080106 A1 (GILLES JEREMY J ET AL), 12 April 2007 (2007-04-12)	1-15
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A	US 5817232 A (ROLL MARK A ET AL), 6 October 1998 (1998-10-06)	1-15
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27-07-2016	28-07-2016
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