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(54) **AIR VENTING DEVICE FOR A FILTER**

(71) Applicants: **Robert Bosch GmbH**, Stuttgart (DE); **Robert Bosch Engineering and Business Solutions Private Limited**, Bangalore (IN)

(72) Inventors: **Deepak Kumar Chinnathambi**, Salem (IN); **Munivel Ackumari**, Karimangalam (IN); **Navaneetha Krishnan Rathinam**, Karamadai (IN); **Suresh Kumar Palanisamy**, Ranagasamudram (IN); **Thangadurai Shanmugam**, Erode (IN); **Albrecht Oedekoven**, Ludwigsburg (DE)

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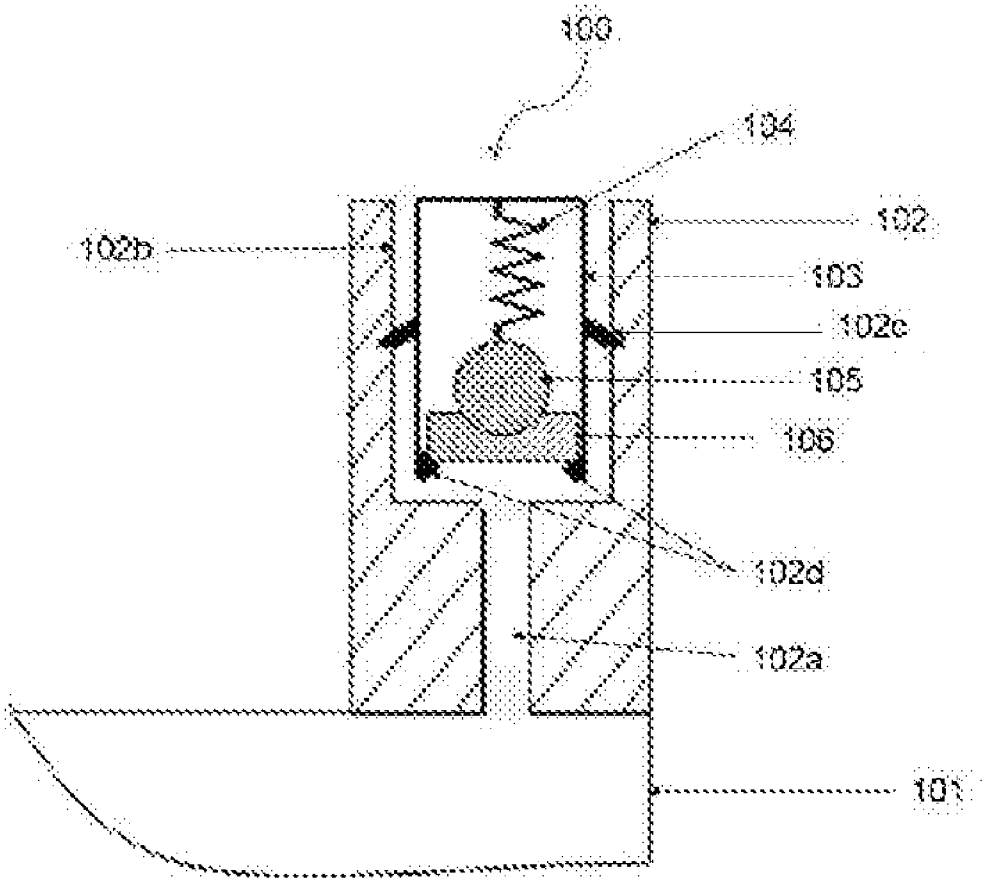
(57) **ABSTRACT**

An air venting device for a filter includes a flow path, a frame, a flexible element, a movable element, and a slab. The flow path includes a first flow path end and an opposite second flow path end, and is adapted to allow a fluid to flow through the air venting device. The frame is located in the second end of the flow path. The flexible element and the movable element are located in the frame in a manner such that one end of the flexible element is attached to the first end of the frame and second end of the flexible element is attached to the movable element. The slab is located in the second end of the frame in a manner such that the movable element abuts the slab.



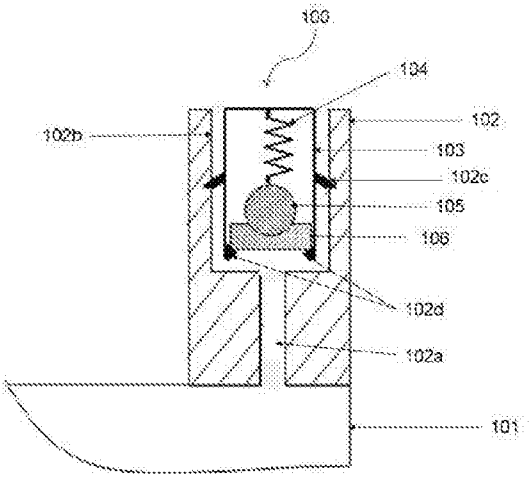


Figure 1

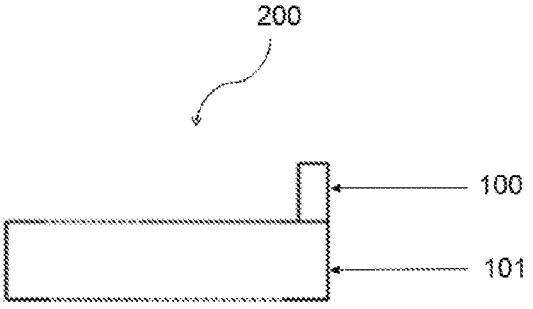


Figure 2

AIR VENTING DEVICE FOR A FILTER

[0001] This application claims priority under 35 U.S.C. § 119 to patent application number IN 201641040878 filed on Nov. 30, 2016 in India, the disclosure of which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The invention here relates to an air venting device for a filter.

BACKGROUND OF THE INVENTION

[0003] Selective Catalytic Reduction system is a technology used in diesel engines to reduce NOx emissions by having chemical reaction between aqueous urea solution and exhaust gas. The hydraulic circuit of selective catalytic reduction system consists of storage tank, pump, filters, valves, hose and spraying device and aqueous urea solution as working medium. In present system, the supply module pumps the working medium to the dosing module. Before pumping the working medium, the working medium is filtered so that to ensure that the clean working medium is supplied to the dosing module. The main filter is permanently fixed or welded with carrier assembly which holds the level sensor and then the carrier assembly is fitted to the tank. During the testing process of vehicle in the assembly plant, the selective catalytic reduction system is supposed to build the required system pressure within specified time which is the threshold value to pass the general criteria for all vehicles but the system fails. This failure is dependent on various parameters.

[0004] The U.S. Pat. No. 5,951,862 discloses a filter. Here the filter comprises a filter cartridge located within a housing. Fuel flows through a filter medium of the cartridge, in use, from an outer chamber to an inner chamber. From the inner chamber, the fuel flows over and around a sedimentation baffle located within a sedimentation chamber. Fuel exits the sedimentation chamber through an outlet passage, an air collection chamber being arranged to collect air from the flow of fuel. Air exits the air collection chamber via openings.

SUMMARY OF THE INVENTION

[0005] A first embodiment of the present invention includes an air venting device for a filter. The air venting device includes a flow path, a frame, a movable element, a flexible element, and a slab. The flow path includes a first flow path end and an opposite second flow path end, and is configured to allow a fluid to flow through the air venting device. The frame is located in the second flow path and includes a first frame end and a second frame end. The movable element is located in the frame. The flexible element is located in the frame and includes a first flexible element end attached to the first frame end and a second flexible element end attached to the movable element. The slab is located in the second frame end. The movable element abuts the slab.

[0006] A further embodiment of the present invention includes a filter for a selective catalytic reduction (SCR) system. The filter includes a filter housing and an air venting device. The filter housing is configured to enable a fluid to flow from the filter. The air venting device includes a flow path, a frame, a movable element, a flexible element, and a slab. The flow path includes a first flow path end and an opposite second flow path end, and is configured to allow a fluid to flow through the air venting device. The frame is located in the second flow path and includes a first frame end and a second frame end. The movable element is located in the frame. The flexible element is located in the frame and includes a first flexible element end attached to the first frame end and a second flexible element end attached to the movable element. The slab is located in the second frame end. The movable element abuts the slab.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[0007] An exemplifying embodiment of the invention is explained in principle below with reference to the drawings. The drawings are,

[0008] FIG. **1** illustrates an air venting device **100** for a filter **200** according to an embodiment of an invention; and

[0009] FIG. **2** illustrates a view of a filter **200** according to an embodiment of an invention.

DETAILED DESCRIPTION OF THE INVENTION

[0010] FIG. **1** shows an air venting device **100** for a filter **200**. The air venting device **100** comprises a flow path **102**, a frame **103**, a flexible element **104**, a movable element **105** and a slab **106**. The flow path **102** adapted to allow a fluid to flow through the air venting device **100**. The frame **103** is located in a second end **102***b* of the flow path **102**. A flexible element **104** and a movable element **105** is located in the frame **103** in a manner such that one end of the flexible element **104** is attached to one end of the frame **103** and second end of the flexible element **104** is attached to the movable element **105** and the slab **106** is located in the second end of the frame **103** in a manner such that the movable element **105** abuts the slab **106**.

[0011] In the air venting device **100**, the flexible element **104** is a spring element and one end of the spring element is attached to the first end of the frame **103** and other end of the spring element is attached to the movable element **105**. The movable element **105** is a structure made up of material which is compatible for the fluid. For example if the fluid is Ad blue then the compatible material for movable element **102***d* is HNBR i.e. hydrogenated nitrile butadiene rubber. Also the fluid disclosed as above refers to air, liquid or any other liquid variants.

[0012] In the air venting device **100**, the first end **102***a* of the flow path **102** is adapted to have first diameter and second end **102***b* of the flow path **102** adapted to have second diameter. The diameters of both the first end **102***a* and the second end **102***b* of the flow path **102** are different and the diameter of the second end **102***b* of the flow path **102** is larger than the diameter of the first end **102***a* of the flow path **102** so that the frame **103** can be easily located in the second end **102***b* of the flow path **102**.

[0013] According to an embodiment of this disclosure, in the air venting device **100**, the frame **103** is locked to the second end **102***b* of the flow path **102** by a locking means **102***c*. Here the locking means **102***c* can be for example a snap fit lock which locks the frame **103** to the second end **102***b* of the flow path **102** from inside. The locking means **102***c* can be any means which is capable to lock the frame **103** to the second end **102***b* of the flow path **102** from inside.

For example the locking means **102***c* is a screw and preferably the locking means **102***c* is located in between the second end **102***b* of the flow path **102** and the frame **103**.

[0014] According to an embodiment of this disclosure, the frame **103** has at least two protrusions **102***d* to hold the slab **106**. Here the protrusions **102***d* are the extensions from the frame **103** so that the slab **106** can be held easily on the extensions. Also the slab **106** is a salt slab which can be dissolved easily into the fluid.

[0015] According to an embodiment of this disclosure, the slab **106** is adapted to hold the movable element **105** when the flexible element **104** is in the compressed state. The movable element **105** is held by the slab **106**. One end of the flexible element **104** is attached to the movable element **105** on one side and the second side of the movable element **105** is free and therefore held by the slab **106**. Also the flexible element **104** is in the compressed state when the slab **106** is holding the movable element **105**.

[0016] The flexible element **104** is adapted to expand and contract based on the movement of the movable element **105**. Also as described above the slab **106** is a salt slab which can dissolve into the fluid. So when the slab **106** comes in contact with the fluid it dissolves and then the movable element **105** due to pre-tensioned force of flexible element **104**, starts moving down and finally seals the first end **102***a* of the flow path **102**.

[0017] FIG. **2** shows a filter **200** for a selective catalytic reduction system. The filter **200** comprises a filter housing **100** for a fluid to flow. The filter **200** further comprises an air venting device **100**. The air venting device **100** comprises a flow path **102**, a frame **103**, a flexible element **104**, a movable element **105** and a slab **106**. The flow path **102** is adapted to allow the fluid to flow through an air venting device **100** from the filter housing **101**. The frame **103** is located in the second end **102***a* of the flow path **102**. The flexible element **104** and the movable element **105** is located in the frame **103** in a manner such that one end of the flexible element **104** is attached to the first end of the frame **103** and second end of the flexible element is attached to the movable element **105** and the slab **106** is located in the second end of the frame **103** in a manner such that the movable element **105** abuts the slab **106**.

[0018] The main aim of the air venting device in accordance with this disclosure is to vent the trapped air out from the filter **200** during final testing of the vehicle. This is a onetime process. By doing this, the selective catalytic reduction system of a vehicle will be able to build the required pressure for example 1.5 bar in a limited time which is say 120 seconds.

[0019] When the fluid is filled inside the filter **200** for the first time, the trapped air from the filter **200** starts moving upwards in the air venting device **100** via the first end **102***a* of the flow path **102** and as the volume of the fluid increases the trapped air is vacated from the filter **200** via air venting device **101**. As the volume of the fluid increases, the fluid from filter housing **101** flows to the air venting device **100** and touches the slab **106** where the slab **106** dissolves in the fluid and the movable element **105** held by the slab **106** moves down and blocks the first end **102***a* of the flow path **102**. One the air venting device **100** is blocked, the fluid starts flowing to the system of the vehicle. This blockage of air venting device **100** will be for the entire life time of the selective catalytic reduction system of the vehicle.

[0020] It must be understood that the embodiments explained in the above detailed description in only illustrative and does not limit the scope of this invention. The scope of this invention is limited only by the scope of the claims. Many modification and changes in the embodiments aforementioned are envisaged and are within the scope of this invention.

1. An air venting device for a filter, comprising:
- a flow path including a first flow path end and an opposite second flow path end, the flow path configured to allow a fluid to flow through the air venting device;
- a frame located in the second flow path end and including a first frame end and a second frame end;
- a movable element located in the frame;
- a flexible element located in the frame and including a first flexible element end attached to the first frame end and a second flexible element end attached to the movable element; and
- a slab located in the second frame end,
- wherein the movable element abuts the slab.

2. The air venting device as claimed in claim **1**, wherein:
- the first flow path end has a first diameter;
- the second flow path end has a second diameter; and
- the first diameter is different from the second diameter.

3. The air venting device as claimed in claim **1**, wherein the frame is locked to the second flow path end by a locking element.

4. The air venting device as claimed in claim **1**, wherein the frame further includes at least two protrusions configured to holds the slab.

5. The air venting device as claimed in claim **1**, wherein, in response to the flexible element being in a compressed state, the slab is configured to hold the movable element.

6. The air venting device as claimed in claim **1**, wherein the flexible element is configured to expand and contract based on movement of the movable element.

7. A filter for an selective catalytic reduction system, comprising:
- a filter housing configured to enable a fluid to flow from the filter; and
- an air venting device including:
  - a flow path including a first flow path end and an opposite second flow path end, the flow path configured to allow the fluid to flow through the air venting device from the filter housing;
  - a frame located in the second flow path end and including a first frame end and a second frame end;
  - a movable element located in the frame
  - a flexible element located in the frame and including a first flexible element end attached to the first frame end and a second flexible element end attached to the movable element; and
  - a slab located in the second frame end such that the movable element abuts the slab.

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