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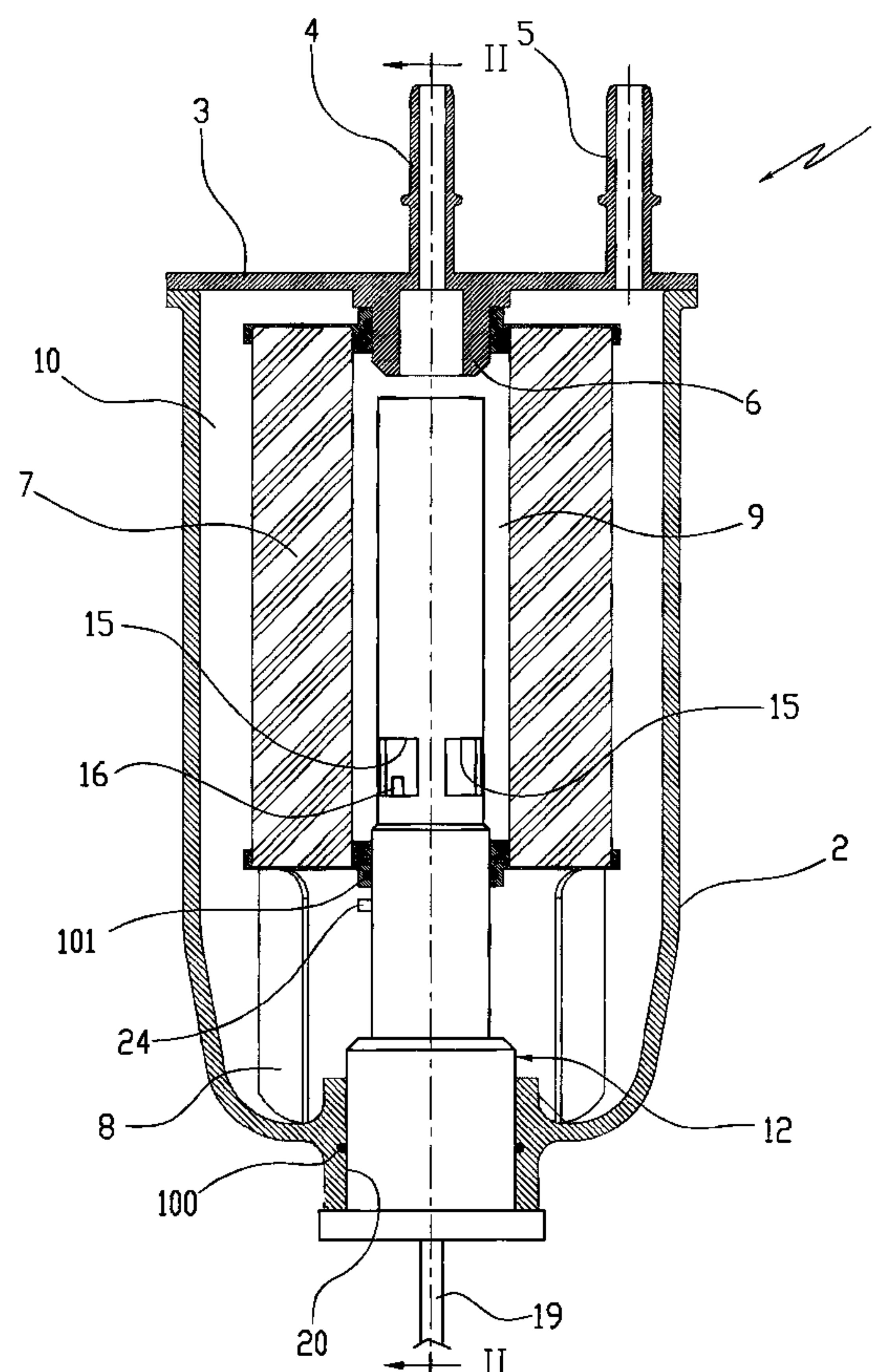
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(54) Title: FUEL FILTER FOR DIESEL INTERNAL COMBUSTION ENGINES



(57) **Abrégé/Abstract:**

For diesel internal combustion engines, an improved filter unit comprising an outer casing (2, 3) the interior of which is separated by a filtering baffle (7) into two separate chambers to which a fuel inlet conduit (4) and a fuel outlet conduit (5) are connected respectively, with said casing there being associated a device (12) provided with sensors (16) for measuring certain characteristic parameters for correct engine operation.

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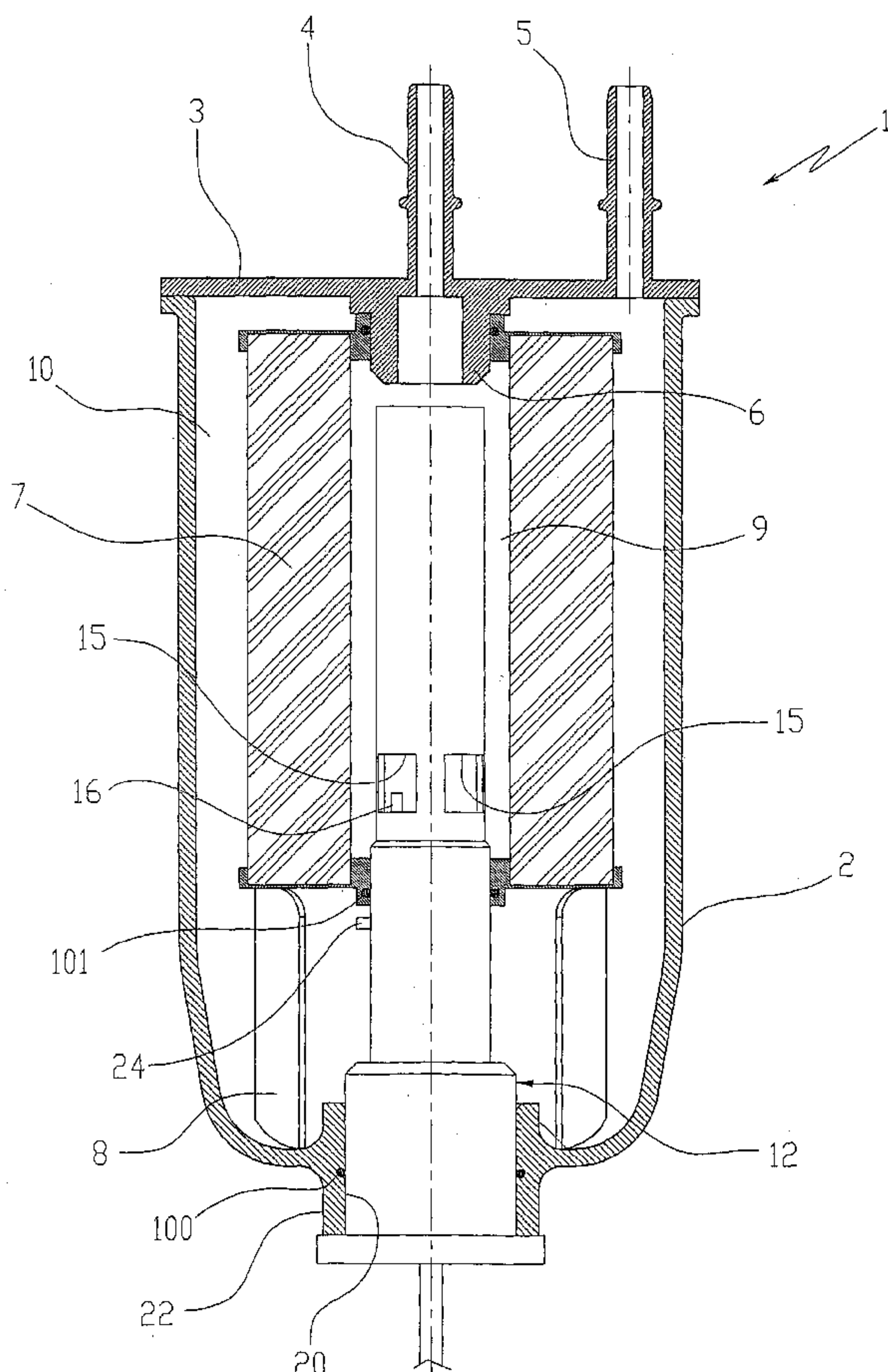
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FUEL FILTER FOR DIESEL INTERNAL COMBUSTION ENGINES**TECHNICAL FIELD**

The present invention relates to a filter unit to be associated with diesel internal combustion engines, and in particular to a filter unit provided with a combined device for measuring certain parameters which enable functional characteristics of the engine to be monitored and/or adjusted.

PRIOR ART

- 10 For their correct operation, modern diesel engines require numerous parameters to be measured, such as the diesel fuel temperature, or possible water presence in the fuel filter.

The known art teaches that some of the parameters to be measured are measured by a plurality of individual devices associated with the fuel filter. For example, devices are known for sensing water presence in the filter, devices for measuring fuel temperature, and devices for regulating the fuel temperature within the filter to facilitate engine start under unfavourable climatic conditions.

- 20 All these devices are currently associated individually with the filter and are often composed of disposable measurement and/or checking elements, i.e. which are replaced together with the filter and are therefore necessarily elements of low quality.

The document DE 20115220 U1 discloses a heating unit to be associated to a fuel filter unit.

The heating unit comprises a the inlet passage for the fuel, an heating means contained in an elongated tube to be inserted into the casing of the filter unit, the

elongated tube having a head intended to be externally fixed to the casing of the filter unit for containing electronic control means of the heating means.

The electric control means is responsive to sensors located within the tube.

The device of DE 20115220 presents some drawbacks because it extends over the overall dimensions of the filter unit, and requests a modification of the design of the filter unit to be associated therewith.

- 10 Specifically, on replacing the filter, the user has to remove all the connection plugs of each sensor of the individual devices to then reconnect them to the sensors installed on the new filter. In view of the large number of sensors, all this represents a considerable time, and a possible source of connection errors.

There is therefore a need for a filter unit provided with a combined device which comprises all the sensors required to measure engine operating parameters and is simple to install on replacing the filter.

DISCLOSURE OF THE INVENTION

- 20 The object of the present invention is to satisfy said requirement within the context of a simple, rational and low-cost solution.

The invention attains said object by virtue of a disposable filter unit for diesel internal combustion engines comprising an outer casing the interior of which is separated by a filtering baffle into a first chamber and a second chamber to which a fuel inlet conduit and a fuel outlet conduit are connected respectively, characterised by comprising a removable device received within the casing through a tubular hole, coaxial to the baffle in a position opposite to said inlet and outlet conduits, said device having an elongated shape internally comprising two separate portions, a first portion positioned entirely inside the first chamber and a second portion

positioned inside the second chamber near the tubular hole, the first portion housing sensors for measuring certain characteristic parameters for correct engine operation, and the second portion housing water level sensor for measuring the level of water which accumulates at the bottom of the casing, all said sensors being permanently connected to electronic control means which are incorporated into said removable device and are permanently connected to control means of the engine which the filter is applied to.

10 Specifically the invention provides, for diesel internal combustion engines, a filter unit comprising an outer casing the interior of which is separated by a filtering baffle into two separate chambers to which a fuel inlet conduit and a fuel outlet conduit are connected respectively, in the interior of said casing there being housed a device, removable from outside the casing, for measuring certain characteristic parameters for correct engine operation.

BRIEF DESCRIPTION OF THE DRAWINGS

20 The characteristics and the constructional merits of the invention will be more apparent from the ensuing description given with reference to the figures of the accompanying drawings which illustrate a particular preferred embodiment by way of non-limiting example.

Figure 1 is a side section through the filter unit of the invention;

Figure 2 is a schematic section, taken on the line II-II of Figure 1, through the combined device with which the unit of the invention is provided;

Figure 3 shows the section III-III of Figure 2.

BEST MODE FOR CARRYING OUT THE INVENTION

Said figures show the filter unit 1, comprising a cup-shaped outer casing 2 closed upperly by a cover 3 on which a fuel inlet conduit 4 and a fuel outlet conduit 5 are

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positioned.

The inlet conduit 4, positioned centrally, extends below the cover to define a stem 6, the function of which will be clarified hereinafter.

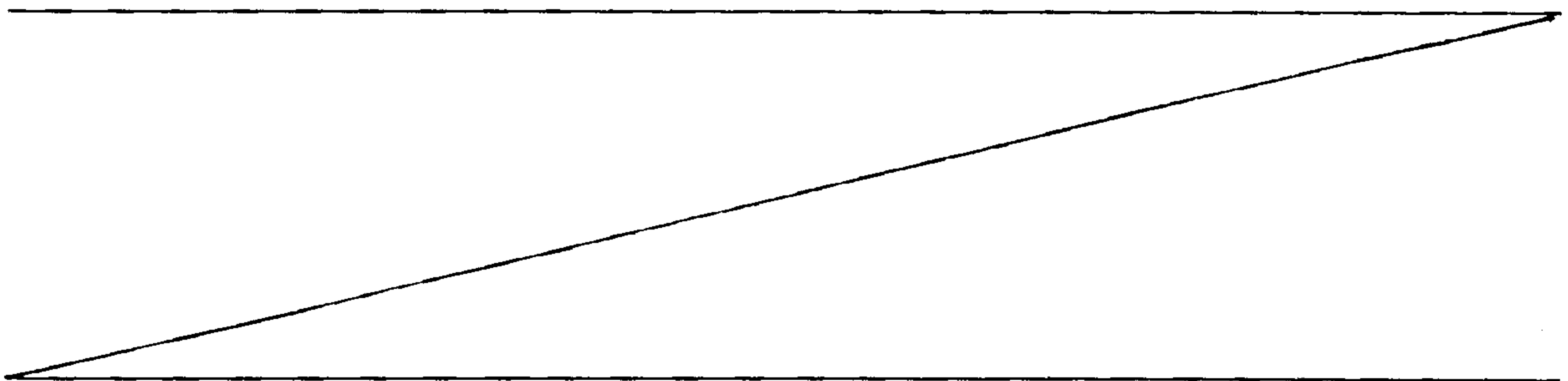
The interior of the casing 2 houses a toroidal filtering baffle 7 supported between a lower end 8 and the stem 6 branching from the cover 3.

10 Said filtering baffle 7 divides the interior of the casing 2 substantially into two separate chambers 9 and 10, of which the first, 9, is connected to the inlet conduit 4 for the fuel to be filtered, and the second, 10, is connected to the outlet conduit 5 for the filtered fuel.

The casing 2 lowerly presents a tubular hole 20 which receives a device 12 carrying sensors for measuring a certain number of parameters necessary for correct operation of the engine, not shown, provided with the filter unit 1.

20 In the illustrated embodiment, the device 12 contains a temperature measurement sensor, a fuel heating device, and a sensor for sensing water collected on the base of the casing 2.

With particular reference to Figures 2 and 3, the device 12 is shaped externally as a shaft of differing cross-section which is inserted under



sealed conditions, by virtue of gaskets 100 and 101, into the casing 2 and the filtering baffle 7, and extends nearly as far as the stem 6. Said device 12 and the filtering baffle 7 then together define said chambers 9 and 10. The device 12 is made rigid with the casing 2 by a usual fixing means, not
5 shown, such as a peg or a set screw.

Internally the device 12 is hollow and divided into two separate portions, of which the upper portion 13 is positioned inside the chamber 9 and the underlying lower portion 14 is positioned inside the chamber 10.

The upper portion 13 is upperly open, being in the form of a cup, and
10 presents two rectangular apertures 15 in its lateral surface.

The portion 13 houses in its interior, in proximity to said apertures 15, a sensor 16 for measuring the fuel temperature, said sensor being connected to an electronic control card 17 housed in the lower portion 14 of the device.

15 The upper portion 13 also houses in its interior a heating device 18, of known type, also connected to said electronic control card 17.

The device 12 also comprises sensors which sense the presence of an excessive quantity of water accumulated in the bottom of the casing 1. In the illustrated embodiment said sensors comprise two inductive electrodes
20 24 which branch from the outer surface of the lower portion 14 of the device 12 and are connected to said control card 17.

The control card 17 is connected to the vehicle control system by a data transmission cable 19.

This integration of all sensors within the device 12 enables the filter to be
25 easily and quickly replaced. For this purpose, after removing the fixing means, not shown, the operator has merely to withdraw the device 12

from the casing 2 and reinsert it into the casing of the new filter unit, hence enabling better quality components to be used.

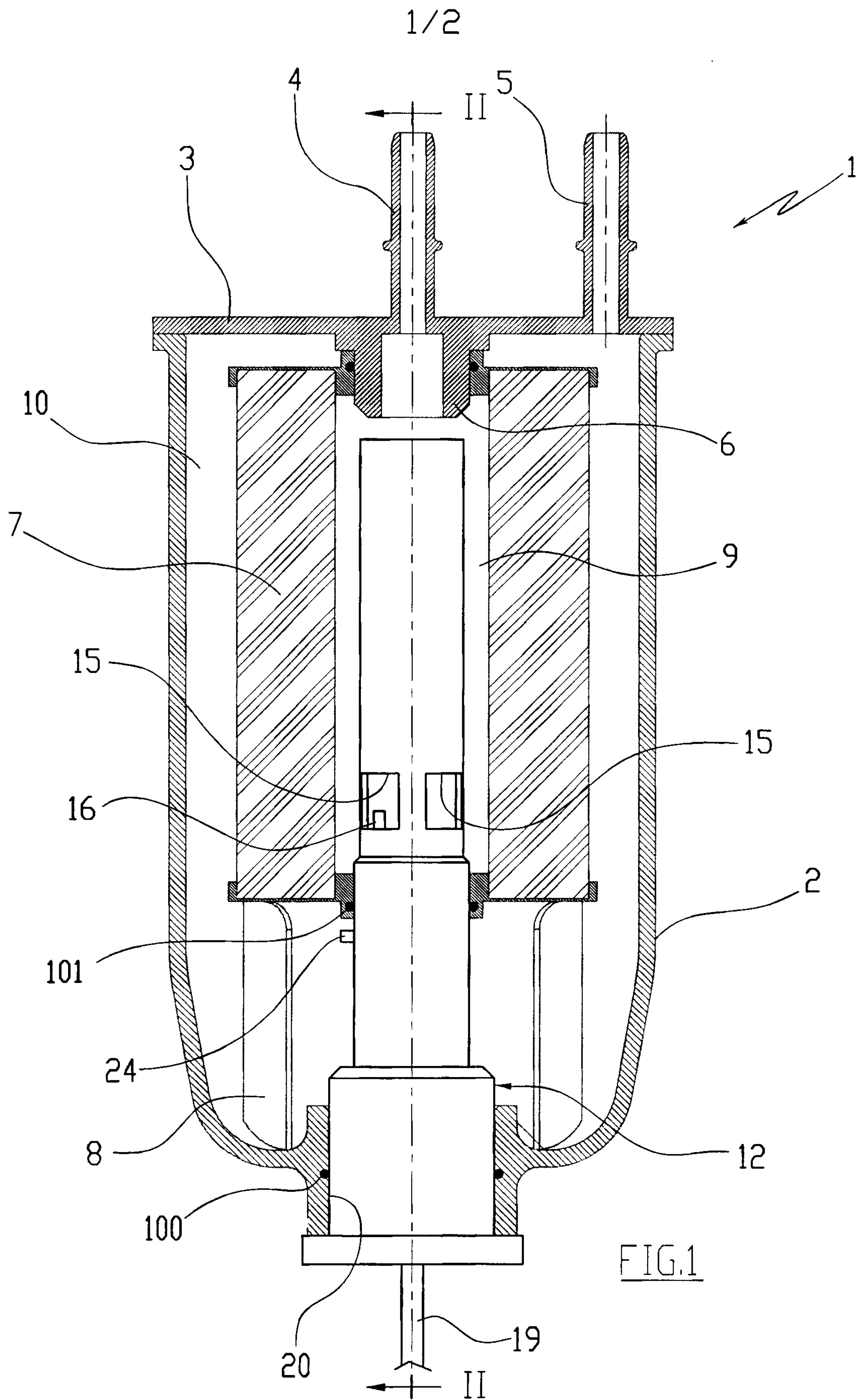
It should also be noted that the shaft-like construction of the device 12 offers the further advantage that no sensor components are disposed of
5 as happens in the known art, so considerably reducing the overall cost of the filter unit.

Finally, in other embodiments the device 12 can incorporate sensors different in terms of number and/or function from those previously described.

WHAT IS CLAIMED IS:

1. For diesel internal combustion engines, a disposable filter unit (1) comprising an outer casing (2) the interior of which is separated by a filtering baffle (7) into a first chamber (9) and a second chamber (10) to which a fuel inlet conduit (4) and a fuel outlet conduit (5) are connected respectively, characterised by comprising a removable device (12) received within the casing (2) through a tubular hole (20), coaxial to the baffle (7) in a position opposite to said inlet and outlet conduits (4, 5), said device (12) having an elongated shape internally comprising two separate portions, a first portion (13) positioned entirely inside the first chamber (9) and a
10 second portion (14) positioned inside the second chamber (10) near the tubular hole (20), the first portion (13) housing sensors (16, 18) for measuring certain characteristic parameters for correct engine operation, and the second portion (14) housing water level sensor (24) for measuring the level of water which accumulates at the bottom of the casing (2), all said sensors (16, 18, 24) being permanently connected to electronic control means (17) which are incorporated into said removable device (12) and are permanently connected to control means of the engine which the filter (1) is applied to.
2. A filter unit (1) as claimed in claim 1, characterised in that a seal gasket (101) is interposed between said device (12) and said filtering baffle (7).
- 20 3. A filter unit (1) as claimed in claim 1, characterised in that said device (12) is shaped as a shaft with different cross-sections.
4. A filter unit (1) as claimed in claim 3, characterised in that said first portion (13) presents in its outer surface at least one aperture (15) for fuel entry.
5. A filter unit (1) as claimed in claim 4, characterised in that said electronic control means comprise an electronic control card (17).

6. A filter unit (1) as claimed in claim 1, characterised in that said sensors (16, 18) for measuring certain characteristic parameters for correct engine operation comprise a temperature measurements device (16) and a heating device (18).
7. A filter unit (1) as claimed in claim 1, characterised in that said water level sensor (24) comprises two inductive electrodes (24) which branch from the outer surface of the second portion (14) of the device (12).



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