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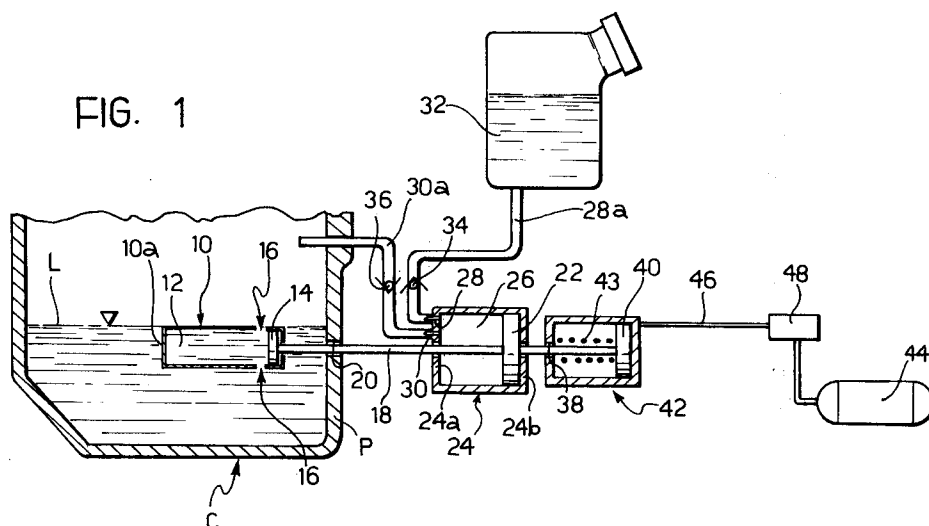
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I-10121 Torino (IT)(54) **An automatic device for topping up engine oil.**

(57) An automatic device for topping up the liquid in a container (C), particularly for topping up lubricating oil in the sump of an internal combustion engine, includes a sensor cylinder (10), an actuator cylinder (24), and programmed operating means (42, 48, 44) for moving the pistons (14, 22) of the sensor and actuator cylinders (10, 24). The presence or absence

of liquid in the chamber (12) of the sensor cylinder (10) prevents or enables the sliding of the pistons (14, 22) so that the piston (22) of the actuator cylinder (24) supplies to the container (C) a quantity of liquid which is correlated with the level of the liquid in the container (C).

FIG. 1

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The present invention relates to an automatic device for topping up the liquid in a container. The invention relates in particular to an automatic device for topping up lubricating oil in the sump of an internal combustion engine.

Currently, automatic top-up devices comprise a system with containers which communicate with float-chambers, or systems in which the oil level in the sump or in the communicating container is detected electronically and topped up by means of an electric pump.

In the first case, failures have been encountered because of the small differences in level involved in closing/opening the valve which admits oil to the sump; in some cases, such failures have led to the sump being completely flooded with oil.

In the second case, both the costs of development in order to achieve adequate levels of reliability and the production costs have been found to be quite high.

The object of the present invention is to provide a device of the type specified at the beginning of the description which achieves high levels of reliability at considerably lower costs than systems in which the level of the oil in the sump is detected electronically.

According to the invention, this object is achieved by virtue of the fact that the device includes a sensor cylinder having a piston slidable sealingly in a chamber and being disposed substantially at the desired level for the liquid in the container, the chamber having at least one hole for the passage of the liquid, an actuator cylinder having a piston and inlet and outlet connectors connected to a supplementary reservoir and to the container, respectively, with the interposition of non-return valves, mechanical connection means between the pistons of the sensor cylinder and the actuator cylinder, and programmed operating means for moving the pistons of the sensor and actuator cylinders, the presence or absence of liquid in the chamber of the sensor cylinder preventing or enabling the sliding of the pistons, and the piston of the actuator cylinder thus supplying to the container a quantity of liquid which is correlated with the level of the liquid in the container.

By virtue of these characteristics, the operation of the sensor cylinder is based substantially on the non-compressibility of liquids. In fact, the quantity of liquid in the chamber of the sensor cylinder is proportional to the level of the liquid in the container; the actuator cylinder can therefore deliver a certain quantity of liquid only when there is a certain quantity of compressible air in the chamber. Moreover, the mechanical connection between the pistons of the sensor and actuator cylinders makes the device particularly compact and reliable and its electronics are considerably simplified and are

limited to a timer associated with the operating means.

Preferably, the sensor cylinder comprises a blind cylinder disposed with its axis substantially parallel to the surface of the liquid in the container, the arrangement of its axis being such that, in the configuration in which the level in the container is at its maximum, the cylinder is almost completely covered by the liquid.

This arrangement improves the sensitivity of the sensor.

Further advantages and characteristics of the top-up device according to the invention will become clear from the following detailed description, given purely by way of non-limiting example, with reference to the appended drawings, in which:

Figure 1 is a schematic view of a device according to the invention in a rest configuration, and

Figure 2 is a detail of the device of Figure 1 in an operative, topping-up configuration.

With reference to the drawings, the maximum level of the oil in the oil sump, indicated C, of a commercial vehicle engine is indicated L in Figure 1. The axis of a blind cylinder 10 fixed in the sump C is substantially parallel to the surface of the oil and is disposed so that, in the configuration shown in Figure 1, in which the level is at its maximum, the surface L laps over the wall of the cylinder 10. The cylinder 10 defines a chamber 12 in which a piston 14 is sealingly slidable. The cylindrical surface of the cylinder 10 has holes 16 adjacent an end opposite its blind end, indicated 10a, through which the oil can pass and the function of which will become clear from the following description.

The centre of the piston 14 is fixed to a rod 18 which is slidable sealingly in a through-hole 20 in a side wall P of the sump C. The centre of a piston 22 of an actuator cylinder 24, disposed outside the sump C and fixed to a support structure (not shown), is fixed to the rod 18.

The actuator cylinder 24 has a cylindrical chamber 26 in which the piston 22 is sealingly slidable and has an end 24a with two connectors 28, 30 which are connected to a supplementary oil reservoir 32 and to the sump C, respectively, by means of pipes 28a and 30a. Non-return valves 34 and 36 are fitted in the pipes 28a and 30a, respectively.

The operating rod 18, which connects the blind cylinder 10 and the actuator cylinder 24, extends beyond the cylinder 24 through a central guide hole 38 in a second end 24b of the cylinder 24; a further piston 40 of a single-acting pneumatic cylinder 42 connected to a compressed-air supply 44 by means of a pipe 46 is fixed to the rod 18. A solenoid valve 48 connected in the pipe 46 is associated with an electronic timing circuit for putting the compressed-air supply 44 periodically into

communication with the pneumatic cylinder 42.

In the configuration shown in Figure 1, in which the oil level is at its maximum, the oil in the chamber 12 of the blind cylinder 10 prevents the piston 14 from sliding and thus prevents the sump C from being topped up with lubricating oil from the supplementary reservoir 32.

When the level L in the sump falls, for example, to a level L_1 , as shown in Figure 2, the level in the chamber 12 of the blind cylinder 10 also falls simultaneously, by virtue of the presence of the through-holes 16. The operation of the pneumatic cylinder 42 thus enables the piston 14 to travel a distance proportional to the volume of air initially present in the chamber 12 of the cylinder 10 (Figure 2). The stroke of the piston 14 corresponds to the stroke of the piston 22 of the actuator 24 which delivers a quantity of oil such as to top up the level L_1 . When the pneumatic cylinder 42 ceases to act (when it is discharged) the chamber 26 is filled with oil from the supplementary reservoir 32 as a result of the return stroke of the piston 22 of the actuator cylinder 24 caused by a spring 43, and the oil is then injected into the sump C during the next topping-up.

Naturally, the principle of the invention remaining the same, the details of construction and forms of embodiment may be varied widely with respect to those described and illustrated, without thereby departing from the scope of the present invention.

For example, the pneumatic cylinder may be replaced by other operating means suitable for moving the pistons 14 and 22. Similarly, the mechanical connection system between the blind cylinder and the actuator cylinder for delivering the lubricating oil to the sump may also differ from that shown by way of example in the drawings.

Moreover, according to another characteristic of the invention, the timer associated with the solenoid valve 48 may be programmable according to the maximum oil flow required.

Claims

1. An automatic device for topping up the liquid in a container, particularly for topping up lubricating oil in the sump of an internal combustion engine, characterised in that it includes:
 - a sensor cylinder (10) having a piston (14) slidable sealingly in a chamber (12) and being disposed substantially at the desired level (L) for the liquid in the container (C), the chamber (12) having at least one hole (16) for the passage of the liquid,
 - an actuator cylinder (24) having a piston (22) and inlet and outlet connectors (28,

30) connected to a supplementary reservoir (32) and to the container (C), respectively, with the interposition of non-return valves (34, 36),

- mechanical connection means (18) between the pistons (14, 22) of the sensor cylinder (10) and the actuator cylinder (24), and
- programmed operating means (42, 48, 44) for moving the pistons (14, 22) of the sensor and actuator cylinders (10, 24), the presence or absence of liquid in the chamber (12) of the sensor cylinder (10) preventing or enabling the sliding of the pistons (14, 22) and the piston (22) of the actuator cylinder (24) thus supplying to the container (C) a quantity of liquid which is correlated with the level of the liquid in the container (C).

2. A device according to Claim 1, characterised in that the sensor cylinder comprises a blind cylinder (10) disposed with its axis substantially parallel to the surface (L, L_1) of the liquid in the container (C), the arrangement of its axis being such that, in the configuration in which the level (L) in the container is at its maximum, the cylinder (10) is almost completely covered by the liquid.

3. A device according to Claim 1 or Claim 2, characterised in that the mechanical connection means comprise a single rod (18) for operating the pistons (14, 22).

4. A device according to Claim 3, characterised in that the programmed operating means comprise a pressurised-fluid cylinder (42) for causing the rod (18) to slide, timing means (48) being associated with the pressurised-fluid cylinder (42) for causing it to operate periodically.

5. A device according to any one of Claims 2-4, characterised in that the blind cylinder (10) is disposed within the sump (C) of an engine, the operating rod (18) being slidable sealingly through a hole (20) in the sump (C).

6. A device for automatically topping-up lubricating oil in the sump of an internal combustion engine, characterised in that it includes:
 - a blind cylinder (10) which has at least one hole (16) for the passage of the liquid and is disposed within the sump (C) parallel to the surface (L, L_1) of the liquid and substantially flush with the surface (L), in a submerged configuration, when the level is at its maximum,

- a piston (14) which is slidable in the cylinder (10) and is operated by a rod (18) which is sealingly slidable through a hole (20) in the side of the sump (C),
- an actuator cylinder (24) with a piston (22) fixed coaxially to the rod (18) and a chamber (27) which is connected to a supplementary reservoir (32) and to the sump (C) of the engine, respectively, with the interposition of non-return valves (34, 36), and
- a pneumatic operating cylinder (42) which has a piston (40) fixed coaxially to the rod (18) and is associated with timing means (48) which put it periodically into communication with a compressed-air supply (44).

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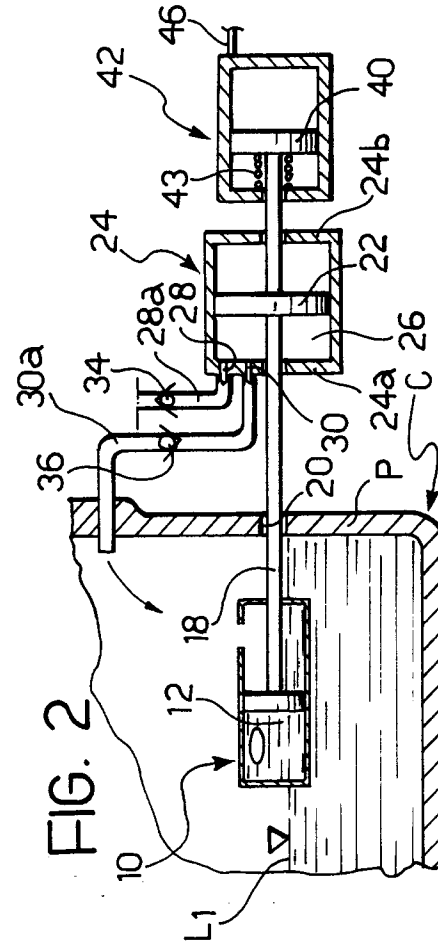
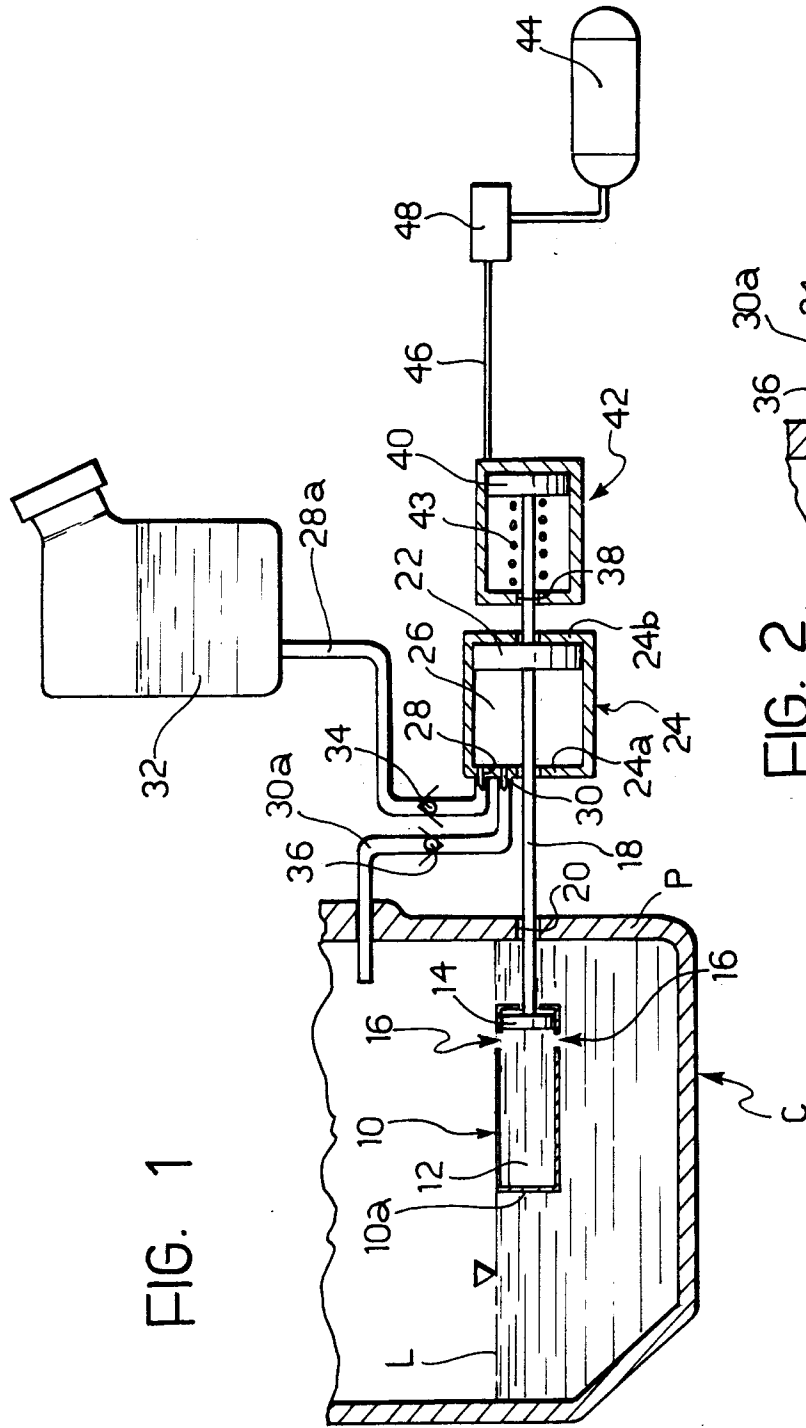
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EUROPEAN SEARCH REPORT

Application Number

EP 92 11 6855

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DE-A-2 011 625 (CATERPILLAR TRACTOR CO.) * page 4, paragraph 1 - page 5, paragraph 3 *	1,2,6	F01M11/04
A	DE-C-1 037 784 (COMPAGNIE DES FREINS ET SIGNAUX WESTINGHOUSE) * the whole document *	1,6	
A	GB-A-2 084 667 (HURNER) * the whole document *	1,6	
A	EP-A-0 416 688 (GROENEVELD TRANSPORT EFFICIENCY B.V) * abstract; figure 1 *	1,6	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			F01M F16N
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	25 NOVEMBER 1992	WASSENAAR G.C.C.	
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