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(54) Starter system for diesel engines.

(57) Starter system for direct or indirect injection diesel engines of one or more cylinders and of small or medium capacity, the system comprising an induction conduit (13) for each piston-cylinder assembly, the induction conduit (13) being connected to its own oil storage tank (24-16) formed in the head of the engine by means of its own connecting conduit (14) operating substantially at atmospheric pressure, the oil storage tank (16) being directly connected to and fed by a lubrication circuit (22) of the engine and comprising an overflow (21) to control its filling, the oil storage tank (16) including also closure valve means (17) which can be opened momentarily and can shut the connecting conduit (14).

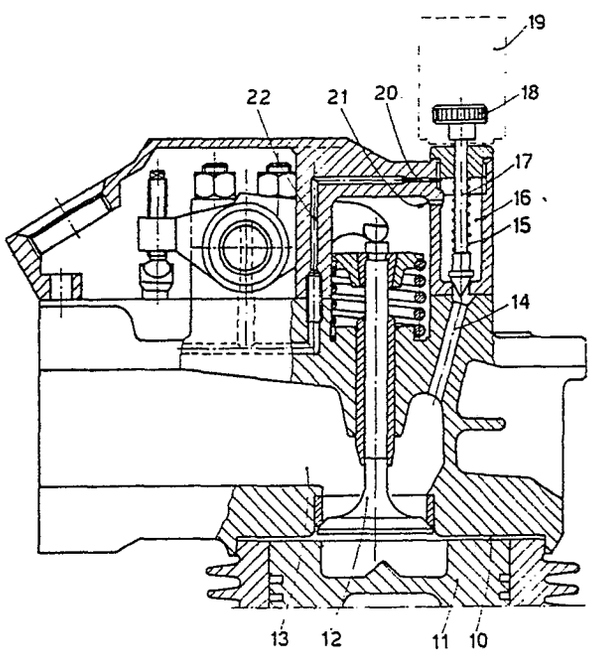

fig. 2

EP 0 342 270 A1

STARTER SYSTEM FOR DIESEL ENGINES

This invention concerns a starter system for direct or indirect injection diesel-cycle engines of small or medium capacity, which provides for the introduction of a measured quantity of lubricating oil into the combustion chamber to assist start-up. This lubricating oil is the same as the oil circulating in the engine and held in the sump of the engine.

To be more exact, the invention concerns a system to assist start-up of direct or indirect injection diesel engines of small or medium capacity, that is, up to 20/25 KW, even in very cold weather.

Systems are known for the start-up of direct or indirect injection diesel-cycle engines of small or medium capacity and of one or two cylinders in very cold weather.

One of these systems arranges that the combustion chamber can be put in communication with the exterior for start-up purposes by means of a conduit above the inlet valve.

An example of a possible known embodiment is shown in Fig.1. Oil is introduced through this communication conduit in quantities commensurate with the displacement of the specific piston-cylinder system.

When the engine is turned over, the inlet valve is opened and the oil enters the combustion chamber, increases the compression ratio and, in cooperation with the piston rings, increases the hydraulic seal engagement of the piston.

This enables the air temperature required for start-up to be reached more easily.

This system in itself is simple but is handicapped considerably by the users themselves.

The manufacturers of these engines now normally equip the engines with the system described above, but nonetheless the users almost always lack the means to introduce the oil at the time of start-up.

Owing to this, start-up in cold weather is often impossible and the manufacturer is therefore confronted with calls for assistance and complaints on the basis of problems which could in fact be overcome.

FR-A-2386696 discloses the idea of introducing a measured quantity of oil into the combustion chamber to assist start-up of multi-cylinder diesel engines. The executive art provides for the employment of an external reservoir and pump to inject oil into the combustion chamber at a very high pressure (about 200 atmospheres).

DE-C-697824 discloses the idea of introducing a measured quantity of oil into the combustion chamber to reduce wear of the cylinder owing to corrosion (especially in marine engines) and not to assist start-up. The text refers generically to engines producing heat (not only diesel engines). The executive art provides for the employment of an external reservoir to introduce the oil into the combustion chamber through an induction manifold.

DE-B-1218795 discloses the idea of introducing a measured quantity of oil into the combustion chamber through the induction manifold to assist start-up of an engine producing heat (generically). It provides for the inclusion of a pump and an external oil reservoir.

US-A-3229678 discloses the idea of a device which introduces oil in a measured quantity into the combustion chamber of an engine producing heat (with special reference to marine engines), the purpose being to reduce wear of the cylinder due to corrosion, but the oil is introduced only after a preset period of time with a view to reducing the consumption of the oil. The executive art provides for an external reservoir and a pump.

To obviate such drawbacks and make it easy, even for the most thoughtless and disorganized user, to start up diesel-cycle engines with direct or indirect injection even in very cold weather, the present applicant has designed, tested and embodied this invention, in which the lubricating oil used is the same as that circulating in the lubricating circuit of the engine.

According to the invention the starter system for direct or indirect injection diesel engines of small or medium capacity is disclosed in the main claim, whereas the dependent claims describe variants of the idea of the solution.

According to the invention the chamber above the inlet valve is connected, for instance by a connecting conduit, to an oil storage tank, closure valve means being interposed which are suitable to shut off the oil in the oil storage tank.

The oil storage tank is advantageously, but not necessarily, located above the induction conduit.

The oil is either introduced beforehand or is caused to arrive in a desired manner in the oil storage tank.

The dimensions of the oil storage tank are such as to hold the required quantity of oil. The storage tank comprises an overflow to discharge any excess of oil advantageously into the drainage circuit of the lubricating oil.

According to the idea of the solution the storage tank is fed by the lubrication circuit which serves to take lubricating oil to the various parts of the engine.

According to a variant the storage tank is fed continuously by the lubrication circuit, whereas according to another variant it is fed periodically by the lubrication circuit.

The excess of oil is recirculated through the overflow.

According to a variant the lubrication circuit is connected to the storage tank through a gauged hole or choke so as to avoid losses of pressure in the lubrication circuit during normal use.

According to another variant the lubrication circuit is connected to the storage tank through a small pressure relief valve which allows oil to pass through only when the pressure in the lubrication circuit is higher than pre-set levels.

According to the invention the closure valve means cooperate with the connecting conduit in shutting off the liquid in the oil storage tank and can be opened momentarily to allow the oil in the storage tank to flow out.

According to a minimum idea of a solution the closure valve means consist of a wedge thrust resiliently against the outlet hole of the oil storage tank.

According to this solution the closure valve means can be actuated externally by grip means, which by overcoming the resistance of spring means put the storage tank in communication with the connecting cnduit, thus allowing the lubricating oil to flow out into the induction conduit above the inlet valve.

According to a variant the grip means are connected to an automatic actuator, which is switched on when the ignition key is inserted, so that upon the simple act of actuating the start-up of the engine the automatic actuator takes action in the storage tank and releases oil into the specific combustion chamber.

The means of the solution are manifold in relation to the geometric design linked to the practical embodiment applied to the various requirements of engines.

The attached figures, which are given as a non-restrictive example, show the following: -

Fig.1 shows the present state of the art;

Fig.2 shows an embodiment according to the invention.

Fig.1 shows a possible head of an engine which contains, substantially at top dead centre, a piston 11 above which is a combustion chamber 10.

An inlet valve 12 cooperates with the combustion chamber 10 and shuts an induction conduit 13.

The induction conduit 13 is connected temporarily with the exterior through a connecting conduit 14 and an oil storage tank 24, which is closed momentarily by a plug 23.

The plug 23 is removed for start-up and the desired quantity of oil is introduced with an appropriate oil can into the storage tank 24.

The plug 23 is then replaced while the oil flows over the inlet valve 12; when the engine is rotated, the inlet valve 12 opens and the oil arrives in the combustion chamber 10, increases the compression ratio, flows down the sides of that chamber 10 and cooperates with the piston rings in improving the engagement seal of the chamber, thus enabling the minimum air temperature necessary for start-up to be reached.

The idea of our embodiment tends substantially to perform the same process but to obviate the need for a person to take action as regards preparation for introduction of the oil.

Fig.2 shows a possible embodiment applied to an engine head substantially the same as that of Fig.1.

Fig.2 shows not only a piston 11, combustion chamber 10, inlet valve 12, induction conduit 13 and connecting conduit 14 but also a storage tank 16 with an overflow 21, which returns any excess of oil within the engine into the lubrication circuit or return circuit for the lubricating oil.

The outlet of the storage tank 16 is shut by closure valve means 17 kept resiliently in the closed position by spring means 15.

Grip means 18 are comprised on the exterior of the closure valve means 17 and permit manual actuation, that is, the lifting of the closure valve means 17 and the communication of the storage tank 16 with the connecting conduit 14.

According to the embodiment of Fig.2 the storage tank 16 is connected to a lubrication circuit 22 through a choke 20.

The dimensions of the choke 20 are such as to prevent excessively great losses of pressure occurring in the lubrication circuit 22.

Before the choke 20 is reached, a pressure relief valve may be comprised which permits oil to reach the storage tank 16 only when desired pressures have been reached within the lubrication circuit 22.

Any excess of lubricating oil entering the storage tank 16 flows out through an overflow 21 and is recirculated through the normal drainage systems.

According to a variant of the idea of the embodiment the grip means 18 cooperate with an automatic actuator 19 governed by the start-up of the engine. This automatic actuator 19 may be a solenoid or another means suitable for the purpose.

Claims

1 - Starter system for direct or indirect injection diesel engines of one or more cylinders and of small or medium capacity, the system comprising an induction conduit (13) for each piston-cylinder assembly, the induction conduit (13) being con-

nected to its own oil storage tank (24-16) formed in the head of the engine by means of its own connecting conduit (14) operating substantially at atmospheric pressure, the starter system being characterized in that the oil storage tank (16) is directly connected to and fed by a lubrication circuit (22) of the engine and comprises an overflow (21) to control its filling, the oil storage tank (16) including also closure valve means (17) which can be opened momentarily and can shut the connecting conduit (14).

2 - Starter system as claimed in Claim 1,in which the lubricating circuit (22) is connected by a choke (20) to the oil storage tank (16) at least momentarily.

3 - Starter system as claimed in Claim 1 or 2, in which the closure valve means (17) comprise grip means (18) positioned outside the engine.

4 - Starter system as claimed in Claim 1 or 2, in which the closure valve means (17) are associated with automatic actuator means (19).

5 - Starter system as claimed in any claim hereinbefore, in which the overflow (21) communicates with a drainage circuit for lubricating oil.

6 - Starter system as claimed in any claim hereinbefore, in which the choke (20) comprises a pressure relief valve.

7 - Starter system as claimed in any claim hereinbefore, in which the oil storage tank (16) is located above the induction conduit (13), the oil flowing by gravity into the induction conduit (13).

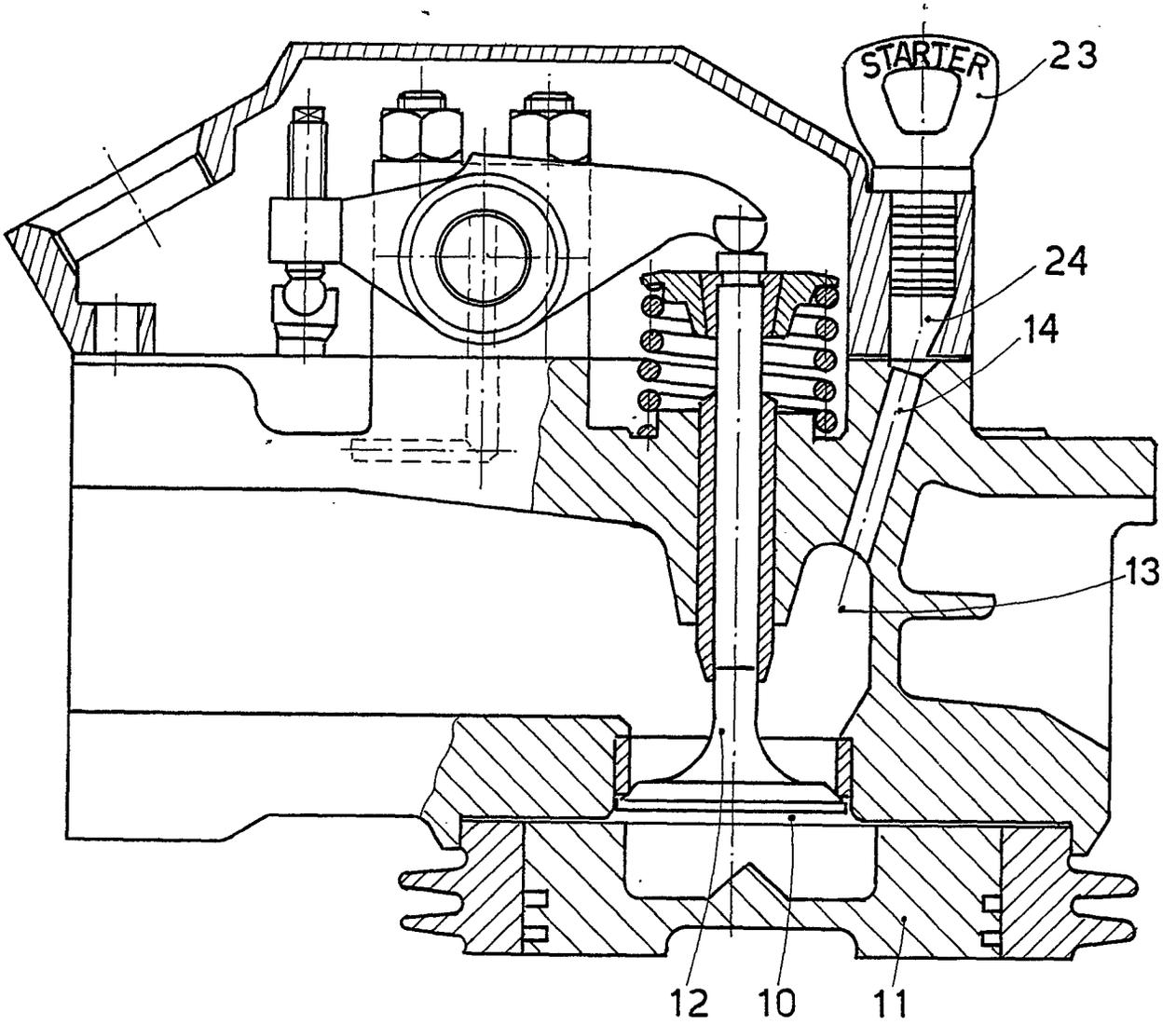

fig.1

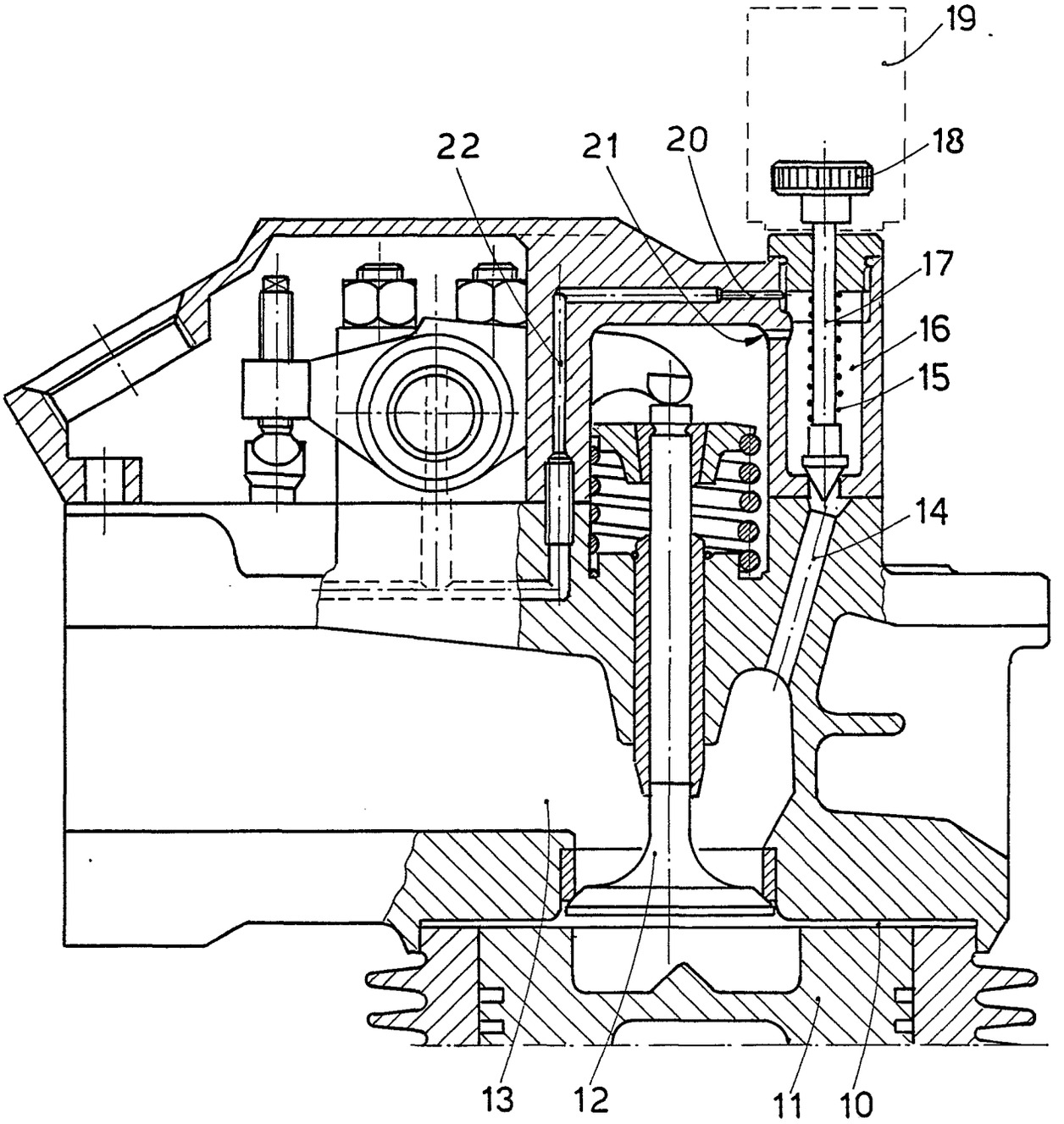

fig. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 11 9413

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.4)
A	FR-A-2386696 (WHITTAKER CORP.) * page 3, line 12 - line 29; figure 1 * * page 5, line 26 - line 29 * * page 6, line 37 - page 7, line 32; figures 2, 3. *	1-4, 6.	F02N17/08 F01M5/00
A	DE-C-697824 (C & S CLEMENTSON) * page 2, line 24 - line 89; figure . *	1, 3, 4, 7.	
A	DE-B-1218795 (EICHER)		
A	US-A-3229678 (ANSPACH)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

F02N
F01M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 AUGUST 1989	BIJN E.A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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