Title: RADIAL-PISTON PUMP FOR HIGH-PRESSURE FUEL SUPPLY OF AN INTERNAL COMBUSTION ENGINE

Abstract: The pump (5) has a hollow body (7) in turn having a group of radial cylinders (6) in which slide respective pistons (16) activated by a common cam (11) rotating inside the hollow body (7). The hollow body (7) is closed by a cover flange (8) carrying a series of fuel supply conduits (10). The hollow body (7) is made of high-tensile steel and integrally carries the cylinders (6), each of which is formed in a radial appendix (18) forming, with an inner surface (19) of the hollow body (7), an annular chamber (20) housing a compression spring (21) for recalling the respective piston (16).
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
RADIAL-PISTON PUMP FOR HIGH-PRESSURE FUEL SUPPLY OF AN INTERNAL COMBUSTION ENGINE

TECHNICAL FIELD

The present invention relates to a radial-piston pump for high-pressure fuel supply of an internal combustion engine.

BACKGROUND ART

Known pumps of the above type, typically pumps with three pistons spaced 120° apart, normally comprise a hollow body having three radial cylinders for the three pistons. The hollow body houses a common cam for sequentially activating the pistons, which are pushed towards the cam by corresponding return springs, and is closed by a cast-iron flange having a support for the camshaft and a series of conduits for supplying fuel to the pump.

In known pumps, the hollow body is made of cast iron and has three radial openings, into each of which is inserted a steel cylinder. Each cylinder has a shoulder on which rests the corresponding return spring, which also rests on a pad carried by the piston and cooperating with a flat portion of a rotary ring on the cam.

Each cylinder is also associated with a valve plate
supporting an intake valve and a delivery valve of the cylinder, and which is fixed to the cylinder, and hence to the hollow body, by a steel fastening plate bolted to the hollow body.

Pumps of the above type have several drawbacks. In particular, the cast-iron hollow body and flange inevitably have extremely thick walls, making the pump relatively bulky; and separate machining of the cylinders and supports, and machining the respective seats in the cast iron are both complex and expensive.

DISCLOSURE OF INVENTION

It is an object of the invention to provide a radial-piston pump of the above type, which is compact, cheap and easy to produce, and therefore provides for eliminating the aforementioned drawbacks typically associated with known pumps.

According to the present invention, there is provided a radial-piston pump for high-pressure fuel supply of an internal combustion engine; the pump comprising a hollow body having a group of radial cylinders, in each of which slides a respective piston, said pistons being activated by a common cam rotating inside said hollow body; and a cover flange for closing said hollow body and carrying a series of supply conduits for the fuel to be compressed; characterized in that said hollow body is made of high-tensile steel and integrally carries said cylinders.
BRIEF DESCRIPTION OF THE DRAWING

referred, non-limiting embodiment of the invention will be described by way of example with reference to the accompanying drawing, which shows a partially sectioned side view of a radial-piston fuel pump in accordance with the invention.

BEST MODE FOR CARRYING OUT THE INVENTION

Number 5 in the accompanying drawing indicates as a whole a high-pressure pump for supplying fuel to an internal combustion engine, e.g. a diesel engine. Pump 5 is a radial-piston type comprising three cylinders 6 (only one shown) arranged radially in a hollow body 7 with the respective axes 120° apart. Hollow body 7 is closed in fluidtight manner by a cover flange 8 having supply conduits 10 for feeding fuel to cylinders 6.

Pump 5 has a drive shaft 9 integral with an eccentric 11 housed in a central chamber 12 of hollow body 7. Cam 11 supports an annular cam for controlling pump 5, and which is defined by a ring 13 rotating on eccentric 11. The outer surface of ring 13 comprises three flat portions 14 associated with cylinders 6 and each perpendicular to the axis of the corresponding cylinder 6.

A respective piston 16 slides inside each cylinder 6; the outer radial surface of piston 16 defines a compression chamber 15 in cylinder 6; and piston 16 projects from cylinder 6 towards shaft 9, and supports a pad 17 which slides in known manner on the corresponding
portion 14 of ring 13. As shaft 9 rotates, ring 13 moves pistons 16 positively and sequentially in the compression direction, i.e. outwards.

According to the invention, hollow body 7 is made of high-tensile steel and is sized to withstand roughly 1,600-bar pressure of the fuel to be compressed. Preferably, hollow body 7 is made of hardened steel, and flange 8 is an aluminium casting. The surfaces mating with other pump members are in any case machined on cutting tools and/or grinders.

More specifically, hollow body 7 comprises, at each cylinder 6, an appendix 18 in the form of a cylindrical sleeve, and which extends radially towards the center of the pump and is precision machined internally according to the diameter of cylinder 6.

Appendix 18 defines, with a cylindrical surface 19 inside body 7, an annular chamber 20 housing a compression spring 21 for recalling respective piston 16. Spring 21 rests, at one end, against the end of annular chamber 20, and, at the other end, against a disk 22 fixed to piston 16 and adjacent to pad 17. Pad 17 is integral with a sleeve 23 sliding on cylindrical surface 19 of body 7, so that spring 21 is prevented from engaging surface 19. Pad 17 has holes 24 for preventing a piston effect of pad 17 in annular chamber 20.

Hollow body 7 comprises, coaxially with each cylinder 6, a threaded seat 26 for a fluidtight ring nut 27. Between threaded seat 26 and a shoulder 28 of hollow
body 7 is interposed a seat 29 for a valve plate 31, which is fixed inside seat 29 by ring nut 27.

Plate 31 supports a known intake valve 32 communicating with supply conduits 10; and a delivery valve (not shown) communicating with a series of conduits carried by hollow body 7 and comprising a delivery conduit 33.

Hollow body 7 also comprises a cylindrical seat 34 parallel to shaft 9, communicating with delivery conduit 33, and for receiving a known delivery valve 36, which is retained inside seat 34 by a threaded ring nut 37 connected to a pressurized fuel conduit fitting 38.

Hollow body 7 is integral with a flange 39 carrying fastening members for fastening pump 5; and flange 8 closing hollow body 7 has a radial seat 41 in which is fitted a supply valve 42 for supplying fuel from a low-pressure pump (not shown) to supply conduits 10.

The advantages, as compared with known pumps, of the radial-piston pump according to the invention will be clear from the foregoing description. Being made of steel, the dimensions of hollow body 7 may be smaller than those required of an iron casting to withstand the high pressures involved, thus making for a more compact pump 5. Moreover, pump 5 is cheaper to produce by cylinders 6 being integral with hollow body 7.

Clearly, changes may be made to the pump as described herein without, however, departing from the scope of the accompanying Claims.
CLAIMS

1) A radial-piston pump for high-pressure fuel supply of an internal combustion engine; the pump comprising a hollow body (7) having a group of radial cylinders (6), in each of which slides a respective piston (16), said pistons (16) being activated by a common cam (11) rotating inside said hollow body (7); and a cover flange (8) for closing said hollow body (7) and carrying a series of supply conduits (10) for the fuel to be compressed; characterized in that said hollow body (7) is made of high-tensile steel and integrally carries said cylinders (6).

2) A pump as claimed in Claim 1, characterized in that each of said cylinders (6) is formed in a respective radial appendix (18) forming, with an inner surface (19) of said hollow body (7), an annular chamber (20) housing a compression spring (21) for recalling the respective piston (16).

3) A pump as claimed in Claim 2, characterized in that said hollow body (7) has, at each cylinder (6), a seat (29) for a valve plate (31), and a threaded seat (26) coaxial with said cylinder (6) and for receiving a ring nut (27) for fastening said plate (31) in fluidtight manner.

4) A pump as claimed in Claim 3, characterized in that said hollow body (7) also has a seat (34) for a delivery valve (36) communicating with a pressurized-fuel
delivery conduit (33).

5) A pump as claimed in one of the foregoing Claims, characterized in that said cover flange (8) is connected in fluidtight manner to said hollow body (7); said flange (8) having a radial seat (41) in which is fitted a supply valve (42) for supplying fuel to said supply conduits (10).

6) A pump as claimed in one of the foregoing Claims, characterized in that said hollow body (7) is integral with another flange (39) supporting pump fastening members.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 F04B1/04 F04B1/053 F04B53/16

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 7 F04B

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

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Kolby, L

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