

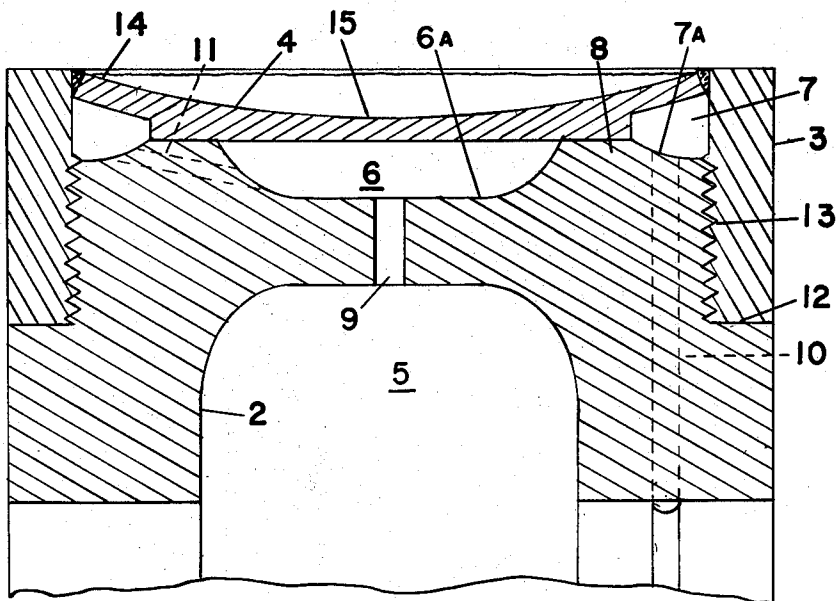
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PISTONS

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1

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PISTONS

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5 Claims. (Cl. 309—9)

This invention relates to pistons for internal combustion engines and particularly to oil-cooled pistons for use in engines of the compression ignition type.

The principal object of the invention is to provide an oil cooled piston having a novel system for the passage of the cooling oil through the piston body. Another object is to provide such a piston, the crown of which is fabricated as a separate unit and then assembled with the body and ring carrier of the piston in such a manner that the crown is held under permanent tension thereby to increase its capacity to withstand the pressures of combustion and as a consequence of such increased capacity, the crown may be so dimensioned that the oil cooling passage can be located close to the combustion chamber to serve as a highly efficient cooling means. Still another object is to provide such a piston assembled as just described so that a portion of the crown may be formed with unusual thinness and may be arranged as a defining wall for the upper portion of the oil cooling system thus providing for a flow of cooling oil past the bottom of the thin portion of the piston crown in close propinquity to the combustion chamber. Another object is to provide a novel oil cooled piston for an internal combustion engine of the compression ignition type in which the elements enclosing the oil passage are separably fabricated and then assembled so that the passage is brought into close propinquity to the combustion chamber.

Other and further objects of the present invention will be apparent from the following description, the accompanying drawing, and the appended claims.

In the drawing, there is shown a vertical section of the head portion of a piston incorporating the invention.

Referring to the drawing, the piston is shown as having a main body 2, a ring carrier 3, and a crown 4. The main body 2 is preferably of a light metal alloy, such as aluminum alloy, and the ring carrier 3 and crown 4 are of a heavy metal alloy, such as a ferrous alloy. The main body is hollow and has a conventional central chamber 5 and dependent skirt (not shown). In its top wall, the main body of the piston has a central cavity or depression 6a which, in conjunction with crown 4, forms a chamber 6. An annular recess 7a, preferably curved in cross section, is formed at the outer corner of the top of the piston body 2 so that an annular flat-topped boss 8 is provided on the top of the body between such recess 7a and cavity 6a. Chamber 6 is connected to the central chamber 5 of the piston body by a duct 9.

The oil cooling system for the piston comprises a passage 10 leading upward from a conventional oil coolant supply through the wrist pin (not shown) into the annular chamber 7 defined by ring carrier 3, crown 4, and the portion of the piston body recessed at 7a; a second passage 11 leading from chamber 7 to chamber 6; and duct 9 leading from chamber 6 into the central chamber 5. The coolant drops from chamber 5 back to the supply source in the well known manner.

2

The upper portion of the periphery of the main piston body is axially recessed to form a shoulder 12 and is preferably threaded at 13 for the reception of ring carrier 3. Ring carrier 3 is preheated and screwed on to the body while in heated condition. It is then permitted to shrink to provide a tight joint between the two elements. The piston crown 4 is supplied as a separate piece for assembly into the piston unit. It is a disk, concave in its top face, adapted to form a combustion chamber in conjunction with the cylinder head (not shown). The lower face of the crown is flat to provide for its seating upon the boss 8. As furnished for assembly, the peripheral portion 14 of the disk is turned up slightly more than shown in the drawing so that it will not contact carrier 3 when seated upon boss 8.

After the ring carrier has been shrunk on to the main body of the piston, the combination is set up in a jig designed for the purpose. The disk is then positioned into the combination so that its bottom face rests flush on boss 8 with the peripheral portion adjacent but not in contact with the ring carrier. The unit, thus far assembled, is brought under a press having a compound plunger. This plunger is designed to include a central element shaped to engage the curved central portion 15 of the disk and an outer annular element shaped to engage the turned up peripheral portion 14 of the disk. The central and peripheral elements of the compound plunger are actuated independently of each other so that the central element descends first to clamp the central portion of the disk upon boss 8 and then the peripheral portion descends to engage the peripheral portion of the disk to force it downwardly and outwardly into contact with the upper portion of ring carrier 3. While the disk is held in this position, the carrier and the peripheral portion of the disk are welded together. The confronting surfaces of the carrier and disk may be shaped to receive the weld, as is well known. The pressure thus applied by the press upon the peripheral portion of the disk "preloads" the disk, that is to say, it places the disk in a state of tension which is permanently maintained by the weldment.

The heat generated by the welding operation causes the carrier to expand in a direction axial to the piston. When the carrier cools, it contracts in such axial direction to draw the peripheral portion of the disk downwardly to tighten the annular joint between the disk and boss 8. The tension generated by the pressing operation is thus further increased.

While there has been hereinbefore described an approved embodiment of this invention, it will be understood that many and various changes and modifications in form and details of construction thereof may be made without departing from the spirit of the invention, and that all such changes and modifications as fall within the scope of the appended claims are contemplated as a part of this invention.

What I claim is:

1. A piston for an internal combustion engine comprising a main body having a reduced portion, a ring carrier secured to the reduced portion, a preloaded disk seated upon the top of the piston body and welded to the ring carrier to form a crown for the piston, the arrangement of the parts being such that the disk is under a permanent state of tension thereby increasing the capacity of the crown to withstand the pressures of combustion.

2. A piston for an internal combustion engine comprising a main body having a reduced portion and a recess formed adjacent its top; a ring carrier secured to the reduced portion; a preloaded disk seated upon the top of the piston body and welded to the ring carrier to form a crown for the piston; and an oil cooling

3

system in the piston, a portion of said system being defined by the recess, ring carrier, and disk; the arrangement of the parts being such that the disk is under a permanent state of tension thereby increasing the capacity of the crown to withstand the pressures of combustion.

3. A piston for an internal combustion engine comprising a main body having a reduced portion adjacent its top and a central cavity in its top, an annular boss on the reduced portion encircling the central cavity, a ring carrier shrunk upon the reduced portion and extending upwardly beyond the top of the body, a concave disk seated upon the boss to form a crown for the piston, a weldment securing the disk to the ring carrier so that the peripheral portion of the disk is maintained in a state of permanent tension, and an oil cooling passageway through the piston, a portion of said passageway lying adjacent the portion of the disk which is under tension.

4. A piston for an internal combustion engine comprising a main body having a reduced portion adjacent its top, a central cavity in the top of the main body, an annular boss on the top of the piston body encircling the central cavity, a ring carrier shrunk upon the reduced portion and extending upwardly beyond the top of the body, a disk concave on its top side and flat on its bottom side, said disk having its bottom side seated on the boss to form a chamber, a weldment connecting the disk and the ring carrier and holding the peripheral portion of the disk in a state of tension, and a cooling system in the piston including a first portion disposed adjacent the tensioned peripheral portion of the disk, means

4

connecting said first portion to a source of coolant supply, a second portion in the chamber between the disk and boss, coolant passage means connecting said first and second portions, and duct means permitting coolant to drop out of the second portion to return to the source of supply.

5. A piston for an internal combustion engine comprising a main body having a reduced portion adjacent its top; a concavity in the top surface in the piston; an annular boss on the top of the main body encircling the concavity; a peripheral recess on the top of the main body adjacent the boss; a ring carrier shrunk on to the reduced portion; a disk seated upon the boss to define a central chamber with said concavity; a weldment joining the peripheral portion of the disk with the ring carrier and holding said peripheral portion in a state of tension, said peripheral portion in conjunction with the ring carrier and the main piston body defining an annular chamber; a passage leading into the annular chamber; a passage between said annular chamber and the central chamber; and a passage leading from the central chamber, said three passages and the two chambers forming a system to conduct a coolant through the piston.

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