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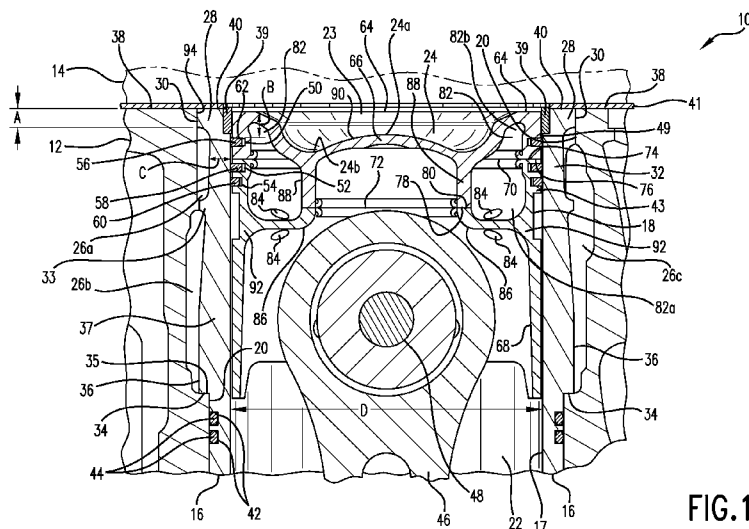


FIG. 1

(57) Abstract: A cylinder liner and piston configuration for an internal combustion engine includes features for improving the cooling of the piston. Specific ratios and dimensions are included to optimize the features of the cylinder liner and piston. Also included are unique piston features that assist in achieving some of the specified dimensions and ratios.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/28105

| <p>A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - F02F 3/00 (2012.01) USPC - 123/193.6 According to International Patent Classification (IPC) or to both national classification and IPC</p> | | | | | | | | | | | | | | | | | |
|--|--|---|--|---|---|--|--|--|--|---|--|---|--|---------------|---|---|------|
| <p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) USPC - 123/193.6</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC - 123/193.1-193.6</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWEST - piston, cylinder liner, two-piece, two-part, multi-piece, multi-part, split, gallery, cooling channel, scraper, dead zone, dead space, ring Google Scholar - reducing piston cylinder dead zone/space; multi-part piston; piston ring dead zone</p> | | | | | | | | | | | | | | | | | |
| <p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X ----- Y</td> <td>US 4,941,440 A (Weber et al.) 17 July 1990 (17.07.1990), figs. 1 and 3, col. 2, ln 12-34, col. 3, 47-60, col. 4, ln 3-18, col. 4, ln 58-68, col. 5, ln 1-52, col. 7, ln 22-40, claim 1</td> <td>1, 4, 10-14 and 18-20 ----- 2, 3, 5-9 and 15-17</td> </tr> <tr> <td>Y</td> <td>US 6,622,613 B1 (Kortas et al.) 23 September 2003 (23.09.2003), col. 2, ln 7-12</td> <td>2 and 3</td> </tr> <tr> <td>Y</td> <td>US 2010/0108001 A1 (Scharp et al.) 06 May 2010 (06.05.2010), fig. 1 and para [0034, 0035, 0038 and 0039]</td> <td>5-9 and 15-17</td> </tr> <tr> <td>A</td> <td>US 2010/0307445 A1 (Kortas et al.) 09 December 2010 (09.12.2010), fig. 3 and para [0016, 0021 and 0022]</td> <td>1-20</td> </tr> </tbody> </table> | | | Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. | X ----- Y | US 4,941,440 A (Weber et al.) 17 July 1990 (17.07.1990), figs. 1 and 3, col. 2, ln 12-34, col. 3, 47-60, col. 4, ln 3-18, col. 4, ln 58-68, col. 5, ln 1-52, col. 7, ln 22-40, claim 1 | 1, 4, 10-14 and 18-20 ----- 2, 3, 5-9 and 15-17 | Y | US 6,622,613 B1 (Kortas et al.) 23 September 2003 (23.09.2003), col. 2, ln 7-12 | 2 and 3 | Y | US 2010/0108001 A1 (Scharp et al.) 06 May 2010 (06.05.2010), fig. 1 and para [0034, 0035, 0038 and 0039] | 5-9 and 15-17 | A | US 2010/0307445 A1 (Kortas et al.) 09 December 2010 (09.12.2010), fig. 3 and para [0016, 0021 and 0022] | 1-20 |
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