Nov. 4, 1969 C. N. FANGMAN 3,476,020

ENGINE BLOCK WITH CASE HARDENING OF CYLINDER WALLS

Filed Sept. 3, 1968

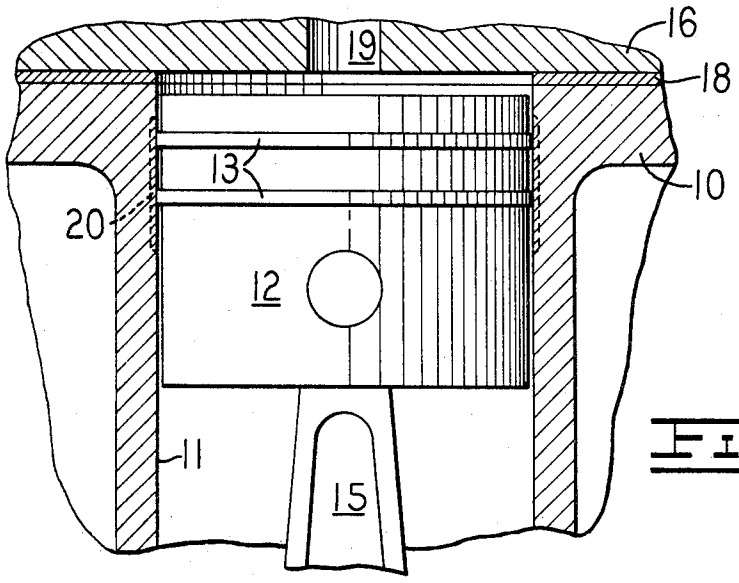

Fig. 1.

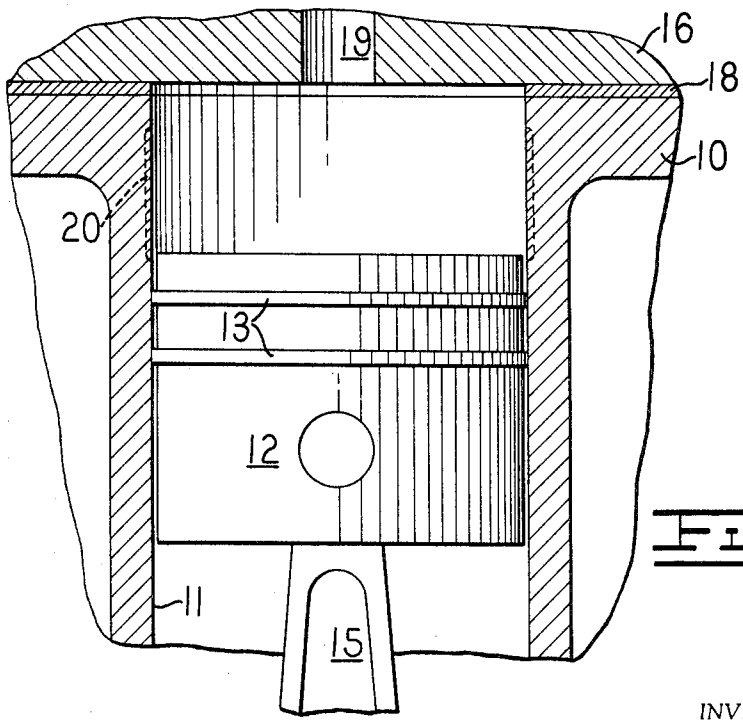

Fig. 2.

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United States Patent Office

3,476,020
Patented Nov. 4, 1969

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3,476,020

ENGINE BLOCK WITH CASE HARDENING OF CYLINDER WALLS

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Filed Sept. 3, 1968, Ser. No. 756,839
Int. Cl. F01b *31/00;* F16j *11/04*
U.S. Cl. 92—169 2 Claims

ABSTRACT OF THE DISCLOSURE

An engine cylinder block in which a very shallow area of a limited part of the cylinder wall is hardened to reduce wear which occurs most critically in the area of piston ring travel.

A serious problem in obtaining long life of cylinder blocks wherein the cylinder bores are machined in integrally cast parts of the blocks is the high rate of wear occurring in the cylnder bore from the reciprocating action of the piston and particularly in the area in which the piston rings reciprocate since the rings are of a harder material generally being steel, whereas the common material for cylinder blocks is cast iron. A wear step usually results in the upper region of the ring travel and generally a less serious wear step occurs at the lower region of ring travel. Since the ring step at the upper end of ring travel is approximately ten times as great as that which occurs at the lower end, it causes greater concern.

One conventional practice in blocks of this type is to press a hardened so-called "dry" sleeve into the bore, though this is an expensive method of obtaining long life and, because of variations in temperature, problems arise in connection with retaining the sleeve in the bore. Hardening of the bore throughout its length is undesirable because brittleness generally accompanies hardening of metals such as cast iron and may result in spalling or breaking away of the very edges of the bore which is most serious adjacent the upper end.

The manner in which the present invention avoids the problems referred to and produces a superior engine block, will be best understood by an understanding of the following specification wherein reference is made to the accompanying drawing.

In the drawing:

FIG. 1 is a fragmentary view taken as a central vertical section of one cylinder of an engine block embodying the present invention showing the piston in top dead-center position; and

FIG. 2 is a similar view showing the piston in the bottom dead-center position.

The drawing shows a portion of a block at **10** with a cylinder wall **11** formed therein and a piston **12** with rings **13** of conventional type reciprocably mounted in the cylinder for actuating a connecting rod **15**. A head, a portion of which is shown at **16**, is held in place by conventional head bolts, not shown, with a gasket **18** disposed between the block and the head. An opening **19** in the head is provided for each cylinder for the accommodation of a spark plug or fuel injection nozzle depending upon the type of engine.

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The hardened area provided in accordance with the present invention is shown at **20** and commences in an area to embrance the uppermost ring in its top dead-center position but short of the upper edge of the cylinder, it extends downwardly for a distance to include the lowermost of the rings **13** when it is at the top dead-center position. The hardened area is illustrated in the drawing as limited for affording protection to the wear area at the top dead-center but may be extended down to include the bottom dead-center position of the rings as they are shown in FIG. 2. However, in no case should it be extended to the very lowermost edge of the cylinder. Because of the fact that any great depth of hardened metal causes stresses in the process of hardening which may be detrimental, the depth of the hardened area is in accordance with the present invention maintained at a minimum which is consistent with good protection against wear and this has been found to be in the order of .005 to .010 of an inch. The extent of the hardened area of an average sized engine may, therefore, be taken for example as between .50 inch below the top deck of the block and extending downwardly for a distance of approximately 1.50 inch. Because of this relatively small area to be hardened, an induction hardening head can be used which will be stationary during use rather than being drawn through the cylinder which is a common way of hardening cylindrical members. This is relatively inexpensive and it avoids the possibility of imparting heat to the very ends of the cylinder bore.

What is claimed is:

1. In an engine block which has a cylinder of a single material having an inner wall and in which a piston with piston rings is arranged to reciprocate between top and bottom dead-center positions, the improvement which comprises a case hardened area of said material throughout the circumference of the cylinder wall and extending a short distance beyond the area of the piston rings when the piston is in top dead-center position.

2. The improvement of claim **1** in which the depth of the hardness in the said area is in the order of .005 to .010 inch.

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U.S. Cl. X.R.

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