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(54) **Self locking valve seat insert.**

(57) A valve seat insert for installation in cylinder heads of internal combustion engines which includes a pilot flange, an annular groove and a locking flange by which the valve seat insert is locked into the cylinder head.

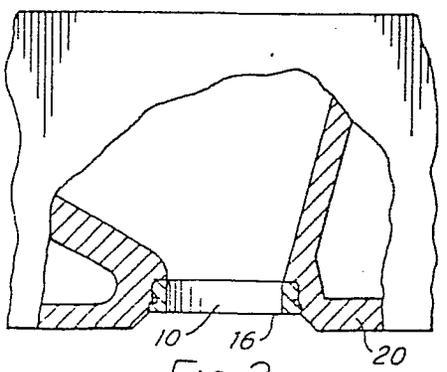

FIG. 3

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This is a continuation in part of my application Serial Number 950,973 filed October 13,1978.

The present invention relates to valve seats and particularly to self locking valve seats for use in internal combustion engines.

It has been common knowledge in the art that successful performance of a valve seat insert requires that there be intimate contact with the surrounding engine material so that adequate heat transfer may occur between the insert and the engine.

The problem of heat transfer is also involved with the problem of securely fastening the valve seat insert in the cylinder head of the engine.

As a means to improve the economy of the Otto type internal combustion engine, auto manufacturers have attempted to switch from cast iron to aluminum block and/or aluminum head engines. This switch has accentuated the problems associated with heat transfer and securely fastening valve seats in the cylinder heads.

A number of solutions have been tried in the past with limited success. Valve seats which are pressed into counterbores and then locked in place with various devices have been used. These have not proved entirely satisfactory because of heat transfer problems, resulting from the build-up of corrosion and carbon deposits around the insert and its fastening device.

Self tapping threads have been used on valve seat inserts as in U.S. 3,868,953 to overcome heat transfer and secure fastening problems. While partially solving those problems this method has introduced new problems of alignment and cost of manufacture. Furthermore, replacement of the insert with the self-cutting thread sometimes results in a loose valve seat since the new insert may not fit tightly into the threadways formed by the previously used valve seat insert.

The method current used for insertion of valve seat inserts is to lower the temperature of a machined insert by immersion in liquid nitrogen. Then heat the cylinder head to expand the machined opening and then force the insert into the opening.

When the insert and cylinder head reach ambient temperature a tight fit results with good heat transfer characteristics. However, this method is expensive since it involves rigid manufacturing tolerances and the use of cryogenic equipment and the handling of liquid nitrogen. There is also a safety hazard involved in handling liquid nitrogen as part of a large production scale operation.

Also, while this cryogenic procedure has proved satisfactor for initial engine production operations, it does not solve the problem of replacing valve seats in the field.

It is an object therefore of this invention to provide a simple economical valve seat insert capable of easy, inexpensive insertion in cylinder heads of internal combustion engines.

It is an object of this invention to provide a valve seat insert, which is self locking into intimate contact with the surrounding material of the cylinder head.

It is still another object of this invention to provide a valve seat insert with improved heat transfer characteristics.

It is a further object of this invention to provide a self locking valve seat insert that can be removed and replaced in the field with common tools available at most service garages.

The present invention accomplishes these objects and others by providing a valve seat insert with a pilot flange to guide the insert into a prebored hole in the cylinder head into which it snuggly fits. A locking flange of greater diameter than the pilot flange and the prebored hole. The locking flange contains longitudinal serrations around the circumference thereof and a forming edge. One shoulder of the locking flange and a shoulder of the pilot flange define an annular groove into which displaced metal is packed.

When the valve seat insert is forced into the cylinder head the forming edge of the shoulder of the locking flange swages metal from the sides of the prebored hole, packing the diplaced metal into the annular groove preventing axial movement of the insert when in place. The serrations around the circumference cut grooves into the walls of the cylinder head and are locked into intimate contact with the cylinder

head in these grooves, preventing rotational movement and insuring maximum heat transfer between the valve seat insert and the cylinder head.

In those instances in which rotational movement is not a problem or in which the rotational forces are minimal, the serrations may be omitted from the locking flange. In that mode (not illustrated) the locking flange shoulder by swaging metal into the annular groove forms a metal to metal lock preventing axial movement and resisting rotational movement.

From the following description taken in conjunction with the accompanying drawings, the objects, features and advantages of this invention will become apparent.

Fig. 1.is a partial cross-section side plan view of the self locking valve seat.

Fig.2 is a top plan view of the self locking valve seat.

Fig. 3 is a partially sectioned view of a cylinder head with a self locking fastener in place.

Referring now to the drawings for an understanding of the invention, particularly to the embodiment in Fig. 1 and 2. A cylindrical ring 10 has a valve seat formed in its upper face 16. Pilot flange 12 designed to guide the ring 10 into a prebored hole in cylinder head 20, is formed in the lower portion of ring 10.

Lead edge 12 is beveled towards the lower face 17 to facilitate entry into the prebored hole. A locking flange 13 greater in diameter than pilot flange 10 has a forming shoulder 14 opposite the valve seat face, the

purpose of which will be clearly described below.

The circumference of locking flange 13 is processed to form longitudinal serrations 14. Between pilot flange 11 and locking flange 13 an annular groove 15 is formed by the shoulders of the two flanges. The self locking valve seat is installed by first drilling a straight sided hole in the cylinder head 20 with a diameter adopted to snuggly accept the pilot flange 11. Fitting 10 is placed above the prebored hole. Pilot flange 11 is inserted in the hole. Insertion pressure is then applied to valve seat face 16. Forming shoulder 14 displaces metal which flows into annular groove 15. Serrations 13 cut cooperating grooves in cylinder head 20 locking the valve seat 10 in place preventing radial movement. The metal displaced from the cylinder head 20 is packed into annular groove 15 forming a metal to metal lock holding the fitting into position and preventing axial movement outward. Valve seats utilizing the device of this invention have resisted push out forces in excess of 15,000 pounds which exceeds operating engine pressures.

Thus it can be seen that the above device, although simple in construction, fills a long established need and surprisingly provides a positively metal to metal lock resistant to high push out pressures. The metal to metal lock also assures efficient heat transfer from valve seat to cylinder wall. The above described self locking valve seat insert can be easily replaced in the event of valve seat failure. The defective valve seat insert 10 is pushed out. A new self locking valve seat insert with longer serrations 13 is then pressed in place to a depth greater by the

increased length of the serrations 13. This will provide sufficient metal flow to pack in said groove 15 to lock the valve seat insert in place so as to resist axial push out. The serrations 13 will mesh with the preformed grooves preventing radial movement. The tight metal to metal lock will insure excellent heat transfer between the valve seat insert and the cylinder head.

While only one embodiment of the invention has been shown and described in detail it is apparent that the invention may be incorporated into valve seat inserts having various different forms and sizes.

Under certain operating conditions where reduced rotational stress is placed upon the guide or in which rotational movement is not objectional, the serrations may be omitted from the locking flange. In those instances (not illustrated) the locking flange forming shoulder 14 is of appropriate diameter to flow the proper amount of material from cylinder head 20 so as to pack annular groove 15 with sufficient material so as to form a metal to metal lock which prevents axial movement and resists rotational movement.

It is also apparent to those skilled in the art that many changes and modifications may be made in the illustrated embodiment without departing from the scope of the invention as described in the specification, drawings and claims.

CLAIMS:

1. A self locking valve seat insert for installation in an engine cylinder head comprising:

a cylindrical metal ring having a valve seat means formed on one face thereof;

a pilot flange beveled at the edge forming the face opposite the valve seat means;

a locking flange means greater in diameter than the pilot flange containing the valve seat on its upper face and forming shoulder at its lower edge;

an annular groove formed by and located between the pilot flange and the locking flange; and

cold formed material displaced from the cylinder head and packed into the annular groove by the forming shoulder to provide a metal to metal lock.

2. The self locking valve insert of claim 1 in which the diameter of said locking flange is not less than .005 of an inch greater or more than .015 of an inch greater than the diameter of the pilot flange.

3. The self locking valve insert of claim 1 in which the circumference of the locking flange means contains longitudinal serrations.

4. A self locking valve seat insert for installation in an engine cylinder substantially as described with reference to the accompanying drawings.

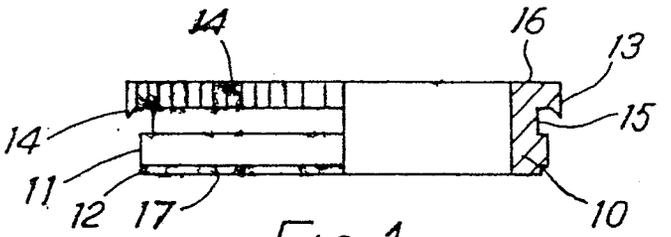

FIG. 1

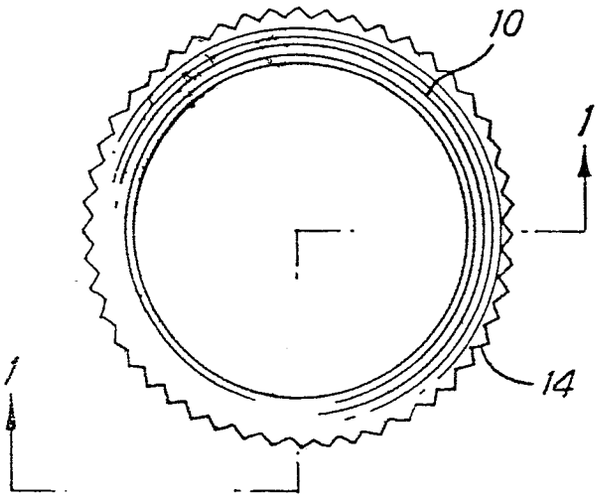

FIG. 2

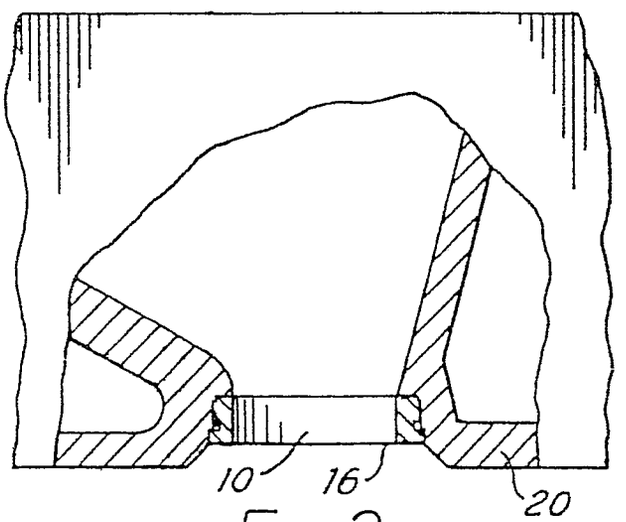

FIG. 3

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EUROPEAN SEARCH REPORT

0014285
Application number

EP 79302609.7

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	DE - A -2 164 357 (DAIMLER-BENZ) + Figure 2 + --	1
	DE - A - 1 526 593 (MIRRLEES-NATIONAL) + Fig. 3-5 + --	1
	DE - A - 2 548 534 (KLÖCKNER-HUMBOLDT-DEUTZ AG) + Totality + --	1
	DE - C - 710 793 (PROSCHE) + Fig. 1,2 + --	3
	CH - A - 534 314 (ROSAN) + Fig. 1 + ----	3

CLASSIFICATION OF THE APPLICATION (Int. Cl.) X 3

F 01 L 3/22

TECHNICAL FIELDS SEARCHED (Int.Cl.) X 3

F 01 L 3/00
F 16 B 11/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	18-01-1980	WASSERMANN

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