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(71) Applicant: **MITSUBISHI JUKOGYO KABUSHIKI KAISHA**
5-1, Marunouchi 2-chome Chiyoda-ku
Tokyo(JP)

(72) Inventor: **Tayama, Keijiro c/o Diesel Engine Engineering S.**
Mitsubishi Jukogyo Kabushiki Kaisha
5-1, Marunouchi 2-chome Chiyoda-ku Tokyo(JP)

(72) Inventor: **Miyano, Hiroaki c/o Diesel Engine Res. & Dev.**
Mitsubishi Jukogyo Kabushiki Kaisha, 1-1
Midori-cho Nishi-ku Yokohama-shi(JP)

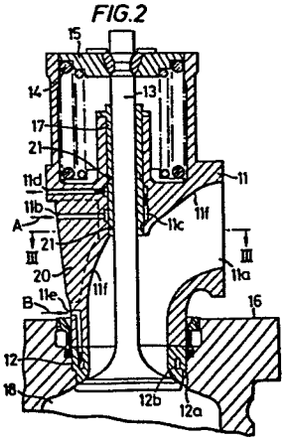
(74) Representative: **Sommerville, John Henry et al,**
Sommerville & Rushton 89, St. Peters Street
St. Albans Herts. AL1 3EN(GB)

(54) Exhaust valve casing.

(57) For an internal combustion engine, an exhaust valve casing (11) is provided of the kind which provides a valve seat (12) and exhaust passage (11a), and supports at (14, 15) the exhaust valve (13), and a valve guide (17) therefor, separately from the cylinder head (16). The positive cooling around the peripheral wall (11f) around the exhaust passage as normally practiced in known constructions of exhaust valve casing is abolished. Thus, cooling chambers (11c, 12b) are provided only at two locations, that is, within a peripheral wall around the valve guide, and within a peripheral wall around the valve seat.

Such an arrangement ensures that thermal losses from the exhaust gases passing through the exhaust passage are kept to a minimum, thereby ensuring that more energy is available for use by a supercharger, exhaust gas economiser, or the like.

FIG.2



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Mitsubishi Jukogyo K.K.
TOKYO, Japan.

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Exhaust Valve Casing.

The present invention relates to exhaust valve casings for an internal combustion engine of the kind which provides an exhaust passage independently of the cylinder head.

Such exhaust valve casings are known and are frequently used in relatively large 2-stroke internal combustion engines.

A known construction of exhaust valve and its valve casing is shown in Figure 1. Thus, in the valve casing 1 are assembled a valve seat 2 and a valve 3 by the intermediary of a valve spring 4 and a spring cap 5; it will be noted that the periphery of the valve seat 2 is formed independently of the cylinder head. In the known construction shown there is also provided a valve guide bush 7 made of a material that is favourable for lubrication in order to obtain smooth sliding movement of the valve 3. It will also be noted that the valve casing 1 is fastened jointly with the valve seat 2 in a pressure-tight manner to a cylinder head 6 at a contact surface 2a between said valve seat 2 and cylinder head by means of bolts (not shown).

Provision is made such that the valve 3 may be opened and closed at predetermined timing by means of an exhaust valve driving apparatus (not shown) so that exhaust gas within the cylinder 8 can flow out, to be replaced by a fresh charge flowing in through a scavenging port (not shown), or the like.

When the valve 3 is opened, high-temperature exhaust gas from the cylinder 8 flows out as shown by the arrows a, and passes through an exhaust passage 1a and thence through an exhaust pipe, supercharger, or exhaust economizer or the like (not shown) to atmosphere. Since the exhaust passage 1a is exposed to high-temperature exhaust gas, for the purpose of preventing a temperature rise in the material of the valve casing 1 and maintaining sufficient lubrication between the stem of the valve 3 and the valve guide bush 7, the exhaust passage 1a is cooled by a coolant such as fresh water, and the valve seat 2 is constructed such that it is also cooled by a coolant, thereby enhancing its durability.

More particularly, as shown by arrows b coolant flows continuously through a coolant inlet 1b provided in the valve casing 1 into cooling chambers 1c and 1d in said valve casing and, after it has cooled the valve casing and valve seat, it flows out through a coolant outlet 1e.

However, in the above-described known valve casing, since the wall of the exhaust passage 1a in the valve casing is also positively cooled by the coolant, exhaust gas discharged through said passage also tends to be cooled. Hence, the energy possessed by the exhaust gas is subjected to a cooling loss by a corresponding amount, and so, the exhaust gas energy that can be utilized in a supercharger, or an exhaust gas economizer is reduced. Consequently, the heat transfer area of an exhaust gas economizer must be enlarged; in some cases it may even happen that a turbogenerator making use of

the exhaust gas becomes inoperable, and so, such a construction of valve casing is unfavourable from the viewpoint of energy saving.

In addition, since the valve casing is formed as a casting, due to casting difficulties, the coolant chambers 1c and 1d cannot be made as small as desired. Consequently, the height of the valve casing 1 must be made greater than desired.

One object of the present invention is to provide an exhaust valve casing of the kind discussed above, in which thermal loss in the exhaust gas is reduced, whilst ensuring adequate cooling of the valve guide, and valve seat.

Another object of the present invention is to provide such an exhaust valve casing, in which the height of the casing, and thus a length of the exhaust valve stem, can be reduced, with resultant saving in weight and manufacturing costs.

According to the present invention, there is provided an exhaust valve casing for an internal combustion engine, of the kind which is intended to be fastened to the cylinder head to provide a valve seat and exhaust gas passage and to support the exhaust valve and a valve guide therefor independently of the cylinder head, characterised in that said casing is provided with cooling chambers only at two locations that is, within a peripheral wall around the valve guide, and within a peripheral wall around the valve seat.

Thus, in accordance with the invention, no cooling chamber or path is located adjacent the exhaust gas passage,

thereby significantly reducing, if not eliminating thermal losses in the exhaust gas flowing througn the casing.

Conveniently, the valve guide is in the form of a bush, and the cooling chamber around the valve guide may be of annular shape and extend along the outer periphery of said bush; also the cooling chamber around the valve seat may be of annular shape and be provided within the wall defining the valve seat, coolent inlet and outlet ducts being provided within the wall of the exhaust valve casing in the proximity of said valve seat.

In the exhaust valve casing according to the present invention, since no coolant chambers or paths are provided in the vicinity of the exhaust passage, no positive cooling can take place in this region. Thus, thermal loss from the exhaust gas is reduced to a minimum, and hence more energy is available from the exhaust gas for use in a supercharger, exhaust gas economizer, or the like.

In addition, since the exhaust valve casing according to the present invention lacks a cooling chamber in the vicinity of the exhaust passage, the height of the valve casing, as well as the length of the valve stem can be reduced, with a consequent saving in weight and manufacturing costs. Also, such a reduced height configuration of the exhaust valve can be advantageous for space utilisation in an engine room.

In order that the invention may be readily understood, and further features and advantages made more apparent, one preferred construction of exhaust valve, and casing therefor,

will now be described by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a longitudinal cross-sectional view of a known construction of exhaust valve,

Figure 2 is a longitudinal cross-sectional view, similar to Figure 1, showing the preferred construction according to the present invention, and,

Figure 3 is a transverse cross-sectional view taken along line III-III of Figure 2.

Referring now to Figures 2 and 3 of the drawings, the exhaust valve casing 11 is provided at its inner end with a wall part defining a valve seat 12 and a valve 13 is supported in the casing by the intermediary of a valve spring 14 and a spring cap 15. The exhaust valve thus provides an exhaust gas passage and valve assembly which is independent of the cylinder head 16. The stem of the valve 13 is slidably mounted in a valve guide bush 17. The valve casing 11 is fastened jointly with the valve seat 12 to the cylinder head 16 in a pressure-tight manner by means of bolts 19 (see Figure 3). In this figure, reference numeral 20 designates ribs provided for enabling transmission of a uniform stress in a circumferential direction through a contact surface 12a (see Figure 2) between the valve seat and cylinder head.

An annular cooling chamber 11c is formed along an outer periphery of the valve guide bush 17, and coolant is introduced thereto through a coolant inlet duct 11b and discharged through

a coolant outlet duct 11d. To prevent coolant from leaking out of the cooling chamber 11c, seals 21 are provided in the valve guide bush 17.

A second annular cooling chamber 12b, is formed within the wall part defining the valve seat 12, and coolant is introduced to this chamber through a coolant inlet duct 11e and discharged through a coolant outlet duct (not shown).

In this preferred construction of exhaust valve, in order to reduce thermal loss from the exhaust gas caused by heat transfer to the coolant, cooling of a peripheral wall 11f around the exhaust passage 11a by means of coolant, as practiced in the known construction discussed above, is abolished. Furthermore the cooling arrangement is constructed in such a manner that only the two locations described above are cooled by the coolant.

More particularly, though the temperature of the valve casing is raised as a whole due to the abolition of cooling of the peripheral wall 11f around the exhaust passage 11a, in order to prevent degradation of the lubricating capability of the valve guide bush 17 due to increased temperature in the material of the valve casing, the outer periphery of the valve guide bush 17 is positively cooled by means of the coolant. In addition, in a similar manner to the known construction, the valve seat 12 is positively cooled by coolant. Furthermore, the peripheral wall 11f around the exhaust passage 11a of the exhaust valve casing 11 is lagged externally by a heat-insulating material 11g (see Figure 3) such as, for example, asbestos.

In the cooling arrangement described coolant is introduced through the coolant inlet duct 11e for valve seat cooling as shown by arrow B, and flows into the cooling chamber 12b, and thereafter, around the cooling chamber, to be discharged externally through the coolant outlet duct. Coolant is also introduced through the coolant inlet duct 11b for the valve guide bush 17 as shown by an arrow A, to flow into the cooling chamber 11c along the outer periphery of the bush 17 and to be discharged externally through the coolant outlet duct 11d.

CLAIMS.

1. An exhaust valve casing for an internal combustion engine, of the kind which is intended to be fastened to the cylinder head to provide a valve seat and exhaust gas passage and to support the exhaust valve and á valve guide therefor independently of the cylinder head, characterized in that said casing is provided with cooling chambers only at two locations, that is, within a peripheral wall around the valve guide, and within a peripheral wall around the valve seat.

2. An exhaust valve casing as claimed in Claim 1, further characterized in that said valve guide is in the form of a bush, and said cooling chamber around the valve guide is of annular shape and extends along an outer periphery of said bush.

3. An exhaust valve as claimed in Claim 1 or Claim 2, further characterized in that said cooling chamber around the valve seat is of annular shape, and in that coolant inlet and outlet ducts are provided within the wall of the exhaust valve casing in the proximity of said valve seat.

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FIG.1

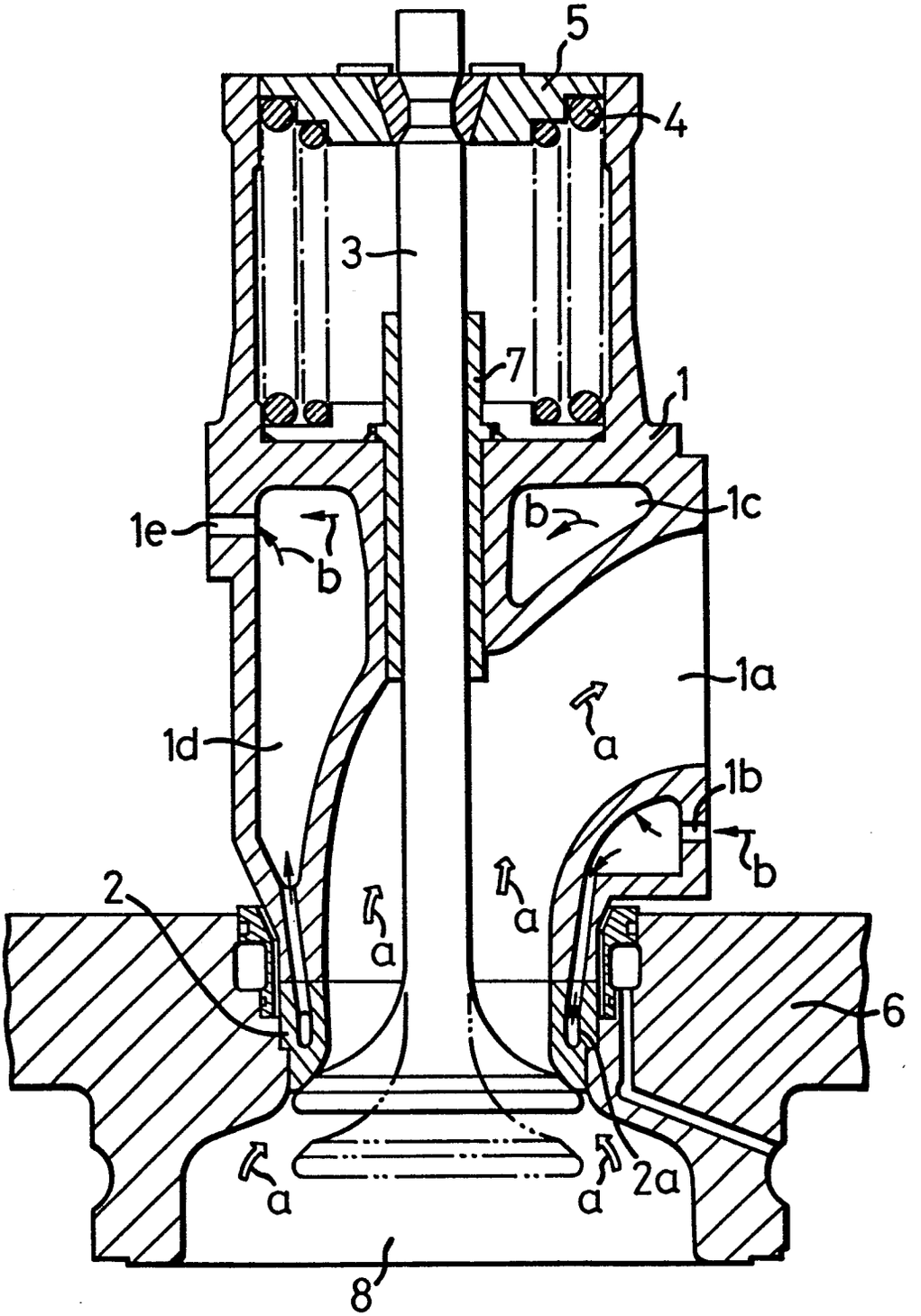


FIG.2

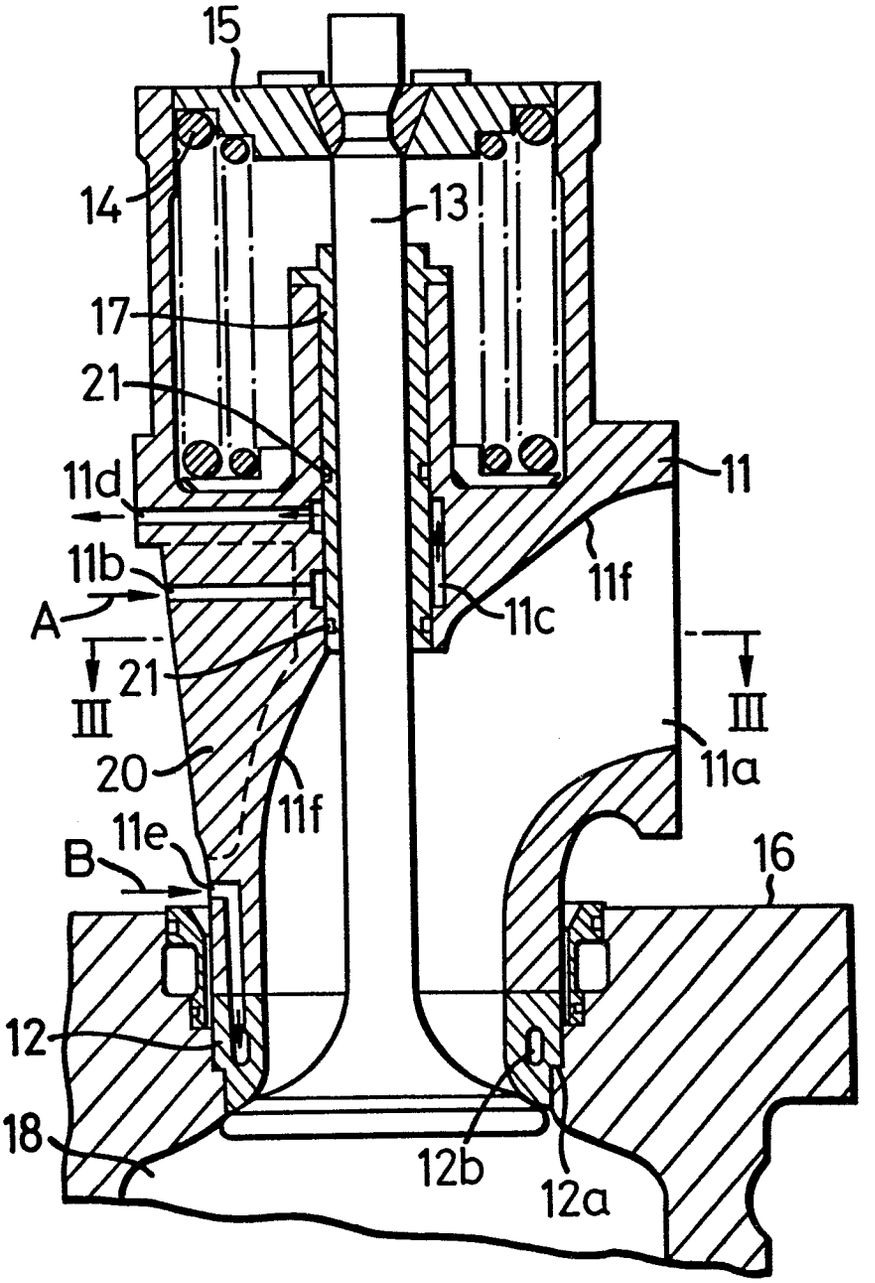
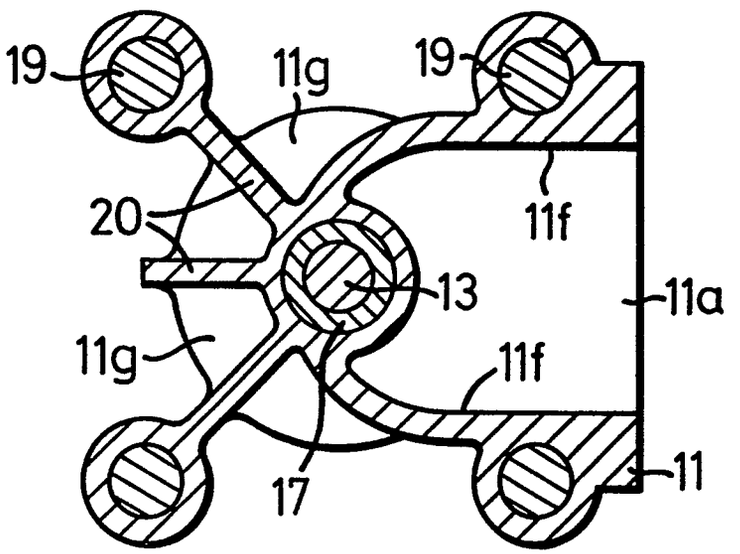

15
14
13
17
21
11d
11
11b
11f
A
11c
21
III
III
20
11a
11f
11e
B
16
12
18
12b
12a

FIG.3



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EUROPEAN SEARCH REPORT

0076348

Application number

EP 81 30 4727.1

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	CH - A - 429 304 (MIRRLEES NATIONAL) * claim and subclaims 1, 2; column 2, line 16 to column 3, line 41; fig. 1 to 4 *:	1-3
X	DE - A1 - 2 441 689 (M.A.N.) * claims 4, 6 to 8; page 7, line 24 to page 9, line 8; fig. *	1-3
A	DE - A - 1 526 593 (MIRRLEES NATIONAL) * whole document *	1-3
A	FR - A1 - 2 378 945 (SULZER FRERES) * whole document *	1-3
A	US - A - 4 000 730 (A. ÖTTL et al.) * whole document *	1-3
A	US - A - 4 008 695 (J.C. BOUQUET) * whole document *	1-3
A	FR - A1 - 2 308 787 (HONDA) * whole document *	
A	DD - A - 110 682 (F. SEIFERT et al.) * page 2, lines 18 to 47; fig. *	
A	DE - A1 - 2 737 689 (M.A.N.) * claim 1; page 4, lines 1 to 13; fig. *	

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

F 01 L 3/18
F 01 P 3/14

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

F 01 L 3/00
F 01 P 3/14

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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A: technological background
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T: theory or principle underlying the invention
E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited 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
Berlin	28-04-1982	CANNICI