



(86) Date de dépôt PCT/PCT Filing Date: 1995/04/24

(87) Date publication PCT/PCT Publication Date: 1995/11/02

(45) Date de délivrance/Issue Date: 2003/06/17

(85) Entrée phase nationale/National Entry: 1996/09/26

(86) N° demande PCT/PCT Application No.: SE 1995/000443

(87) N° publication PCT/PCT Publication No.: 1995/029333

(30) Priorité/Priority: 1994/04/25 (9401401-6) SE

(51) Cl.Int.⁶/Int.Cl.⁶ F02F 11/00

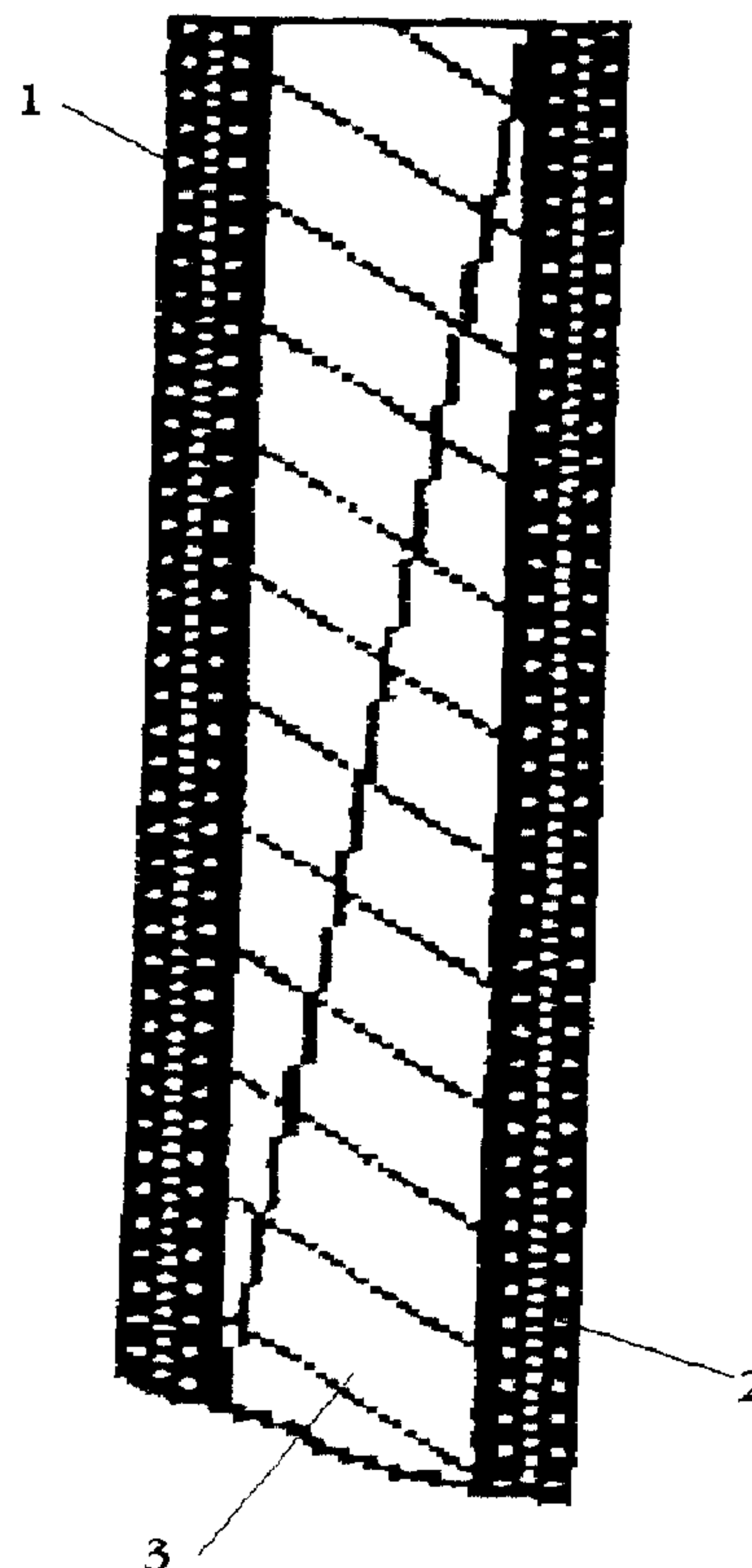
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(54) Titre : JOINT DE CULASSE DE CYLINDRE

(54) Title: HEAD GASKET



(57) Abrégé/Abstract:

The present invention relates to a cylinder head gasket for internal combustion engines. According to the invention, the gasket comprises a laminate which consists in a thin stainless steel plate or a heat-resistant steel plate that is coated on each side with still thinner carrier-calendered rubber films which have a thickness of at least 0.05 mm and which are affixed to the steel plate by vulcanization. The steel plate suitably has a thickness of about 0.2 to 0.4 mm and the rubber films each have a thickness of at least 0.05 to 0.20 mm.



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : F02F 11/00	A1	(11) International Publication Number: WO 95/29333 (43) International Publication Date: 2 November 1995 (02.11.95)
(21) International Application Number: PCT/SE95/00443 (22) International Filing Date: 24 April 1995 (24.04.95) (30) Priority Data: 9401401-6 25 April 1994 (25.04.94) SE (71) Applicant (for all designated States except US): TRELLEBORG RUBORE AB [SE/SE]; P.O. Box 860, S-391 28 Kalmar (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): JOSEFSSON, Percy [SE/SE]; K�lbyg�rde Pr�stg�rd, S-388 80 Ljungbyholm (SE). (74) Agent: LUNDIN, Bj�rn-Eric; Trelleborg AB, Patents and Trademarks, P.O. Box 21024, S-100 31 Stockholm (SE).		(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG). Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i> 2186629
(54) Title: HEAD GASKET (57) Abstract The present invention relates to a cylinder head gasket for internal combustion engines. According to the invention, the gasket comprises a laminate which consists in a thin stainless steel plate or a heat-resistant steel plate that is coated on each side with still thinner carrier-calendared rubber films which have a thickness of at least 0.05 mm and which are affixed to the steel plate by vulcanization. The steel plate suitably has a thickness of about 0.2 to 0.4 mm and the rubber films each have a thickness of at least 0.05 to 0.20 mm.		

Head Gasket

The present invention relates to a gasket, and more specifically to a cylinder head gasket for internal combustion engines.

Present-day cylinder head gaskets consist in a pack of several thin metal
5 plates, which are often riveted together. The pack may contain from three to six plates, which may have been coated with an extremely thin layer of paint, rubber or some other polymer that has been applied in the form of a solution or dispersion.

There is proposed in FR-A5-2184133 a cylinder head gasket which comprises
10 a metal band that has been coated with a layer of rubber on each side thereof. The rubber layer is applied in the form of a solution and is then heated to drive-off the solvent and form said layer. Prior publications DE-C2-3500071 and JP-A-62/101873 also teach gaskets of this kind that are produced from different types of rubber solutions. US-A 5,110,630 describes the manufacture of a
15 metal-rubber gasket in which a thin steel band is treated with chromate and rubber adhesive in sequence in a continuous process followed by a heat-treatment process, whereafter a rubber layer is applied. This is said to be affected by coating the adhesive layer to a desired thickness. The laminate will thus have an adhesive layer between each rubber layer and the metal surface.
20 In many cases, the gaskets used today present problems and especially when used with engines in which the cylinder heads and engine blocks are comprised of dissimilar materials, as is becoming more and more usual. For instance, it is becoming more usual to produce the cylinder head from an aluminium alloy and to produce the engine block from cast iron. As a result of the different thermal
25 properties of the materials, transverse movements occur between cylinder head and motor block while the engine is running.

This increases the requirement of the gaskets to withstand the shear forces to which they are subjected as a result of thermally forced transverse movements. Hitherto, one solution has been to increase the number of metal layers in the
30 gasket. However, this solution cannot be considered to be the final solution, for other reasons. Firstly, more complicated gaskets become more expensive, of course, since both material costs and manufacturing costs are greatly

-2-

increased. A second reason has an environmental connotation. The thicker the gaskets, the more liable it is that pockets are formed which are capable of causing a higher concentration of non-combusted hydrocarbons in the exhaust gases, a consequence which is extremely problematic in view of present-day
5 environmental requirements.

An ideal gasket material for modern internal combustion engines shall thus exhibit good properties with regard to compressibility and its ability to absorb shear forces while, at the same time, being thin and easy to manufacture cheaply, besides having an effective blow-by resistance, which is particularly
10 important in the present context, i.e. the gasket shall provide the best possible seal under the difficult conditions that prevail in respect of a cylinder head gasket.

The object of the present invention is to provide a cylinder head gasket which will fulfil the aforesaid high requirements that are placed on gaskets for modern
15 engines which operate under highly advanced operating conditions.

According to the invention, a cylinder head gasket for internal combustion engines is produced from a laminate which comprises a thin stainless steel plate or a heat-resistant steel plate which is coated on each side with a carrier-calendered rubber films which have a thickness of at least 0.05 mm, while
20 being thinner than said steel plate, said rubber films being fixed to the steel plate by vulcanization.

The invention will now be described in detail with reference to the accompanying drawing which shows a not-to-scale, diagrammatically cross-section of the inventive laminate.

25 The inventive cylinder head gasket includes a laminate which comprises a thin stainless steel plate and/or heat-resistant steel plate 3. The plate 3 is coated on each side with a carrier-calendered rubber films which are thinner than the steel plate and which have a thickness of at least 0.05 mm and are affixed to the steel plate by vulcanization.

-3-

The stainless and/or heat-resistant steel plate will suitably have a thickness of about 0.2-0.4 mm, and each of the rubber films will preferably have a thickness of 0.05-0.20 mm. The outwardly facing surface of the rubber films will suitably have a textile-carrier structure, preferably a roughened or
5 "pimpled" structure.

The specific combination of characteristic features defined in the Claims gives the laminate the unique combination of being compressible, having good shear-force absorbing ability and blow-by resistance (sealing ability), indicated above. It is thus important that the rubber coatings will have those specific properties
10 and that specific structure that are exhibited by calendered rubber films, among other things homogeneity and uniformity with regard to both physical properties and dimensions, and shall be as pore-free as possible. These properties cannot be achieved with a rubber covering that has been applied in the form of a solution or in the form of a dough that has been rolled-out
15 directly on the plate or substrate surfaces, since rubber coatings or coverings formed in this way will always include dough-forming residues or solvent residues that result in the formation of pores and other inhomogeneities and thereby give rise to weakened zones and also possible adhesive layers. It is also important that the rubber films have been applied to the plate with the aid
20 of a calendering carrier or vehicle which will ensure highly effective and primarily flat abutment with the surface of the plate in the absence of any tendency towards unevenness in the abutment surfaces, and which will also allow the outer surface to be given a structure that is commensurate with the carrier or vehicle chosen. The surface structure that is obtained when
25 calendering or vulcanizing a textile carrier, for instance with a so-called linen structure has been found especially beneficial. It has surprisingly been found that the essentially rough or "pimpled" outer surface provides improved abutment and sealing against metal surfaces. A material which possesses these qualities can also be affixed efficiently by vulcanization with regard to the
30 mechanical strength of the rubber-plate joins. The method of manufacturing using carriers and band-vulcanizing machines is the same as that described in our earlier patent specification published for instance, as EP-A-594601 (WO

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91/13758). The resulting laminate is also referred to herebefore and hereafter as comprising "carrier (3) calendered rubber films (1, 2)".

The invention will be presented in more detail below with reference to a number of examples which describe different tests that have been carried out
5 on the material.

Example 1

A laminate comprised of a 0.20 mm stainless steel plate and two 0.08 mm rubber layers was subjected to a compressibility test in accordance with the following:

- 10 A pack consisting in ten material samples measuring 40 x 40 mm was subjected to a pressure of 16.5 MPa with a force of 2.4 kN at room temperature. This was repeated seven times while maintaining the pressure for a period of one second. The pack of laminate samples was found to have been compressed by 16 um, which corresponds to a specific compressibility of 2
15 um/10 MPa.

Example 2

- A test was carried out on a 4-cylinder, 2 litre, 16 valve SAAB 9000 fuel injection engine over a period of twenty-four hours. The engine was prepared by lowering the piston heads to receive a thinner cylinder head gasket
20 produced from the above laminate.

CLAIMS

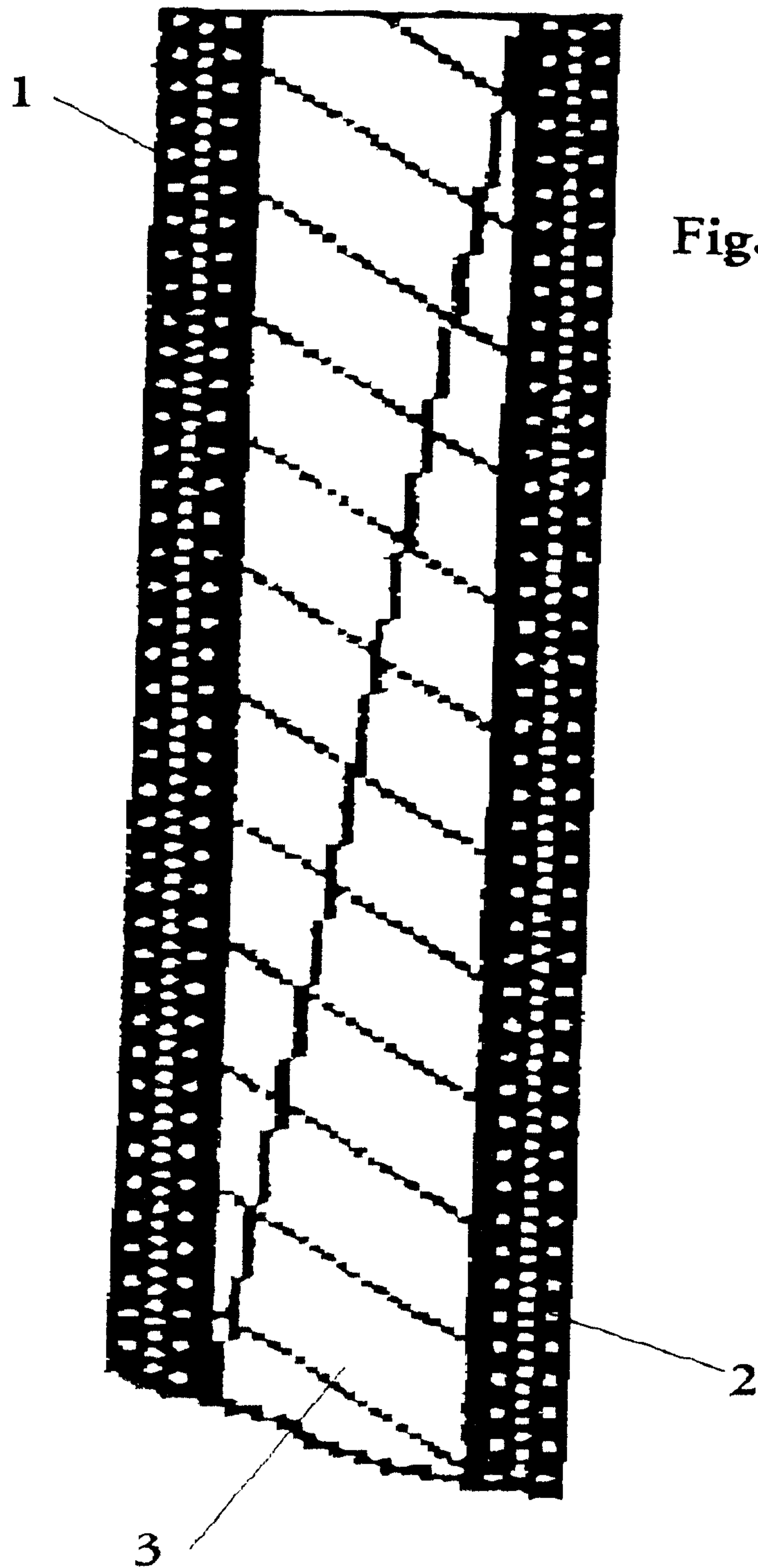
1 1. A cylinder head gasket for internal combustion engines, characterized
2 in that the gasket comprises a laminate which consists of a thin stainless steel
3 plate that is coated on each side with a carrier-calendered rubber films which
4 have a thickness of at least 0.05 mm, while being thinner than said steel plate,
5 and which rubber films are affixed to the steel plate by vulcanization.

1 2. A cylinder head gasket for internal combustion engines, characterized
2 in that the gasket comprises a laminate which consists of a thin heat-resistant
3 steel plate that is coated on each side with a carrier-calendered rubber films
4 which have a thickness of at least 0.05 mm, while being thinner than said steel
5 plate, and which rubber films are affixed to the steel plate by vulcanization.

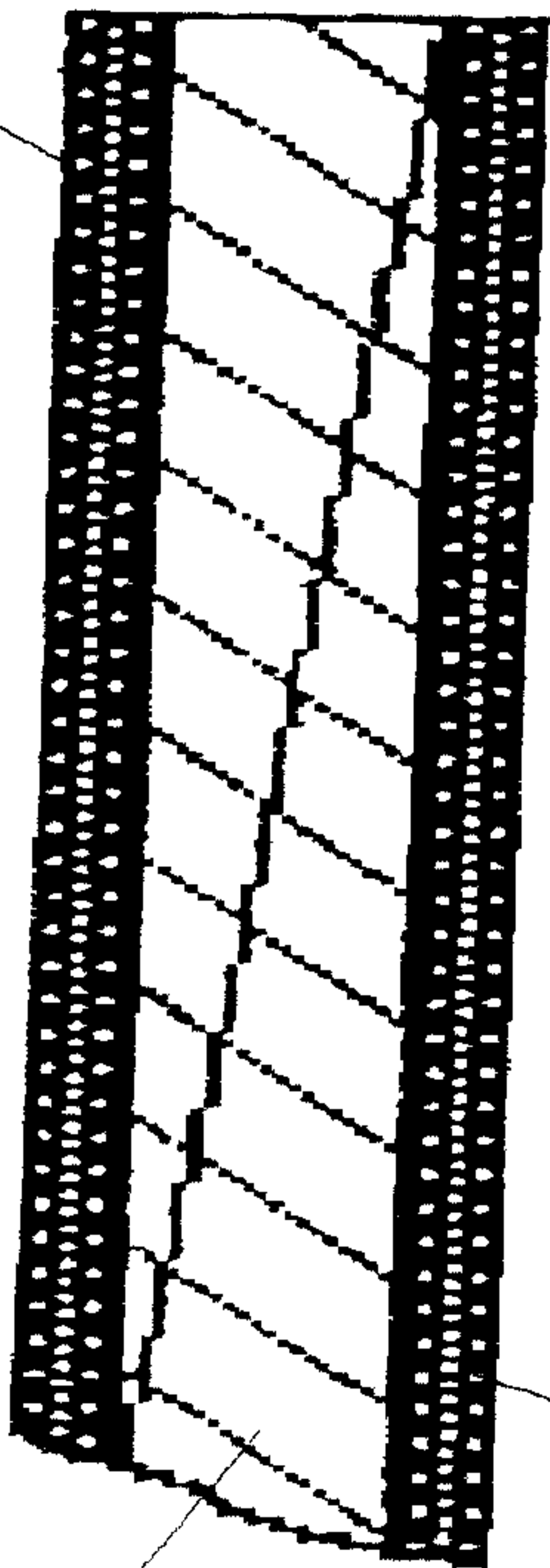
1 3. A gasket according to claims 1 or 2, characterized in that the steel
2 plate has a thickness of 0.2-0.4 mm and each of the rubber films has a
3 thickness of 0.05-0.20 mm.

1 4. A gasket according to any one of claims 1, 2 or 3, characterized in that
2 the outwardly facing surfaces of the rubber films have a textile-carrier
3 structure.

1 5. The use of a gasket according to any one of claims 1, 2, 3 or 4,
2 characterized in that the gasket is comprised of a plurality of laminates that
3 have been vulcanized together.



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