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(54) **Gasket for spigot joints in exhaust tubes of internal combustion engines**

(57) The gasket comprises a tubular sleeve of a thin steel plate. The gasket is slipped over a spigot end of a first tube, which is then inserted in the expanded socket

end of a second tube. The sleeve has retaining lips at its opposite ends, and a peripheral salient bead around its middle portion.

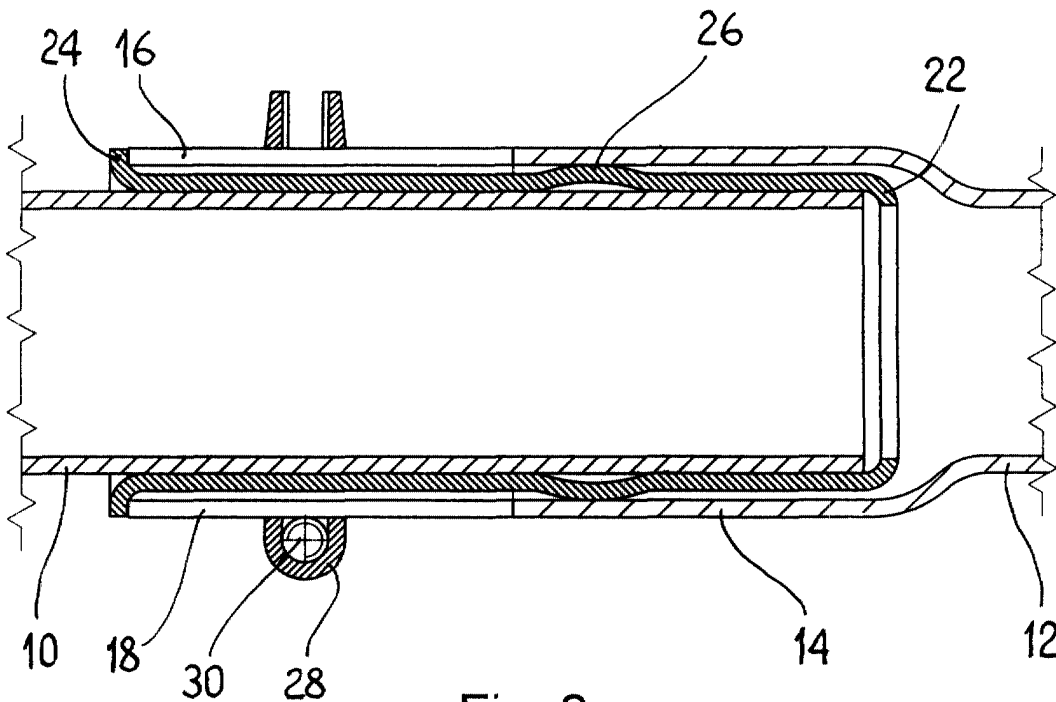


Fig. 2

Description

[0001] This invention is concerned with a gasket for exhaust tubes of internal combustion engines, and more particularly with a gasket for spigot joints in said exhaust tubes.

[0002] Spigot joints have been used in exhaust tubes of internal combustion engines, as an alternative to flanged joints, particularly in low-priced motor vehicles, because of their low manufacturing cost. In practice, spigot joints are made by just force-inserting one end of a tube into the end of the next tube, which has been previously expanded and slotted to make a socket, and by clamping the overlapping zone with a metallic collar, without any gasket, in view of the high temperatures reached by exhaust tubes.

[0003] The seal of such gasketless spigot joints was, obviously, quite poor: for instance, with an average flow rate of 5000 lt/min, which is typical of an engine of middle power, leaks were often in the range of a few tens of lt/min. However, this was tolerated, since, in any case, the leaked gas was intended to be eventually discharged to the atmosphere.

[0004] However, with the coming of leadless fuels and the catalization of exhaust gases, it has become more desirable to rigorously confine the exhaust gas in the area of post-combustion processing. Better seals are therefore required in modern motor vehicles, and this trend has been further enhanced by recently enacted European rules. Flange joints are generally adopted for this purpose, because they are easily provided with heat-resistant gaskets, although it would be desirable, from the point of view of low cost, to use spigot joints at least in the section of the exhaust system downstream of the catalizer.

[0005] Accordingly, the main object of the invention is to provide a gasket for spigot joints in exhaust tubes of internal-combustion engines, which provides the joint with an improved seal with respect to the gasketless spigot joint, while resisting the high temperatures prevailing in the exhaust tubes, and, more particularly, which reduces the leaks in the joints to less than 1 lt/min.

[0006] The invention achieves the above and other objects and advantages, such as will appear from the following disclosure, with a gasket for spigot joints in exhaust tubes of internal combustion engines, having the features set out in claim 1.

[0007] The invention will be further described in the following disclosure, with reference to a preferred embodiment, shown by way of nonlimiting example in the attached drawing, wherein:

Fig. 1 is a side view of a spigot joint of two exhaust tubes, provided with a gasket according to the preferred embodiment of the invention; and

Fig. 2 is a view in axial cross-section made along line II-II of Fig. 1.

[0008] With reference to the Figures, 10 and 12 are two tubes of an exhaust system for an internal combustion engine of a motor vehicle (not shown). Both tubes 10 and 12 typically are made from steel plate of about 5 mm thickness, having an outside diameter of, e.g., 56 mm. Tube 12 has an expanded bell-shaped socket 14, with an inside diameter substantially larger than the outside diameter of tube 10, for example 65 mm. Socket 14 is cut with two longitudinal slots 16, 18, extending from its end to a point about midway in the bell-shaped socket. The end of tube 10 is inserted as a spigot into socket 14, substantially for its entire length.

[0009] A gasket 20 is interposed between the spigot 10 and socket 14. Gasket 20 is a sleeve of thin steel plate, preferably of less than 0.6 mm thickness, even more preferably in the range 0.2 to 0.4 mm. Sleeve 20 is provided with an in-turned lip 22 at one end and with an out-turned lip 24 at its opposite end. At a point about one third of the way from lip 22, and therefore outside the extension of slots 16, 18, sleeve 20 has an outwardly salient bead 26.

[0010] As shown on Fig. 2, gasket 20 is slipped over the spigot end of tube 10 and lip 22 acts as a retainer against the spigot rim. At its opposite end, lip 24 of the gasket acts as a retainer against the rim of socket 14, so that when the spigot is pushed home into the socket, the action of both lips 22 and 24 will insure that the joint is in the proper position. Bead 26 will be slightly squeezed between the spigot and the socket, in an area outside the extension of slots 16, 18.

[0011] After spigot 10, lined with gasket 20, has been pushed home into socket 14, the joint is made secure by means of a metallic fastening collar 28, clamped by a fastening screw 30, of a type known per se.

[0012] The degree of radial projection of bead 26 is chosen so that, when collar 28 is clamped, the bead is compressed radially. The compression should be partly elastic, partly plastic, so that the bead is able to recover small dimensional variations due to vibration and/or to temperature change. A typical radial projection is about 6 mm from the outside diameter of the gasket.

[0013] The above-described gasket is preferably made from thin-plate tubing, that is cut to size and then roll-formed, in a way known to the person skilled in the art, so that the retaining lips and the bead are obtained. Alternatively, pot die forming could be used instead. The tubing may be conventional tubing made by roll forming of flat thin steel plate and welding or braising of the adjacent opposite sides.

[0014] Another method of manufacturing the gasket that could be envisaged is deep drawing from a steel workpiece.

[0015] Although steel, and preferably stainless steel, is the preferred material for the gasket, other metals could be envisaged, depending on cost and availability.

[0016] Other changes may be made in the preferred embodiment disclosed above. For instance, two peripheral beads may be made side by side, instead of a single

bead. Also, the out-turned lip, although desirable, could be dispensed with.

Claims

- 5
1. A gasket for spigot joints in exhaust tubes of internal combustion engines, wherein a spigot end of a first tube is inserted in the expanded socket end of a second tube, characterized in that the gasket comprises a tubular sleeve of a thin plate, for insertion between the spigot and the socket, having at least one peripheral bead in an intermediate position between its ends, and a first retaining lip projecting inwardly at one end of the sleeve. 10 15
 2. A gasket for spigot joints according to claim 1, characterized in that said first retaining lip is made by roll forming from a tubular sleeve having a cylindrical end. 20
 3. A gasket for spigot joints according to claim 1 or 2, characterized in that it is further provided with a second retaining lip, projecting outwardly at the opposite end of the sleeve. 25
 4. A gasket for spigot joints according to claim 1, characterized in that said second retaining lip is also made by roll forming from a tubular sleeve having a cylindrical end. 30
 5. A gasket for spigot joints according to any of claims 1 to 4, characterized in that said salient bead on the sleeve is made by roll forming. 35
 6. A gasket for spigot joints according to any of claims 1 to 5, characterized in that said sleeve is made from tubing obtained by roll forming of flat thin metal plate and welding or braising of the adjacent opposite sides. 40
 7. A gasket for spigot joints according to any of claims 1 to 6, characterized in that said sleeve is made of steel plate. 45
 8. A gasket for spigot joints according to any of claims 1 to 6, characterized in that said sleeve is made of stainless steel plate.
 9. A gasket for spigot joints according to any of claims 1 to 8, characterized in that the metal plate of said sleeve is 0.1 to 0.4 mm thick. 50

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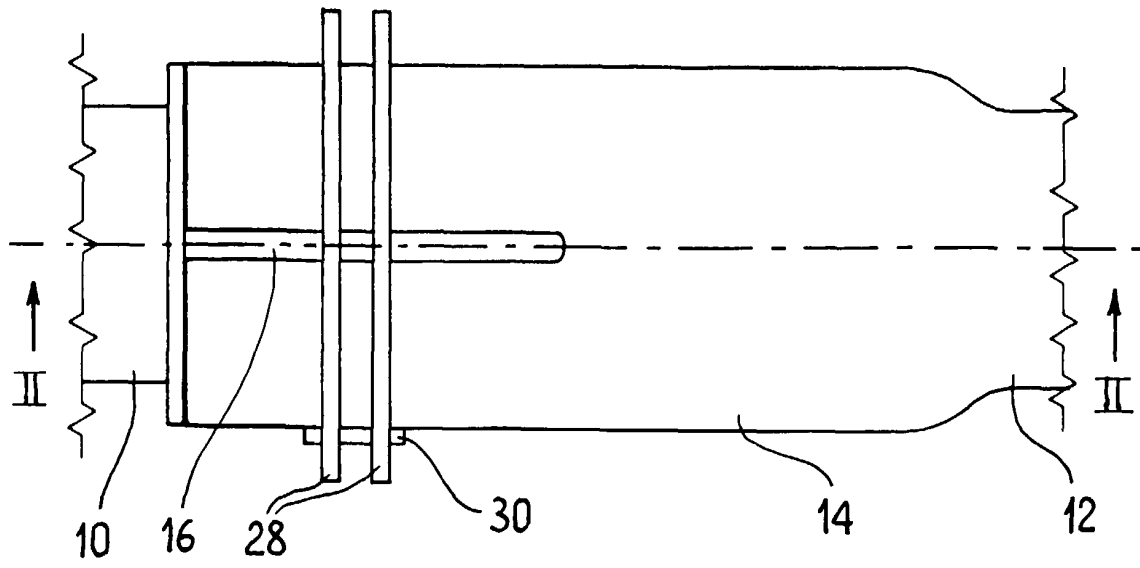


Fig. 1

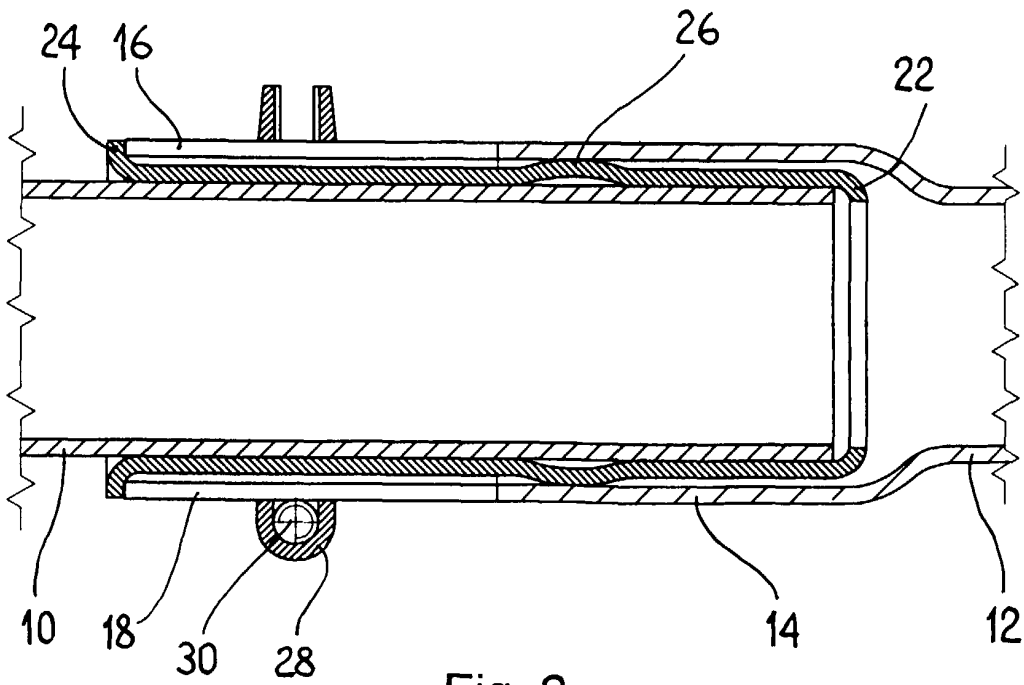


Fig. 2



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 99 83 0785

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 26 12 828 A (VOLKSWAGENWERK AG) 29 September 1977 (1977-09-29) * page 2, paragraph 1 - paragraph 2 * * page 3, paragraph 2 - page 4, paragraph 3; figure 1 *	1	F01N7/18
A	US 4 270 689 A (CANFIELD) 2 June 1981 (1981-06-02) * abstract * * column 3, line 47 - column 4, line 21; figures 1-3 *	1	
A	DE 92 13 063 U (H.J.S. FAHRZEUGTEILE-FABRIK GMBH) 26 November 1992 (1992-11-26) * page 1, paragraph 1 * * page 3, paragraph 7 - page 4, paragraph 4; figures 1,2 *	1	
A	DE 88 03 199 U (OSKAR PURUCKER MASCHINENBAU LANDTECHNIK) 5 May 1988 (1988-05-05)		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F01N
Place of search	Date of completion of the search	Examiner	
THE HAGUE	24 May 2000	Van Zoest, A	
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 83 0785

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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24-05-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2612828 A	29-09-1977	NONE	
US 4270689 A	02-06-1981	NONE	
DE 9213063 U	26-11-1992	NONE	
DE 8803199 U	05-05-1988	NONE	

EPO FORM P0468

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82