



(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
20.12.2023 Bulletin 2023/51

(43) Date of publication A2:
25.10.2023 Bulletin 2023/43

(21) Application number: **23162167.3**

(22) Date of filing: **15.03.2023**

(51) International Patent Classification (IPC):
F01L 1/053 ^(2006.01) **F02F 7/00** ^(2006.01)
F02F 1/24 ^(2006.01) **F02B 77/08** ^(2006.01)
F02M 26/41 ^(2016.01)

(52) Cooperative Patent Classification (CPC):
F01L 1/053; F02B 77/082; F02F 1/24;
F02F 7/0068; F02M 26/41; F01L 2820/041

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **31.03.2022 JP 2022059894**

(71) Applicant: **Suzuki Motor Corporation**
Hamamatsu-shi, Shizuoka 432-8611 (JP)

(72) Inventor: **YAMAMOTO, Kanji**
HAMAMATSU-SHI, 432-8611 (JP)

(74) Representative: **Plasseraud IP**
66, rue de la Chaussée d'Antin
75440 Paris Cedex 09 (FR)

(54) **CAM ANGLE SENSOR ATTACHING STRUCTURE FOR INTERNAL COMBUSTION ENGINE**

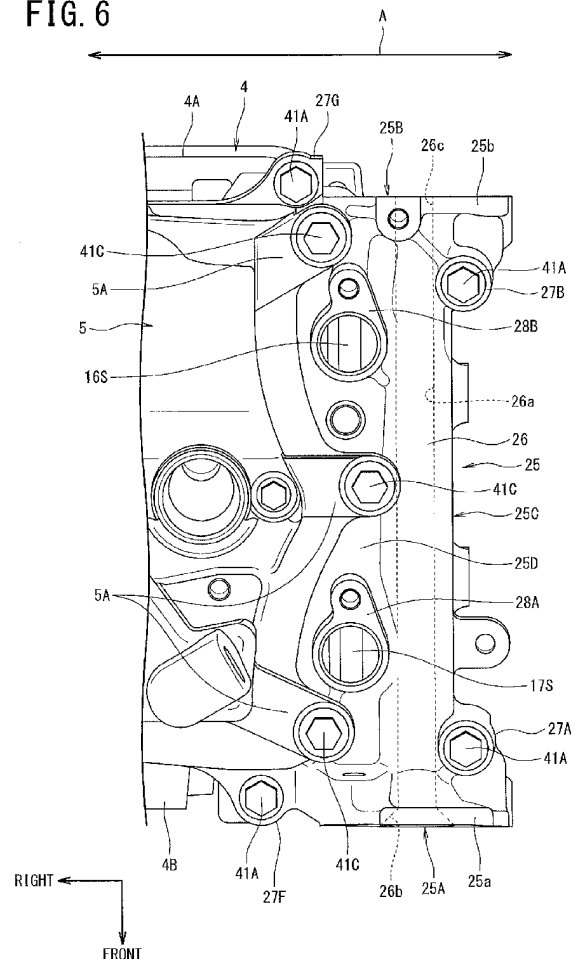
(57) [Problem to be Solved]

It is to provide a cam angle sensor attaching structure for an internal combustion engine capable of enhancing stiffness around a point where a cam angle sensor is attached to suppress vibration of the cam angle sensor to thereby prevent accuracy of detecting a rotational angle of a camshaft from deteriorating.

[Solution]

An EGR housing portion 25 attached to a cylinder head 4 includes: an upper wall 25D with an attaching boss portion 28A, 28B to which a cam angle sensor 31, 32 is attached, the upper wall being connected to a front wall 25A, a rear wall 25B, and a left side wall 25C; and a tubular EGR passage portion 26 with an EGR passage 26a through which an EGR gas flows, the EGR passage portion being located on the same side as the left side wall 25C. The EGR passage portion 26 includes: an EGR gas inlet 26b provided at the front wall 25A, to introduce the EGR gas into the EGR passage 26a; and an EGR gas outlet 26c provided at the rear wall 25B, to discharge the EGR gas from the EGR passage 26a. The attaching boss portion 28A, 28B is connected to the EGR passage portion 26.

FIG. 6





EUROPEAN SEARCH REPORT

Application Number

EP 23 16 2167

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 10 2019 121123 A1 (FEV GROUP GMBH [DE]) 19 September 2019 (2019-09-19) * the whole document *	1-6	INV. F01L1/053 F02F7/00 F02F1/24 F02B77/08 F02M26/41
A	EP 1 471 213 A2 (NISSAN MOTOR [JP]; RENAULT SAS [FR]) 27 October 2004 (2004-10-27) * the whole document *	1-6	
A	EP 1 156 191 A1 (YAMAHA MOTOR CO LTD [JP]) 21 November 2001 (2001-11-21) * the whole document *	1-6	
A	EP 1 748 168 A2 (NISSAN MOTOR LTD [JP]) 31 January 2007 (2007-01-31) * the whole document *	1-6	
A	EP 1 081 342 A1 (HONDA MOTOR CO LTD [JP]) 7 March 2001 (2001-03-07) * the whole document *	1-6	
A	US 10 731 601 B2 (MAZDA MOTOR [JP]) 4 August 2020 (2020-08-04) * the whole document *	1-6	TECHNICAL FIELDS SEARCHED (IPC)
A	EP 3 726 044 A1 (YANMAR POWER TECHNOLOGY CO LTD [JP]) 21 October 2020 (2020-10-21) * the whole document *	1-6	F02F F02M F02B F01L
A	EP 3 889 417 A1 (MAZDA MOTOR [JP]) 6 October 2021 (2021-10-06) * the whole document *	1-6	
A	US 5 979 421 A (YAMASHITA NORIYUKI [JP] ET AL) 9 November 1999 (1999-11-09) * the whole document *	1-6	
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		6 October 2023	Paulson, Bo
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
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			



EUROPEAN SEARCH REPORT

Application Number

EP 23 16 2167

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2020/318586 A1 (UCHIBORI MASATAKA [JP] ET AL) 8 October 2020 (2020-10-08) * the whole document *	1-6	
A	GB 2 522 848 A (GM GLOBAL TECH OPERATIONS INC [US]) 12 August 2015 (2015-08-12) * the whole document *	1-6	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
Place of search Munich			Date of completion of the search 6 October 2023
Examiner Paulson, Bo			
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
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			

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 23 16 2167

5 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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

06-10-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102019121123 A1	19-09-2019	DE 102019121123 A1	19-09-2019
		DE 102020004421 A1	10-09-2020
EP 1471213 A2	27-10-2004	CN 1540150 A	27-10-2004
		EP 1471213 A2	27-10-2004
		JP 4151469 B2	17-09-2008
		JP 2004324444 A	18-11-2004
		KR 20040091592 A	28-10-2004
		US 2004211376 A1	28-10-2004
EP 1156191 A1	21-11-2001	DE 60113478 T2	13-07-2006
		EP 1156191 A1	21-11-2001
		JP 2001329885 A	30-11-2001
		US 2001042527 A1	22-11-2001
EP 1748168 A2	31-01-2007	CN 1904332 A	31-01-2007
		EP 1748168 A2	31-01-2007
		JP 4321504 B2	26-08-2009
		JP 2007032309 A	08-02-2007
		KR 20070013224 A	30-01-2007
		KR 20070115854 A	06-12-2007
		US 2007017282 A1	25-01-2007
EP 1081342 A1	07-03-2001	BR 0003968 A	04-06-2002
		CA 2317159 A1	03-03-2001
		CN 1287220 A	14-03-2001
		DE 60010602 T2	30-09-2004
		EP 1081342 A1	07-03-2001
		JP 3604304 B2	22-12-2004
		JP 2001073826 A	21-03-2001
		TW 445343 B	11-07-2001
		US 6481270 B1	19-11-2002
US 10731601 B2	04-08-2020	CN 109252973 A	22-01-2019
		DE 102018116664 A1	17-01-2019
		JP 6528810 B2	12-06-2019
		JP 2019019735 A	07-02-2019
		US 2019017466 A1	17-01-2019
EP 3726044 A1	21-10-2020	CN 111465761 A	28-07-2020
		EP 3726044 A1	21-10-2020
		JP 6871845 B2	19-05-2021
		JP 2019108810 A	04-07-2019
		KR 20200095449 A	10-08-2020
		US 2020340423 A1	29-10-2020
		US 2021301758 A1	30-09-2021

EPO FORM P0459

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

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 23 16 2167

5 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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

06-10-2023

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
			US 2022268235 A1	25-08-2022	
			WO 2019116835 A1	20-06-2019	

15	EP 3889417	A1	06-10-2021	CN 113494394 A	12-10-2021
				EP 3889417 A1	06-10-2021
				JP 2021161979 A	11-10-2021
				US 2021310447 A1	07-10-2021

20	US 5979421	A	09-11-1999	JP 3490232 B2	26-01-2004
				JP H10122061 A	12-05-1998
				US 5979421 A	09-11-1999

25	US 2020318586	A1	08-10-2020	CN 111492136 A	04-08-2020
				EP 3734056 A1	04-11-2020
				JP 6867282 B2	28-04-2021
				JP 7167230 B2	08-11-2022
				JP 2019116856 A	18-07-2019
				JP 2021120571 A	19-08-2021
				KR 20200095450 A	10-08-2020
				US 2020318586 A1	08-10-2020
30				WO 2019130760 A1	04-07-2019

	GB 2522848	A	12-08-2015	NONE	

35					
40					
45					
50					

ORM P0459

EPO FORM P0459

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