



- (51) International Patent Classification:
F02M 35/10 (2006.01) *B60K 13/02* (2006.01)
- (21) International Application Number:
PCT/SE2016/050044
- (22) International Filing Date:
25 January 2016 (25.01.2016)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
1550103-4 2 February 2015 (02.02.2015) SE
- (71) Applicant: CHINA-EURO VEHICLE TECHNOLOGY
AKTIEBOLAG [SE/SE]; Theres Svenssons gata 7, SE-
417 55 Göteborg (SE).
- (72) Inventors: HENRIKSSON, Christoffer; Rant-
mästaregatan 23C, SE-416 58 Göteborg (SE). BLIXT, An-
dreas; Lars Kaggsatan 37, SE-415 04 Göteborg (SE).
- (74) Agent: BERGENSTRÄHLE & PARTNERS GÖTE-
BORG AB; Lindholmspiren 5A, SE-417 56 Göteborg
(SE).

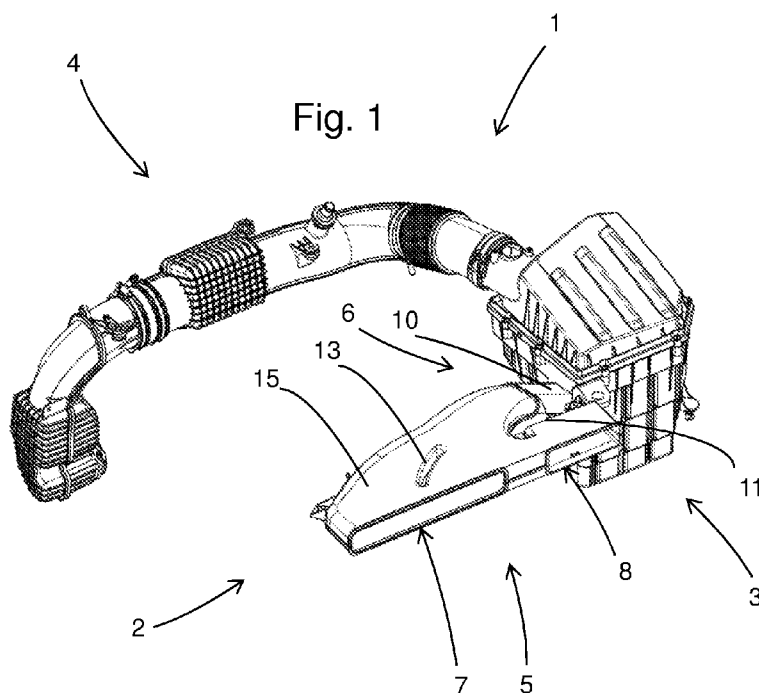
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: AIR INTAKE



(57) Abstract: Air intake (2) for a vehicle comprising an inlet portion (5) and an outlet portion (6), and the inlet portion (5) is in air communication with air located outside the exterior of the vehicle. The inlet portion (5) comprises primary and secondary inlet portions (7, 8) which are internally connected to each other by means of a channel (9).



AIR INTAKE

Technical field

[0001] The present invention relates generally to an air intake according to the preamble of claim 1, and a method for supply of air into an air intake according to claim 9.

Background art

[0002] From prior art air intakes for vehicles are known, which are arranged to provide the engine with combustion air. The air intake is provided with an inlet portion and an outlet portion. The inlet portion is preferably arranged in the front of the vehicle, and the outlet portion is connected to an air filter box, wherein debris and dirt are removed before the air is supplied to the combustion chamber.

[0003] The inlet portion is provided with a primary and a secondary inlet portion. The primary air inlet portion is preferably arranged in a front of the vehicle, and the secondary inlet portion is preferably arranged in the engine compartment.

[0004] At driving during normal conditions, combustion air is firstly drawn into the combustion chamber from the primary inlet portion, and in the event that the capacity of the primary inlet portion is too low or the primary inlet portion is clogged, e.g. by snow, the combustion air is drawn from the secondary inlet portion, situated inside the interior of the engine compartment.

[0005] To achieve high engine efficiency and performance, the combustion air supplied to the engine need to be as cold as possible. The principle behind a cold air intake is that cool air has a higher density, thus containing more oxygen per volume unit than warm air.

[0006] Thus, when the primary inlet portion of the air intake is clogged and the air is drawn from the engine compartment through the secondary inlet portion, the inlet air is heated by the engine, and it is not as cold as the air exterior to the vehicle body. Thus, the result of this is that the combustion process taken place in

the combustion chamber will be less efficient and engine performance will be partially lost.

Summary of invention

[0007] An object of the present invention is to provide an air intake which will be able to provide cold intake air to a vehicle even if the air inlet intake has reduced capacity or is clogged.

[0008] One aspect of the present invention relates to an air intake for a vehicle comprising an inlet portion and an outlet portion. The inlet portion is in air communication with exterior air at the exterior of the vehicle. The inlet portion comprises a primary and a secondary inlet portion which are internally connected to each other by means of a channel.

[0009] The outlet portion is divided into a primary outlet portion and a secondary outlet portion. The primary outlet portion is connected to an air cleaning assembly and the secondary outlet portion is in flow communication with the engine compartment.

[0010] The primary inlet portion is provided with a purifying device, which prevents particles present in the air entering the air intake. The purifying device is detachable from the inlet portion. The purifying device of the primary inlet portion is a filter. The primary and secondary inlet portions of the inlet portion are situated in an exterior portion or a front portion of the vehicle.

[0011] The primary and secondary inlet portions are provided in the vicinity of each other. Further a partition wall is provided in the area behind the primary inlet portion. A further aspect of the invention relates to an air intake system for a vehicle comprising the air intake described above.

[0012] Further the invention comprises a method for supply of air into an air intake according to any of claims 1-7 for a vehicle which method comprises supplying air into the primary inlet portion and the secondary inlet portion of the air intake, and supplying air from a secondary inlet portion into a primary inlet portion

through a channel, by means of a created negative pressure when the primary inlet portion is clogged.

Brief description of drawings

[0013] The invention is now described, by way of example, with reference to the accompanying drawings, in which:

[0014] Fig. 1 is an air intake system for a vehicle, comprising the air intake according to the invention,

[0015] Fig. 2 is an isometric view of an air intake according to the invention,

[0016] Fig. 3 is a top section view of the air intake according to the invention, and

[0017] Fig. 4 is a top section view of the air intake according to the invention.

Description of embodiments

[0018] In the following, a detailed description of an air intake system 1 and an air intake 2 for a vehicle according to the invention is given.

[0019] In this context the term “vehicle” means any mobile machine that transports people or cargo. Examples of such mobile machines are motor vehicles e.g. motorcycles, cars, commercial vehicles e.g. trucks, buses, trains, utility vehicles, watercraft, e.g. ships, boats, heavy duty vehicles e.g. dumper trucks, excavators, tractors, space crafts, aircrafts etc..

[0020] In fig. 1 an air intake system 1 for a vehicle is shown. The air intake system 1 comprises an air intake device 2, an air cleaning assembly 3 and an air intake duct 4. The air intake device 2 is an air intake through which air is feed from the exterior of the vehicle into the air intake system 1. The air cleaning assembly 3 is an air filter box within which exterior air feed through the air intake 2 is filtered by means of a cleaning arrangement, e.g. a filter (not shown). The exterior air is cooling air. Thus the cooling air has a temperature that is lower than the temperature of the air present in the engine compartment or the air present in the

cooling package. The air filter box 3 preferably filters object as debris and dirt out of the exterior air supplied into the air inlet system 1. Following the cleaning or filtering of the air in the air filter box 3, the air is feed into the engine through the air intake duct 4.

[0021] In fig. 2 an isometric view of the air intake 2 is shown. The air intake 2 comprises an inlet portion 5 and an outlet portion 6. The inlet portion 5 is in air communication with air located outside the exterior of the vehicle. Further, the inlet portion 5 comprises a primary 7 and a secondary inlet portion 8 which are internally connected to each other by means of a channel or aperture 9. The channel or aperture 9 extends in the interior of the air intake 2.

[0022] The outlet portion 6 of the air intake 2 is divided into a primary 10 and a secondary outlet portion 11. The primary outlet portion 10 is connected to the air cleaning assembly 3 and the secondary outlet portion 11 is in open flow communication with the engine compartment. The secondary inlet portion 8 and the secondary outlet portion 11 are provided essentially in front of each other in a substantial horizontal direction.

[0023] The primary inlet portion 7 is provided with a purifying device 12, which prevents particles from the intake air entering the air intake 2. The secondary inlet portion 8 is an aperture which is completely open and will allow unfiltered air to pass into and through the air intake 2. The purifying device 12 of the primary inlet portion 7 is preferably a filter. The filter is preferably a close-meshed net manufactured out of plastic or metal. Thus, the air is cleaned in a first step by means of the purifying device 12 such that less dirt will have to be filtered out of the flow of air into the air filter box 3, within which air filter box 3 the air is filtered in a second step.

[0024] In the internal area of the air intake 2 behind the primary inlet portion 7 a partition wall 13 is provided. The partition wall 13 is provided to strengthen and stiffen the air intake 2, and to guide the flow of air. The partition wall 13 extends between a lower wall 14 and an upper wall 15 of the air intake.

[0025] The primary and secondary inlet openings 7, 8 are preferably provided in the vicinity of each other, so that the channel 9 that connects the primary inlet portion 7 with the secondary inlet portion 8 has a configuration minimizing air pressure drop such that the channel is as short as possible to avoid unnecessary decrease in air pressure. The primary and secondary inlet portions 7, 8 are preferably arranged next to each other. The longitudinal directions of the primary and secondary inlet portions 7, 8 are preferably on an essentially similar height above a ground surface, whereupon the vehicle is arranged. The primary and secondary inlet portions 7, 8 may in another embodiment be arranged one above the other.

[0026] The primary and secondary inlet portions 7, 8 exemplified in the Fig. 1-2, are of an elongated design, but any other configuration may be possible e.g. circular, oval, quadric, rectangular etc..

[0027] The primary and secondary inlet portions 7, 8 are situated in an exterior portion of the vehicle, and preferably in a front portion of the vehicle.

[0028] The purifying device 12 may be permanently fixed to the primary inlet portion 7 or be detachable from the inlet portion 7, due to cleaning purposes.

[0029] In this context the term “normal driving conditions” means any condition when the air contains e.g. rain, dust, minor debris of a size that does not clog the purifying device.

[0030] In this context the term “extraordinary driving conditions” means any condition when the air contains particles of a size that may clog the purifying device e.g. snow, snow slush, sand etc..

[0031] When the engine is running and the vehicle is standing still, and both the primary and secondary inlet portions 7, 8 are open, the inlet air to the engine is supplied through both the primary and secondary inlet portions 7, 8, and no or a minor amount of air is supplied through the secondary outlet portion 11 into the engine compartment.

[0032] When the engine is running and the vehicle is standing still, and the primary inlet portion 7 is clogged and the secondary inlet portion 8 is open, the majority of the air supplied through the secondary inlet portion 8 is supplied into the primary inlet portion 7 from the secondary inlet portion 8 through the secondary inlet portion 8, and no or a minor amount of air is supplied through the secondary outlet portion 11 into the engine compartment. This due to that the vehicle is standing still and that a negative pressure is created in the air intake system 1.

[0033] Fig. 3 shows the air flow 16, 17, 18 through the air intake 2 when driving during normal driving conditions. When driving of the vehicle during normal driving conditions, the air will flow into the air intake 2 through both the primary and secondary inlet portions 7, 8. Thus, the major part of the inlet air 17 supplied through the secondary inlet portion 8 will flow straight through the air intake 2 and straight out through the secondary outlet portion 11 into the engine compartment, and only a minor part of the inlet air 18 through the secondary inlet portion will enter the air filter box 3. The major part of the air 16 supplied through the primary inlet portion 7 will flow through the air intake 2 and the purifying device 12 and out through the primary outlet portion 10 through the air filter box 3 and into the engine through the air intake duct 4. Minor amounts of intake air 18 will flow through the channel 9 from the secondary intake portion 8 to the primary inlet portion 7, due to no negative pressure in the system. Thus, the air 16 through the primary inlet portion is cleaned in the first step by means of the purifying device 12 such that less dirt will have to be filtered from the flow of air inside the air filter box 2, in the second purifying step.

[0034] Thus, the air supplied into the primary inlet portion 7 is the portion which will supply the engine with air, during normal driving conditions.

[0035] Fig. 4 shows the air flow 19, 20 through the air intake 2 when driving during extraordinary driving conditions. When driving during extraordinary driving conditions, e.g. driving during snowfall or general wintry conditions the roads may be covered with e.g. snow and snow slush, which will splash onto the front of the vehicle. Thus, when this is the case the primary inlet portion 7 will sooner or later

be clogged and the supply of air to the engine will decrease or stop through the primary inlet portion 7. When less or no air is supplied through the primary inlet portion 7, due to a clogged purifying device 12, a negative pressure is created within the air intake 2, and due to a negative pressure air 20 is drawn from the secondary inlet portion 8 through the channel 9 to the air filter box 3. During these conditions the amount of air 20 drawn into the primary inlet portion 7 from the secondary inlet portion 8 through the channel 9 is enough to run the engine without notable performance loss. Preferably, the percentage of the air 20 supplied into the primary inlet portion 7 from the secondary inlet portion 8 through the secondary inlet portion 8 supplied through the channel 9 into the air filter box 3 is minor, approximately 10%, and the major part, approximately 90%, of the air 19 flows from the secondary inlet portion 8 and straight through the air intake 2 and out through the secondary outlet portion 11 into the engine compartment.

[0036] Thus, the supply of air into an air intake 2 according to the invention for a vehicle comprises supplying air 16, 17, 18 into the primary inlet portion 7 and the secondary inlet portion 8 of the air intake 2, and supplying air 20 from the secondary inlet portion 8 into the primary inlet portion 7 through the channel 9, by means of a created negative pressure when the primary inlet portion 8 is clogged.

CLAIMS

1. Air intake (2) for a vehicle comprising an inlet portion (5) and an outlet portion (6), wherein the inlet portion (5) is in air communication with exterior air of the vehicle,

characterized in that

the inlet portion (5) comprises a primary and a secondary inlet portion (7, 8) which are internally connected to each other by means of a channel (9), and the outlet portion (6) is divided into a primary outlet portion (10) and a secondary outlet portion (11), the primary outlet portion (10) is connected to an air cleaning assembly (3) and the secondary outlet portion (11) is in flow communication with the engine compartment.

2. Air intake (2) according to claim 1, wherein the primary inlet portion (7) is provided with a purifying device (12), which prevents particles present in the air entering the air intake (2).

3. Air intake (2) according to any of claims 1-2, wherein the purifying device (12) is detachable from the inlet portion (7).

4. Air intake (2) according to any of claims 1-3, wherein the purifying device (12) of the primary inlet portion (7) is a filter.

5. Air intake (2) according to any of claims 1-4, wherein the primary and secondary inlet portions (7, 8) of the inlet portion (5) are situated in an exterior portion or a front portion of the vehicle.

6. Air intake (2) according to any of claims 1-5, wherein a partition wall (13) is provided in the area behind the primary inlet portion (7).

7. Air intake system (1) for a vehicle comprising the air intake (2) according to any of claims 1-6.

8. Method for supply of air into an air intake according to any of claims 1-6 for a vehicle which method comprises:

- supplying air (16, 17, 18) into the primary inlet portion (7) and the secondary inlet portion (8) of the air intake (2), and
- supplying air (20) from a secondary inlet portion (8) into a primary inlet portion (7) through a channel (9), by means of a created negative pressure when the primary inlet portion (7) is clogged.

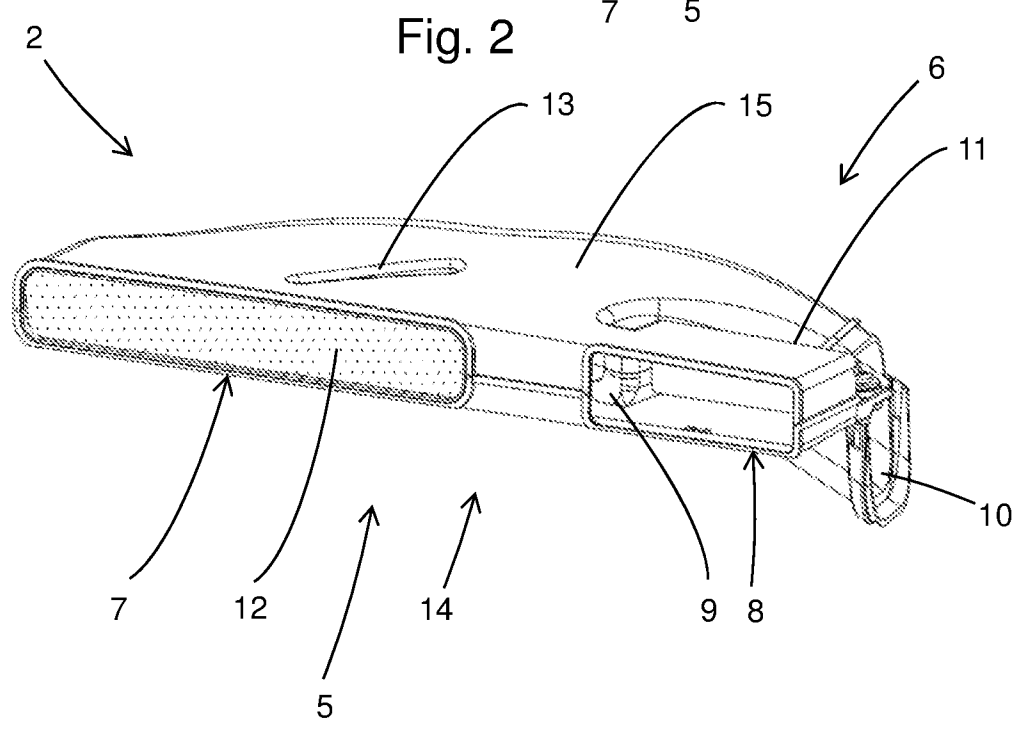
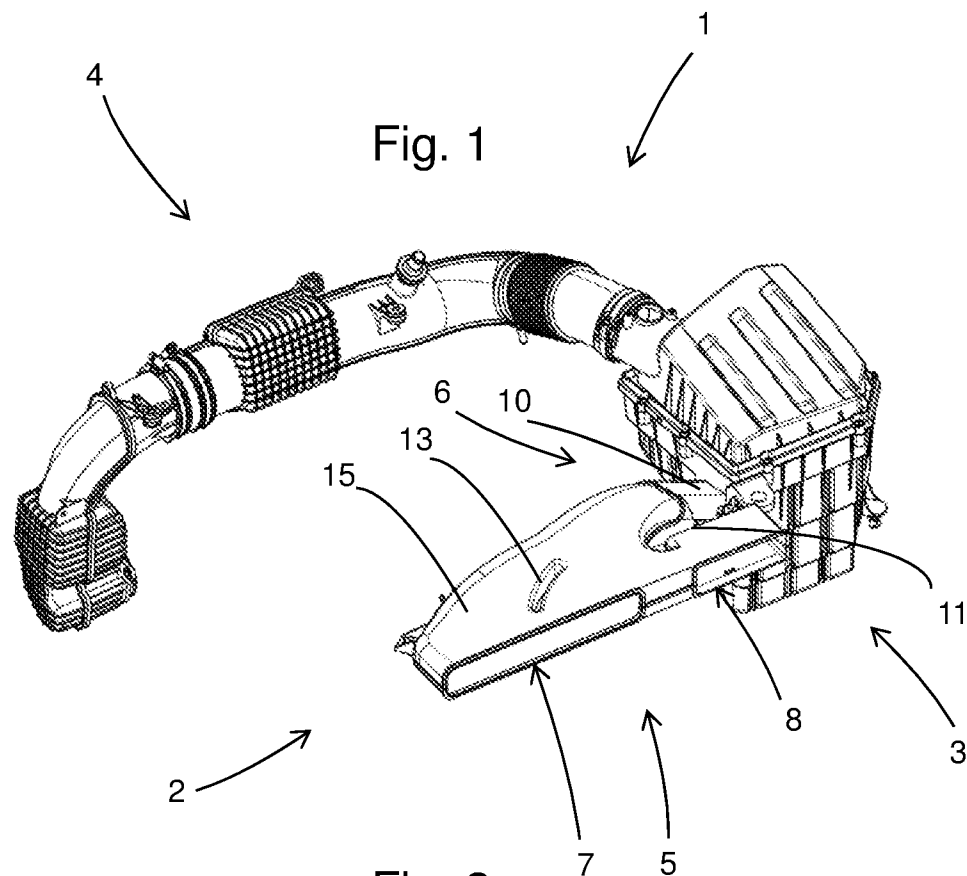


Fig. 3

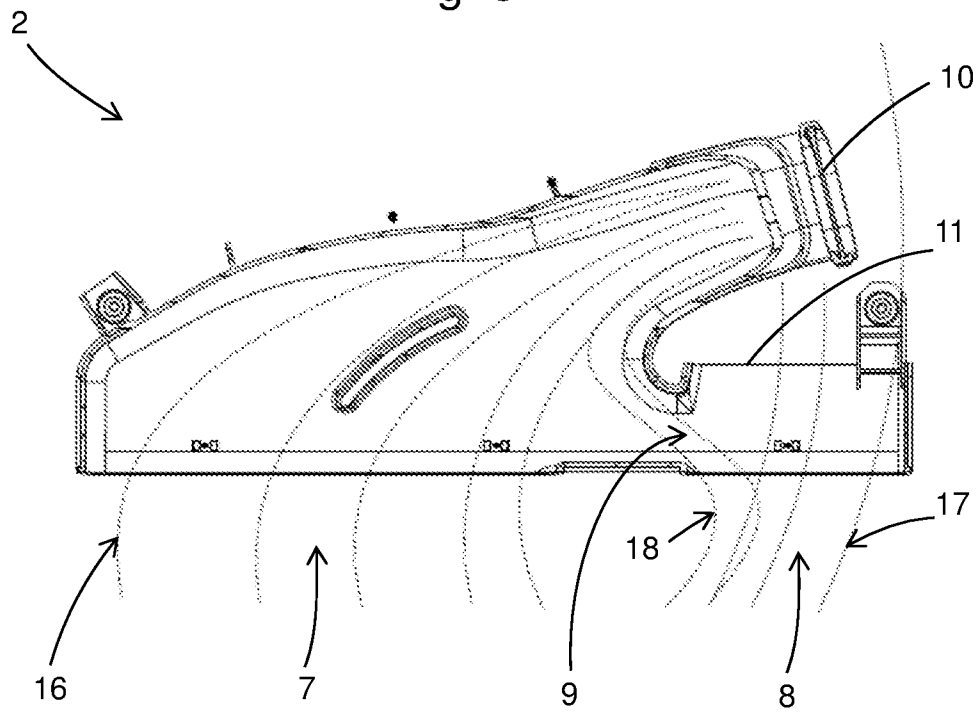
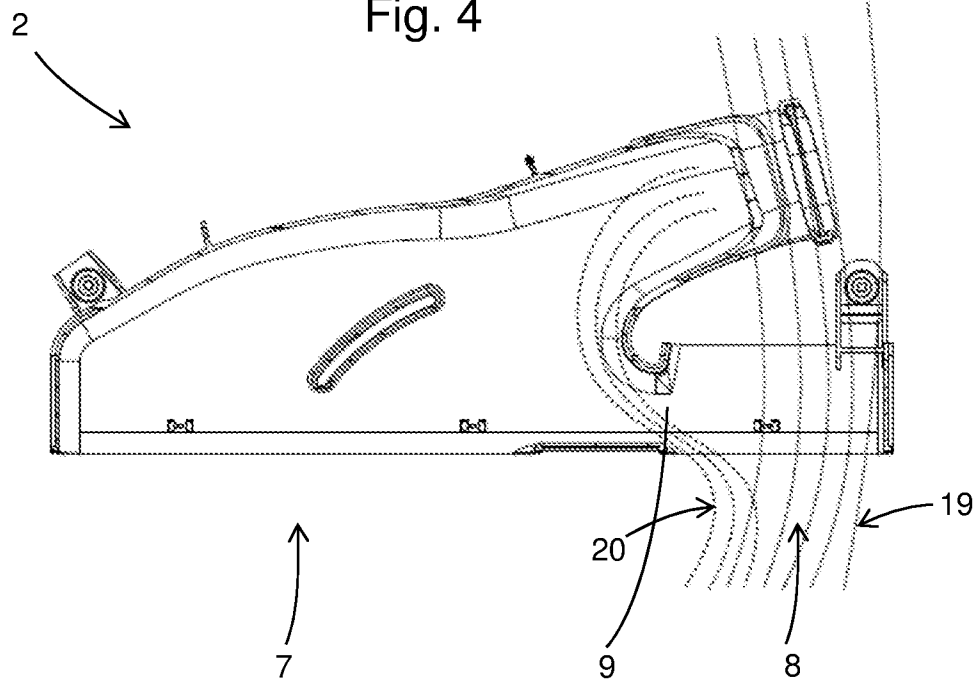


Fig. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2016/050044

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B60K, F02M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 102011084797 A1 (ROECHLING AUTOMOTIVE AG & CO), 25 April 2013 (2013-04-25); paragraphs [0042]-[0043]; figure 2	1-7
Y	--	8
Y	DE 4408097 A1 (BAYERISCHE MOTOREN WERKE AG), 14 September 1995 (1995-09-14); column 2, line 56 - line 64; figures	8
A	--	1-7



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

07-04-2016

Date of mailing of the international search report

08-04-2016

Name and mailing address of the ISA/SE
Patent- och registreringsverket
Box 5055
S-102 42 STOCKHOLM
Facsimile No. + 46 8 666 02 86

Authorized officer

Göran Carlström

Telephone No. + 46 8 782 28 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2016/050044

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20110155492 A1 (MATSUDA YOSHIHARU ET AL), 30 June 2011 (2011-06-30); whole document --	1-8
A	GB 2497143 A (LAND ROVER - (B) JAGUAR LAND ROVER [GB]), 5 June 2013 (2013-06-05); whole document --	1-8
A	JP 06239148 A (MAZDA MOTOR), 30 August 1994 (1994-08-30); abstract; figures -- -----	1-8

Continuation of: second sheet

International Patent Classification (IPC)

F02M 35/10 (2006.01)

B60K 13/02 (2006.01)

INTERNATIONAL SEARCH REPORT

Information on patent family members

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