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(54) Title: SPOILER OF A VEHICLE

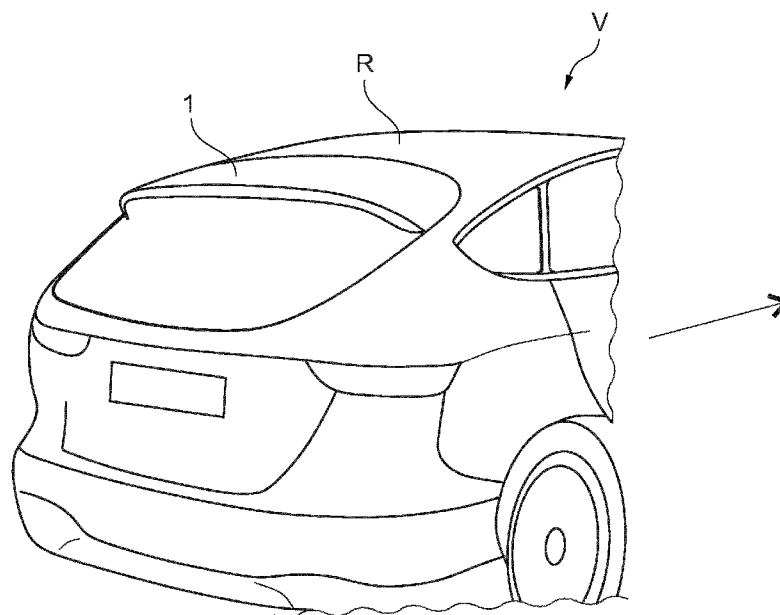


Fig. 1

(57) Abstract: The invention relates to a spoiler (1) of a vehicle (V) comprising a body and an electronic component, wherein the body comprises a cavity, wherein the electronic component is arranged in this cavity, wherein the spoiler comprises an outer recess and the spoiler comprises an outer heat sink, wherein the outer heat sink is arranged in the outer recess of the body and wherein the outer recess passes over into the cavity.



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- 1 -

Spoiler of a vehicle

FIELD OF THE INVENTION

5

The present disclosure relates to a spoiler of a vehicle.

BACKGROUND OF THE INVENTION

10 From US 2019/027818 A1 it is known to arrange a TCU in a cavity of a spoiler.

SUMMARY OF THE INVENTION

15 It is an object of the invention to propose a spoiler of a vehicle which allows to improve the functional availability of a telematics system.

The invention provides a spoiler of a vehicle comprising a body
20 and an electronic component, wherein the body comprises a cavity, wherein the electronic component is arranged in this cavity, wherein the spoiler comprises an outer recess, wherein the spoiler comprises an outer heat sink, wherein the outer heat sink is arranged in the outer recess of the body and wherein the
25 outer recess passes over into the cavity. Such a spoiler is appropriate to enhance the thermal management of a telematics system since the electronic component which is part of the spoiler can be cooled efficiently.

30 It is further provided that the body of the spoiler comprises an inner recess and the spoiler comprises an inner heat sink,

- 2 -

wherein the inner heat sink is arranged in the inner recess of the body and the inner recess passes over into the cavity and wherein the cavity is arranged between the outer recess and the inner recess. The second heat sink enhance the cooling capacity of the spoiler.

It is further provided that the outer heat sink forms a part of a skin of the body or the outer heat sink is covered by a skin of the body. Such a positioning of the outer heatsink provides an efficient cooling since the heat sink can be cooled directly or nearly directly by the air stream.

It is further provided that the body comprises a cooling channel structure, wherein the inner recess is arranged between the cavity and a middle section of the cooling channel structure and wherein the cooling channel structure comprises at least one inlet and at least one outlet. The cooling capacity is enhanced by a cooling channel structure. This means that cooling is more effective.

It is further provided that the inlet and the outlet are positioned in such a way on the spoiler that an airflow is generated in the cooling channel structure by the airstream, wherein the inlet is located in a frontside area of the body of the spoiler in which overpressure is generated by the airstream and wherein the outlet is located in a backside area of the body of the spoiler in which the pressure is lower than the overpressure. Such an arrangement generates a highly effective cooling.

It is further provided that the inlet and the outlet are positioned in such a way on the spoiler that an airflow is generated in the cooling channel structure by the airstream, wherein the outlet is located in a frontside area of the body of

- 3 -

the spoiler in which suction is generated by the airstream and the inlet is located in a backside area of the body of the spoiler in which air can be sucked in. Such an arrangement generates a highly effective cooling.

5

It is further provided that the spoiler comprises a fan, wherein the fan is arranged either in the cooling channel structure or outside the body at the outlet or at the inlet of the cooling channel structure, whereby in the case that the fan is located outside the body of the spoiler the fan comprises a housing which is shaped aerodynamically and complements the body. Such an arrangement allows to continue efficient cooling during parking of the vehicle or during a traffic jam. Additionally the location of the fan in the spoiler has the advantage that the fan would not be audible in an interior of the vehicle since there is no direct connection between the spoiler and the interior of the vehicle.

It is further provided that the electronic component comprises

- antennas or
- a TCU or
- antennas and a TCU or
- antennas and a TCU and additional electronics e.g. at least one amplifier,

wherein for the case that the electronic component comprises antennas and the TCU the antennas are housed in the cavity adjacent to the outer heat sink and the TCU is housed in the cavity adjacent to the inner heat sink. Such an architecture guaranties a reliable cooling of the TCU.

30

Further it is provided that the least one amplifier is arranged in the cavity either near to the TCU and near to the inner heat sink or near to the antennas and near to the outer heat sink. Such an architecture allows an efficient cooling of a greater

- 4 -

part of the electronics which are necessary for telematics functions and especially of the amplifiers for the antennas.

According to another embodiment it is provided that a first
5 cooling channel structure is positioned in such a way that the TCU is cooled and at least one additional cooling channel structure is positioned in such a way that at least one antenna and/or at least one amplifier is cooled. Such an arrangement with multiple cooling channel structures makes the cooling more
10 effective and allows to dimension each cooling channel structure with respect to the necessary cooling capacity.

According to the invention a TCU is an embedded system on board of a vehicle that provides radio communication capabilities to
15 the vehicle to. e.g., access the Internet.

According to the invention an electronic component comprises at least one electronic unit and for example as a first electronic unit a TCU and as a second electronic unit antennas and
20 optionally as a third electronic unit amplifiers.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other features and advantages of the present invention will become apparent to those skilled in the art to
25 which the present invention relates upon reading the following description with reference to the accompanying drawing, in which:

Figure 1 shows a spoiler of a vehicle, which is mounted to a roof of a vehicle;

30

Figure 2 shows in a cutting view schematically a first embodiment of an inventive spoiler;

Figure 3 shows in a cutting view schematically a second embodiment of an inventive spoiler;

5 Figure 4 shows in a cutting view schematically a third embodiment of an inventive spoiler and

Figure 5 shows in a top view a forth embodiment of an inventive spoiler.

10

Figure 1 shows a spoiler 1 of a vehicle V, which is mounted to the roof R of the vehicle V and is representative for the spoilers shown in figures 2 to 5.

15 Figure 2 shows in a cutting view schematically a first embodiment of an inventive spoiler 101 of a vehicle V, wherein the spoiler 101 is designed generally similar to the spoiler 1 shown in figure 1.

20 The Spoiler 101 comprises a body 102 and an electronic component 103. The body 102 comprises a cavity 104, wherein the electronic component 103 is arranged in this cavity 104. Additionally the spoiler 101 comprises an outer recess 105 and that the spoiler comprises an outer heat sink 106, wherein the outer heat sink
25 106 is arranged in the outer recess 105 of the body 102 and wherein the outer recess 105 passes over into the cavity 104.

The electronic component 103 is cooled by the heat sink 106 which is in contact with a bottom side of a skin 102a of the
30 body 102 of the spoiler 101. Heat that is generated by the electronic component 103 is conveyed via the outer heat sink 106 through the skin 102a of the body 102 to a top side of the skin

- 6 -

102a and from the top side of the skin 102a to the ambient air A, wherein the cooling effect is enlarged when the vehicle V moves and an airstream AS cools the skin 102a of the body 102 in an area of the heat sink 106.

5

According to an embodiment that is not shown the heat sink forms a part of a skin of the body of the spoiler and the heat is directly transferred from the heat sink to the ambient air.

10 Figure 3 shows in a cutting view schematically a second embodiment of an inventive spoiler 201 of a vehicle V.

The Spoiler 201 comprises a body 202 and an electronic component 203. The body 202 comprises a cavity 204, wherein the electronic component 203 is arranged in this cavity 204. The spoiler 201 comprises an outer recess 205 and the spoiler comprises an outer heat sink 206, wherein the outer heat sink 206 is arranged in the outer recess 205 of the body 202 and wherein the outer recess 205 passes over into the cavity 204. Additionally the spoiler 201 comprises an inner recess 221 and the spoiler 201 comprises an inner heat sink 222, wherein the inner heat sink 222 is arranged in the inner recess 221 of the body 202 and the inner recess 221 passes over into the cavity 204 and wherein the cavity 204 is arranged between the outer recess 205 and the inner recess 221.

The electronic component 203 is cooled by the heat sink 206 which is in contact with a skin 202a of the body 202 of the spoiler 201. Heat that is generated by the electronic component 203 is conveyed through the skin 202a to ambient air A, wherein the cooling effect is enlarged when the vehicle V moves and an airstream AS cools the skin 202a of the body 202 in an area of the heat sink 206.

- 7 -

According to an embodiment that is not shown the heat sink forms the surface of the body and the heat is directly transferred to the ambient air. Thus the heat sink forms a part of the surface of the body of the spoiler.

5

Additionally the body 202 comprises a cooling channel structure 241, wherein the inner recess 221 is arranged between the cavity 204 and a middle section 242 of the cooling channel structure 241 and wherein the cooling channel structure 241 comprises an inlet 243 and an outlet 244. Thus the inner heat sink 222 is cooled by ambient air A flowing through the cooling channel structure 241.

The inlet 243 and the outlet 244 are positioned in such a way on the body 202 of the spoiler 201 that an airflow AF is generated in the cooling channel structure 241 by the airstream AS, wherein the inlet 243 is located in a frontside area 245 of the body 202 of the spoiler 201 in which overpressure P1 is generated by the airstream AS. The outlet is located opposite to the inlet 243 in a backside area 246 of the body 202 of the spoiler 201. The airstream AS and the airflow AF run in much in the same direction, namely in the direction of the airstream AS.

The electronic component 203 comprises antennas 251 and a TCU 252, wherein antennas 251 are housed in the cavity 204 adjacent to the outer heat sink 206 and the TCU 252 is housed in the cavity 204 adjacent to the inner heat sink 222.

According to a first optional embodiment of figure 3 the spoiler 201 may comprise an electric fan 261 (shown in dotted lines), wherein the fan 261 is arranged in the cooling channel structure 241 between the inlet 243 and the middle section 242 of the cooling channel structure 241 and shown by dotted lines. According to one possible embodiment the fan will be active,

- 8 -

when the vehicle V is stationary and the electronic component 203 is active. The fan 261 may be additionally controlled by a temperature sensor.

5 According to a second optional embodiment of figure 3 which can be realized as alternative to the first optional embodiment of figure 3 the spoiler 201 may comprise an electric fan 262 (shown in dotted lines), wherein the fan 262 is arranged outside the body 202 at the outlet 244 of the cooling channel structure 241.
10 The fan 262 comprises a housing 263 which is shaped aerodynamically and complements the body 202 of the spoiler 201. According to one possible embodiment the fan 262 will be active, when the vehicle V is stationary and the electronic component 203 is active. The fan 262 may be additionally controlled by a
15 temperature sensor.

Figure 4 shows in a cutting view schematically a third embodiment of an inventive spoiler 301 of a vehicle V.

20 The Spoiler 301 comprises a body 302 and an electronic component 303. The body 302 comprises a cavity 304, wherein the electronic component 303 is arranged in this cavity 304. The spoiler 301 comprises an outer recess 305 and the spoiler comprises an outer heat sink 306, wherein the outer heat sink 306 is arranged in
25 the outer recess 305 of the body 302 and wherein the outer recess 305 passes over into the cavity 304. Additionally the spoiler 301 comprises an inner recess 321 and the spoiler 301 comprises an inner heat sink 322, wherein the inner heat sink 322 is arranged in the inner recess 321 of the body 302 and the
30 inner recess 321 passes over into the cavity 304 and wherein the cavity 304 is arranged between the outer recess 305 and the inner recess 321.

- 9 -

The electronic component 303 is cooled by the outer heat sink 306 which is in contact with a skin 302a of the body 302 of the spoiler 301. Heat that is generated by the electronic component 303 is conveyed via the outer heat sink 306 through the skin 302a to ambient air A, wherein the cooling effect is enlarged when the vehicle V moves and an airstream AS cools the skin 302a of the body 302 in an area of the heat sink 306.

According to an embodiment that is not shown the heat sink forms the surface of the body and the heat is directly transferred to the ambient air. Thus the heat sink forms a part of the surface of the body of the spoiler.

Additionally the body 302 comprises a cooling channel structure 341, wherein the inner recess 321 is arranged between the cavity 304 and a middle section 342 of the cooling channel structure 341 and wherein the cooling channel structure 341 comprises an inlet 343 and an outlet 344. Thus the inner heat sink 322 is cooled by ambient air A flowing through the cooling channel structure 341.

The inlet 343 and the outlet 344 are positioned in such a way on the body 302 of the spoiler 301 that an airflow AF is generated in the cooling channel structure 341 by the airstream AS, wherein the inlet 343 is located in a backside area 346 of the body 302 of the spoiler 301. The outlet 344 is located opposite to the inlet 343 in a frontside area 345 of the body 302 of the spoiler 301. The airstream AS and the airflow AF run in much in the opposite directions. The airstream AS runs opposite to a moving direction x of the vehicle V and the airflow AF runs in the moving direction x of the vehicle V. In order to generate such a reverse airflow AF the outlet is positioned in such a way that a Venturi effect is generated and suction is generated by the airstream at the outlet.

- 10 -

The electronic component 303 comprises antennas 351 and a TCU 352, wherein antennas 351 are housed in the cavity 304 adjacent to the outer heat sink 306 and the TCU 352 is housed in the
5 cavity 304 adjacent to the inner heat sink 322.

Figure 5 shows in a top view schematically a forth embodiment of an inventive spoiler 401 of a vehicle. The spoiler 401 is symbolized by a rectangular outline. The spoiler 401 comprises a
10 body 402 and an outer recess 421 and a cavity 404. The outer recess 421 houses an outer heat sink 406 which lies below a skin 402a of the body which is shown in a transparent manner. The cavity 404 lies below the outer recess 421 and houses a TCU 452 as a first part of an electronic component 403 and houses
15 antennas 451 as a second part of the electronic component 403. Wherein the TCU 452 is in direct contact with the outer heat sink 406 and the antennas 451 are arranged next to the TCU 452 and are cooled by the outer heat sink 406 via the TCU 452.

20 According to a first optional embodiment the spoiler 401 comprises two amplifiers 461, 462 which are arranged in the cavity 404 near to the antennas 451 and are cooled via the antennas 451 and the TCU 452.

25 According to a second optional embodiment the spoiler 401 comprises additionally or alternatively to the outer heat sink 406 an inner heat sink 422 which is positioned adjacent to the TCU 452, to the antennas 451 and to the amplifiers 461, 462. The spoiler 401 comprises according to the second optional
30 embodiment a first cooling channel structure 441a, a second cooling channel structure 441b and a third cooling channel structure 441c. The inner heat sink 422 is cooled by the first cooling channel structure 441a, the second cooling channel structure 441b and the third cooling channel structure 441c,

- 11 -

wherein the second and the third cooling channel structures 441b, 441c are additional cooling channel structures with respect to the first cooling channel structure 441a. The TCU 452 is mainly cooled by the first cooling channel structure 441a. The left
5 side antennas 451 and the amplifier 461 are mainly cooled by the second cooling channel structure 441b and the right side antennas 451 and the amplifier 462 are mainly cooled by the third cooling channel structure 441c. The cooling channel structures 441a, 441b and 441c are designed similar to the
10 cooling channel structure shown in figure 3 or 4.

REFERENCE NUMERALS:

	1	spoiler
5		
	A	ambient air
	AF	airflow
	AS	airstream
	P1	overpressure
10	R	roof of V
	V	vehicle
	x	moving direction of V
	101	spoiler (first embodiment)
15	102	body of 101
	102a	skin of 102
	103	electronic component
	104	cavity in 102
	105	outer recess in 102
20	106	outer heat sink
	201	spoiler (second embodiment)
	202	body of 201
	202a	skin of 202
25	203	electronic component
	204	cavity in 202
	205	outer recess in 202
	206	outer heat sink
30	221	inner recess
	222	inner heat sink
	241	cooling channel structure

- 13 -

	242	middle section of 241
	243	inlet of 241
	244	outlet of 241
	245	frontside area
5	246	backside area
	251	antennas
	252	TCU
10	261	fan
	262	fan
	263	housing of 262
	301	spoiler (third embodiment)
15	302	body of 301
	302a	skin of 302
	303	electronic component
	304	cavity in 302
	305	outer recess in 302
20	306	outer heat sink
	321	inner recess
	322	inner heat sink
25	341	cooling channel structure
	342	middle section of 341
	343	inlet of 341
	344	outlet of 341
	345	frontside area
30	346	backside area
	351	antennas
	352	TCU

- 14 -

	401	spoiler (forth embodiment)
	402	body of 401
	402a	skin of 402
	403	electronic component
5	404	cavity
	406	outer heat sink
	421	outer recess
	422	inner heat sink
10		
	441a	first cooling channel structure
	441b	second cooling channel structure
	441c	third cooling channel structure
15	451	antennas
	452	TCU
	461, 462	amplifier
20		

CLAIMS:

1. Spoiler (1; 101; 201; 301; 401) of a vehicle (V) comprising
5 a body (102; 202; 302; 402) and an electronic component (103;
203; 303; 403), wherein the body (102; 202; 302; 402) comprises
a cavity (104; 204; 304; 404), wherein the electronic component
(103; 203; 303; 404) is arranged in this cavity (104; 204; 304;
404) characterized in that the spoiler (1; 101; 201; 301; 401)
10 comprises an outer recess (105; 205; 305; 405) and that the
spoiler (1; 101; 201; 301; 401) comprises an outer heat sink
(106; 206; 306; 406), wherein the outer heat sink (106; 206; 306;
406) is arranged in the outer recess (105; 205; 305; 405) of the
body (102; 202; 302; 402) and wherein the outer recess (105; 205;
15 305; 405) passes over into the cavity (104; 204; 304; 404).

2. Spoiler according to claim 1 characterized in that the body
(202; 302) of the spoiler (1; 201; 301) comprises an inner
recess (221; 321) and the spoiler (201; 301) comprises an inner
20 heat sink (222; 322), wherein the inner heat sink (222; 322) is
arranged in the inner recess (221; 321) of the body (202; 302)
and the inner recess (221; 321) passes over into the cavity (204;
304) and wherein the cavity (204; 304) is arranged between the
outer recess (205; 305) and the inner recess (221; 321).

25
3. Spoiler according to claim 1 characterized in that the outer
heat sink (106; 206; 306) forms a part of a skin (102a; 302a;
302a) of the body (102; 202; 302) or the outer heat sink (106;
206; 306) is covered by a skin (102a; 202a; 302a) of the body
30 (102; 202; 302).

4. Spoiler according to claim 2 or 3 characterized in that the
body (202; 302) comprises at least one cooling channel structure
(241; 341), wherein the inner recess (221; 321) is arranged

- 16 -

between the cavity (204; 304) and a middle section (242; 342) of the cooling channel structure (241; 341) and wherein the cooling channel structure (241; 341) comprises at least one inlet (243; 343) and at least one outlet (244; 344).

5

5. Spoiler according to claim 4 characterized in that the inlet (243) and the outlet (244) are positioned in such a way on the body (202) of the spoiler (201) that an airflow (AF) is generated in the cooling channel structure (241) by the airstream (AS), wherein the inlet (243) is located in a frontside area (245) of the body (202) of the spoiler (201) in which overpressure (P1) is generated by the airstream (AS).

6. Spoiler according to claim 4 characterized in that the inlet (343) and the outlet (344) are positioned in such a way on the body (302) of the spoiler (301) that an airflow (AF) is generated in the cooling channel structure (341) by the airstream (AS), wherein the outlet (344) is located in a frontside area (345) of the body (302) of the spoiler (301) in which suction is generated by the airstream (AS).

7. Spoiler according to claim 4 characterized in that the spoiler (201) comprises a fan (261; 262), wherein the fan (261; 262) is arranged

- either in the cooling channel structure (241)
- or outside the body (202) at the outlet (244) or at the inlet (243) of the cooling channel structure (241),
- whereby in the case that the fan (262) is located outside the body (202) of the spoiler (201) the fan (262) comprises a housing (263) which is shaped aerodynamically and complements the body (202).

8. Spoiler according to claim 2 characterized in that the electronic component (103; 203; 303; 403) comprises

- 17 -

- antennas (251; 351; 451) or
 - a TCU (252; 352; 452) or
 - antennas (251; 351; 451) and a TCU (252; 352; 452) or
 - antennas (451) and a TCU (452) and additional electronics e.g.
5 at least one amplifier (461; 462),
 - wherein for the case that the electronic component (203; 303) comprises antennas (251; 351) and the TCU (252; 352) the antennas (251; 351) are housed in the cavity (204; 304) adjacent to the outer heat sink (206; 306) and the TCU (252;
10 352) is housed in the cavity (204; 304) adjacent to the inner heat (222; 322) sink.
9. Spoiler according to claim 8 characterized in that at least one amplifier (461; 462) is arranged in the cavity (404)
- 15 - either near to the TCU and near to the inner heat sink
- or near to the antennas (451) and near to the outer heat sink (406).
10. Spoiler according to claim 4 characterized in that a first
20 cooling channel structure (241; 341; 441a) is positioned in such a way that the TCU (252; 352; 452) is cooled and at least one additional cooling channel structure (441b; 441c) is positioned in such a way that at least one antenna (251; 351; 451) and/or at least one amplifier (461; 462) is cooled.

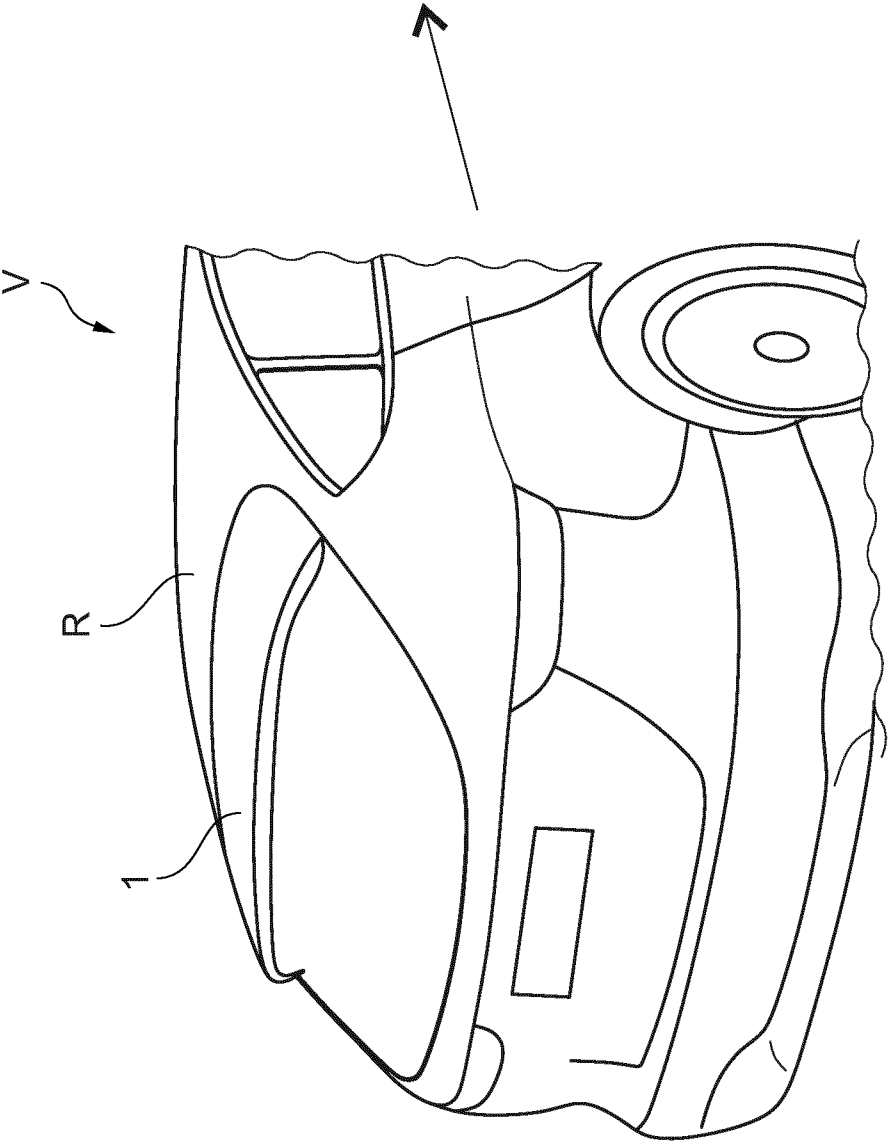


Fig. 1

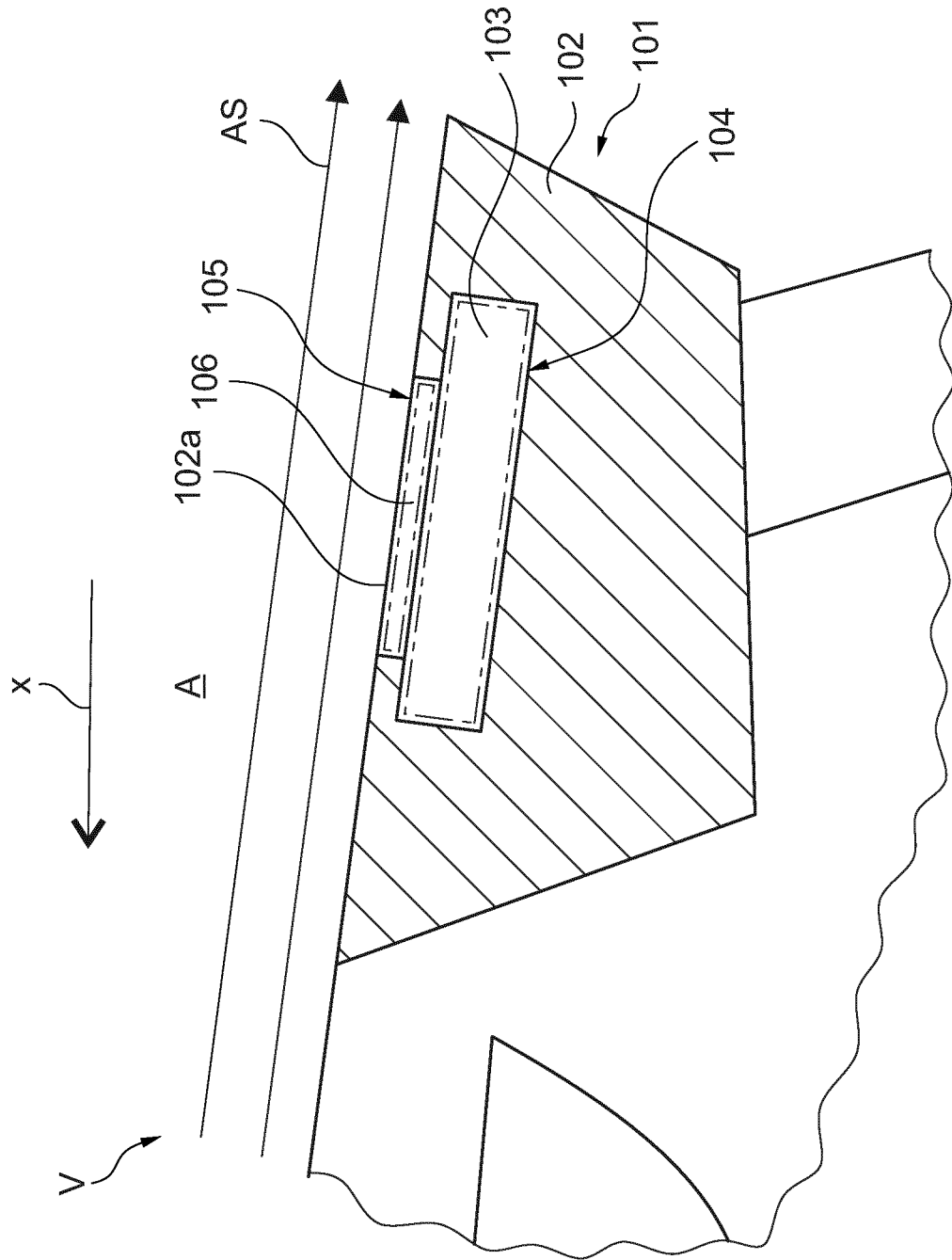


Fig. 2

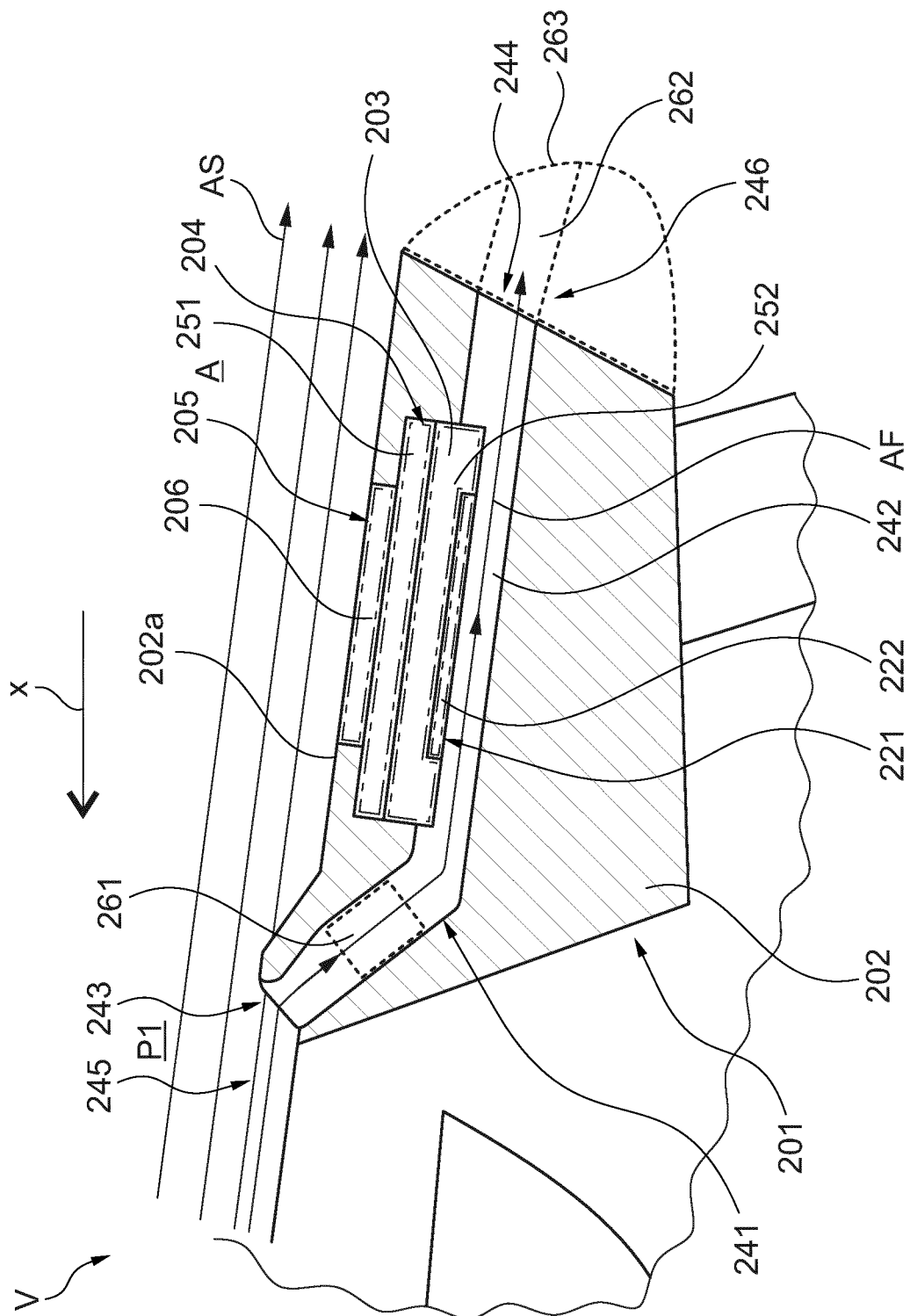


Fig. 3

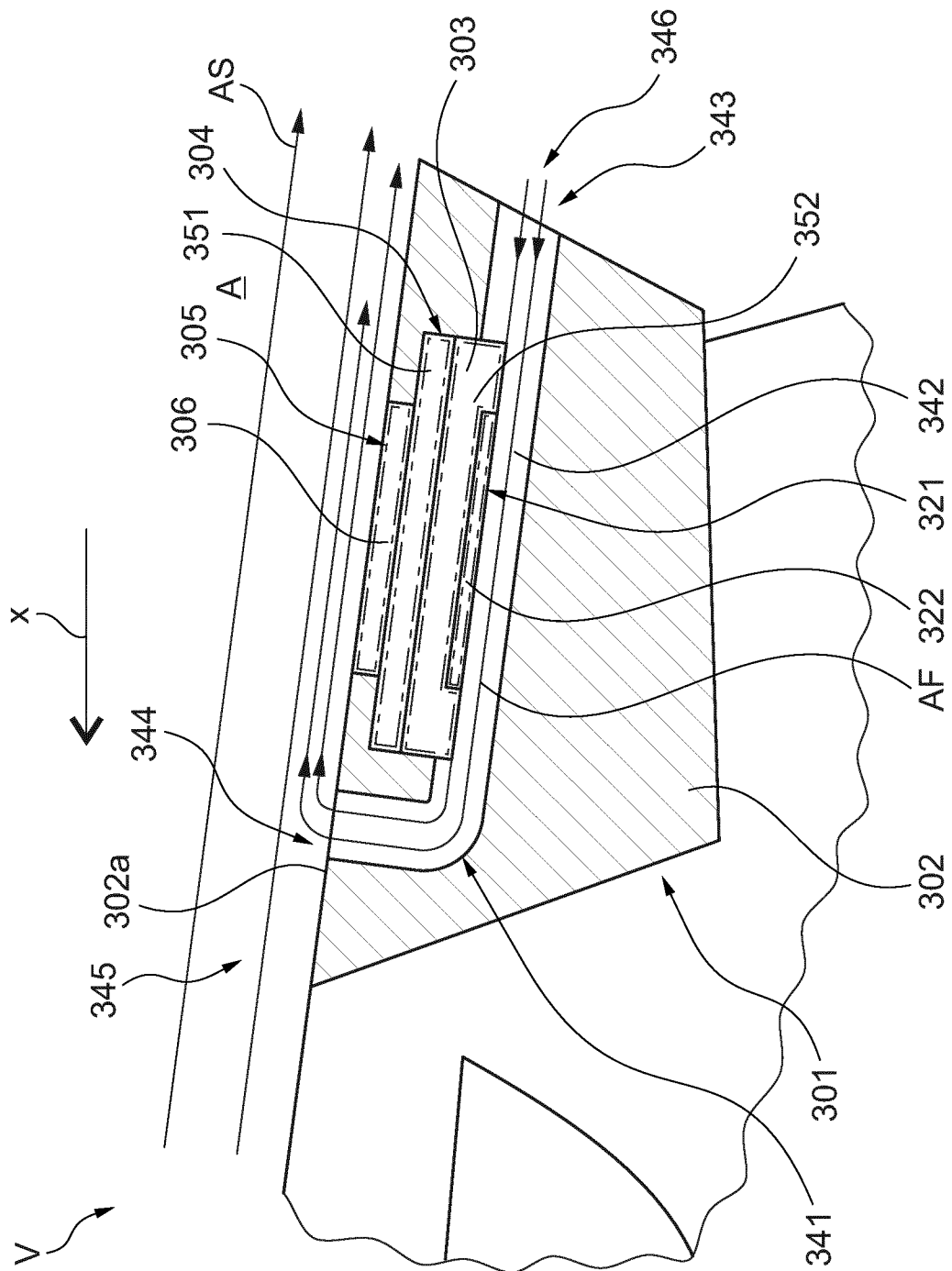
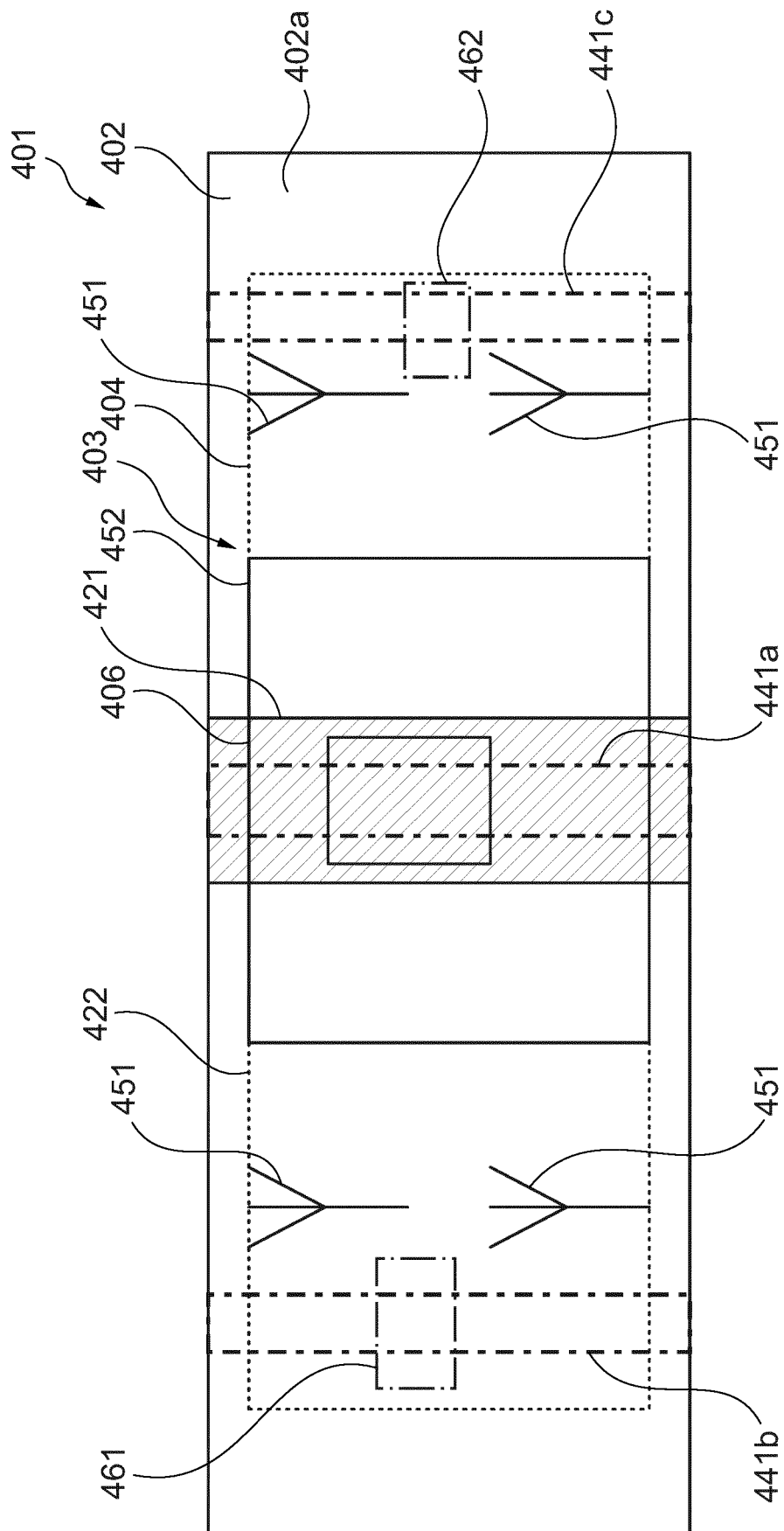


Fig. 4



5.6.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2021/065964

A. CLASSIFICATION OF SUBJECT MATTER INV. B62D35/00 H01Q1/32 H01Q1/02 H01Q1/42 H01Q1/44 H01Q23/00 ADD. 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) B62D H01Q Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data														
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US 6 505 696 B1 (PREVOST CLEMON P [US]) 14 January 2003 (2003-01-14)</td> <td>1,3</td> </tr> <tr> <td>A</td> <td>column 2, lines 28-63 column 3, line 41 - column 4, line 29 figures 1,2 figures 6,8</td> <td>2,4-10</td> </tr> <tr> <td>A</td> <td>----- US 2013/062132 A1 (WOLF THOMAS [DE]) 14 March 2013 (2013-03-14) paragraphs [0015] - [0020] figures 1,2 ----- -/--</td> <td>1,2</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 6 505 696 B1 (PREVOST CLEMON P [US]) 14 January 2003 (2003-01-14)	1,3	A	column 2, lines 28-63 column 3, line 41 - column 4, line 29 figures 1,2 figures 6,8	2,4-10	A	----- US 2013/062132 A1 (WOLF THOMAS [DE]) 14 March 2013 (2013-03-14) paragraphs [0015] - [0020] figures 1,2 ----- -/--	1,2
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.														
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Date of the actual completion of the international search 13 August 2021		Date of mailing of the international search report 23/08/2021												
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