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(54) Title: AN IN-VEHICLE SENSOR ARRANGEMENT STRUCTURE

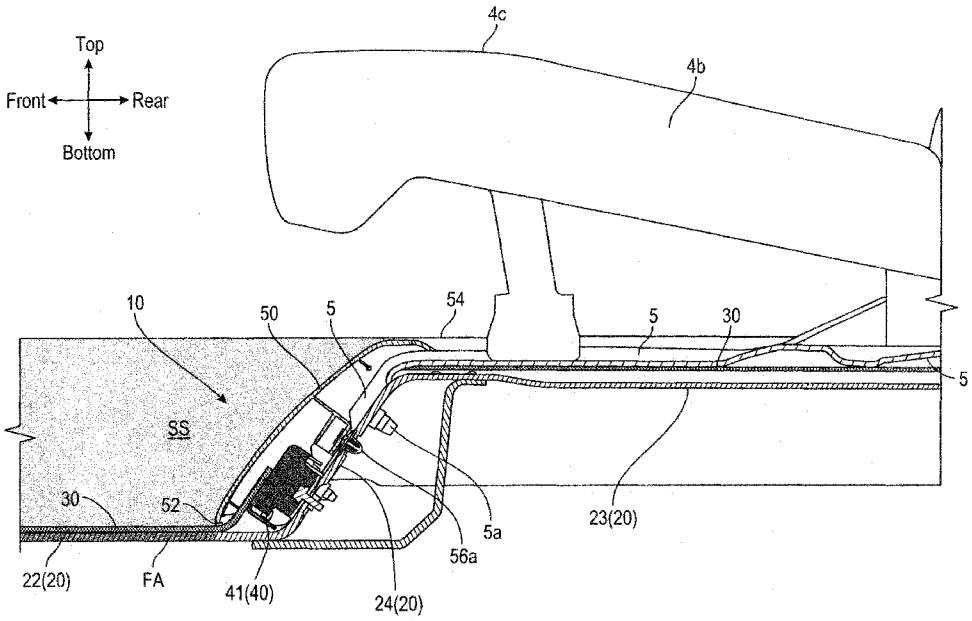

FIG. 2

(57) Abstract: The present invention discloses an in-vehicle sensor arrangement structure (10) which includes: a floor panel (20) having a bottom surface (22) including a passenger's foot area FA, a rearward surface (23) which is positioned higher than the bottom surface (22) and extended rearward of a vehicle (1), and an inclined surface (24) which connects the bottom surface (22) and the rearward surface (23); a sensor (40) which is disposed on the floor panel (20) and positioned at the inclined surface (24); and a cover member (50) which is arranged to cover the sensor (40). An upper end portion (54) of the cover member (50) is extended to the rearward surface (23), and a lower end portion (52) of the cover member (50) is extended to the bottom surface (22).

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[Continued on next page]

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— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

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

TITLE OF THE INVENTION
AN IN-VEHICLE SENSOR ARRANGEMENT STRUCTURE

FIELD OF INVENTION

The present invention relates to an in-vehicle sensor arrangement structure.

BACKGROUND OF THE INVENTION

It is known that an in-vehicle electric equipment arrangement structure, includes an antenna which is disposed on a floor panel of an automobile and under its seat cushion as an electric equipment, as disclosed in International Publication No. WO2016/185591A1 hereinafter called a prior art.

Also, the prior art includes a cover member which is formed to swell on a carpet, to completely cover the antenna, and to be curved in an arc shape in the cross section in the width direction of the automobile.

Since a recess is formed in a region where a surface of the carpet which covers an inclined surface of the floor panel intersects a surface of the arc cover member, the surfaces of the cover member and the carpet on the inclined surface of the floor panel are unsmooth. As such, there is a possibility that it is difficult for the passenger who sits on the seat cushion to smoothly move own foot.

Therefore, the development of the in-vehicle sensor arrangement structure that can facilitate the movement of the passenger foot so as to be moved smoothly without any obstacles, is required.

CITATION LIST

Patent Literature

PTL 1: International Publication No. WO2016/185591A1

SUMMARY OF THE INVENTION

It is an objective of the present inventions to provide an in-vehicle sensor arrangement structure, that the passenger can move own foot smoothly and freely.

In order to achieve the above objective, an embodiment of the present invention provides an in-vehicle sensor arrangement structure comprising: a floor panel comprising: a bottom surface including a passenger's foot area; a rearward surface which is positioned higher than the bottom surface and extended rearward of a vehicle; and an inclined surface which connects the

bottom surface and the rearward surface; a sensor which is disposed on the floor panel, wherein the sensor is positioned at the inclined surface; and a cover member which is arranged to cover the sensor, wherein an upper end portion of the cover member is extended to the rearward surface, and a lower end portion of the cover member is extended to the bottom surface.

According to the embodiment of the present invention, firstly, the floor panel comprises a bottom surface including a passenger' s foot area, the rearward surface which is positioned higher than the bottom surface and extended rearward of the vehicle, and the inclined surface which connects the bottom surface and the rearward surface.

Secondly, the cover member is arranged to cover the sensor which is disposed on the floor panel and positioned at the inclined surface. Moreover, the upper end portion of the cover member is extended to the rearward surface, and the lower end portion of the cover member is extended to the bottom surface. As such, on the inclined surface of the floor panel, there is no recess which is formed by the cover member and the inclined surface even if the carpet is laid on the bottom surface.

Therefore, there is no obstacle to limit the movement of the passenger' s foot in a space which is surrounded by the passenger' s foot area and the inclined surface. This can prevent the passenger foot from being stuck or hit into the recess. As a result, the passenger can move own foot smoothly and freely in the space which is surrounded by the passenger' s foot area and the inclined surface.

In in-vehicle sensor arrangement structure of the embodiment of the present invention, the floor panel is covered by a carpet, and the carpet includes a rib which is sandwiched between the cover member and the sensor.

According to the embodiment of the present invention, the floor panel is covered by the carpet, and the carpet includes the rib. Namely, the rib is a part of the carpet. As such, the rib can maintain the position of the carpet, and furthermore can prevent the carpet from being moved from the predetermined position when the passenger steps on the cover member or moves own foot toward the cover member.

Moreover, since the rib of the carpet is sandwiched between the cover member and the sensor, the rib covers at least a part of the sensor in the direction from the cover member to the sensor. As such, it is possible to protect the sensor because the cover member is directly not in contact with the sensor even if the passenger moves own foot to the cover member.

In in-vehicle sensor arrangement structure of the embodiment of the present invention, it is preferable that the rib is contacted with the lower end portion of the cover member.

According to the embodiment of the present invention, since the rib is contacted with the lower end portion of the cover member, there is no gap between the lower end portion of the cover member and the rib. Therefore, the rib can prevent the vibration of the cover member, and thereby can securely protect the sensor.

In in-vehicle sensor arrangement structure of the embodiment of the present invention, a seat rail is positioned on the floor panel, and a fixing point of the seat rail is covered by the cover member.

According to the embodiment of the present invention, since the cover member is enabled to cover the sensor and the fixing point, the cover member is enabled to function as a cover of the sensor as well as a cover of fixing the point.

Since the cover member functions as a cover of the sensor as well as a cover of the fixing point, the in-vehicle sensor arrangement structure does not require any member to cover the fixing point, besides the cover member. Therefore, it is possible to reduce a material weight and a manufacturing cost.

In in-vehicle sensor arrangement structure of the embodiment of the present invention, it is preferable that the fixing point of the seat rail is disposed on the incline surface higher than the sensor, and the sensor and the fixing point are positioned in line along a longitudinal direction of the vehicle when viewed from above.

According to the embodiment of the present invention, since the sensor and the fixing point are positioned in line along a longitudinal direction of the vehicle when viewed from above, it is possible to reduce a size of the cover member.

In in-vehicle sensor arrangement structure of the embodiment of the present invention, a length of the lower end portion of the cover member is longer than that of the upper end portion when viewed from front of the cover member, and the cover member is formed to be inclined along a shape of the inclined surface.

According to the embodiment of the present invention, since the length of the lower end portion of the cover member is longer than that of the upper end portion, the lower end portion of the cover member functions as a stable base on the bottom surface. Therefore, since the cover member is stable on the bottom surface, it is difficult to displace the cover member from the predetermined position.

Moreover, since the cover member is formed to be inclined along a shape of the inclined surface, it is possible to make an in-vehicle appearance good and clear. Furthermore, if the cover member is formed to cover the sensor and the fixing point of the seat rail, it is possible to make an in-vehicle appearance better and clearer.

BRIEF DESCRIPTION OF DRAWINGS

The principle of the present invention and its advantages will become apparent in the following description taking in consideration with the accompanying drawings in which:

FIG.1 is a perspective view showing a seat arrangement state in the room inside of a vehicle 1 that is provided with an in-vehicle sensor arrangement structure 10 according to an embodiment of the present invention;

FIG.2 is a sectional view showing the inside of a cover member 50 of the in-vehicle sensor arrangement structure 10 and is a sectional view of taken along line II-II of FIG.1;

FIG.3 is a front view of the in-vehicle sensor arrangement structure 10 according to the embodiment of the present invention, when the cover member 50 is removed;

FIG.4 is a perspective view of the cover member 50;

FIG.5 is a front view of the cover member 50;

FIG.6 is a rear view of the cover member 50; and

FIG.7 is a left side view of the cover member 50.

DETAILED DESCTIPTION OF EMBODIMENTS OF THE INVENTION

Hereinafter, an in-vehicle sensor arrangement structure 10 according to an embodiment of the present invention will be described in detail with reference to FIG.1 to FIG.7.

As shown in FIG.1 and FIG.2, the in-vehicle sensor arrangement structure 10 according to the embodiment of the present embodiment is provided at a room inside of a vehicle 1.

The vehicle 1 includes, for example, a first-row seat 2, a second-row seat 3, and a third-row seat 4 that are arranged in three rows from the front toward the rear in the vehicle front-to-rear direction on a floor panel 20. However, the number of the row seats is not limited to three. For example, the number of the row seats in the vehicle 1 may be more than three.

The floor panel 20 includes a first floor 21, a second floor 22 and a third floor 23. The in-vehicle sensor arrangement structure 10 is provided, for example, behind the second-row seat 3 and below the third-row seat 4. The second floor 22 is also called a "bottom surface", and the third floor 23 is also called a "rearward surface". The third floor 23 is higher than the second floor 22. The first-row seat 2 and the second-row seat 3 are disposed on the bottom surface 22 and the third-row seat 4 is disposed on the rearward surface 23.

The first-row seat 2 is provided on the first floor 21. The first floor 21 is joined to the second floor 22 at a higher position in the vertical direction than the first floor 21. The second-

row seat 3 is provided on the second floor 22. The second floor 22 is joined to the third floor at a higher position in the vertical direction than the second floor 22.

The third-row seat 4 is provided on the third floor. The third floor forms a floor of a luggage room provided at the rear of the third-row seat 4. The third-row seat 4 is configured so that a seat back 4a is reclined so as to overlap a seat surface 4c of a seat cushion 4b. Additionally, a carpet 30 is provided to be laid on the surface of the floor panel 20.

Hereinafter, the in-vehicle sensor arrangement structure 10 provided behind the second-row seat 3 and below the third-row seat 4 is described.

As shown in FIG.1 to FIG.3, the in-vehicle sensor arrangement structure 10 includes the floor panel 20, a sensor 40 which is disposed on the floor panel 20 and a cover member 50.

As shown in FIG. 2 and FIG. 4, the floor panel 20 near the third-row seat 4 includes the bottom surface (second floor) 22 including a bottom area for a passenger's foot area FA, a rearward surface (third floor) 23 which is positioned higher than the bottom surface 22 and extended rearward of a vehicle 1, and an inclined surface 24 which connects the bottom surface 22 and the rearward surface 23.

As shown in FIG. 1 and FIG. 2, the passenger's foot area FA is an area where the passenger who sits on the third-row seat 4 can place own foot. The passenger's foot area FA is included in the bottom surface 22. A surrounded space SS is defined as a space which is surrounded by the passenger's foot area FA of the bottom surface 22 and the inclined surface 24. The surrounded space SS is defined as a space where the passenger who sits on the third-row seat 4 can move own foot.

The rearward surface 23 extends from the top of the inclined surface 24 up to the rearward of a vehicle 1. In this embodiment, two pairs of the seat rails 5,5 for the third-row seat 4 are positioned and mounted on the rearward surface 23 of the floor panel 20 so that the third-row seat 4 is detachably / attachably attached on the seat rails 5,5. Each seat rail is formed in a rail shape along the longitudinal direction of the vehicle 1.

As shown in FIG. 2, the inclined surface 24 is formed to connect the bottom surface 22 and the rearward surface 23, and to be inclined against the bottom surface 22 and the rearward surface 23.

As shown in FIG. 2 and FIG. 3, a side curtain airbag sensor 41 and a smart entry sensor 42, as the sensor 40, are disposed on the inclined surface 24 which are connected to a harness 43. In this embodiment, as the sensors 40, the side curtain airbag sensor 41 and the smart entry sensor 42 are disposed on the inclined surface 24, but not limited to these.

The side curtain airbag sensor 41 is a sensor which detects the collision of the vehicle 1 so that airbags (not shown) are developed and cover the side window when the side curtain airbag sensor 41 detects the collision. The side curtain airbag prevents the passenger from being thrown outside of the vehicle 1. Also, the smart entry sensor 42 is, for example, a sensor which detects the radio wave from a smart entry key so that doors are unlocked when the driver who has the smart entry key comes closer to the vehicle 1.

Also, the seat rail 5 is formed to extend to the inclined surface 24. A fixing point 5a of the seat rail 5 is positioned on the inclined surface 24 and is disposed higher than the sensor 40 (41,42). In the fixed point, in this embodiment, the seat rail 5 is fixed on the inclined surface 24 by a bolt and a nut. As shown in FIG. 3, the sensor 40 (41,42) and the fixing point 5a are positioned in line along a longitudinal direction of the vehicle 1 when viewed from above.

As shown in FIG. 1 to FIG. 4, the cover member 50 is arranged to cover the sensor 40 (41,42) and the fixing point 5a of the seat rail 5 which are disposed on the inclined surface 24. The cover member 50 is a member that is mounted on the inclined surface 24 so that the sensor 40 (41,42) is sandwiched between the cover member 50 and the inclined surface 24. As such, the cover member 50 functions as a protective member of the sensor 40 (41,42).

As shown in FIG. 2 and FIG. 4, an upper end portion 54 of the cover member 50 is extended to the rearward surface 23, and a lower end portion 52 of the cover member 50 is extended to the bottom surface 22. As such, on the inclined surface 24 of the floor panel 20, there is no recess which is formed by the cover member 50 and the inclined surface 24. (See FIG.2)

Namely, there is no obstacle to limit the movement of the passenger' s foot in the surrounding space SS. This can prevent the passenger foot from being stuck or hit into the recess. As a result, the passenger can move own foot smoothly and freely in the surrounding space SS.

As described above, since the cover member 50 is arranged to cover the sensor 40 (41,42) and the fixing point 5a of the seat rail 5 which are disposed on the inclined surface 24, the cover member 50 functions as a cover of the sensor 40 (41,42) as well as a cover of the fixing point 5a. Due to the cover member 50, the in-vehicle sensor arrangement structure 10 does not require any member to cover the fixing point 5a, besides the cover member 50. Therefore, it is possible to reduce a material weight and a manufacturing cost.

Moreover, as shown in FIG. 3, since the sensor 40 (41,42) and the fixing point 5a are positioned in line along a longitudinal direction of the vehicle 1 when viewed from above, it is possible to reduce a size of the cover member 50.

As shown in FIG. 5 and FIG. 6, the cover member 50 is formed in a nearly trapezoidal shape so that a length of the lower end portion 52 of the cover member 50 is longer than that of the upper end portion 54 when viewed from front of the cover member 50. In the mounting state of the cover member 50, the lower end portion 52 of the cover member 50 functions as a stable base on the bottom surface 22. Therefore, since the cover member 50 is stable on the bottom surface 22, it is difficult to displace the cover member 50 from the predetermined position.

Moreover, as shown in FIG. 2, FIG. 4 and FIG. 7, the cover member 50 is formed to be inclined along a shape of the inclined surface 24. As such, it is possible to make an in-vehicle appearance better and clearer.

In this embodiment, for the purpose of mounting the cover member 50 on the floor panel 20, the cover member 50 includes an upper clip 56a which is positioned in the middle of an upper part of the cover member 50, and lower clips 56b, 56b which are positioned in both of left lower and right lower sides of the cover member 50. In the inclined surface 24, an upper opening 25a is formed in a mounting place corresponding to the upper clip 56a and each lower opening 25b is formed in a mounting place corresponding to each lower clip 56b.

As shown in FIG2 and FIG. 3, the carpet 30 is provided to be laid on the surface of the bottom surface 22 of the floor panel 20 and the bottom surface 22 of the floor panel 20 is covered by the carpet 30. Moreover, the carpet 30 includes the rib 32 is configured to be sandwiched between the cover member 50 and the sensor 40 (41). In this embodiment, the rib 32 is an outer edge of the carpet 30 on the bottom surface 22 at the rearward direction, the rib 32 is formed to rise up from the flat carpet 30. Additionally, notches may be provided in both the sides of rib 32.

As such, the rib 32 can maintain the position of the carpet 30, and further can prevent the carpet 30 from being moved from the predetermined position when the passenger steps on the cover member 50 or moves own foot toward the cover member 50.

As shown in FIG. 2, the rib 32 covers at least a part of the sensor 40 (41). As such, it is possible to protect the sensor 40 (41) because the cover member 50 is directly not in contact with the sensor 40 (41) even if the passenger moves own foot to the cover member 50.

Moreover, the rib 32 is contacted with the lower end portion 52 of the cover member 50 (See FIG. 2.). Since there is no gap between the lower end portion 52 of the cover member 50 and the rib 32, the rib 32 can prevent the vibration of the cover member 50, and thereby can securely protect the sensor 40 (41,42).

Next, the operation of the in-vehicle sensor arrangement structure 10 when the passenger who sits on the third-row seat 4 moves own foot, will be provided with reference to FIG. 1 to FIG.4.

Firstly, the passenger who sits on the third-row seat 4 places own foot on the bottom area for the passenger' s foot area FA. The passenger' s foot area FA of the bottom surface 22 is an area which is surrounded by the second-low seat 2 and the inclined surface 24, when viewed from above. The passenger's foot area FA is included in the surrounded space SS.

Secondly, in case that the passenger who sits on the third-row seat 4 moves own foot and applies pressing force for pressing the carpet 30 against the second-row seat side, the rib 32 prevents the carpet 30 from moving from the predetermined position since the rib 32 of the carpet 30 is sandwiched between the cover member 50 and the sensor 40 (41). As such, the rib 32 can maintain the position of the carpet 30.

Thirdly, in case that the passenger who sits on the third-row seat 4 moves own foot in a rear direction and/or in a left and right direction, the passenger' s foot may contact the cover member 50.

Since the lower end portion 52 of the cover member 50 is extended to the bottom surface 22, there is no recess which is formed by the cover member 50 and the inclined surface 24. As such, there is no obstacle to limit the movement of the passenger's foot in the surrounded space SS. The passenger can prevent own foot from being stuck or hit into the recess, thereby the passenger can move own foot smoothly and freely in the surrounded space SS.

Moreover, since the rib 32 of the carpet 30 is sandwiched between the cover member 50 and the sensor 40 (41), the rib 32 covers at least a part of the sensor 40 (41). As such, it is possible to protect the sensor 40 (41) because the cover member 50 is directly not in contact with the sensor 40 (41) even if the passenger moves own foot to the cover member 50.

Furthermore, since the rib 32 is contacted with the lower end portion 52 of the cover member 50, there is no gap between the lower end portion 52 of the cover member 50 and the rib 32. Therefore, the rib 32 can prevent the vibration of the cover member 50, and thereby can securely protect the sensor 40 (41,42).

Although specific embodiments of the invention have been disclosed and described as well as illustrated in the companying drawings, it is simply for the purpose of better understanding of the principle of the present invention and it is not as a limitation of the scope and spirit of the teaching of the present invention. Adaption and modification to various structures such as design or material of the invention, mounting mechanism of various parts and elements or embodiments are possible and apparent to a skilled person without departing from the scope of the present invention which is to be determined by the claims.

List of reference:

1 vehicle

2 first-row seat

3 second-row seat

4 third-row seat

4a seat back

4b seat cushion

4c seat surface

5 seat rail

5a fixing point

10 in-vehicle sensor arrangement structure

20 floor panel

21 first floor

22 second floor, bottom surface

23 third floor, rearward surface

24 inclined surface

25a upper opening

25b lower opening

30 carpet

32 rib

40 sensor

41 side curtain airbag sensor

42 smart entry sensor

43 harness

50 cover member

52 lower end portion

54 upper end portion

56a upper clip

56b lower clip

FA passenger's foot area

SS surrounded space

CLAIMS

1. An in-vehicle sensor arrangement structure (10) comprising:

a floor panel (20) comprising:

a bottom surface (22) including a passenger's foot area (FA);

a rearward surface (23) which is positioned higher than said bottom surface (22) and extended rearward of a vehicle (1); and

an inclined surface (24) which connects said bottom surface (22) and said rearward surface (23);

a sensor (40) which is disposed on said floor panel (20), wherein said sensor is positioned at said inclined surface (24); and

a cover member (50) which is arranged to cover said sensor (40), wherein an upper end portion (54) of said cover member (50) is extended to said rearward surface (23), and a lower end portion (52) of said cover member (50) is extended to said bottom surface (22).

2. The in-vehicle sensor arrangement structure (10) of claim 1, wherein said floor panel (20) is covered by a carpet (30), and wherein said carpet (30) includes a rib (32) which is sandwiched between said cover member (50) and said sensor (40).

3. The in-vehicle sensor arrangement structure (10) of claim 2, wherein said rib (32) is contacted with said lower end portion (52) of said cover member (50).

4. The in-vehicle sensor arrangement structure (10) of claim 1, wherein a seat rail (5) is positioned on said floor panel (20), and a fixing point (5a) of said seat rail (5) is covered by said cover member (50).

5. The in-vehicle sensor arrangement structure (10) of claim 4, wherein said fixing point (5a) of said seat rail (5) is disposed on said incline surface and higher than said sensor (40), and wherein said sensor (40) and said fixing point (5a) are positioned in line along a longitudinal direction of said vehicle (1) when viewed from above.

6. The in-vehicle sensor arrangement structure (10) according to any one of claims 1 to 5, wherein a length of said lower end portion (52) of said cover member (50) is longer than that

of said upper end portion (54) when viewed from front of said cover member (50), and wherein said cover member (50) is formed to be inclined along a shape of said inclined surface (24).

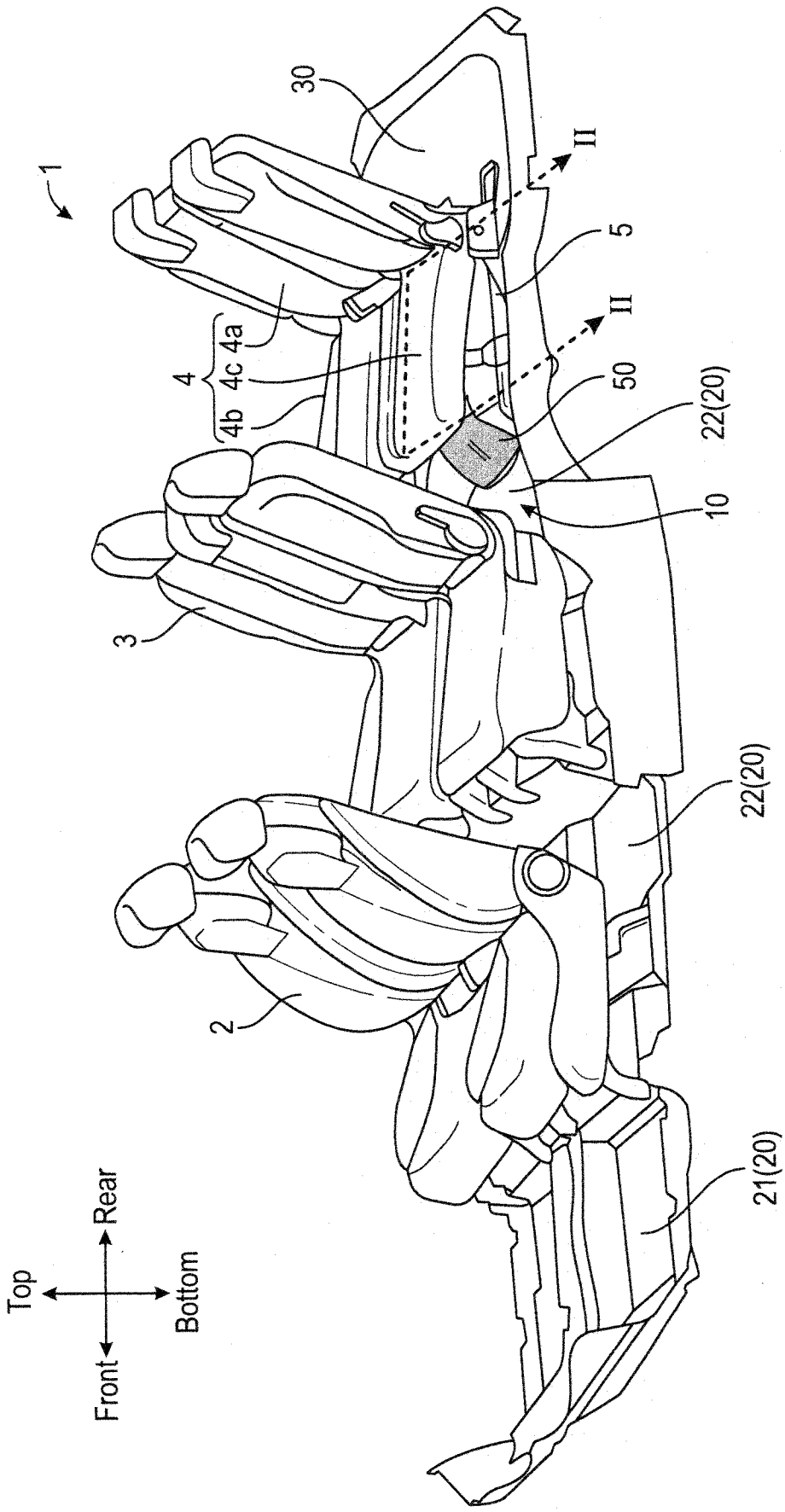
1
30
II
5
II
4
4a
4c
4b
50
22(20)
10
3
2
22(20)
21(20)
Top
Rear
Bottom
Front

FIG. 1

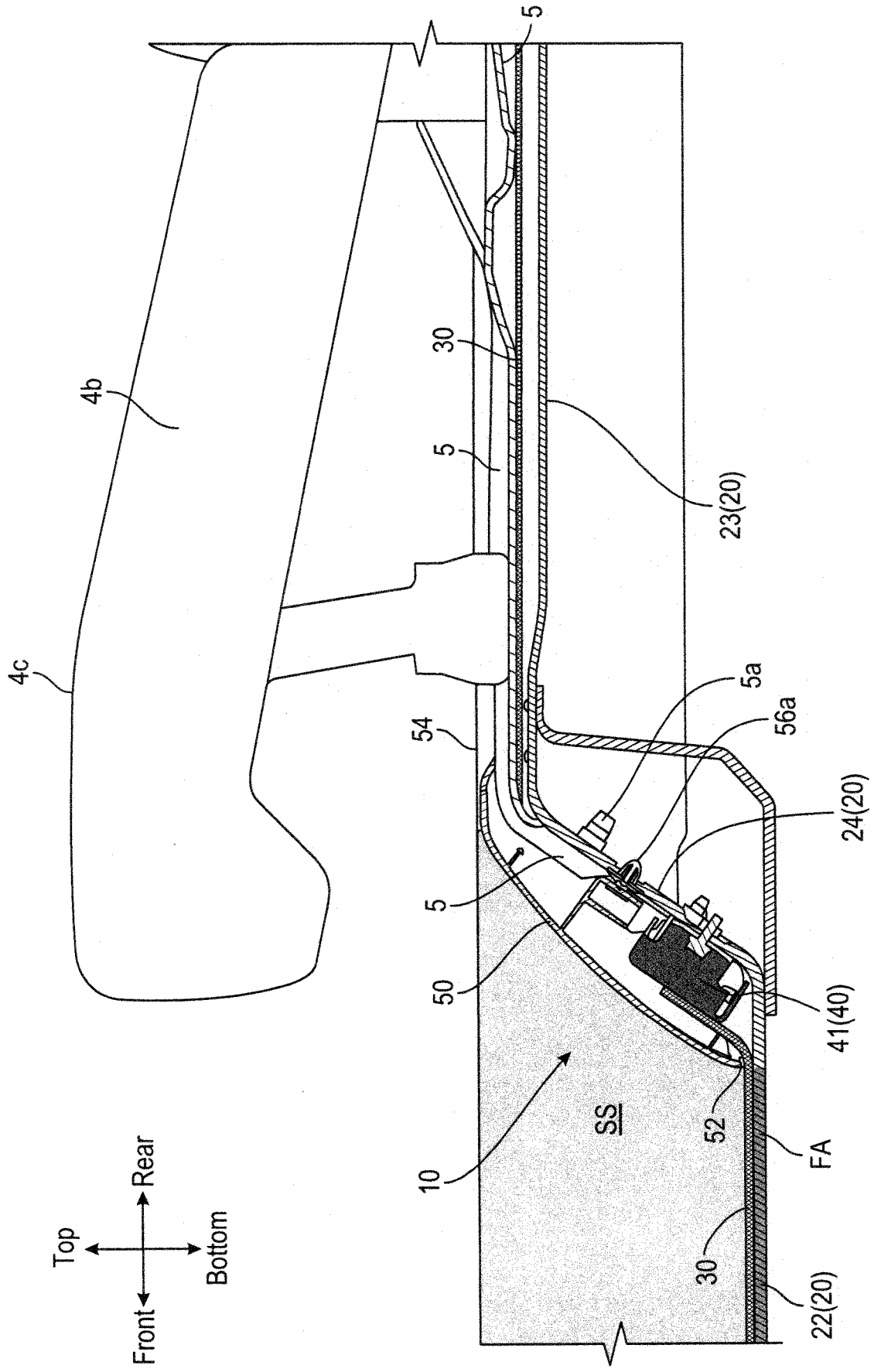
5
4b
30
5
23(20)
4c
5a
56a
54
24(20)
5
50
41(40)
SS
52
FA
10
30
22(20)
Top
Rear
Bottom
Front

FIG. 2

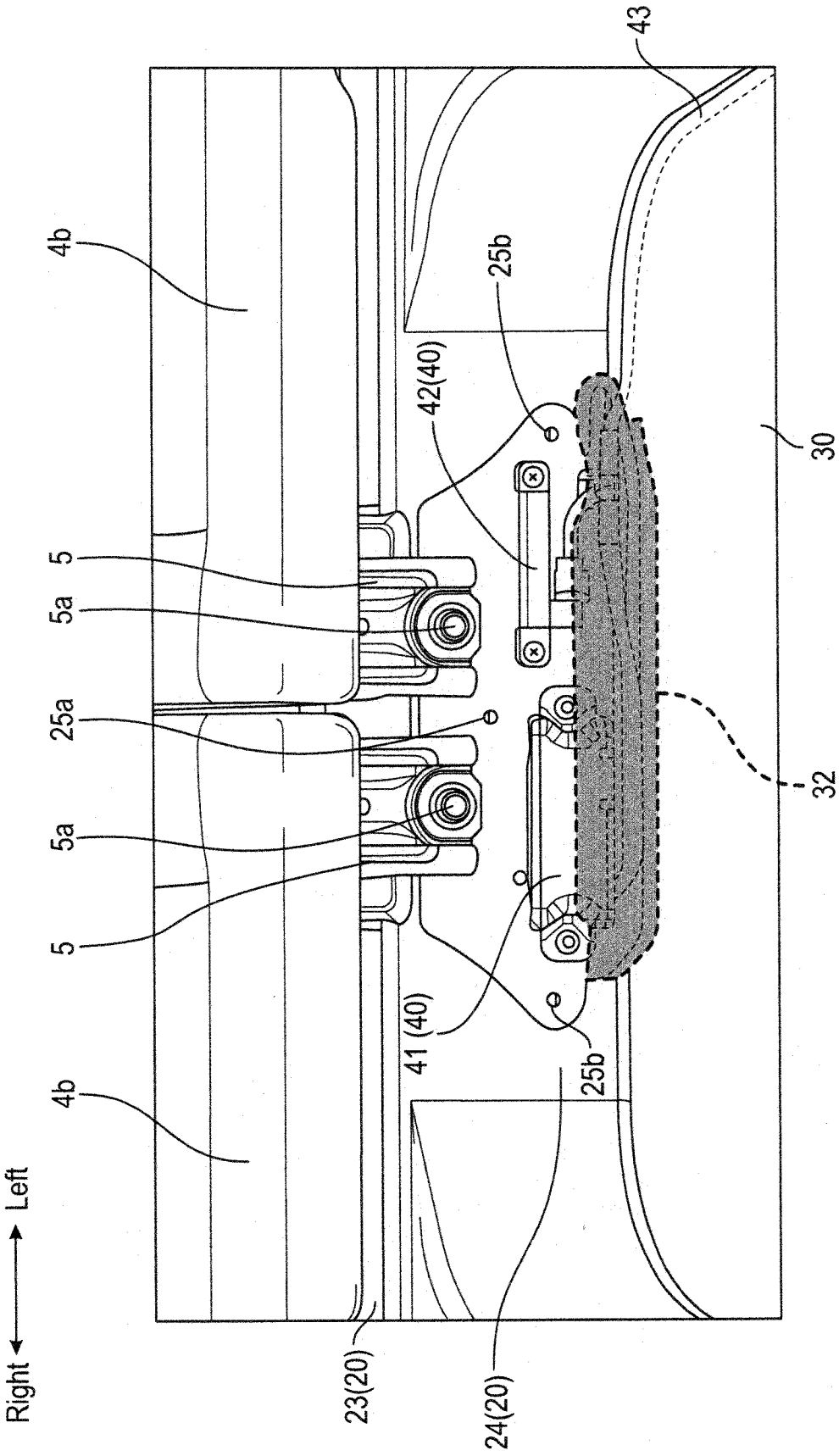
43
4b
25b
42(40)
30
5
5a
25a
5a
5
32
41 (40)
25b
4b
Left
Right
23(20)
24(20)

FIG. 3

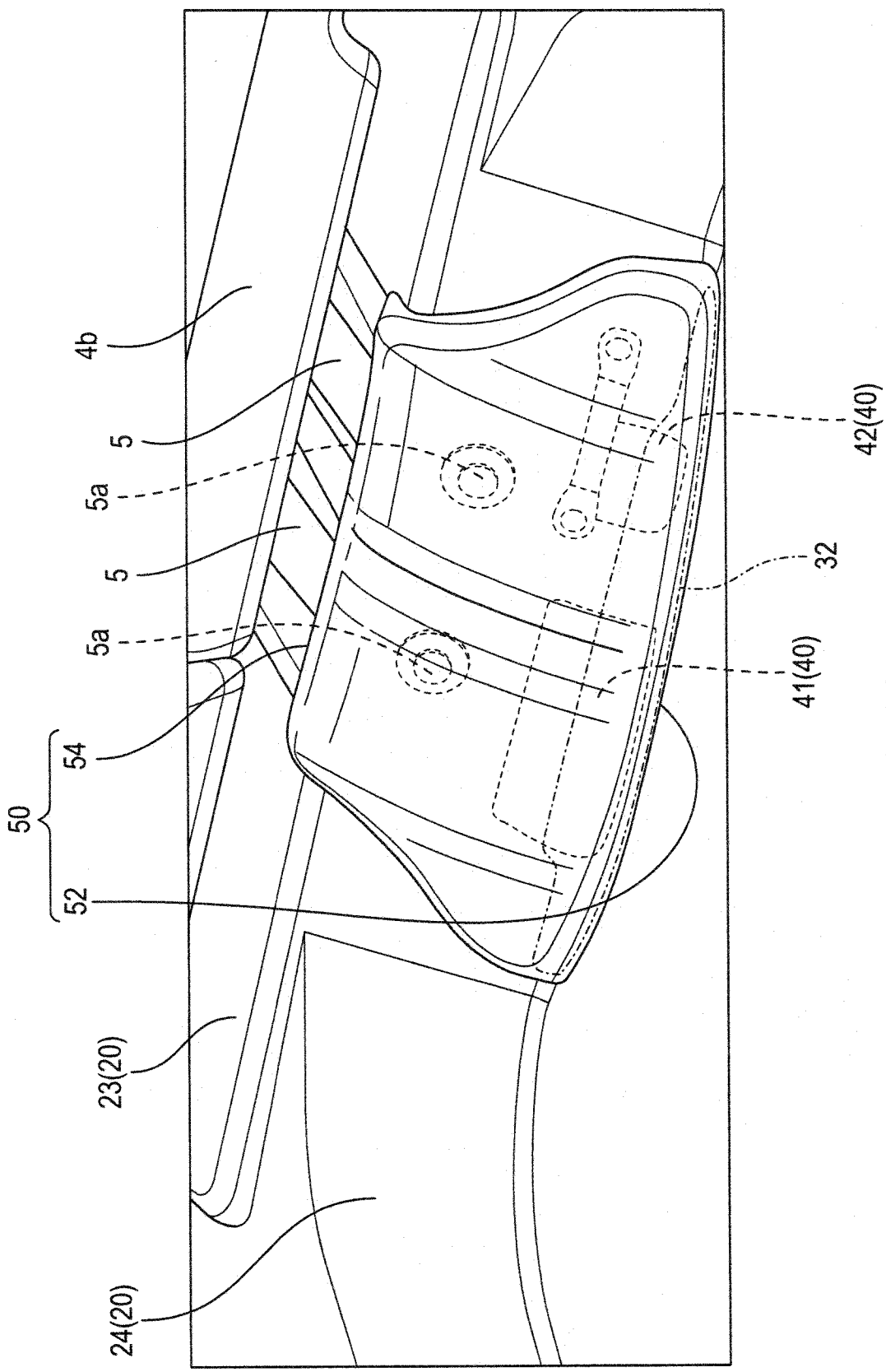

FIG. 4

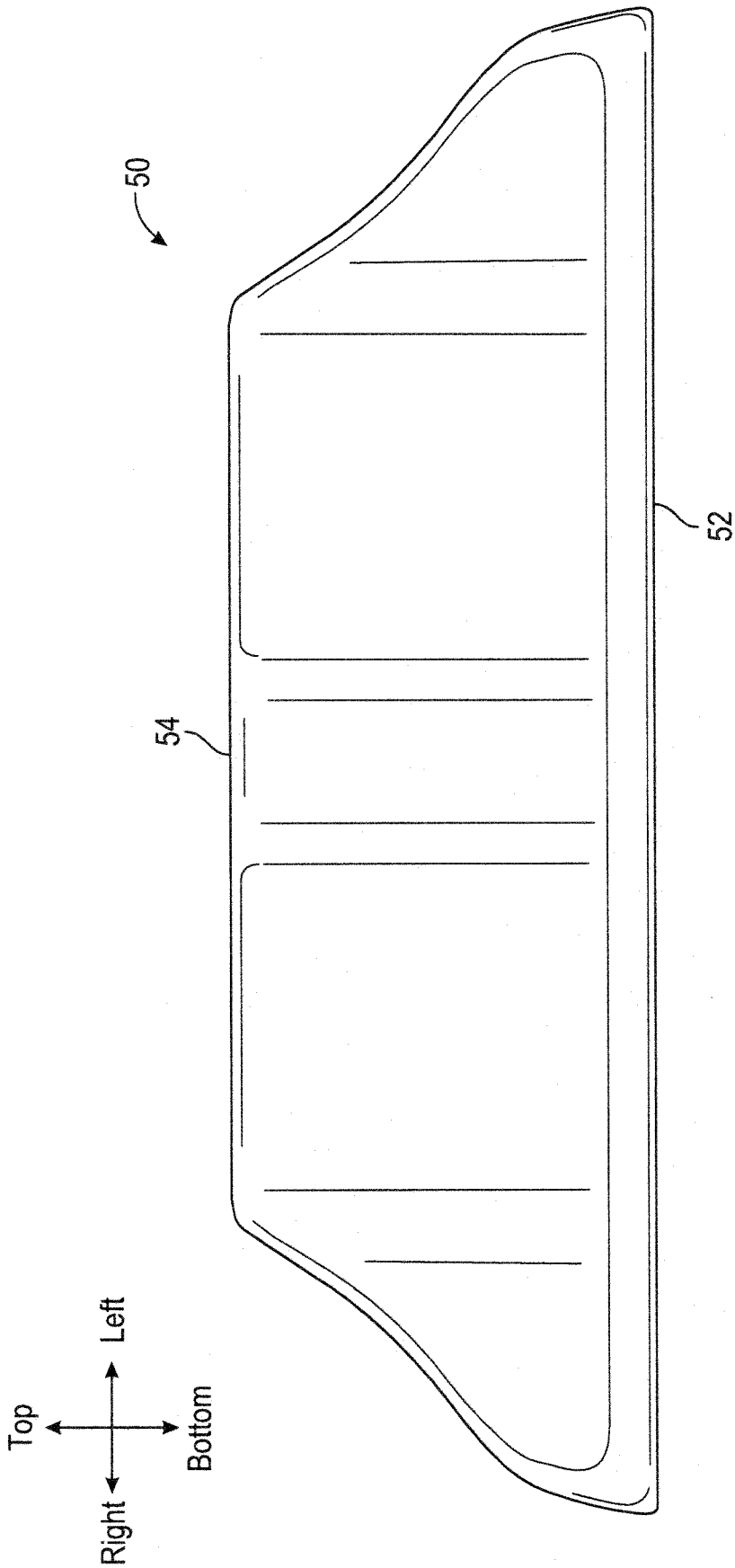

FIG. 5

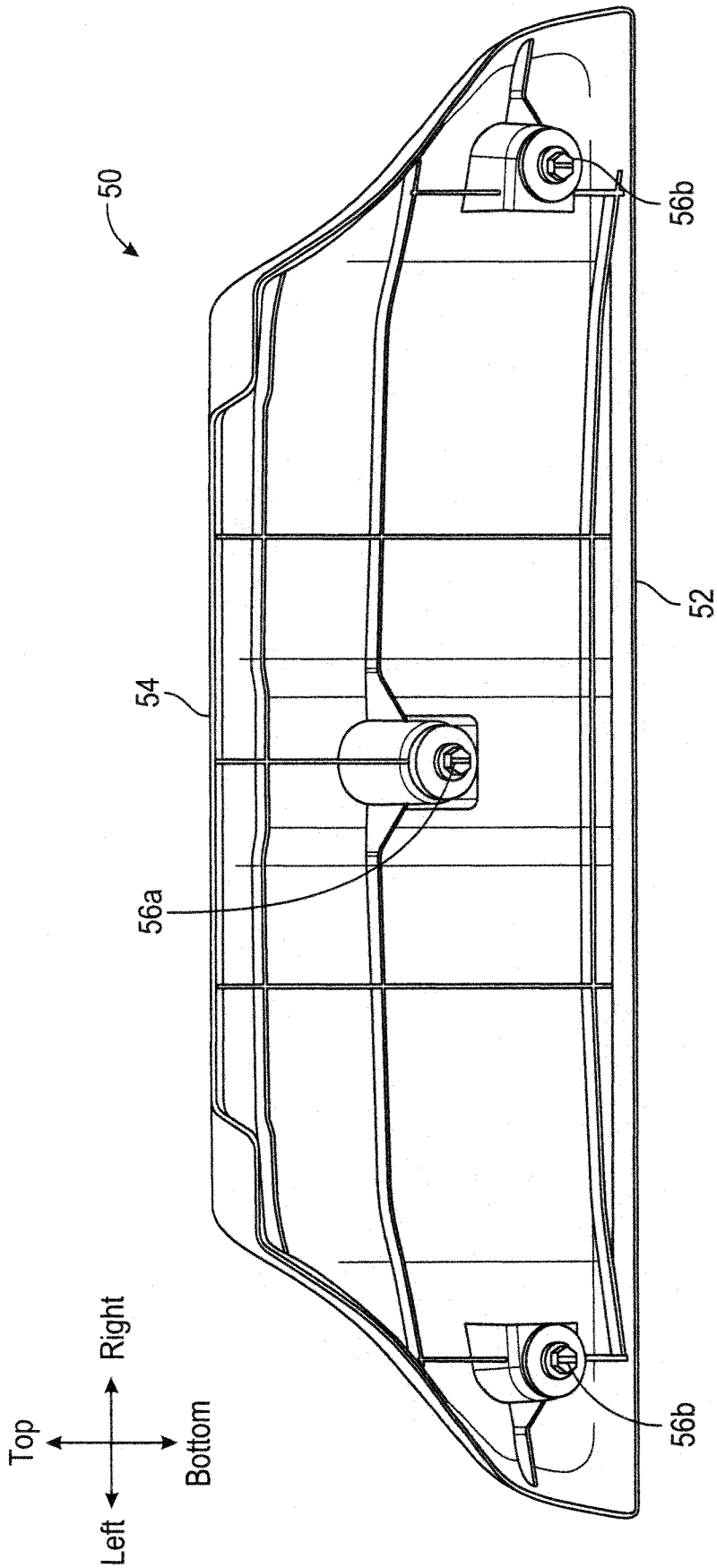

FIG. 6

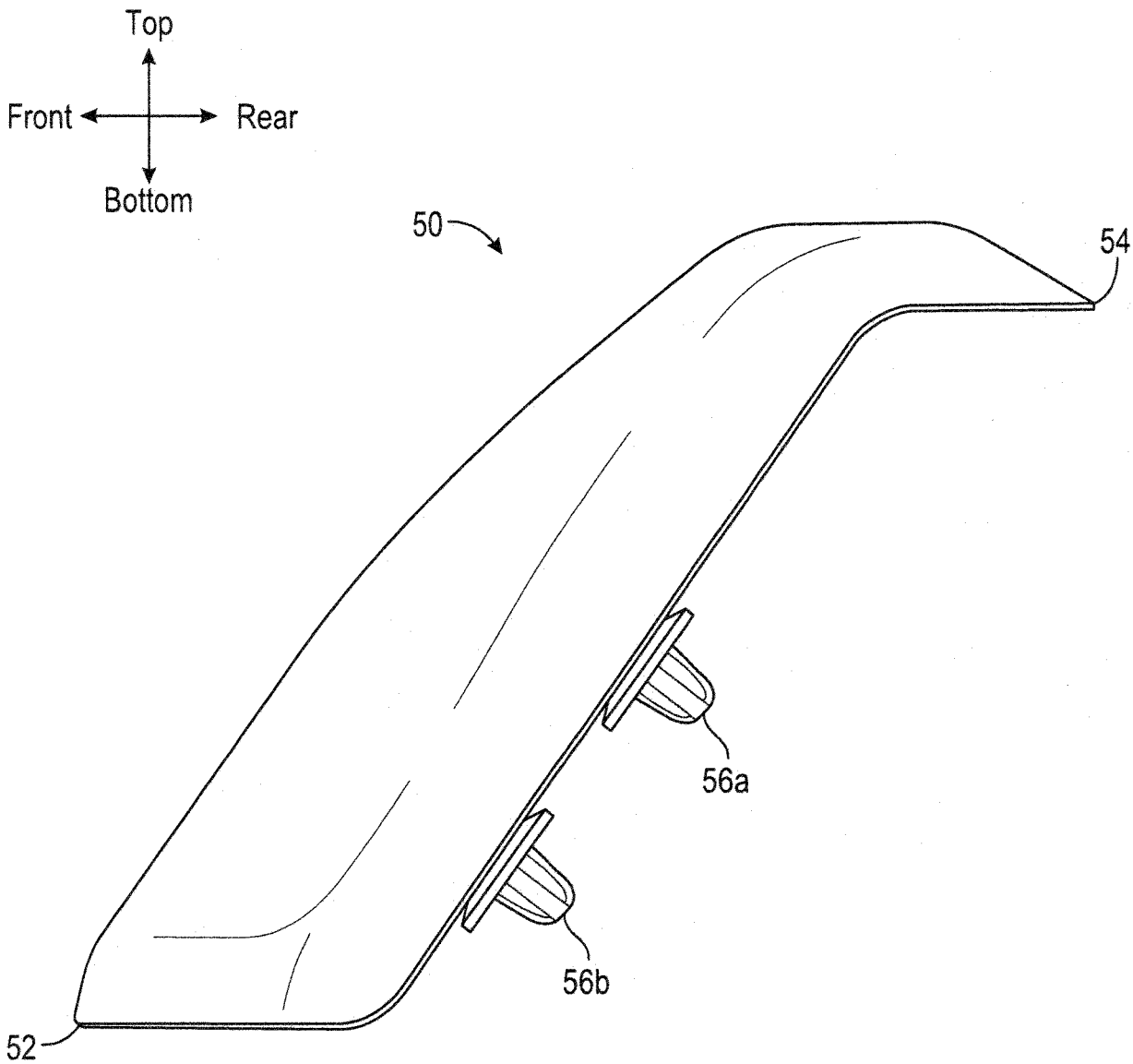

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/TH2020/000038

A. CLASSIFICATION OF SUBJECT MATTER

B60R 11/02(2006.01)i
FI: B60R11/02 Z

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)

B60R11/02

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

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2020
Registered utility model specifications of Japan 1996-2020
Published registered utility model applications of Japan 1994-2020

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2019-59267 A (TOYODA GOSEI CO., LTD.) 18 April 2019 (2019-04-18)	1-6
A	JP 2017-94855 A (NISSAN MOTOR CO., LTD.) 01 June 2017 (2017-06-01)	1-6
A	JP 2019-81513 A (SUZUKI MOTOR CORP.) 30 May 2019 (2019-05-30)	1-6

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

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10 December 2020	**22 December 2020**
Name and mailing address of the ISA/JP **Japan Patent Office** **3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo** **100-8915, Japan**	Authorized officer **MIYACHI Masato 3Q 5068** Telephone No. **+81-3-3581-1101 Ext. 3381**

INTERNATIONAL SEARCH REPORT
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