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Yoshida et al.

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(54) **VEHICLE SEAT**

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See application file for complete search history.

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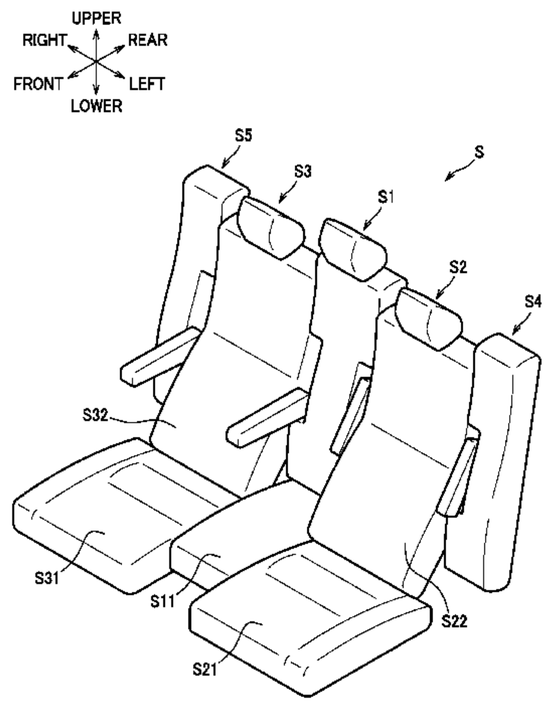
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(57) **ABSTRACT**

A vehicle seat includes a seat cushion frame, a slide mechanism, a drive source, and a transmission mechanism configured to receive a driving force from the drive source and to cause the seat cushion frame to move in a front-rear direction. The slide mechanism includes a guide member extending in the front-rear direction and a slide member movable along the guide member relative to the guide member; the seat cushion frame is fixed to one of the guide member and the slide member, and another of the guide member and the slide member is fixed to a floor of a vehicle; and the drive source is fixed to the floor of the vehicle.

17 Claims, 11 Drawing Sheets



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B60N 2/64	(2006.01)
B60N 2/68	(2006.01)

(52) **U.S. Cl.**

CPC ***B60N 2/68*** (2013.01); *B60N 2002/0236* (2013.01)

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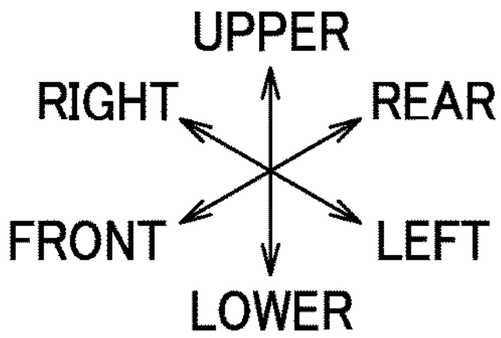
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FIG.1


UPPER
RIGHT
REAR
FRONT
LEFT
LOWER

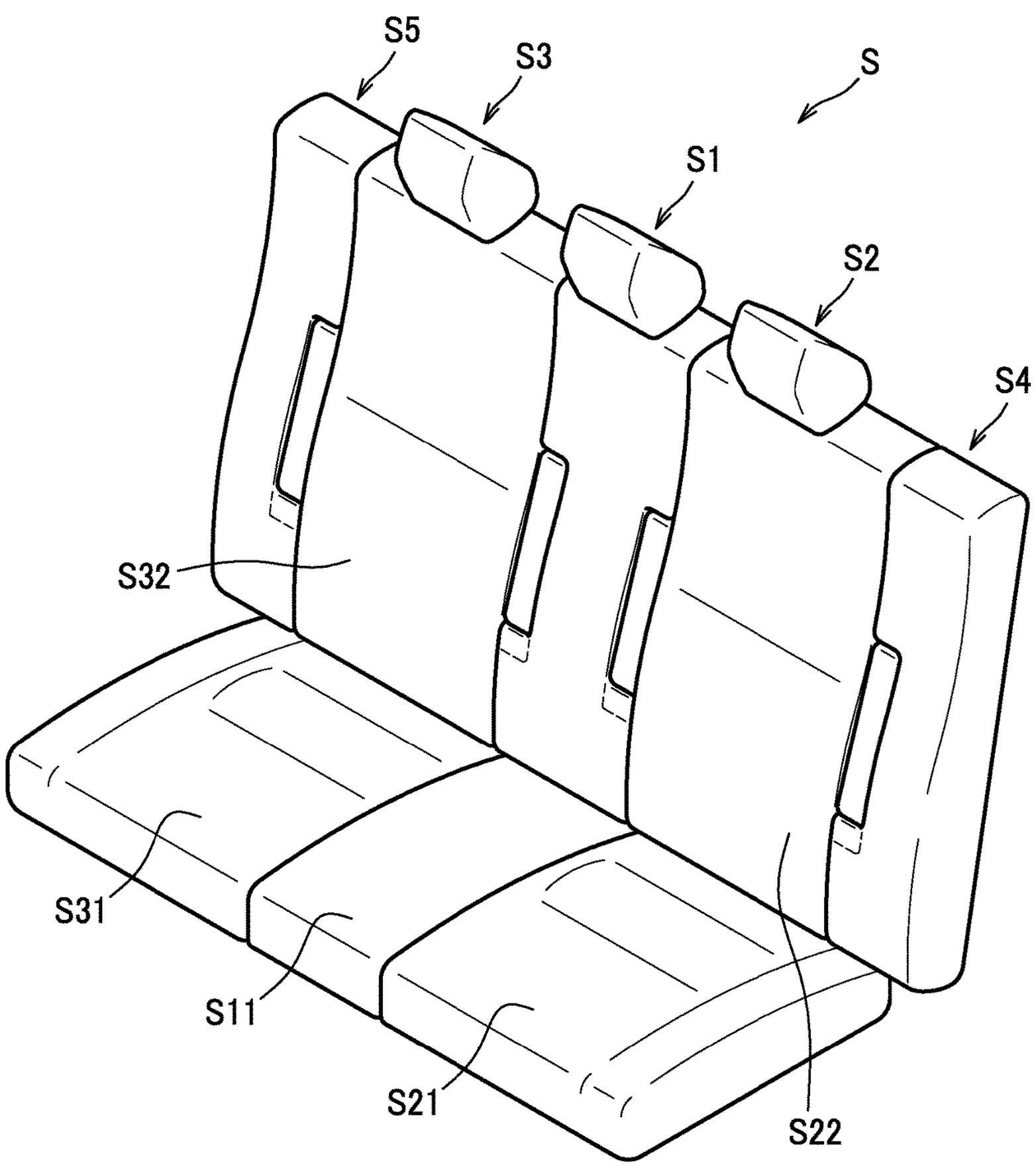
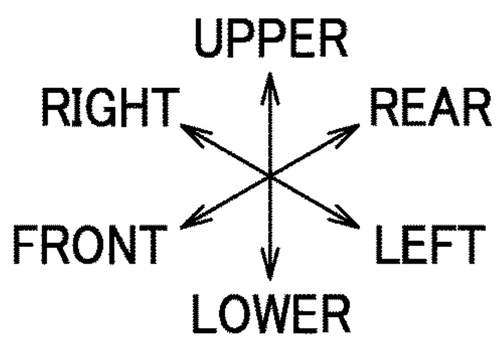

S5
S3
S
S1
S2
S4
S32
S31
S11
S21
S22

FIG.2


UPPER
RIGHT
REAR
FRONT
LEFT
LOWER

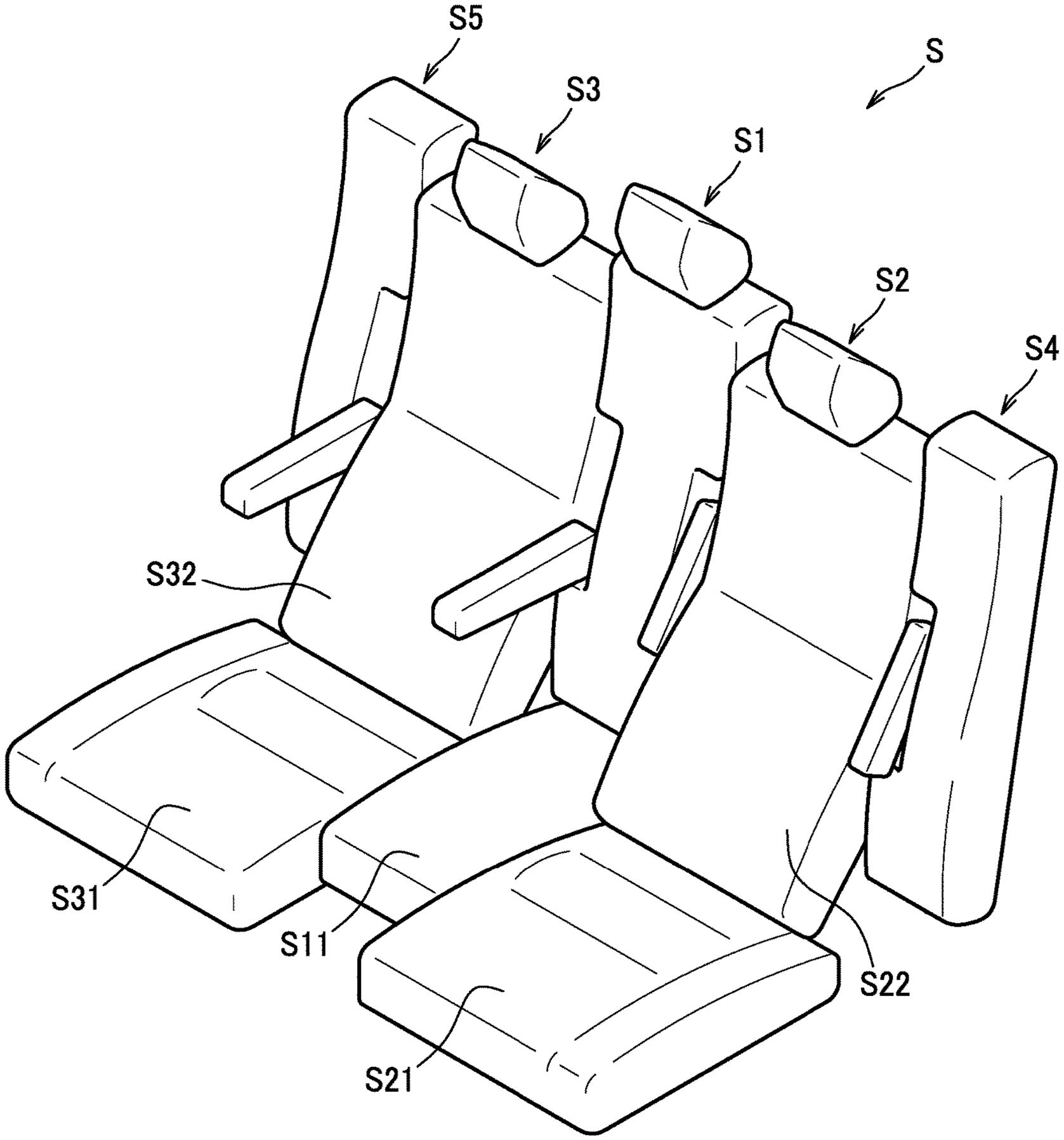

S5
S3
S
S1
S2
S4
S32
S31
S11
S22
S21

FIG.3

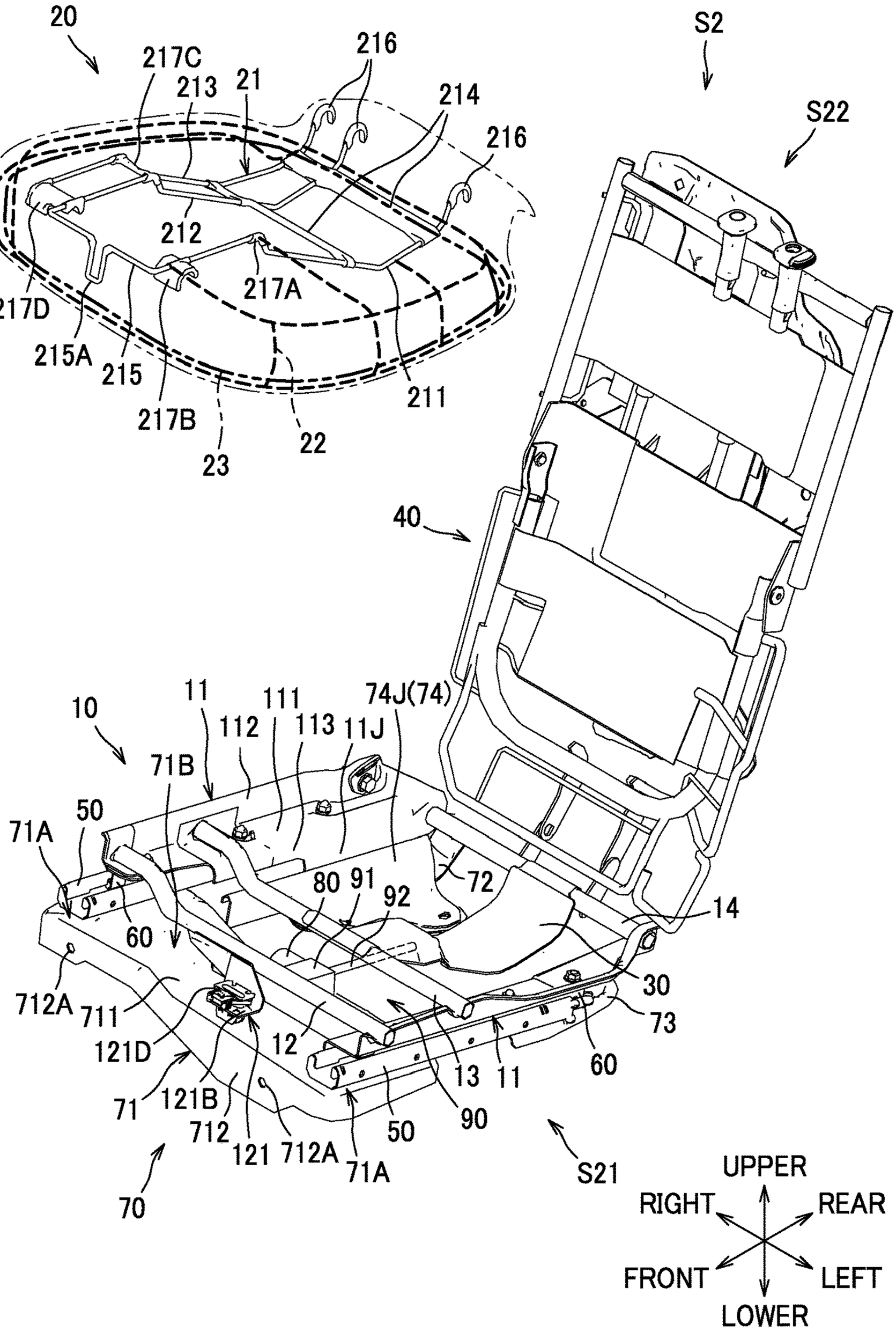

20
217C
213
21
216
214
216
212
217A
217D
215A
215
217B
23
22
211
S2
S22
40
10
11
111
74J(74)
112
113
11J
71B
50
71A
80
91
92
72
14
60
30
73
712A
711
121D
12
13
11
60
71
121B
712
121
712A
71A
50
90
70
S21
UPPER
RIGHT
REAR
FRONT
LEFT
LOWER

FIG.4

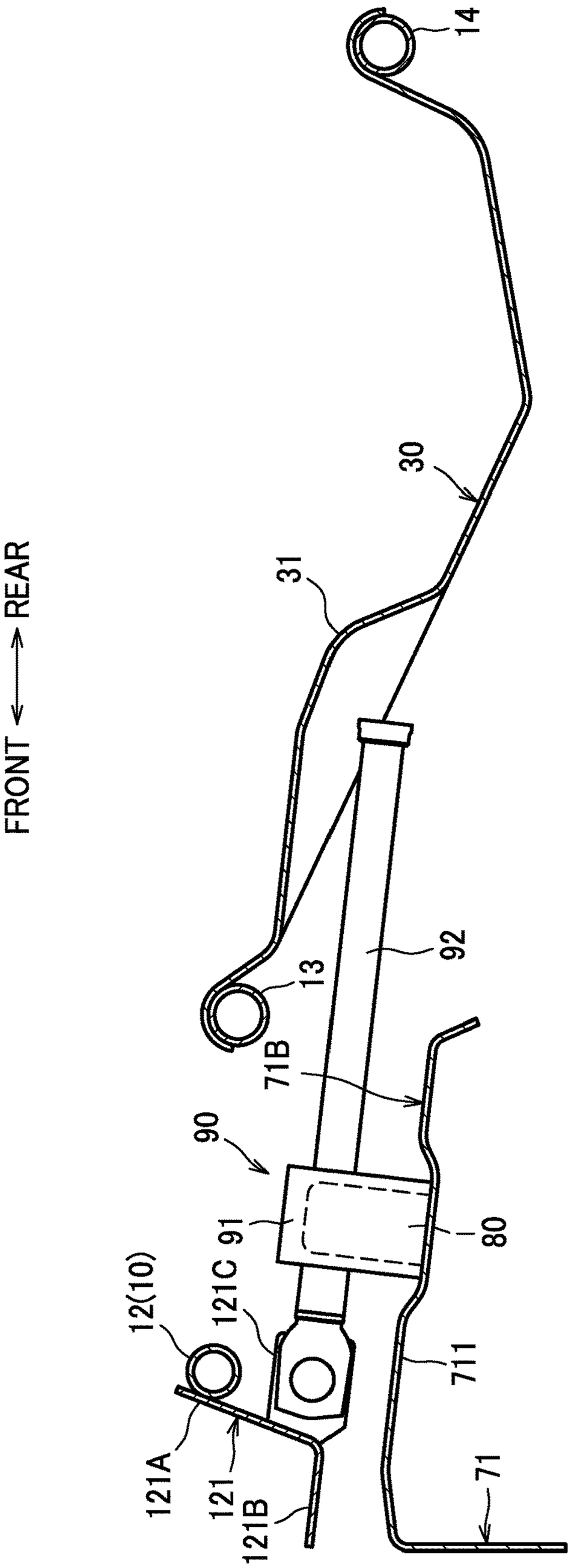

FRONT ⟷ REAR
14
30
31
92
13
71B
90
91
121C
12(10)
121A
121
121B
80
711
71

FIG.5

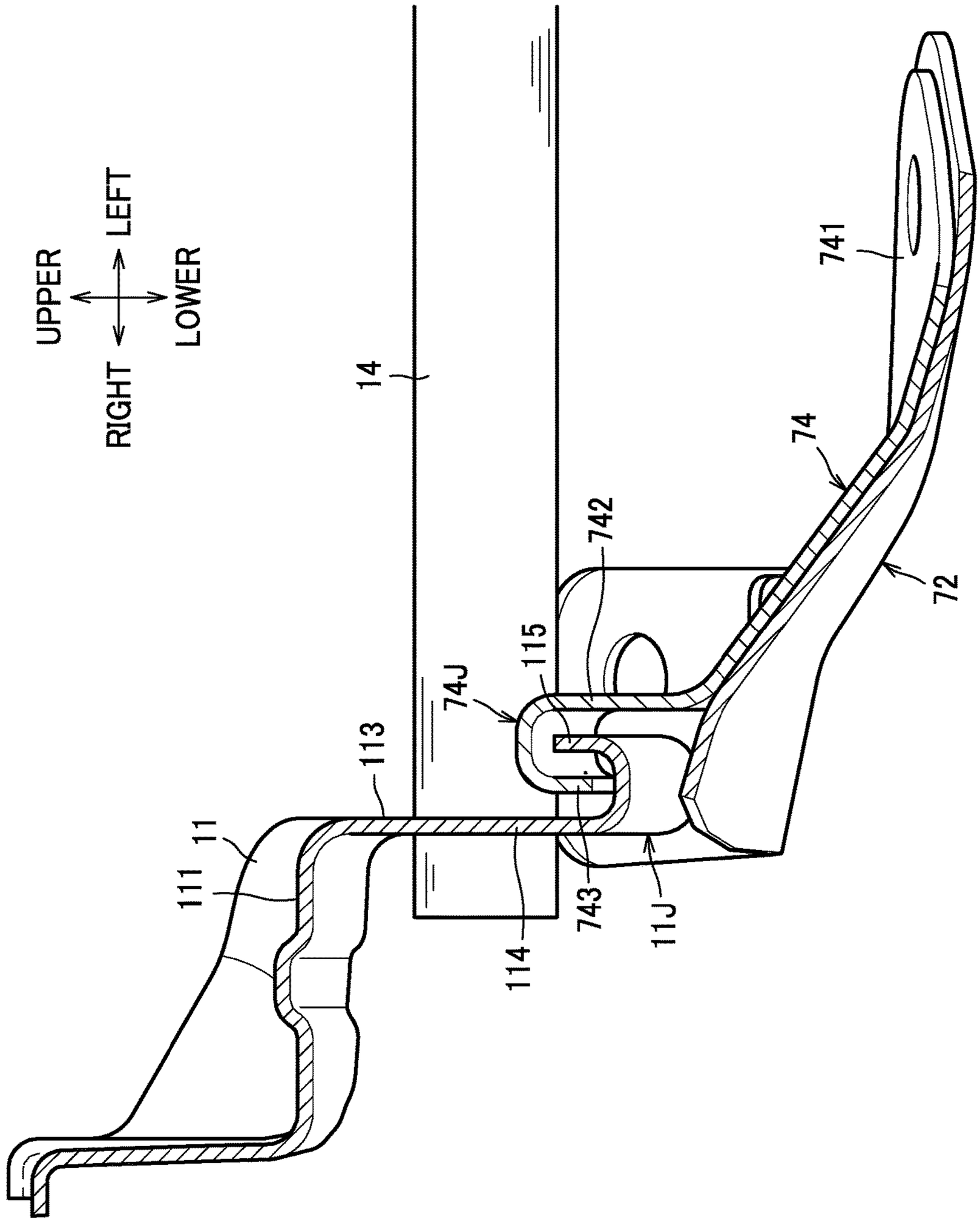

UPPER
LEFT
RIGHT
LOWER
14
741
74
742
72
115
74J
113
111
11
743
11J
114

FIG.6

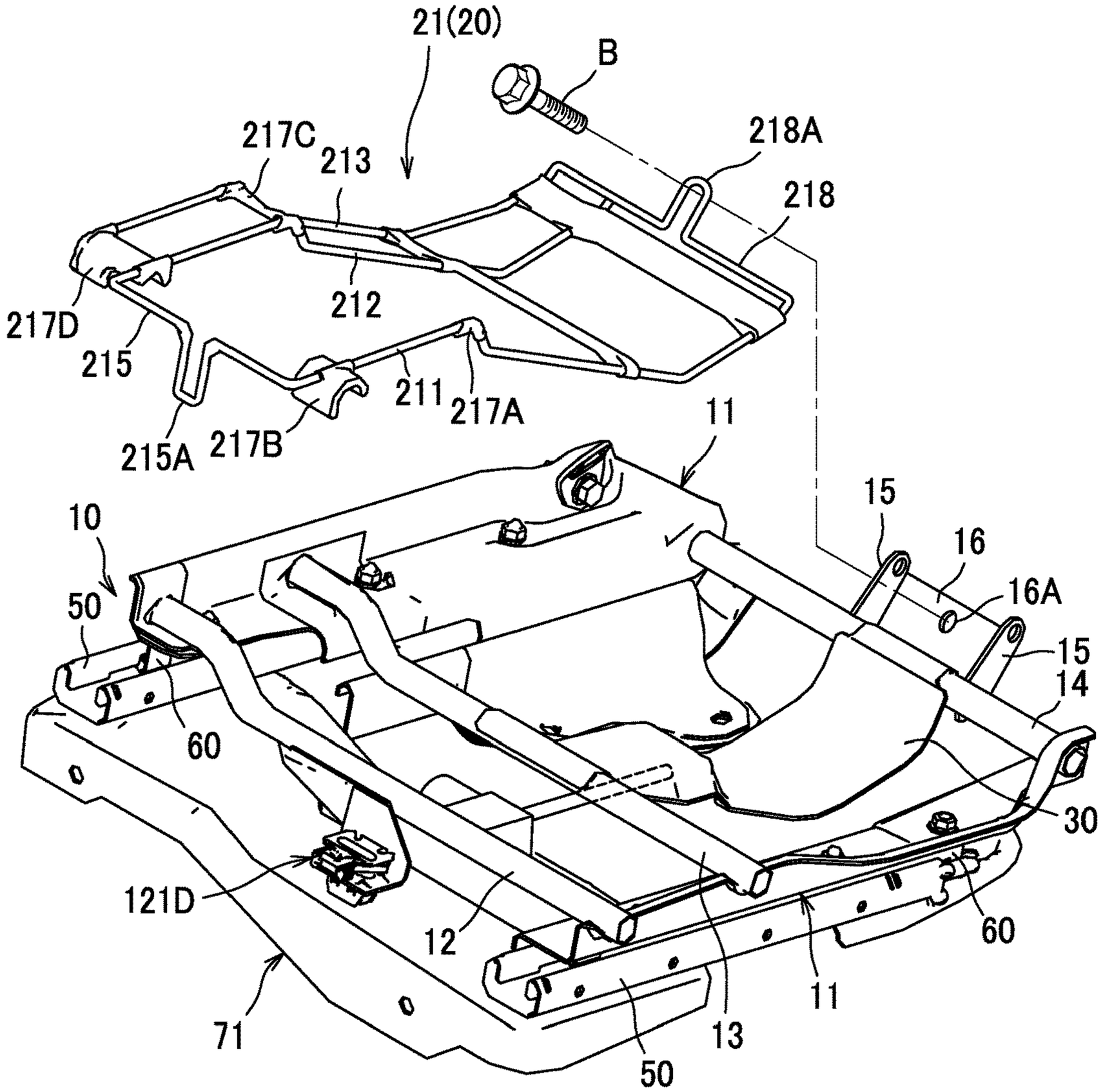

21(20)
B
217C
213
218A
218
217D
212
215
211
217A
215A
217B
11
10
15
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16A
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15
14
60
30
121D
12
60
71
13
11
50

FIG.7

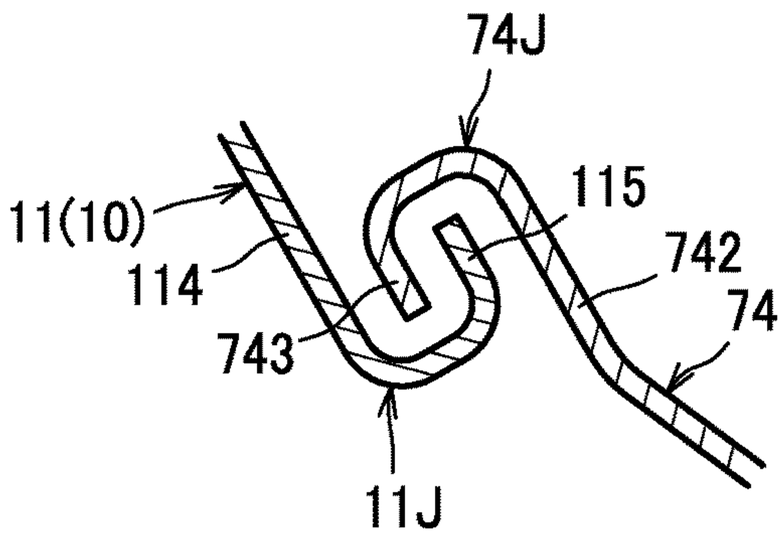

74J
11(10)
115
742
114
74
743
11J

FIG.8

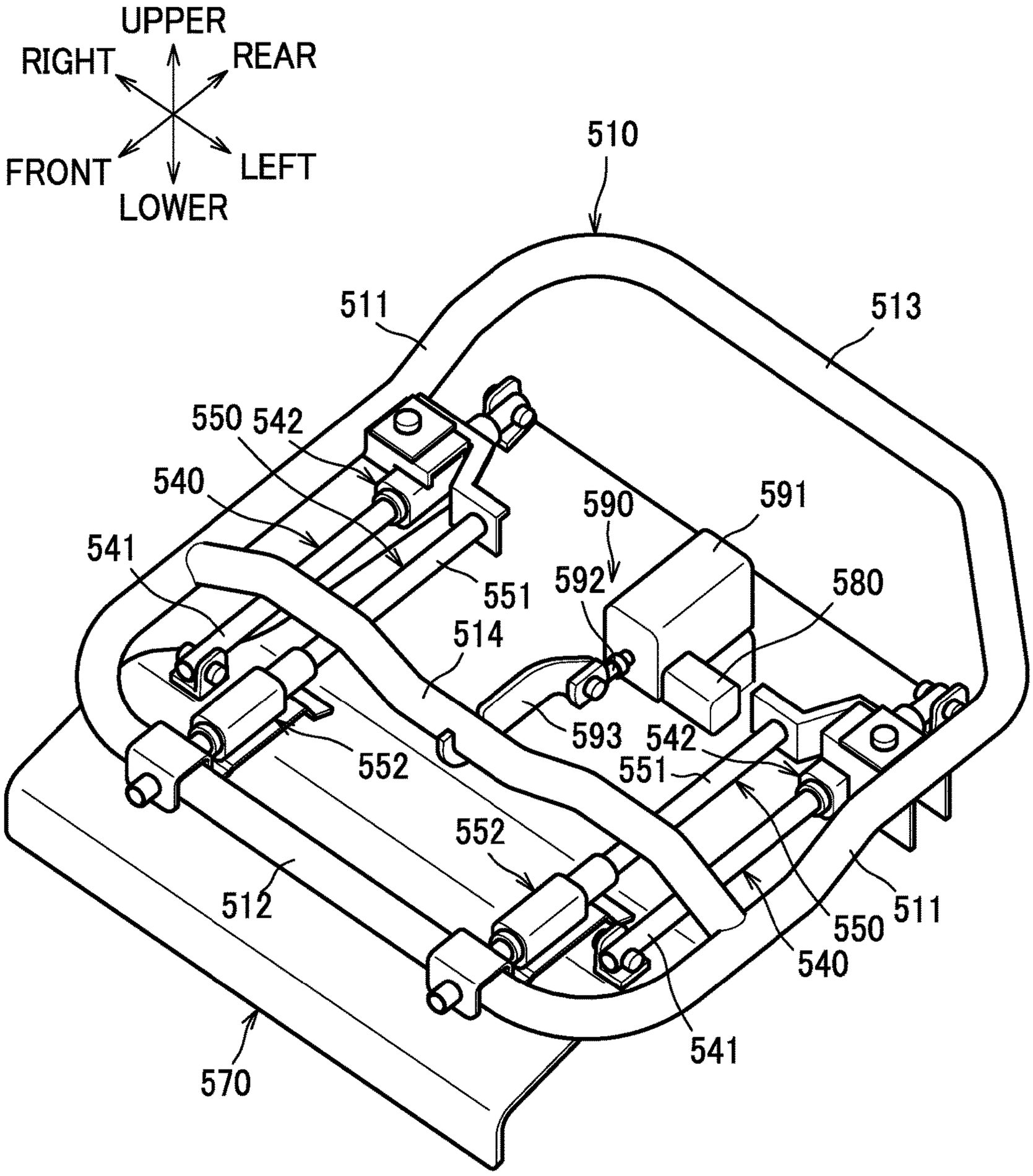

UPPER
RIGHT
REAR
FRONT
LEFT
LOWER
510
511
513
550
542
540
590
591
541
592
580
551
514
593
542
552
551
552
512
511
550
540
541
570

FIG.9

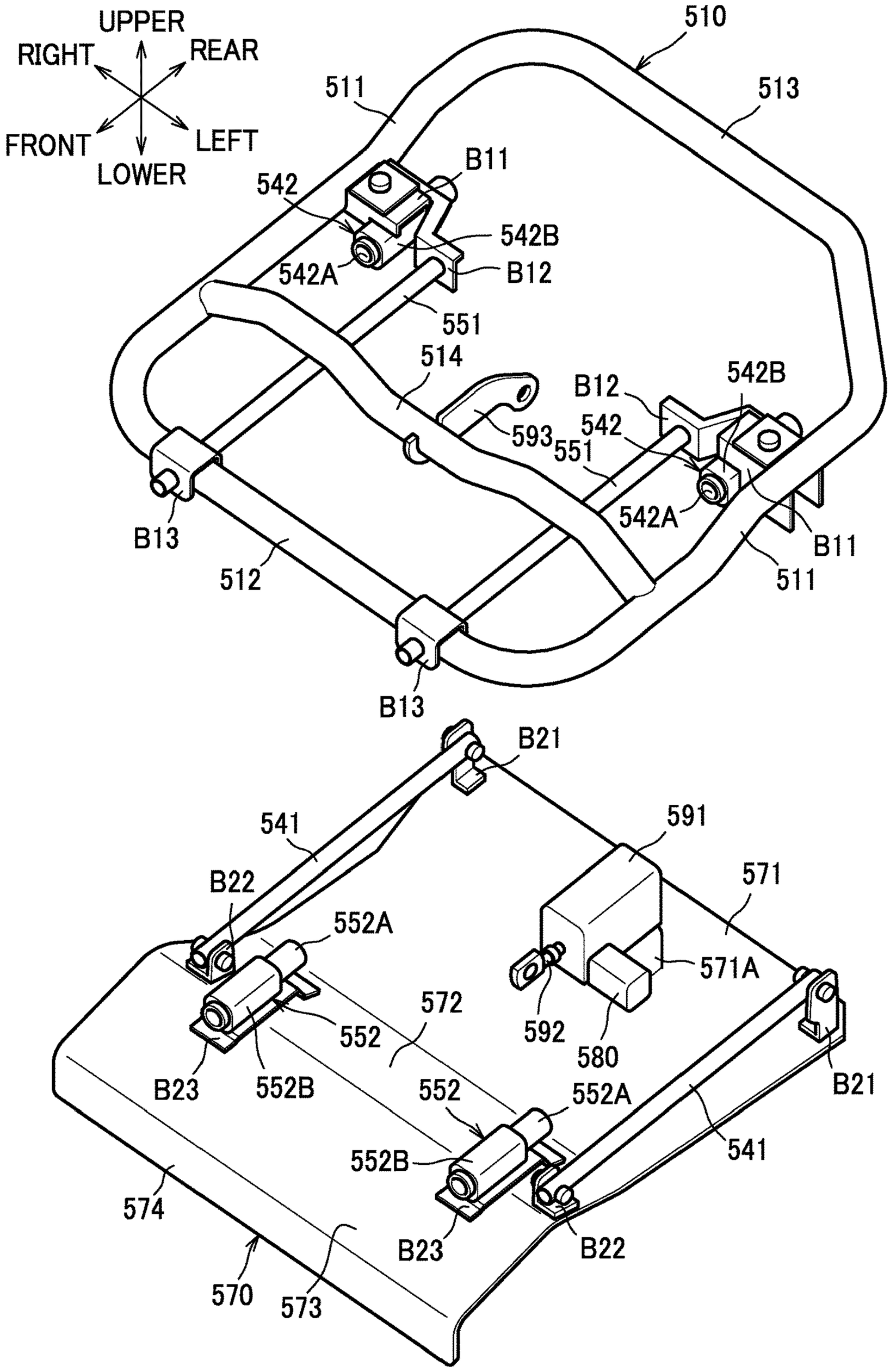

UPPER
RIGHT
REAR
FRONT
LEFT
LOWER
510
511
513
B11
542
542B
542A
B12
551
514
593
B13
512
B21
541
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571
B22
552A
571A
572
552
592
580
B23
552B
574
570
573

FIG.10

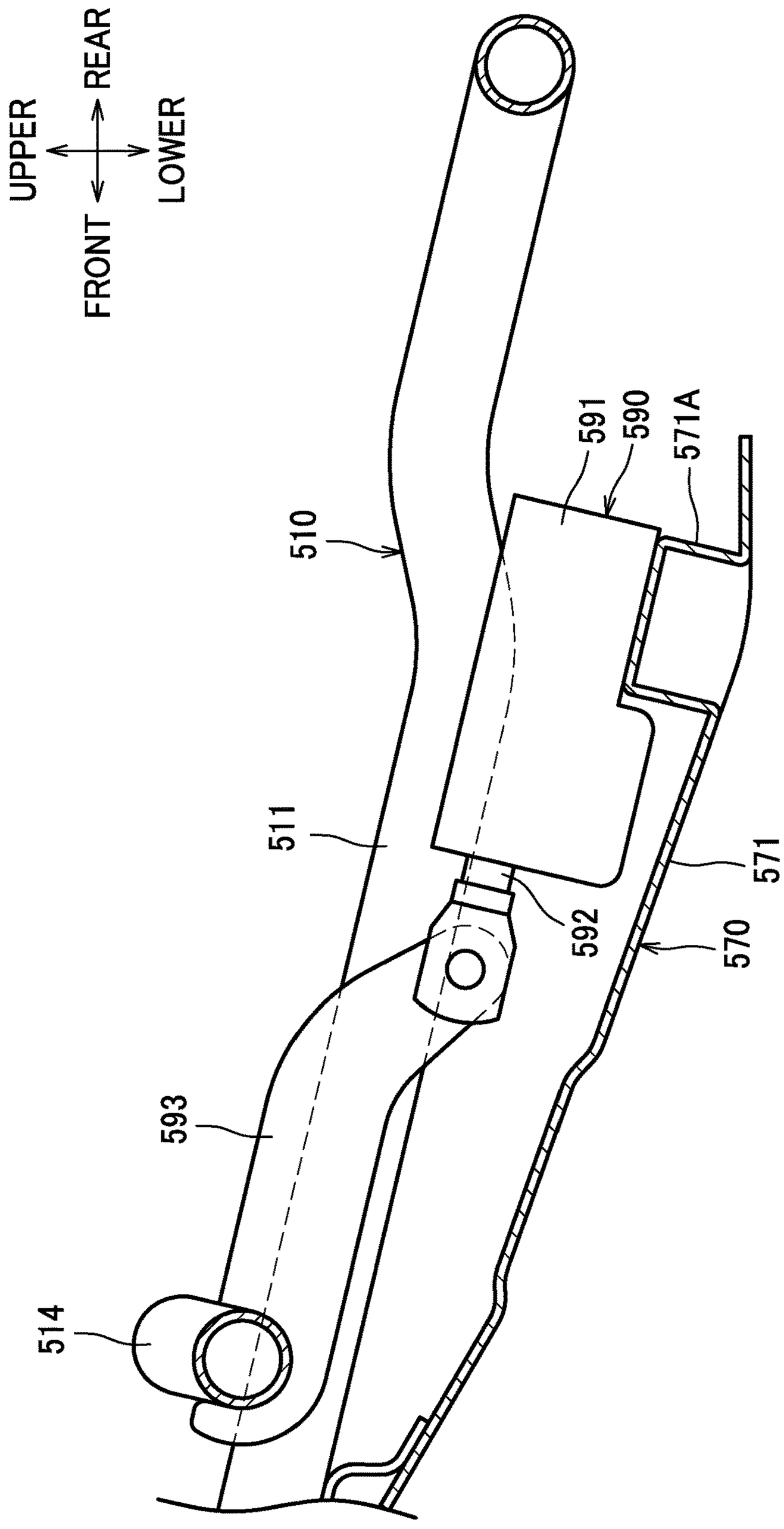

UPPER
REAR
FRONT
LOWER
510
511
514
591
590
571A
571
592
570
593

FIG.11

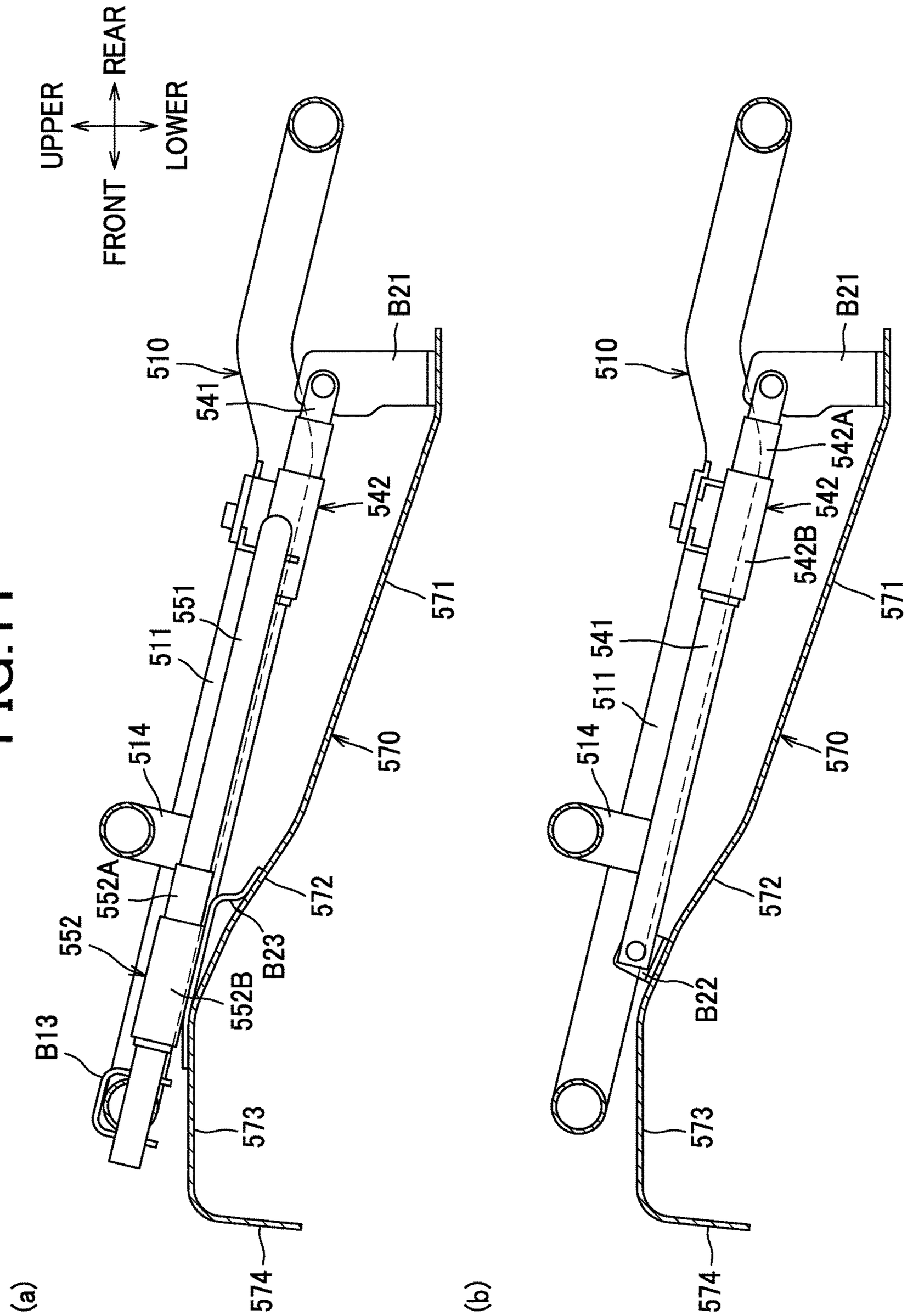
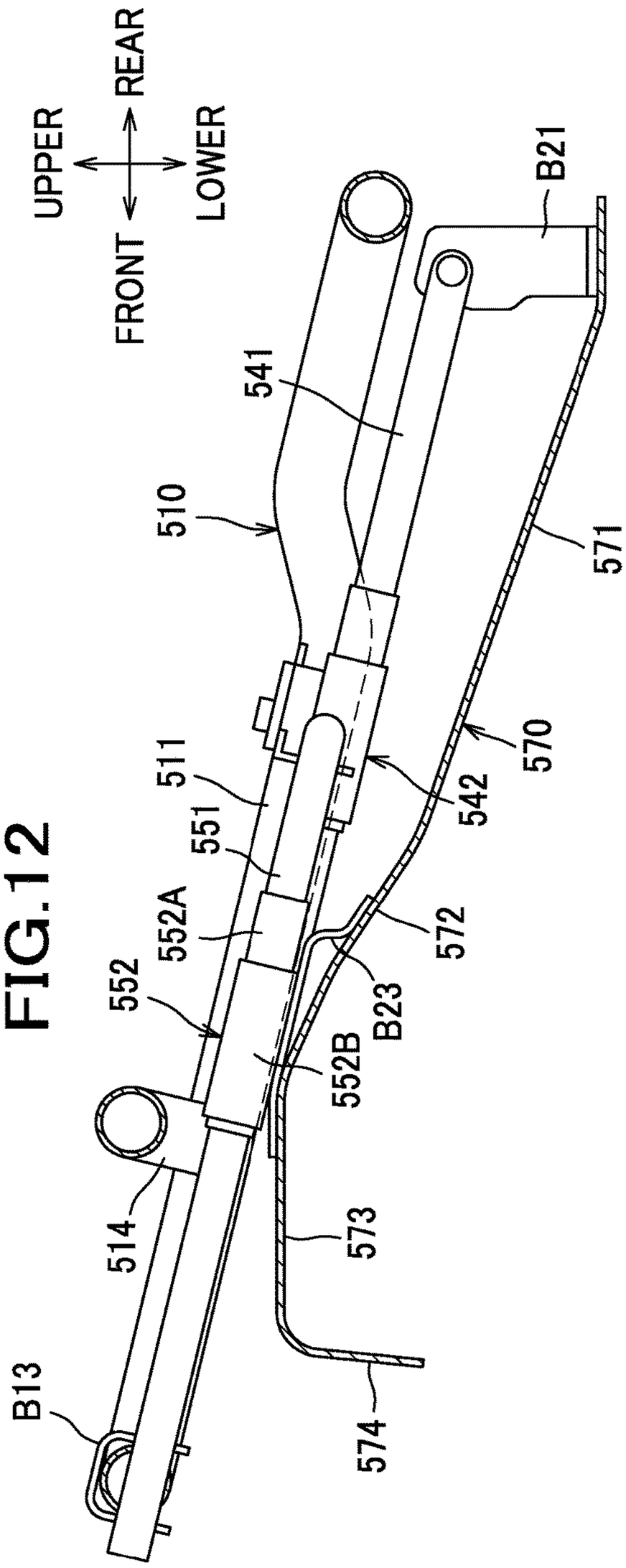
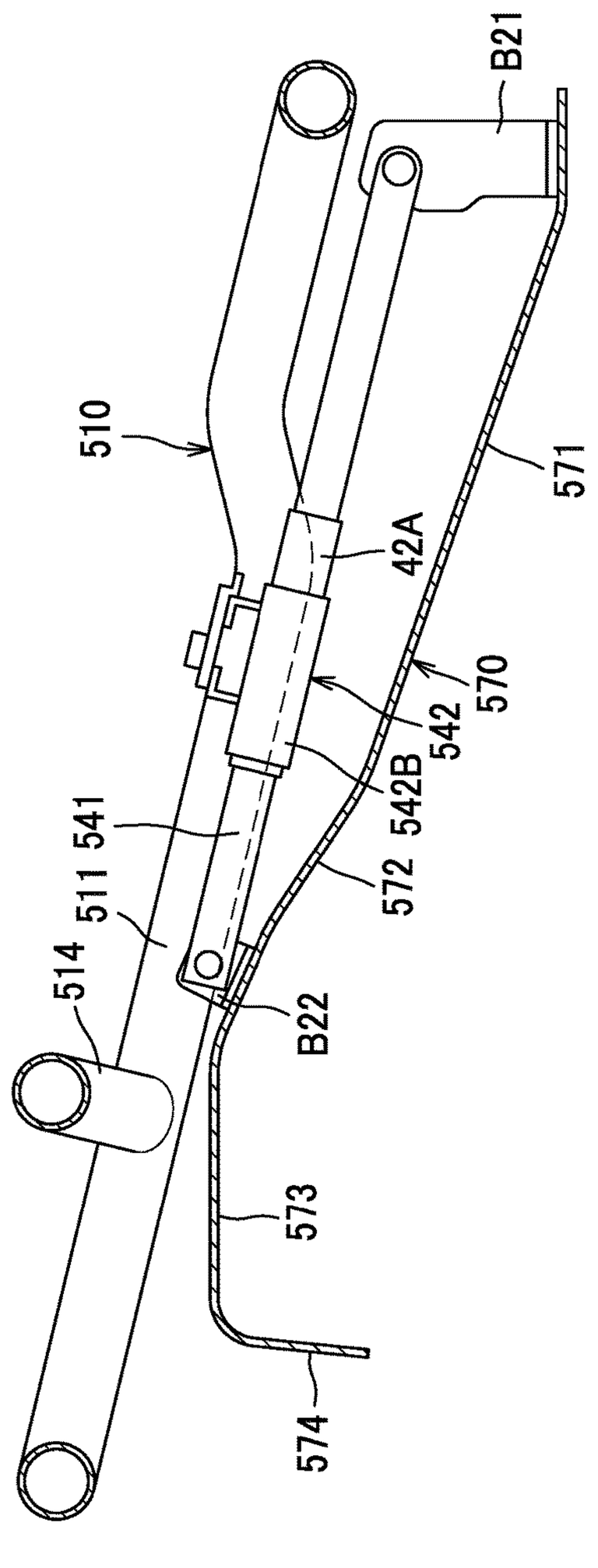

UPPER
REAR
FRONT
LOWER
510
541
B21
542
571
551
511
514
570
552A
572
552
552B
B23
B13
573
574
(a)
510
B21
542A
542
542B
571
541
511
514
570
572
B22
573
574
(b)

FIG.12


UPPER
REAR
FRONT
LOWER
B21
541
510
571
511
551
542
570
552A
572
552
552B
B23
514
573
B13
574

(a)


B21
510
571
42A
542
570
542B
541
511
572
514
B22
573
574

(b)

VEHICLE SEAT

TECHNICAL FIELD

The present invention relates to a vehicle seat including a seat cushion movable in a front-rear direction.

BACKGROUND ART

A vehicle seat configured such that a seat cushion is rendered movable in a front-rear direction by the use of a driving force of a motor is hitherto known in the art. For example, a vehicle seat disclosed in Patent Document 1 includes left and right lower rails elongate in the front-rear direction which are fixed on the floor of a vehicle, left and right upper rails configured to support a seat cushion and to be movable along the lower rails, a motor, and a transmission mechanism configured to receive a driving force from the motor and to cause the seat cushion to move in the front-rear direction. The motor is disposed on a bracket which connects the left and right upper rails.

There is also known in the art a vehicle seat for use as a rear seat or the like in an automobile, which is configured such that a seat cushion slides frontward according as a lower portion of a seat back juts out frontward. For example, a vehicle seat disclosed in Patent Document 2 includes a lower slide unit fixed to the floor of a vehicle body, and an upper slide unit fixed to a seat cushion frame, wherein a seat cushion is caused to slide in the front-rear direction by the movement of the upper slide unit along the lower slide unit.

CITATION LIST

Patent Literature

Patent Document 1: JP 2015-3590 A
Patent Document 2: JP H10-86720 A

SUMMARY OF INVENTION

Technical Problem

With the technical solution disclosed in Patent Document 1 as described above, however, arrangement of the motor on the bracket connecting the upper rails would disadvantageously make an assembly configured to slide in the front-rear direction relative to the floor heavy.

With this in view, there is a need to provide a vehicle seat with a configuration in which a seat cushion is movable in the front-rear direction while an assembly configured to slide in the front-rear direction is made lightweight.

It would be further preferable to check any increase of the number of parts.

With the technical solution disclosed in Patent Document 2 as described above, on the other hand, provision of the upper slide unit and the lower slide unit between the floor of the vehicle body and the seat cushion frame would make the position of the seat cushion frame higher than that of an alternative configuration in which no upper or lower slide unit is provided. This would necessitate making a cushion material provided to cover the seat cushion frame thinner, and the thus-thinner cushion material would disadvantageously impair the comfort of the occupant to be seated thereon.

Therefore, there is a need to provide a vehicle seat with a seat cushion configured to be movable in the front-rear direction while the comfort of the occupant can be improved.

There is also a need to provide a vehicle seat in which deformation of a slide mechanism for guiding a motion of the seat cushion frame can be suppressed.

It would be further preferable to provide a vehicle seat in which the slide mechanism can be arranged to conform to the shape of a portion of the vehicle body on which the seat cushion is disposed.

Solution to Problem

A vehicle seat comprising a seat cushion frame, a slide mechanism, a drive source, and a transmission mechanism configured to receive a driving force from the drive source and to cause the seat cushion frame to move in a front-rear direction is disclosed. The slide mechanism includes a guide member extending in the front-rear direction and a slide member movable along the guide member relative to the guide member, the seat cushion frame being fixed to one of the guide member and the slide member, another of the guide member and the slide member being fixed to a floor of a vehicle. The drive source is fixed to the floor. For example, in one embodiment, the guide member includes a pair of rails fixed to the floor, and the slide member includes a pair of sliders engageable with the pair of rails and slidable relative to the pair of rails, and the seat cushion frame is fixed to the pair of sliders.

With this configuration, in which the drive source is fixed to the floor of the vehicle and not disposed on an assembly configured to slide relative to the floor, the assembly configured to slide relative to the floor can be made lightweight.

The above-described vehicle seat may preferably include a first bracket connecting the pair of rails, wherein the drive source is fixed to the first bracket.

In the aforementioned vehicle seat with the first bracket, optionally, the first bracket may preferably be fixed to the floor.

With this configuration, the pair of rails and the drive source can be fixed to the floor with a single part, and thus increase in the number of parts can be suppressed.

The vehicle seat as described above may comprise a second bracket fixed to the floor and configured to support the rails, and a support frame fixed to the second bracket, and may preferably be configured such that the support frame includes a first engageable portion so extending as to have a distal end facing downward, wherein the seat cushion frame includes a pair of left and right side frames, and wherein the side frames include a second engageable portion so extending as to have a distal end facing upward, the second engageable portion being engageable with the first engageable portion in an upward-downward direction.

With this configuration, when the seat cushion frame tends to move upward (e.g., in a collision of a vehicle), the first engageable portion and the second engageable portion are engaged with each other, so that the seat cushion frame can be prevented from separating from the floor.

It is preferable that a distal end portion of the second engageable portion is inclined toward a proximal end portion of the second engageable portion with respect to a vertical direction, and a distal end portion of the first engageable portion is inclined to a direction away from the proximal end portion of the second engageable portion with respect to the vertical direction.

With this configuration, the second engageable portion can be prevented from getting disengaged from the first engageable portion when the second engageable portion tends to move upward.

The vehicle seat as described above may include a cushion pad with which the seat cushion frame is covered, and the cushion pad may include a wire having a hook with which the wire is hooked on to the seat cushion frame.

With this configuration, furnishing the seat cushion frame with the cushion pad can be done simply by engaging the hook of the cushion pad with the seat cushion frame only, thus with increased ease.

The vehicle seat as described above may be configured such that the seat cushion frame includes a pair of left and right side frames and a pipe frame connecting the pair of side frames, wherein the side frames are made of sheet metal, and wherein the pipe frame includes left and right end portions placed on upper surfaces of the side frames and welded to the side frames.

With this configuration, a load placed from an occupant on the pipe frame can be received by the side frames.

The vehicle seat as described above may further include a pan frame fixed to the seat cushion frame, and may preferably be configured such that the pan frame has an undersurface of which a portion lying over the transmission mechanism is recessed upward.

With this configuration, the pan frame can be disposed in a lower position while suppressing interference of the transmission mechanism with the pan frame; therefore, the cushion pad with which the seat cushion frame is covered can be made thicker.

The vehicle seat as described above may further include a base portion fixed to the floor, and may be configured such that the seat cushion frame includes a pair of left and right side frames, wherein the guide member includes a guide shaft, wherein the guide shaft or the slide member is fixed to the base portion, and wherein at least part of the guide shaft overlaps the side frames as viewed from a left or right direction.

With this configuration, the seat cushion frame can be provided in a lower position in comparison with an alternative configuration in which the guide shaft does not overlap the side frames as viewed from the left or right direction. This can ensure that a sufficiently thick cushion material is provided for covering the seat cushion frame, so that the comfort of an occupant can be improved.

In the vehicle seat as described above, the slide mechanism may include two pairs of slide mechanisms, one pair being disposed at a left side, and another pair disposed at a right side (i.e., the total four units of the guide shaft and the slide member).

With this configuration, a load placed from an occupant on the seat cushion frame can be distributed, so that the distortion of the slide mechanism can be suppressed.

A pair of the slide mechanisms of the vehicle seat as described above may include two guide shafts disposed in positions shifted in the front-rear direction.

With this configuration, the guide shafts can be arranged to conform to the shape of a portion of the vehicle on which the seat cushion is disposed.

A pair of the slide mechanisms of the vehicle seat as described above may preferably include two guide shafts of which portions coextensive (located in same positions) in the front-rear direction are disposed at a same height.

With this configuration, the seat cushion frame can be provided in a lower position in comparison with an alternative configuration in which the two guide shafts are disposed in positions shifted from each other in an upward-downward direction.

A pair of the slide mechanisms of the vehicle seat as described above may include two guide shafts of which portions coextensive in the front-rear direction are disposed in positions shifted from each other in an upward-downward direction.

With this configuration, the guide shafts can be arranged to conform to the shape of a portion of the vehicle on which the seat cushion is disposed.

A pair of the slide mechanisms of the vehicle seat as described above may preferably include two slide members which are disposed in positions separate from each other in the front-rear direction, a front slide member being fixed to the base portion, a guide shaft corresponding to the front slide member being fixed to the seat cushion frame, a rear slide member being fixed to the seat cushion frame, and a guide shaft corresponding to the rear slide member being fixed to the base portion.

With this configuration, the guide shafts can be provided in such an arrangement that the guide shafts would not protrude out of the seat cushion frame frontward or rearward when the seat cushion frame moves in the front-rear direction.

The vehicle seat as described above may preferably be configured such that all guide shafts are disposed between the pair of side frames when viewed from above or below.

With this configuration, the vehicle seat can be miniaturized in comparison with an alternative configuration in which the guide shafts are disposed outside of the pair of side frames.

The vehicle seat as described above may be configured such that the transmission mechanism includes an actuator connected to the seat cushion frame, and a screw shaft extending in the front-rear direction, the screw shaft being configured to transmit a driving force from the drive source to the actuator, wherein the screw shaft is disposed in a center between the pair of side frames.

With this configuration, even if a portion of the cushion material under which the screw shaft is provided is made thinner, an occupant is unlikely to feel uncomfortable because the center between the pair of side frames is a portion with which the buttocks of the occupant will not contact.

In the vehicle seat as described above, the side frames may preferably be made of pipes.

With this configuration, the thickness of the seat cushion can be reduced in comparison with an alternative configuration in which the side frames are made of sheet metal.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a perspective view of a car seat.

FIG. **2** is a perspective view showing a state in which seat cushions of a left seat and a right seat have been moved to the front.

FIG. **3** is an exploded perspective view of a seat cushion frame, a cushion pad, a seat back frame, and others.

FIG. **4** is a sectional view of a first bracket, a first pipe frame, a second pipe frame, a third pipe frame, a pan frame, a drive source, a transmission mechanism, and a mount plate, as taken in a position shifted to the left side from the transmission mechanism.

FIG. **5** is a sectional view of a side frame, a second bracket, and a support frame, as taken in a plane passing through a first engageable portion and a second engageable portion.

FIG. **6** is an exploded perspective view showing a modified example of an engageable wire and a seat frame.

FIG. **7** is a sectional view showing a modified example of the first engageable portion and the second engageable portion.

FIG. **8** is a perspective view showing a seat cushion frame, a base frame, a drive source, a transmission mechanism, and a slide mechanism.

FIG. **9** is an exploded perspective view showing the seat cushion frame, the base frame, the drive source, the transmission mechanism, and the slide mechanism.

FIG. **10** is a sectional view showing relative positions of the transmission mechanism and the side frame.

FIG. **11** includes (a) a sectional view showing relative positions of an inner slide mechanism and the side frame, and (b) a sectional view showing relative positions of an outer slide mechanism and the side frame, as assumed when the seat cushion frame is in the rearmost position.

FIG. **12** includes (a) a sectional view showing relative positions of the inner slide mechanism and the side frame, and (b) a sectional view showing relative positions of the outer slide mechanism and the side frame, as assumed when the seat cushion frame has been moved to the front.

DESCRIPTION OF EMBODIMENTS

Hereafter, some illustrative embodiments will be described with reference to the drawings. To describe the present invention, the front/rear (frontward/rearward), left/right (leftward/rightward; lateral) and upper/lower (upward/downward; vertical) directions will be designated with reference to a person seated on the vehicle seat (occupant).

First, referring to FIGS. **1** to **7**, a first embodiment is described.

As shown in FIG. **1**, a vehicle seat according to the first embodiment is configured as a car seat S for use in a rear seat of an automobile as an example of a vehicle. The car seat S mainly includes a center seat S**1**, a left seat S**2** arranged adjacent to the left side of the center seat S**1**, a right seat S**3** arranged adjacent to the right side of the center seat S**1**, a left side portion S**4** arranged adjacent to the left side of a seat back S**22** of the left seat S**2**, and a right side portion S**5** arranged adjacent to the right side of a seat back S**32** of the right seat S**3**. In the present embodiment, the car seat S is configured to be bilaterally symmetric; thus, in the following description, the left-side configuration including the left seat S**2** is described.

The left seat S**2** mainly includes a seat cushion S**21** and a seat back S**22**. The right seat S**3** mainly includes a seat cushion S**31** and a seat back S**32** which have the same constructions as those of the left seat S**2**.

The left seat S**2** is, as shown in FIG. **2**, configured such that the seat cushion S**21** is slidable in the front-rear direction, and that the seat back S**22** is configured to lean backward and down relative to the seat cushion S**21** (capable of reclining) when the seat cushion S**21** moves frontward.

The seat cushion S**21** includes a seat cushion frame **10** shaped substantially like a four-bar frame structure, a cushion pad **20** with which the seat cushion frame **10** is covered, and a pan frame **30**, as shown in FIG. **3**.

The seat back S**22** includes a seat back frame **40**, which is upholstered with a cushion material made of urethane foam or the like and an outer covering made of leather, fabrics, or the like.

Elements of the left seat S**2** provided under the seat cushion frame **10** mainly include a pair of rails **50** (guide member) and a pair of sliders **60** (slide member) as an example of a slide mechanism, a base frame **70** as an example of a base portion, a drive source **80**, and a transmission mechanism **90**.

The pair of rails **50** are arranged side by side. Each rail **50** extends in the front-rear direction, and is fixed to a floor of the automobile.

The pair of sliders **60** are engageable with the pair of rails **50**, and slidable relative to the pair of rails **50** in the front-rear direction.

The base frame **70** includes a first bracket **71** supporting front end portions of the pair of rails **50**, a second bracket **72** supporting a rear end portion of the right rail **50**, a third bracket **73** supporting a rear end portion of the left rail **50**, and a support frame **74** fixed to the second bracket **72**.

The first bracket **71** is a part made by bending sheet metal, and is fixed to the floor. The first bracket **71** includes a flat plate portion **711** extending along an upper surface of the floor, and a floor anchor portion **712** extending from a front end of the flat plate portion **711** downward. The floor anchor portion **712** has two through holes **712**A provided at the left and at the right. The first bracket **71** is directly fixed to the floor using bolts inserted through the two through holes **712**A and fastened to the floor.

The first bracket **71** is provided to connect the pair of rails **50**. To be more specific, the first bracket **71** is disposed under the rails **50**, and includes left and right support portions **71**A to which the rails **50** are fixed, and a connecting portion **71**B connecting the left and right support portions **71**A.

The second bracket **72** and the third bracket **73** are made of sheet metal, respectively, and fixed to the floor. The support frame **74** is made of sheet metal. A detailed structure of the support frame **74** will be described later.

The seat cushion frame **10** is fixed to the pair of sliders **60** and configured to be movable together with the pair of sliders **60**.

The seat cushion frame **10** includes a pair of left and right side frames **11**, a first pipe frame **12** and a second pipe frame **13** as an example of a pipe frame connecting front end portions of the pair of side frames **11**, and a third pipe frame **14** connecting rear end portions of the pair of side frames **11**.

The side frames **11** are made by bending sheet metal, and each include a base portion **111** fixed to an upper wall of the slider **60**, a first side wall portion **112** extending from a laterally outer end of the base portion **111** upward, and a second side wall portion **113** extending from a laterally inner end of the base portion **111** downward.

The first pipe frame **12** and the second pipe frame **13** are so arranged one behind another as to have their longitudinal directions oriented in the lateral direction. To be more specific, the second pipe frame **13** is disposed rearward of the first pipe frame **12**.

The first pipe frame **12** and the second pipe frame **13** each include left and right end portions placed on upper surfaces of the left and right side frames **11** (more specifically, on upper surfaces of the base portions **111**) and welded to the upper surfaces of the base portion **111**. With this configuration, a load placed from an occupant on the first pipe frame **12** and the second pipe frame **13** can be received by the left and right side frames **11**.

A mount plate **121** is provided in a laterally central portion of the first pipe frame **12**. As shown in FIG. **4**, the mount plate **121** includes a fixed portion **121**A disposed frontward of the first pipe frame **12**, a clip support portion **121**B extending from a lower end of the fixed portion **121**A frontward, and a shaft mount portion **121**C extending from the fixed portion **121**A rearward under the first pipe frame **12**. The fixed portion **121**A of the mount portion **121** is

welded to the first pipe frame **12**. As shown in FIG. **3**, a clip **121**D on which an engageable wire **21** of the cushion pad **20** as will be described later is hooked is fixed to the clip support portion **121**B of the mount plate **121**.

The pan frame **30** is an elongate part made of sheet metal which has a longitudinal direction oriented in the front-rear direction. The pan frame **30** is fixed to the seat cushion frame **10**. The pan frame **30** includes a front end portion placed on an upper side of the second pipe frame **13** and welded to the second pipe frame **13**, and a rear end portion placed on an upper side of the third pipe frame **14** and welded to the third pipe frame **14**.

The pan frame **30** has a lateral width smaller than a distance between the pair of side frames **11**, and is disposed in a laterally central position inside the seat cushion frame **10**.

The cushion pad **20** incorporates engageable wires **21** as an example of a wire, exterior-shaping wires **22**, and a tuck-in wire **23**. Each of the wires **21**, **22**, **23** is embedded in the cushion pad **20** by insert molding. In FIG. **4**, for the sake of clarity, the exterior-shaping wires **22** are indicated by broken lines, and the tuck-in wire **23** is indicated by a chain double-dashed line.

The engageable wires **21** include three longitudinal wires **211**, **212**, **213** elongate in the front-rear direction; to be more specific, a first longitudinal wire **211** is disposed on a left side of the cushion pad **20** with respect to the laterally central position of the cushion pad **20**, a second longitudinal wire **212** is disposed on a right side of the cushion pad **20** with respect to the laterally central position of the cushion pad **20**, and a third longitudinal wire **213** is disposed on a right side of the second longitudinal wire **212**. Front ends of the first longitudinal wire **211** and the second longitudinal wire **212** are connected by a transverse wire **215** that is so arranged as to extend in the lateral direction. The three longitudinal wires **211**, **212**, **213** are connected into an integral wire assembly via two connecting members **214** that are arranged one behind another.

Each of the longitudinal wires **211**, **212**, **213** includes a rear end portion having a hook **216** with which it is hooked on to the third pipe frame **14** of the seat cushion frame **10**. Each longitudinal wire **211**, **212**, **213** is bent to have an upwardly-bulging segment provided in a portion thereof overlapping the second pipe frame **13**.

A first engageable member **217**A laid over the second pipe frame **13** is provided in a portion of the first longitudinal wire **211** overlapping the second pipe frame **13**. In addition, a second engageable member **217**B exposed at an undersurface of the cushion pad **20** and engageable with the first pipe frame **12** is provided in a portion of the first longitudinal wire **211** overlapping the first pipe frame **12**.

Portions of the second longitudinal wire **212** and the third longitudinal wire **213** overlapping the second pipe frame **13** are connected via a third engageable member **217**C that is so formed as to be laid over the second pipe frame **13**. In addition, portions of the second longitudinal wire **212** and the third longitudinal wire **213** overlapping the first pipe frame **12** are connected via a fourth engageable member **217**D that is so formed as to be exposed at the undersurface of the cushion pad **20** and engageable with the first pipe frame **12**.

The transverse wire **215** includes a downwardly-bulging U-shaped bent portion **215**A, which is provided in a mid-section of the transverse wire **215**. A lower end portion of the bent portion **215**A is exposed at the undersurface of the cushion pad **20** so that it is hooked on the clip **121**D provided at the seat cushion frame **10**.

When the cushion pad **20** including the engageable wires **21** as described above is mounted to the seat cushion frame **10**, first of all, the rear end portion of the cushion pad **20** is brought close to the seat cushion frame **10** and the hooks **216** are hooked on to the third pipe frame **14**. Then, the lower end portion of the bent portion **215**A provided at the front end portion of the cushion pad **20** is fitted into the clip **121**D. In this way, according to the present embodiment, the cushion pad **20** can be fixed to the seat cushion frame **10** in a simple and easy operation.

The exterior-shaping wires **22** are provided to keep the shape of the cushion pad **20**, and arranged along the outside shape of the cushion pad **20**.

The tuck-in wire **23** is provided to provide a tuck-in functionality for an end portion of the outer covering (not shown), which constitutes an outer surface of the cushion pad **20**. To be more specific, the cushion pad **20** has a groove provided along the tuck-in wire **23**. The tuck-in wire **23** is exposed to the outside at appropriate spots in the groove. The outer covering includes hook members provided to be hooked on the exposed tuck-in wire **23**.

The drive source **80** and the transmission mechanism **90** are mechanisms for actuating the seat cushion frame **10**.

Examples of the drive source **80** include a motor. As shown in FIG. **4**, the drive source **80** is fixed on an upper side of the flat plate portion **711** of the connecting portion **71**B of the first bracket **71**. In other words, the drive source **80** is fixed to the floor via the first bracket **71** so as not to move relative to the floor. With this configuration in which the drive source **80** is fixed relative to the floor via the first bracket **71**, no additional member for fixing the drive source **80** is required, so that increase in the number of parts can be suppressed. Moreover, since the first bracket **71** also serves to support the pair of rails **50**, the pair of rails **50** and the drive source **80** can be fixed to the floor using a single part; thus, increase in the number of parts can be suppressed as well. In FIG. **4**, for the sake of clarity, illustration of the side frames **11**, the rails **50** and the sliders **60** is omitted.

The transmission mechanism **90** is configured to receive a driving force from the drive source **80** and to cause the seat cushion frame **10** to move in the front-rear direction. The transmission mechanism **90** mainly includes a gearbox **91** and a screw shaft **92**.

The gearbox **91** is a member that houses gears for reducing the speed with which a rotary driving force generated in the drive source **80** is transmitted to the screw shaft **92**, and a nut engaging with the screw shaft **92**. The gearbox **91** is disposed on the left side of the drive source **80**, and fixed on the upper side of the flat plate portion **711** of the connecting portion **71**B of the first bracket **71**.

The gearbox **91** is disposed in a laterally central position inside the seat cushion frame **10** (see FIG. **3**).

The gearbox **91** is disposed such that an upper end thereof is in a position lower than the second pipe frame **13**. With this arrangement, interference of the gearbox **91** with the second pipe frame **13** which would otherwise occur when the seat cushion frame **10** slides in the front-rear direction can be made less likely to occur.

The screw shaft **92** is disposed to extend out through the gearbox **91** in the front-rear direction. This screw shaft **92** is configured to move in the front-rear direction when driven by the drive source **80**. This screw shaft **92** has a front end portion fixed to the mount plate **121** fixed to the first pipe frame **12**. To be more specific, the front end portion of the screw shaft **92** is fixed using a bolt fastened to the shaft mount portion **121**C of the mount plate **121**. In this way, the screw shaft **92** is connected to the seat cushion frame **10**.

The rear end portion of the screw shaft **92** is disposed in a position rearward of the position of the second pipe frame **13**.

Hereinafter, the structure of the pan frame **30** is described.

The pan frame **30** generally has a downwardly-depressed shape such that a portion thereof disposed between the second pipe frame **13** and the third pipe frame **14** is in a position lower than those of the second pipe frame **13** and the third pipe frame **14**. With this configuration, the cushion pad **20** laid on the pan frame **30** can be made thicker, so that the comfort of an occupant can be improved.

The pan frame **30** includes a front end portion overlapping the rear end portion of the screw shaft **92** in an upward-downward direction. This pan frame **30** has an undersurface of which a portion lying over the transmission mechanism **90** (screw shaft **92**) is recessed upward. In other words, the pan frame **30** includes in its front end portion a bulging portion **31** that is so formed as to bulge upward through plastic deformation effected in the pan frame **30**.

With this configuration, the rear end portion of the screw shaft **92** can be arranged in a space under the bulging portion **31**; therefore, the screw shaft **92** longer in length can be provided, and the pan frame **30** can be arranged to extend up to some frontwardly extended range. Since the pan frame **30** is disposed above the rear end portion of the screw shaft **92**, the cushion pad **20** when weighted down with the occupant's weight would not come in contact with the screw shaft **92** and rather be supported by the pan frame **30**, so that the occupant can be kept unlikely to feel uncomfortable. Furthermore, since the bulging portion **31** is provided in the laterally central position inside the seat cushion frame **10** (i.e., corresponding to a portion between the thighs of the occupant), the occupant can be kept unlikely to feel uncomfortable even if the cushion pad **20** is designed to be thinner in this portion.

Next, a description is given of a detailed structure of the support frame **74** and the right side frame **11**.

As shown in FIG. **5**, the support frame **74** is fixed to the second bracket **72** in a position on the left side with respect to the position of the right side frame **11**. The support frame **74** includes a first engageable portion **74**J that is an elongate member having a substantially J-shaped cross section protruding from the second bracket **72** upward and then so extending as to have a distal end facing downward, and its longitudinal direction oriented in the front-rear direction (see also FIG. **3**).

To be more specific, the support frame **74** includes a fixed portion **741** fixed to the second bracket **72**, a first extension portion **742** extending from the fixed portion **741** upward, and a first claw portion **743** extending from the first extension portion **742** rightward and then extending downward.

The right side frame **11** includes a second engageable portion **11**J extending further from the second side wall portion **113** downward, which second engageable portion **11**J is an elongate member having its longitudinal direction oriented in the front-rear direction (see also FIG. **3**). This second engageable portion **11**J is configured to extend so as to have a distal end facing upward, and is configured to be engageable with the first engageable portion **74**J in the upward-downward direction.

To be more specific, the right side frame **11** includes a second extension portion **114** extending from the rear end portion of the second side wall portion **113** downward, and a second claw portion **115** extending from the second extension portion **114** leftward under the first claw portion **743** and then extending upward.

Because of the provision of the first engageable portion **74**J and the second engageable portion **11**J configured as described above, upward motion of the seat cushion frame **10**, which would be caused in a collision of the automobile or on other occasions, results in engagement of the first engageable portion **74**J with the second engageable portion **11**J, thus making it possible to restrain the seat cushion frame **10** from moving upward.

Operation of the left seat S**2** configured as described above is described hereafter.

In normal times, as shown in FIG. **1**, the seat cushion S**21** of the left seat S**2** is in a state with its front end aligned with that of the seat cushion S**11** of the center seat S**1**. In this state, the seat cushion frame **10** is, as shown in FIG. **3**, in a state where it is in the rearmost position.

When the drive source **80** is actuated by an operation of an occupant or otherwise and causes the screw shaft **92** to move frontward, the seat cushion frame **10** is pushed frontward by the screw shaft **92**. Accordingly, the seat cushion frame **10** slides frontward relative to the floor with the sliders **60** being guided by the rails **50**. At that time, the second engageable portion **11**J of the right side frame **11** moves along the first engageable portion **74**J of the support frame **74**.

In the present embodiment, the drive source **80** is fixed relative to the floor; therefore, a member which is caused to slide by actuation of the drive source **80** can be made lightweight in comparison with an alternative configuration in which the drive source **80** is fixed to the seat cushion frame **10** or any other member which moves together with the seat cushion frame **10**. As a result, a load imposed on the drive source **80** when the seat cushion frame **10** is caused to slide can be reduced.

Since the pan frame **30** has an under surface of which a portion disposed in a lateral position corresponding to the transmission mechanism **90** is recessed upward, interference of the gear box **91** with the pan frame **30** which would otherwise occur when the seat cushion frame **10** slides frontward can be made less likely to occur.

In a state where the seat cushion frame **10** is in a frontwardly moved position, when the drive source **80** is activated to cause the screw shaft **92** to move rearward, the seat cushion frame **10** is pulled by the screw shaft **92** rearward. This causes the seat cushion frame **10** to slide rearward relative to the floor while allowing the sliders **60** to be guided by the rails **50**. As a result, as shown in FIG. **1**, the seat cushion S**21** of the left seat S**2** is moved back to its original position.

Although the first embodiment has been described above, the present invention is not limited to the above-described embodiment. Specific configurations may be modified where appropriate without departing from the gist of the present invention.

In the above-described embodiment, the drive source **80** is fixed to the first bracket **71** to thereby be fixed relative to the floor, but the arrangement of the drive source is not limited thereto. For example, the drive source **80** may be fixed to a bracket provided separately from the first bracket and fixed to the floor, or may be fixed directly to the floor. The pair of rails **50** may also be fixed directly to the floor without using the first bracket.

In the above-described embodiment, the engageable wire(s) **21** includes a hook **216** to be hooked on the third pipe frame **14**, but the arrangement for fixing the cushion pad **20** to the seat cushion frame **10** is not limited thereto. For example, as shown in FIG. **6**, the engageable wire(s) **21** may be fixed to the seat cushion frame **10** using a bolt B.

Specifically, the seat cushion frame **10** includes a pair of left and right link pieces **15** fixed to the third pipe frame **14**, and a mount wall **16** connecting the pair of link pieces **15**.

The pair of link pieces **15** extend from the third pipe frame **14** in an obliquely-rearward-and-upward direction. The mount wall **16** is made of sheet metal, and is welded to the pair of link pieces **15**. The mount wall **16** has an opening **16**A formed in its center.

The engageable wire **21** includes no such hook **216** as in the above-described embodiment, but instead includes a rear end connecting wire **218** connecting rear ends of the three longitudinal wires **211**, **212**, **213**. The rear end connecting wire **218** includes a rear end bent portion **218**A provided in a laterally central portion thereof, which rear end bent portion **218**A is bent to have a U-shaped configuration bulging in an obliquely-rearward-and-upward direction.

The engageable wire **21** configured as described above is fixed to the seat cushion frame **10** by screwing the bolt B passed through the rear bent portion **218**A, into the opening **16**A of the mount wall **16**.

In the above-described embodiment, the first bracket **71** and the second bracket **72** are configured as separate parts, but the configurations of the first bracket and the second bracket are not limited thereto; the first bracket and the second bracket may be configured as a single integral part.

In the above-described embodiment, the second bracket **72** and the support frame **74** are configured as separate parts, but the configuration of the support frame is not limited thereto. For example, the second bracket and the support frame may be configured as a single integral part; that is, the second bracket may be configured as a support frame including a first engageable portion.

As shown in FIG. **7**, the distal end portion of the second engageable portion **11**J may be inclined toward the proximal end portion of the second engageable portion **11**J with respect to the vertical direction, and the distal end portion of the first engageable portion **74**J may be inclined to a direction away from the proximal end portion of the second engageable portion **11**J with respect to the vertical direction (i.e., the distal end portions of the first engageable portion **74**J and the second engageable portion **11**J extending in the upward-downward directions opposite to each other and overlapping each other may be inclined toward the second extension portion **114**). With this configuration, when the second engageable portion **11**J tends to move upward, a load between the second engageable portion **11**J and the first engageable portion **74**J is imposed in such a direction that the second engageable portion **11**J and the first engageable portion **74**J are unlikely to get disengaged from each other. Therefore, the second engageable portion **11**J can be prevented from getting disengaged from the first engageable portion **74**J.

In the above-described embodiment, a pair of rails **50** and a pair of sliders **60** are provided in a unit, but the configuration of the vehicle seat is not limited thereto. For example the vehicle seat may include two or more units each consisting of one pair of rails and one pair of sliders.

Next, referring mainly to FIGS. **8** to **12**, a second embodiment is described.

In the second embodiment, as shown in FIG. **8**, the left seat S**2** mainly includes a seat cushion frame **510** and elements disposed under the seat cushion frame **510** which include a base frame **570** as an example of a base portion, a drive source **580**, a transmission mechanism **590**, and an outer slide mechanism **540** and an inner slide mechanism **550** as an example of a slide mechanism, which outer and inner slide mechanisms **540**, **550** are disposed over the base frame **570**.

The seat cushion frame **510** is made of a metal pipe. The seat cushion frame **510** includes a pair of side frames **511** which extends in the front-rear direction and constitutes left and right frames of the seat cushion S**21**, a front frame **512** connecting front end portions of the pair of side frames **511**, a rear frame **513** connecting rear end portions of the pair of side frames **511**, and a cross member **514** connecting the pair of side frames **511** at their positions between the front frame **512** and the rear frame **514**.

In the present embodiment, the seat cushion frame **510** is configured such that the side frames **511** have rear portions bent upward and the rear frame **513** has an upwardly recessed shape beyond the front frame **512**, in order that the seat cushion frame **510** actuated to move frontward can avoid interfering with the vehicle body or the slide mechanisms **540**, **550** or other components. In other words, the seat cushion frame **510** is shaped to have its front portion positioned close to the vehicle body to such an extent that it does not interfere with the vehicle body or the slide mechanisms **540**, **550**, or other components.

The base frame **570** is made of sheet metal, and bent to conform to the shape of the vehicle body. As shown in FIG. **9**, the base frame **570** according to the present embodiment is configured generally to ascend frontward, and includes a first portion **571** gently inclined to lead up to a higher position toward frontward, a second portion **572** extending from the front end of the first portion **571** at an inclination steeper than that of the first portion **571** toward frontward, a third portion **573** extending substantially horizontally from the front end of the second portion **572** toward frontward, and a fourth portion **574** extending downward from the front end of the third portion **573** (see also FIG. **11**(*a*)).

The drive source **580** and the transmission mechanism **590** are mechanisms for actuating the seat cushion frame **510**. The drive source **580** is configured, for example, as a motor. The transmission mechanism **590** is configured to receive a driving force from the drive source **580** and to cause the seat cushion frame **510** to move in the front-rear direction. The transmission mechanism **590** mainly includes a gearbox **591**, a screw shaft **592** and a link member **593**, and is fixed to the base frame **570**.

The gearbox **591** is a member that houses gears for reducing the speed with which a rotary driving force generated in the drive source **580** is transmitted to the screw shaft **592**, and a nut engaging with the screw shaft **592**. The gearbox **591** is disposed in a laterally central position inside the base frame **570**.

The gearbox **591** is, as shown in FIG. **10**, fixed on an upper side of a seating portion **571**A formed in the first portion **571** of the base frame **570**, and thus disposed in a position higher than that of an upper surface of the first portion **571**. In the present embodiment, the seating portion **571**A consists of a protruded portion protruding upward from the first portion **571**, which protruded portion is provided by drawing the base frame **570**. In FIG. **10**, for the sake of clarity, illustration of the outer slide mechanism **540** and the inner slide mechanism **550** is omitted.

The screw shaft **592** is disposed to extend in the front-rear direction and protrudes from the gearbox **591** frontward. The screw shaft **592** is configured to move in the front-rear direction when driven by the drive source **580**. Since the gearbox **591** is arranged in the position higher than that of the first portion **571**, the screw shaft **592** is made unlikely to

interfere with the second portion **572** or other components of the base frame **570** when the screw shaft **592** protrudes frontward.

As shown in FIG. **8**, the screw shaft **592** is disposed in a center between the pair of side frames **511**. With this configuration, even if a portion of the cushion material with which the screw shaft **592** is covered is made thinner due to the higher position of the screw shaft **592**, an occupant is less likely to feel uncomfortable because the center between the pair of side frames **511** is a portion with which the buttocks of the occupant will not contact.

This screw shaft **592** is connected to the seat cushion frame **510** by being fixed to the link member **593** as an example of an actuator, which is fixed to the seat cushion frame **510**.

The link member **593** is a member (actuator) by which a driving force transmitted from the drive source **580** through the transmission mechanism **590** is conveyed to the seat cushion frame **510** side in order to cause the seat cushion frame **510** to move in the front-rear direction relative to the base frame **570**. The link member **593** extends in the front-rear direction with a rear end portion thereof bolted or otherwise fixed to the front end portion of the screw shaft **592**, and a front end portion thereof welded or otherwise fixed to the cross member **514** of the seat cushion frame **510**.

In the transmission mechanism **590** configured as described above, in the state where the seat cushion frame **510** is in the rearmost position, as shown in FIG. **10**, part of the gearbox **591**, part of the screw shaft **592** and part of the link member **593** are located to overlap the side frame **511** when viewed from the left or right. Furthermore, the gearbox **591** and the screw shaft **592** are provided so as not to protrude from the side frame **511** upward when viewed from the left or right.

As shown in FIG. **8**, the outer slide mechanism **540** and the inner slide mechanism **550** are members which guide the movement of the seat cushion frame **510** in the front-rear direction, respectively. Two outer slide mechanisms **540** are provided of which one is disposed on the left side of the drive source **580** (and the transmission mechanism **590**) and another is disposed on the right side of the drive source **580** (and the transmission mechanism **590**). Of two inner slide mechanisms **550** provided between the two outer slide mechanisms **540**, one is disposed on the left side of the drive source **580** (and the transmission mechanism **590**) and another is disposed on the right side of the drive source **580** (and the transmission mechanism **590**). In other words, the slide mechanisms **540**, **550** are provided in pairs at the left and at the right. Provision of pairs of the slide mechanisms **540**, **550** at the left and at the right makes it possible to support the load imposed from the occupant on the seat cushion frame **510** in a distributed manner, and thus serves to suppress the deformation of the slide mechanisms **540**, **550**.

It is understood that the cross member **514** crossing over the outer slide mechanism **540** and the inner slide mechanism **550** may be bent to have an upwardly-bulging portion provided over the outer slide mechanism **540** and the inner slide mechanism **550** in order to avoid interference with the outer slide mechanism **540** and the inner slide mechanism **550**.

The outer slide mechanism **540** includes an outer guide shaft **41** as an example of a guide shaft, extending in the front-rear direction, and an outer slide member **542** as an example of a slide member, configured to be movable along the outer guide shaft **541** relative to the outer guide shaft **541**. The inner slide mechanism **550** includes an inner guide shaft **551** as an example of a guide shaft, extending in the front-rear direction, and an inner slide member **552** as an example of a slide member, configured to be movable along the inner guide shaft **551** relative to the inner guide shaft **551**.

In the left or right pair of slide mechanisms **540**, **550**, the inner guide shaft **551** is provided in a position shifted to the front relative to the outer guide shaft **541**; thus, the two guide shafts **541**, **551** are disposed in positions shifted in the front-rear direction. With this arrangement of the two guide shafts **541**, **551**, the guide shafts **541**, **551** can be arranged to conform to the shape of the vehicle body more flexibly in comparison with an alternative configuration in which a single long guide shaft is provided.

In the left or right pair of slide mechanisms **540**, **550**, the inner slide member **552** is provided in a position frontward of a position of the outer slide member **542**, and the two slide members **542**, **552** are disposed separate from each other in the front-rear direction.

Moreover, in order to downsize the left seat S**2**, all the guide shafts **541**, **551** are disposed between the pair of side frames **511** when viewed from above or below.

As shown in FIG. **9**, the outer slide mechanism **540** is provided to support the rear portion of the seat cushion frame **510**; the outer guide shafts **541** are fixed to the base frame **570** via the first brackets B**21** and the second brackets B**22**, while the outer slide members **542** (rear slide members) are fixed to the rear portion of the seat cushion frame **510** via the third brackets B**11**.

The outer guide shafts **541** are each configured as a metal rod, and extend from a position in which they overlap the rear end portion of the first portion **571** of the base frame **570** to a position in which they overlap the second portion **572** of the base frame **570**, when viewed from above or from below. The first brackets B**21** are fixed to the rear end portion of the first portion **571** of the base frame **570**, and configured to support the rear end portions of the outer guide shafts **541**. The second brackets B**22** are fixed to the second portion **572** of the base frame **570** and configured to support the front end portions of the outer guide shafts **541**.

The outer slide members **542** extend in the front-rear direction, and are each configured to include a plastic tube **542**A inside of which the outer guide shaft **541** is disposed, and a metal sheath **542**B provided to cover the outer periphery of the tube **542**A. The third brackets B**11** are fixed to the rear portions of the side frames **511**. The outer slide members **542** are each supported by the third bracket B**11** with the sheath **542**B welded or otherwise fixed to the third bracket B**11**.

In this outer slide mechanism **540**, when the seat cushion frame **510** is in the rearmost position, the outer slide members **542** are positioned at the rear portions of the outer guide shafts **541** (see FIG. **8**). The outer slide members **542** are configured to be movable together with the seat cushion frame **510** along the outer guide shafts **541** in the front-rear direction.

The inner slide mechanism **550** is provided to support the front portion of the seat cushion frame **510**; the inner guide shafts **551** are fixed to the seat cushion frame **510** via the fourth brackets B**12** and the fifth brackets B**13**, while the inner slide members **552** (front slide members) are fixed to the base frame **570** via the sixth brackets B**23**.

The inner guide shafts **551** are each configured as a metal rod, and extend from a position in which they are adjacent to laterally inner sides of the outer slide members **542** to a position in which they protrude frontward slightly beyond the front frame **512**. It is to be understood that the inner

guide shafts **551** may be provided so as not to protrude frontward beyond the front frame **512**. The fourth brackets B**12** are connected to the third brackets B**11** using bolts fastened thereto, and thus fixed to the side frames **511** via the third brackets B**11**. The fourth brackets B**12** are configured to support the rear end portions of the inner guide shafts **551**. The fifth brackets B**13** are welded or otherwise fixed to the front frame **512**, and configured to support the front end portions of the inner guide shafts **551**.

The inner slide members **552** extend in the front-rear direction, and are each configured to include a plastic tube **552**A inside of which the inner guide shaft **551** is disposed, and a metal sheath **552**B provided to cover the outer periphery of the tube **552**A. The sixth brackets B**23** are fixed to the base frame **570** at positions thereof corresponding to the position of the front portion of the seat cushion frame **510** that has been moved to the rearmost position (see FIG. **8**). To be more specific, the sixth brackets B**23** are provided astride the border between the second portion **572** and the third portion **573** of the base frame **570**. The inner slide members **552** are supported by the sixth brackets B**23** with the sheaths **552**B welded or otherwise fixed to the sixth brackets B**23**.

In this inner slide mechanism **550**, as shown in FIG. **8**, when the seat cushion frame **510** is in the rearmost position, the inner guide shafts **551** are in a position in which they have been moved to the rearmost position relative to the inner slide members **552**, i.e., the inner slide members **552** are positioned at the front portions of the inner guide shafts **551**. The inner guide shafts **551** are configured to be movable together with the seat cushion frame **510** relative to the inner slide members **552** frontward and rearward.

As shown in FIG. **11**(*a*), the outer guide shaft **541** and the inner guide shaft **551** are arranged to ascend frontward in accordance with the inclination of the base frame **570**.

As the outer guide shaft **541** and the inner guide shaft **551** are arranged to conform to the shape of the vehicle body, in the present embodiment, the inner guide shaft **551** is in a position shifted upwardly from a position of the outer guide shaft **541**. In other words, a pair of the slide mechanisms **540**, **550** includes two guide shafts **541**, **551** of which portions coextensive in the front-rear direction are disposed in positions shifted from each other in the upward-downward direction.

As shown in FIG. **11**(*b*), when the seat cushion frame **510** is in the rearmost position, part of the outer guide shaft **541** overlaps the side frame **511** as viewed from a left or right direction. Similarly, as shown in FIG. **12**(*b*), when the seat cushion frame **510** has been moved to the front relative to the position shown in FIG. **11**(*b*), part of the outer guide shaft **541** overlaps the side frame **511** as viewed from the left or right direction.

As shown in FIG. **11**(*a*), when the seat cushion frame **510** is in the rearmost position, part of the inner guide shaft **551** overlaps the side frame **511** as viewed from the left or right direction. Similarly, as shown in FIG. **12**(*a*), when the seat cushion frame **510** has been moved to the front relative to the position shown in FIG. **11**(*a*), part of the inner guide shaft **551** overlaps the side frame **511** as viewed from the left or right direction.

In this way, according to the present embodiment, the seat cushion frame **510** is provided in a position close to the vehicle body such that the guide shafts **541**, **551** overlap the side frame **511** as viewed in the left or right direction; therefore, the cushion material with which the seat cushion frame **510** is covered can be made thick enough. Accordingly, the comfort of the occupant can be improved.

Moreover, in the present embodiment, the seat cushion frame **510** including the side frames **511** is made of pipe; therefore, the thickness of the seat cushion frame **510** can be reduced while keeping its rigidity more effectively in comparison with an alternative configuration in which the side frames are made of sheet metal. Consequently, the cushion material with which the seat cushion frame **510** is covered can be configured to have an adequate thickness, so that the comfort of an occupant can be improved more.

Next, the operation of the left seat S**2** is described.

As describe in FIG. **1**, in normal times, the seat cushion S**21** of the left seat S**2** is so positioned as to have its front end aligned with the front end of the seat cushion S**11** of the center seat S**1**. At this time, the seat cushion frame **510** is, as shown in FIG. **8**, in the rearmost position.

When the drive source **580** is operated by an occupant or otherwise driven to cause the screw shaft **592** to move frontward, the seat cushion frame **510** is pushed frontward by the link member **593**. The seat cushion frame **510** is thereby slid relative to the base frame **570** in an obliquely-frontward-and-upward direction while being guided by the outer slide mechanism **540** and the inner slide mechanism **550**. As a result, as shown in FIG. **2**, the seat cushion S**21** of the left seat S**2** shifts its position and protrudes frontward farther than the seat cushion S**11** of the center seat S**1**.

In the outer slide mechanism **540**, when the seat cushion frame **510** is pushed frontward, the outer slide members **542** fixed to the rear portion of the seat cushion frame **510** are, as shown in FIG. **12**(*b*), moved frontward along the outer guide shafts **541** from the rear portions of the outer guide shafts **541** fixed to the base frame **570** as shown in FIG. **11**(*b*).

In the present embodiment, the outer slide members **542** for supporting the rear portion of the seat cushion frame **510** are fixed to the seat cushion frame **510**; therefore, the outer guide shafts **541** may be so arranged as to extend from the position corresponding to the rear portion of the seat cushion frame **510** in the base frame **570** frontward. With this arrangement, the outer guide shafts **541** do not have to be so arranged as to protrude rearward beyond the seat cushion frame **510** in the rearmost position, so that the left seat S**2** can be made compact.

In the inner slide mechanism **550**, on the other hand, when the seat cushion frame **510** is pushed frontward, the inner slide members **552** located in a position corresponding to the front portion of the seat cushion frame **510** and fixed to the base frame **570** are, as shown in FIG. **12**(*a*), moved rearward relative to the inner guide shafts **551** from the front portions of the inner guide shafts **551** as shown in FIG. **11**(*a*).

In the present embodiment, the inner slide members **552** supporting the front portion of the seat cushion frame **510** are fixed to the base frame **570**; therefore, the inner guide shafts **551** may be so arranged as to extend from the front end of the seat cushion frame **510** rearward. With this arrangement, the inner guide shafts **551** do not have to be so arranged as to protrude frontward beyond the seat cushion frame **510**, so that the left seat S**2** can be made compact.

Thereafter, from the states shown in FIGS. **12**(*a*), (*b*), when the drive source **580** is driven to cause the screw shaft **592** to retract rearward, the seat cushion frame **510** is pulled rearward by the link member **593**. The seat cushion frame **510** is thereby slid relative to the base frame **570** in an obliquely-rearward-and-downward direction as shown in FIGS. **11**(*a*), (*b*) while being guided by the outer slide mechanism **540** and the inner slide mechanism **550**. As a result, as shown in FIG. **1**, the seat cushion S**21** of the left seat S**2** is moved back to its original position.

Although the second embodiment has been described above, the present invention is not limited to the above-described embodiment. Specific configurations may be modified where appropriate without departing from the gist of the present invention.

In the second embodiment, the left or right pair of the slide mechanisms **540**, **550** includes two guide shafts **541**, **551** of which portions coextensive in the front-rear direction are disposed in positions shifted from each other in the upward-downward direction, but the arrangement of the guide shafts is not limited thereto. For example, a pair of slide mechanisms may include two guide shafts of which portions coextensive in the front-rear direction are disposed at a same height. With this configuration, the seat cushion frame **510** can be provided in a lower position in comparison with an alternative configuration in which the two guide shafts are disposed in positions shifted from each other in the upward-downward direction.

In the second embodiment, all the guide shafts **541**, **551** are disposed between the pair of side frames **511** when viewed from above or below, but the arrangement of the guide shafts is not limited thereto. For example, the outer guide shafts may be arranged at the outer sides of the pair of side frames **511**.

In the second embodiment, part of each guide shaft **541**, **551** is so provided as to overlap the side frame **511** as viewed from the left or right direction, but an alternative configuration may be feasible for example such that when the seat cushion frame **510** is in the rearmost position, the entire guide shaft overlaps the side frame **511** as viewed from the left or right direction.

In the second embodiment, the guide shafts **541**, **551** are each configured as a metal rod, but the guide shafts may, for example, be configured as a round or rectangular pipe, or as a plate-shaped member having a U-shaped cross section. The material for the guide shafts may preferably be metal but may be plastic, instead.

In the first and second embodiments, the left seat S**2** includes the drive source **80**, **580** and the transmission mechanism **90**, **590**, and is configured such that a driving force transmitted from the drive source **80**, **580** via the transmission mechanism **90**, **590** is used to actuate the seat cushion frame **10**, **510**, but the configuration of the drive source is not limited thereto. The drive source and/or the transmission mechanism may be provided separately from the left seat S**2**. The drive source may not employ a motor to electrically actuate the seat cushion frame **10**, **510**, but may use a hand-operated rotary handle to allow the screw shaft **92**, **592** to be manipulated or otherwise provide manual operation means to actuate the seat cushion frame **10**, **570**.

In the first and the second embodiments, the base portion is exemplified by the base frame **70**, **570**, but the base portion may be embodied in the vehicle body.

In the above-described embodiments, the seat for use in the rear seat of an automobile is illustrated as an example of a seat to which the present invention is applicable, but the present invention is not limited thereto. For example, the resent invention is also applicable to a seat for use in the driver's seat or the passenger seat next to the driver's seat. Furthermore, the present invention may be applicable to a seat for use in any vehicles other than an automobile, such as rail cars, ships and aircrafts, etc.

The invention claimed is:

1. A vehicle seat comprising:

a seat cushion frame;

a slide mechanism including a guide member extending in a front-rear direction and a slide member movable along the guide member relative to the guide member, the seat cushion frame being fixed to one of the guide member and the slide member, another of the guide member and the slide member being fixed to a floor of a vehicle;

a drive source;

a transmission mechanism configured to receive a driving force from the drive source and to cause the seat cushion frame to move in the front-rear direction;

a bracket fixed to the floor; and

a support frame fixed to the bracket,

wherein the drive source is fixed to the floor,

wherein the guide member includes a pair of rails fixed to the floor,

wherein the bracket is configured to support the rails,

wherein the slide member includes a pair of sliders engageable with the pair of rails and slidable relative to the pair of rails,

wherein the seat cushion frame is fixed to the pair of sliders,

wherein the support frame includes a first engageable portion so extending as to have a distal end facing downward,

wherein the seat cushion frame includes a pair of left and right side frames, and

wherein the side frames include a second engageable portion so extending as to have a distal end facing upward, the second engageable portion being engageable with the first engageable portion in an upward-downward direction.

2. The vehicle seat according to claim **1**, further comprising an another bracket connecting the pair of rails,

wherein the drive source is fixed to the another bracket.

3. The vehicle seat according to claim **2**, wherein another bracket is fixed to the floor.

4. The vehicle seat according to claim **1**, wherein a distal end portion of the second engageable portion is inclined toward a proximal end portion of the second engageable portion with respect to a vertical direction, and a distal end portion of the first engageable portion is inclined to a direction away from the proximal end portion of the second engageable portion with respect to the vertical direction.

5. The vehicle seat according to claim **1**, further comprising a cushion pad with which the seat cushion frame is covered,

wherein the cushion pad includes a wire having a hook with which the wire is hooked on to the seat cushion frame.

6. The vehicle seat according to claim **1**, wherein the seat cushion frame includes a pair of left and right side frames, and a pipe frame connecting the pair of side frames,

wherein the side frames are made of sheet metal, and

wherein the pipe frame includes left and right end portions placed on upper surfaces of the side frames and welded to the side frames.

7. The vehicle seat according to claim **1**, further comprising a pan frame fixed to the seat cushion frame, wherein the pan frame has an undersurface of which a portion lying over the transmission mechanism is recessed upward.

8. The vehicle seat according to claim **1**, further comprising a base portion fixed to the floor,

wherein the seat cushion frame includes a pair of left and right side frames,

wherein the guide member includes a guide shaft, wherein the guide shaft or the slide member is fixed to the base portion, and

wherein at least part of the guide shaft overlaps the side frames as viewed from a left or right direction.

9. The vehicle seat according to claim **8**, wherein the slide mechanism includes two pairs of slide mechanisms, one pair being disposed at a left side, and another pair at a right side.

10. The vehicle seat according to claim **9**, wherein a pair of the slide mechanisms includes two guide shafts disposed in positions shifted in the front-rear direction.

11. The vehicle seat according to claim **9**, wherein a pair of the slide mechanisms includes two guide shafts of which portions coextensive in the front-rear direction are disposed at a same height.

12. The vehicle seat according to claim **9**, wherein a pair of the slide mechanisms includes two guide shafts of which portions coextensive in the front-rear direction are disposed in positions shifted from each other in an upward-downward direction.

13. The vehicle seat according to claim **9**, wherein a pair of the slide mechanisms includes two slide members which are disposed in positions separate from each other in the front-rear direction, a front slide member being fixed to the base portion, a guide shaft corresponding to the front slide member being fixed to the seat cushion frame, a rear slide member being fixed to the seat cushion frame, and a guide shaft corresponding to the rear slide member being fixed to the base portion.

14. The vehicle seat according to claim **9**, wherein all guide shafts are disposed between the pair of side frames when viewed from above or below.

15. The vehicle seat according to claim **8**, wherein the transmission mechanism includes an actuator connected to the seat cushion frame, and a screw shaft extending in the front-rear direction, the screw shaft being configured to transmit a driving force from the drive source to the actuator, and

wherein the screw shaft is disposed in a center between the pair of side frames.

16. The vehicle seat according to claim **8**, wherein the side frames are made of pipes.

17. The vehicle seat according to claim **8**, further comprising a pan frame fixed to the seat cushion frame, wherein the pan frame has an undersurface of which a portion lying over the transmission mechanism is recessed upward.

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