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(71) Applicant *(for all designated States except US)*: **POLARIS INDUSTRIES INC.** [US/US]; 2100 Highway 55, Medina, MN 55340 (US).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: **KINSMAN, Anthony J.** [US/US]; 6853 256th street, Wyoming, MN 55092 (US).

(74) Agent: **GROEN, Eric J.**; Faegre Baker Daniels LLP, 300 North Meridian Street, Suite 2700, Indianapolis, IN 46204 (US).

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(54) **Title**: SIDE BY SIDE ALL TERRAIN VEHICLE

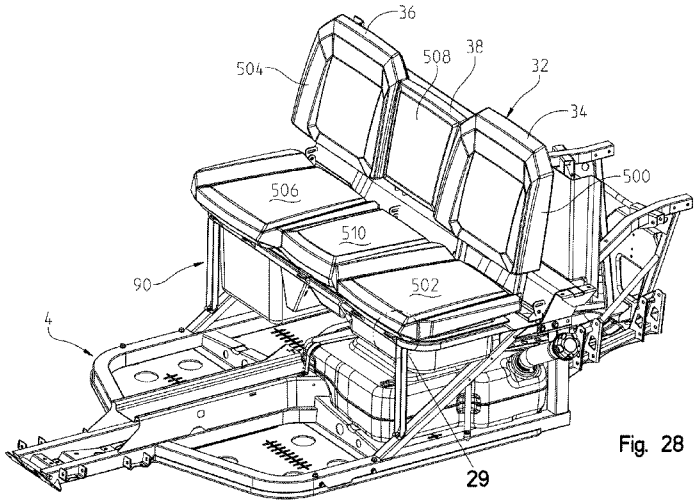

Fig. 28

(57) **Abstract**: A side by side vehicle (2) is disclosed having a vehicle frame (4) having frame tubes (60) extending from a front to a rear. A vehicle seat frame (90) is positioned in a mid portion of the frame, and positions a seat at a raised position relative to the frame tubes. A powertrain (150, 152) is positioned rearward of the vehicle seat frame and is coupled to the vehicle frame. Side by side seats (32, 34, 36)are supported by the seat frame; and one or more storage units (310, 312, 314) are positioned under the side by side seats. The side by side vehicle also has a rear suspension (200) comprising at least one rear alignment arm (202, 204) coupled to each side of a rear of the vehicle frame, where the alignment arms are coupled to the vehicle frame at front (206)and rear (208) connection points. A distance between the front connection points (W_1) is greater than a distance between the rear connection points (W_2), and at least a portion of the powertrain (150, 152) is positioned between the front connection points (206) of the alignment arms.

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SIDE BY SIDE ALL TERRAIN VEHICLE

[0001] The subject disclosure is generally related to side by side all terrain vehicles.

[0002] Generally, all terrain vehicles ("ATVs") and utility vehicles ("UVs") are used to carry one or two passengers and a small amount of cargo over a variety of terrains. Due to increasing recreational interest in side by side vehicles, such as those used for trail riding, recreational use, and cargo hauling have entered the market place.

[0003] Most side by side vehicles include seating for two to three passengers. Side-by-side vehicles, in which the driver and passenger are seated beside each other on laterally spaced apart seats, have become popular because of the ability to allow the passenger to share the driver's viewpoint and riding experience instead of being positioned behind the driver. Two styles of vehicle are known in the marketplace; a first sportive version is known where the driver sits low in the vehicle, and one such vehicle is shown in US patent 7,819,220 (and counterpart EP2057060), the subject matter of which is incorporated herein by reference. The second version has the driver seated higher in the vehicle, and one such vehicle is shown in US patent application publication number 20090301830, the subject matter of which is incorporated herein by reference.

[0004] In one embodiment described herein, a side by side vehicle is disclosed having a vehicle frame having frame tubes extending from a front to a rear. A vehicle seat frame is positioned in a mid portion of the frame, and positions a seat frame at a raised position relative to the frame tubes. A powertrain is positioned rearward of the vehicle seat frame and is coupled to the vehicle frame. Side by seats are supported by the seat frame; and one or more storage units are positioned under the side by side seats.

[0005] In another embodiment, a side by side vehicle comprises a vehicle frame having frame tubes extending from a front to a rear. A vehicle seat frame is positioned in a mid portion of the frame, and positions a seat frame at a raised position relative to

the frame tubes. A powertrain is positioned rearward of the vehicle seat frame and is coupled to the vehicle frame. Side by side seats are supported by the seat frame. A rear suspension comprising at least one rear alignment arm is coupled to each side of a rear of the vehicle frame, where the alignment arms are coupled to the vehicle frame at front and rear connection points. A distance between the front connection points is greater than a distance between the rear connection points, and at least a portion of the powertrain is positioned between the front connection points of the alignment arms.

[0006] In another embodiment, a side by side vehicle comprises a vehicle frame, a vehicle seat frame positioned in a mid portion of the frame, and positioned at a raised position relative to the frame tubes. A powertrain is positioned rearward of the vehicle seat frame and is coupled to the vehicle frame. Side by side seats are supported by the seat frame and one or more storage units positioned under the side by side seats. A rear suspension has at least one first connection point to the frame, wherein at least a portion of the powertrain is positioned rearward of the first connection point.

[0007] In another embodiment, a side by side vehicle comprises a vehicle frame; and a vehicle seat frame positioned in a mid portion of the frame, with the seat frame at a raised position relative to the frame tubes. Side by side seats are supported by the seat frame. A powertrain is positioned rearward of the vehicle seat frame and is supported by the vehicle frame. At least one storage unit is positioned under the side by side seats; and the storage bin houses an electronic assembly of the vehicle.

[0008] In yet another embodiment, a side by side vehicle comprises a vehicle frame, side by side seats supported by the frame, a powertrain supported by the vehicle frame; a cargo storage device supported by the frame, the storage area device having apertures extending therethough; and tie down members extending through the apertures to an upper side of the cargo storage device, and coupled to an opposite side.

[0009] The embodiments will now be described by way of the drawings, where:

[0010] FIG. 1 is a front left perspective view of the vehicle of the present disclosure;

[0011] FIG. 2 is a front left perspective view of the frame of the present vehicle;

[0012] FIG. 3 is a right rear perspective view of the vehicle of the present disclosure;

[0013] FIG. 4 is a plan view of the frame of FIGS. 2-3;

[0014] FIG. 5 is a partial rear perspective view of the frame of the present disclosure;

[0015] FIG. 6 is an underside perspective view of the frame of FIG. 5;

[0016] FIG. 7 is a perspective view showing removable frame components of the frame exploded away from the vehicle frame;

[0017] FIG. 8 shows a detailed view of a portion of the removable component;

[0018] FIG. 9 shows another portion of a removable component;

[0019] FIG. 10A shows a rear perspective view showing the engine and the transmission positioned in the frame of the present disclosure;

[0020] FIG. 10B shows a top plan view showing the engine and the transmission positioned in the frame of the present disclosure;

[0021] FIG. 11 shows a rear perspective view of the rear suspension;

[0022] FIG. 12 shows a top view of the A-arms of the present disclosure;

[0023] FIG. 13 shows a rear perspective view of the suspension assembly;

[0024] FIG. 14 shows an exploded view of a portion of the suspension of the present disclosure;

[0025] FIG. 15 shows components positioned under the seat frame of the present disclosure;

[0026] FIG. 16 shows a partially assembled vehicle showing chassis components positioned over the vehicle's seat frame;

[0027] FIG. 17 is a top plan view of the vehicle of FIG. 16;

[0028] FIG. 18 is a cross sectional view through lines 18-18 of FIG. 9;

[0029] FIG. 19 shows a side view of the utility dump box;

[0030] FIG. 20 shows an underside perspective view of a side of the utility dump box;

[0031] FIG. 21 shows integrated tie downs positioned in the utility dump box.

[0032] FIG. 22 is a left front perspective view of the roll cage attached to the frame;

[0033] FIG. 23 is a left front perspective view of the roll cage;

[0034] FIG. 24 shows the roll cage of FIG. 23 in an exploded fashion;

[0035] FIG. 25 shows an enlarged view of the connection points of the collapsible roll cage;

[0036] FIG. 26 shows a cross section of the roll cage showing the configuration of the components;

[0037] FIG. 27 shows a lateral cross section showing a cross section configuration of the lateral roll cage members;

[0038] FIG. 28 is a left front perspective view of the seating assembly of the present vehicle as assembled to the frame;

[0039] FIG. 29 is an enlarged view of the portion denoted in FIG. 28;

[0040] FIG. 30 is a right front perspective view of the seating assembly of FIG. 28;

[0041] FIG. 31 is a front view of the seating assembly of FIG. 28;

[0042] FIG. 32 is a left rear perspective view of the seating assembly of FIG. 28;

[0043] FIG. 33 is an underside perspective view of the seating assembly removed from the vehicle;

[0044] FIG. 34 shows the seating assembly of FIG. 33 exploded from one another;

[0045] FIG. 35 shows the seat frame of the vehicle;

[0046] FIG. 36 shows an underside perspective view of the driver's seat; and

[0047] FIG. 37 shows a cross sectional view through lines 37-37 of FIG. 36.

[0048] With reference to FIG. 1, the utility vehicle is shown generally at 2 to include a frame 4 supported by front wheels 6 and rear wheels 8. Utility vehicle 2 includes a front end 10 having a hood 12, bumper 14 and side body panel 16. Utility vehicle 2 also includes a rear end 20 having a utility cargo box 22 as described further herein. Utility vehicle 2 also includes an operator area at 30 comprising a bench seat assembly 32 having a driver's seat 34, a passenger seat 36 and a center passenger seat at 38. Operator controls such as a steering wheel is provided at 40. A roll cage 42 surrounds the entire operator area 30.

[0049] With reference now to FIGS. 2 through 6, the frame will be described in greater detail. With reference first to FIG. 2, frame 4 generally includes a frame front portion 50, a frame mid portion 52 and a frame rear portion at 54. Central frame tubes 60 extend generally lengthwise between the front frame portion 50 and the rear frame portion 54 having a front portion at 60a and a flared out portion towards the rear at 60b. An outer frame tube member is provided at 62 which is connected to frame tube portion 60a; by tube portion 62a adjacent a front, and spaced apart from frame tube 60b by frame tube portion 62b. A cross tube such as 64 integrates the frame tubes 60 and 62 towards a center of the vehicle and frame channels 66 and 67 (FIG 3) integrate the frame tubes 60 and 62 adjacent a rear of the vehicle.

[0050] A removable frame portion 70 is attached to frame tube 62 by way of brackets 72, as further described herein. As shown best in Fig. 7, removable frame portion 70 has a lower frame portion 70a, a vertically upstanding portion at 70b and an upper horizontally extending portion 70c. Removable frame portion 70 further includes gussets at 82 as described herein. A transverse brace 80 extends between the two portions 70c. Frame 4 further includes a seat frame portion at 90 having transversely extending frame tubes at 92 and 94 supported by upstanding braces 96 and diagonal braces 98. As shown best in FIG. 3, support posts 100 upstand from frame tubes 62 and support a transverse beam 102. Transverse beam 102 is removable from post 100 and also includes an upper mounting area or flange at 104, as further described herein.

[0051] With respect now to FIGS. 4-6, a rear engine pan 110 is provided extending from channel 67 and frame tubes 60. Pan 110 defines the support platform for the drivetrain of the vehicle as will be described herein. Vertically extending channels 120, 122 (FIGS 5, 6) extend from each side of the pan 10 and define locations for mounting alignment arms (A-arms) as described herein. Vertically extending tubes 130 extend upwardly from pan 110 and support upper frame arms 132.

[0052] With respect now to FIGS. 7 and 8, frame 4 further includes an upper mounting flange 134 attached to diagonal tube 98 and a side tube 136 (FIG 8) extending between diagonal tube 98 and post 100. As shown in FIG 8, transverse beam 102 is provided with a bracket 138 and a flange 140, where flange 140 attaches to flange 134 and where bracket 138 attaches to side tube 136 by way of fasteners as shown. As shown in FIG. 9, removable frame portion 70 includes a bracket 142 attached to horizontally extending portion 70c which is removably attached to transverse brace 80 by way of fasteners as shown. Lower frame portion 70a is also attached to frame tube 62 by way of fasteners through brackets 72 as shown.

[0053] With reference now to FIG. 10A and 10B, engine 150 is shown mounted on pan 110 together with transmission 152. It should be noted that engine 150 is of the type shown and described in assignee's serial number 61/385,802 filed September 23, 2010, and corresponding PCT application PCT/US2011/52914; the subject matter of

which are incorporated herein by reference. Transmission 152, the mounting of the engine 150 and transmission 152 together, as well as the mounting of the engine 150 and the transmission 152 to frame 4, is similar to that shown in either of U.S. Patent Applications 12/849,480 or 12/849,516, both of which were filed on August 3, 2010, and corresponding PCT application PCT/US2011/46395; the subject matter of which are incorporated herein by reference.

[0054] As shown, an air intake 160 is shown which would be mounted to a cover which surrounds the roll cage 50.

[0055] A re-designed suspension is shown generally as 200 in FIGS. 11-14. The suspension is re-designed to provide a space for the engine and transmission 150, 152 when the engine and transmission is mounted rearward of the seats as shown herein. More particularly, the rear suspension is provided by upper alignment arms 202 and lower alignment arms 204 whereby forward connections 206 of upper alignment arms 204 are spaced apart by a greater distance than their respective rearward connections 208; that is $W_1 > W_2$ (FIG 12). This provides a lateral distance or width W_1 between the alignment arms which can receive the transmission, or at least a portion of the powertrain, there between. In a like manner, lower alignment arms 204 have forward connections 210 spaced apart at a greater distance than lower connections 212.

[0056] As shown, both upper and lower alignment arms 202, 204 are rectangular in configuration, and connect to a hub 220 at a forward and outer corner of the alignment arms. As shown in FIG. 12, the alignment arms extend at oblique angles Ø relative to a longitudinal axis L, and each of the hubs 220 includes a spindle 222 which rotates along an axis X transverse to the longitudinal axis L. As shown in FIG. 14, lower alignment arms 204 further comprise a lower plate portion 230 which provides a bracket 232 for both a shock absorber 240 and a mounting arm 242 of torsion bar 244. Torsion bar 244 is shown in FIGS. 10-13 rotationally mounted to upright 130, and with torsion bar arms 246 extending forwardly. The location of the hubs 220 provides room for the shock absorbers 240 and mounting arm 242 of the torsion bar 244, as best shown in FIG. 12.

[0057] With reference now to FIG. 15, due to the location of the engine rearward of the seat 32, the area beneath the seat frame 90 is now available for other system components. As shown, fuel tank 260 is shown positioned below the seat frame 90 with a filler tube 262 extending out from the driver's side and beyond the frame formed by frame tube 62 and post 100. Battery 270 is shown positioned below a passenger side of the seat frame 90. Meanwhile an electronic assembly 280 is positioned below the center seat of frame 90, and the electronic assembly may comprise an engine control unit, a vehicle control unit, relays and the like.

[0058] With respect now to FIGS. 16-17, vehicle 2 is finished off by floor board 300, side panel 302, seat side cover 304 and seat front cover 306. Storage pan 308 is positioned over frame 90 and over transverse bar 102 (FIG. 10) and includes three separate storage areas, namely storage area 310 directly below driver's seat, center storage area 312 accommodating the electronic assembly 280, and storage area 314 (FIGS. 12 and 17) positioned below passenger seating area. Panel 320 surrounds the intersection of rear roll cage portion 402 and plate 104 (FIG. 10) and a sound/heat shield 330 (FIG. 16) is positioned behind seat 32 and forward of engine 150 to prevent heat and noise from the engine 150 into the operator's area.

[0059] With reference now to FIGS. 9 and 18, a channel member 350 is positioned over frame tubes 60 from a position from the front 50 of the vehicle to a position extending over truss member 67 defining an opening 352 (FIG. 18). The channel member 350 defines an opening or tunnel between the front of the vehicle to a position under the seats for receiving the drive shaft that extends from the rear of the vehicle to the front of the vehicle for driving a front differential. The channel member 350 is coupled to the main frame tubes 60, 62 to define a rigid member resistant to torsion. The top of the channel 350 defines a passageway 353 for receiving other essentials extending from the front of the vehicle to the rear of the vehicle, such as a wiring harness (lights, electronic throttle control wiring, etc), cooling tubes, brake lines, etc. As shown best in FIGS. 3 and 18, a shear plate 354 also extends upwardly from frames tubes 62 to upper frame portion 356 also provided to resist torsion to the vehicle frame 4. Shear plate 354 also allows for the mounting of accessories thereto.

[0060] With reference now to FIGS. 19-21, the rear utility box 22 is shown in greater detail. As shown in FIG. 19, the utility box 22 has an underside surface 360 which inclines upwardly and forwardly providing a small draft angled surface on the inside of the utility box. This provides for easier dumping of the contents of the utility box, as well as raises the inside surface of the utility box for clearance purposes due to the rearwardly adjusted engine 150 and transmission 152. Furthermore as shown in FIG. 21, the side edges of the utility box include a plurality of molded in slots 370 which extend downwardly through a floor 372 of the box, the slots extending outwardly of inwardly molded posts 374 (FIG. 20). Tie downs 380 are provided having an upwardly extending portion 382 for extending through slots 370, a shank portion 384 for extending downwardly through the slot, and a flange portion 386 for positioning against the post 374. Fasteners may be positioned through apertures 388 of the tie downs 382 fastening the tie downs to the utility box in a semi-fixed fashion. It should be understood that the tie downs may be positioned in alternate orientations as decided by the owner/user.

[0061] With reference now to FIGS. 22-26, the roll cage 50 will be described in greater detail. As shown, cage 50 includes a front cage portion 400 and a rear cage portion 402. As shown best in FIG. 24, front cage portion 400 includes upright portions 404, horizontal portions 406, crossbeam 408 and lower crossbeam 410. As defined, front cage portion 400 defines surfaces 412 of uprights 404, surface 414 of crossbeam 408 and surface 416 of lower crossbeam 410 all arranged in a plane for receiving an accessory windshield. In a like manner, surfaces 420 are defined on portions 406 and surface 422 is defined on overhead beam 408 to define a planar surface for receiving either an accessory overhead roof piece or see through moon roof. As shown, upright portions 404 include brackets 422 for connection to gussets 82 (FIG. 9). Finally, cage portion 400 includes rear connectors 424 for connection to rear cage portion 402 as described herein.

[0062] As shown best in FIG. 24, rear cage portion 402 includes uprights 430, cross member 432, diagonal braces 434, cross members 436 and 438 and cross member 440 retaining head rests 442. Side supports 450 extend forwardly from

uprights 430. Rear portion 402 includes brackets 452 for attachment to upper flange 104 (FIG. 8). As shown best in FIG. 25, the intersection of upright 430 and cross member 432 defines a profile 460 for the receipt of connector 424. Thus, the front and rear cage portions 400, 402 are easily connectable by way of fasteners 462. As also shown in FIG. 25, cage portion 406 includes an outwardly facing surface or lip at 470 which is planar with a surface 472 on connector 424 and with surface 474 (FIG. 27) of rear upright 430. This allows for the addition of an accessory door. The exact configuration of the cross section of cage portion 406 is shown in FIG. 27 which is somewhat hourglass or a figure eight configuration.

[0063] With respect now to FIGS. 28-37, the seating assembly of the present disclosure will be described in greater detail. With reference first to FIG. 28, the seating assembly 32 is shown in an installed position in the seat frame 90. As shown, driver's seat 34 includes a seat back 500 and a seat bottom 502, passenger seat 36 includes a seat back 504 and a seat bottom 506; and center seat 38 includes a seat back 508 and a seat bottom 510.

[0064] As shown best in FIGS. 33, 34 and 36, the front edges of the seating assembly includes hooks 520 which are pivotally clipped into an opening 522 of a bracket 524 (FIG. 29) clipping the seats into the seat frame 90. It should be appreciated then that the seat can tip forward towards the steering wheel and/or the dash board of the vehicle for removal of the seats and for access to the storage bins under the seat.

[0065] As shown best in FIG. 33 and 34, driver's seat 34 and the combined passenger seat 36 and center seat 38 are separate assemblies. As shown, the passenger seat 36 and center seat 38 would include a lower structural frame 530 upon which the seat bottom would be constructed, and to which hooks 520 would be assembled or integrated. As shown the driver seat is approximately 40% of the width of the side by side seats, and the passenger seat and center seat are approximately 60% of the width of the side by side seats.

[0066] As shown best in FIGS. 36 and 37, driver's seat 34 includes a lower slide assembly 540 to which hooks are provided. Seat 34 further includes an adjustment

mechanism 542 as well as an inner slide track 544 (FIG. 37) allowing sliding movement between a lower track member 550 and an upper track member 552 of track assembly 540. Frame 560 of seat back 500 is attached to the lower track assembly 540, and thus when upper track portion 552 moves relative to lower track portion 550, seat back moves with seat bottom 502.

[0067] While the power source of the present disclosure is shown as a combustion engine, illustratively a combustion engine, the engine could also take on the form of a multi-fuel engine capable of utilizing various fuels. An exemplary multifuel engine capable of utilizing various fuels is disclosed in US Patent Application Serial No. 11/445,731 filed June 2, 2006, (and counterpart PCT application number PCT/US07/70220), Docket No. PLR-00-1505.01P, the disclosure of which is expressly incorporated by reference herein. In another embodiment, the power source could be a hybrid electric engine. In another embodiment, the power source could be an electric engine, where the spacing under the seats is utilized for the battery packs. An illustrative electric vehicle is shown in any one of assignee's applications, serial number 12/484,921 filed June 15, 2009 (and counterpart PCT application number PCT/US2010/38711) or serial number 12/816,004 filed December 16, 2010 the subject matter of which is incorporated herein by reference.

[0068] The vehicle could also include a range extender of the type disclosed in application serial number 12/928,479 filed December 13, 2010 (and counterpart PCT application number PCT/US2010/049167).

[0069] While this invention has been described as having an exemplary design, the present invention may be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practices in the art to which this invention pertains.

CLAIMS

1. A side by side vehicle comprising a vehicle frame comprising main frame tubes extending generally longitudinally; a vehicle seat frame positioned in a mid portion of the frame, and positioned at a raised position relative to the frame tubes with side by side seats supported by the seat frame; characterized in that a powertrain is positioned rearward of the vehicle seat frame and is supported by the vehicle frame; and one or more storage units are positioned under the side by side seats.

2. The vehicle of claim 1, characterized in that the seats are movable to access the one or more storage units under the side by side seats.

3. The vehicle of claim 2, characterized in that the seats are pivotally movable to access the one or more storage units.

4. The vehicle of any one of claims 1-3, characterized in that the side by side seats comprise a driver seat, a passenger seat and a center seat.

5. The vehicle of claim 4, characterized in that the driver seat is approximately 40% of the width of the side by side seats, and the passenger seat and center seat is approximately 60% of the width of the side by side seats.

6. The vehicle of any one of claims 1-5, characterized in that the driver seat moves forwardly and backwardly relative to the passenger seat and center seat.

7. The vehicle of any one of claims 1-6, characterized in that the side by side seats comprise seat backs and seat bottoms, and the side by side seats pivot forward about the seat bottoms to expose the storage units.

8. The vehicle of any one of claims 1-7, characterized in that a fuel tank is positioned beneath one of a passenger seat and driver seat.

9. The vehicle of claim 8, characterized in that a battery is positioned beneath the other of the passenger seat or driver seat.

10. The vehicle of claim 8 or 9, characterized in that the storage units extend from a position beneath the side by side seats to the battery and fuel tank.

11. The vehicle of any of claims 4-10, further characterized by a storage bin beneath the center seat.

12. The vehicle of claim 11, characterized in that the storage bin beneath the center seat houses the electronic assembly of the vehicle.

13. The vehicle of claim 12, characterized in that the electronic assembly of the vehicle comprises an engine control module.

14. A side by side vehicle comprising a vehicle frame extending generally longitudinally; a vehicle seat frame positioned in a mid portion of the frame, and positioned at a raised position relative to the frame tubes; side by side seats supported by the seat frame; a powertrain supported by the frame; and a rear suspension comprising at least one rear alignment arm coupled to each side of a rear of the vehicle frame, the alignment arms being coupled to the vehicle frame at front and rear connection points; characterized in that a distance between the front connection points of the rear suspension is greater than a distance between the rear connection points, and the powertrain is positioned rearward of the vehicle seat frame with at least a portion of the powertrain positioned between the front connection points of the alignment arms.

15. The vehicle of claim 14, characterized in that the connection points of the alignment arms are positioned along lines of rotation relative to a longitudinal axis of the vehicle, and the lines of rotation are at an acute angle relative to the longitudinal axis.

16. The vehicle of claim 14 or 15, characterized in that the alignment arms are defined by upper and lower alignment arms and a wheel hub connects the two upper and lower alignment arms.

17. The vehicle of claim 16, characterized in that the alignment arms are defined as generally rectangular, with the hubs attached to a front outside corner of the alignment arms.

18. The vehicle of claim 16 or 17, characterized in that the alignment arms extend outwardly and rearwardly from the frame at an acute angle.

19. The vehicle of claim 18, characterized in that the hubs are skewed relative to the alignment arms and extend outwardly at an angle transverse to the longitudinal axis.

20. The vehicle of any of claims 16-19, characterized in that a prop shaft is connected between the hubs and a differential.

21. The vehicle of claim 20, characterized in that the prop shafts extend rearwardly.

22. The vehicle of claim 21, further characterized by a shock absorber coupled to the lower alignment arm.

23. The vehicle of claim 22, characterized in that the shock absorber is positioned rearward of the prop shaft.

24. The vehicle of any of claims 20-24, further characterized by a torsion bar coupled to the lower alignment arm.

25. The vehicle of claim 24, characterized in that the torsion bar comprises a transverse bar portion and longitudinal bar portions, and in that the transverse bar portion extend rearwardly of the shock absorber and the longitudinal bar portions extending forwardly and outside of the shock absorbers.

26. The vehicle of claim 25, characterized in that the torsion bar is coupled to the lower alignment arm.

27. The vehicle of claim 26, characterized in that a link arm extends downwardly from each longitudinal bar portion, and couples to the lower alignment arm.

28. The vehicle of claim 27, characterized in that the link arm and the shock absorber are coupled together at the lower end thereof.

29. A side by side vehicle comprising a vehicle frame, a vehicle seat frame positioned in a mid portion of the frame and positioned at a raised position relative to the frame tubes, with side by side seats supported by the seat frame, a powertrain coupled to the vehicle frame and a rear suspension having at least one first connection point to the frame, characterized in that the powertrain is positioned rearward of the vehicle seat frame and at least a portion of the powertrain is positioned rearward of the first connection point, and in that at least one storage unit is positioned under the side by side seats.

30. The vehicle of claim 29, comprising at least one rear alignment arm coupled to each side of a rear of the vehicle frame, wherein the first connection point is a front connection point of the alignment arm.

31. The vehicle of claim 29 or 30, characterized in that the alignment arms are coupled to the vehicle frame at first and second connection points, wherein the second connection point is rearward of the first connection point.

32. The vehicle of any of claims 29-31, characterized in that a distance between the front connection points is greater than a distance between the rear connection points, and wherein at least a portion of the powertrain is positioned between the front connection points of the alignment arms.

33. The vehicle of any of claims 29-32, characterized in that the seats are movable to access the one or more storage units under the side by side seats.

34. The vehicle of claim 33, characterized in that the seats are pivotally movable to access the one or more storage units.

35. The vehicle of any one of claims 29-34, characterized in that the side by side seats comprise a driver seat, a passenger seat and a center seat.

36. The vehicle of claim 35, characterized in that the driver seat is approximately 40% of the width of the side by side seats, and the passenger seat and center seat is approximately 60% of the width of the side by side seats.

37. The vehicle of any of claims 29-36, characterized in that the driver seat moves forwardly and rearwardly relative to the passenger seat and center seat.

38. The vehicle of any of claims 29-37, characterized in that the side by side seats comprise seat backs and seat bottoms, and the side by side seats pivot forwardly about the seat bottoms to expose the storage units.

39. The vehicle of any of claims 29-38, characterized in that a fuel tank is positioned beneath one of a passenger seat and driver seat.

40. The vehicle of claim 39, characterized in that a battery is positioned beneath the other of the passenger seat or driver seat.

41. The vehicle of claim 40, characterized in that the storage units extend from a position beneath the side by side seats to the battery and fuel tank.

42. The vehicle of claim 29, characterized in that the storage bin houses an electronic assembly of the vehicle.

43. The vehicle of claim 42, characterized in that the electronic assembly of the vehicle comprises an engine control module.

44. A side by side vehicle comprising a vehicle frame, side by side seats supported by the seat frame, a powertrain supported by the frame, characterized in that the

powertrain is positioned rearward of the side by side seats, and in that at least one enclosure is positioned under the side by side seats and wherein the enclosure houses an electronic assembly of the vehicle.

45. The vehicle of claim 44, characterized in that the electronic assembly of the vehicle comprises an engine control module.

46. The vehicle of claim 44 or 45, further comprising a rear suspension having at least one first connection point coupled to the frame, wherein at least a portion of the powertrain is positioned rearward of the first connection point.

47. The vehicle of any of claims 44-46, characterized in that the suspension comprises at least one rear alignment arm coupled to each side of a rear of the vehicle frame, wherein the first connection point is a front connection point of the alignment arm.

48. The vehicle of claim 47, characterized in that the alignment arms are coupled to the vehicle frame at first and second connection points, wherein the second connection point is rearward of the first connection point.

49. The vehicle of claim 48, characterized in that a distance between the front connection points is greater than a distance between the rear connection points, and wherein at least a portion of the powertrain is positioned between the front connection points of the alignment arms.

50. The vehicle of any of claims 44-49, characterized in that the seats are movable to access the one or more storage units under the side by side seats.

51. The vehicle of claim 50, characterized in that the seats are pivotally movable to access the one or more storage units.

52. The vehicle of any of claims 44-51, characterized in that a fuel tank is positioned beneath one of a passenger seat and driver seat.

53. The vehicle of claim 52, characterized in that a battery is positioned beneath the other of the passenger seat or driver seat.

54. The vehicle of claim 53, characterized in that the storage units extend from a position beneath the side by side seats to the battery and fuel tank.

55. A side by side vehicle comprising a vehicle frame; side by side seats supported by the frame; a powertrain supported by the vehicle frame and a cargo storage device supported by the frame, characterized in that the storage area device having apertures extending therethough and tie down members extending through the apertures to an upper side of the cargo storage device, and coupled to an opposite side.

56. The vehicle of claim 59, characterized in that the cargo storage device is blow molded.

57. The vehicle of claim 60, characterized in that the tie down members are metallic.

58. The vehicle of claim 61, characterized in that the portion extending into the upper side is profiled as a blade portion.

59. The vehicle of claim 62, characterized in that the blade portion comprises a securing portion.

60. The vehicle of claim 59, characterized in that the securing feature is an aperture in the blade portion.

61. The vehicle of claim 59, characterized in that the tie down member includes a flange which is coupled to the cargo storage device.

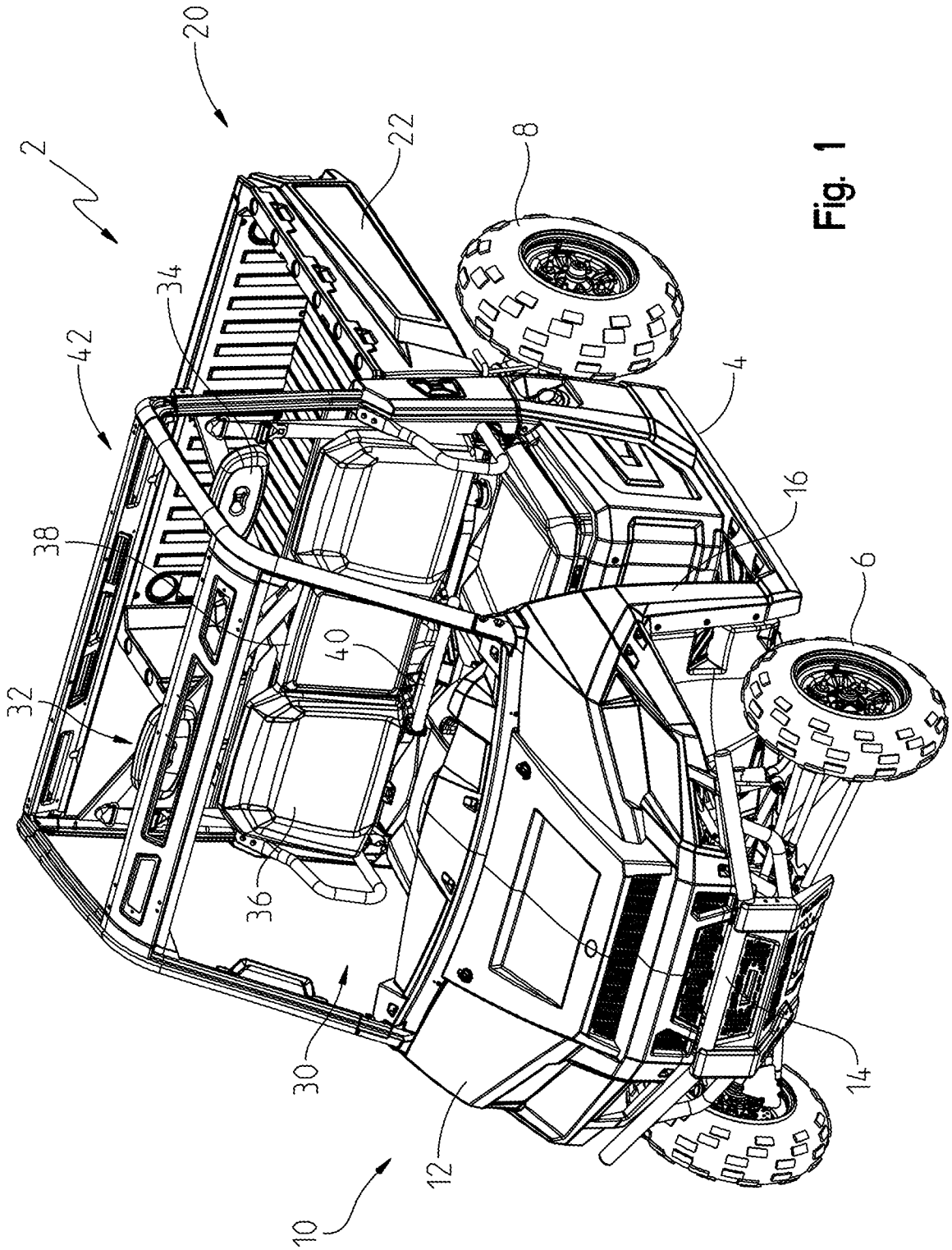

Fig. 1

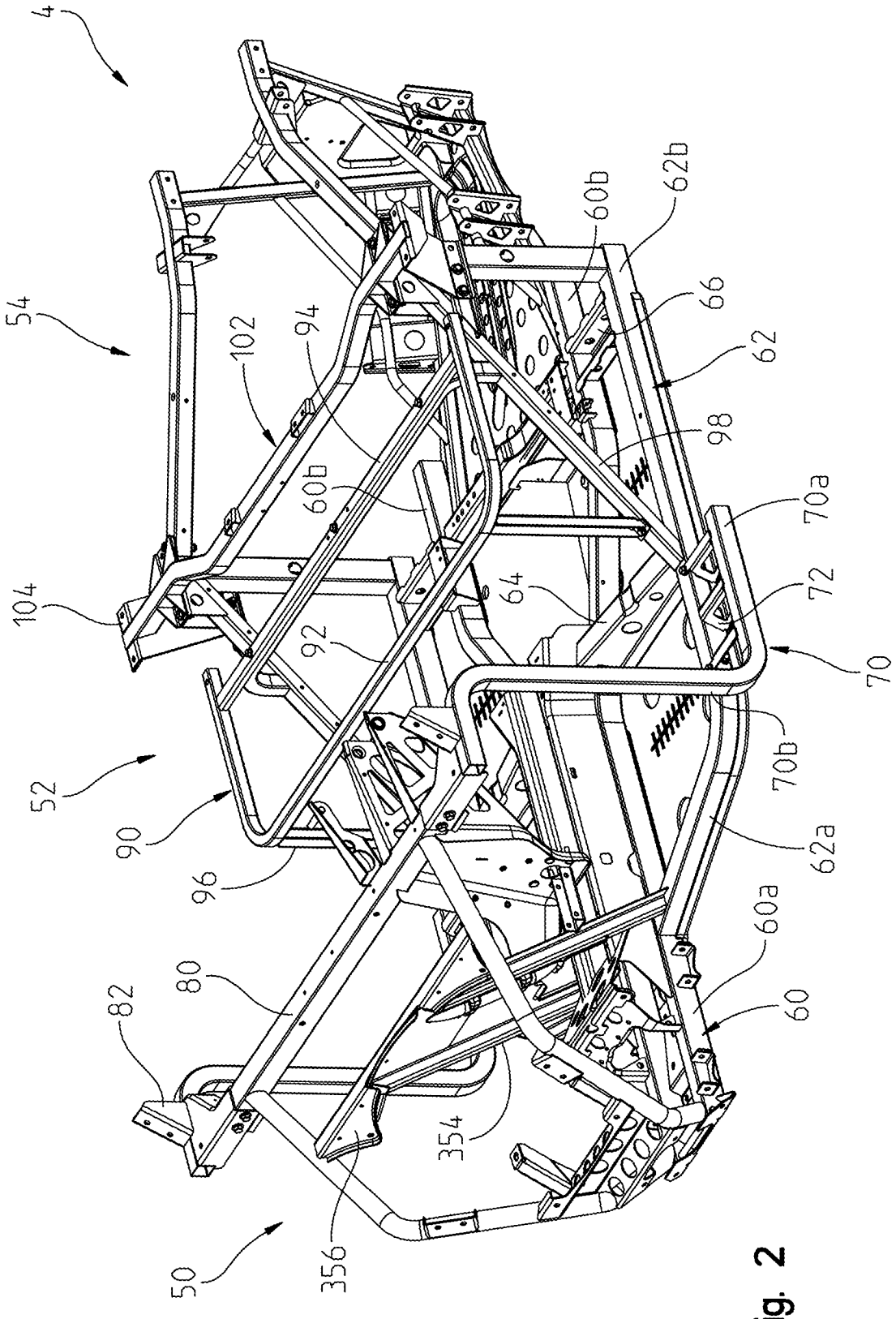
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Fig. 2

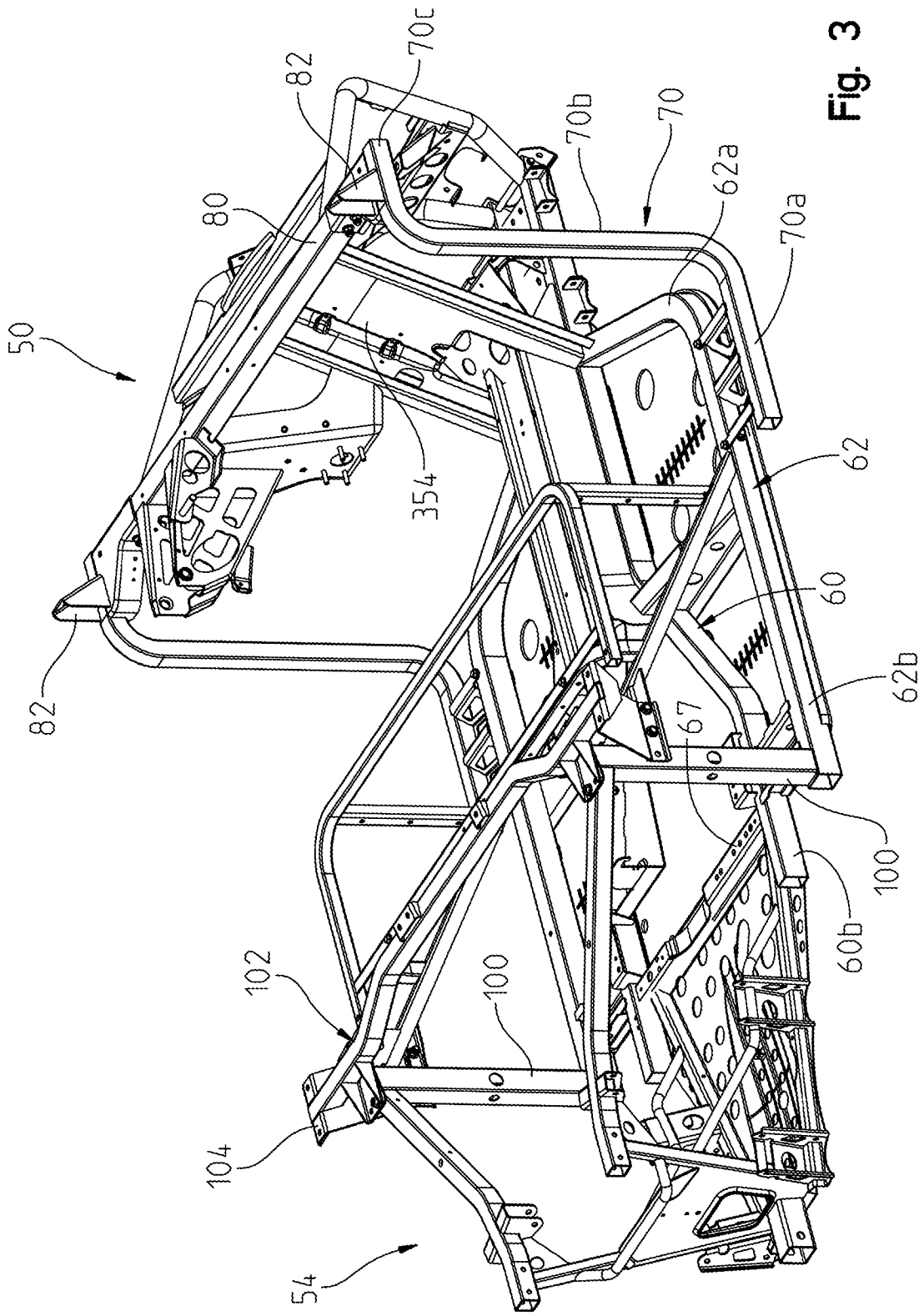
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Fig. 3

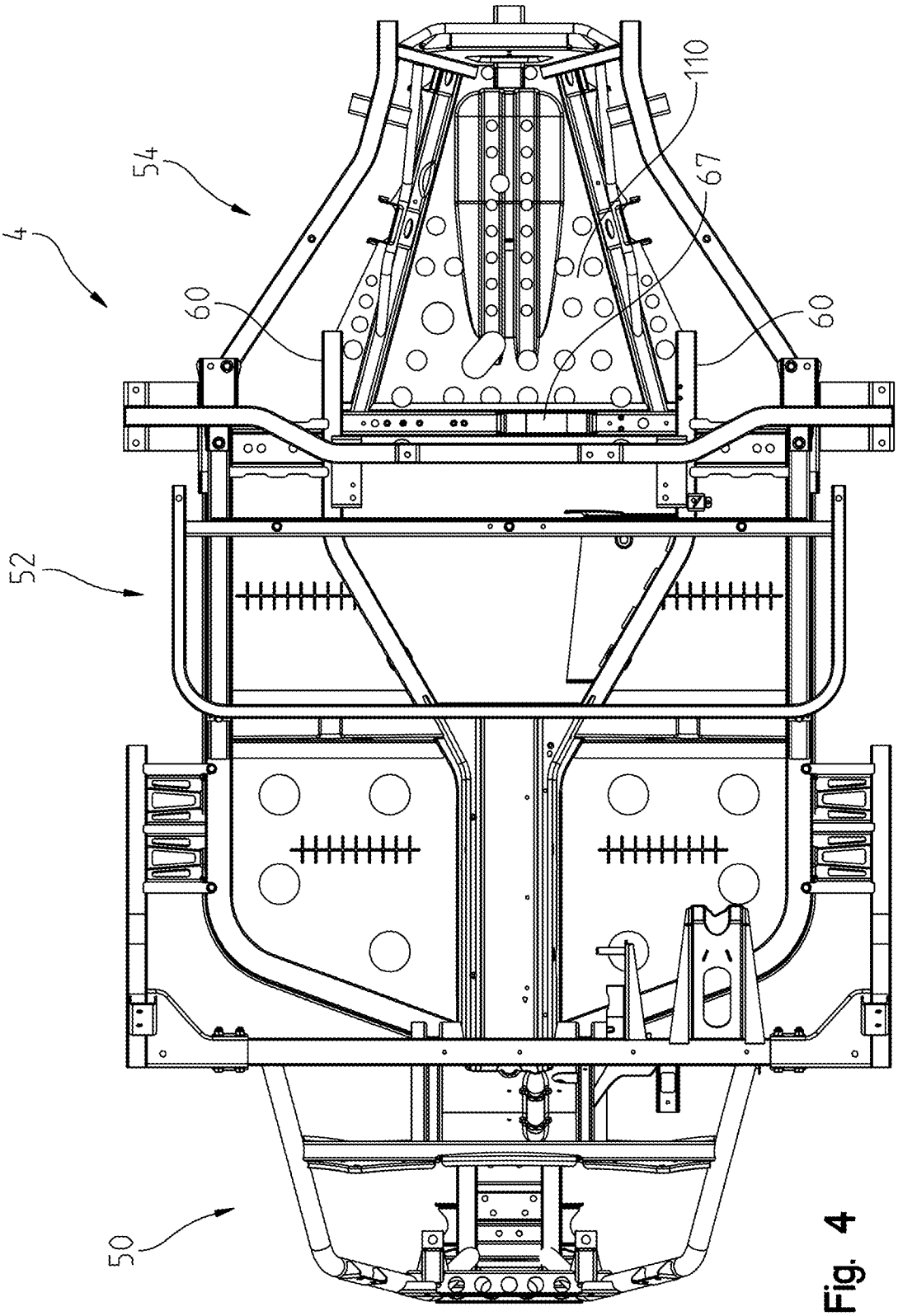

Fig. 4

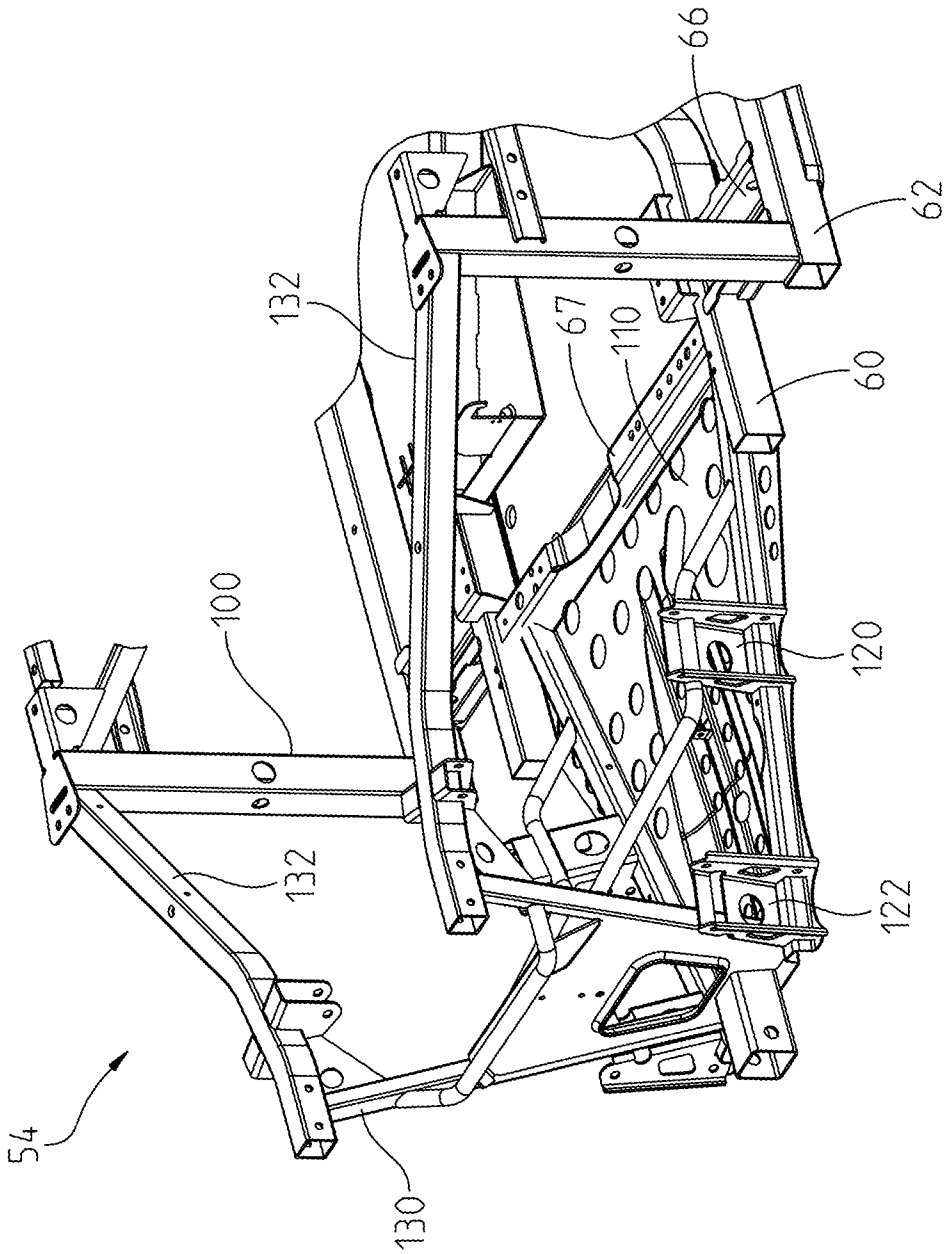

Fig. 5

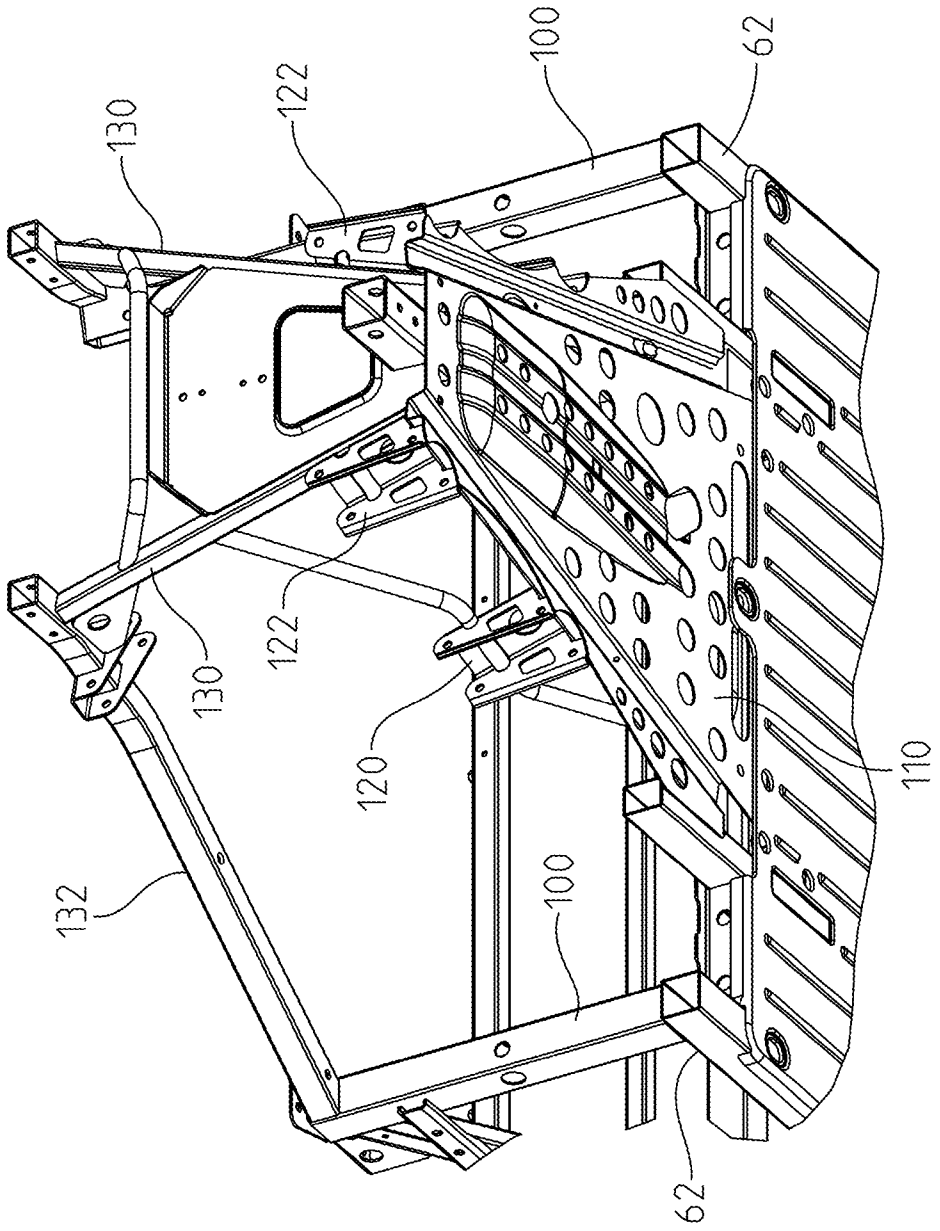

Fig. 6

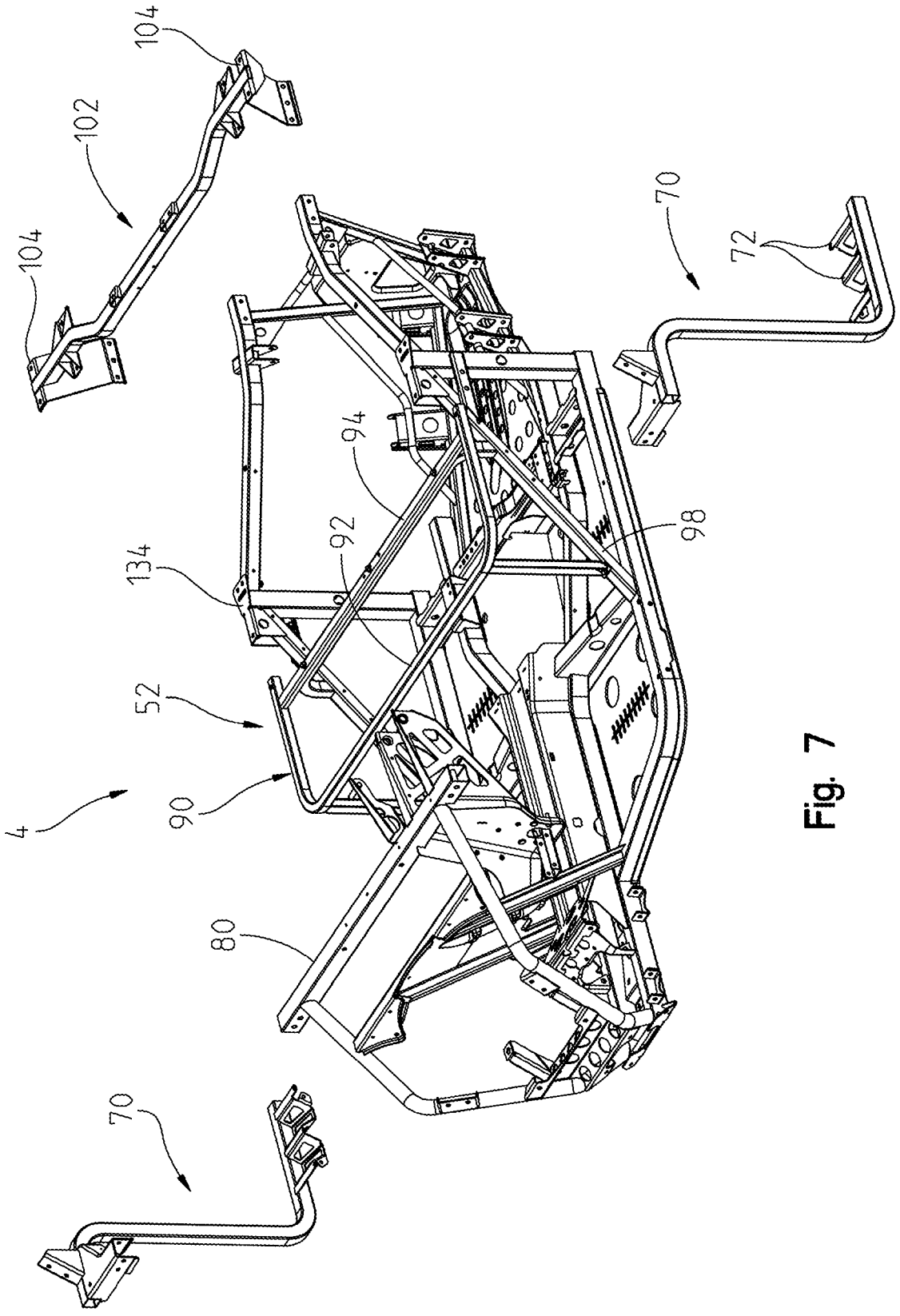

Fig. 7

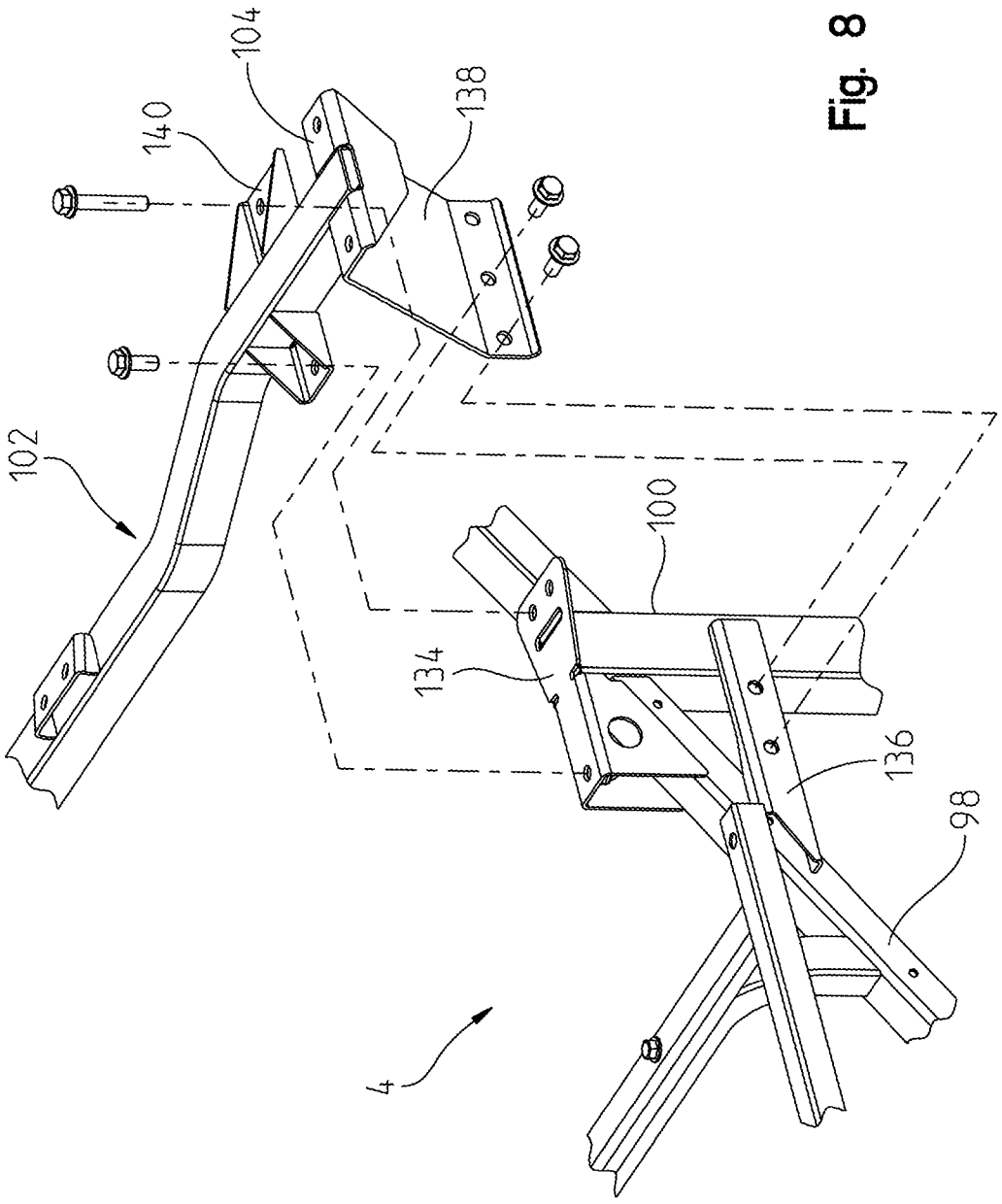

Fig. 8

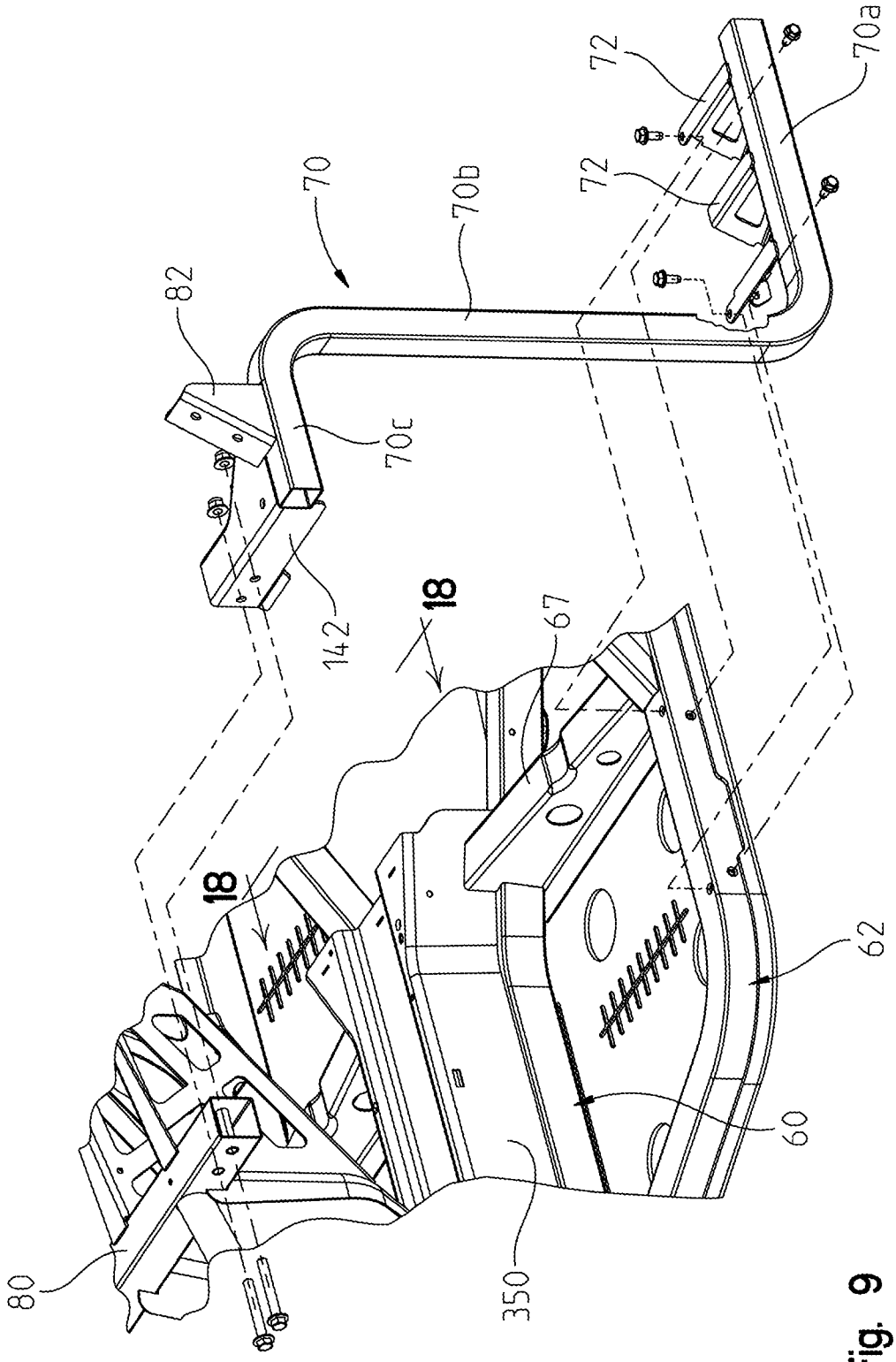

Fig. 9

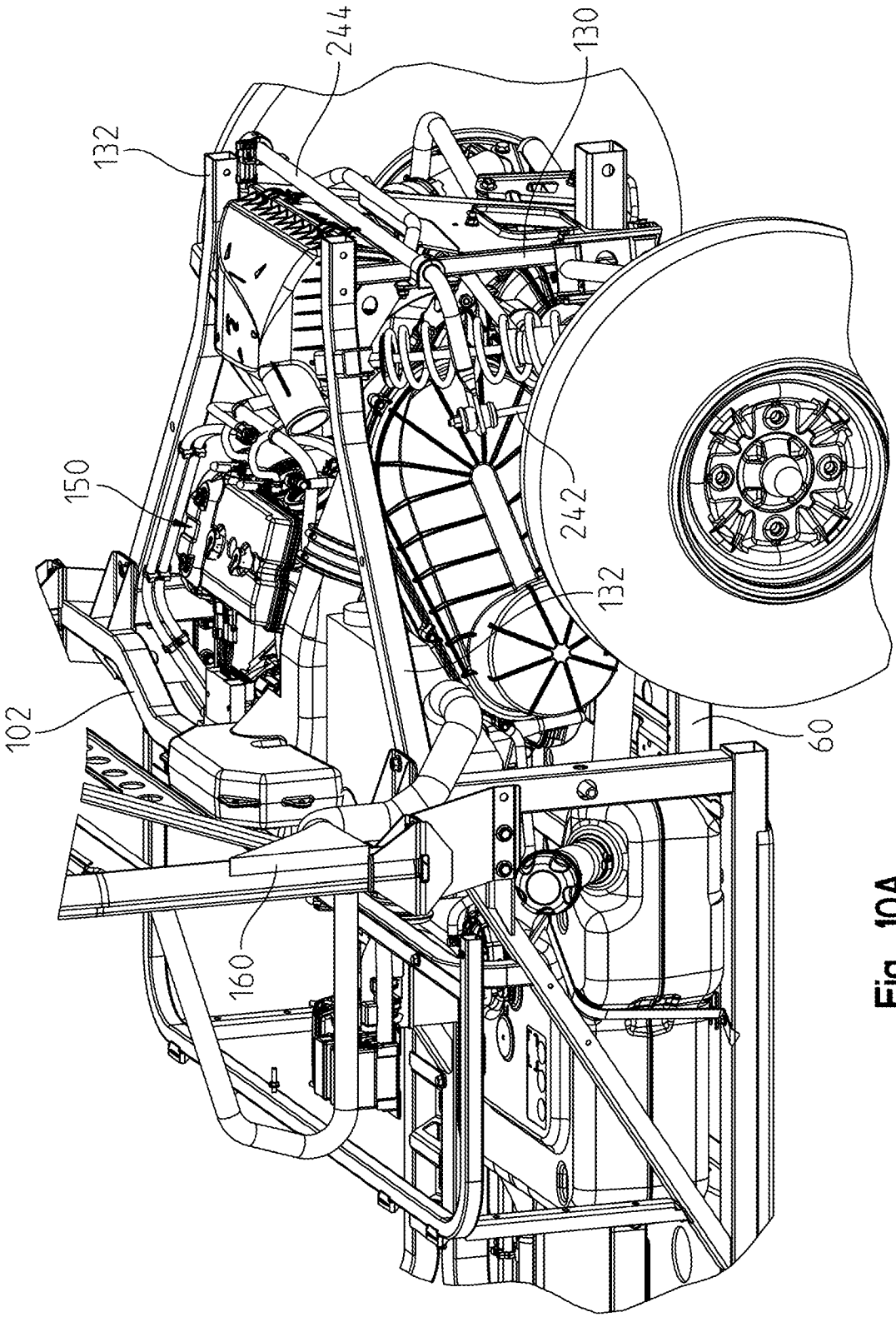

Fig. 10A

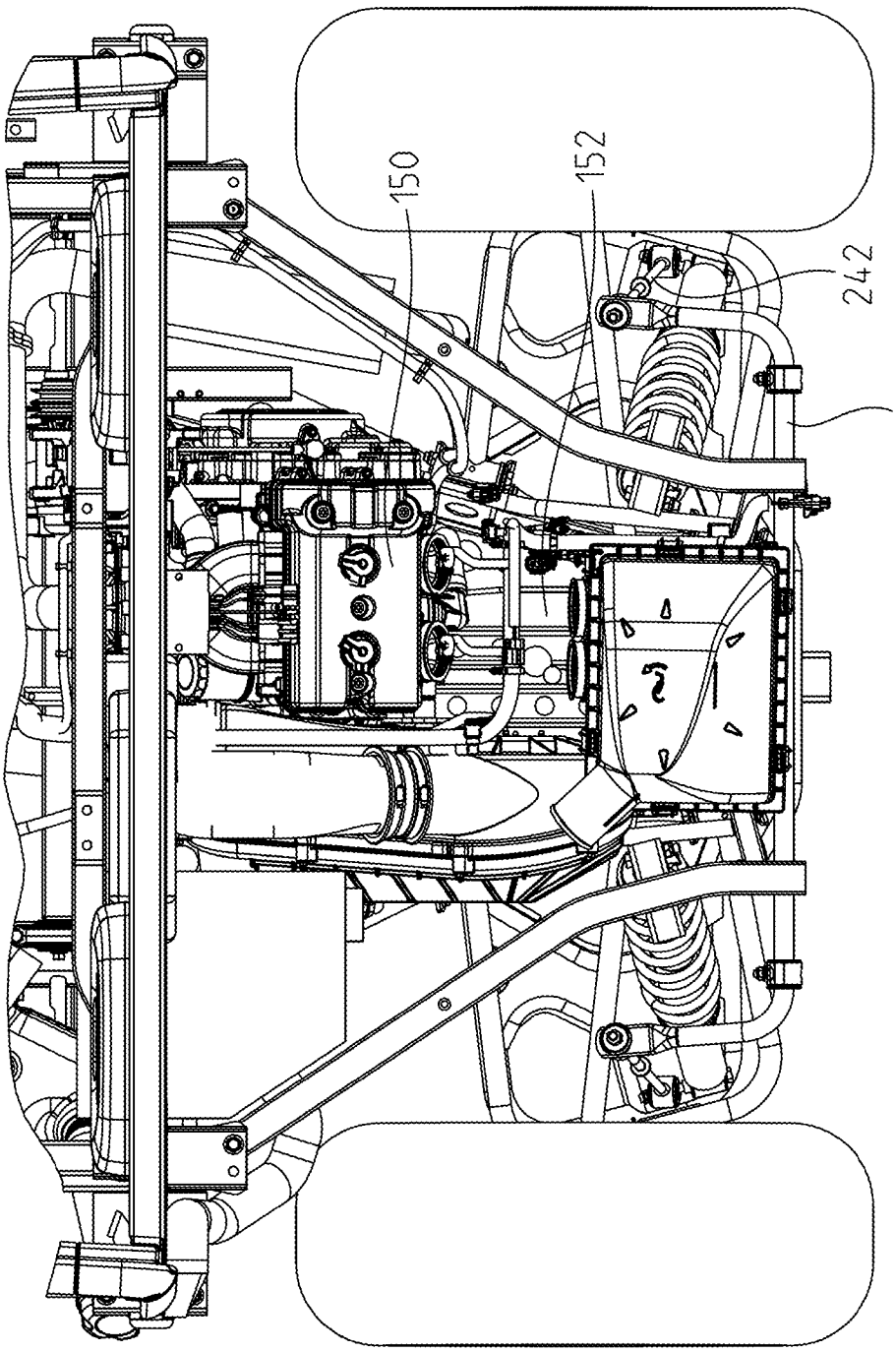

Fig. 10B

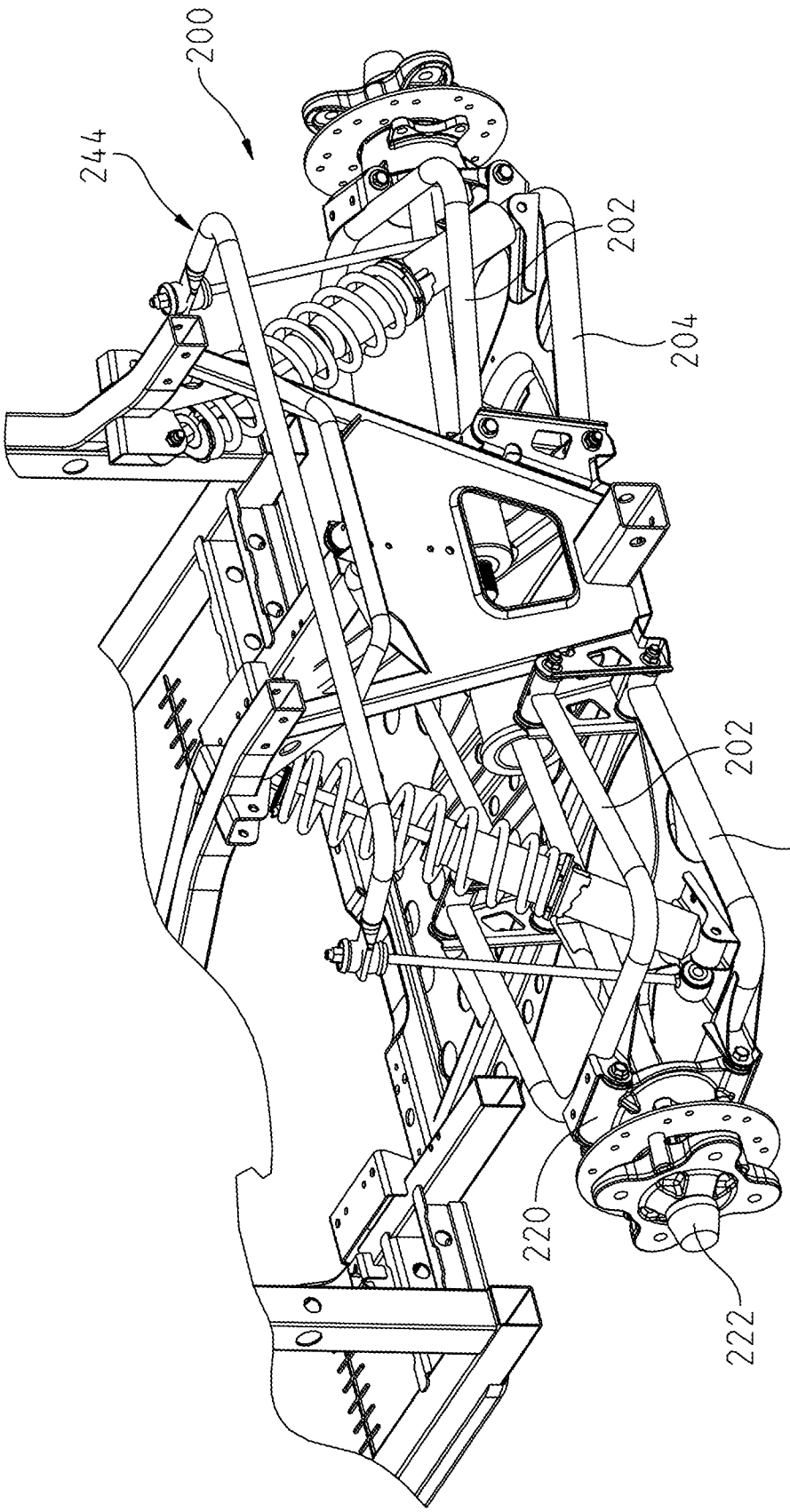

Fig. 11

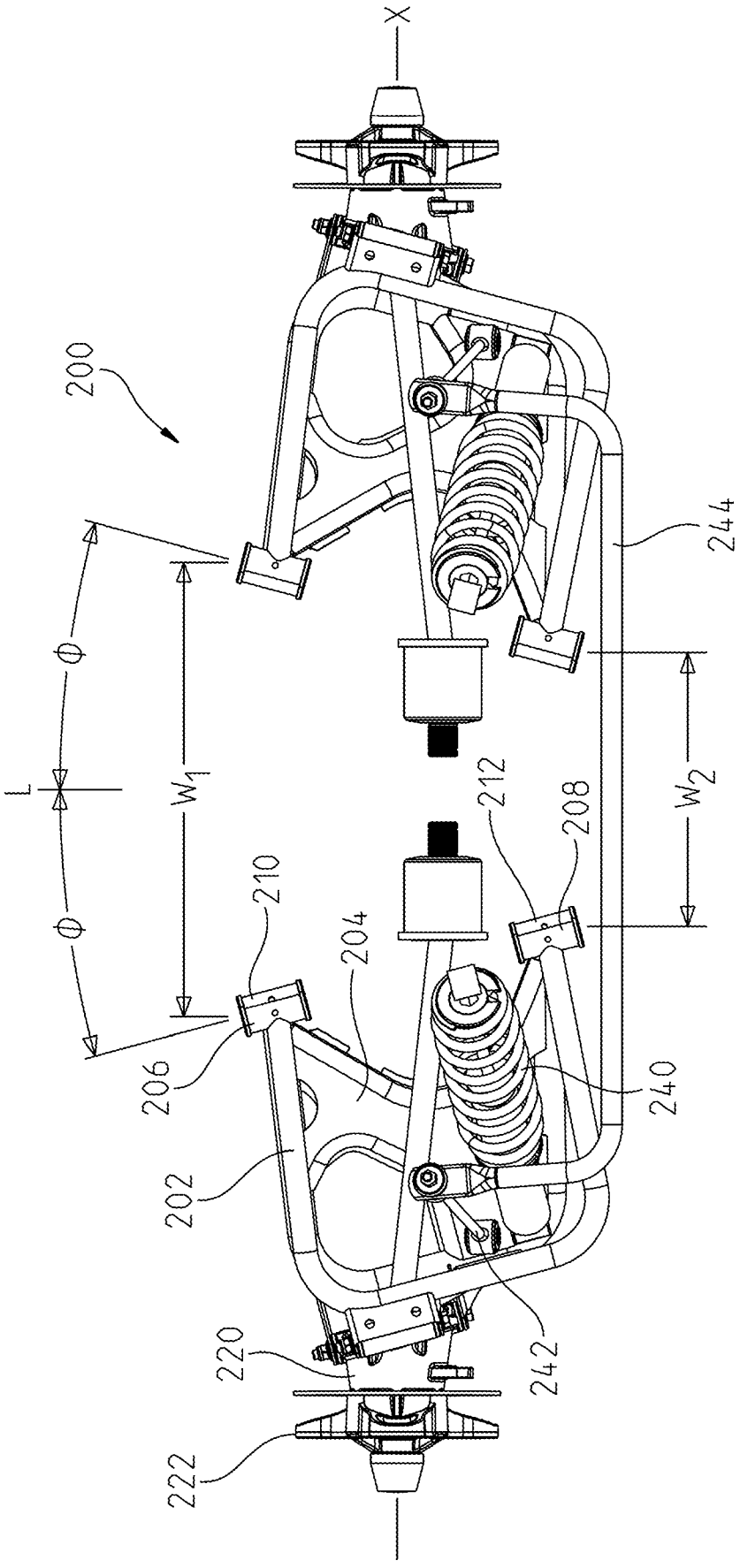

Fig. 12

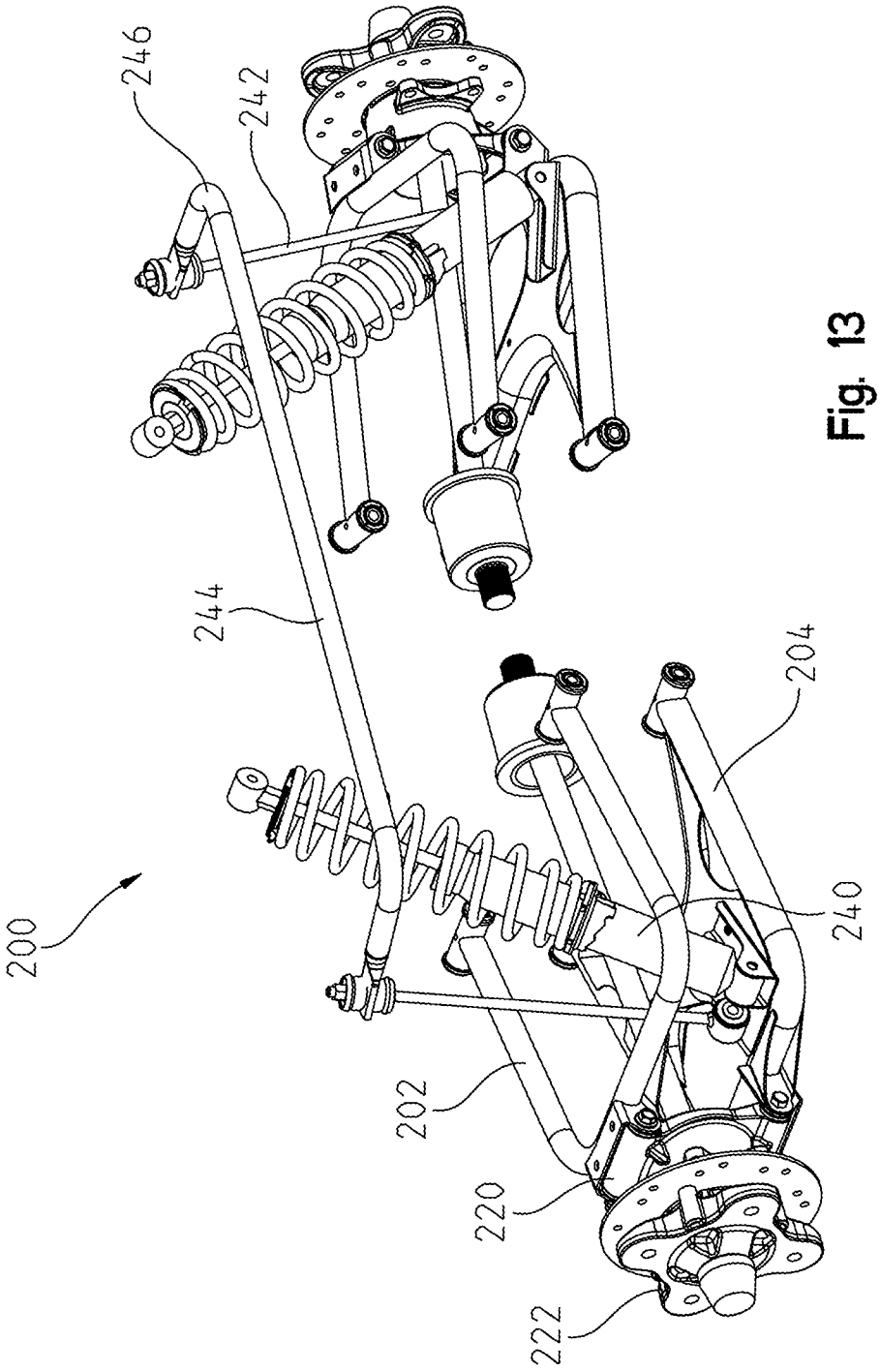

Fig. 13

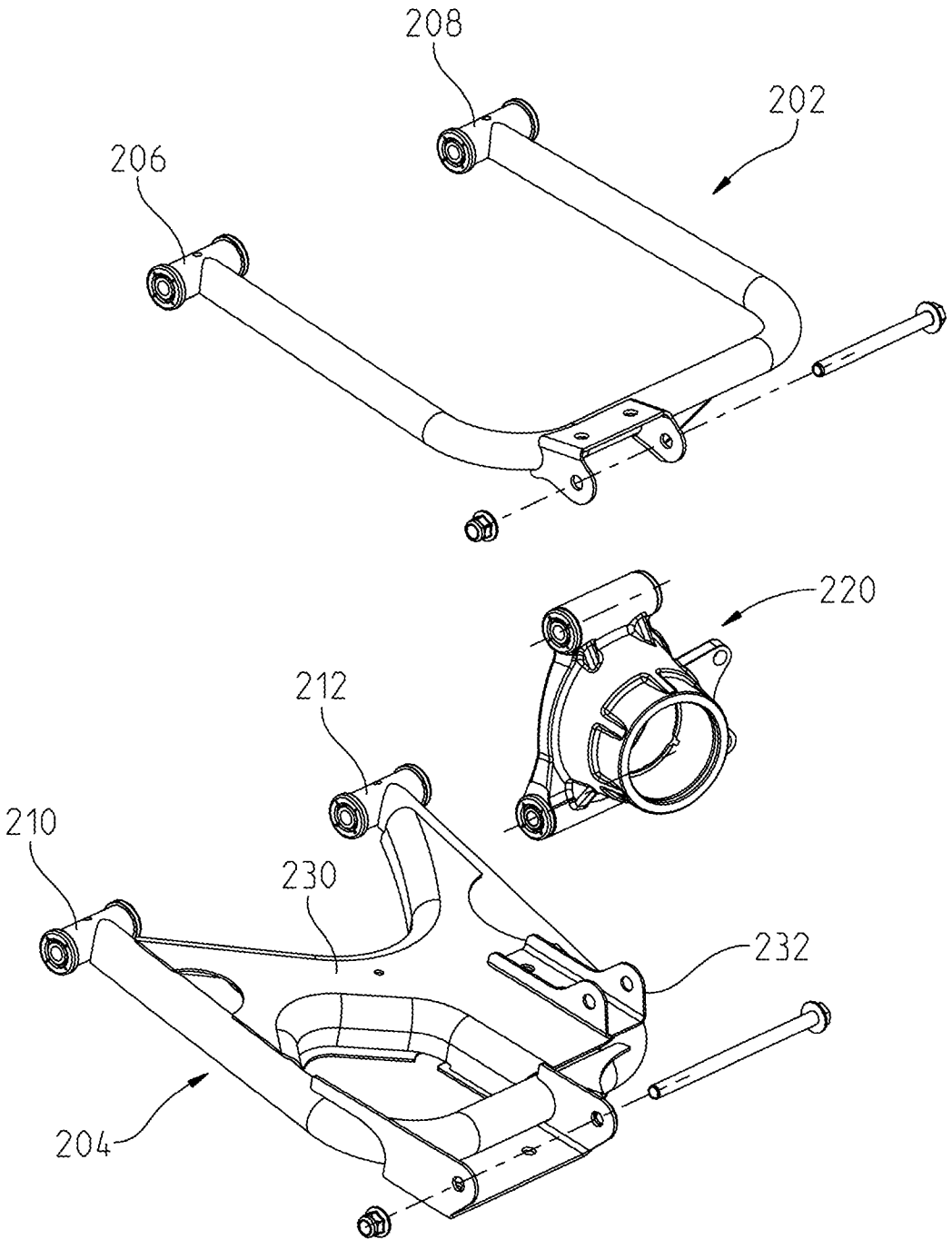

Fig. 14

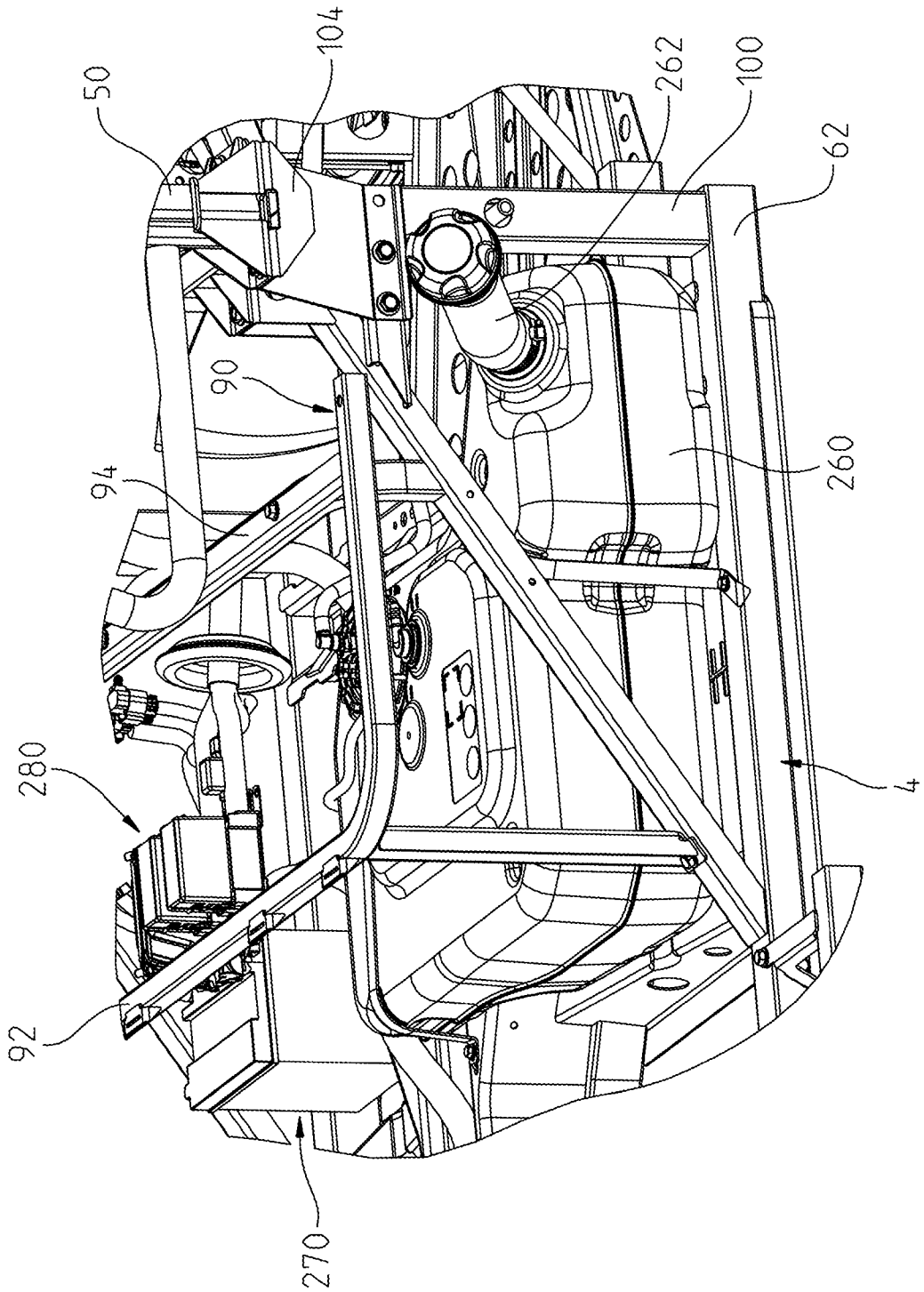

Fig. 15

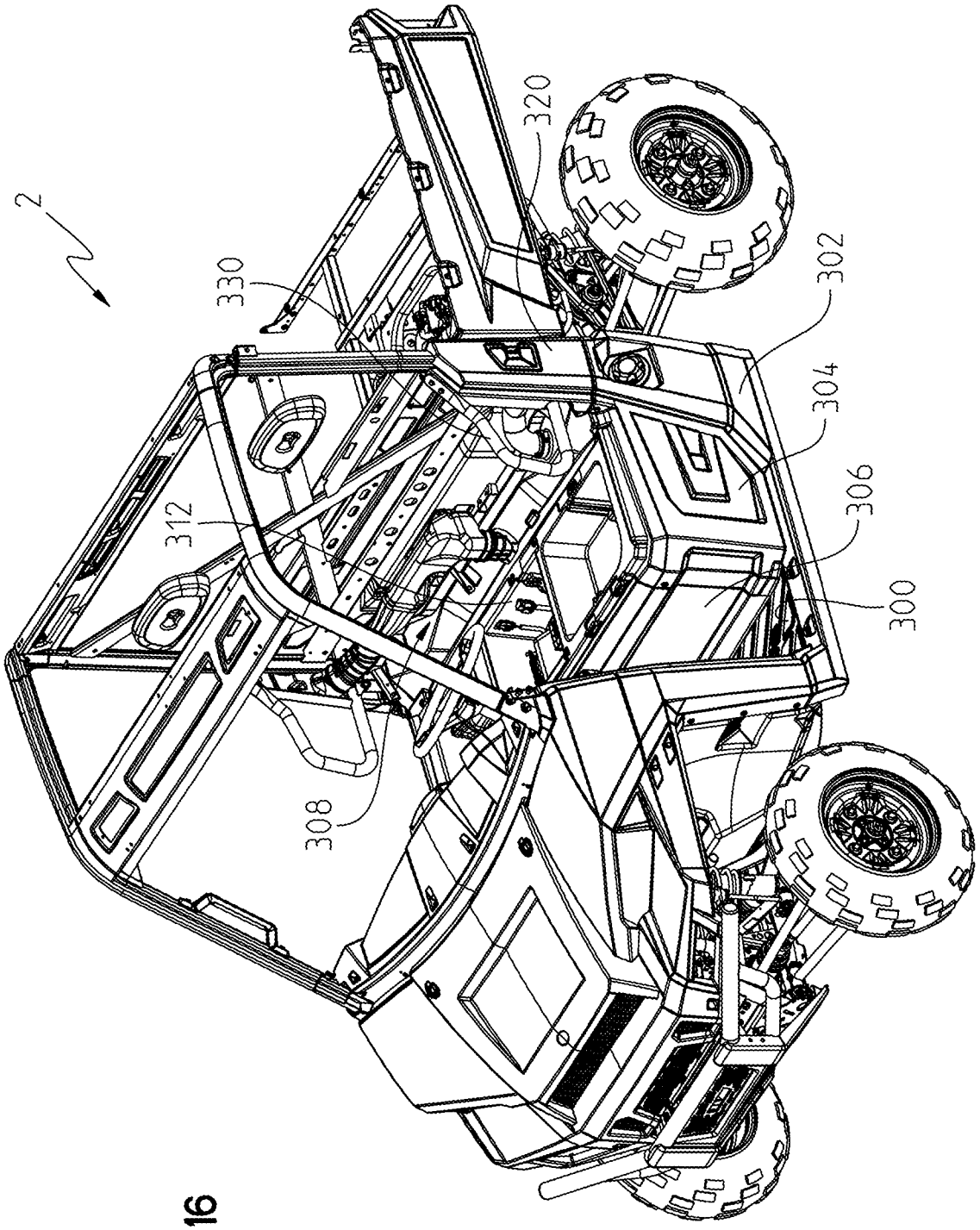

Fig. 16

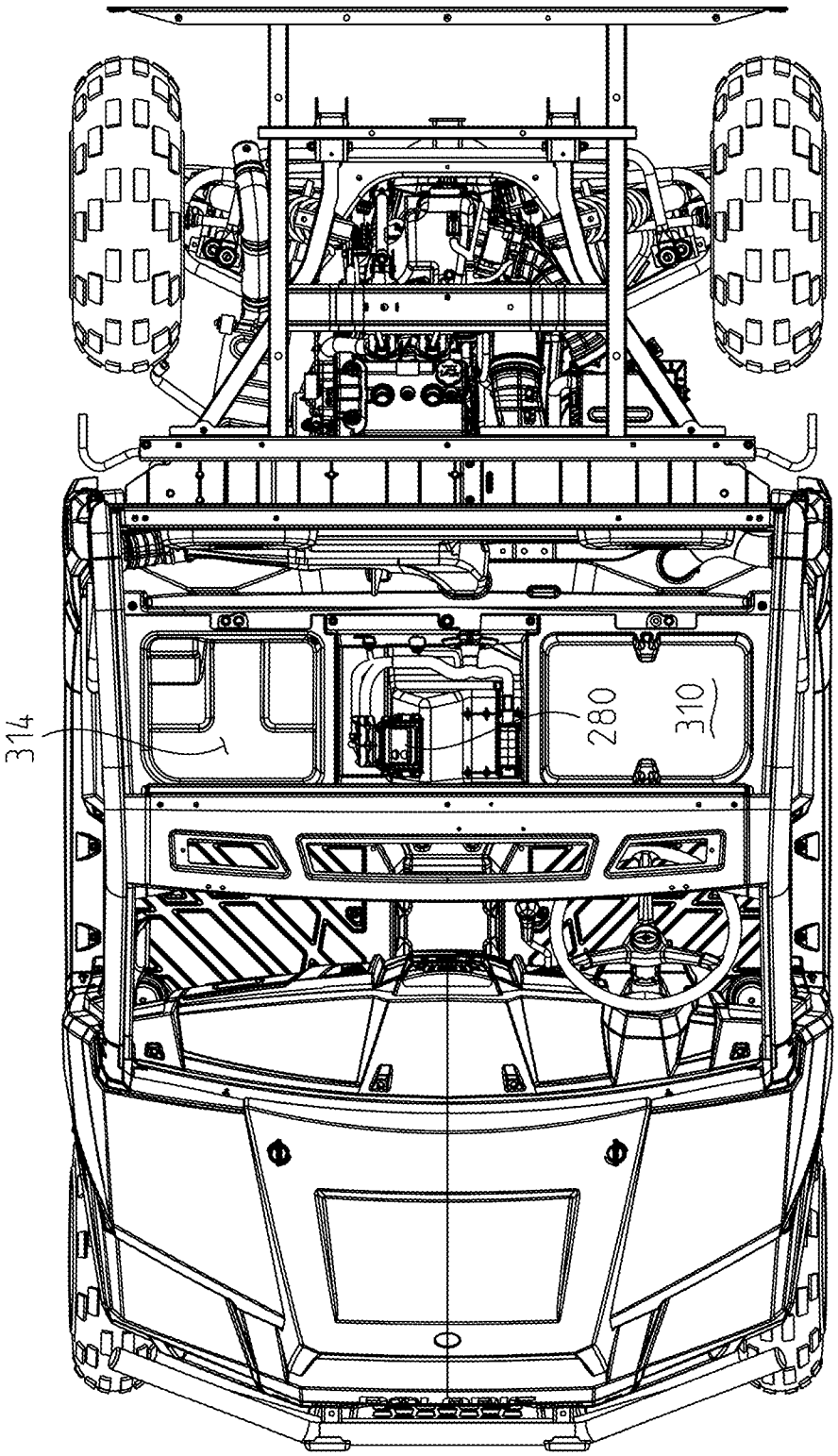

Fig. 17

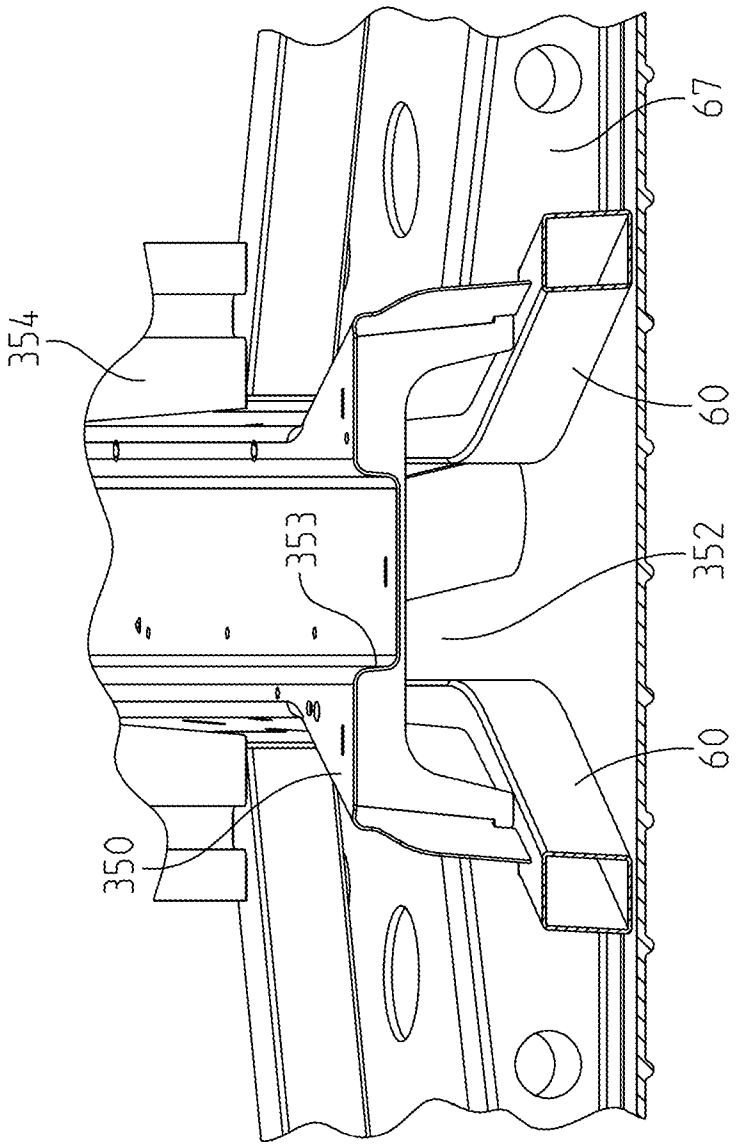

Fig. 18

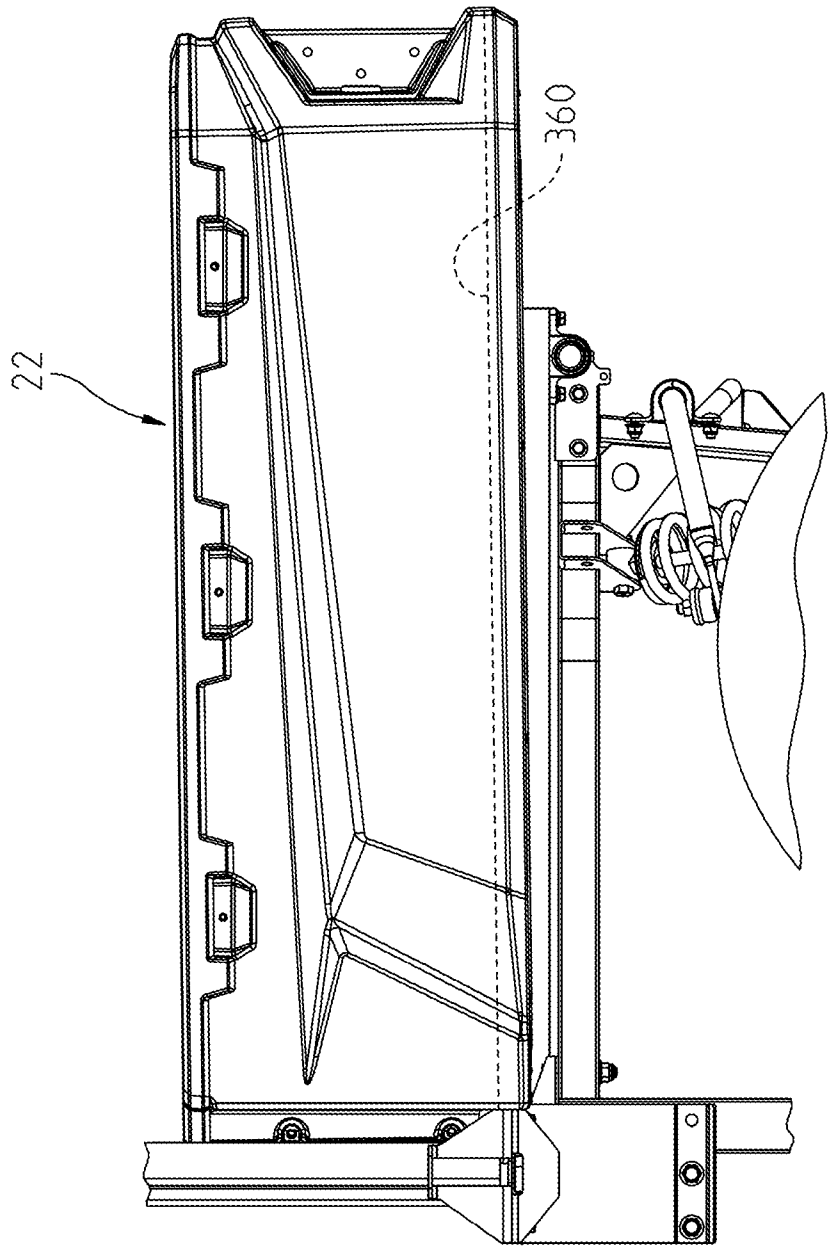

Fig. 19

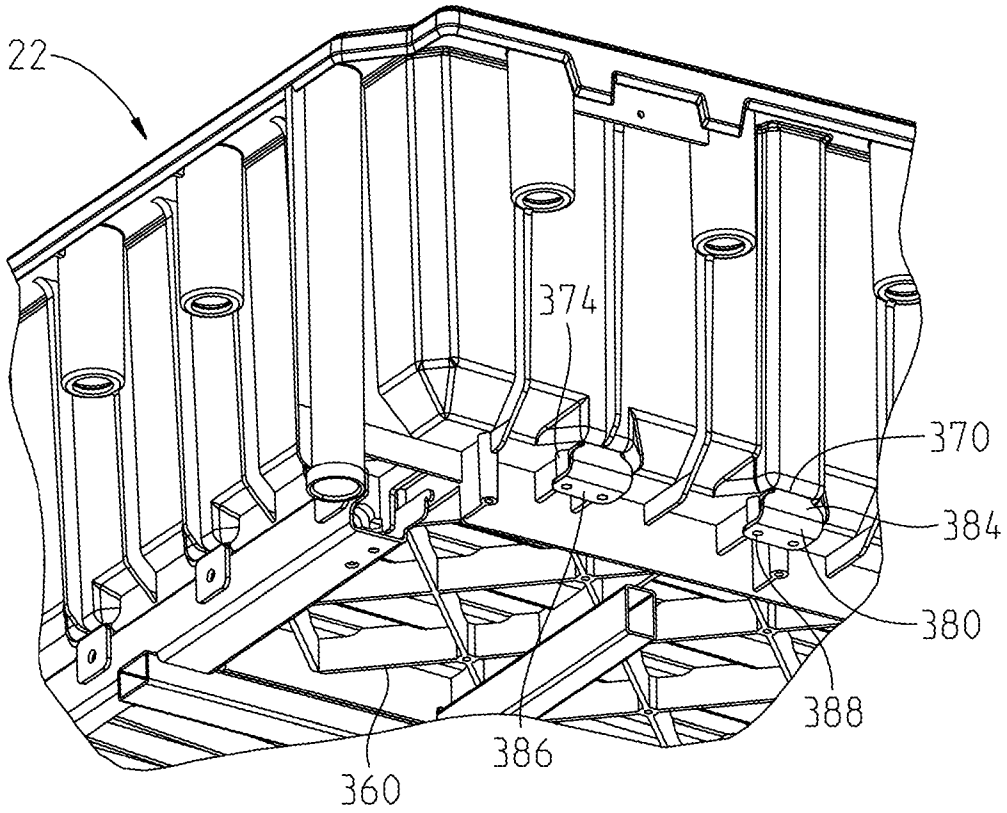

Fig. 20

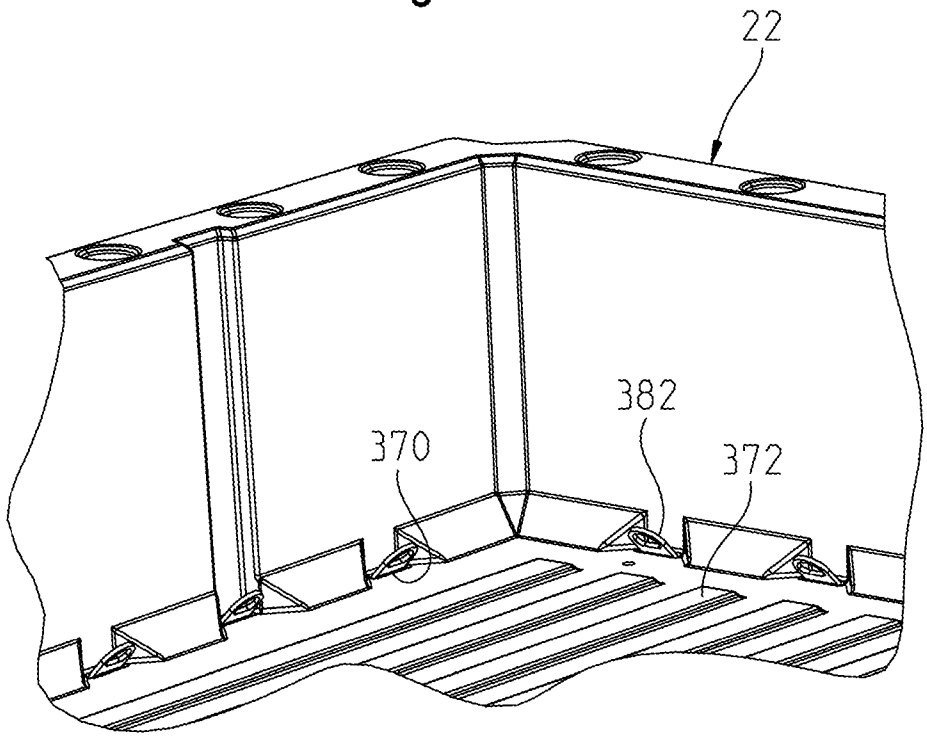

Fig. 21

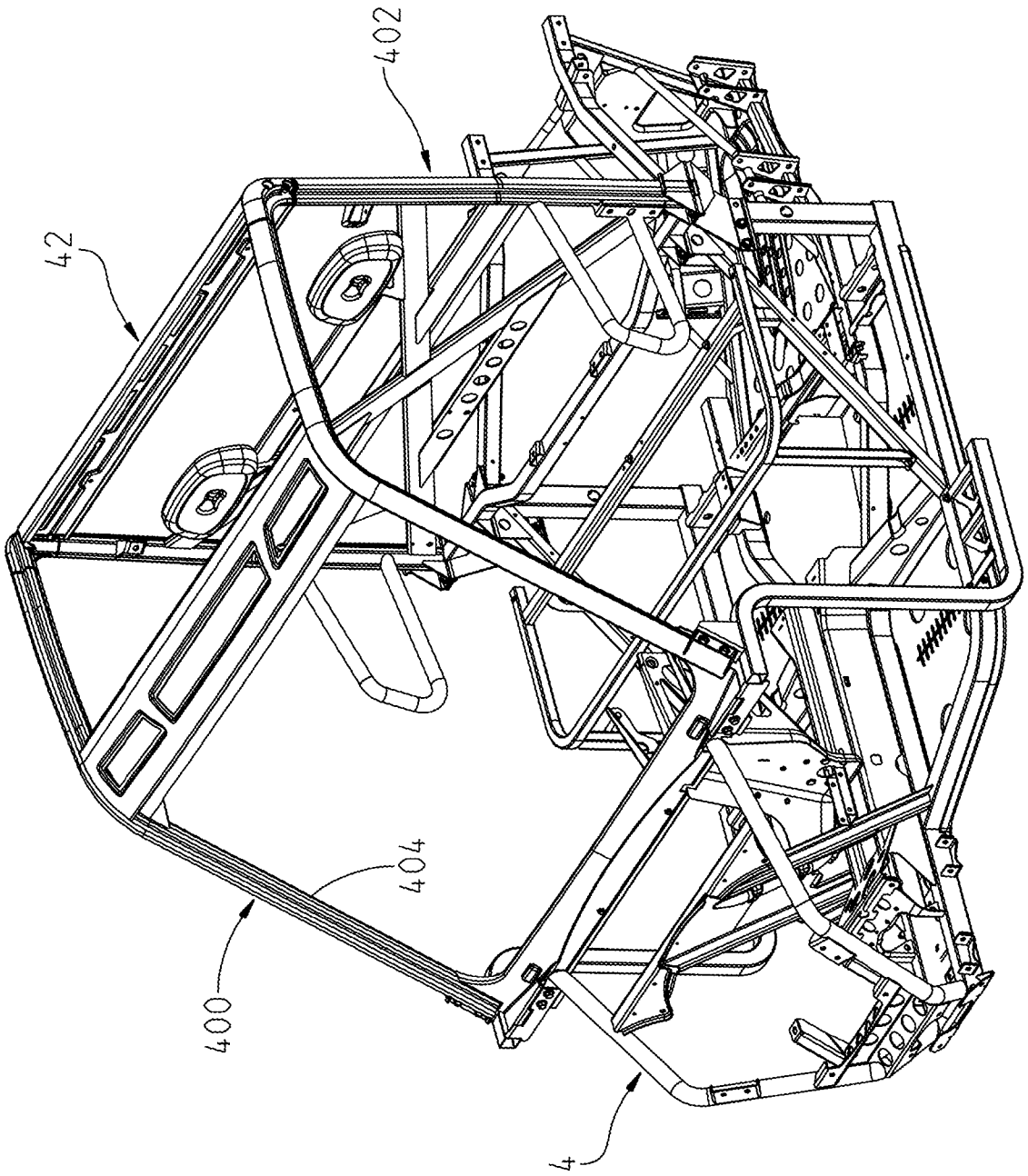

Fig. 22

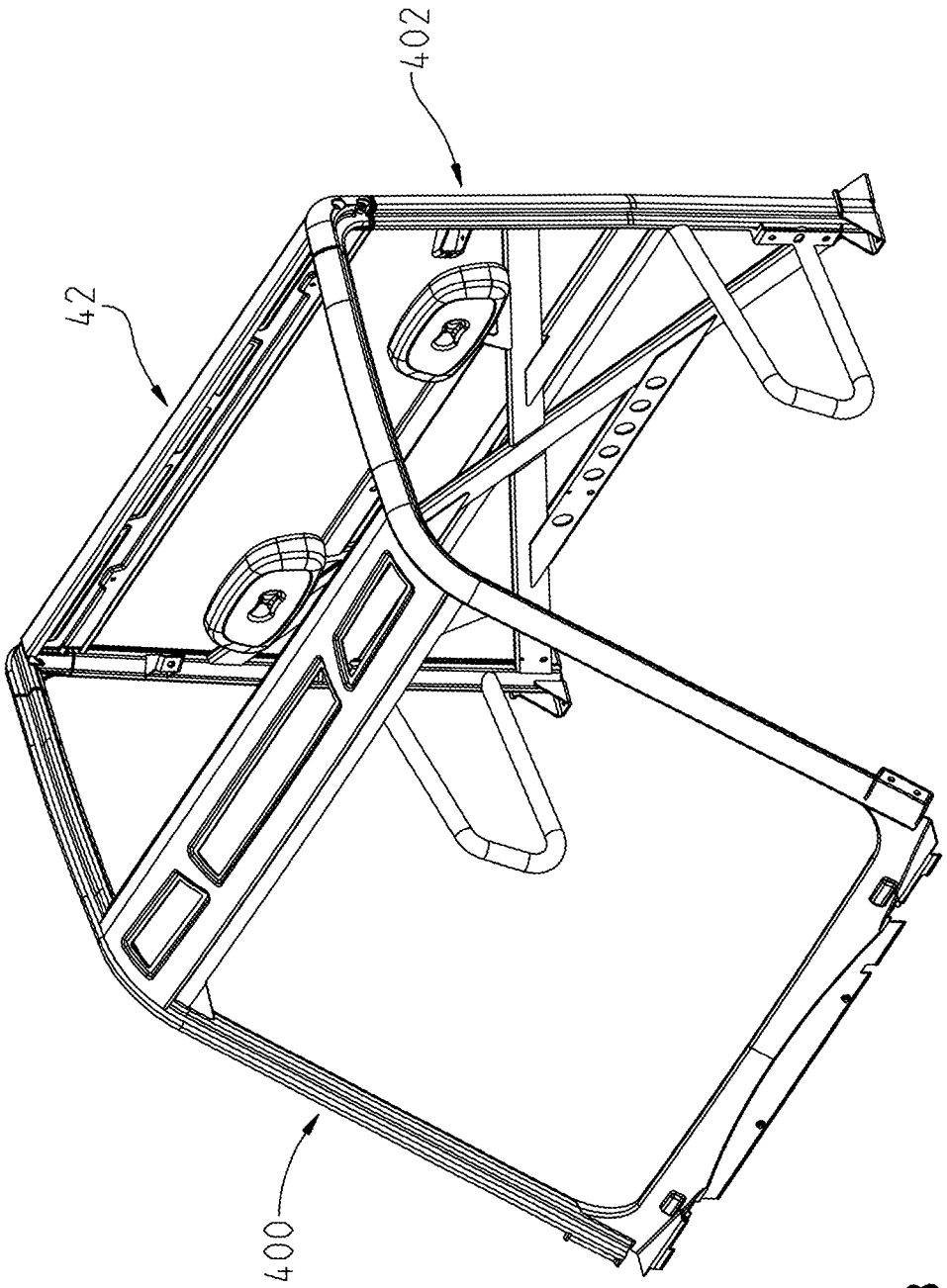

Fig. 23

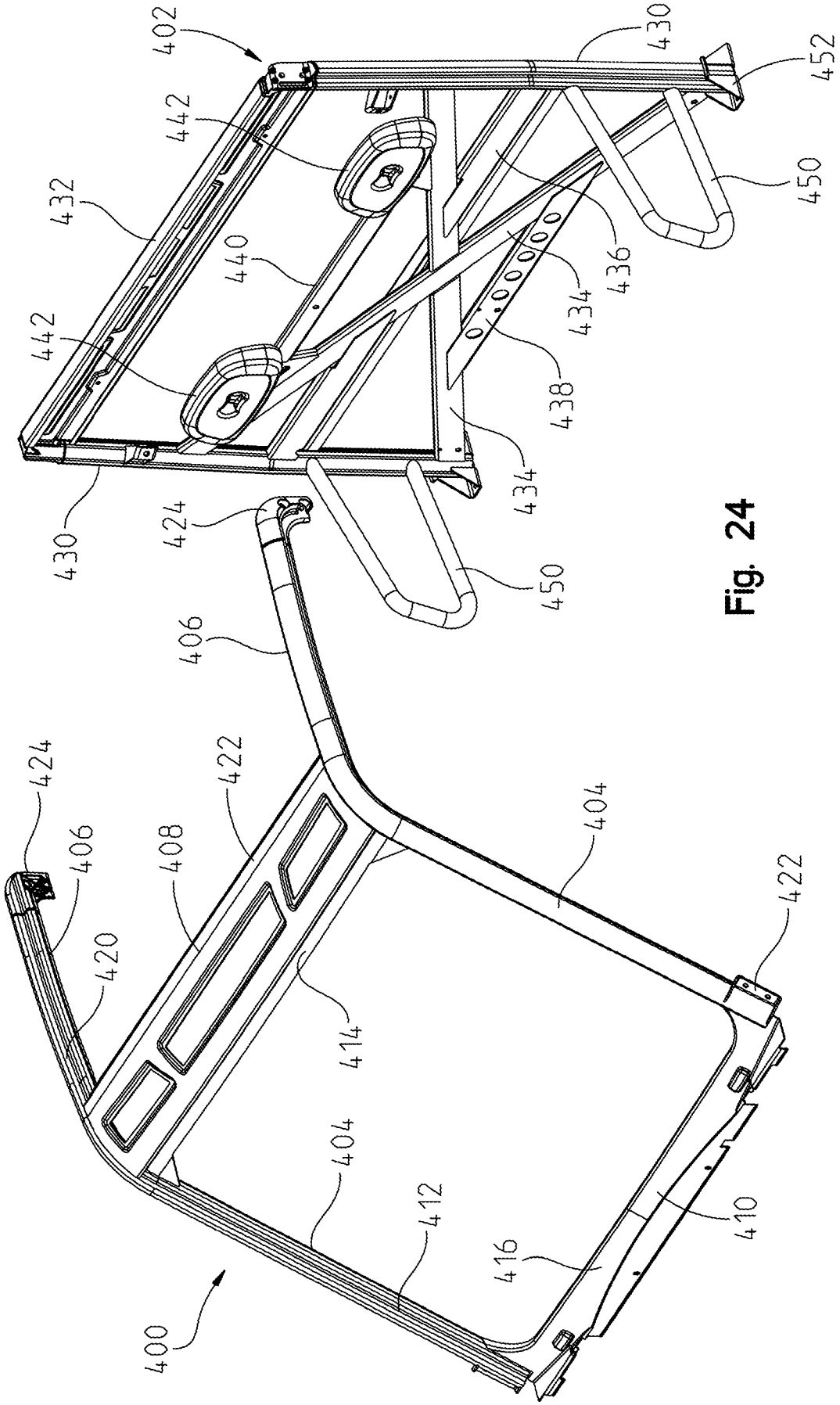
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Fig. 24

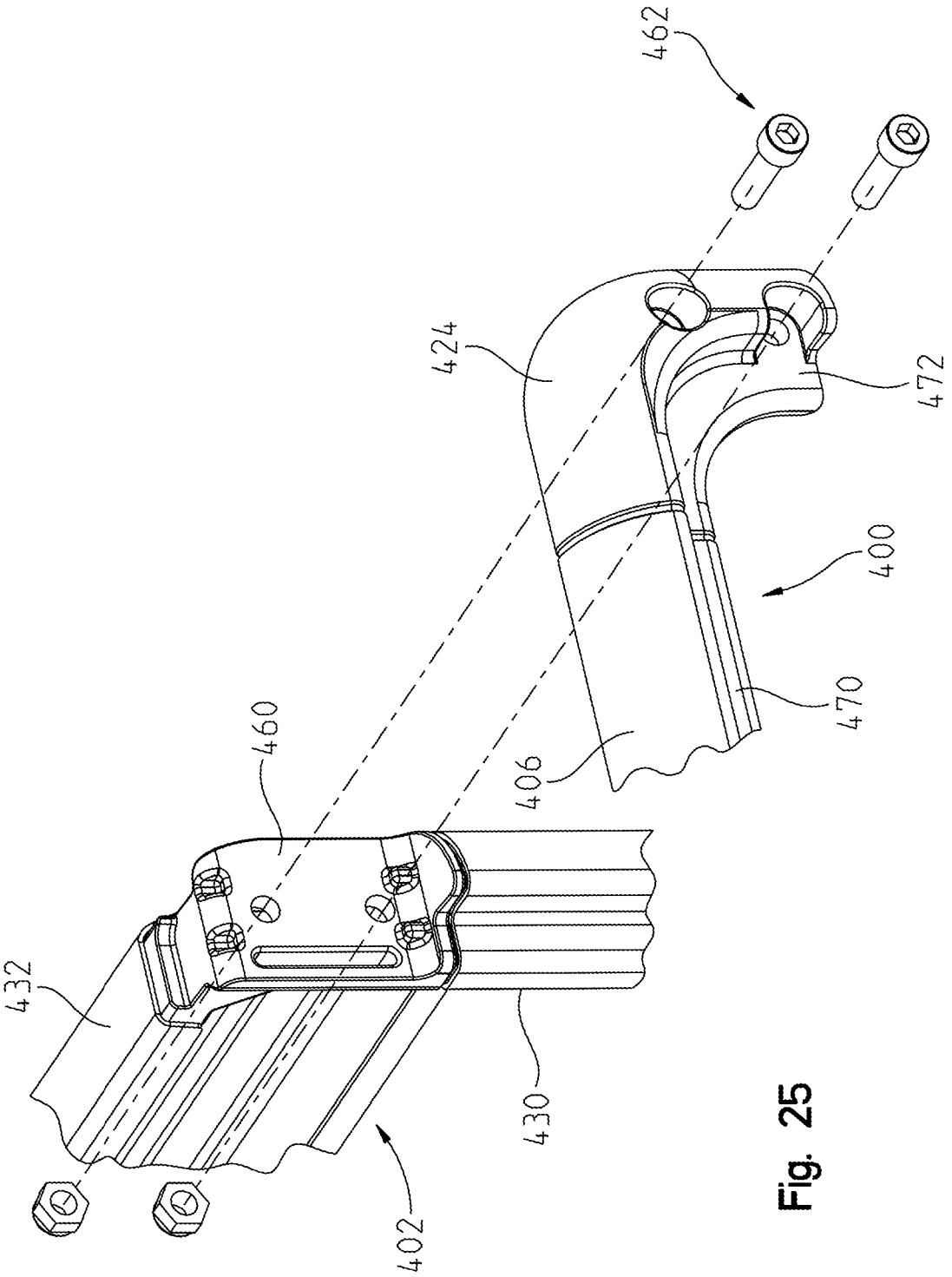

Fig. 25

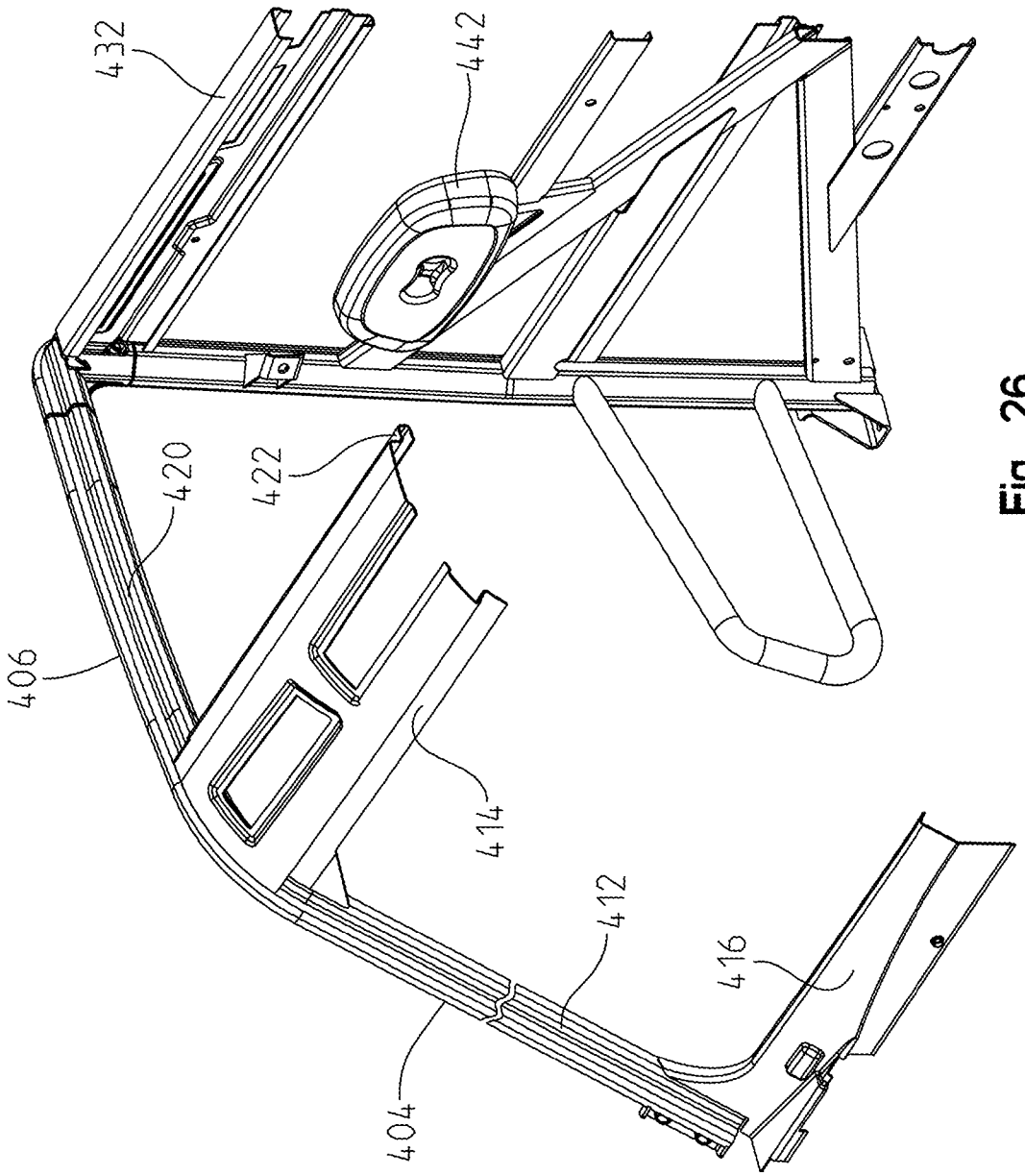

Fig. 26

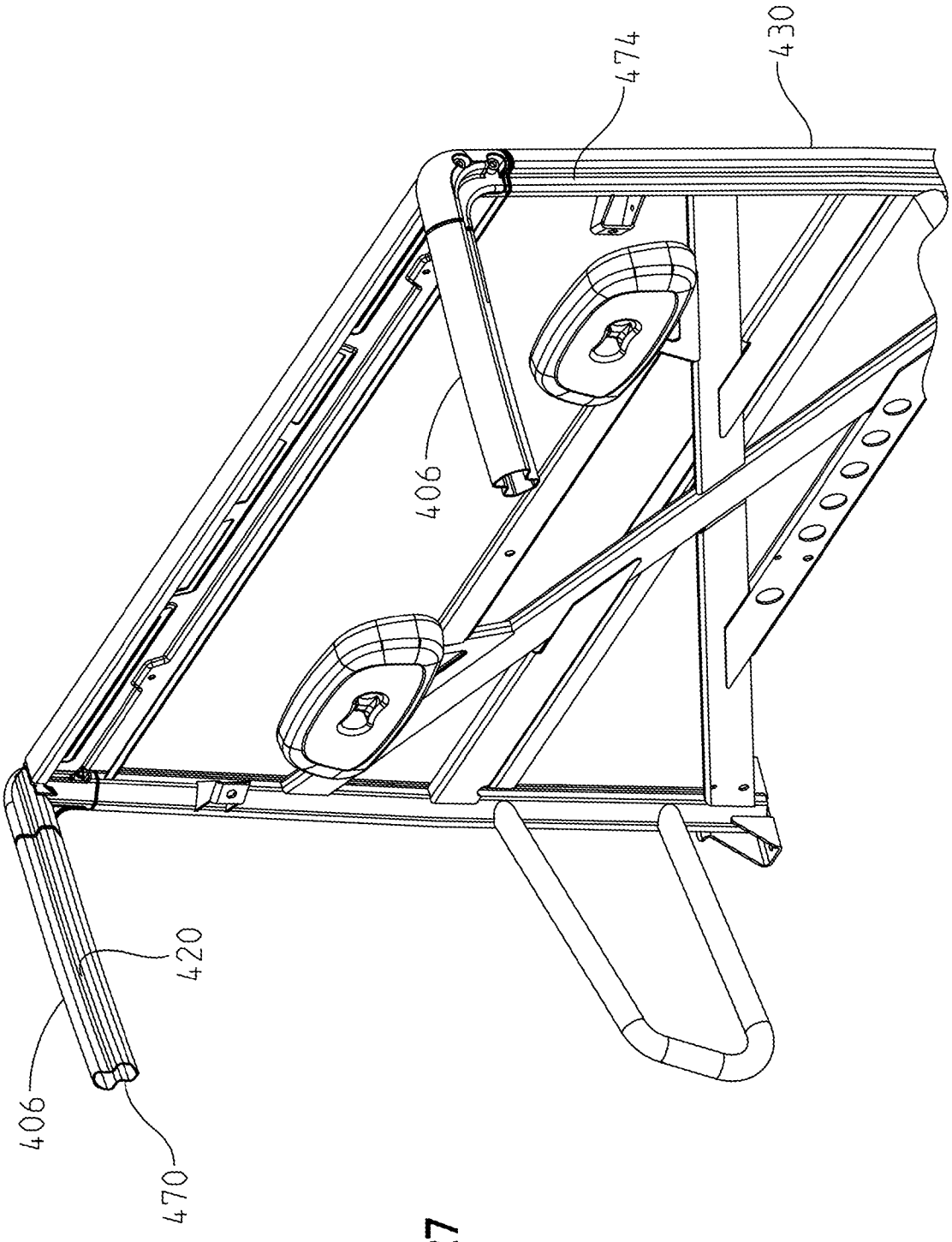

Fig. 27

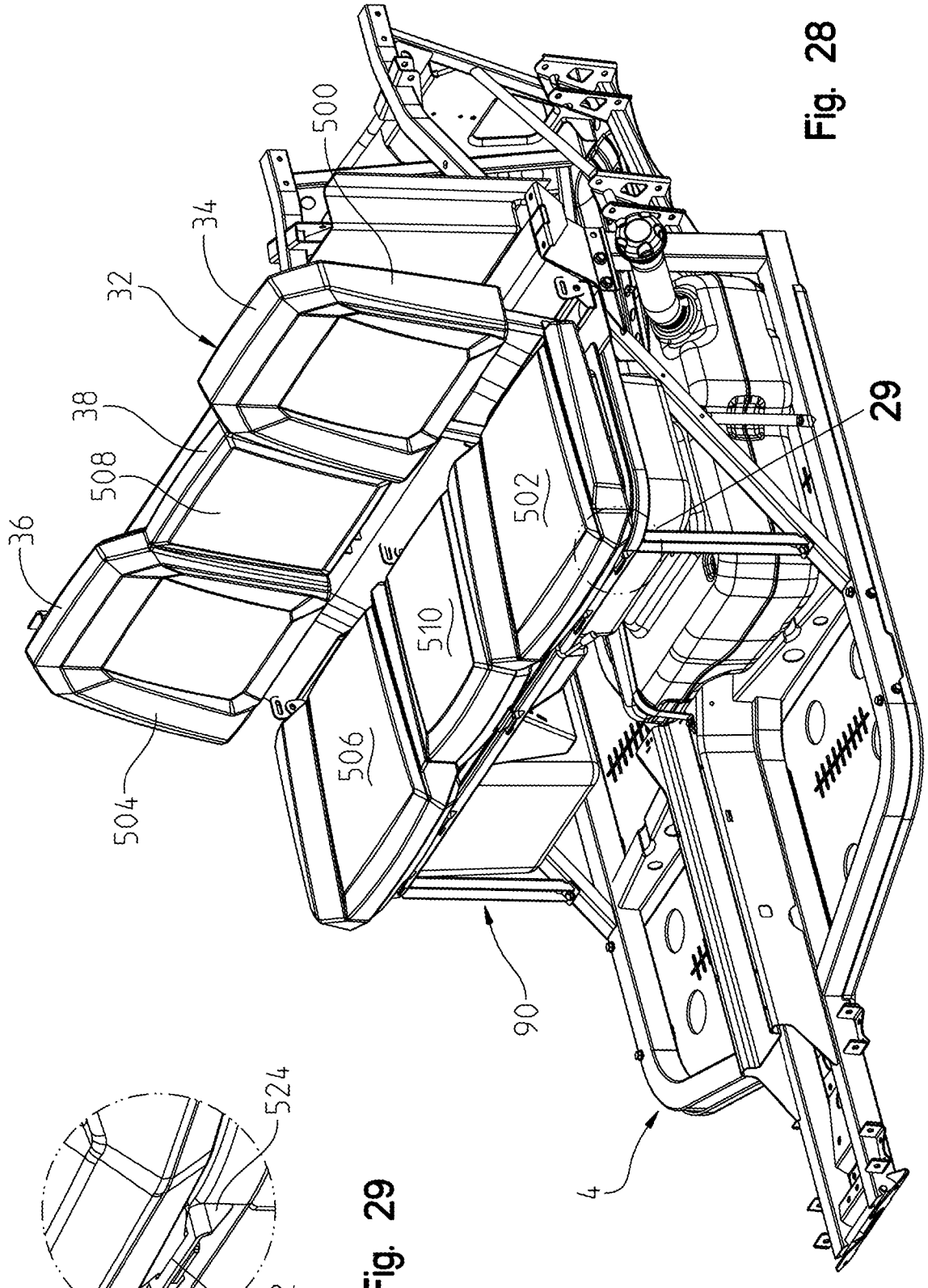

Fig. 28

Fig. 29

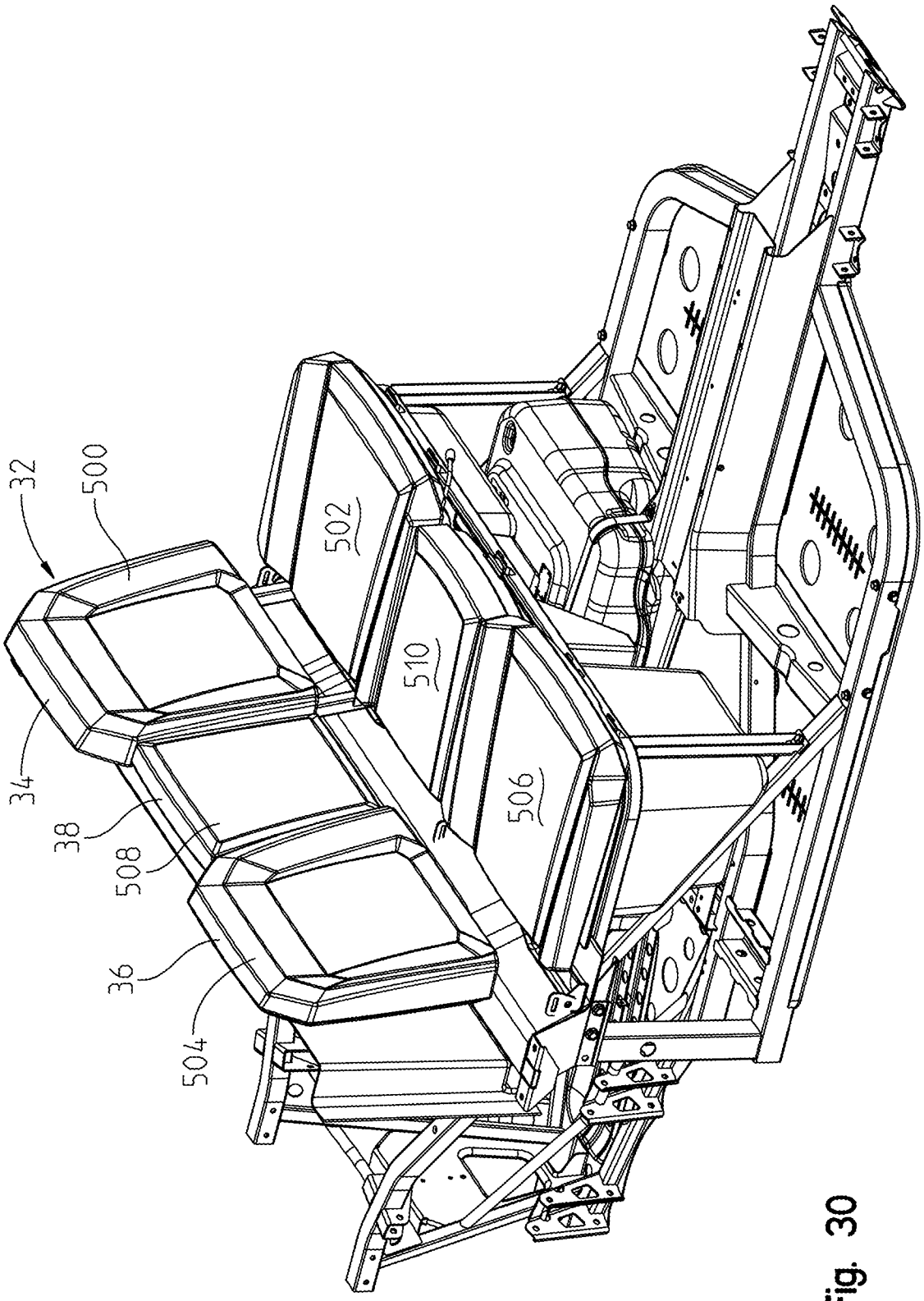

Fig. 30

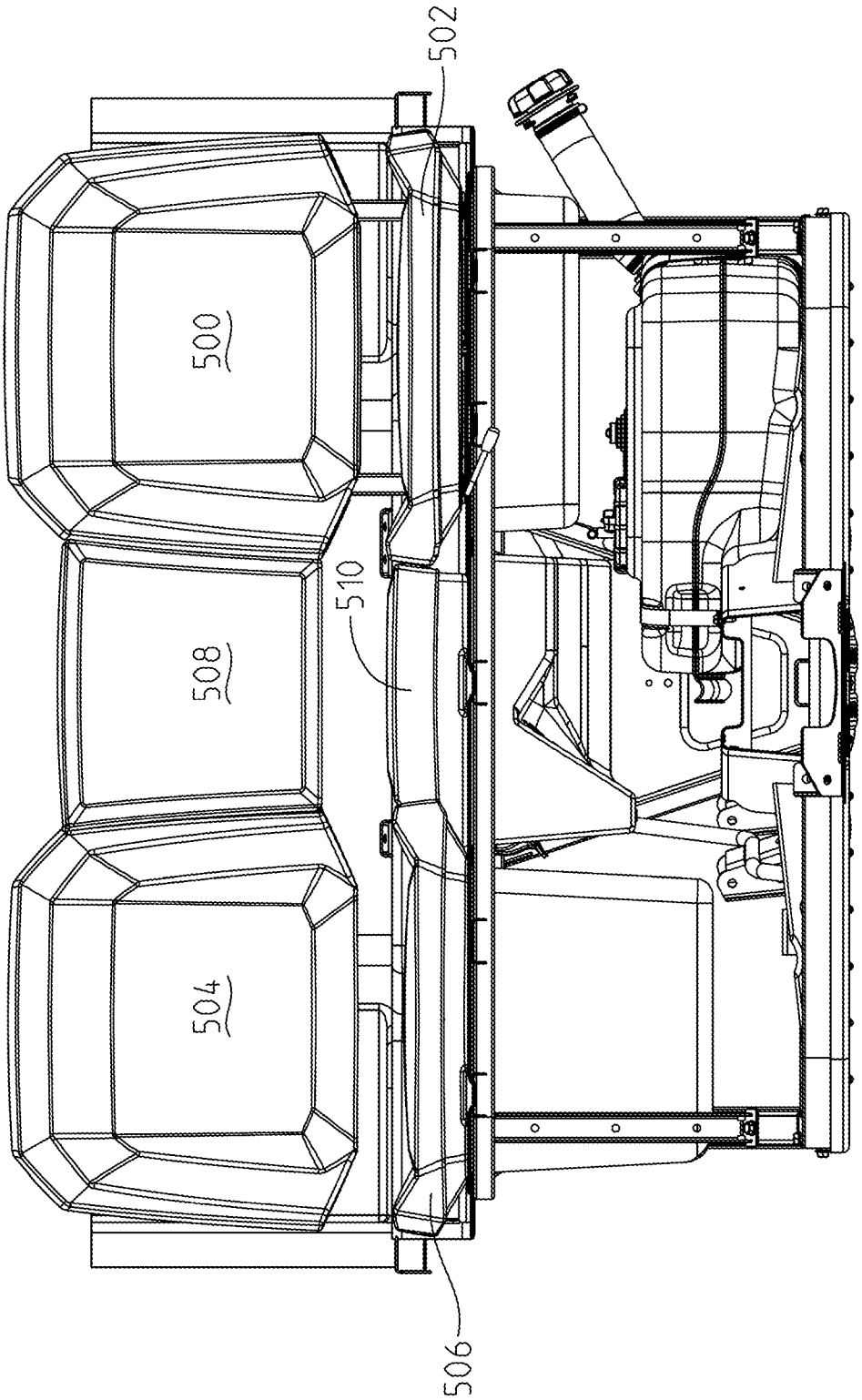

Fig. 31

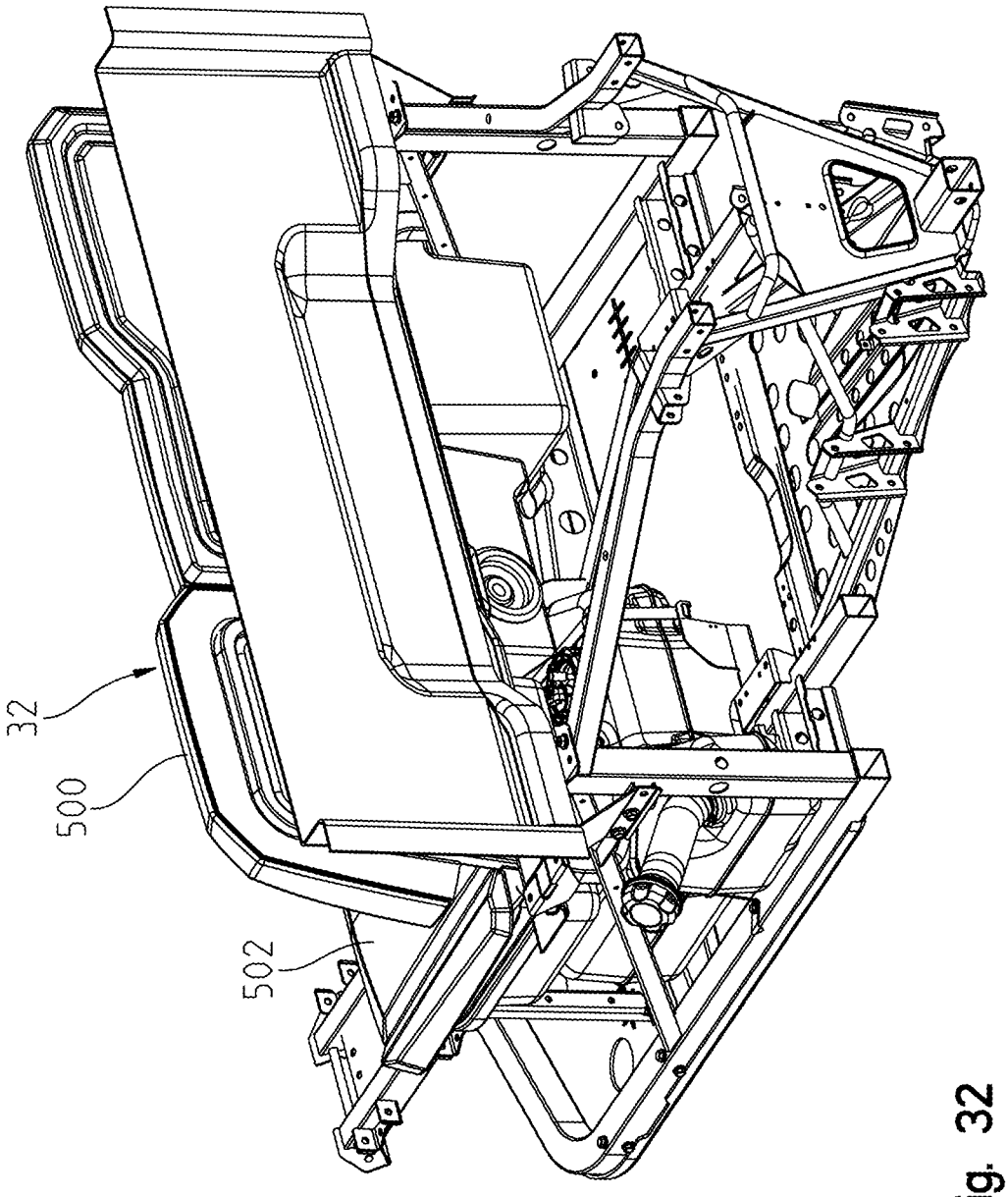

Fig. 32

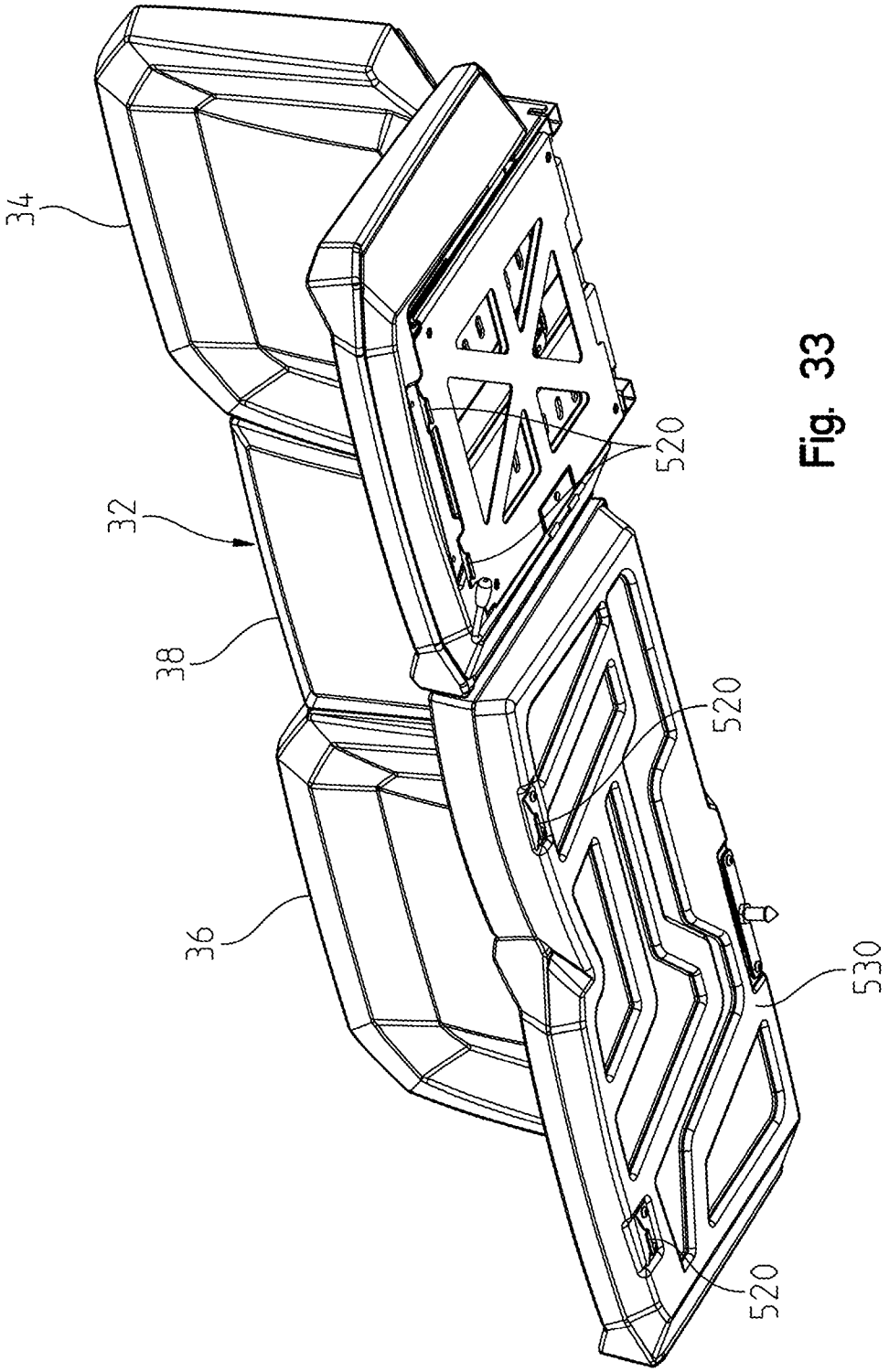

Fig. 33

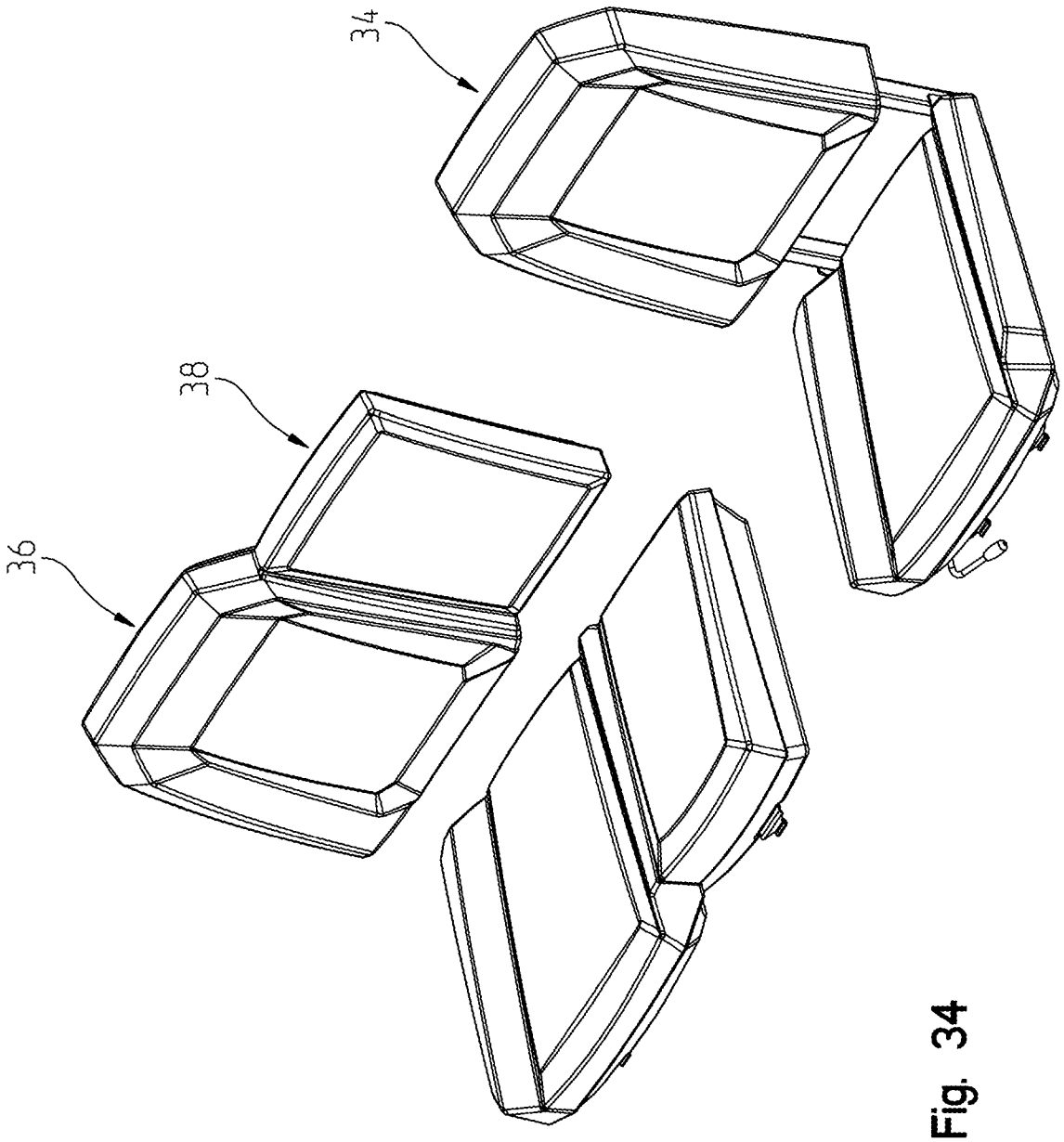

Fig. 34

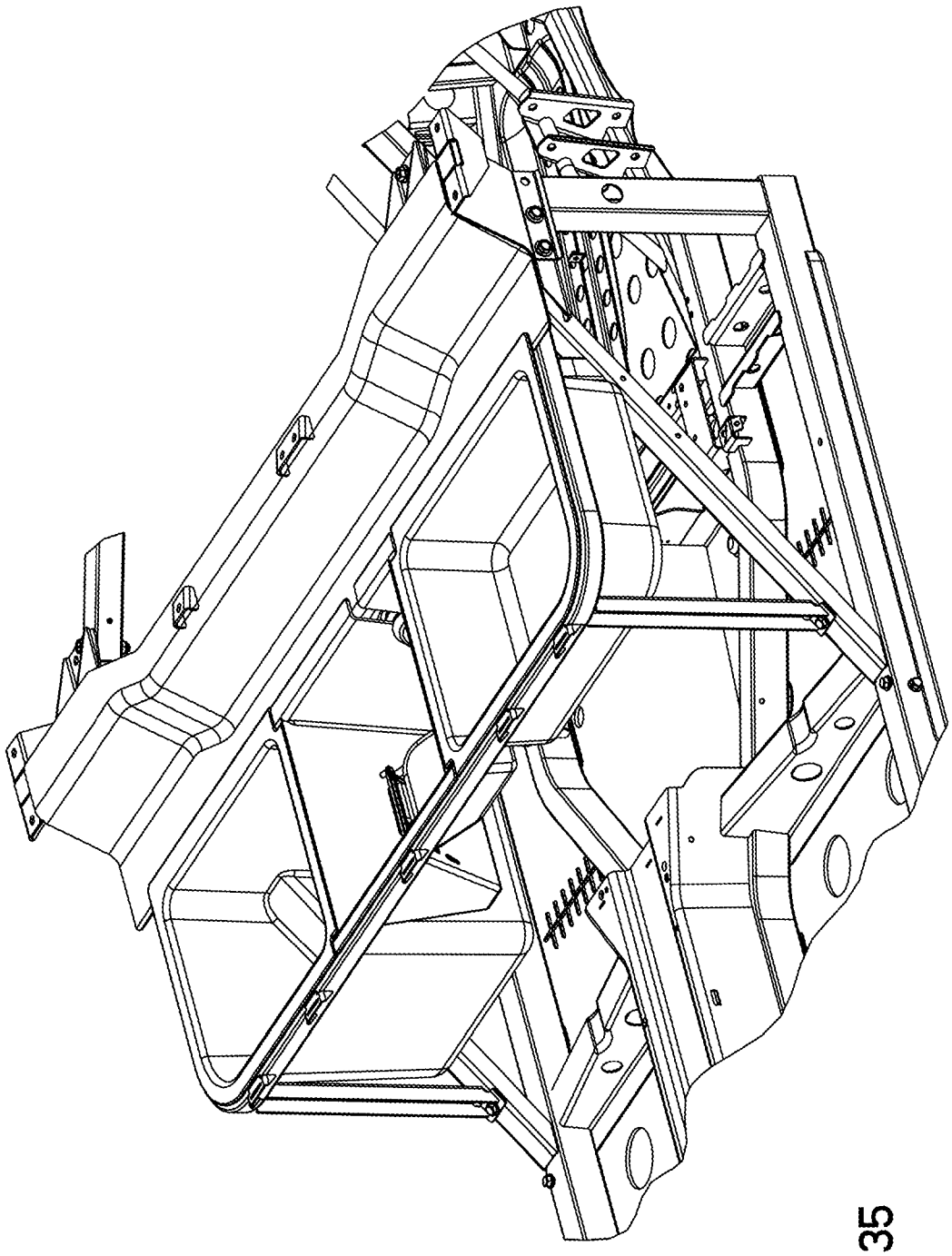

Fig. 35

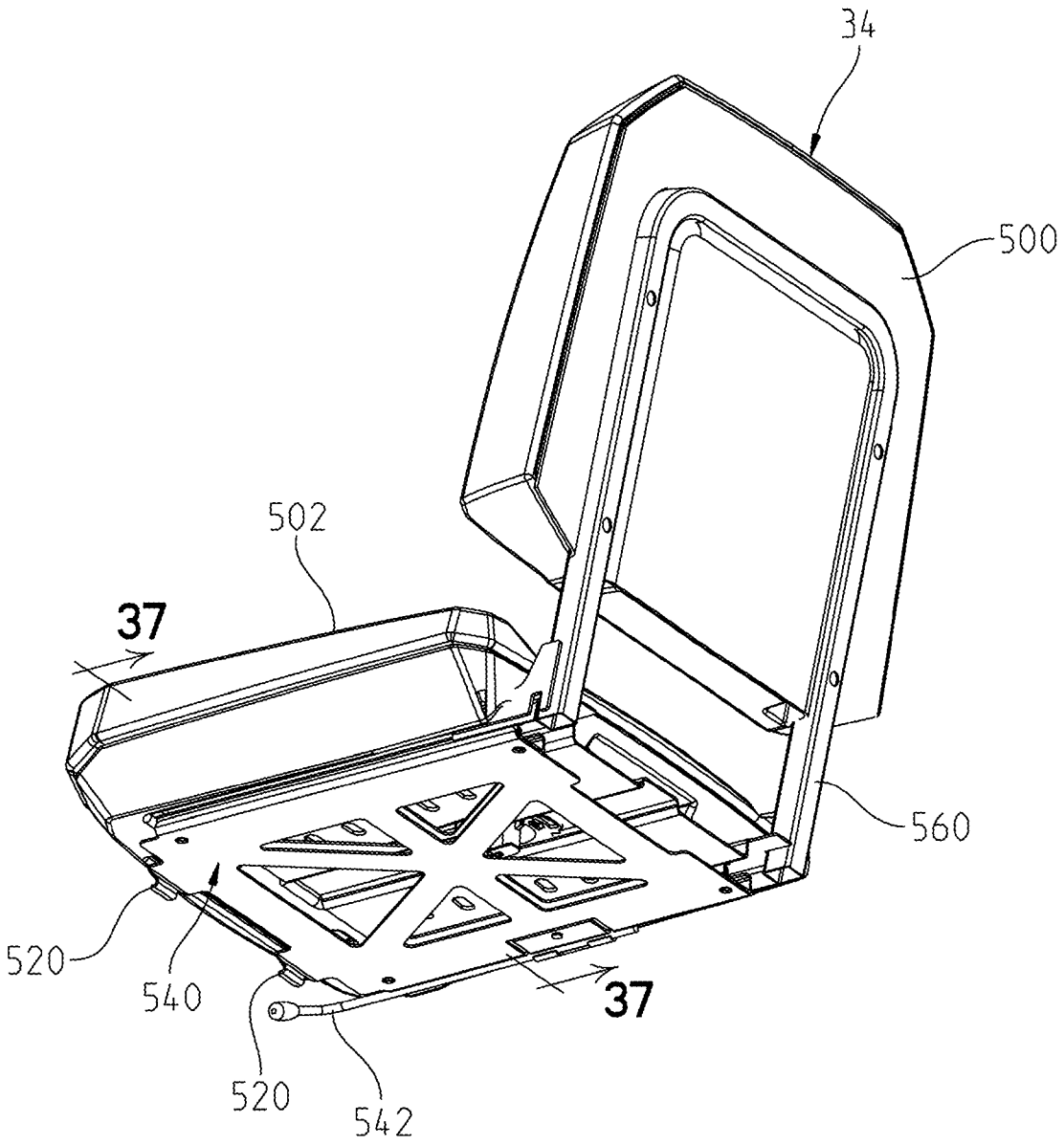

Fig. 36

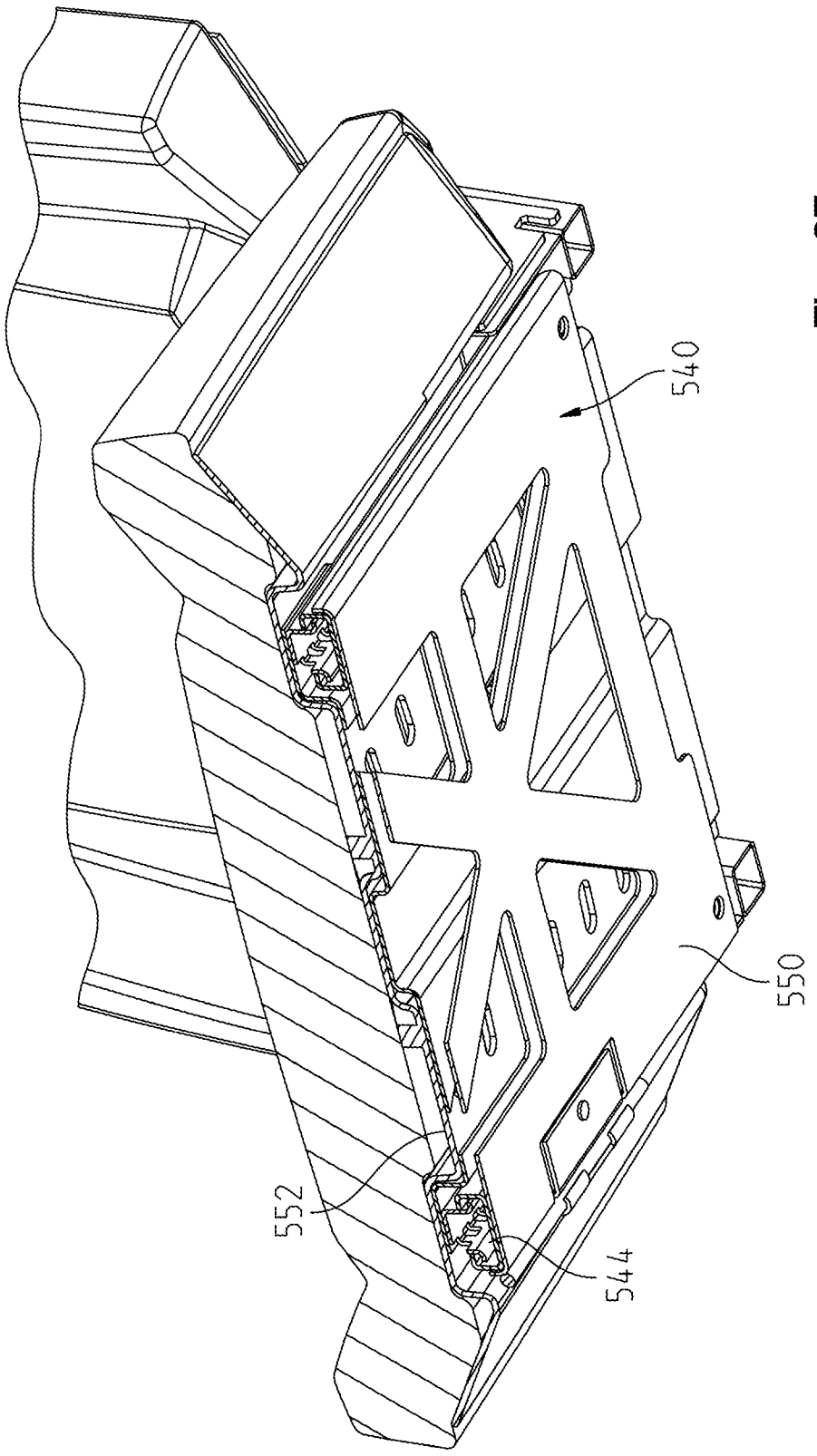

Fig. 37

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/024664

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60N2/10 B60R7/04 B60G3/20 B60G7/00 B60G7/02
B62D21/18 B62D23/00 B62D33/027 B60P7/08
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60N B60R B60G B62D B60P

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 7 819 220 B2 (SUNSDAHL RICHARD LARRY [US] ET AL) 26 October 2010 (2010-10-26) cited in the application column 3, lines 50,51; figures 2,5,9,14,20,25 column 4, lines 3-5 column 4, lines 40-43 column 5, lines 13-37 column 7, lines 59-63	1-10, 29-31, 33-43 11-16, 18-28, 32,49, 52-54
Y	US 3 422 918 A (MUSSER JAMES G JR ET AL) 21 January 1969 (1969-01-21) column 2, lines 9-27; figures 1,3	14-16, 18-28,49
X A	DE 37 435 C (BENZ AND CO [DE]) 2 November 1886 (1886-11-02) figure 1	1,4,5,8 39,52

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 June 2012	06/07/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Sleightholme-Albanis

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/024664

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 817 985 A (ENOKIMOTO AKITO [JP] ET AL) 4 April 1989 (1989-04-04) column 2, lines 16-23,46-52; figures 1,5-7 column 3, line 50 - column 4, line 5	14-16, 18-28
X Y A	US 4 650 210 A (HIROSE TAKEO [JP] ET AL) 17 March 1987 (1987-03-17) column 3, line 53 - column 4, line 19; figures 1,2,5	14-16, 18-28 32 46-49
X Y	US 2010/314184 A1 (STENBERG KURT E [US] ET AL) 16 December 2010 (2010-12-16) cited in the application paragraphs [0035], [0048]; claims 44,45; figures 6B,7,8	44-48, 50,51 11-13, 49,52-54
X	US 2001/031185 A1 (SWENSEN FREDERICK B [US]) 18 October 2001 (2001-10-18) paragraph [0040]; figures 7,8	55-61
X	US 5 738 471 A (ZENTNER EDWARD [US] ET AL) 14 April 1998 (1998-04-14) column 2, line 66 - column 3, line 38; figures 1-3	55-57
X	US 5 752 791 A (EHRLICH RODNEY P [US]) 19 May 1998 (1998-05-19) column 2, lines 12-44; figures 1-4	55-57
A	US 2009/301830 A1 (KINSMAN ANTHONY J [US] ET AL) 10 December 2009 (2009-12-10) cited in the application paragraphs [0046], [0071]; figures 1,12,33,34	1
A	JP 7 040783 A (SUZUKI MOTOR CO) 10 February 1995 (1995-02-10) abstract; figure 2	1-3,7, 50,51
A	FR 2 914 597 A1 (RENAULT SAS [FR]) 10 October 2008 (2008-10-10) abstract; figures 3,6 page 1, lines 7-10 page 4, lines 14-19 page 11, lines 8-26	2-7,11, 50,51
A	EP 1 493 624 A1 (MAZDA MOTOR [JP]) 5 January 2005 (2005-01-05) abstract; figures 1,5 paragraph [0001]	4-6,11, 50,51
A	JP 2001 130304 A (IKEDA BUSSAN CO) 15 May 2001 (2001-05-15) abstract; figure 3	7

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/024664

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2005/077098 A1 (TAKAYANAGI SHINJI [JP] ET AL) 14 April 2005 (2005-04-14) figure 6	17
A	US 5 895 063 A (HASSHI SUEHIRO [JP] ET AL) 20 April 1999 (1999-04-20) column 3, line 52 - column 4, line 14; figures 1,2	14-16, 22-28, 46-49
A	US 4 046 403 A (YOSHIDA HIROSHI) 6 September 1977 (1977-09-06) column 3, lines 52-56 column 2, lines 28-30; figures 3,4	49
A	GB 2 036 659 A (MCCULLOUGH W) 2 July 1980 (1980-07-02) abstract; figures 12-16	55
A	US 6 113 328 A (CLAUCHERTY BURRELL STEWART [US]) 5 September 2000 (2000-09-05) abstract; figures 1,2	55

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/024664

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/024664

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7819220 B2	26-10-2010	AU 2006346807 A1	07-02-2008
		CN 101878146 A	03-11-2010
		EP 2057060 A2	13-05-2009
		US 2008023249 A1	31-01-2008
		US 2009178871 A1	16-07-2009
		US 2011048828 A1	03-03-2011
		WO 2008016377 A2	07-02-2008
		WO 2008045119 A1	17-04-2008
US 3422918 A	21-01-1969	NONE	
DE 37435 C	02-11-1886	NONE	
US 4817985 A	04-04-1989	NONE	
US 4650210 A	17-03-1987	AU 579290 B2	17-11-1988
		AU 4882385 A	07-08-1986
		NZ 213782 A	29-02-1988
		US 4650210 A	17-03-1987
US 2010314184 A1	16-12-2010	AU 2010260151 A1	02-02-2012
		CA 2764399 A1	23-12-2010
		EP 2442995 A2	25-04-2012
		US 2010314182 A1	16-12-2010
		US 2010314183 A1	16-12-2010
		US 2010314184 A1	16-12-2010
		US 2010317484 A1	16-12-2010
		US 2010317485 A1	16-12-2010
		WO 2010148016 A2	23-12-2010
US 2001031185 A1	18-10-2001	NONE	
US 5738471 A	14-04-1998	NONE	
US 5752791 A	19-05-1998	NONE	
US 2009301830 A1	10-12-2009	US 2009301830 A1	10-12-2009
		US 2012085588 A1	12-04-2012
JP 7040783 A	10-02-1995	JP 3099591 B2	16-10-2000
		JP 7040783 A	10-02-1995
FR 2914597 A1	10-10-2008	NONE	
EP 1493624 A1	05-01-2005	CN 1576106 A	09-02-2005
		DE 602004002622 T2	16-08-2007
		EP 1493624 A1	05-01-2005
		US 2005052044 A1	10-03-2005
JP 2001130304 A	15-05-2001	NONE	
US 2005077098 A1	14-04-2005	DE 602004000800 T2	28-12-2006
		EP 1520775 A1	06-04-2005
		ES 2260720 T3	01-11-2006
		US 2005077098 A1	14-04-2005
US 5895063 A	20-04-1999	CA 2232202 A1	21-09-1998
		DE 19811903 A1	24-09-1998

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-13, 44-54

   Seat arrangement in side by side vehicle

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2. claims: 14-43

   Suspension for side by side vehicle

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3. claims: 55-61

   Rear utility box for side by side vehicle

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/024664

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		FR 2761007 A1	25-09-1998
		GB 2323574 A	30-09-1998
		TW 494069 B	11-07-2002
		US 5895063 A	20-04-1999
US 4046403 A	06-09-1977	NONE	
GB 2036659 A	02-07-1980	AU 5281679 A	29-05-1980
		BR 7907484 A	08-07-1980
		DE 2945550 A1	29-05-1980
		FR 2441530 A1	13-06-1980
		GB 2036659 A	02-07-1980
US 6113328 A	05-09-2000	NONE	