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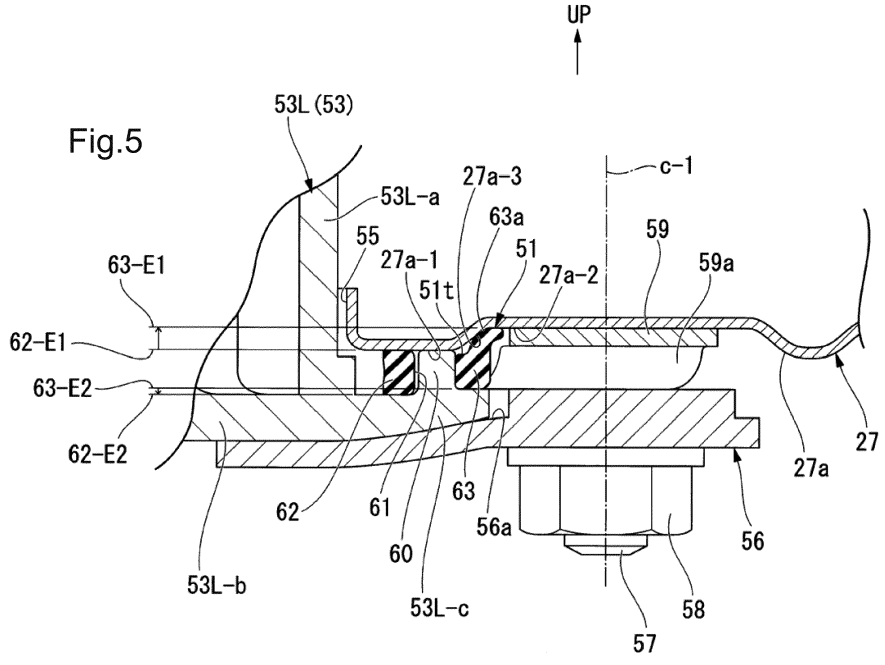
(54) SEAL STRUCTURE FOR FUEL PUMP UNIT

(57) The present invention aims to downsize the installation portion of a unit case (53) and to provide a seal structure of a fuel pump unit (50) which allows to downsize and reduce in weight in the vicinity of the fuel tank (27).

An engage convex portion 60 is provided on a part of the flange portion (53L-c) opposite to the outer periphery portion of the unit installing port (55), the seal member (51) has a fitting portion (61) fitted into the engage convex portion (60); an annular fuel seal portion (62) for preventing the fuel leakage from the unit installing port (55) on the inside of the fitting portion (61) in the radial direction; and an annular dust seal portion (63) for preventing the dust from entering from the outside on the outside of the fitting portion (61) in the radial direction, the formed part of the fitting portion (61) and the fuel seal portion (62), and the dust seal portion (63) are integrally formed.

Fig.5



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Description

Technical field

[0001] The present invention relates to a seal structure for a fuel pump unit installed on a fuel tank of a vehicle.

Background of the Invention

[0002] A fuel pump unit is installed on a fuel tank of a vehicle for supplying the fuel to an engine. The fuel pump unit is configured such that a unit case holds a fuel pump main body for pressure feeding the fuel inside the fuel tank and the unit case is installed on the fuel tank by penetrating a unit installing port of the fuel tank. A flange portion opposite to the outer periphery portion of a unit installing port is extended on the portion of the unit case exposed to the outside of the fuel tank. A seal member is interposed between the flange portion and the outer periphery portion of the unit installing port for preventing the fuel leakage (for example, see Japanese Laid-Open Patent Publication No. 2005-113892).

[0003] The fuel pump unit mentioned in Japanese Laid-Open Patent Publication No. 2005-113892 is configured such that a bending portion bent to the fuel tank side is provided on an outer periphery portion of a flange portion of the unit case, an annular seal member is disposed on the inside of the bending portion. The seal member of the fuel pump unit functions as a fuel seal for preventing the fuel leakage exclusively from the unit installing port, and the bending portion of the flange portion functions as a dust seal for preventing from entering the dust from the outside to the seal member direction.

Description of the Related Art

Problem to Be Solved by the Invention

[0004] The fuel pump unit mentioned in Japanese Laid-Open Patent Publication No. 2005-113892 is configured such that the bending portion is provided on the flange portion of the unit case, the bending portion forms the dust seal. Accordingly, the flange portion formed on the unit case becomes larger. Therefore, the installation portion of the unit case occupies larger space. In addition, the total weight of the unit case will be increased.

[0005] The present invention aims to downsize the installation portion of the unit case and to provide a seal structure of a fuel pump unit which allows to downsize and reduce in weight in the vicinity of the fuel tank.

Means for Solving the Problem

[0006] In order to solve the above-mentioned problem, in a seal structure of a fuel pump unit for vehicle wherein a unit case (53) holding a fuel pump main body (52) penetrates a unit installing port (55) of a fuel tank (27) and is attached to the fuel tank (27), a flange portion (53L-c) opposite to the outer periphery portion of the unit installing port (55) is provided on an exposed portion of the unit case (53) to the outside of the fuel tank (27), the flange portion (53L-c) is pressed and fixed on the outer periphery portion of the unit installing port (55) while an annular seal member (51) is sandwiched between the flange portion (53L-c) and the outer periphery portion of the unit installing port (55),

an engage convex portion (60) is provided on a portion of the flange portion (53L-c) opposite to the outer periphery portion of the unit installing port (55) of the flange portion (53L-c), the seal member (51) has a fitting portion (61) fitted into the engage convex portion (60), an annular fuel seal portion (62) for preventing the fuel leakage from the unit installing port (55) on the inside of the fitting portion (61) in the radial direction, and an annular dust seal portion (63) for preventing the dust from entering from the outside on the outside of the fitting portion (61) in the radial direction, and the fitting portion (61) and the fuel seal portion (62), and the dust seal portion (63) are integrally formed.

[0007] Accordingly, the seal member (51) is positioned due to the fact that the fitting portion (61) formed between a fuel seal portion (62) and a dust seal portion (63) is fitted into the engage convex portion (60) on the flange portion (53L-c) side. In the state, the flange portion (53L-c) of the unit case (53) is pressed and fixed on the outer periphery portion of the unit installing port (55) of the fuel tank (27), and the annular fuel seal portion (62) and the dust seal portion (63) are closely contacted with the flange portion (53L-c) and the outer periphery portion of the unit installing port (55). Accordingly, the fuel seal portion (62) prevents the fuel leakage from the unit installing port (55). Simultaneously, the dust seal portion (63) prevents the dust entering from the outside.

[0008] It is preferable that the dust seal portion (63) is formed on an approximately same outer diameter as the flange portion (53L-c). In this case, it is possible to reduce the outer diameter of the flange portion (53L-c) on the unit case (53) side, while the pressing force on the fuel seal portion (62) of the seal member (51) and the dust seal portion (63) is secured.

[0009] A hollow portion (27a-2) recessed stepwise may be provided on the outer periphery portion of the unit installing port (55) of the fuel tank (27), and a part of the dust seal portion (63) may abut on a bottom of the hollow portion (27a-2). In the case, the height of the dust seal portion (63) can be secured higher while the projection height of the unit case (53) from the fuel tank (27) can be suppressed. Accordingly, as the flange portion (53L-c) is pressed and fixed on the outer periphery portion of the unit installing port (55), it is possible to suppress the increase of the reaction force which works on the dust seal portion (63) and the decrease of the adhering force of the fuel seal portion (62).

[0010] The hollow portion (27a-2) is continuously formed on the outer periphery portion of the unit installing port (55) of the fuel tank (27) through a slope portion

(27a-3). A part of the dust seal portion (63) may abut on the slope portion (27a-3). In the case, the dust seal portion (63) abuts on the wide area of the slope portion (27a-3), which allows to efficiently prevent the dust from entering.

[0011] A stationary plate (56) pressing the flange portion (53L-c) to the fuel tank (27) direction is layered on the flange portion (53L-c). Fastening members (57, 58) fix the stationary plate (56) at the outer side position in the radial direction of the flange portion (53L-c) on the outer periphery portion of the unit installing port (55). The seal member (51) and the flange portion (53L-c) may be positioned respectively at the inner side position of the positions where the fastening members (57, 58) are fastened and fixed in the radial direction. In the case, the seal member (51) and the flange portion (53L-c) can reduce the diameter.

[0012] The stationary plate (56) pressing the flange portion (53L-c) to the fuel tank (27) direction may be layered on the flange portion (53L-c), the fastening members (57, 58) fix the stationary plate (56) at the outer position of the flange portion (53L-c) in the radial direction on the outer periphery portion of the unit installing port (55), an installation member (59) for installing the fastening members (57, 58) may be projected at the outside position; of the hollow portion (27a-2) in the radial direction on the outer periphery portion of the unit installing port (55) of the fuel tank (27), and the outside portion of the dust seal portion (63) in the radial direction may closely be disposed abuttable on the installation member (59).

[0013] In the case, the flange portion (53L-c) is installed on the outer periphery portion of the unit installing port (55) through the stationary plate (56), the fastening members (57, 58) for attaching the stationary plate (56) to the outer periphery portion of the unit installing port (55) are disposed on the outer side of the seal member (51) in the radial direction.

[0014] Therefore, in comparison with the case that the fastening members (57, 58) directly attach the flange portion (53L-c) of the unit case (53) to the fuel tank (27), the flange portion (53L-c) and the seal member (51) can reduce the diameter. Moreover, the outside portion of the dust seal portion (63) in the radial direction may be closely disposed abuttable on the installation member (59). Accordingly, the installation member (59) can control the positional displacement of the dust seal portion (63) to the outside direction in the radial direction.

[0015] In the state that the unit case (53) is attached to the fuel tank (27), the seal member (51) may be configured such that an upper end (63-E1) of the dust seal portion (63) is positioned on the upper direction side of an upper end (62-E1) of the fuel seal portion (62), a lower end (62-E2) of the fuel seal portion (62) is positioned on the lower direction side of a lower end (63-E2) of the dust seal portion (63). In the case, the upper and lower seal surfaces in the fuel seal portion (62) side in the vicinity of the unit installing port (55) are positioned below the upper and lower seal surfaces in the dust seal portion (63) side respectively. Accordingly, the fuel inside the fuel tank (27) hardly flows from the fuel seal portion (62) side to the dust seal portion (63) side, which allows to prevent the fuel leakage favorably.

[0016] A plurality of fitting portions (61) may be configured so as to be formed along the circumferential direction of the seal member (51), and simultaneously to be formed in an arc-like long hole shape along the circumferential direction of the seal member (51). A plurality of engage convex portions (60) may be configured so as to be formed along the circumferential direction of the flange portion (53L-c), and simultaneously so as to be formed in an arc-like shape which matches the long hole shape of the fitting portion (61) in the upper view. In the case, the engage convex portion (60) is formed in an arc shape in the upper view, and simultaneously the fitting portion (61) is formed in an arc-like long hole shape. Accordingly, without widening the separation width in the radial direction between the seal member (51) of the fuel seal portion (62) and the dust seal portion (63). It is possible to favorably prevent the positional displacement of the seat member (51) at the fitting part of the engage convex portion (60) and the fitting portion (61).

Effect of the Invention

[0017] According to the present invention, the seal member integrally has the fitting portion fitted into the engage convex portion of the flange portion, the fuel seal portion for preventing the fuel leakage on the inside of the fitting portion in the radial direction, and the dust seal portion for preventing the dust from entering on the outside of the fitting portion in the radial direction. Accordingly, the flange portion can be further downsized in comparison with the case that the dust seal portion is integrally formed on the outer periphery portion of the flange portion on the unit case side. Therefore, according to the present invention, the installation portion of the unit case can be downsized and reduced in weight in the vicinity of the fuel tank.

Brief Description of the Drawings

[0018]

FIG.1 is a side view of the motorcycle according to the one embodiment of the present invention.

FIG.2 is a side view of the motorcycle according to the one embodiment of the present invention.

FIG.3 is a plain view of the motorcycle according to the one embodiment of the present invention.

FIG.4 is a longitudinal section view showing the installation portion of the fuel pump unit according to the one embodiment of the present invention.

FIG.5 is a sectional view showing an enlarged V part of the installation portion of the fuel pump unit in FIG. 4 according to the one embodiment of the present invention.

FIG.6 is a perspective view of the fuel pump unit according to the one embodiment of the present invention.

FIG.7 is a perspective view of the seal member according to the one embodiment of the present invention.

FIG.8 is a plain view in the state that the seal member is attached to the fuel pump unit according to the embodiment.

FIG.9 is a partly cross-sectional perspective view of the installation portion of the fuel pump unit according to the one embodiment.

Best Mode for Carrying Out the Invention

[0019] Hereinafter, the one embodiment of the present invention will be explained with reference to the drawings. Moreover, in the drawing, an arrow FR shows a front direction of the vehicle, an arrow UP shows an upper direction of the vehicle, and an arrow LH shows the left side direction of the vehicle.

[0020] Firstly, the total configuration of the vehicle according to the embodiment, with reference to FIGs.1 to 3. The vehicle according to the embodiment is a motorcycle which is a form of straddle type vehicles. FIG.1 is a left side view of the main parts of the vehicle centering on the body frame portion of the motorcycle. FIG.2 is a left side view of the main parts of the vehicle, which shows a state that a part of the seat is lifted. Moreover, FIG.3 is a plain view of the main parts of the body.

[0021] In FIG. 1, a body frame F has a head pipe 11 on a front end, a main frame 12 extended from the head pipe 11 to the rear direction of the vehicle body by bifurcated right and left, a single down frame 13 extended obliquely downward from a position in the vicinity of the head pipe 11 which is a front portion of the main frame 12 to the rear portion, a right and left pair of seat rails 14 extended obliquely upward to the rear direction behind the main frame 12, and a right and left pair of pivot plates 15 connecting the rear end portion of the main frame 12 and the front end portion of the seat rail 14 and simultaneously extended obliquely downward to the front portion.

[0022] A steering shaft 16 is freely and rotationally supported on the head pipe 11. An upper end portion and a lower end portion of the steering shaft 16 are connected to a top bridge 17a and a bottom bridge 17b, respectively. The upper end portion of the right and left pair of front forks 18 are supported on the top bridge 17a and the bottom bridge 17b respectively. An unillustrated front wheel is freely and rotationally supported between the lower end portion of the right and left of front forks 18. A bar handle 19 is attached to the top bridge 17a. A front wheel is steerable by rotationally operating the bar handle 19.

[0023] An air cleaner 20 and a storage box 21 are supported on the main frame 12. The storage box 21 opens at the upper direction side, and a box lid 22 can close the opening on the upper portion of the storage box so as to be freely openable. The storage box 21 secures the comparably larger internal volume, which allows to store a helmet and the like inside of the storage box. Moreover, a sign 23 in the drawings shows a front top cover covering the upper direction of the air cleaner 20 and the front portion of the box lid 22.

[0024] The fuel tank 27 is supported on the seat rail 14. A seat 28 is supported on the fuel tank 27. The seat 28 is formed so as to be longitudinally long for a pillion passenger, the front portion is formed as a rider seat 30 (driver's seat), and the rear portion is formed as a pillion seat 31 for a pillion passenger.

[0025] The pillion seat 31 is rotatably flipped up through a hinge mechanism 31a provided on the rear end portion side. The pillion seat 31 also functions as a fuel lid, and it is possible to access the fuel cap 27b on the fuel tank 27 during fueling, by flipping up the front portion side to the upper direction.

[0026] The fuel tank 27 is formed so as to be longitudinally long over the approximately whole length of the seat 28, and is slightly inclined downward to the front direction and is disposed along the seat rail 14. The fuel cap 27b is detachably attached to the unillustrated fuel filler opening positioned on the upper portion on the rear half portion side of the fuel tank 27. The front half portion side of the fuel tank 27 is a large volume portion positioned below the rider seat 30, and a below-described fuel pump unit 50 is installed on a bottom wall 27a of the front portion side of the fuel tank.

[0027] A tank stay 33 is installed on the upper portion of the rear end side of the main frame 12. The front end portion of the fuel tank 27 is supported on the tank stay 33. A seat stay 34 extended obliquely rearward to the upper portion is installed on the tank stay 33. The front portion of the rider seat 30 in the lower direction is supported on the seat stay 34. Moreover, a box stay 36 extended obliquely upward to the front portion is installed on the seat stay 34. The box stay 36 supports the storage box 21 at the rear end of the bottom portion.

[0028] An engine 37 is disposed below the main frame 12. As for the engine 37, the upper portion thereof is supported on the main frame 12. Simultaneously, the front portion thereof is supported on the down frame 13. The rear portion thereof is supported on the pivot plate 15. The body frame F has a diamond frame structure by using the engine 37 as a part of the frame structure. Moreover, a sign 38 in FIG.1 is an exhaust pipe connected to a cylinder head of the engine 37.

[0029] Furthermore, a pivot shaft 40 swingably sup-

ports the front end portion of the swing arm 41 on the pivot plate 15. A rear wheel Wr is rotatably supported on the rear end portion of the swing arm 41. The engine 37 drives the rear wheel Wr by transmitting the power through an unillustrated chain.

[0030] Moreover, a sign 43 in FIG.1 shows a cushion unit for the rear wheel. As for the cushion unit 43, the upper end portion is supported on the body frame F, the lower end portion is attached to a link mechanism 42 provided between the swing arm 41 and the pivot plate 15. Furthermore, a sign 44 in FIG.3 shows a front side cover covering the side portion of the vehicle body on the further front direction side of the storage box 21. The front side cover 44 is omitted in FIGs.1, 2, for convenience for showing it in the drawings.

[0031] FIG.4 is a drawing showing the longitudinal cross section of the installation portion of the fuel pump unit 50 in the fuel tank 27. FIG.5 shows an enlarged V portion in FIG.4. Moreover, FIG.6 is a perspective view of a part of the fuel pump unit 50. FIG.7 is a perspective view of a seal member 51 attached to the fuel pump unit 50. FIG.8 is a plain view of the fuel pump unit 50 to which the seal member 51 is attached. Moreover, as for the fuel tank 27 and the fuel pump unit 50, "upper" and "lower" in the below-mentioned explanation means "upper" and "lower" in the state that the fuel pump unit is attached to the vehicle otherwise mentioned.

[0032] As for the fuel pump unit 50, the fuel pump main body 52 for sucking and discharging the fuel inside the fuel tank 27 is held inside the unit case 53 with an unillustrated relief valve and passage components and the like. The unit case 53 has the fuel pump main body 52, an upper case 53U to which a float mechanism 54 (see FIGs.1, 2) and the like for measuring the residual fuel in the fuel tank 27 are attached, and a lower case 53L fitted and fixed on the lower edge outer periphery of the upper case 53U and covering the lower direction of the upper case 53U.

[0033] The lower case 53L has an approximately cylindrical surrounding wall portion 53L-a fitted and fixed to the upper case 53U, a bottom wall portion 53L-b blocking the lower end of the surrounding wall portion 53L-a, and an annular flange portion 53L-c bulging from the outer periphery surface of the bottom wall portion 53L-b to the outer side of the surrounding wall portion 53L-a in the radial direction.

[0034] The lower case 53L is formed in a bottomed cylindrical shape with the surrounding wall portion 53L-a and the bottom wall portion 53L-b, and the annular flange portion 53L-c bulges from an outer peripheral surface of a bottomed cylindrical bottom portion to the outer side in the radial direction.

[0035] The unit case 53 is attached to the fuel tank 27 by penetrating an approximately annular unit installing port 55 formed on the bottom wall 27a of the fuel tank 27. As for the unit case 53, the whole upper case 53U and the surrounding wall portion 53L-a of the lower case 53L are disposed inside the fuel tank 27, and the bottom wall portion 53L-b of the lower case 53L and the flange portion 53L-c are disposed outside of the fuel tank 27. Accordingly, the flange portion 53L-c is provided on the exposed portion of the unit case 53 to the outside of the fuel tank 27. The flange portion 53L-c is opposite to the outer periphery portion of the unit installing port 55 of the bottom wall 27a of the fuel tank 27.

[0036] An annular seal member 51 from the resin material with elasticity and liquid-tightness is interposed between the upper surface of the flange portion 53L-c of the unit case 53 and the lower surface of the outer periphery portion of unit installing port 55. Then, an annular setting plate 56 as a metal stationary plate is layered on the lower surface of the flange portion 53L-c of the unit case 53. The setting plate 56 is fastened and fixed on the bottom wall 27a of the fuel tank 27. The flange portion 53L-c receives the pressing force from the setting plate 56 and is pressed and fixed on the outer periphery portion of the unit installing port 55 in the state that the flange portion sandwiches the seal member 51.

[0037] As for the setting plate 56, the upper surface side of the inner peripheral edge portion is annually lightened, a concaved portion 56a formed stepwise by lightening on the upper surface close to the center. The flange portion 53L-c of the unit case 53 is contained and disposed on the concaved portion 56a of the setting plate 56. The thickness portion on the outer side of the concaved portion 56a in the radial direction is fastened and fixed on the bottom wall 27a of the fuel tank 27.

[0038] The fastening members fastening and fixing the setting plate 56 on the bottom wall 27a of the fuel tank 27 consist of a plurality of bolts (fastening members) 57 with the shaft portion projecting from the lower surface side of the fuel tank 27 to the lower direction, nuts (fastening members) 58 screwed with the shaft portion of each bolt 57. The shaft portion of each bolt 57 penetrate an unillustrated insertion hole provided on the thick outer periphery portion of the setting plate 56, and the nut 58 is screwed with the penetrated end portion. In the present embodiment, the bolt 57 is held by a recessed bend portion 59a of a set ring 59 (installation member) welded and fixed on the lower surface of the bottom wall 27a of the fuel tank 27. The set ring 59 is formed with a larger inner diameter of the diameter of the unit installing port 55. Simultaneously, the set ring is attached to the position of the bottom wall 27a so as to be concentric with the unit installing port 55.

[0039] As shown in FIG.5, an annular region 27a-1 with a predetermined width adjacent to the unit installing port 55 is flatly formed as a part of the bottom wall 27a of the fuel tank 27. A slope portion 27a-3 inclined to the upper direction side heading for the outer side in the radial direction is formed on the outer side portion of the annular region 27a-1 in the radial direction. Furthermore, a hollow portion 27a-2 recessed to the upper direction side through the slope portion 27a is continuously formed. The above-mentioned set ring 59 is attached to the position of the hollow portion 27a-2 slightly separated to the

outside in the radial direction relative to the slope portion 27a-3.

[0040] A plurality of engage convex portions 60 are projected on the upper surface of the flange portion 53L-c of the unit case 53 so as to be along the circumferential direction of the flange portion 53L-c. The engage convex portion 60 is formed in an arc-shape along the circumferential direction of the flange portion 53L-c in the upper view, and is disposed on the flange portion 53L-c so as to be apart from each other at equal intervals.

[0041] Moreover, the seal member 51 has a plurality of fitting holes 61 (fitting portion) fitted into the engage convex portion 60 on the flange portion 53L-c. The fitting hole 61 is formed in an arc-like and longitudinal long hole shape along the circumferential direction of the seal member 51, and is formed with the same number of the engage convex portion 60 corresponding to the engage convex portion 60 on the flange portion 53L-c one-to-one.

[0042] The seal member 51 has an annular fuel seal portion 62 and a dust seal portion 63 on the inner side in the radial direction and the outer side in the radial direction so as to sandwich arranging portions of a plurality of fitting holes 61. The fuel seal portion 62 is disposed at the adjacent position on the outer side of the unit installing port 55 of the fuel tank 27. The fuel seal portion functions so as to prevent the fuel leakage from the unit installing port 55.

[0043] Moreover, the dust seal portion 63 functions so as to prevent the dust from entering from the outside to the fuel seal portion 62 direction in the outer side region of the fuel seal portion 62 and a plurality of fitting holes 61 in the radial direction. The annular fuel seal portion 62 and the dust seal portion 63 are provided so as to be concentric, and are connected each other by a partition wall part separating the adjacent fitting holes 61 in the circumferential direction. The fitting hole 61 (fitting hole forming portion), the fuel seal portion 62 and the dust seal portion 63 are integrally formed of a resin material.

[0044] FIG.9 is a partly cross-sectional perspective view of the installation portion of the fuel pump unit 50, which shows an initial state before the seal member 51 is attached in a virtual line. As also shown in FIG.9, the adjacent region of the fitting hole 61 in the radial direction of the seal member 51 is formed such that the vertical thickness thereof is approximately constant. Hereinafter, the region of the seal member 51 is called as a reference thickness portion 51t. As for the fuel seal portion 62, the vertical thickness is gradually increased from the inner side end in the radial direction adjacent to the reference thickness portion 51t to the outer side end in the radial direction. Moreover, the dust seal portion 63 is formed such that the upper surface side is largely bulged from the adjacent portion to the reference thickness portion 51t to the end portion on the inner side in the radial direction. An annular seal lip 63a is formed such that the outer direction end in the radial direction projects upward by bulging.

[0045] As for the fuel seal portion 62, the lower surface side abuts on the upper surface of the flange portion 53L-c, and simultaneously the upper surface side abuts on the annular region 27a-1 of the lower surface of the bottom wall 27a of the fuel tank 27, in the inner side region of the engage convex portion 60 of the flange portion 53L-c in the radial direction.

[0046] When the unit case 53 is attached to the fuel tank 27, the flange portion 53L-c of the unit case 53 is pressed to the outer periphery portion direction of the unit installing port 55 through the setting plate 56. Then, the fuel seal portion 62 is vertically crushed and is closely contact with the flange portion 53L-c and the annular region 27a-1.

[0047] As for the dust seal portion 63, the lower surface side abuts on the upper surface of the flange portion 53L-c, simultaneously, the seal lip 63a on the upper surface side abuts on the bottom of the slope portion 27a-3 and the continuously connected hollow portion 27a-2 as a part of the bottom wall 27a of the fuel tank 27, in the outer side region of the engage convex portion 60 of the flange portion 53L-c in the radial direction. When the unit case 53 is attached to the fuel tank 27, the flange portion 53L-c of the unit case 53 is pressed to the outer periphery portion direction of the unit installing port 55 through the setting plate 56. Then, the dust seal portion 63 is closely contacted with the bottoms of the slope portion 27a-3 and the hollow portion 27a-2 by the deflection of the seal lip 63a.

[0048] Moreover, the dust seal portion 63 (the seal member 51) is formed on the approximately same outer diameter as the flange portion 53L-c of the unit case 53. When the fuel tank 27 is attached to the unit case 53, the pressing force is applied from the flange portion 53L-c to the seal member 51. Then, the load pressing the seal lip 63a to the direction of the bottom of the hollow portion 27a-2 is surely transferred from the vicinity of the end portion on the outer side of the flange portion 53L-c in the radial direction to the dust seal portion 63.

[0049] The set ring 59 for installing the bolts welded and fixed on the hollow portion 27a-2 of the fuel tank 27 is positioned on the slightly separated part from the slope portion 27a-3 as a part of the hollow portion 27a-2. The seal lip 63a (dust seal 63) of the seal member 51 abuts on the adjacent position to the set ring 59 as a part of the hollow portion 27a-2. Moreover, when the deflection of the seal lip 63a is partly larger and so on, the seal lip 63a controls the excessive deflection by abutting on the set ring 59.

[0050] Moreover, as shown in FIG.5, the seal member 51 and the flange portion 53L-c supporting the seal member are positioned on the inner side of the fastened and fixed position with the bolts 57 and the nuts 58 in the radial direction. A sign c-1 in FIG.5 shows a fastening center of the fastening member with the bolts 57 and the nuts 58.

[0051] Moreover, as shown in FIG.5 and 9, in the state that the unit case 53 is attached to the fuel tank 27, the seal member 51 is configured such that an upper end

63-E1 of the dust seal portion 63 (seal lip 63a) is positioned on the upper direction side of the upper end 62-E1 of the fuel seal portion 62, and an lower end 62-E2 of the fuel seal portion 62 is positioned on the lower direction side of an lower end 63-E2 of the dust seal portion 63.

[0052] When the unit case 53 is attached to the fuel tank 27, the unit case 53 is configured such that a surrounding wall portion 53L-a of the lower case 53L is inserted from the lower direction side into the unit installing port 55 of the fuel tank 27 in the state that the seal member 51 is set on the flange portion 53L-c of the lower case 53L. Then, the seal member 51 is engaged and fixed due to the fact that the engage convex portion 60 on the flange portion 53L-c is fitted into the fitting hole 61. After that, the setting plate 56 layered on the outer periphery portion of the flange portion 53L-c on the lower surface side is fastened and fixed with the bolts 57 and the nuts 58 to the set ring 59 of the bottom wall 27a of the fuel tank 27. Then, the fuel seal portion 62 and the dust seal portion 63 of the seal member 51 are closely contacted with the flange portion 53L-c and the outer periphery portion of the unit installing port 55.

[0053] As above mentioned, the seal structure of the fuel pump unit 50 according to the embodiment is configured such that the fitting portion 61 fitted into the engage convex portion 60 of the flange portion 53L-c is provided on the seal member 51, simultaneously the fuel seal portion 62 is provided on the inner side of the fitting portion 61 of the seal member 51 in the radial direction, and the dust seal portion 63 is provided on the outer side of the fitting portion 61 in the radial direction.

[0054] Accordingly, the flange portion 53L-c can be further downsized in comparison with the case that the part for preventing the dust from entering to the outer edge of the flange portion is integrally formed in addition to the seal member for preventing the fuel leakage. Therefore, the adaption of the structure according to the embodiment allows to downsize the installation portion of the unit case 53. Consequently, the vicinity of the fuel tank 27 of the vehicle can be downsized and reduced in weight.

[0055] Moreover, the seal structure according to the embodiment is configured such that the dust seal portion 63 of the seal member 51 is formed in an approximately same outer diameter as the flange portion 53L-c. Accordingly, it is possible to reduce the outer diameter of the flange portion 53L-c, while the pressing force of the flange portion 53L-c relative to the fuel seal portion 62 and the dust seal portion 63 is fully secured. Therefore, the installation portion of the unit case 53 can be further downsized.

[0056] The seal structure according to the embodiment is configured such that the hollow portion 27a-2 recessed stepwise is provided on the outer periphery portion of the unit installing port 55 of the fuel tank 27, and a part of the dust seal portion 63 (seal lip 63a) of the seal member 51 can abut on the bottom of the hollow portion 27a-2.

[0057] Accordingly, the vertical height of the dust seal portion 63 can be secured higher while the projection amount of the unit case 53 from the bottom wall 27a of the fuel tank 27 can be suppressed. Accordingly, as the flange portion 53L-c is pressed and fixed on the outer periphery portion of the unit installing port 55, the adoption of the seal structure according to the embodiment allows to suppress the increase of the reaction force which is applied on the dust seal portion 63 and the contrary decrease of the adhering force side of the fuel seal portion 62.

[0058] Moreover, in the seal structure according to the embodiment, the slope portion 27a-3 is provided on the outer periphery portion of the unit installing port 55 of the fuel tank 27. The hollow portion 27a-2 is continuously formed through the slope portion 27a-3. Simultaneously, a part of the dust seal portion 63 (seal lip portion 63a) abuts on the slope portion 27a-3. Accordingly, the dust seal portion 63 abuts on the wide area of the slope portion 27a-3, which allows to efficiently prevent the dust from entering.

[0059] Furthermore, in the seal structure according to the embodiment, the bolts 57 and nuts 58 fasten and fix the setting plate 56 layered at the outer side position in the radial direction of the flange portion 53L-c on the flange portion 53L-c on the outer periphery portion of the unit installing port 55. The seal member 51 and the flange portion 53L-c are positioned respectively at the inner side position in the radial direction of the positions where the bolts 57 and nuts 58 are fastened and fixed. Accordingly, the adaption of the structure according to the embodiment allows to reduce the diameter of the seal member 51 and the flange portion 53L-c.

[0060] Moreover, in the seal structure according to the embodiment, the bolts and nuts 57, 58 fasten and fix the setting plate 56 layered on the flange portion 53L-c at the outer position of the flange portion 53L-c in the radial direction on the outer periphery portion of the unit installing port 55. Simultaneously, the set ring 59 for installing the bolt is attached to the outer side position of the hollow portion 27a-2 in the radial direction. The outer side part of the dust seal portion 63 of the seal member 51 in the radial direction is closely disposed.

[0061] Accordingly, the flange portion 53L-c and the seal member 51 can be downsized (can reduce the diameter). Moreover, the set ring 59, especially the bending portion 59a bulging below thereof, can efficiently control the positional displacement of the seal lip 63a of the seal member 51 to the outside direction in the radial direction.

[0062] Therefore, the adaption of the structure allows to further downsize the installing portion of the unit case 53 and to secure the stable seal function of the dust seal portion 63.

[0063] Furthermore, in the seal structure according to the embodiment, the upper end 63-E1 of the dust seal portion 63 is positioned on the upper direction side of the upper end 62-E1 of the fuel seal portion 62, and the lower

end 62-E2 of the fuel seal portion 62 is positioned on the lower direction side of the lower end 63-E2 of the dust seal portion 63 in the state that the unit case 53 is attached to the fuel tank 27.

[0064] Accordingly, the fuel seal portion 62 is positioned below the dust seal portion 63 on the outer periphery side, which allows to favorably prevent the fuel inside the fuel tank 27 from flowing from the fuel seal portion 62 side to the dust seal portion 63 side.

[0065] Moreover, the upper end 63-E1 of the dust seal portion 63 is positioned on the upper direction side of the upper end 62-E1 of the fuel seal portion 62, which allows to efficiently prevent the dust blowing to the lower surface of bottom wall 27a of the fuel tank 27 from entering to the fuel seal portion 62 direction.

[0066] Moreover, in the embodiment as explained above, the unit case 53 is attached to the bottom wall 27a of the fuel tank 27. The unit case 53 can be attached to the upper wall side of the fuel tank 27. In the case, even though the vertical arrangement between the wall of the fuel tank 27 and the flange portion 53L-c of the unit case 53 and the like are opposite to the above-mentioned seal structure, the approximately same structure can be adopted. In the case, it is preferable that the upper end of the dust seal portion 63 of the seal member 51 is positioned on the upper direction side of the upper end of the fuel seal portion 62 and the lower end of fuel seal portion 62 is positioned on the lower direction side of the lower end of the dust seal portion 63. Then, the fuel seal portion 62 side is positioned below the dust seal portion 63 on the outer periphery side, which allows to prevent the fuel inside the fuel tank 27 from flowing from the fuel seal portion 62 side to the dust seal portion 63 side.

[0067] Moreover, in the case of the seal structure according to the embodiment, the plurality of fitting portions 61 of the seal member 51 may be configured so as to be formed along the circumferential direction of the seal member 51, and simultaneously so as to be formed in an arc-like long hole shape along the circumferential direction of the seal member 51. The engage convex portions 60 on the flange portion 53L-c side may be configured so as to match the number and the shape of the fitting portion 61 on the seal member 51 side.

[0068] Accordingly, without widening the separation width in the radial direction between the fuel seal portion 62 and the dust seal portion 63 of the seal member 51, the fitting part of the engage convex portion 60 and the fitting portion 61 can efficiently prevent the positional displacement of the seal member 51.

[0069] Therefore, the adaption of the structure allows to downsize (to reduce the diameter of) the seal member 51 and the flange portion 53L-c.

[0070] Furthermore, the invention is not limited to the above-mentioned embodiment, various modifications should be possible without deviating from the scope. For example, the above-mentioned embodiment adopts the fitting hole 61 vertically penetrating the seal member 51 as the fitting portion fitting with the engage convex portion 60 of the flange portion 53L-c. The fitting portion may be a hole recessed from the lower direction to the upper direction side.

Main Reference Numerals

[0071]

27	fuel tank
27a-2	hollow portion
27a-3	slope portion
50	fuel pump unit
51	seal member
52	fuel pump main body
53	unit case
53L-c	flange portion
55	unit installing port
56	setting plate (stationary plate)
57	bolt (fastening member)
58	nut (fastening member)
59	set ring (installation member)
60	engage convex portion
61	fitting hole (fitting portion)
62	fuel seal portion
62-E1	upper end
62-E2	lower end
63	dust seal portion
63-E1	upper end
63-E2	lower end

Claims

1. In a seal structure of a fuel pump unit for vehicle wherein
a unit case (53) holding a fuel pump main body (52) penetrates a unit installing port (55) of a fuel tank (27) and is attached to the fuel tank (27),
a flange portion (53L-c) opposite to the outer periphery portion of said unit installing port (55) is provided on an exposed portion of said unit case (53) to the outside of said fuel tank (27),
said flange portion (53L-c) is pressed and fixed on the outer periphery portion of said unit installing port (55) while an annular seal member (51) is sandwiched between said flange portion (53L-c) and the outer periphery portion of said unit installing port (55),
a seal structure of a fuel pump unit characterized that an engage convex portion (60) is provided on a part of said flange portion (53L-c) opposite to the outer periphery portion of said unit installing port (55), said seal member (51) has a fitting portion (61) fitted into said engage convex portion (60); an annular fuel seal portion (62) for preventing the fuel leakage from said unit installing port (55) on the inside of said fitting portion (61) in the radial direction; and an annular dust seal portion (63) for preventing the dust from

entering from the outside on the outside of said fitting portion (61) in the radial direction,
said fitting portion (61), said fuel seal portion (62), and said dust seal portion (63) are integrally formed.

2. The seal structure of the fuel pump unit according to Claim 1 characterized that said dust seal portion (63) is formed on an approximately same outer diameter as said flange portion (53L-c).

3. The seal structure of the fuel pump unit according to Claims 1 or 2 characterized that a hollow portion (27a-2) recessed stepwise is provided on the outer periphery portion of said unit installing port (55) of said fuel tank (27), and
a part of said dust seal portion (63) abuts on a bottom of said hollow portion (27a-2).

4. The seal structure of the fuel pump unit according to Claim 3 characterized that said hollow portion (27a-2) is continuously formed on the outer periphery portion of said unit installing port (55) of said fuel tank (27) through a slope portion (27a-3),
a part of said dust seal portion (63) abuts on said slope portion (27a-3).

5. The seal structure of the fuel pump unit according to Claims 3 or 4 characterized that a stationary plate (56) pressing the flange portion (53L-c) to said fuel tank (27) direction is layered on said flange portion (53L-c),
fastening members (57, 58) fix the stationary plate (56) at the outer side position in the radial direction of said flange portion (53L-c) on the outer periphery portion of said unit installing port (55), and
said seal member (51) and said flange portion (53L-c) are positioned respectively at the inner side position of the positions where said fastening members (57, 58) are fastened and fixed in the radial direction.

6. The seal structure of the fuel pump unit according to any one of Claims 3 to 5 characterized that the stationary plate (56) pressing the flange portion (53L-c) to said fuel tank (27) direction is layered on said flange portion (53L-c),
the fastening members (57, 58) fix the stationary plate (56) at the outer position of said flange portion (53L-c) in the radial direction on the outer periphery portion of said unit installing port (55), an installation member (59) for installing said fastening members (57, 58) is projected at the outside position of said hollow portion (27a-2) in the radial direction as a part of the outer periphery portion of said unit installing port (55) of said fuel tank (27), and
the outside part of said dust seal portion (63) in the radial direction is closely disposed abuttable on said installation member (59).

7. The seal structure of the fuel pump unit according to any one of Claims 1 to 6 characterized that in the state that said unit case (53) is attached to said fuel tank (27), said seal member (51) is configured such that an upper end (63-E1) of said dust seal portion (63) is positioned on the upper direction side of an upper end (62-E1) of said fuel seal portion (62), and a lower end (62-E2) of said fuel seal portion (62) is positioned on the lower direction side of a lower end (63-E2) of said dust seal portion (63).

8. The seal structure of the fuel pump unit according to any one of Claims 1 to 7 characterized that a plurality of said fitting portions (61) are configured so as to be formed along the circumferential direction of said seal member (51), simultaneously to be formed in an arc-like long hole shape along the circumferential direction of said seal member (51),
a plurality of said engage convex portions (60) are configured so as to be formed along the circumferential direction of said flange portion (53L-c), and simultaneously so as to be formed in an arc-like shape which matches the long hole shape of said fitting portion (61) in the upper view.

Fig.1

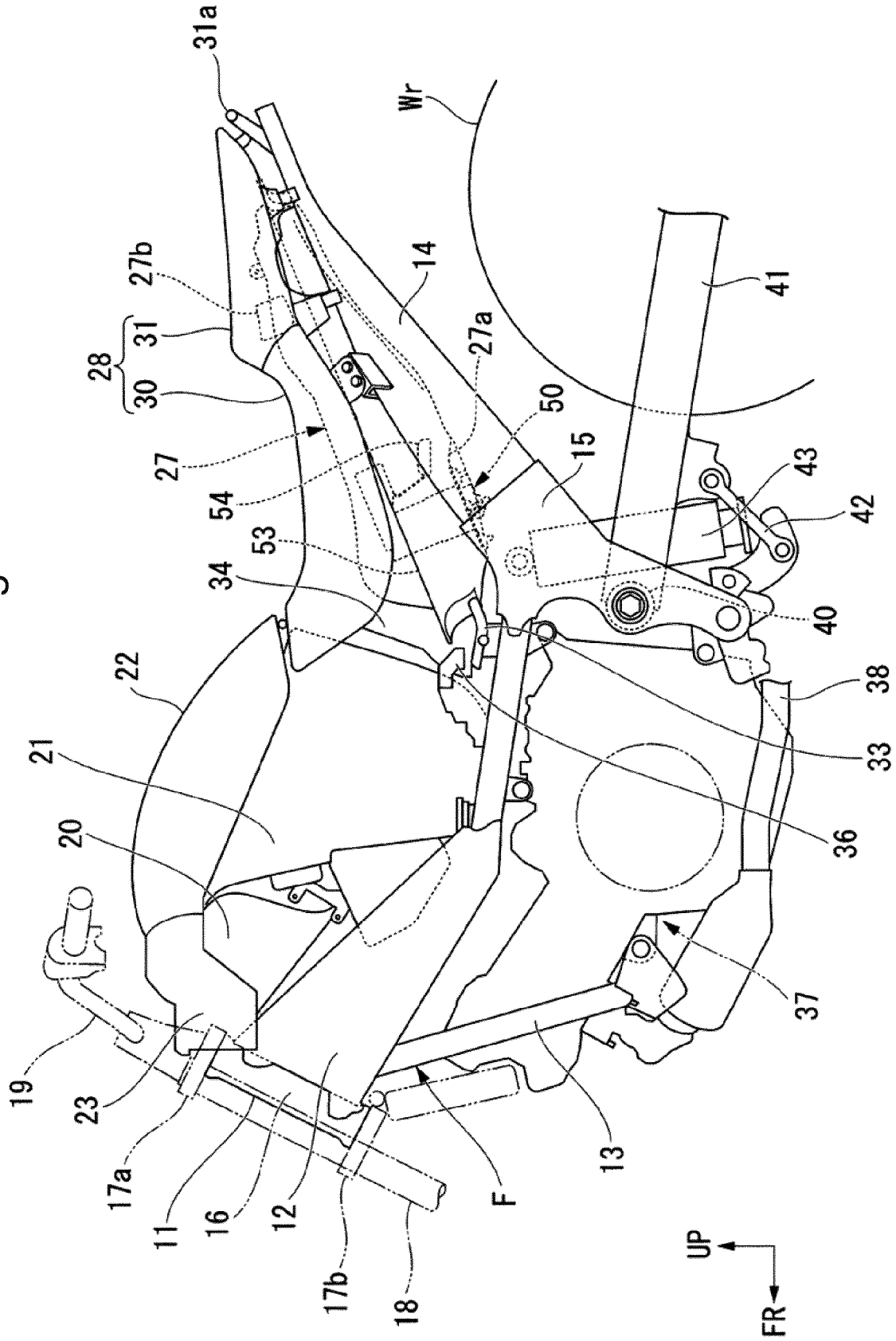
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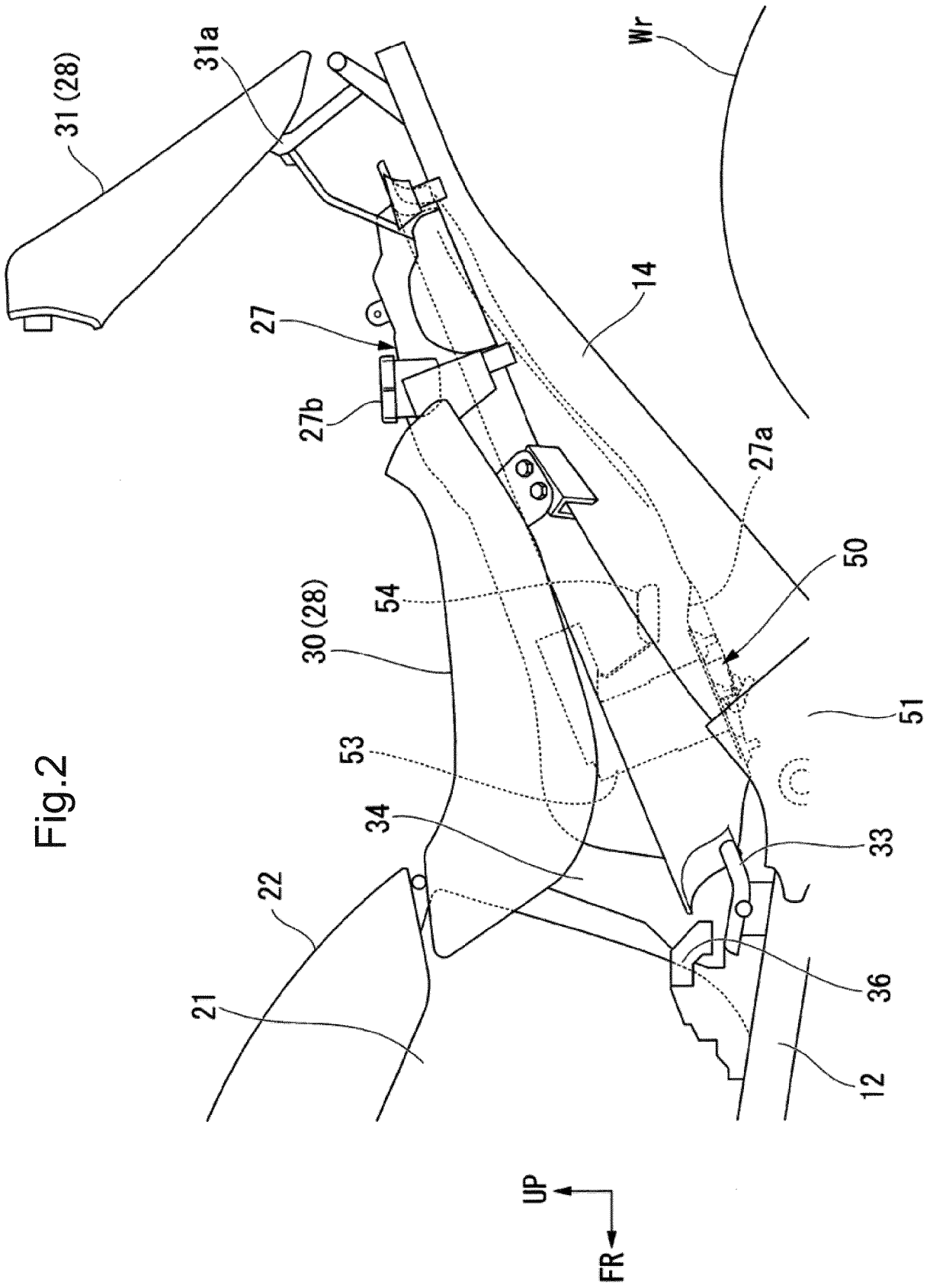
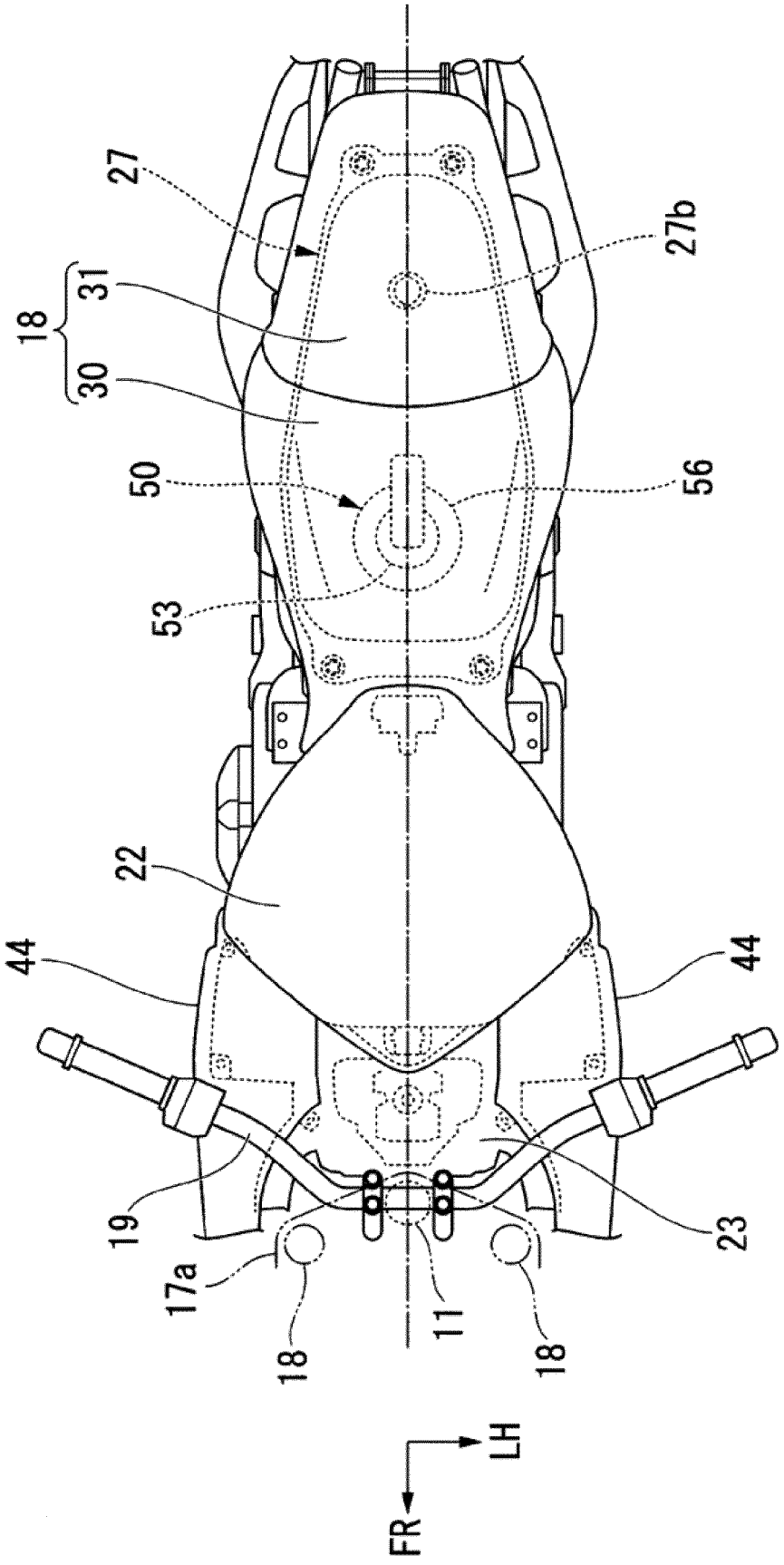
Fig.2





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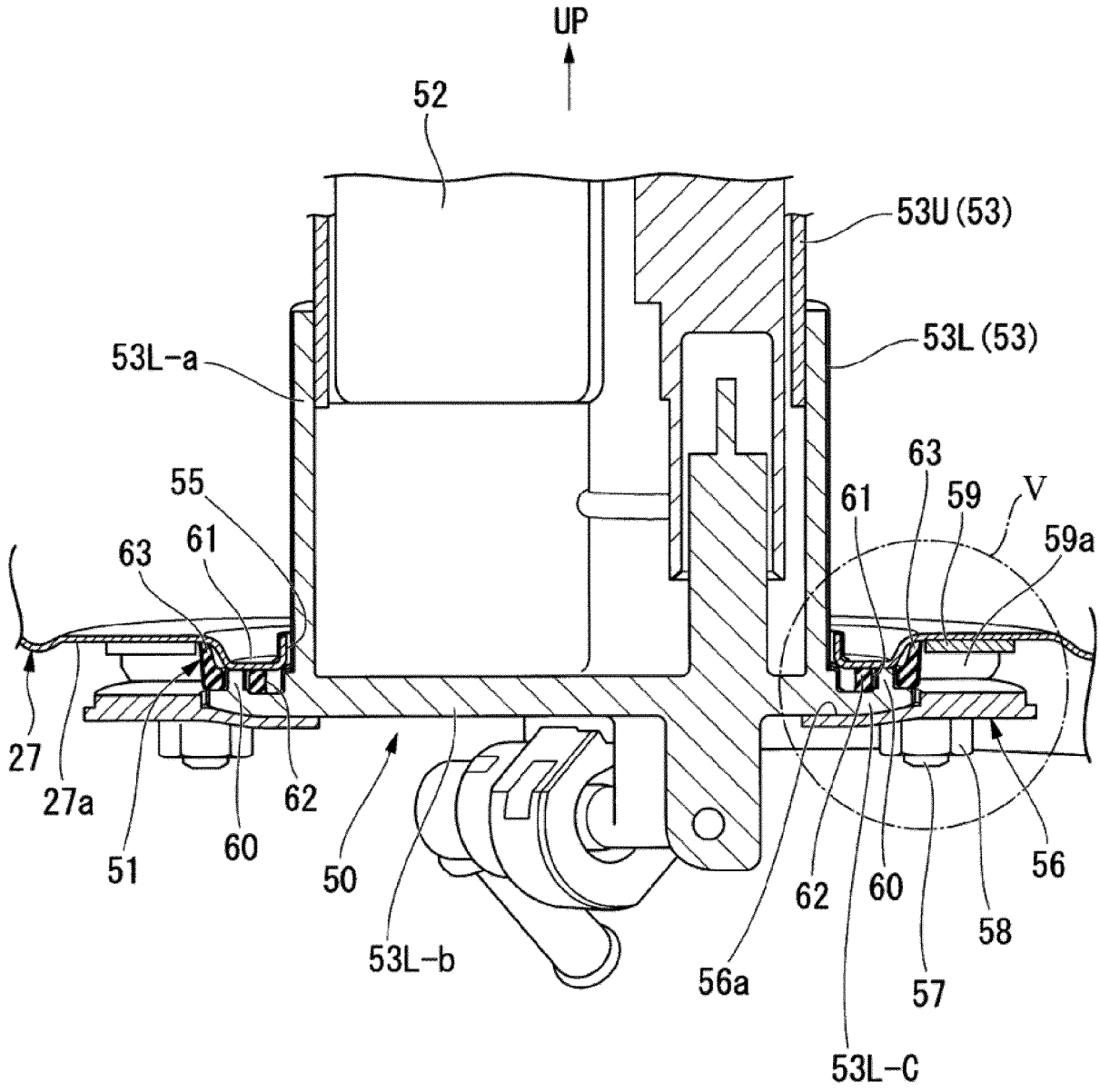
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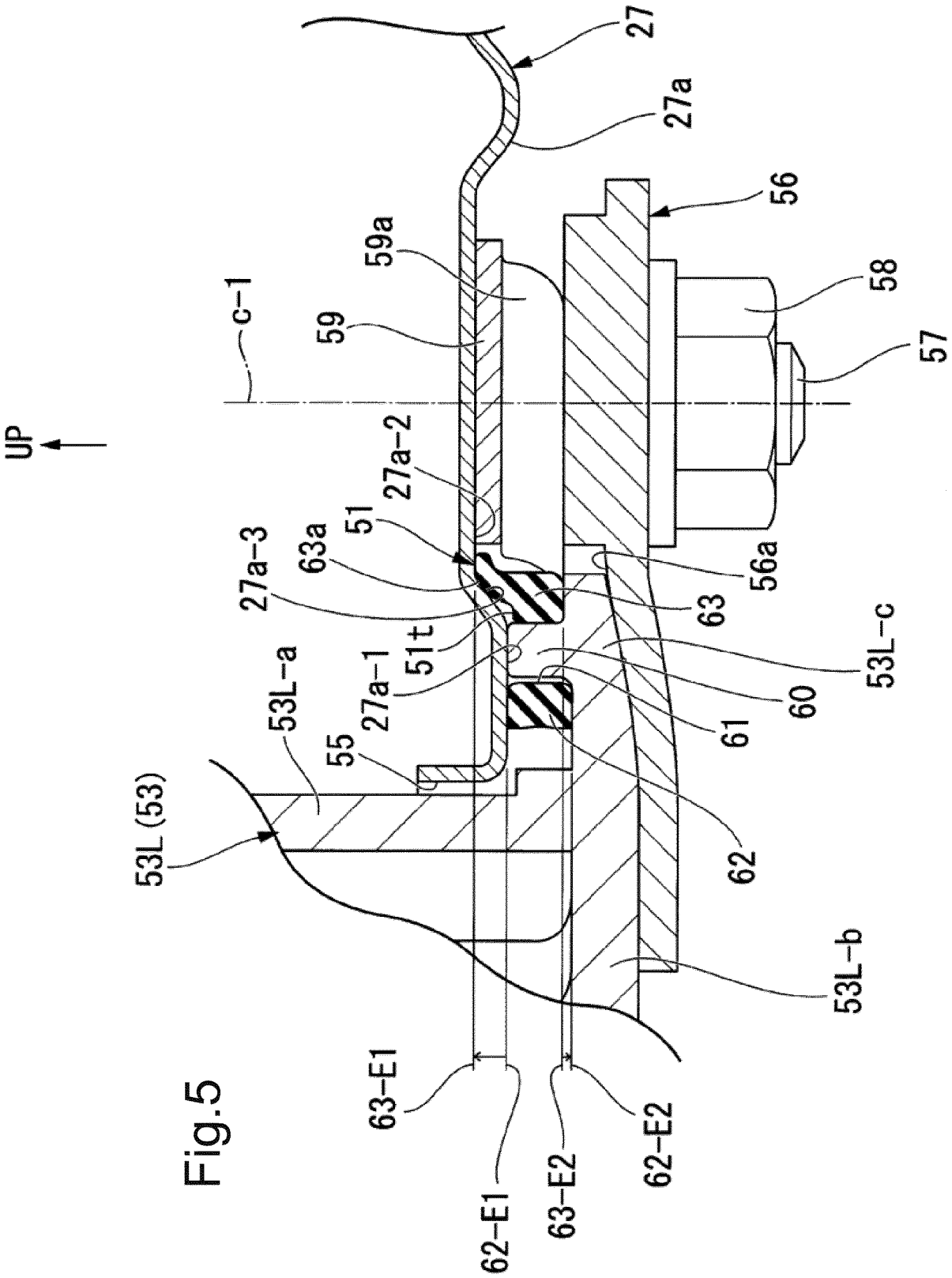
Fig.4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63-E2

Fig.5

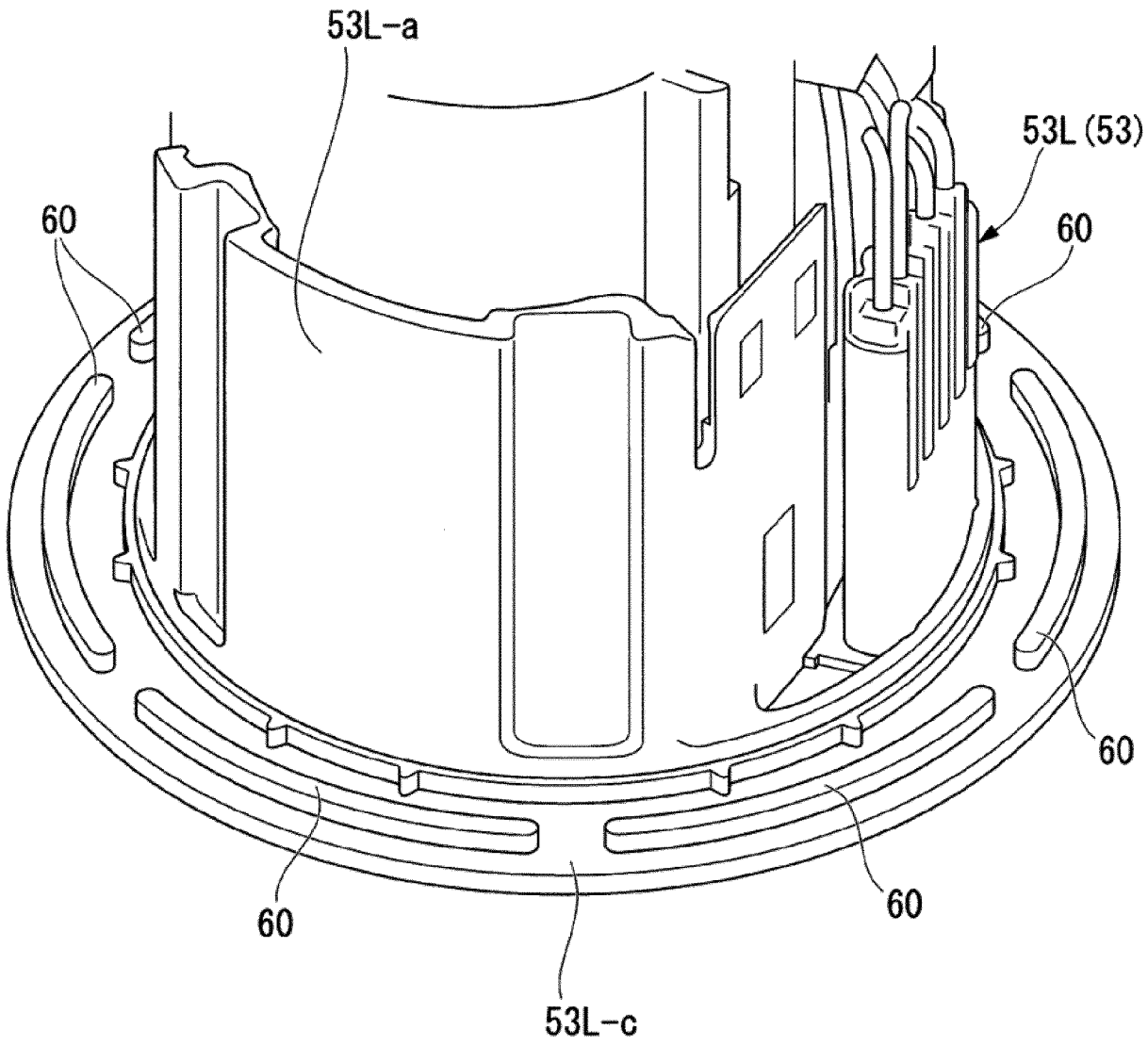


Fig.6

Fig.7

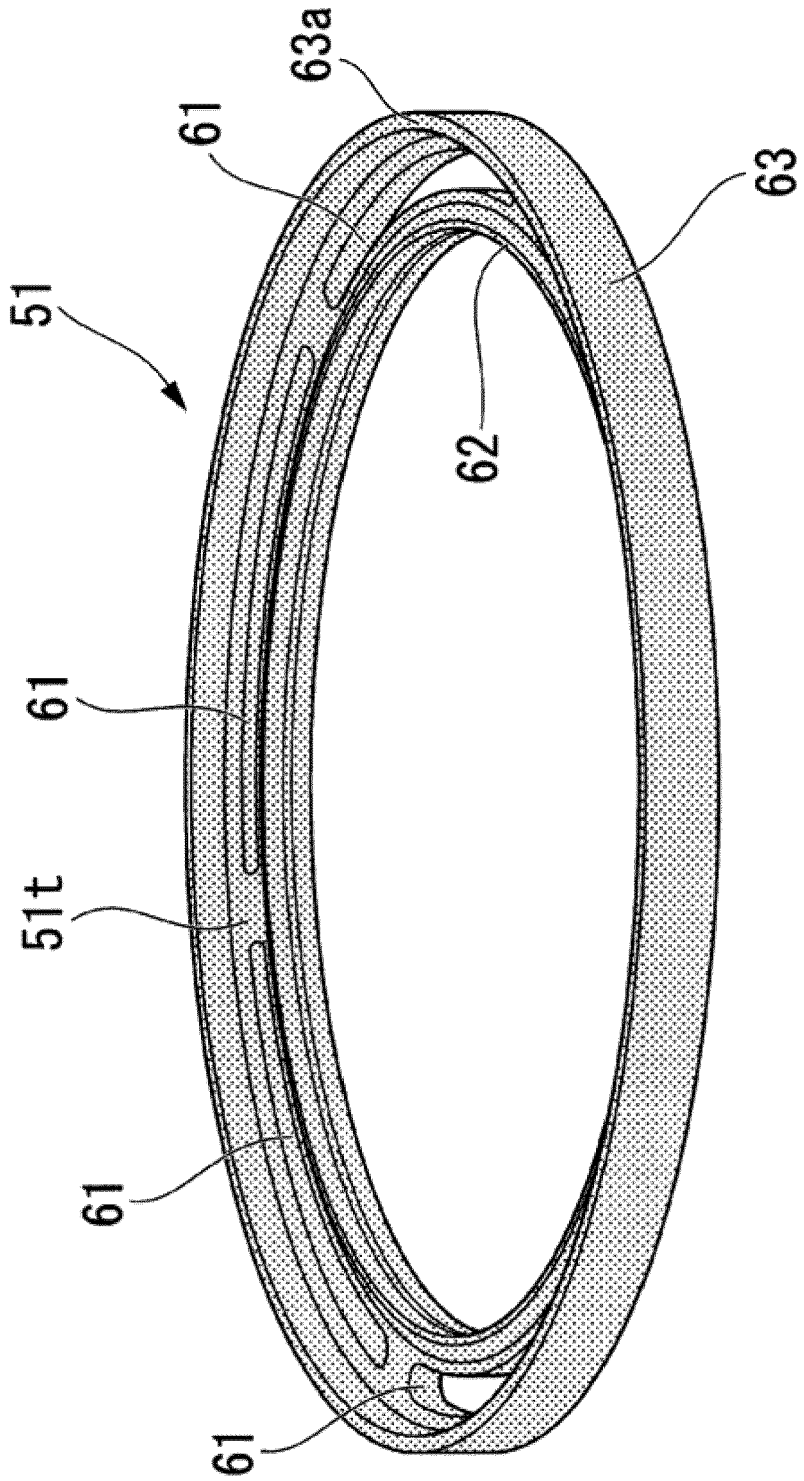
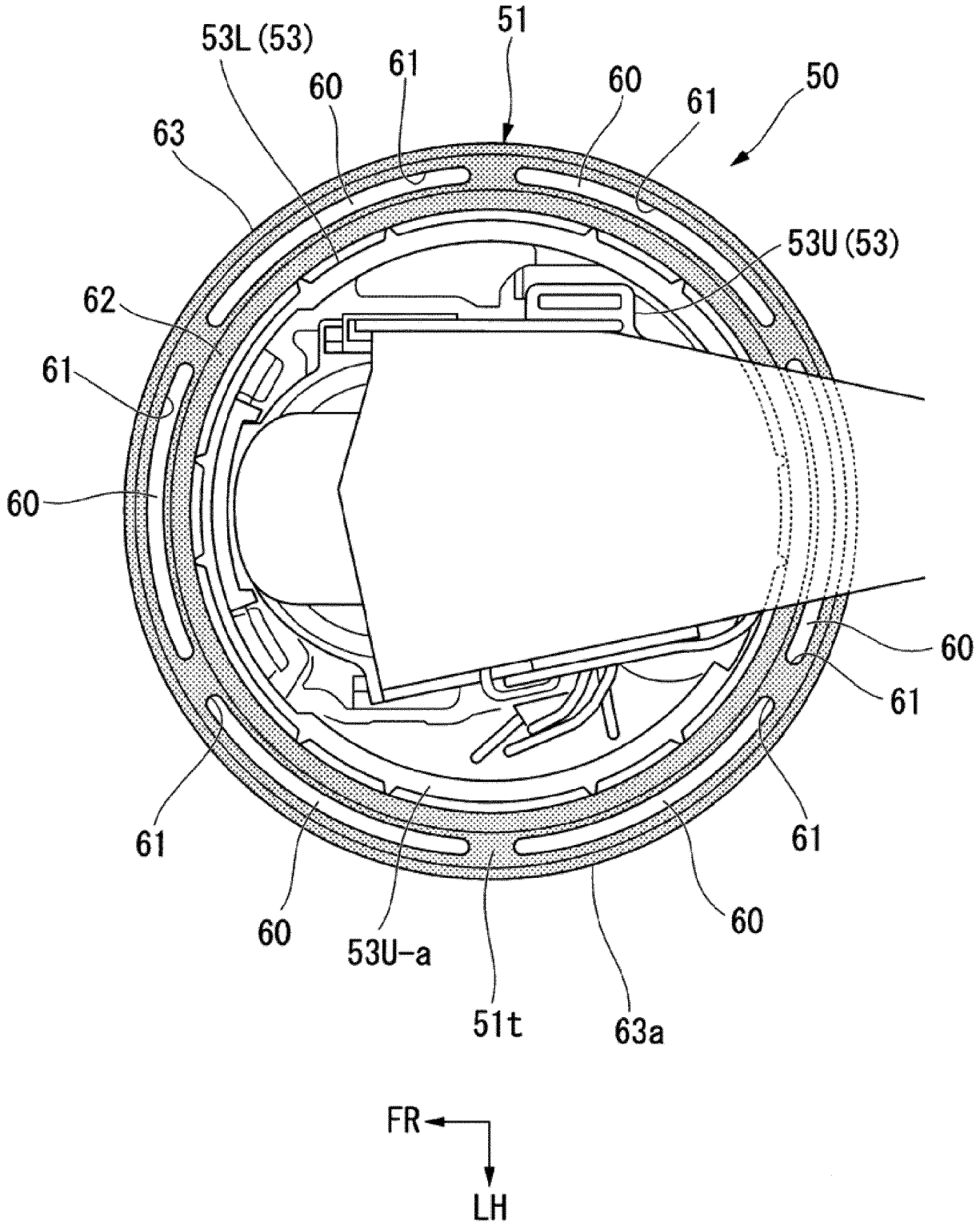


Fig.8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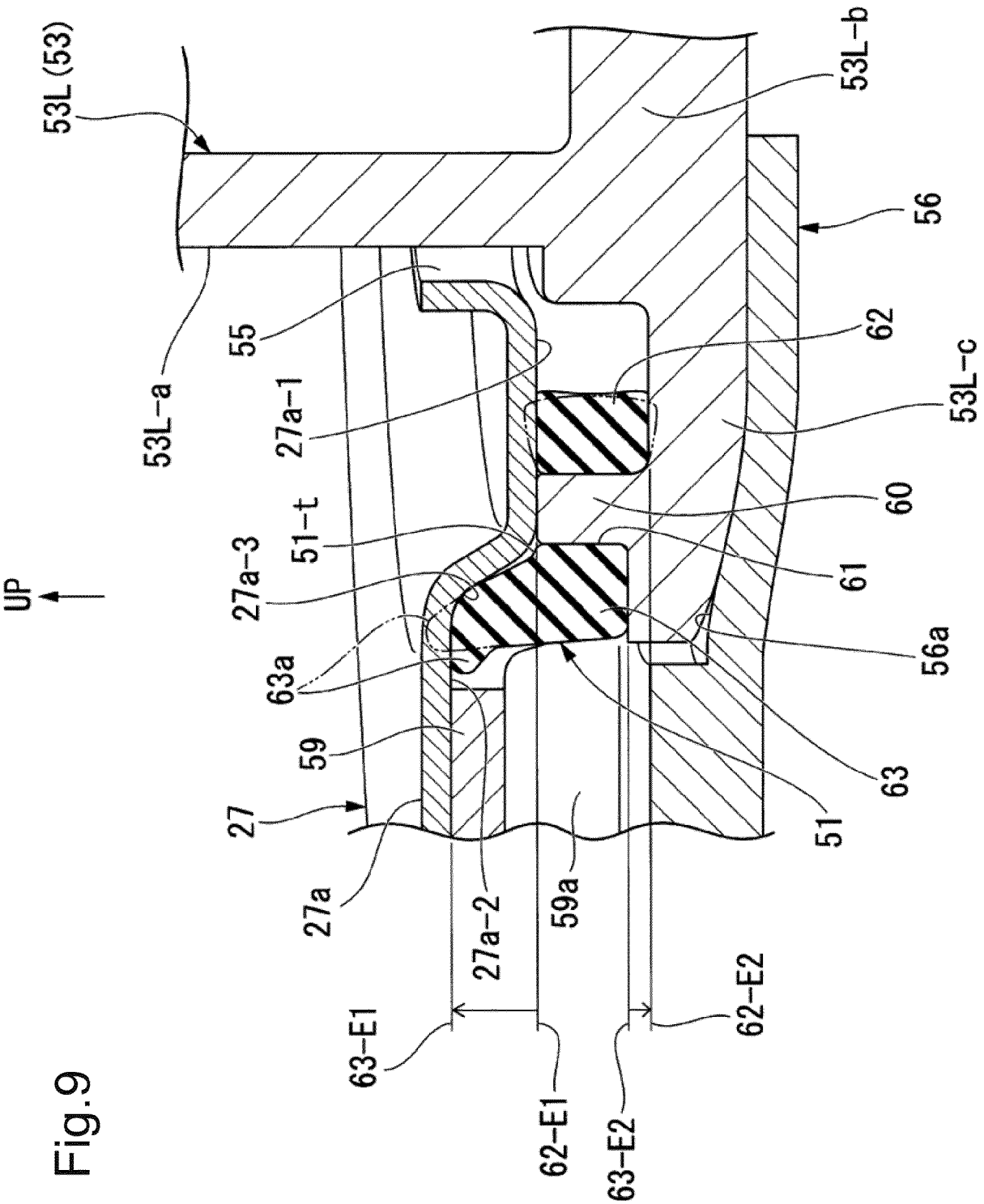
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62-E2
62-E1
63-E2
UP

Fig.9

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EUROPEAN SEARCH REPORT

Application Number
EP 15 19 8079

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F02M B60K F16J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 May 2016	Payr, Matthias

CATEGORY OF CITED DOCUMENTS

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