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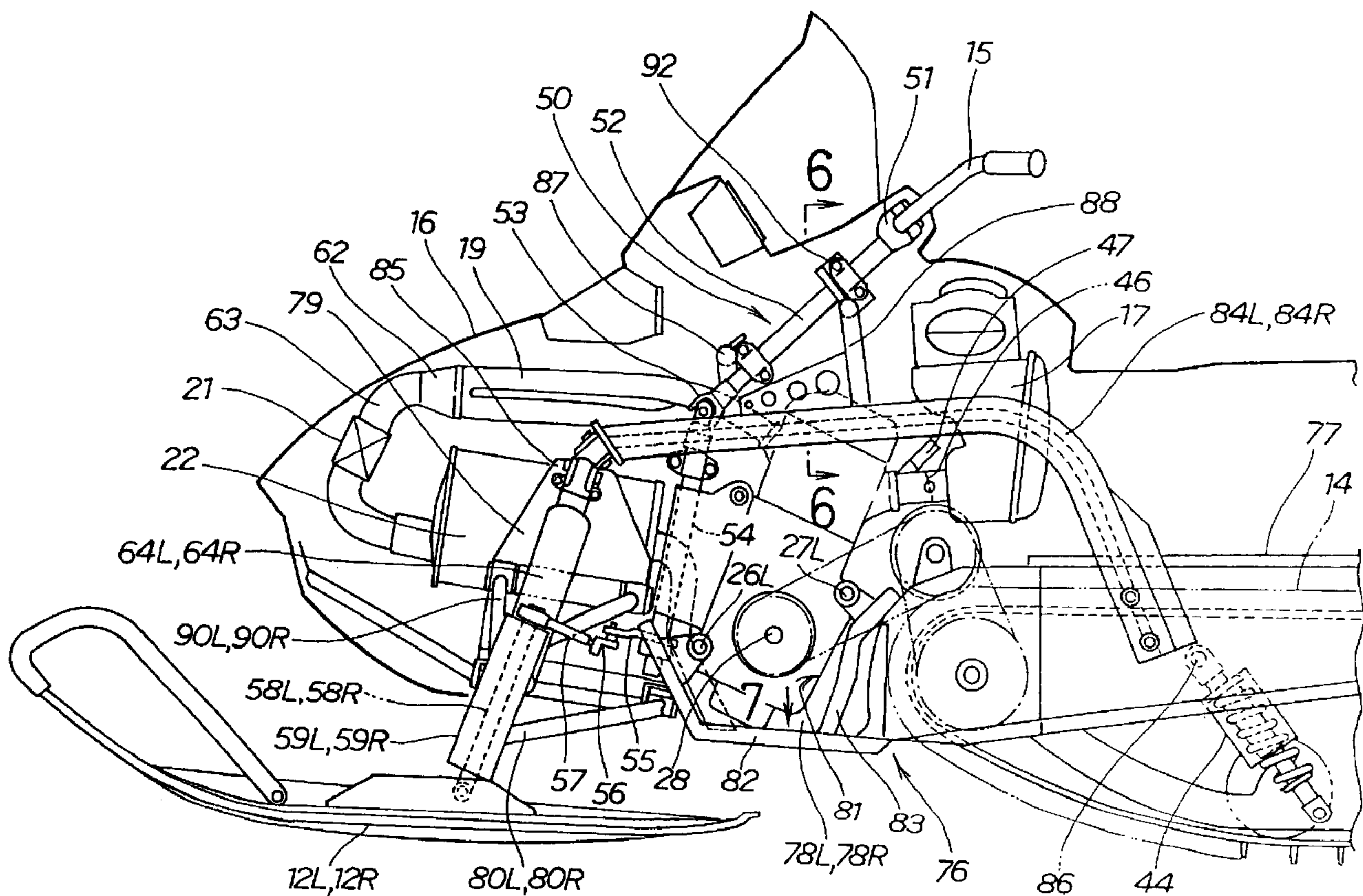
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(54) Title: SNOWMOBILE



(57) Abrégé/Abstract:

To provide a snowmobile in which an engine can be displaced rearwards. A characteristic feature lies in that a silencer is disposed on the front side of an engine, and a steering shaft lower portion of a steering shaft for transmitting a steering force from a steering

(57) **Abrégé(suite)/Abstract(continued):**

handle to skis is passed between the silencer and the engine. The engine is laid out on the rear side relative to the steering shaft lower portion. Namely, the steering shaft lower portion is disposed on the front side of the engine, whereby the engine can easily be displaced rearwards.

ABSTRACT OF THE DISCLOSURE

To provide a snowmobile in which an engine can be displaced rearwards. A characteristic feature lies in that a silencer is disposed on the front side of an engine, and a steering shaft lower portion of a steering shaft for transmitting a steering force from a steering handle to skis is passed between the silencer and the engine. The engine is laid out on the rear side relative to the steering shaft lower portion. Namely, the steering shaft lower portion is disposed on the front side of the engine, whereby the engine can easily be displaced rearwards.

SNOWMOBILE

FIELD OF THE INVENTION

- 5 The present invention relates to a snowmobile which can be made to travel on a snow field, with an engine as a drive source.

BACKGROUND OF THE INVENTION

- 10 In snowmobiles which can each travel by the power of an engine, a variety of proposals have been made as to the layout of equipment (the layout of an air cleaner and a silencer) around the engine (refer to, for example, Japanese Patent Laid-open No. 2002-364468 (Fig. 3) and Japanese Patent Laid-open No. Hei 7-228288 (page 3, Fig. 2)

- 15 In Fig. 3 of Japanese Patent Laid-open No. 2002-364468 (Fig. 3), symbol 1 denotes a snowmobile, symbol 2 denotes an engine, symbol 25 denotes a steering post, and symbol 26 denotes a steering. An engine 2 is disposed on the front side of the steering post 26. If it is intended to move rearwards the position of the engine 2, which is a heavy component, in
20 consideration of the need to regulate the position of the center of gravity, the presence of the steering post 25 hampers the engine 2 from being displaced rearwards. Therefore, the layout in Japanese Patent Laid-open No. 2002-364468 (Fig. 3) leads to the inconvenience that it is difficult to regulate the position of the center of gravity.

- 25 Lines 4 to 6 in the paragraph No. [0019] of Japanese Patent Laid-open No. Hei 7-228288 (page 3, Fig. 2) describe that "... a generator 19, a recoil starter 20 and a silencer 21 are disposed on a lateral side (the right side) of the engine 14." In recent years, for the purposes of strengthening the measure
30 to cope with emission, enhancing the silencing performance and the like,

the silencer has been increased in size and weight. When the silencer 21 is increased in size and weight, it becomes difficult to maintain the left-right balance, which affects the turning performance, particularly.

- 5 It is an object of the present invention to provide a snowmobile in which an engine can be displaced rearwards and which is excellent in turning performance.

SUMMARY OF THE INVENTION

- 10 The present invention resides in a snowmobile comprising a left-right pair of skis, an engine, and a track belt on a vehicle body in this order from the front side toward the rear side, the track belt being driven by the power of the engine to thereby cause the snowmobile to travel, and the skis being steered by an operation on a steering handle, characterized in that a
15 silencer provided in an exhaust system of the engine is disposed on the front side of the engine, and a steering shaft for transmitting a steering force from the steering handle to the skis is passed between the silencer and the engine.
- 20 According to the present invention, the silencer is disposed on the front side of the engine, so that the silencer can be disposed at, or in the vicinity of, the center of the vehicle width. As a result, the left-right balance can be easily equalized, and the turning performance can be enhanced. In addition, since the engine is disposed on the rear side relative to the
25 steering shaft, the engine can be easily displaced rearwards.

- Besides, there may be contemplated a structure in which the steering shaft is passed on the front side of the silencer and a structure in which the steering shaft is passed between the silencer and the engine. If the steering
30 shaft is passed on the front side of the silencer, the steering shaft becomes longer. On the other hand, if the steering shaft is passed between the silencer and the engine, the steering shaft becomes shorter. Therefore, according to the present invention, a shortening of the steering shaft can be easily achieved.
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An aspect of the invention is characterized in that the engine comprises a plurality of cylinders, and an exhaust pipe manifold portion for

manifolding a plurality of exhaust pipes, and the steering shaft is passed between the exhaust pipes which are not yet manifolded and which are adjacent to each other.

5 According to this aspect of the invention, the steering shaft is passed between the exhaust pipes which are not yet manifolded and which are adjacent to each other, so that the dead space inevitably generated between the adjacent exhaust pipes can be changed to an effective space.

10 Another aspect of the invention is characterized in that a universal joint is interposed in the course of the steering shaft, and a steering shaft lower portion is disposed close to the engine.

15 According to this aspect of the invention, a universal joint is interposed in the course of the steering shaft, and a steering shaft lower portion is disposed close to the engine. Where the steering shaft lower portion can be disposed close to the engine, the silencer can also be disposed close to the engine in conjunction therewith. As a result, concentration of mass in the vehicle body front-rear direction can be achieved.

20 A further aspect of the invention is characterized in that a steering shaft upper portion of the steering shaft can be regulated in inclination angle.

25 According to this aspect of the invention, a steering shaft upper portion of the steering shaft can be regulated in inclination angle, so that the height and angle of the steering handle can be changed in conformity with the rider's physique or preference, and the convenience in use of the snowmobile can be enhanced.

30 Yet another aspect of the invention resides in a snowmobile comprising a left-right pair of skis, an engine, and a track belt on a vehicle body in this order from the front side toward the rear side, the track belt being driven by the power of the engine to thereby cause the snowmobile to travel, and the skis being steered by an operation on a steering handle, characterized
35 in that a silencer provided in an exhaust system of the engine is disposed on the front side of the engine and between left and right front suspensions for suspending the left and right skis, and a connection

portion of the silencer for connection with each of exhaust pipes is provided on the front side or the rear side of the silencer.

5 According to this aspect of the invention, the silencer is disposed between the left and right front suspensions, whereby the heavy body can be disposed close to the center of the vehicle body, the turning performance can thereby be enhanced more, a slim vehicle body can be adopted, and the vehicle body can be reduced in size.

10 In addition, since the connection portion between the silencer and each of exhaust pipes is provided on the front side or the rear side of the silencer, the longitudinal axis of the silencer can be set parallel to the longitudinal axis of the vehicle body, the vehicle width can be reduced without being affected by the width of the silencer, and slimming of the vehicle body can
15 be promoted.

A further aspect of the invention is characterized in that the exhaust pipes and an exhaust pipe manifold portion are passed on the upper side of the silencer, and a downstream-side exhaust pipe on the downstream side of
20 the exhaust pipe manifold portion is bent back in a U shape and connected to a front portion of the silencer.

According to this aspect of the invention, the exhaust pipes and an exhaust pipe manifold portion are passed on the upper side of the silencer.
25 In other words, the silencer is disposed under the exhaust pipes. The silencers in recent years are comparatively large in size and heavy. If the silencer being a heavy body can be laid out at a low position, lowering of the center of gravity of the vehicle body can be promoted.

30 Another aspect of the invention resides in a snowmobile comprising a left-right pair of skis, an engine, and a track belt on a vehicle body in this order from the front side toward the rear side, the track belt being driven by the power of the engine to thereby cause the snowmobile to travel, and the skis being steered by an operation on a steering handle, characterized
35 in that a silencer provided in an exhaust system of the engine is disposed on the front side of the engine and between left and right front suspensions for suspending the left and right skis, and a connection

portion of the silencer for connection with each of exhaust pipes is provided on a lateral side of the silencer.

5 According to this aspect of the invention, the silencer is disposed between the left and right front suspensions, whereby the heavy body can be disposed close to the center of the vehicle body, the turning performance can thereby be enhanced more, a slim vehicle body can be adopted, and the vehicle body can be reduced in size.

10 Meanwhile, where the connection portion between the silencer and each of exhaust pipes is provided on the front side of the silencer, the exhaust pipes must be passed on the upper or lower side of the silencer, leading to the tendency that a front portion of the vehicle body would be large in height. From this point of view, according to claim 7, the connection
15 portion between the silencer and each of the exhaust pipes is provided on a lateral side of the silencer, so that the exhaust pipes are absent on the upper side of the silencer or the like, and the height of the front portion of the vehicle body can be set small.

20 A further aspect of the invention is characterized in that the silencer is a flat shaped silencer which is small in height and is broad sideways.

According to this aspect of the invention, a flat shaped silencer small in height and broad sideways is adopted. With the silencer set small in
25 height, it is possible to achieve a lowering of the center of gravity of the silencer, and to further promote the lowering of the center of gravity of the vehicle body.

BRIEF DESCRIPTION OF THE DRAWINGS

30 Preferred embodiments of the invention are shown in the drawings, wherein:

Fig. 1 is an overall side view of a snowmobile according to the present invention.

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Fig. 2 is a side view of a front portion of the snowmobile according to the present invention.

Fig. 3 is a plan view of the front portion of the snowmobile according to
5 the present invention (a vehicle body cover is omitted).

Fig. 4 is a perspective view of a silencer adopted in the present invention.

Fig. 5 is a front view of the snowmobile according to the present invention
10 (the vehicle body cover is omitted).

Fig. 6 is a sectional view along line 6-6 of Fig. 2.

Fig. 7 is a view along arrow 7 of Fig. 2.
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Fig. 8 is a sectional view of a fuel tank according to the present invention.

Fig. 9 is another embodiment view of Fig. 2 with a modification in the
steering handle.
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Fig. 10 is a further embodiment view of Fig. 2 with a modification in the
steering handle.

Fig. 11 is a plan view of an essential part concerning a modification in the
25 layout of the silencer.

Fig. 12 is a figure corresponding to a side view of Fig. 11.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

30 The best mode for carrying out the present invention will be described
below, based on the accompanying drawings. Incidentally, the drawings
are to be looked at according to the posture of symbols. In addition, L is a
subscript indicating the left as viewed from the driver, and R is a subscript
indicating the right as viewed from the driver.

35 Fig. 1 is an overall side view of a snowmobile according to the present
invention. The snowmobile 10 is a snow vehicle which comprises a left-

right pair of skis 12L, 12R (12R is behind 12L, here and hereinafter), an engine 13 and a track belt 14 in this order from the front side toward the rear side of a vehicle body 11, which can travel by driving the track belt 14 by the power of the engine 13, and in which the skis 12L, 12R can be
5 steered by operating a steering handle 15. The configuration of a steering system will be described in detail referring to another figure.

Symbol M denotes the rider, 16 denotes a vehicle body cover, 17 denotes an air cleaner, 18 denotes an oil tank, 19 denotes an exhaust pipe, 21
10 denotes a catalyst, 22 denotes a silencer, 23 denotes a tail pipe, 24 denotes a seat, and 25 denotes a fuel tank.

First, an intake and exhaust system will be described. Air taken in through the air cleaner 17 is fed into a combustion chamber of the engine 13. An
15 exhaust gas generated upon combustion is discharged into the atmosphere through the exhaust pipe 19, the catalyst 21, the silencer 22, and the tail pipe 23. The tail pipe 23 extends from the silencer 22, then extends toward the depth of the drawing, and then extends downward, whereby the exhaust gas is blown to the snow surface.

20 Next, a running system will be described. The engine 13 is mounted on a vehicle body frame through engine hangers 26L, 26R, 27L, 27R (details of the layout of them will be described later), and a drive pulley 31 is fitted over a crankshaft 28 of the engine 13.

25 A CVT belt 33 is wrapped around the drive pulley 31 and a driven pulley 32 disposed under the air cleaner 17, whereby a belt-type non-stage transmission 30 is constituted. A cross shaft 34 for supporting the driven pulley 32 is extended toward the depth of the drawing, a sprocket 35 is
30 attached to the tip end of the cross shaft 34, and a chain 38 is wrapped around the sprocket 35 and a sprocket 37 annexed to a drive wheel 36.

The power of the engine 13 is transmitted sequentially through the drive pulley 31, the CVT belt 33, the driven pulley 32, the cross shaft 34, the
35 sprocket 35, the chain 38, and the sprocket 37, whereby the drive wheel 36 can be rotated normally or reversely.

The track belt 14 is wrapped around the drive wheel 36 disposed at a front portion, the driven wheel 39 disposed at a rear portion, a plurality of rotary wheels 41 disposed at an intermediate lower portion, and an idler 42 disposed at an upper portion, and projections 43 provided on the outside surface of the track belt 14 are driven into the snow surface, for traveling.
5 Vertical movements generated at the time of riding over the ruggedness on the snow surface and the like are absorbed by rear cushions 44, 45.

Fig. 2 is a side view of a front portion of the snowmobile according to the present invention, in which the steering handle 15 and the skis 12L, 12R are connected by use of a steering shaft 50 (described below) and links. Incidentally, symbol 46 denotes a throttle valve provided on the downstream side of the air cleaner 17, and 47 denotes an injector provided on the downstream side relative to the throttle valve 46.
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15 The steering shaft 50 is composed of a steering shaft upper portion 52 provided with a steering handle holder 51 at the top end thereof and inclined forwardly downwards, a universal joint 53 attached to the lower end of the steering shaft upper portion 52, and a steering shaft lower portion 54 extending substantially vertically downwards from the universal joint 53.
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A lever 55 is provided at the lower end of the steering shaft lower portion 54, a drive member 56 extended in the vehicle width direction (the face-back direction of the drawing) is connected to the lever 55, levers 57 are attached respectively to the left and right ends of the drive member 56, and vertically directed spindles 58L, 58R are rotated about roughly vertical axes by the levers 57, whereby the skis 12L, 12R can be steered.
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30 Incidentally, the spindles 58L, 58R are rotatably contained in front leg portions 59L, 59R vertically movably supported by lower arms 80L, 80R, upper arms 90L, 90R and front suspensions 64L, 64R which are vertically movably mounted to the vehicle body frame.

35 In addition, a characteristic feature lies in that the silencer 22 is disposed on the front side (the left side in the figure) of the engine 13, and the steering shaft lower portion 54 of the steering shaft 50 is passed between

the silencer 22 and the engine 13. The engine 13 is disposed on the rear side relative to the steering shaft lower portion 54. Namely, the steering shaft lower portion 54 is disposed on the front side of the engine 13, so that the engine 13 can be easily moved rearwards.

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Meanwhile, there can be contemplated two structures, i.e., a structure in which the steering shaft lower portion 54 is passed on the front side of the silencer 22 and another structure in which the steering shaft lower portion 54 is passed between the silencer 22 and the engine 13. If the steering shaft lower portion 54 is passed on the front side of the silencer 22, the overall length of the steering shaft 50 becomes large. From this point of view, in the present invention, the steering shaft lower portion 54 is passed between the silencer 22 and the engine 13, so that a shortening of the steering shaft 50 can be easily achieved.

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In addition, a characteristic feature resides in that the universal joint 53 is interposed at an intermediate portion of the steering shaft 50, and the steering shaft lower portion 54 is set close to the engine 13. When the steering shaft lower portion 54 can be set close to the engine 13, the silencer 22 can also be set close to the engine 13 in conjunction with this. As a result, it is possible to achieve concentration of mass in the vehicle body front-rear direction.

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The vehicle body frame 76 is a frame in which intermediate frames 78L, 78R formed in U shape in side view are connected to front portions of a rear frame 77 having a roughly U shaped section opened to the lower side so as to be situated astride the top surface and the left and right side surfaces of the track belt 14, and a front frame 79 is connected to front portions of the intermediate frames 78L, 78R, and which is characterized in that a reinforcement as described below is applied to the intermediate frames 78L, 78R.

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The intermediate frames 78L, 78R are made to be frames U-shaped in side view and each provided with a cutout portion 81 for permitting the crankshaft 28 or the like to be passed therethrough. Since the intermediate frames 78L, 78R are U-shaped frames, it is desirable to apply appropriate reinforcement to the frames. In view of this, an L-shaped reinforcement

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member 82 and an I-shaped reinforcement member 83 are annexed to each of the intermediate frames 78L, 78R along the cutout portion 81, to thereby reinforce the cutout portion 81.

5 Further, an upper portion of the front frame 79 and a front upper portion of the rear frame 77 are connected by side frames 84L, 84R so as to cross the cutout portion 81. Specifically, the front suspensions 64L, 64R are mounted to the front frame 79, and the tip ends of the side frames 84L, 84R are connected to the vicinity of a suspension receiving portion 85
10 provided for the mounting. The rear cushion 44 is mounted to the rear frame 77, and the rear ends of the side frames 84L, 84R are connected to the vicinity of a cushion receiving portion 86 provided for the mounting. By this, the front frame 79 and the rear frame 77 can be firmly connected to each other.

15 Returning to Fig. 1, the engine 13 is disposed in the state of being inclined rearwards. Specifically, the engine head portion 13a and the cylinder 13b are inclined by an angle θ rearwards from the vertical axis, so that it is possible to contrive a lowering of the center of gravity of the engine, and
20 to set the center of gravity of the snowmobile close to the center of the vehicle body. Since the center of gravity can be set close to the center of the vehicle body, it is possible to keep the vehicle body stable, particularly during high-speed running and running on a largely rugged snow surface. As a result, it is possible to achieve more pleasant running.

25 Fig. 3 is a plan view of a front portion of the snowmobile according to the present invention (the vehicle body cover is omitted). The engine 13, i.e. a series 4-cylinder engine in this embodiment, is so disposed that the crankshaft extends in the vehicle width direction and that exhaust ports 61
30 (indicates plurality, here and hereinafter) are directed toward the front side.

The exhaust pipes 19 are extended respectively from the exhaust ports 61, and are united into a single pipe at an exhaust pipe manifold portion 62; a
35 single manifolded exhaust pipe 63 is extended forwards from an outlet of the exhaust pipe manifold portion 62, is then bent back in U shape, and is connected to a front portion of the silencer 22. The left and right front

suspensions 64L, 64R are disposed respectively on the left side and the right side of the silencer 22.

As is clear from the figure, the silencer 22 is so disposed that the longitudinal axis of the silencer 22 is parallel to the longitudinal axis of the vehicle body (an axis equivalent to the vehicle width center axis 65), so that the length of the silencer 22 does not exert any influence on the vehicle body width. The silencer 22 not affecting the vehicle body width is disposed between the left and right front suspensions 64L, 64R, which makes it possible to adopt a slim vehicle body and to reduce the vehicle body size.

In addition, since the silencer 22 is disposed on the front side of the engine 13, the silencer 22 can be laid out on the vehicle width center axis 65 or in the vicinity of the vehicle width center axis 65. As a result, the left-right balance can be easily evened, and steering performance can be enhanced.

Furthermore, the steering shaft 50 is passed between adjacent exhaust pipes 19, 19. As a result, a dead space 66 inevitably generated between the adjacent exhaust pipes 19, 19 can be changed into an effective space.

Fig. 4 is a perspective view of the silencer adopted in the present invention. The silencer 22 is a silencing box having a structure in which a porous plate 68 and a partition wall 69 are interposed in the inside of an elliptic tube 67 having an elongate section, the partition wall 69 is provided with a passing pipe 71, the front and rear openings of the elliptic tube 67 are closed with front and rear lids 72, 73, an exhaust gas inlet pipe 74 is provided to penetrate through the front lid 72, the partition wall 69 and the porous plate 68, and an exhaust gas outlet pipe 75 is provided to penetrate through the partition wall 69, the porous plate 68 and the rear lid 73.

An exhaust gas flows through the exhaust gas inlet pipe 74 into a first chamber C1, flows from the first chamber C1 through the porous plate 68 into a second chamber C2, flows from the second chamber C2 through the passing pipe 71 into a third chamber C3, and flows from the third chamber C3 through the exhaust gas outlet pipe 75 into the tail pipe 23.

Adoption of the silencer 22 being thus small in height and broad sideways makes it possible to achieve a lowering of the center of gravity of the silencer 22. By laying out the silencer 22 of the low center-of-gravity type
5 as shown in Fig. 2 and in Fig. 5 described later, it is possible to further promote the lowering of the center of gravity of the vehicle body.

Fig. 5 is a front view of the snowmobile according to the present invention (the vehicle body cover is omitted, in which lower arms 80L, 80R are
10 extended to the left and right sides from the front frame 79, upper arms 90L, 90R are extended to the left and right sides from the front frame 79, and the front leg portions 59L, 59R are connected to the tip ends of the arms. In addition, the lower ends of the front suspensions 64L, 64R are
15 connected to the tip ends of the lower arms 80L, 80R, whereby a suspension mechanism for the skis 12L, 12R is constituted.

The left and right J-shaped frames 84L, 84R are present on the depth side (in the figure) of portions for supporting the left and right front
20 suspensions 64L, 64R, and front and rear two cross pipes 87, 88 are bridgingly disposed between the J-shaped frames 84L, 84R, to form a structure for enhancing the rigidity in the vehicle body sectional direction.

Fig. 6 is a sectional view along line 6-6 of Fig. 2, in which the left and right J-shaped frames 84L, 84R coupled by the cross pipe 88 are composed of
25 extruded members being -shaped in section. Two ribs 89, 89 are bridgingly provided in the inside of the molded member, in addition to the -shaped section, whereby it is possible to drastically enhance the flexural rigidity and deflectional rigidity. Since extrusion permits free selection of the sectional shape, a -shaped section and a -plus-+ shaped section can be
30 obtained by decreasing or increasing the number of the ribs 89.

In addition, the cross pipe 88 is provided with a bracket 91, a bearing block 92 is attached to the bracket 91, and the steering shaft upper portion 52 is
35 rotatably supported on the bearing block 92. With the steering shaft upper portion 52 movably supported by ingeniously utilizing the cross pipe 88 provided for the purpose of holding the left and right side frames 84L, 84R

from moving in the left-right direction, it is possible to contrive an expanded use of the cross pipe 88.

Fig. 7 is a view along arrow 7 of Fig. 2, showing that the left intermediate frame 78L is provided with the engine hangers 26L, 27L, whereas the right intermediate frame 78R is provided with the engine hangers 26R, 27R, and the engine is supported on the vehicle body frame 76 through the four engine hangers 26L, 26R, 27L, 27R arranged on the front and rear sides and the left and right sides.

Fig. 8 is a sectional view of the fuel tank according to the present invention, in which a radiator 93 is formed as one body with the rear frame 77, and the radiator 93 is provided with heat-radiating fins 94 so that the snow raked up by the track belt 14 will make contact with the heat-radiating fins 94. Incidentally, the radiator 93 may naturally be so shaped as to extend over the entire part of the lower surface of the rear frame 77, for earning the heat-radiating area.

In addition, it is shown that the box-shaped fuel tank 25 is disposed on the rear frame 77, and the seat 24 is disposed on the upper side of the fuel tank 25. The seat 24 is formed to be thicker at its portion on which the hip point Mh of the rider M fronts and to be thinner at its portion which is clamped by both knees Ms of the rider M and on which no load is substantially exerted.

On the other hand, while the fuel tank 25 is fitted with the oil supply pipe 96, an oil supply cap 97 and the fuel pump 98, it is desirable to provide the oil supply pipe 96 at a position as high as possible. Besides, the fuel pump 98 is inserted into the fuel tank 25 from the upper side so that the fuel pump 98 can be inspected immediately upon opening the seat 24.

Meanwhile, the engine according to the present invention is a fuel injection type engine, and, for this purpose, it is essential for the fuel pump 98 to be a high-pressure pump and be a large-sized pump. In order to contain the large-sized pump, it is necessary for the fuel tank 25 to have a predetermined height (depth).

In view of this, of a ceiling plate 99 of the fuel tank 25, the portion ranging from an intermediate position to a front portion is made to be a raised portion 101 raised forwardly upwards, for earning the height. As a result, the oil supply pipe 96 can be mounted at a higher position. Similarly, the fuel pump 98 is attached to a higher portion so that the height of the fuel pump 98 can be earned.

Correspondingly to this, the height of the fuel tank 25 at a rear half portion is set to be small so as to earn the thickness of the seat 24, whereby the seating comfort is enhanced. As is clear from the figure, in the present invention, the height of the seat 24 and the height of the fuel tank 25 are harmonized, whereby it is possible to secure the required thickness of the seat 24 and the required height of the fuel tank 25, while keeping constant the height from the top surface of the seat 24 to the bottom surface of the fuel tank 25.

Now, another embodiment of the present invention will be described below, based on the drawings. Fig. 9 is another embodiment view of Fig. 2 with a modification in the steering handle, in which the same portions as in Fig. 2 are denoted by the same symbols as used above, detailed description thereof is omitted, and modified portions will be described principally.

An arcuate plate 102 is attached to the cross pipe 88, an arcuate hole 103 is bored in the arcuate plate 102, and the bearing block 92 is fastened to the arcuate hole 103 by a bolt 104. An arcuate plate 105 attached to the lower cross pipe 87 and the bearing block 92 are attached in the same manner. Incidentally, the arcuate plates 102 and 105 may be rectangular plates inasmuch as the arcuate hole 103 can be securely bored therein.

By the action of the arcuate hole 103, the steering handle 15 indicated by solid lines can be raised or lowered to the position indicated by imaginary lines, whereby inclination angle can be regulated. With the bolt 104 fixed in situ, the position of the steering handle 15 is determined. Namely, the height and angle of the steering handle 15 can be changed in conformity with the rider's physique or preference, and the convenience in use of the snowmobile can be enhanced accordingly.

Fig. 10 is a further embodiment view of Fig. 2 with a modification in the steering handle, in which the same portions as in Fig. 2 are denoted by the same symbols as used above, detailed description thereof is omitted, and
5 modified portions will be described principally.

It is shown that, by adopting a steering shaft 106 penetrating through the oil tank 18, the universal joint 53 shown in Fig. 2 can be omitted. Specifically, the single steering shaft 106 is passed on the front side of the
10 engine 13 and on the rear side of the silencer 22, whereby it is possible to contrive a reduction in the number of component parts of the steering system.

Fig. 11 is a plan view of an essential part concerning a modification in the layout of the silencer, in which the silencer 22 is so laid out that its longitudinal axis extends in the vehicle width direction, a curved exhaust pipe 108 is extended from the left end (the left and the right are as viewed from the rider) of an exhaust manifold 107 annexed to the engine 13, the curved exhaust pipe 108 is connected to the left side surface of the silencer
20 22, and the tail pipe 23 is extended from the right side surface of the silencer 22. The other component elements are denoted by the same symbols as used in Fig. 3, and detailed description thereof is omitted.

Fig. 12 is a figure corresponding to a side view of Fig. 11, and shows that
25 the silencer 22 is extended in the face-back direction of the drawing. The curved exhaust pipe 108 is compact, and, returning to Fig. 11, the curved exhaust pipe 108 and the tail pipe 23 can be laid out substantially symmetrically on the left and right sides of the silencer 22, so that the left-right balance property can be easily enhanced. In addition, since the
30 exhaust pipes are not present on the upper side of the silencer 22, it is possible to reduce the height of the front portion of the vehicle body. The other component elements are denoted by the same symbols as used in Fig. 2, and detailed description thereof is omitted.

35 The present invention is preferable for application to snowmobiles designed to travel on a snow surface or a snow field.

- 16 -

Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

WH-12576/cs

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A snowmobile comprising a left-right pair of skis, an engine, and a track belt on a vehicle body in this order from the front side toward the rear side, said track belt being driven by the power of said engine to thereby cause said snowmobile to travel, and said skis being steered by an operation on a steering handle, wherein a silencer provided in an exhaust system of said engine is disposed on the front side of said engine, and a steering shaft for transmitting a steering force from said steering handle to said skis is passed between said silencer and said engine.
2. A snowmobile as set forth in claim 1, wherein said engine comprises a plurality of cylinders, and an exhaust pipe manifold portion for manifolding a plurality of exhaust pipes, and said steering shaft is passed between said exhaust pipes which are not yet manifolded and which are adjacent to each other.
3. A snowmobile as set forth in claim 1, wherein a universal joint is interposed in the course of said steering shaft, and a steering shaft lower portion is disposed close to said engine.
4. A snowmobile as set forth in claim 3, wherein a steering shaft upper portion of said steering shaft can be regulated in inclination angle.
5. A snowmobile as claimed in claim 1 wherein said silencer is disposed between left and right front suspensions for suspending said left and right skis, and a connection portion of said silencer for connection with each of exhaust pipes is provided on the front side or the rear side of said silencer.
6. A snowmobile as set forth in claim 5, wherein said exhaust pipes and an exhaust pipe manifold portion are passed on the upper side of said silencer, and a downstream-side exhaust pipe on the downstream side of said exhaust pipe manifold portion is bent back in a U shape and connected to a front portion of said silencer.
7. A snowmobile as claimed in claim 1 wherein said silencer is disposed between left and right front suspensions for suspending said left and right skis,

WH-12576CA
SN 2,498,588

- 18 -

and a connection portion of said silencer for connection with each of exhaust pipes is provided on a lateral side of said silencer.

8. A snowmobile as set forth in claims 1, 5 or 7, wherein said silencer is a flat shaped silencer which is small in height and is broad sideways.

FIG. 1

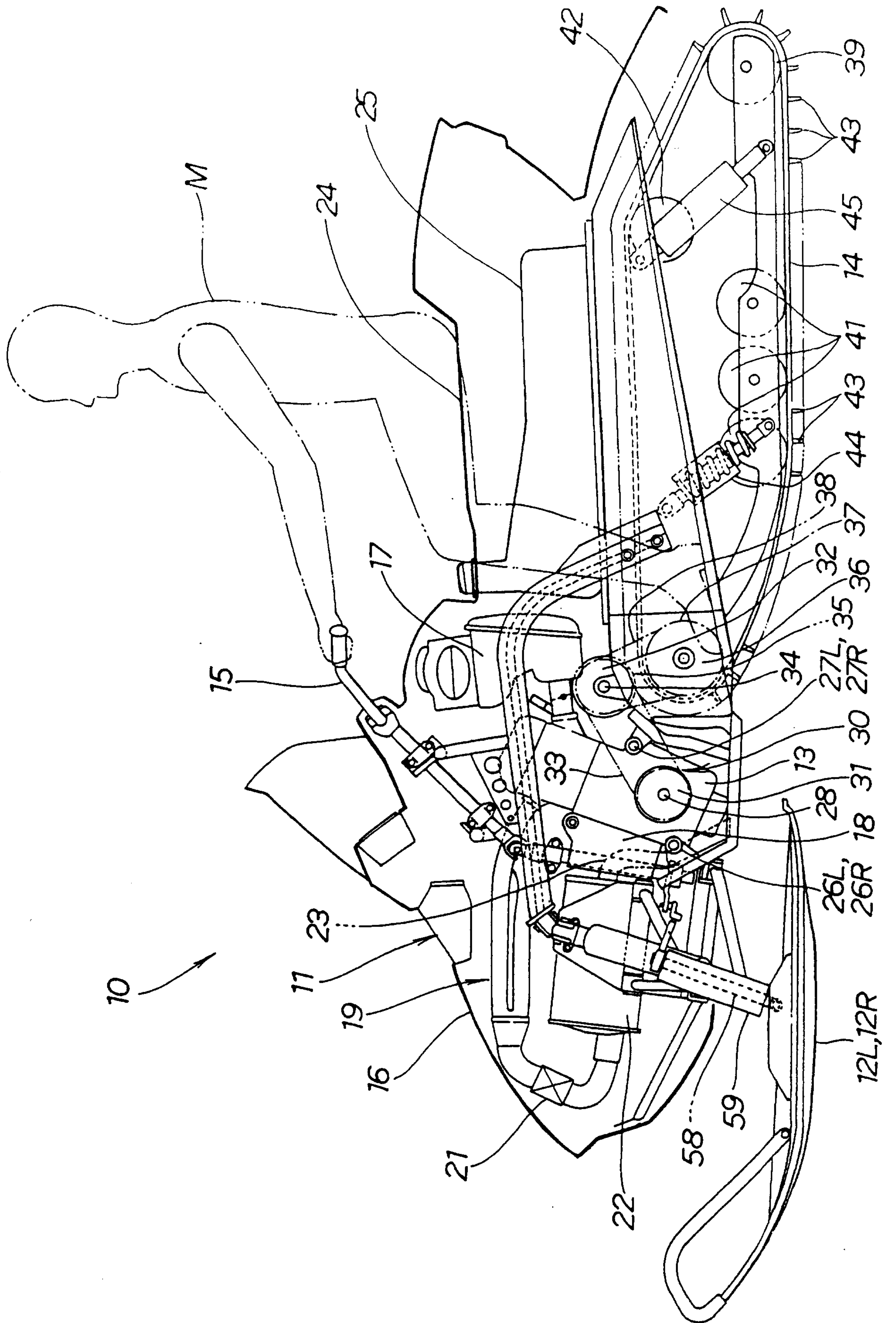


FIG. 2

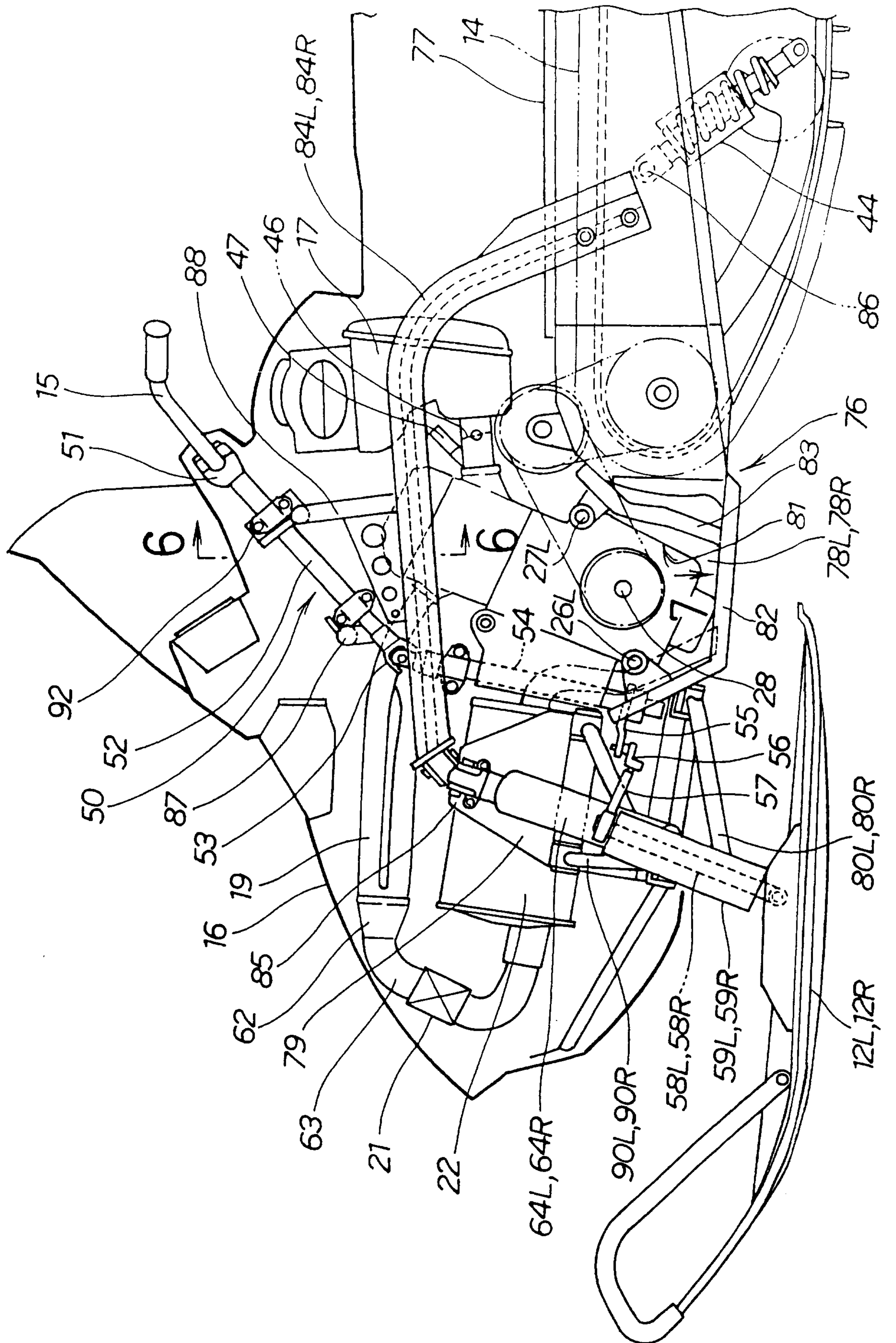


FIG. 3

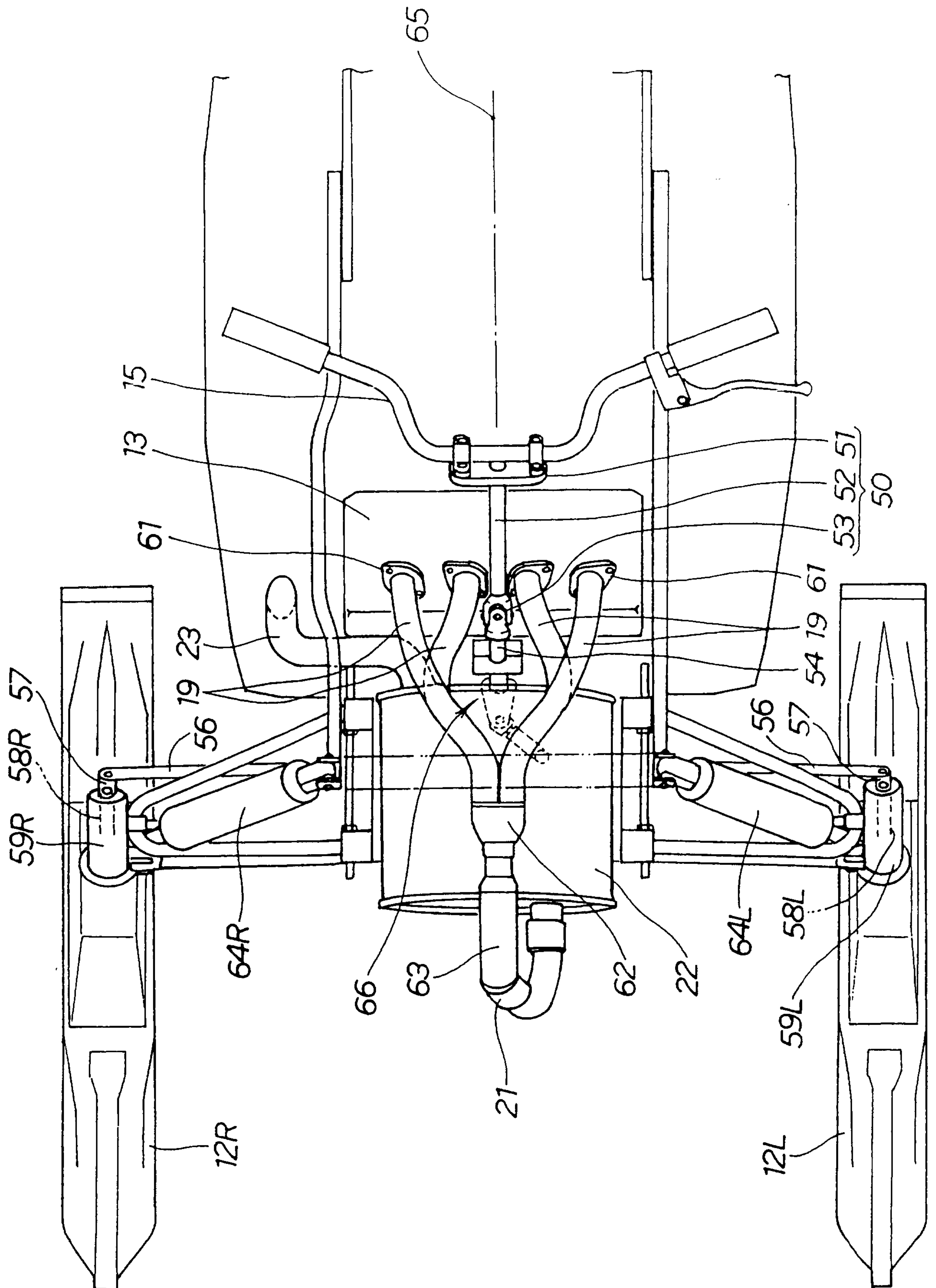


FIG. 4

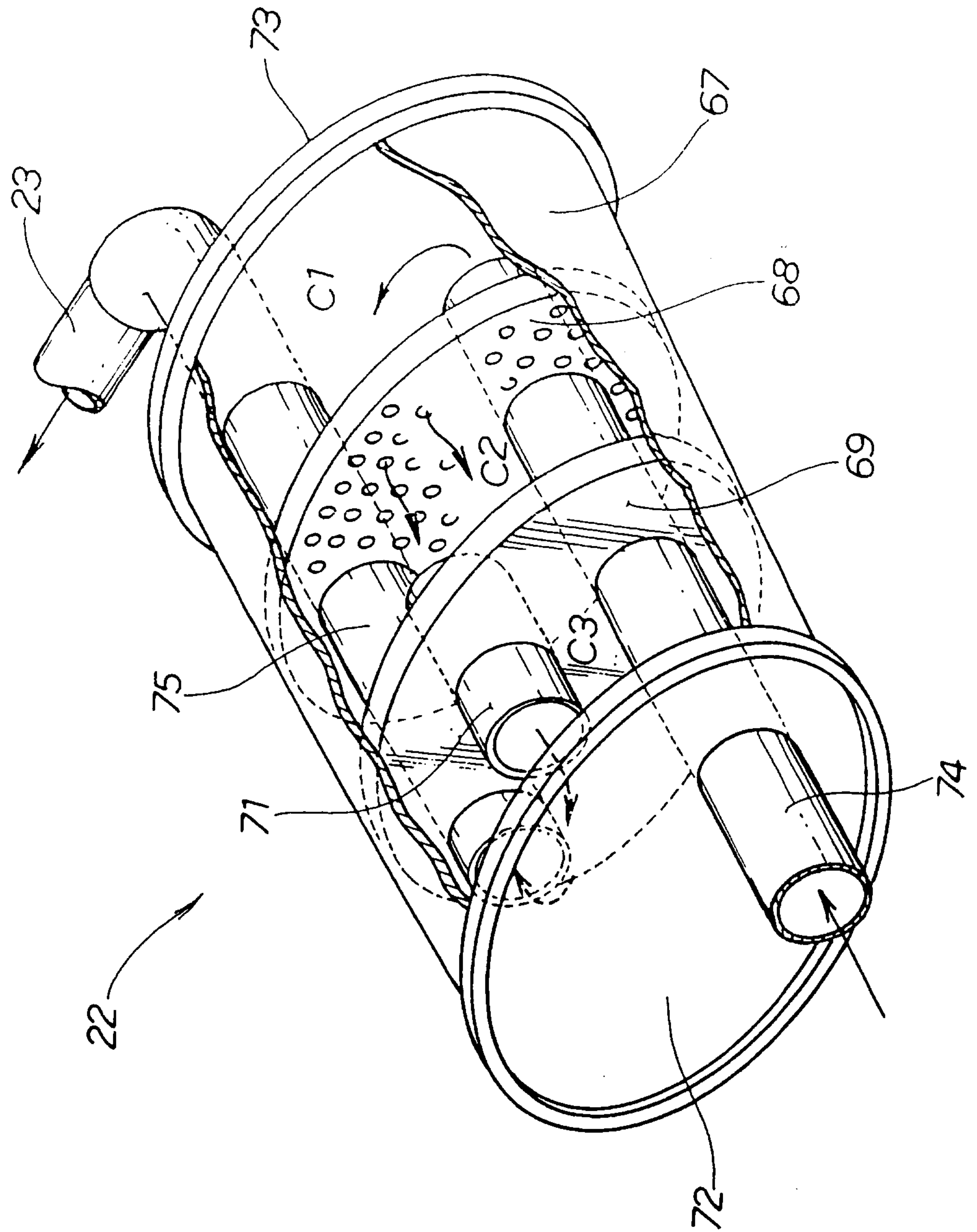


FIG. 5

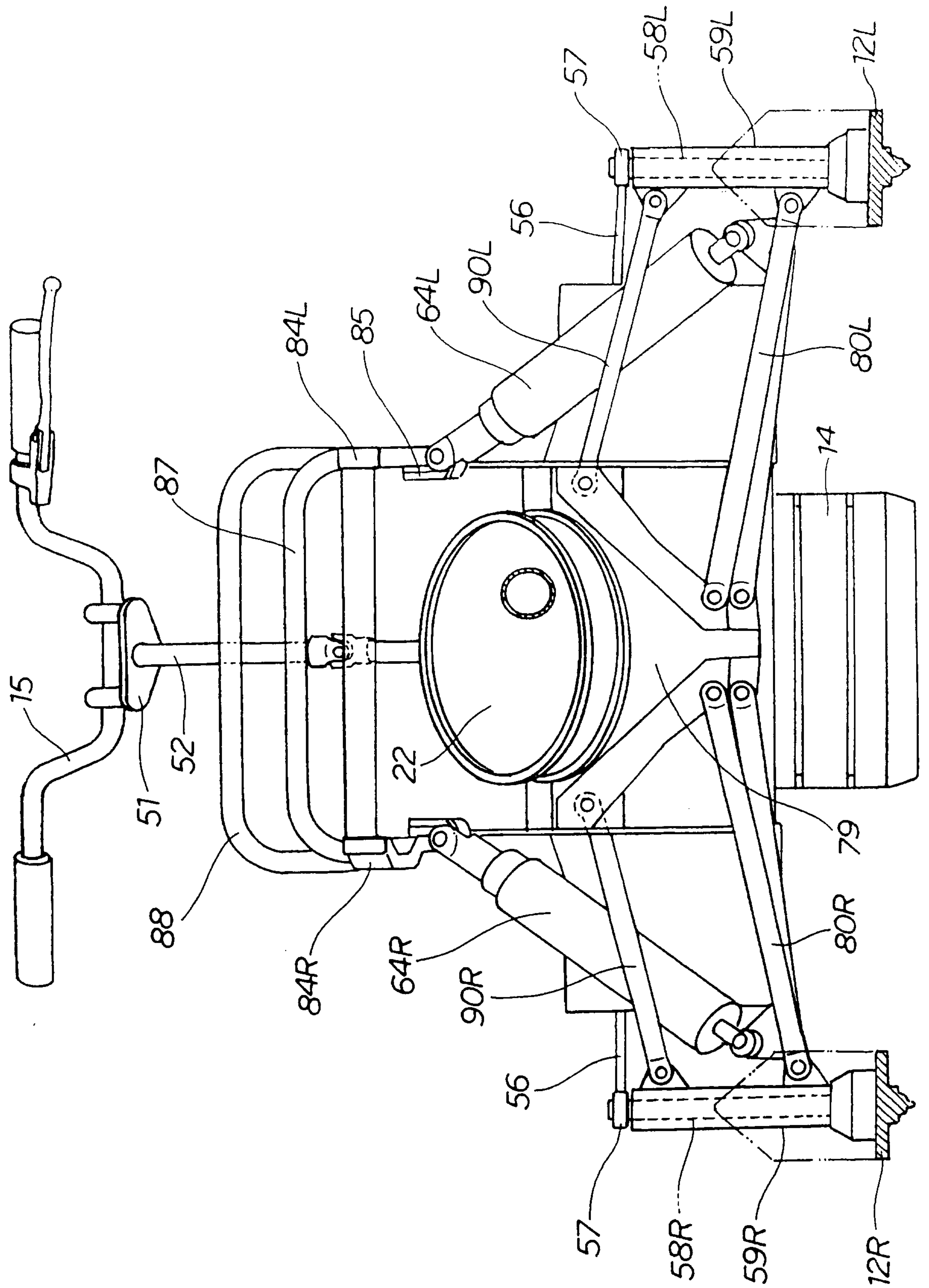


FIG. 6

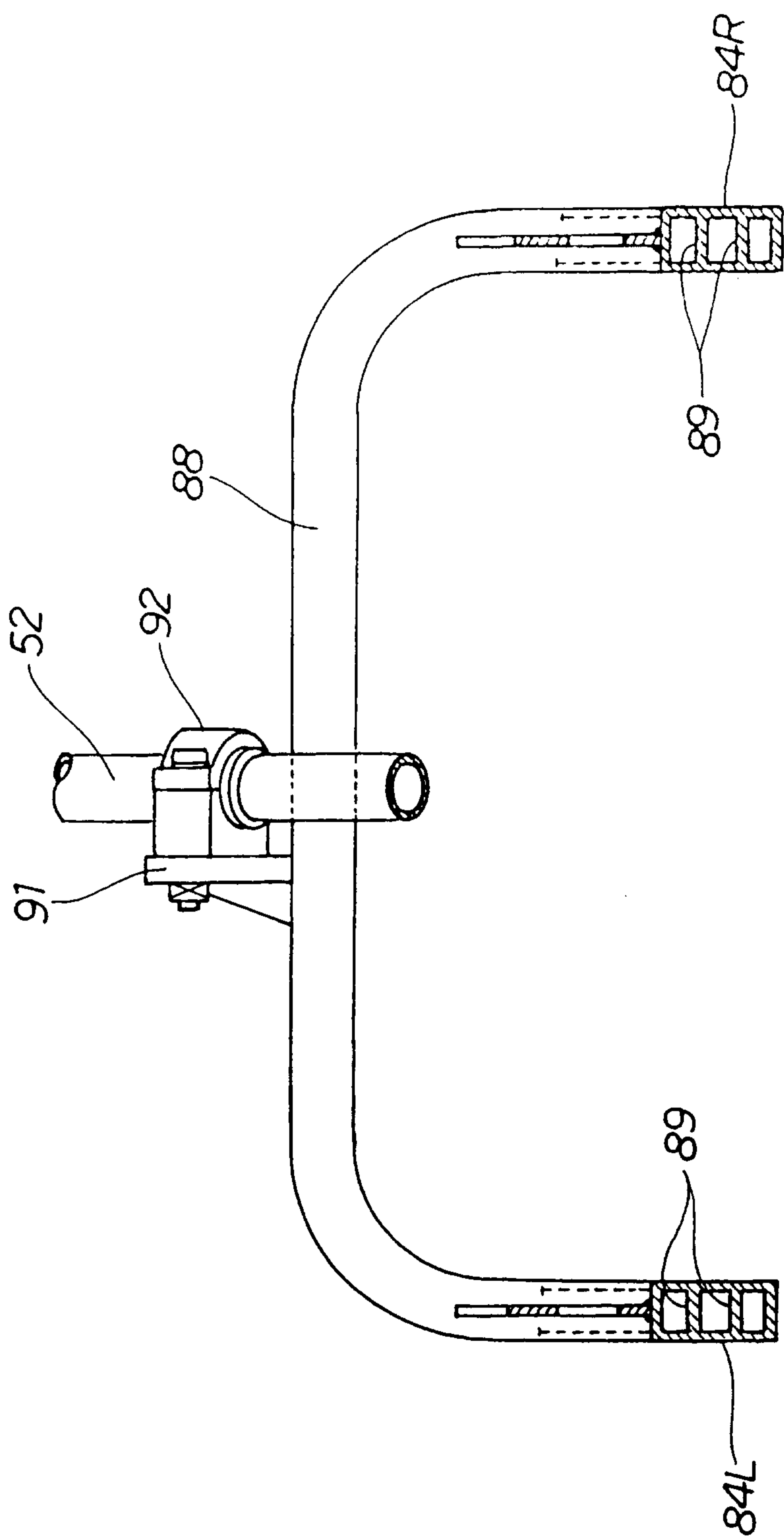


FIG. 7

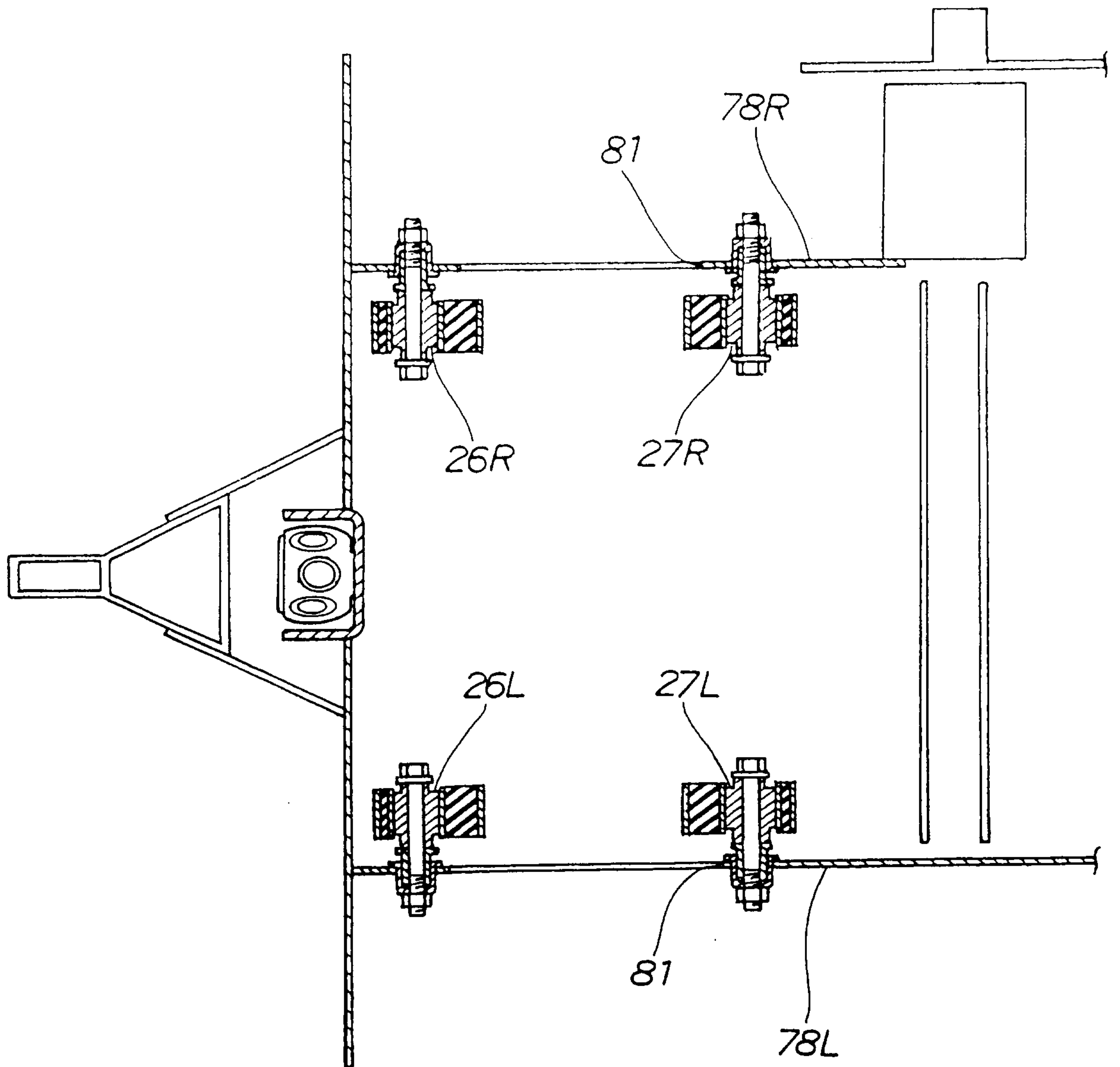


FIG. 8

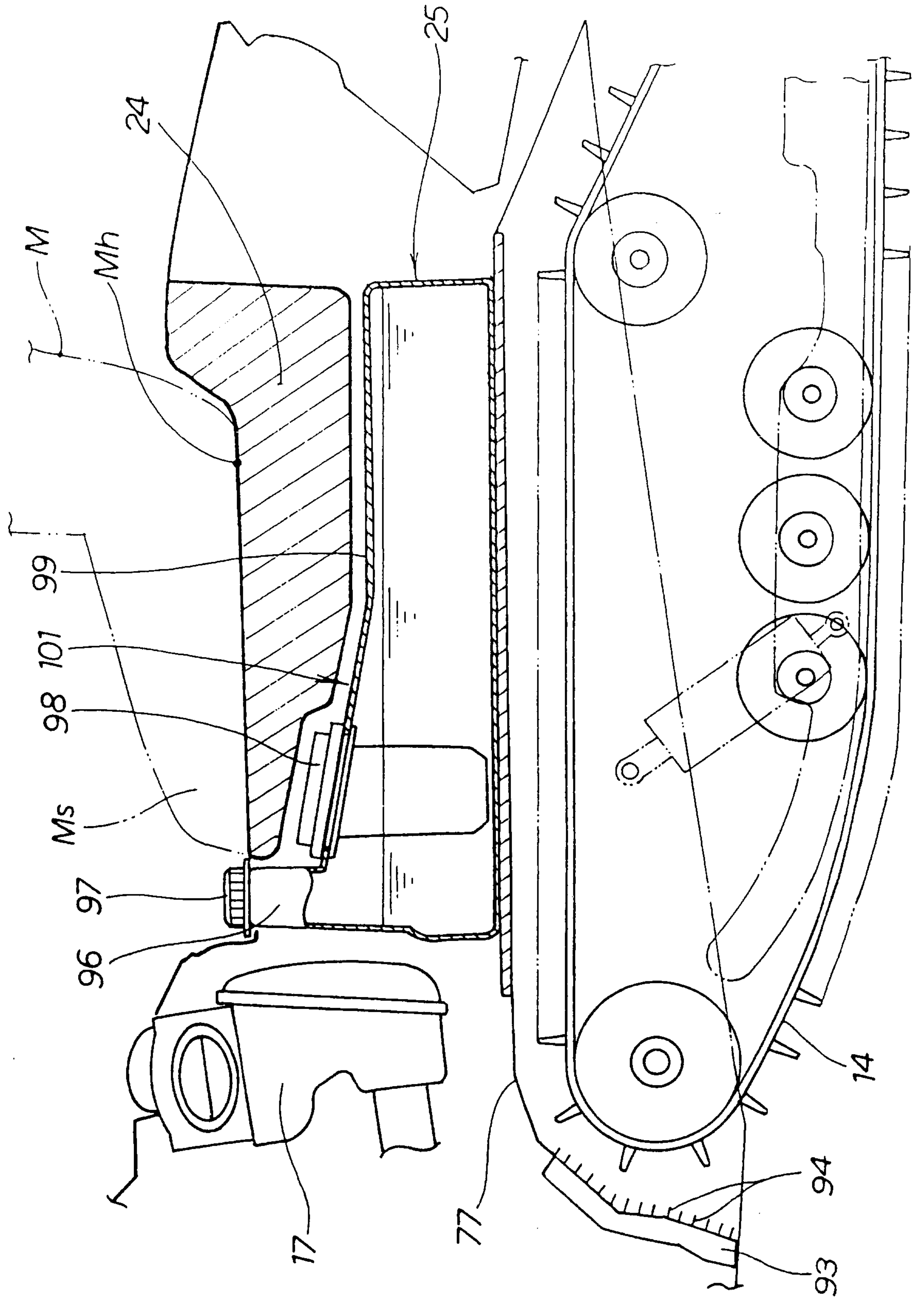


FIG. 9

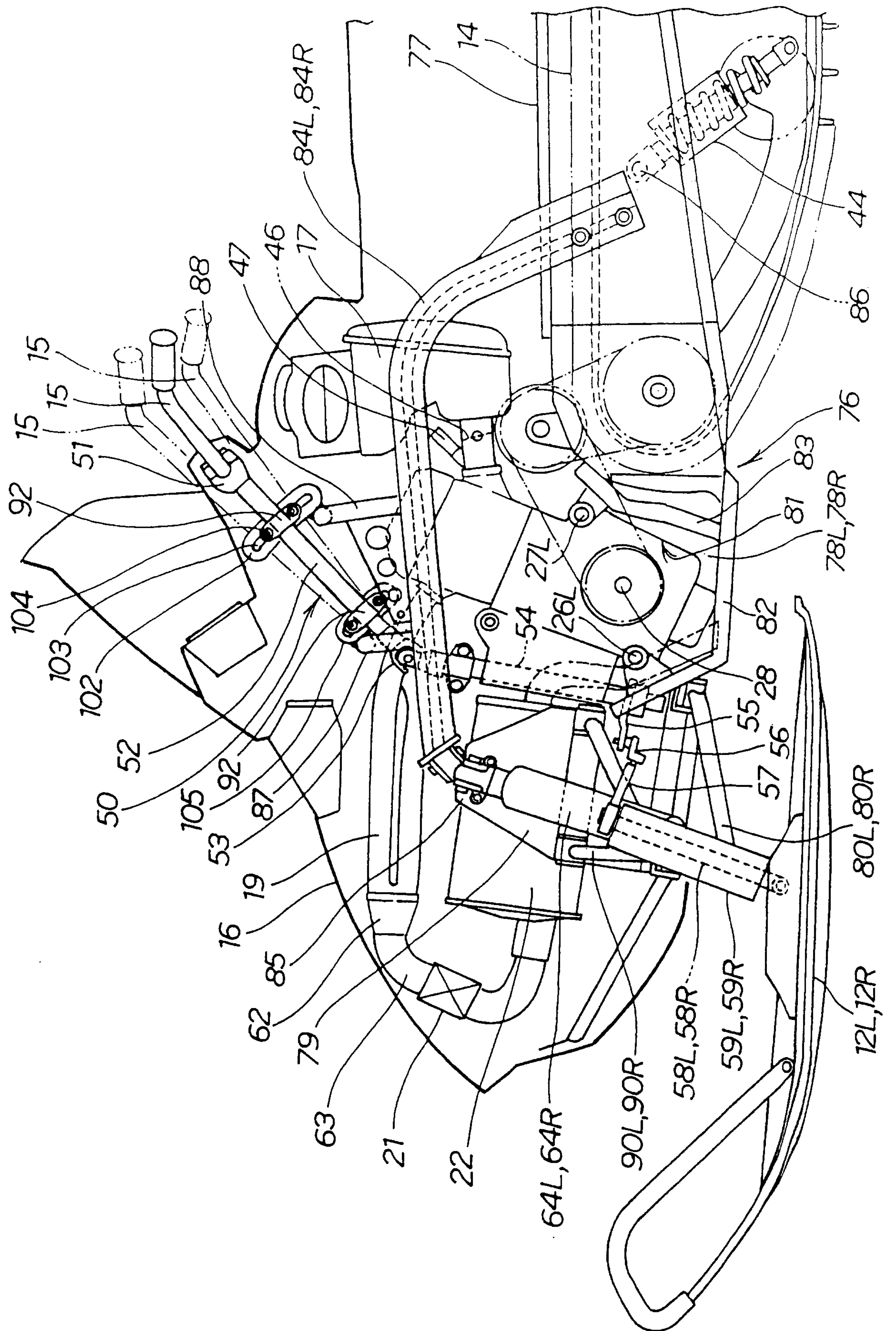


FIG. 10

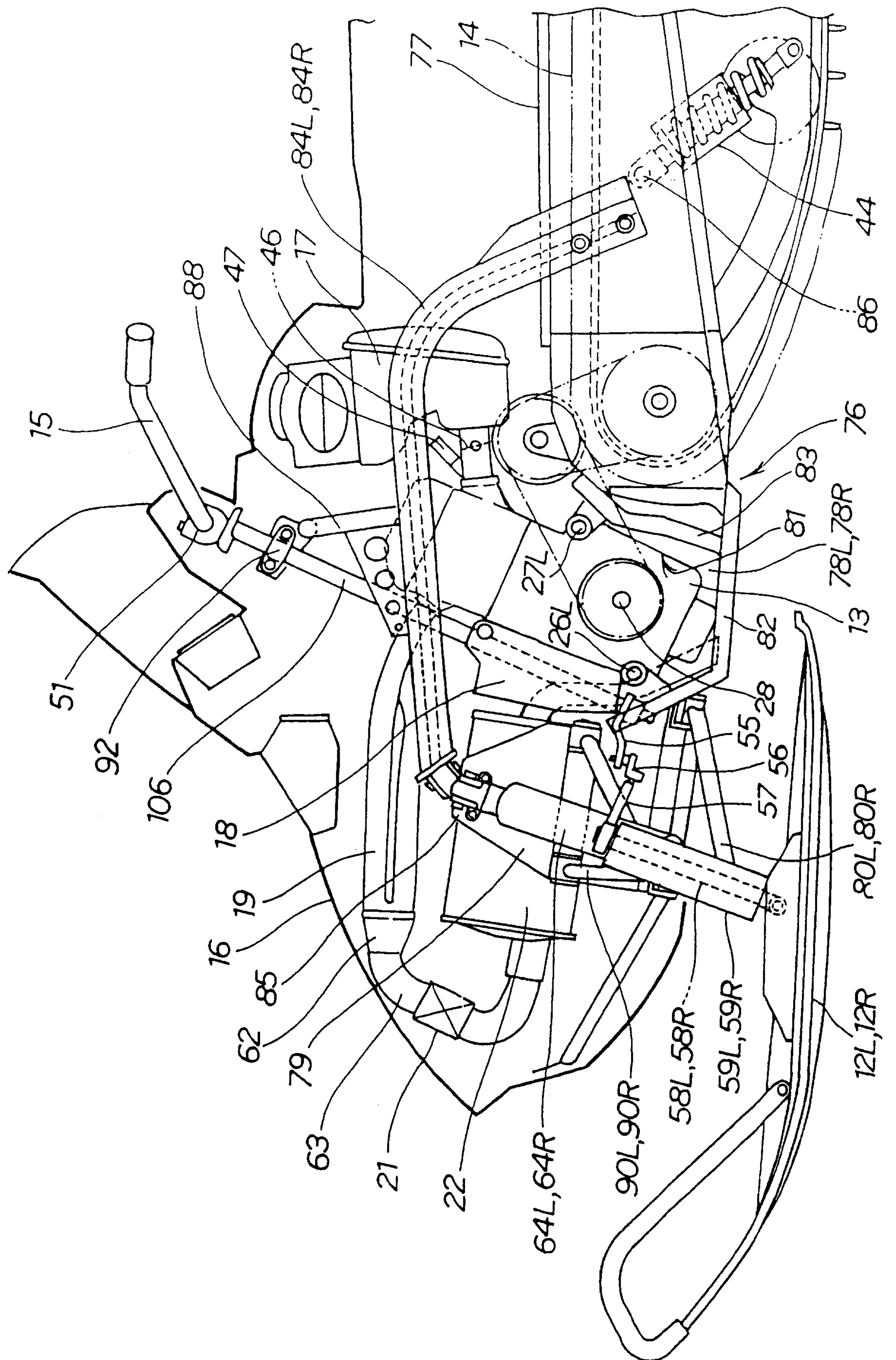


FIG. 11

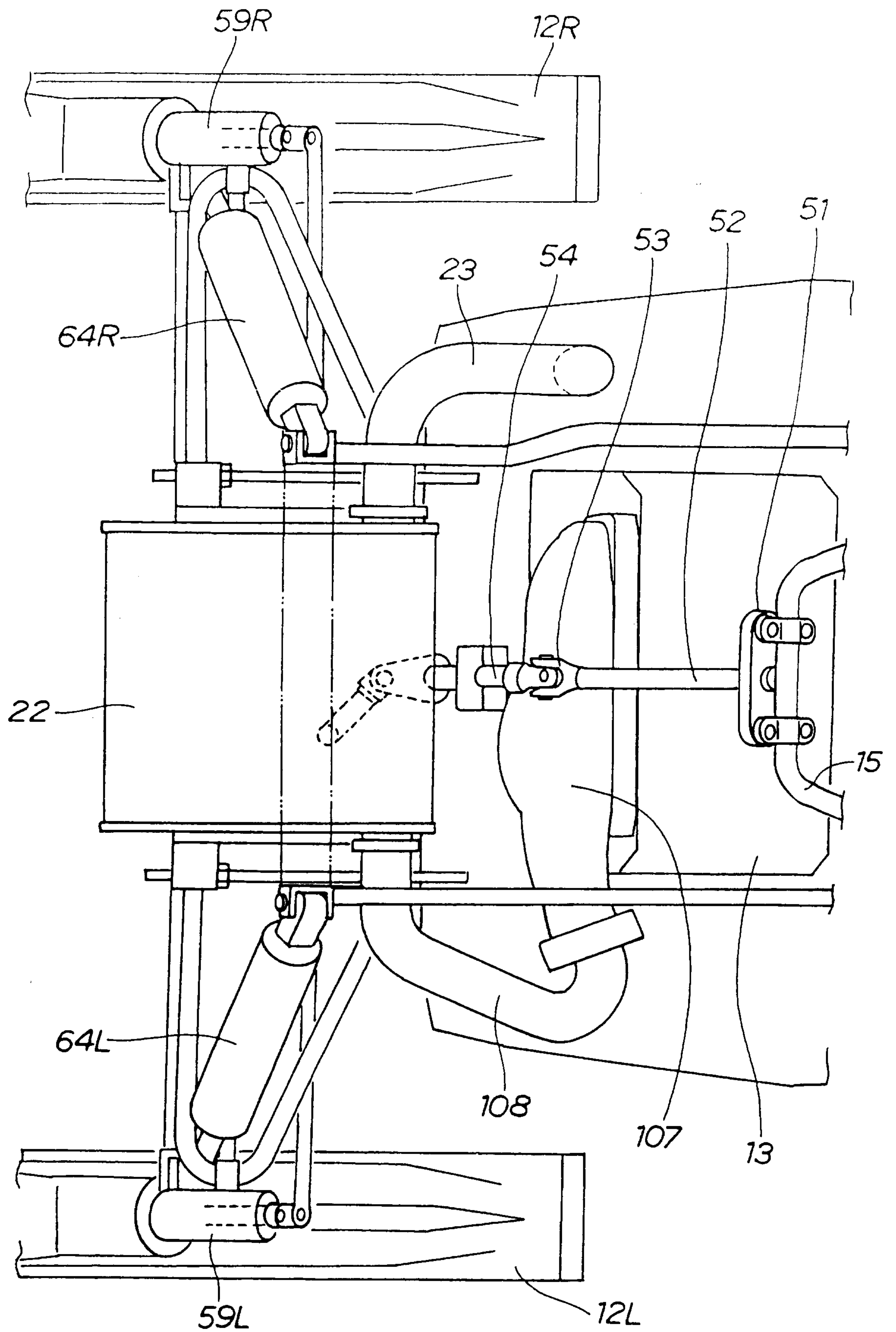


FIG. 12

