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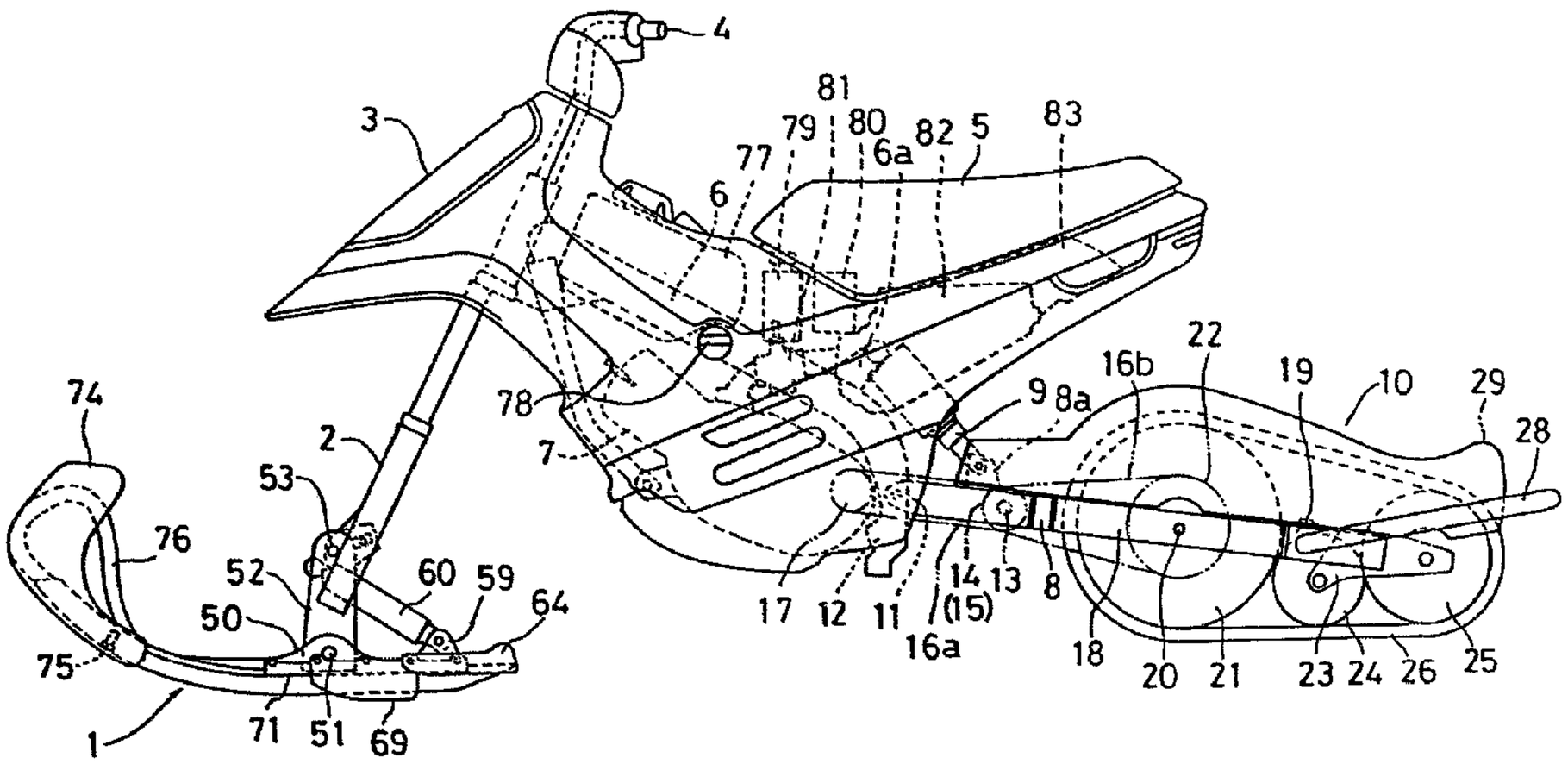
(54) VEHICULE A CHENILLE

(54) VEHICLE WITH ENDLESS BELT



(57) A snow vehicle employing a motorcycle body with a steering ski and supporting assembly replacing the front wheel and an endless belt type driving device replacing the rear wheel. A rear fork pivotally mounted to the rear portion of the motorcycle body and includes an integrally formed arm extending rearwardly from the rear fork to mount a drive wheel and one or more guide wheels which in turn mount an endless track belt. The arm extends rearwardly to either side of the track and inwardly thereof for mounting of the guide wheel or wheels.

ABSTRACT OF THE DISCLOSURE

A snow vehicle employing a motorcycle body with a steering ski and supporting assembly replacing the front wheel and an endless belt type driving device replacing the rear wheel. A rear fork pivotally mounted to the rear portion of the motorcycle body and includes an integrally formed arm extending rearwardly from the rear fork to mount a drive wheel and one or more guide wheels which in turn mount an endless track belt. The arm extends rearwardly to either side of the track and inwardly thereof for mounting of the guide wheel or wheels.

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SPECIFICATION

VEHICLE WITH ENDLESS BELT

BACKGROUND

The field of the present invention is vehicles such as snowmobiles having a driving device provided with an endless belt and connected to a rear fork, and more particularly to such vehicles wherein the driving device is made slim and the cost is reduced.

A vehicle utilizing a vehicle body of a motorcycle or the like and substituting a steering ski for a front wheel of the motorcycle and an endless belt type driving device for a rear wheel of the motorcycle has been developed. A drive wheel and guide wheels are supported by a pair of right and left parallel rear arms. An endless belt is wrapped around the drive wheel and the guide wheels to construct a driving device. Front end portions of the rear arms are connected on the laterally outer sides of rear end portions of a rear fork which is in turn swingably mounted to a vehicle body and extending rearwardly therefrom. An axle of the drive wheel is inserted through connecting portions between the rear arms and the rear fork, thus connecting the driving device to the rear fork.

In the above-mentioned construction, the lateral size of the vehicle is increased by an amount of lateral overlap of the rear arms to the rear fork. That is, as a portion of the rear wheel of the motorcycle corresponding to a hub and a rim without a tire is utilized for the drive wheel,

a supporting structure and the dimensional relationship of the drive wheel with respect to the rear fork remains unchanged. Therefore, the rear arms cannot be interposed between the rear fork and the drive wheel, but they are obliged to be disposed on the lateral outside of the rear fork. As a result, the rear fork and at least front portions of the rear arms project laterally outwardly of the drive belt. Such a lateral projection causes a problem such that stack, snow accumulation, tends to occur during running on a snow surface. In order to improve anti-stack performance which is very important in this type of vehicle, a laterally projecting amount of the supporting member for supporting the guide wheels or the like projecting from the lateral opposite sides of the endless belt is preferably reduced as much as possible to make the driving device slim. Further, as the rear fork is independent of the rear arms, the number of parts and the number of assembling steps are increased in assembling the vehicle. Accordingly, it is also desired to reduce the number of parts and the number of assembling steps for the purpose of reducing cost.

SUMMARY OF THE INVENTION

According to the present invention, there is provided in a vehicle including a vehicle body, a rear fork swingably mounted to a rear portion of said vehicle body, and a driving device connected to said rear fork. The driving device is provided with a drive wheel, at least one guide wheel and an endless belt wrapped around the drive wheel and the guide wheel. The guide wheel is rotatably mounted to the rear fork. The rear portion of the vehicle body is bent inwardly to a position inwardly of the endless belt and the guide wheel is rotatably mounted to the rear portion.

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As the rear end portions of the rear fork are bent inwardly to extend into the inside space defined by the endless belt, and the guide wheels are supported to the rear end portions, rear arms formed independently of the rear fork for supporting the guide wheels can be eliminated. Thus, the rear fork is integrally formed with the rear arms to eliminate the latter, and it is unnecessary to connect the rear arms on the lateral outside surfaces of the rear fork. Therefore, a laterally projecting amount of the supporting portion for supporting the guide wheels projecting from the lateral opposite sides of the endless belt can be reduced, thereby making the driving device slim in the lateral direction. Furthermore, since no rear arms are connected to the rear fork, the number of parts and the number of assembly steps can be reduced in assembling the vehicle.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an overall side view of the snowmobile in the preferred embodiment of the present invention;

Fig. 2 is a plan view of Fig. 1;

Fig. 3 is a partially sectional side view of the driving device;

Fig. 4 is a horizontal sectional view of the driving device;

Fig. 5 is a partly cut-away enlarged side view of the steering ski device;

Fig. 6 is a cross section taken along the line A-A in Fig. 5;

Fig. 7 is an enlarged plan view of the rear portion of the steering ski device;

Fig. 8 is a side view of another preferred embodiment of the vehicle body of the snowmobile according to the present invention;

Fig. 9 is an enlarged cross section taken along the line A-A in Fig. 8; and

Fig. 10 is an enlarged cross section taken along the line B-B in Fig. 8.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figs. 1 to 7 show a preferred embodiment of the present invention constructed as a snowmobile as modified from a motorcycle. The snowmobile is primarily constructed of a steering ski 1, a front fork 2, a cover 3 for generally covering a vehicle body, a handle 4, a seat 5, a frame 6, an engine 7, a rear fork 8, a rear cushion 9, a driving device 10, and brackets 6a and 8a provided on the frame 6 and the rear fork 8, respectively, for mounting the rear cushion 9.

The rear fork 8 is swingably mounted at its front ends through a pivot 11 to a pair of pivot plates 12 provided at right and left rear lower portions of the frame 6. As shown in Fig. 9, a pair of intermediate sprockets 14 and 15 are coaxially mounted on an intermediate shaft 13 at opposite ends thereof, and the intermediate shaft 13 is supported to an intermediate portion of the rear fork 8. The intermediate sprocket 14 is connected through a first chain 16a to a drive sprocket 17 to be driven by the engine 7. The rear fork 8 is constructed of a pair of right and left laterally expanded portions 18 bent laterally outwardly at a position just behind the intermediate shaft 13 and extending rearwardly in substantially parallel relationship to each other, and a pair of right and left laterally converged portions 19 extending rearwardly continuously from the rear ends of the expanded portions 18 and inclined in such a manner as to be converged toward the lateral center line of the vehicle.

An axle 20 extends laterally between the right and left expanded portions 18 of the rear fork 8. A drive wheel 21 and a driven sprocket 22 are rotatably supported on the axle 20. A pair of right and left wheel brackets 23 are fixed by welding to the rear ends of the converged portions 19. A small-diameter guide wheel 24 and a pair of large-diameter guide wheels 25 are rotatably supported through guide wheel shafts 45 and 46, respectively, which are fixed to the wheel brackets 23. An endless belt 26 is wrapped around the drive wheel 21 and the guide wheels 24 and 25. Thus, the driving

device 10 is constructed of the drive wheel 21, the driven sprocket 22, the guide wheels 24 and 25 and the endless belt 26.

As shown in Fig. 2, a laterally elongated scraper 27 is fixedly mounted on the upper surfaces of the right and left converged portions 19 at the intermediate portions thereof, and a U-shaped bumper 28 is provided to extend rearwardly from the outer side surfaces of the converged portions 19 at the intermediate positions thereof in such a manner as to be inclined upwardly. The bumper 28 is fixed to the converged portions 19 by welding. However, it may be bolted to the converged portions 19. A cover 29 is provided over the endless belt 26. The endless belt 26 shown in Fig. 1 is illustrated in a cross section showing a laterally central thick-walled portion of the endless belt 26.

Fig. 3 is an enlarged vertical sectional view of the driving device 10, and Fig. 4 is a horizontal cross section of Fig. 3. provided that the cover 29 is not shown. The axle 20 is formed as an elongated bolt, and it is supported at its opposite ends to the expanded portions 18 of the rear fork 8 through a pair of right and left chain adjusters. Each of the chain adjusters is constructed of an eccentric plate 30 formed at its outer periphery with a waved groove, a holder 32 supported to the expanded portion 18 and formed with a longitudinally elongated hole 31 through which the axle 20 is inserted, and a stopper rod 33 embedded in the expanded

portion 18 and projecting outside to engage the waved groove of the eccentric plate 30.

The driven sprocket 22 is fixedly mounted to one lateral end surface of a hub 34 of the drive wheel 21, and a drum portion 35 incorporating a known drum brake mechanism is provided on the other lateral end surface of the hub 34. A rim 36 of the drive wheel 21 is bolted to an outer circumference of the drum portion 35. The rim 36 is formed at its central outer circumference with an annular recess 37, and the outer circumference of the rim 36 is formed at its laterally opposite edges with a pair of curled portions 38. A plurality of hollow pins 39 each having a leg portion 40 are welded to the outside surfaces of the curled portions 38 in such a manner that the leg portions 40 are inserted into the curled portions 38, thus projecting laterally outwardly from the curled portions 38 of the rim 36. The hollow pins 39 are arranged at given intervals to engage a plurality of laterally elongated lugs 41 formed on an inner surface of the endless belt 26 and arranged at given intervals. The scraper 27 is formed at its laterally central portion with a projection 42 projecting into the recess 37 of the rim 36 (see Fig. 4). The scraper 27 is formed at its opposite end portions with a pair of longitudinally elongated holes 43 for engaging a pair of bolts 44, so that the scraper 27 may be longitudinally adjustably mounted on the upper surfaces of the converged portions 19 at the intermediate positions thereof. As the scraper 27 laterally extends between the right and left

converged portions 19 of the rear fork 8 as mentioned above, the length of the scraper 27 can be made relatively short, resulting in an advantage from the viewpoint of rigidity.

A front portion of the endless belt 26 is accommodated in a space defined inside the right and left expanded portions 18, while the right and left converging portions 19 except the portions connected to the expanded portions 18 as well as the right and left wheel brackets 23 are accommodated in a space defined inside the endless belt 26.

The front and rear guide wheel shafts 45 and 46 are fixedly supported to the right and left wheel brackets 23. The small-diameter guide wheel 24 is rotatably supported on the front guide wheel shaft 45 at a central position thereof, while the large-diameter guide wheels 25 are rotatably supported on the rear guide wheel shaft 46 at spaced positions such that the outer circumference of the rear portion of the guide wheel 24 is interposed between the outer circumferences of the front portions of the guide wheels 25. A pair of chain adjusters having the same positioning structure as that of the chain adjusters for the axle 20 are provided at the opposite ends of the guide wheel shaft 46. Thus, the guide wheel shaft 46 is supported through the chain adjusters to the wheel brackets 23. Each of the chain adjusters for the guide wheel shaft 46 includes an eccentric plate 47 having the same structure as that of the eccentric plate 30 mentioned previously. As apparent from Fig. 3, the cover 29 is formed at its lower edge near the eccentric plates 30 and 47 with a

plurality of recesses 35 for permitting rotation of the eccentric plates 30 and 47.

Figs. 5 to 7 show the steering ski 1 and its associated parts in the preferred embodiment. Fig. 5 is a partially cut-away enlarged side view of a rear half portion of the steering ski 1 and the associated parts, and Fig. 6 is a cross section taken along the line A-A in Fig. 5. An upwardly projecting supporting member 50 having an inverted U-shape as viewed in cross section is provided on a substantially central portion of the steering ski 1, and a pair of right and left ski brackets 52 are rotatably supported at their lower end portions through a pivotal shaft 51 to the supporting member 50. The right and left front forks 2 are formed with a pair of mounting portions 54 projecting forwardly, and a support shaft 53 extends between the mounting portions 54. The ski brackets 52 are welded at their upper end portions to a collar 53a mounted on the support shaft 53. The right one of the ski brackets 52 extends upwardly to form an engaging portion 55 having an engagement hole 56 to be engaged with a boss 2a projecting inwardly from an inner side surface of the right front fork 2. Thus, the ski brackets 52 are positioned, and they are operated integrally with the front forks 2.

The ski brackets 52 are chamfered at their lower front edges to form a pair of inclined corner portions 57. When a swing angle α of the steering ski 1 (i.e., an angle to be defined by a steering axis S and a line L parallel to a

general surface of the steering ski 1) is in a given range less than about 90° during a normal running, the corner portions 57 are maintained in spaced relationship from a pair of stopper surfaces 58 formed by bending the lower ends of the supporting member 50 and attaching the same onto the upper surface of the steering ski 1 (see Fig. 6). On the other hand, when the swing angle α exceeds the given range to reach about 90°, for example, as shown by a phantom line in Fig. 5, the corner portions 57 are brought into abutment against the stopper surfaces 58. That is, when the steering ski 1 is swung at an angle θ to be defined by the movement of the line L to a line L_1, resulting in the swing angle α becoming about 90°, further swinging operation of the steering ski 1 is restricted. With this construction, a stopper mechanism for restricting the swinging operation of the steering ski 1 can be simplified.

A stay 59 is formed behind the supporting member 50 to projecting upwardly from the upper surface of the steering ski 1, and a lower end of a front sub cushion 60 is pivotally supported to the stay 59. A pair of cushion brackets 61 are welded at their upper ends to the collar 53a around the support shaft 53, and an upper end of the front sub cushion 60 is pivotally supported to the cushion brackets 61.

A plate 62 is provided at a rear end of the steering ski 1 to project upwardly from the upper surface of the steering ski 1 and be inclined forwardly. A pair of weld nuts 63 are mounted on the plate 62. A rear ski cover 64 is

provided to cover the upper surface of the rear end portion of the steering ski 1, and a rear wall 65 of the rear ski cover 64 is incline forwardly at substantially the same inclined angle as that of the plate 62. The rear wall 65 is mounted on the plate 62, and they are fixed together by engaging a pair of bolts 66 with the weld nuts 63. Opposite side walls 67 of the rear ski cover 64 extend forwardly to the front side of the stay 59, and they are fixed at their front ends by a pair of bolts 68 together with a pair of right and left skid plates 69 to a pair of right and left supporting plates 71 of the steering ski 1. Thus, the rear ski cover 64 is fixed to the steering ski 1 at four positions.

Fig. 7 is a plan view of the rear portion of the steering ski 1. The rear ski cover 64 is formed in a substantially U-shape as viewed in plan in such a manner as to surround the stay 59. As apparent from Figs. 6 and 7, the steering ski 1 is formed at its opposite side edges with a pair of curled portions 70, and the right and left supporting plates 71 are welded to the outside surfaces of the curled portions 70 at the intermediate portion thereof. Each of the supporting plates 71 is provided on its inside surface with a plurality of weld nuts 72 arranged at give intervals in the longitudinal direction. The skid plates 69 are mounted to the supporting plates 71 by selectively engaging a plurality of bolts 68 with the weld nuts 72 in such a manner that a mounting position of the skid plates 69 may be adjusted in the longitudinal direction. Reference numeral 73 denotes a collar

mounted around the pivot shaft 51 and welded to the supporting member 50.

As shown in Figs. 1 and 2, a front ski cover is mounted to a front end portion of the steering ski 1. The front ski cover 74 is fixed by a pair of bolts 75 to a bottom surface of the steering ski 1 in such a manner as to surround the front end portion of the steering ski 1. A looped reinforcing pipe 76 is provided at a laterally central position of the front end portion of the steering ski 1 to project upwardly, and the front and side portions of the reinforcing pipe 76 are covered with the front ski cover 74. The front ski cover 74 extends upwardly more than the reinforcing pipe 76.

Referring to Fig. 1, the snowmobile is provided with a fuel tank 77, a fuel tank cock 78, an oil tank 79, a battery 80, a carburetor 81, an air cleaner 82 and a muffler 83. These parts are entirely covered with the cover 3.

In operation, an output from the engine 7 is transmitted through the drive sprocket 17, the first chain 16a, the intermediate sprocket 14, the intermediate shaft 13, the intermediate sprocket 15, the second chain 16b and the driven sprocket 22 to the drive wheel 21. Thus, the drive wheel 21 is rotated, and the pins 39 of the rim 36 are brought into engagement between the adjacent lateral lugs 41 of the endless belt 26, thereby rotating the endless belt 26 around the drive wheel 21 and the guide wheels 24 and 25. Thus, the vehicle is driven to forward.

The guide wheels 24 and 25 are supported by the converging portions 19 continuously extending rearwardly from the expanded portions 18 of the rear fork 8 and accommodated in the inside space of the endless belt 26. It is unnecessary to prepare right and left arms for supporting the guide wheels 24 and 25 independently of the rear fork 8 and connect the rear arms to the laterally outside surfaces of the rear end portions of the rear fork 8 as with separate arms. Accordingly, a laterally projecting amount of the rear fork 8 projecting from the lateral opposite sides of the endless belt 26 can be made a minimum. Therefore, the driving device is made slim to thereby improve the anti-stack performance. Furthermore, as the converged portions 19 for supporting the guide wheels 24 and 25 are formed integrally with the rear fork 8 without separate rear arms, the number of parts and the number of assembling steps may be reduced to thereby reduce cost.

Alternatively, the converged portions 19 may be formed independently of the expanded portions 18 of the rear fork 8, and may be bolted to the rear portions of the expanded portions 18. However, a complicated connecting structure between the rear fork 8 and the rear arms is not necessary. That is, various parts inclusive of collars for damping or restricting relative swinging motion between the rear fork and the rear arms can be omitted to thereby simplify the connecting structure and reduce the number of parts and the number of assembling steps. Further, as the bumper 28 is

mounted to the converged portions 19, it also serves as a reinforcing member for the converged portions 19.

As the carburetor 81 and the air cleaner 82 are covered with the cover 3, an outside air flowing inside the cover 3 is warmed up to near an ordinary temperature by the engine 7 and the muffler 83, thereby suppressing icing of the carburetor 81.

Figs. 8 to 10 show another preferred embodiment of the vehicle body of the snowmobile for the purpose of preventing the icing of the carburetor. Fig. 8 is a side view of a central portion of the vehicle body of the snowmobile mounting a water-cooled engine 7. A radiator 84 is provided before the frame 6, and a pair of right and left radiator shrouds 85 are provided on the right and left sides of the radiator 84. Upper portions of the radiator shrouds 85 are located to contact the opposite side surfaces of the fuel tank 77, and lower portions of the radiator shrouds 85 are connected to right and left side covers 86. The side covers 86 are so provided as to cover the outer periphery of the carburetor 81. That is, an upper front portion of each side cover 86 is mounted to overlap the radiator shroud 85, and is connected together by a screw 87. A lower portion of the side cover 86 is fixed through stays 88 by bolts 88a to the side surface of a case of the engine 7. A rear portion of the side cover 86 is fixed to the frame 6 by a pair of bands 89 such as rubber bands. Thus, the side cover 86 is detachably mounted

to the vehicle body, so as to permit easy maintenance of the carburetor 81.

Fig. 9 is an enlarged sectional view of the left side cover 86 taken along the line A-A in Fig. 8, and Fig. 10 is an enlarged sectional view of the left side cover 86 taken along the line B-B in Fig. 8. As apparent from Figs. 9 and 10, the side cover 86 is constructed of an outer side wall 90, a bottom wall 91 and a rear wall 92, thus surrounding the three sides of the carburetor 81. Although the side cover 86 is open on the inner side thereof, an inner side wall 90a substantially parallel to the outer side wall 90 may be provided as shown in Fig. 9 to cover the inner side of the side cover 86. As apparent from Fig. 9, the bands 89 provided on the rear wall 92 are wound around the frame 6.

The bottom wall 91 also serves as a partition wall for partitioning the carburetor 81 from the first chain 16a located under the carburetor 81. As apparent from Fig. 10, the rear wall 92 is formed with a recess 93 cut from the inner side of the side cover 86, and a connector hose 94 for connecting the carburetor 81 with the air cleaner 82 is inserted in the recess 93. That is, the left side cover 86 can be mounted from the left side of the engine 7 in such a manner that the recess 93 comes into engagement with the connector hose 94 as shown in Fig. 10. However, in the case that the inner side wall 90a (see Fig. 9) is provided, it is a matter of course that the left side cover 86 cannot be mounted from the left side of the engine 7.

Referring back to Fig. 8, an air duct 95 opening to the front side is provided above the air cleaner 82 and near the bottom of the seat 5. A rear cover 96 covering the rear and side portions of the vehicle body is provided behind the air cleaner 82, and the muffler 83 located on the right side of the vehicle body is covered with the rear cover 96.

The right side cover 86 not shown is provided on the right side of the vehicle body in symmetrical relationship with the left side cover 86. The right side cover 86 is so located as to cover the right side of the carburetor 81 and an exhaust pipe 97 extending from the engine 7 through the right side of the vehicle body to the muffler 83. A lower cover 98 may be provided below each side cover 86 to cover each side of the engine 7. Each side cover 86 may be formed integrally with both the radiator shroud 85 and the lower cover 98 on the same side, or may be formed integrally with the lower cover 98 on the same side. The other construction is substantially the same as the construction shown in Fig. 1, and the same or corresponding parts as those in Fig. 1 are designated by the same reference numerals in Fig. 8.

According to the above-mentioned construction shown in Fig. 8, the icing of the carburetor 81 can be prevented without entirely covering the vehicle body by the cover 3 as in Fig. 1. In operation, cold outside air flows into the inside area defined between the right and left side covers 86, and it is warmed to above freezing by the engine 7 and the exhaust pipe 97. Then, the warmed air is allowed to pass

aside the carburetor 81, and is then induced from the air duct 95 into the air cleaner 82. Further, snow scattered by the first chain 16a is blocked by the bottom wall 91 and the rear wall 92 of each side cover 86, thereby preventing the snow from being attached to the carburetor 81. Furthermore, it is possible to prevent deposition of emulsified matter to be formed by freezing of a mixture of oil and moisture, which emulsified matter tends to be formed at low temperatures less than -3°C. Thus, the icing of the carburetor 81 can be avoided. The warmed air in the inside area between the side covers 86 is guided by the rear walls 92 of the side covers 86 to reach the air duct 95. Therefore, the warmed air is induced into the air cleaner 82 to thereby suppress entry of snow into the air cleaner 82 and prevent blinding of an element in the air cleaner 82 due to deposition of the snow. This effect may be made more remarkable by extending the side portions of the side covers 86 (as well as the rear walls 92 as required) to the air duct 95.

Accordingly, as the rear end portions of the rear fork are bent inwardly to extend into the inside space defined by the endless belt, and the guide wheels are supported by the rear end portions, rear arms formed independently of the rear fork for supporting the guide wheels can be eliminated. As a result, a laterally projecting amount of the rear fork projecting from the lateral opposite sides of the endless belt can be reduced since no rear arms are connected on the outside surfaces of the rear fork. Thus, the driving device can be

made slim to thereby improve the anti-stack performance. Further, as the rear fork is integrally formed with the rear arms to eliminate the latter, the number of parts and the number of assembling steps can be reduced to thereby reduce a cost. While embodiments and applications of this invention have been shown and described, it would be apparent to those skilled in the art that many more modifications are possible without departing from the inventive concepts herein. The invention, therefore is not to be restricted except in the spirit of the appended claims.

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CLAIMS:

1. A vehicle comprising:

a vehicle body;

a rear fork swingably mounted to a rear portion of said vehicle body and including a rear converging portion;

a drive mounted to said rear fork and including a drive wheel, at least one guide wheel and an endless belt wrapped around said drive wheel and said guide wheel, said guide wheel being rotatably mounted to said rear fork, said rear portion being bent inwardly to a position inwardly of said endless belt and said guide wheel being rotatably mounted to said rear portion.

2. The vehicle of claim 1 wherein said rear portion is integrally formed with said rear fork.

3. The vehicle of claim 1 wherein said rear fork includes a diverging portion from said rear portion of said vehicle and a mounting portion for mounting said drive wheel between said diverging portion and said converging portion, said mounting portion being outwardly of said endless belt.

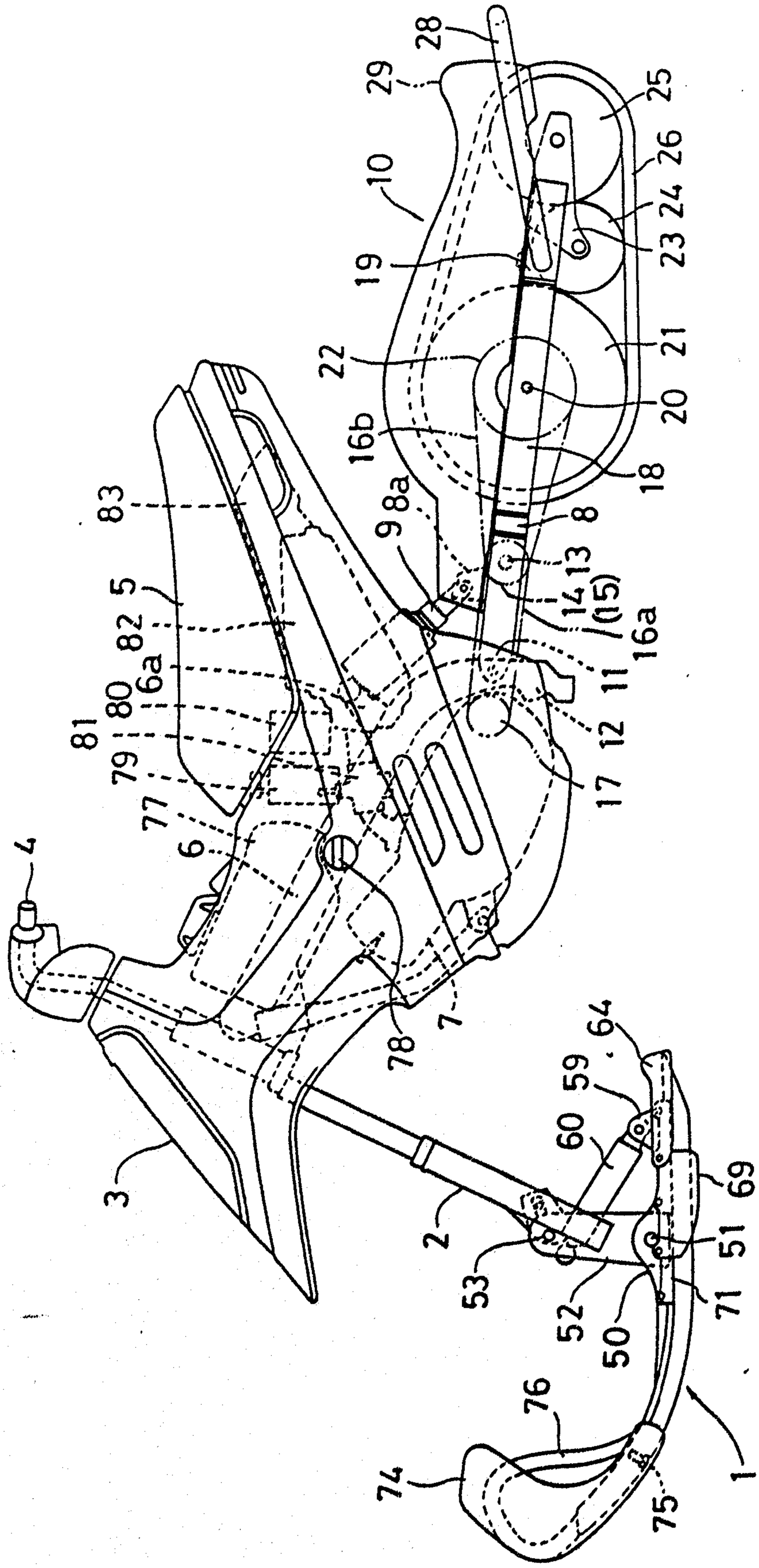
4. The vehicle of claim 1 wherein there is a plurality of guide wheels.

SMART & BIGGAR

OTTAWA, CANADA

PATENT AGENTS

Fig. 1



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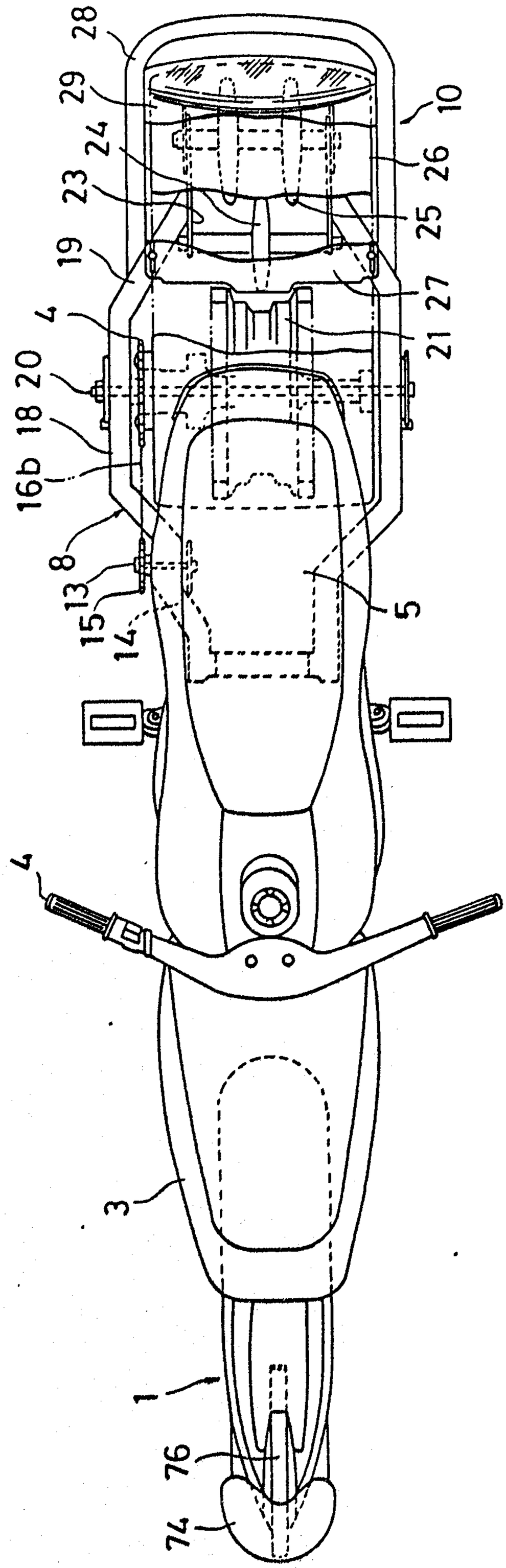

Fig. 2

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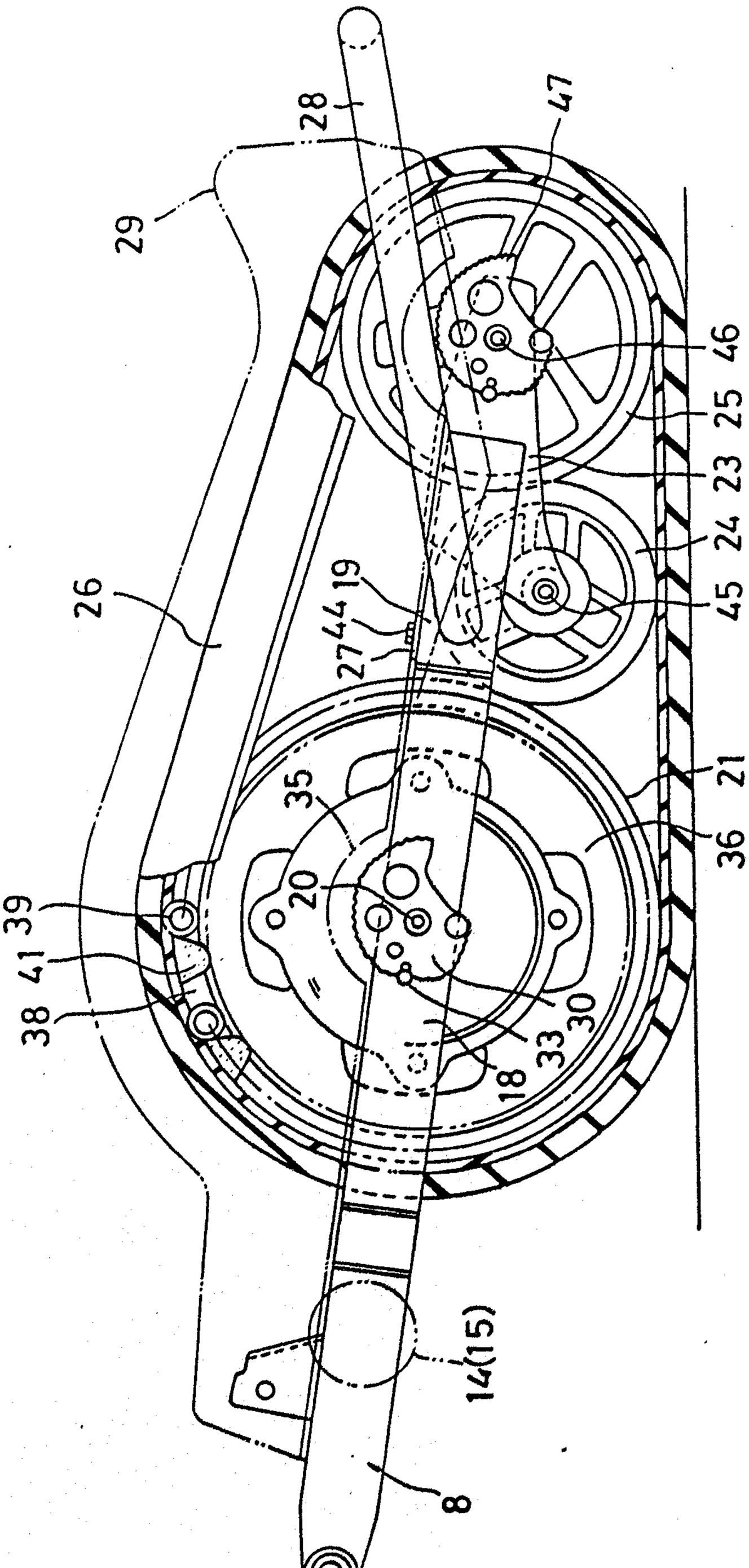

Fig. 3

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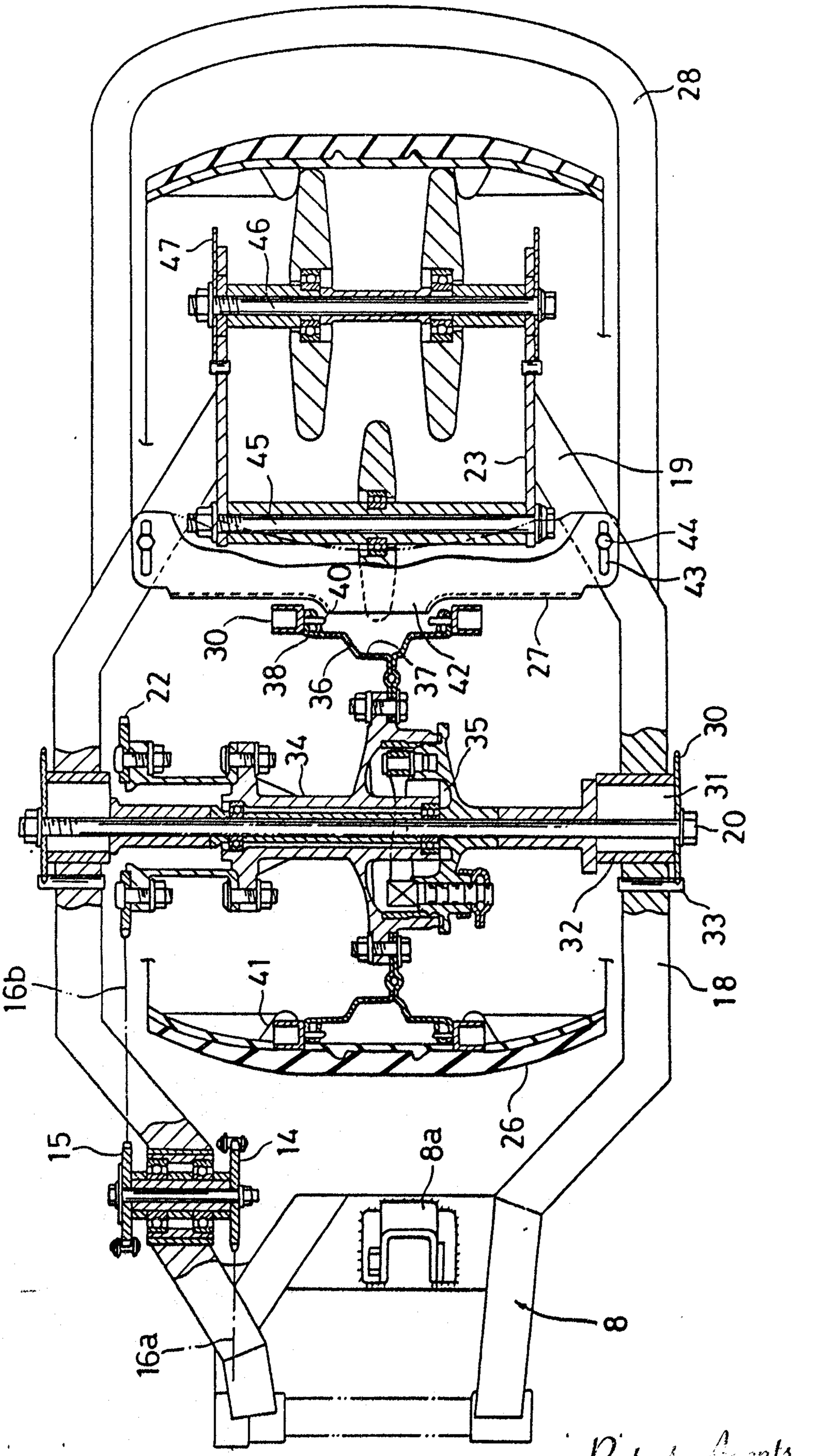

Fig. 4

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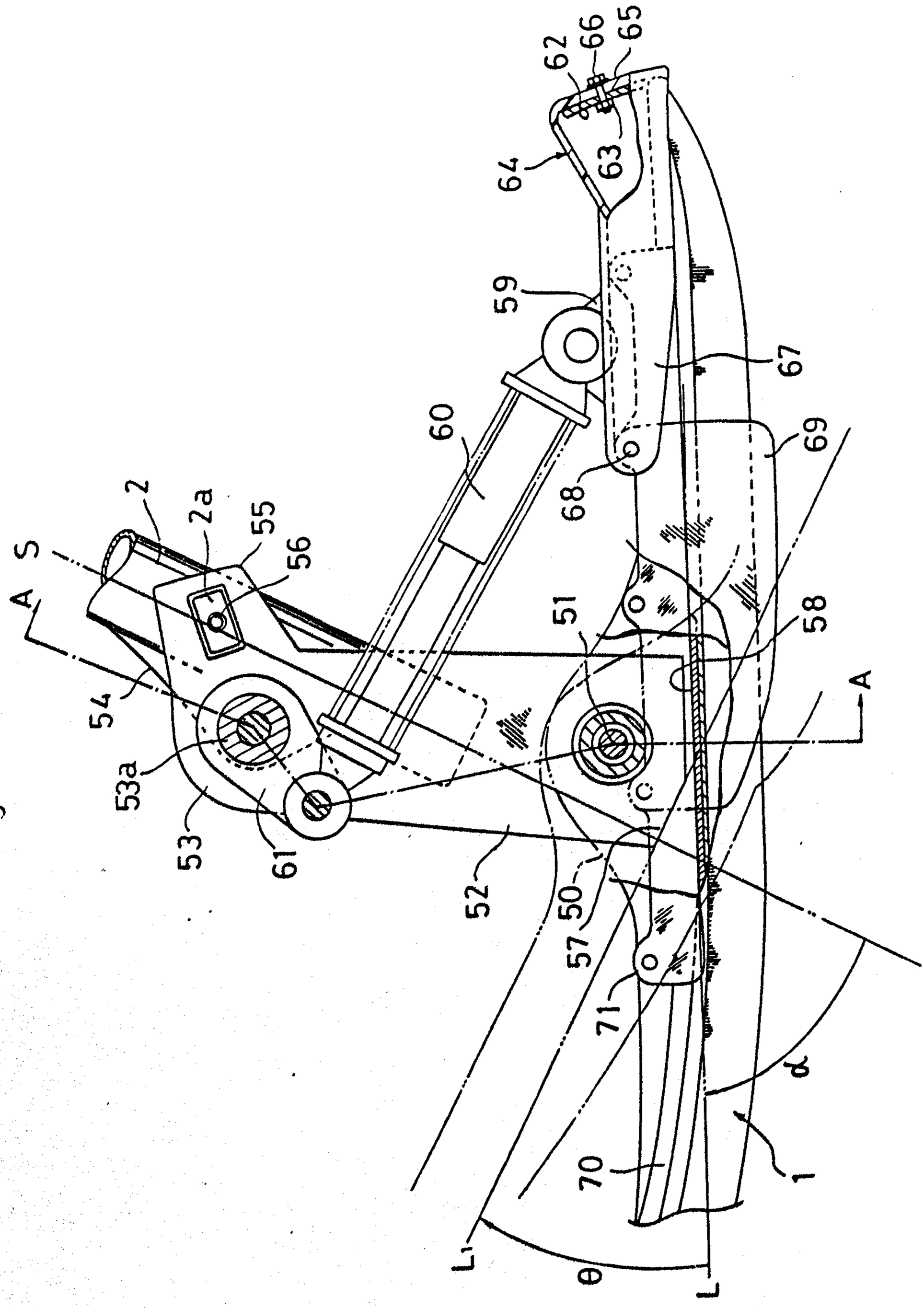

Fig. 5

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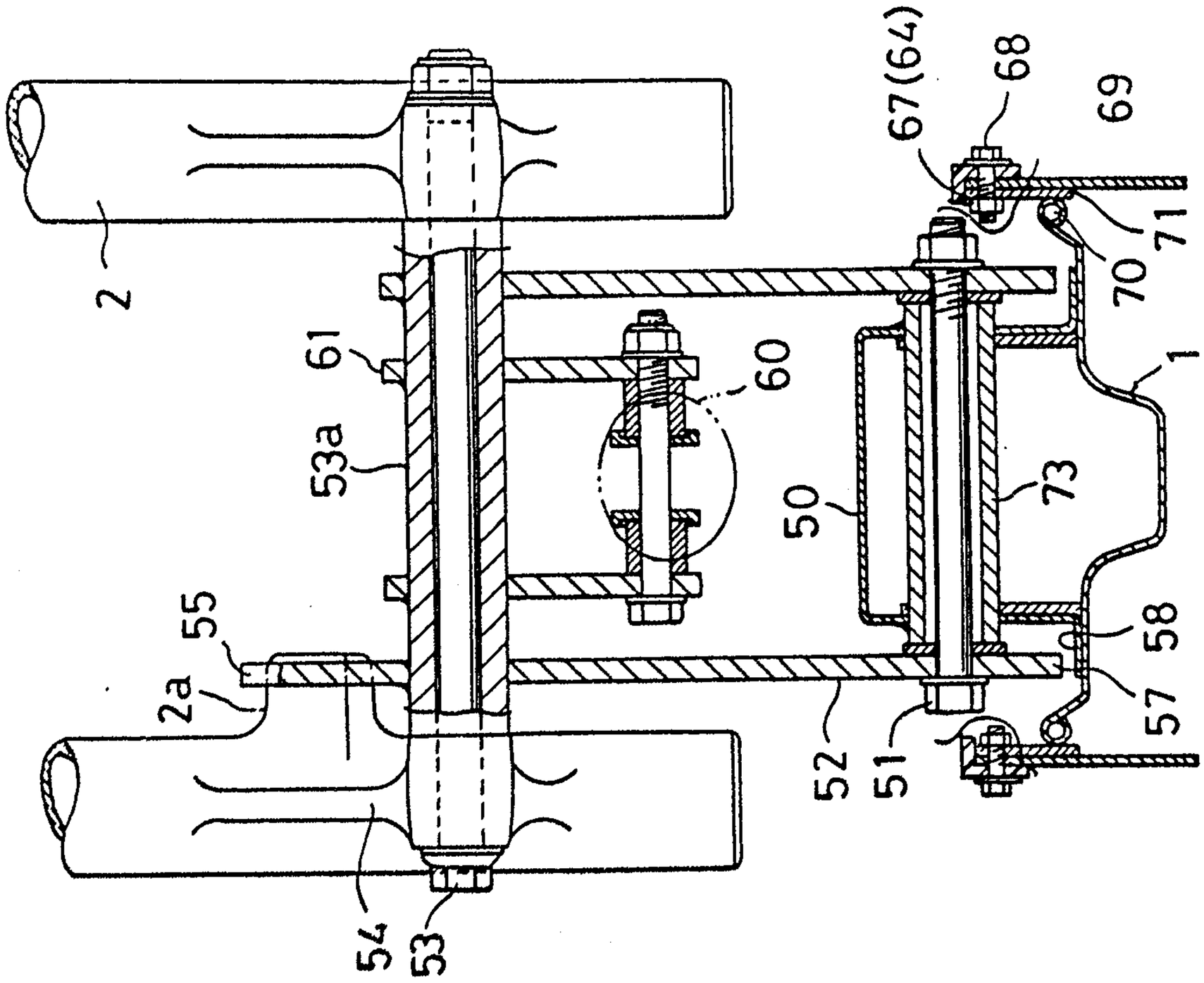

Fig. 6

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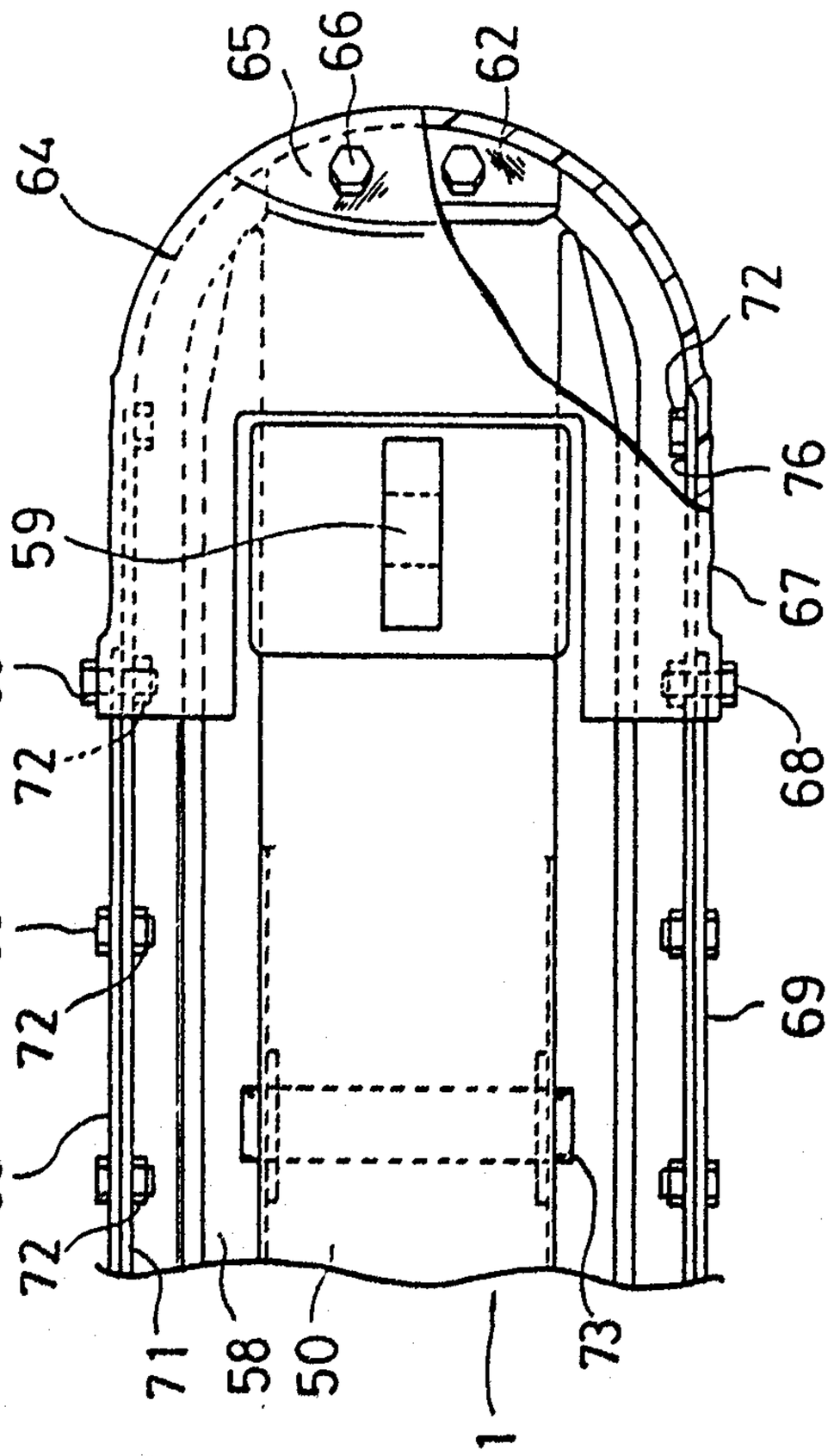

Fig. 7

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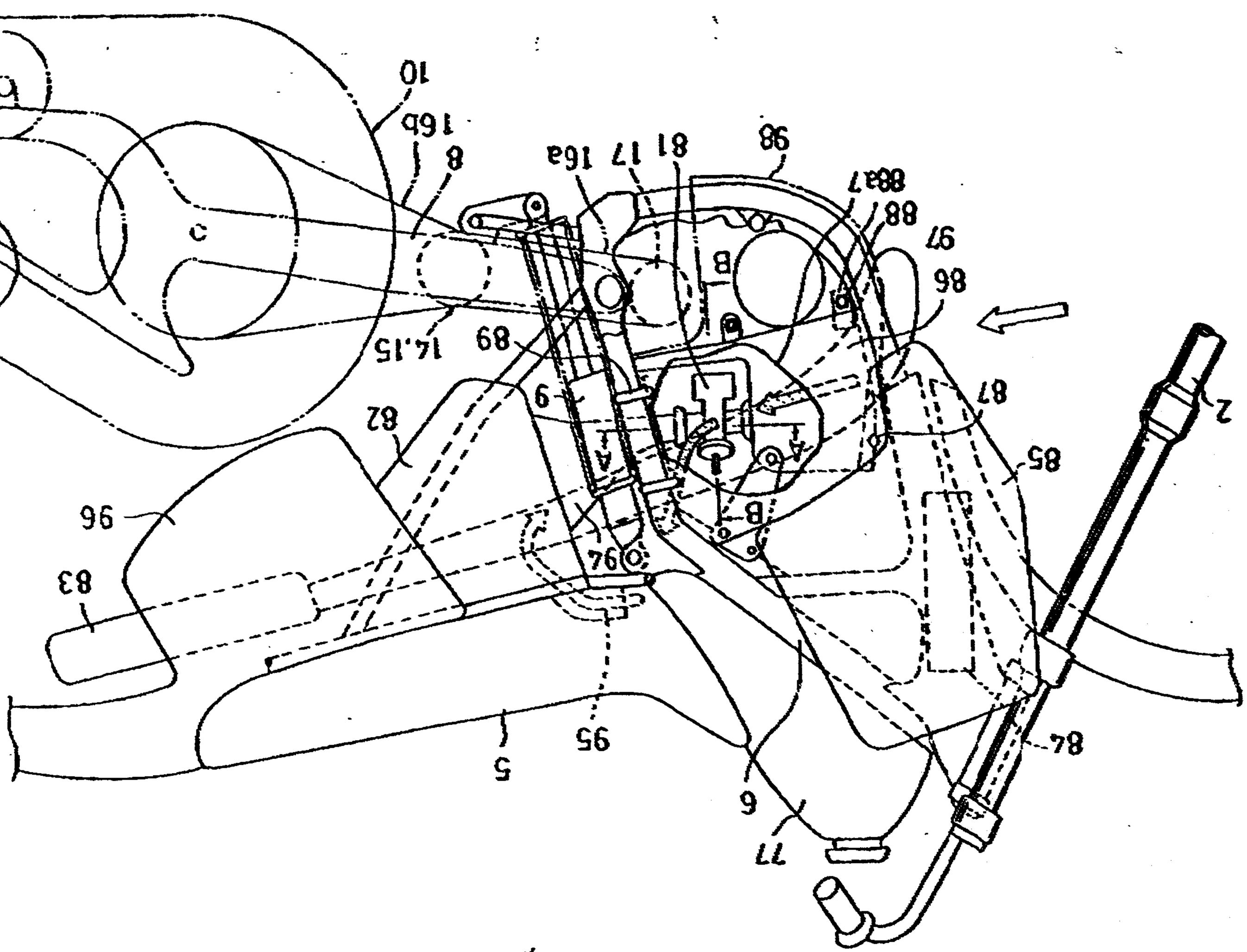


Fig 8

Fig. 9

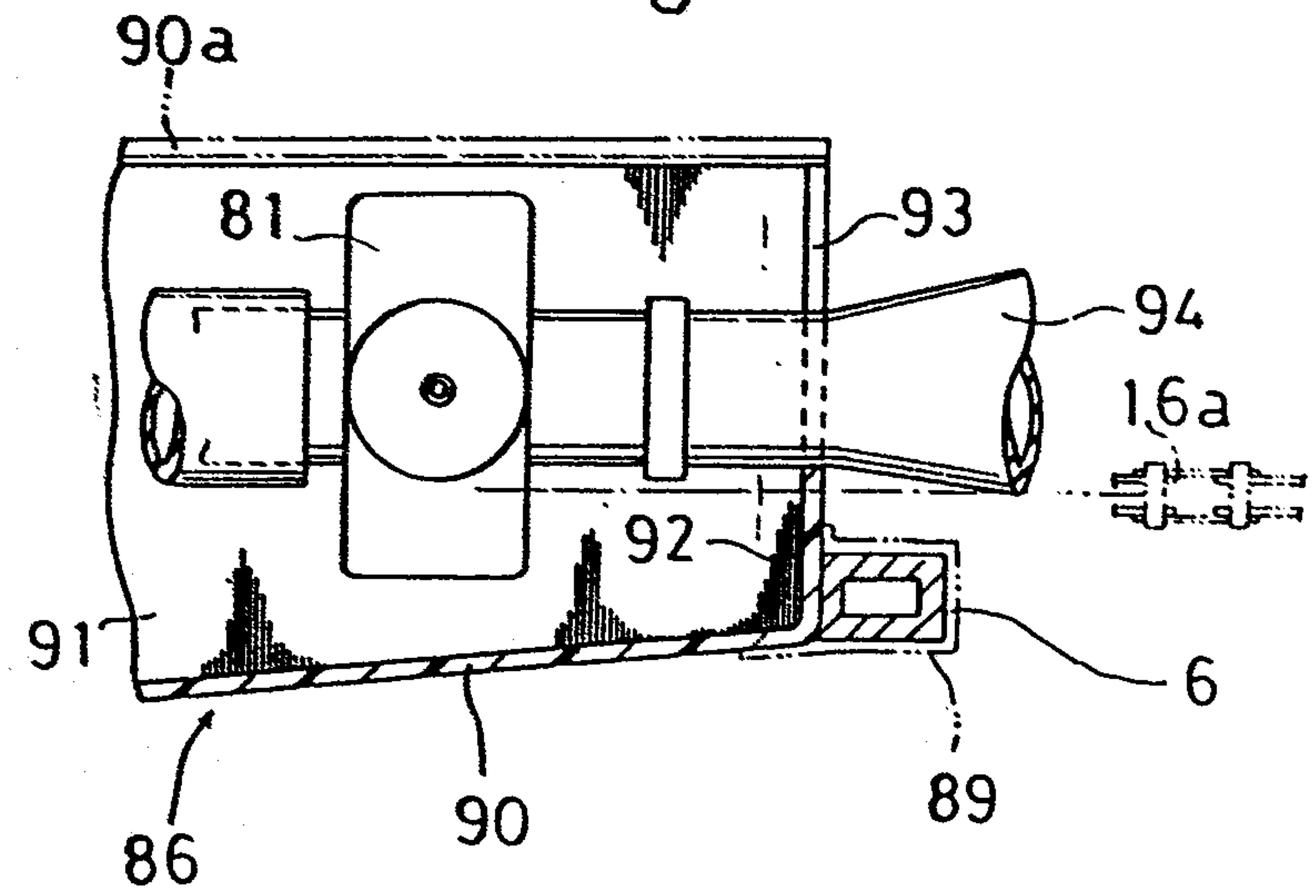
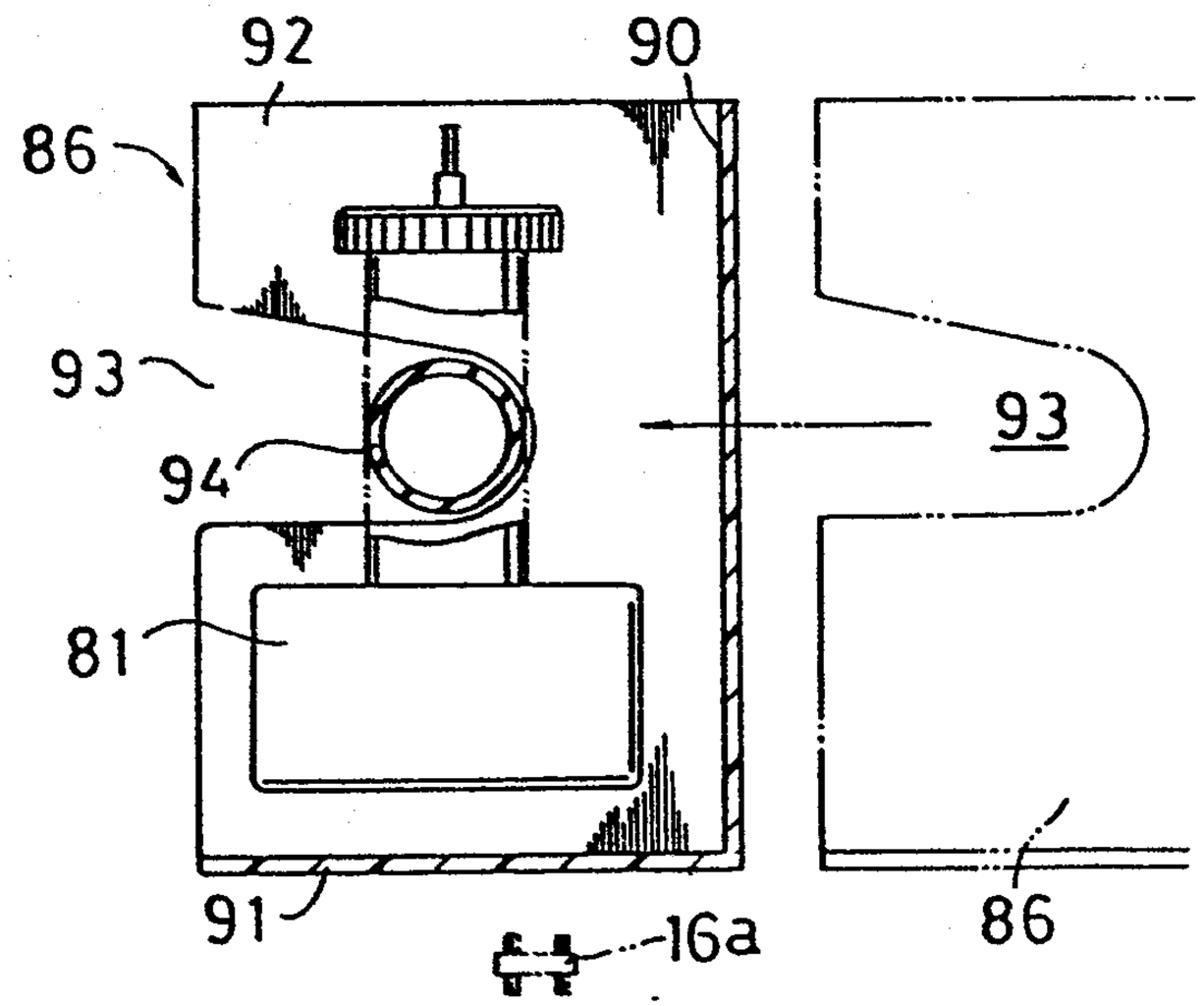


Fig. 10



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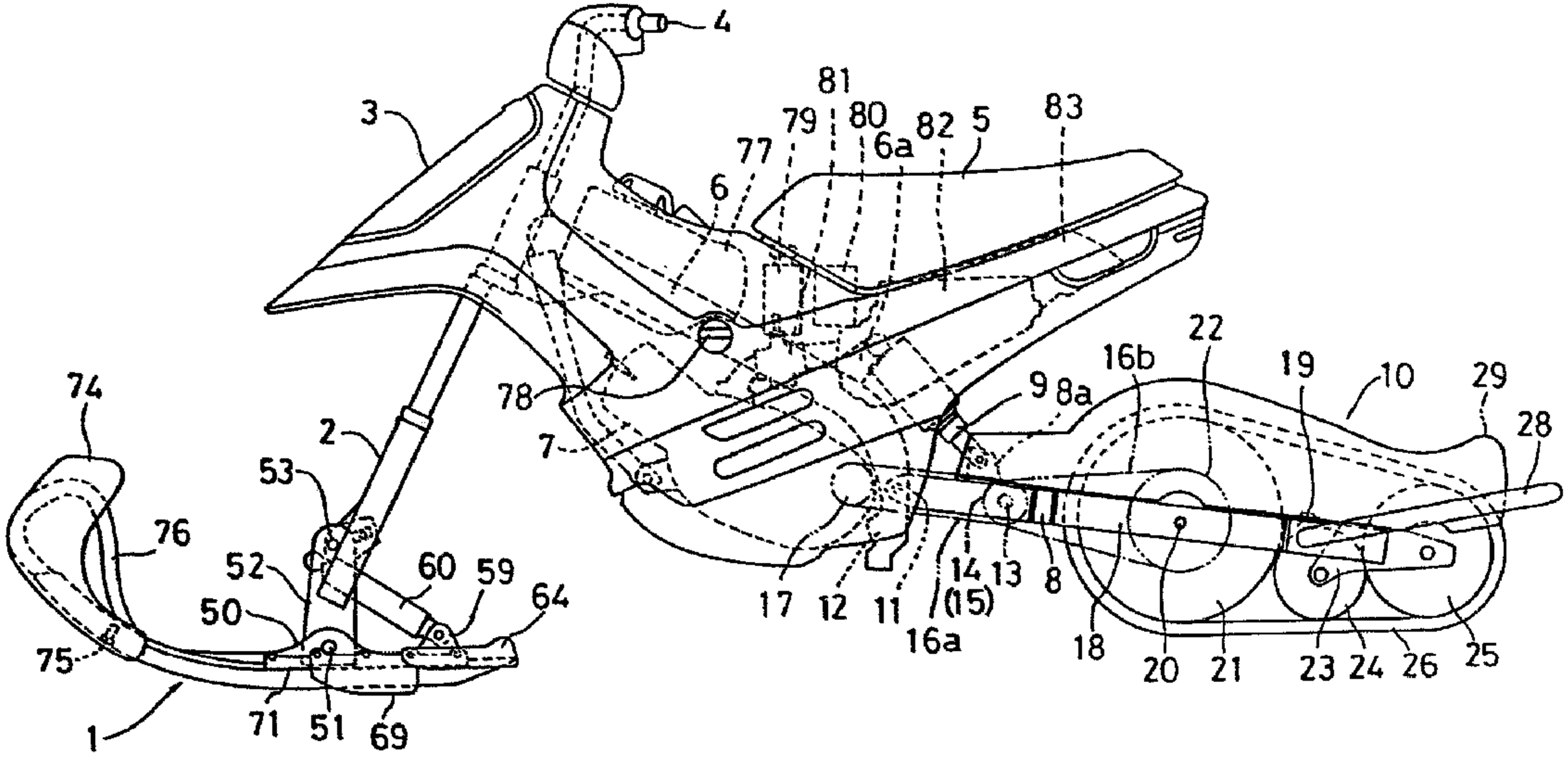
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