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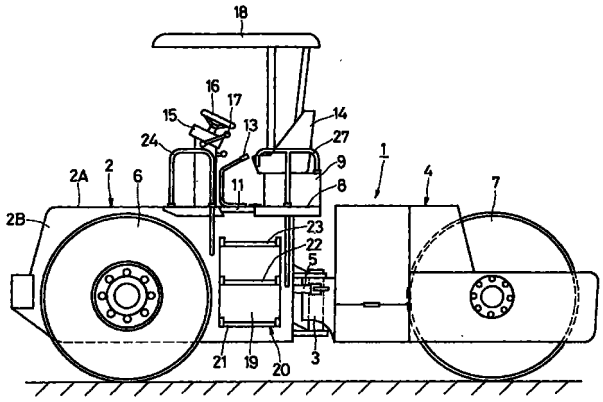
(54) ROAD ROLLER

(57) A road roller which permits an operator to climb up or down the road roller quickly in a safe manner at the time of getting on or off an operator's seat on the road roller. Ascending/descending steps (20) which are provided at an lateral side (2B) of a front vehicle body (2) are constituted by a lower stepping plate (21), a middle stepping plate (22) and an upper stepping plate (23). These stepping plates (21, 22 and 23) are arranged such that their projection lengths from the lateral side (2B) of the front vehicle body (2) are gradually reduced from a lower stepping plate to an upper stepping plate in the fashion of staircase. Consequently, an operator can see a footing surface on the projected outer end of the lower stepping plate (21) from the projected outer end of the middle stepping plate (22), and similarly can see a footing surface on the projected outer end of the middle stepping plate (22) from the projected outer end of the upper stepping plate (23). This means that, at the time of getting on or off the operator's seat, the operator can climb up or down the road roller quickly in a safe manner, thereby ascertaining the positions of the respective stepping plates (21, 22 and 23).

Fig . 1



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Description

TECHNICAL FIELD

[0001] This invention relates to a road roller particularly suitable for use in road paving work, i.e., for compacting paving material such as gravel or asphalt which is spread over the surfaces of a road or ground.

BACKGROUND ART

[0002] In paving road surfaces, for example, road roller machines which are called "drum roller", "tire roller" or "macadam roller" are generally resorted to at road construction sites or the like. In this regard, it is usually the case that after laying paving material such as gravel, asphalt or the like on leveled road surfaces, the paving material is compacted by running a road roller machine thereon.

[0003] By way of example, a prior art road roller of this sort is described below with reference to Figs. 17 to 19.

[0004] In these figures, indicated at 101 is a vehicle body of the road roller, including a front vehicle body 102 and a rear vehicle body 104 which are connected with each other through a coupler 103. Provided between the front vehicle body 102 and the rear vehicle body 104 is a steering cylinder 105 which permits the rear vehicle body 104 to turn horizontally to the right and left relative to the front vehicle body 102 and about the coupler 103.

[0005] In this instance, the front vehicle body 102 is formed in a box-like shape, having a top side 102A, right and left sides 102B and a floor panel 108 which will be described hereinbelow, and adapted to accommodate therein a prime mover and a hydraulic pump (both not shown).

[0006] Indicated at 106 are a pair of front pressing rollers which are located in laterally or transversely spaced positions and rotatably provided on the front vehicle body 102. Each one of the front pressing rollers 106 is constituted, for example, by a metallic drum in which water or the like is sealed for the purpose of weight adjustments. Further, provided between the front vehicle body 102 and each one of the front pressing rollers 106 is a hydraulic motor (not shown) which drives the front pressing rollers 106.

[0007] Denoted at 107 is a single rear pressing roller which is rotatably provided on the rear vehicle body 104. This rear pressing roller 107 is constituted by a metallic drum which is larger than the front pressing rollers 106 in axial length and in which similarly water or the like is sealed for weight adjustment purposes. Further, for driving the rear pressing roller 107, a hydraulic motor (not shown) is provided between the rear vehicle body 104 and the rear pressing roller 107.

[0008] Indicated at 108 is a floor panel which is located flush with and on the rear side of the top side surface 102A of the front vehicle body 102. The floor panel 108 consists of a rectangular steel plate and constitutes part of the front vehicle body 102. In this case, as shown in Fig. 18, the floor panel 108 is comprised of a central floor portion 108A which is located centrally between the opposite lateral sides 102B of the front vehicle body 102, and right and left side wing portions 108B which are projected outward from the opposite lateral sides 102B of the front vehicle body 102 in the fashion of eaves. Transversely extended across a rear portion of the floor plate 108 is a support bed 109 for operator's seats 110 which will be described hereinafter.

[0009] Denoted at 110 are a couple of seats which are provided in laterally spaced positions on the support bed 109. Transversely extended on the front side of the operator's seats 110 is an operation control table or stand 111, on which a couple of steering devices 112 are provided in positions which confront the two operator's seats 110. In response to one of the two steering devices 112 which is under control by an operator, the steering cylinder 105 is either stretched out or shrunk in, turning the rear vehicle body 104 to the right or to the left relative to the front vehicle body 102 and about the coupler 103 to control the traveling direction of the road roller.

[0010] Indicated at 113 are forward/reverse drive levers which are provided on the operation table 111 in the proximity of the right and left steering devices 112, respectively. If one of the forward/reverse drive levers 113 is tilted to a forward drive position or to a reverse drive position, the vehicle body 101 is driven in the forward or reverse direction. A canopy 114 is provided over the two operator's seats 110.

[0011] Indicated at 115 are ascending/descending steps or climbing steps providing stepped footing surfaces for an operator climbing up to or climbing down from the operator's seat 110. These ascending/descending steps 115 are provided on the opposite lateral sides 102B of the front vehicle body 102. Further, as shown particularly in Fig. 19, the ascending/descending steps 115 are constituted by a plural number of stepping plates (e.g., four stepping plates) 117 in the fasion of vertical ladder. And, ascending/descending steps 115 are fixedly attached to an outside plate 116 which is projected horizontally from each lateral side 102B of the front vehicle body 102. In this instance, the stepping plates 117 are each constituted by a steel plate which is bent in U-shape and projected laterally in the outward direction by the same length S from the lateral side 102B of the front vehicle body 102.

[0012] Designated at 118 are front handrails which are erected at and around front right and left corner portions of the floor panel 108. The front handrails 118 are located forward of the ascending/descending steps 115 in such a manner as to circumvent the respective steering devices 112. Indicated at 119 are rear handrails which are erected at and around rear right and left cor-

ner portions of the floor panel 108. These rear handrails 119 are located rearward of the ascending/descending steps 115 in such a way as to circumvent the operator's seats 110, respectively. When climbing up or climbing down the ascending/descending steps 115 to get on or off an operator's seat 110, an operator can hold one of these handrails 118 and 119 for safety purposes.

[0013] In a road paving work using the above-described prior art road roller, firstly an operator can get onto the operator's seat 110 on the floor panel 108 by holding the handrails 118 and 119 while going up the ascending/descending steps 115.

[0014] Nextly, the operator who has now seated on the operator's seat 110 operates the steering device 112 and the forward/reverse drive lever 113, driving the road roller in the forward or reverse direction and rolling the front and rear pressing rollers 106 and 107 on and along road surfaces to compact paving material which is spread over the road surfaces.

[0015] In the case of the above-described prior art road roller, however, as explained below, an operator can face difficulties or problems when operator climbs up to or climbs down from the operator's seat 110 by way of the ascending/descending steps 115 which are provided on a lateral side of the front vehicle body 102.

[0016] Firstly, in order to climb up to or climb down from the operator's seat 110 by way of the ascending/descending steps 115, the operator puts his or her right and left legs alternately on stepping plates 117 of the ascending/descending steps 115, facing toward the lateral side 102B of the front vehicle body 102 and holding the handrails 118 and 119 to support his or her body. On such an occasion, since the ascending/descending steps 115 are arranged in the form of a vertical ladder, the operator may find it difficult to watch and ascertain the positions of the respective stepping plates 117 with his or her eyes, and often misses some stepping plates 117.

[0017] Besides, the stepping plates 117 of the ascending/descending steps 115 are each constituted by an opaque steel plate bent in U-shape, so that the respective stepping plates 117 could block the view of an operator, for example, when an operator who is seated on the operator's seat 110 looks down toward the ground to check for paved road surface conditions.

[0018] Furthermore, since the respective stepping plates 117 are made of steel plates, the stepping plates 117 easily become slippery, for instance, when paving material is dropped thereon off the shoes or boots of an operator who is going up the ascending/descending steps 115.

[0019] Further, the handrails 118 and 119 which are arranged to stand upright from the top surface of the floor panel 108, it may become difficult or it may take efforts for certain operators to reach and grip even the lower end of the handrail 118.

[0020] Moreover, in case an operator slips off a stepping plate 117 in a lower position of the ascending/descending steps 115 at night or in raining or snowing conditions, he or she could fall on the ground because it would be difficult for operator to reach out and grip the handrail 118 or 119 on the floor panel 108 instantly.

[0021] Further, side wing portions 108B of the floor plate 108 are hanging over the upper side of the ascending/descending steps 115, which are provided at each lateral side 102B of front vehicle body 102. And, the side wing portions 108B are projected outward from the lateral sides 102B of the front vehicle body 102 in the fashion of eaves. Therefore, as an operator gets onto the floor plate 108 from a stepping plate 117 in an uppermost position of the ascending/descending steps 115, operator may get his or her leg or body caught by the side wing portion 108B of the floor plate 108 and prevented from getting quickly on or off the operator's seat 110.

[0022] Furthermore, should an operator inadvertently touch the forward/reverse drive lever 113 at the time of getting on or off the operator's seat 110, causing the forward/reverse drive lever 113 to turn into a forward or reverse drive position, the vehicle body 101 can be started abruptly in the forward or reverse direction contrary to the operator's intention. Thus, the safety of an operator who is climbing up to or climbing down from the operator's seat 110 could be endangered.

DISCLOSURE OF THE INVENTION

[0023] In view of the above-explained problems with the prior art, it is an object of the present invention to provide a road roller which permits an operator to climb up to or climb down from an operator's seat in a quick and safe manner.

[0024] It is another object of the present invention to provide a road roller which is arranged to ensure a broadened view field downward of a floor panel for an operator at the time of getting on or off the machine.

[0025] It is still another object of the present invention to provide a road roller with safety measures which prevent the road roller from being started abruptly by an inadvertent action of an operator at the time of getting on or off the machine.

[0026] In order to achieve the above-stated objectives, the present invention is applied to a road roller of the type which has front and rear pressing rollers rotatably mounted on a vehicle body, an operator's seat located on a floor panel of the vehicle body, and ascending/descending steps fixed at a lateral side of the vehicle body to climb up to or climb down from the operator's seat.

[0027] The road roller according to the present invention is characterized in that the ascending/descending steps are constituted by a plural number of stepping plates which are projected outward from each lateral side of the vehicle body and gradually reduced in projection length from the lateral side of the

vehicle body from a lower stepping plate to an upper stepping plate in the fashion of staircase.

[0028] With the arrangements just described, a footing surface on the outer end of a lower stepping plate, which is projected further outward of an upper stepping plate in a lateral direction, can be seen clearly by an operator at the time of getting onto the operator's seat so that the operator can advance his or her step securely upward without getting caught by an upper stepping plate. On the other hand, when getting down from the operator's seat, the operator can advance his or her step securely downward without missing a lower stepping plate because the footing surface on the respective stepping plates are clearly in his or her view.

[0029] In this instance, according to the present invention, the vehicle body can be constituted by front and rear vehicle bodies having a front pressing roller and a rear pressing roller rotatably mounted thereon, respectively, and the ascending/descending steps can be provided at each lateral side of the front vehicle body.

[0030] Further, according to the present invention, rear end positions of the stepping plates of the ascending/descending steps are shifted in a forward direction gradually from a lower stepping plate toward an upper stepping plate in the fashion of staircase.

[0031] With these arrangements, the outer end of a lower stepping plate provides a footing surface which is projected further outward of the outer end of an upper stepping plate in a lateral direction, while the rear end of the lower stepping plate provides a footing surface which is projected further rearward of the rear end of the rear end of the upper stepping plate. Therefore, when climbing up or down the machine by way of the ascending/descending steps, an operator can see the footing surfaces on the respective stepping plates and as a consequence can securely and successively advance his or her step from one stepping plate to another. Besides, in case of a road paving work on a narrow road where it is difficult to find ample space on the opposite lateral sides of the vehicle body, for example, an operator can climb up or climb down the machine by using the ascending/descending steps in or from the back and forth direction of the vehicle.

[0032] Further, according to the present invention, the respective stepping plates of the ascending/descending steps are provided with peeping openings, permitting an operator on the floor panel of the vehicle body to check for road surface conditions through the peeping openings.

[0033] In this instance, during a road paving work, for example, an operator on the floor panel of the vehicle body can see and check for surface conditions of the road under construction through the peeping openings in the stepping plates. Besides, even if paving material is dropped on the stepping plates from operator's shoes when climbing up to the operator's seat, it can be easily removed through the peeping holes to prevent slipping accidents on the stepping plates.

[0034] Further, according to the present invention, a fuel tank or an operating oil tank is fixedly attached to the lateral side of the vehicle body, and at least plural stepping plates in lower position of the ascending/descending steps are securely fixed to a lateral side of said tank.

[0035] In this case, since the tank is projected on the lateral side of the vehicle body to a certain extent, it becomes possible to reduce to a corresponding extent the length in the lateral direction of the stepping plate or plates which are fixed on the lateral side of the tank.

[0036] Further, according to the present invention, a couple of operator's seats can be provided in transversely spaced position on the floor panel of the vehicle body, and the ascending/descending steps can be provided at each lateral side of the vehicle body.

[0037] In this case, when paving a left side lane of a road, for example, the operator can sits on an operator's seat on the left side in driving the vehicle, and climb down from or climb up to the operator's seat by the use of ascending/descending steps on the side of the operator's seat.

[0038] Furthermore, according to the present invention, vehicle body is provided with a vertically extending handrail at least on a front or rear side of the ascending/descending steps, the handrail having a lower end thereof extended as far as a point downward of the floor panel of the vehicle body.

[0039] In this case, in going up the ascending/descending steps, an operator can hold the handrail securely from the ground surface up to the floor panel on which the operator's seat is provided. Therefore, the operator can climb up to or climb down from the operator's seat quite safely and in a far effortless manner.

[0040] Further, according to the present invention, the vehicle body is constituted by a front vehicle body and a rear vehicle body having a front pressing roller and a rear pressing roller rotatably provided thereon, respectively, and the front vehicle body is provided with vertically extending front and rear handrails on front and rear sides of the ascending/descending steps, a handrail on the front side being extended to a point downward of the floor panel of the front vehicle body between the front pressing roller and the ascending/descending step, and a handrail on the rear side being extended as far as a point downward of the floor panel of said front vehicle body between the ascending/descending steps and a coupler which couples the front and rear bodies with each other.

[0041] With the arrangements just described, while going up or down the ascending/descending steps, an operator can hold the handrail on the front vehicle body. In this case, even if an operator slips off a stepping plate, operator can hold the front handrail and prevent his or her body falling in a direction of the front pressing roller. On the other hand, by gripping or holding the rear handrail, operator can prevent his or her body from falling in the direction of the couple between the front and

rear vehicle bodies.

[0042] Further, according to the present invention, the floor panel is provided with an indented opening at confronting position relative to said ascending/descending steps, and a movable floor panel which is movable between an open position and a closed position to uncover and cover said indented opening.

[0043] In this case, when climbing up to or climbing down from the operator's seat, the indented opening can be uncovered by moving the movable floor panel to the open position. Accordingly, as an o operator advances from the ascending/descending steps to the floor panel, his or her foot and other body part can be passed through the indented opening. Thanks to the indented opening, an operator can climb up to or climb down from the operator's seat quickly in a safe manner without having a foot or other body part caught by the floor panel.

[0044] Further, according to the present invention, the floor panel of the vehicle body is provided with a side wing portion at least on the side of the ascending/descending steps, the side wing portion being extended on a lateral side of the vehicle body and provided with an indented opening at a position confronting the ascending/descending steps, and the floor panel is further provided with a movable floor panel adapted to be moved between an open position and a closed position to cover and uncover the said opening.

[0045] In the case of the arrangements just described, the movable floor panel is moved to the open position to uncover the indented opening in the floor panel, permitting passage of an operator climbing up to or climbing down from the operator's seat. Accordingly, as an operator advances onto the floor panel from the ascending/descending steps, the feet or other body part of the operator are allowed to pass through the indented opening. During a road paving operation as the movable floor panel is moved to the closed position to cover the indented opening, the wide footing surface is maintained on the side wing portion, thereby improving the working efficiency in the road paving work.

[0046] Further, according to the present invention, the floor panel of the vehicle body is provided with an indented opening at a position confront the ascending/descending steps, a movable floor panel adapted to be moved between an open position and a closed position to open and close the indented opening, and a handle member attached to the movable floor to move the latter from the open position to the closed position or vice versa.

[0047] With the arrangements just described, the movable floor panel can be opened and closed by way of the handle member easily and safely without getting a finger or fingers pinched between the indented opening and the movable floor panel.

[0048] Further, in a preferred form of the present invention, handle member is realized in the form of a gate lock lever adapted to block a passage between the ascending/descending steps and the floor panel when the movable floor panel is in the closed position and to uncover the passage when the floor panel is in the open position.

[0049] In this case, when the movable floor panel is located in the closed position, the gate lock lever blocks the passage between the floor panel and the ascending/descending steps. Therefore, it serves to prevent an operator from inadvertently climbing up or down the machine during a road paving operation when the movable floor panel is in the closed position, for guaranteeing safety of the road paving work.

[0050] Further, according to the present invention, the road roller further comprises a vertically extending handrail fixedly provided on the vehicle body either on the front or rear side of or on both sides of the ascending/descending steps and having a lower end portion thereof extended as far as a point downward of the floor panel of the vehicle body, an indented opening provided in the floor panel at a position confronting the ascending/descending steps, a movable floor panel attached to the floor panel and adapted to be moved between an open position and a closed position to uncover and cover the indented opening, and a handle member attached to the movable floor panel to move the latter from the open position to the closed position or vice versa.

[0051] With the arrangements just described, in climbing up or down by way of the ascending/descending steps, an operator can hold the handrail securely as he or she advances his or her step from one stepping plate to another. Besides, upon moving the movable floor panel to the open position to uncover the indented opening, the operator can get on or off the operator's seat quickly and safely since his or her feet or other body portions can pass through the indented opening in the floor panel.

[0052] Further, according to the present invention, a sensor means is provided on the vehicle body to detect opening and closing of the movable floor panel, and a driving power reduction means is operatively connected to a roller drive mechanism of the pressing rollers and to the sensor means to reduce driving power of the roller drive mechanism as soon as opening of the movable floor panel is detected by the sensor means.

[0053] In this instance, the driving force for the pressing rollers can be reduced by the driving force reduction means as soon as the movable floor panel is moved to the open position by an operator climbing up to or climbing down from the operator's seat. Accordingly, even if the pressing rollers are erroneously actuated by an inadvertent action of an operator at the time of climbing up to or climbing down from the operator's seat, the vehicle body is prevented from abruptly starting contrary to the intention of the operator, thereby insuring safety in climb-up and climb-down actions.

[0054] Further, according to the present invention, the roller drive mechanism can be arranged to include a

variable displacement hydraulic pump driven from a prime mover and having a tiltable variable delivery section, a hydraulic motor operated on operating oil pressure delivered from the hydraulic pump to rotate the pressing rollers, a tilting actuator having a piston slidably fitted in a cylinder in such a way as to define a couple of oil chambers on opposite sides thereof and adapted to put the hydraulic motor in forward or reverse rotation by tilting the variable delivery section of the hydraulic pump according to displacement of the piston, and a directional control valve provided in a conduit connected between the tilting actuator and a pilot oil pressure source to switch rotational direction of the hydraulic motor by switching direction of operating oil supply to and from the tilting actuator; and the driving power reduction means can be arranged to include a bypass conduit provided between a couple of conduits connecting the directional control valve with the oil chambers of the tilting actuator or between the oil chambers of the tilting actuator, and an on-off valve adapted to open the bypass conduit when opening of the movable floor panel is detected by the sensor means and to close the bypass conduit when closure of the movable floor panel is detected by the sensor means.

[0055] With the arrangements just described, the on-off valve opens the bypass conduit as soon as the movable floor panel is moved to the open position, thereby equalizing the oil pressure in the two oil chambers of the tilting actuator to hold the variable delivery section of the hydraulic pump in a neutral position. As a consequence, the vehicle body is prevented from starting abruptly even if the hydraulic motor is put in reverse or forward rotation by an inadvertent action of an operator in climbing up to or climbing down from the operator's seat.

[0056] Further, according to the present invention, the roller drive mechanism can be arranged to include a variable displacement type hydraulic pump driven from a prime mover and having a variable delivery section, a hydraulic motor operated on operating oil pressure supplied from the hydraulic pump to rotate the pressing rollers, a tilting actuator having a piston slidably fitted in a cylinder in such a way as to define a couple of oil chambers on opposite sides thereof and adapted to put the hydraulic motor in forward or reverse rotation by tilting the variable delivery section of the hydraulic pump according to displacement of the piston, and a directional control valve provided in a conduit connected between the tilting actuator and a pilot oil pressure source to switch rotational direction of the hydraulic motor by switching direction of operating oil supply to and from the tilting actuator; and the driving power reduction means can be arranged to include an on-off valve located in the conduit at a position upstream of the directional control valve and adapted to relief oil pressure out of the tilting actuator when opening of the movable floor panel is detected by the sensor means and to supply oil pressure to the tilting actuator when closure of the movable floor panel is detected by the sensor means.

[0057] With the arrangements just described, when the movable floor panel is moved to the open position, oil pressure in the tilting actuator is drained through the on-off valve, thereby retaining the variable delivery section of the hydraulic pump in a neutral position. As a consequence, the vehicle body is prevented from starting abruptly even if the hydraulic motor is put in reverse or forward rotation by an inadvertent action of an operator in climbing up to or climbing down from the operator's seat.

[0058] Further, according to the present invention, the roller drive mechanism can be arranged to include a variable displacement type hydraulic pump driven from a prime mover and having a variable delivery section, a hydraulic motor operated on operating oil pressure supplied from the hydraulic pump, and a parking brake adapted to apply brakes to the hydraulic motor when in a parking position and to relieve the hydraulic motor of a braking force when in operation; and the driving power reduction means can be arranged to include an on-off valve provided within a brake conduit which supplies brake cancellation oil pressure to the parking brake, the on-off valve being adapted to relief oil pressure out of the parking brake when opening of the movable floor panel is detected by the sensor means and to supply oil pressure to the parking brake when closure of the movable floor panel is detected by the sensor means.

[0059] With the arrangements just described, the oil pressure in the parking brake is drained through the on-off valve when the movable floor panel is moved to the open position, so that braking force is applied to the hydraulic motor by the parking brake. Therefore, the vehicle body is prevented from abruptly starting by an inadvertent action of an operator climbing up to or climbing down from the operator's seat.

[0060] Further, according to the present invention, there is provided a road roller of the type having front and rear pressing rollers rotatably mounted on a vehicle body, an operator's seat located on a floor panel of the vehicle body, and ascending/descending steps fixedly provided at a lateral side of the vehicle body to get on or off said the operator's seat, characterized in that: the vehicle body is provided with a vertically extending handrail either on front or rear side of or on the opposite sides of the ascending/descending steps, the handrail having a lower end extended as far as a point downward of the floor panel of said vehicle body.

[0061] With the arrangements just described, when getting onto or off the operator's seat by way of the ascending/descending steps, an operator can hold the handrail securely as he or she goes up from the ground surface to the operator's seat on the floor panel, thereby advancing his or her step from one stepping plate to another. Therefore, the operator can climb up or down the road roller quite effortlessly.

[0062] Furthermore, according to the present inven-

tion, there is also provided a road roller of the type having front and rear pressing rollers rotatably mounted on a vehicle body, an operator's seat located on a floor panel of the vehicle body, and ascending/descending steps fixedly provided at a lateral side of the vehicle body to get on or off the operator's seat, characterized in that: the vehicle body is provided with an indented opening in a floor panel portion confronting the ascending/descending steps, a movable floor panel attached to the floor panel and movable between an open position and a closed position to open and close the indented opening, and a handle member attached to the movable floor panel to move the latter from the open position to the closed position or vice versa.

[0063] With the arrangements just described, in uncovering the indented opening in the floor panel at the time of climbing up to or climbing down from the operator's seat, an operator can easily open the movable floor panel by way of the handle member, and can get on or off quickly in a safe manner, thereby passing through the indented opening in the floor panel without getting a foot or other part of the body caught by the floor panel or missing a step on the ascending/descending steps.

BRIEF DESCRIPTION OF THE DRAWINGS

[0064]

Fig. 1 is a front view of a road roller according to a first embodiment of the present invention;

Fig. 2 is a front view on an enlarged scale of ascending/descending steps, front and rear handrails and movable deck plate of the road roller shown in Fig. 1;

Fig. 3 is a plan view on an enlarged scale of the ascending/descending steps, front and rear handrails and movable deck plate;

Fig. 4 is a perspective view of the ascending/descending steps;

Fig. 5 is a sectional view of the ascending/descending steps taken in the direction of arrows V-V in Fig. 2;

Fig. 6 is an enlarged front view similar to Fig. 2, showing the movable deck plate in an open position;

Fig. 7 is an enlarged plan view taken from above the movable deck plate in an open position;

Fig. 8 is a front view of a road roller according to a second embodiment of the present invention;

Fig. 9 is a perspective view of ascending/descending steps shown in Fig. 8;

Fig. 10 is an enlarged front view similar to Fig. 2, showing a road roller according to a third embodiment of the present invention;

Fig. 11 is an enlarged front view of a flooring plate of a movable deck along with switches of the road roller shown in Fig. 10;

Fig. 12 is a hydraulic circuit diagram, showing a roller drive mechanism and driving power reduction means employed in the third embodiment;

Fig. 13 is a hydraulic circuit diagram, showing the roller drive mechanism and the driving power reduction means employed in the third embodiment;

Fig. 14 is a hydraulic circuit diagram, showing a modification of the roller drive mechanism and the driving power reduction means employed in the third embodiment;

Fig. 15 is a perspective view of a modification of the ascending/ descending steps;

Fig. 16 is a perspective view of another modification of the ascending/descending steps;

Fig. 17 is a front view of a prior art road roller;

Fig. 18 is a plan view of the same prior art road roller; and

Fig. 19 is a sectional view of prior art ascending/descending steps, taken in the direction of arrows XIX-XIX of Fig. 17.

BEST MODE FOR CARRYING OUT THE INVENTION

[0065] Hereafter, the road roller according to present invention is described more particularly by way of its preferred embodiments and with reference to Figs. 1 through 16.

[0066] Referring first to Figs. 1 through 6, there is shown a first embodiment of the present invention, in which indicated at 1 is a vehicle body of the road roller, including a front vehicle body 2 having front pressing rollers 6 rotatably mounted thereon, and a rear vehicle body 4 having a rear pressing roller 7 rotatably mounted thereon. The rear vehicle body 4 is coupled with the front vehicle body 2 through a coupler 3 which will be described hereinafter. Provided between the front vehicle body 2 and the rear vehicle body 4 is a steering cylinder 5 which permits the rear vehicle body 4 to turn itself about the coupler 3 horizontally to the right and left relative to the front vehicle body 2.

[0067] In this instance, the front vehicle body 2 is formed in a box-like structure including a top side panel 2A, right and left side panels 2B and a floor panel 8, which will be described hereinafter, to accommodate therein a prime mover along with hydraulic pumps (both not shown).

[0068] Indicated at 6 are a pair of front pressing rollers which are rotatably mounted on the front vehicle body 2 in positions which are spaced from each other in the transverse or lateral direction. Each one of the front pressing rollers 6 is constituted, for example, by a metal drum and has water or the like sealed therein for adjusting its weight. Located between the front vehicle body 2 and each one of the front pressing rollers 6 is a hydraulic motor (not shown) which rotationally drives the front pressing roller 6.

[0069] Denoted at 7 is a single rear pressing roller

which rotatably provided on the rear vehicle body 4. This rear pressing roller 7 is constituted by a metal drum which is larger than the front pressing rollers 6 in axial length and has water or the like sealed therein for adjusting its weight similarly to the front pressing rollers 6. Further, located between the rear vehicle body 4 and the rear pressing roller 7 is a hydraulic motor (not shown) which rotationally drives the rear pressing roller 7.

[0070] Upon rotating the hydraulic drive motors of the front pressing rollers 6 and the rear pressing roller 7 at uniform speeds, the vehicle body 1 is driven to run on and along road surfaces, pressing the paving material which is spread over the road surfaces by the front pressing rollers 6 and the rear pressing rollers 7.

[0071] Indicated at 8 is a floor panel according to the present embodiment. The floor panel 8 is provided on the rear side of front vehicle body 2 substantially in level with the top side 2A of the front vehicle body 2. As shown in Fig. 3, the floor panel 8 is constituted by a center panel 8A of a width which can fit in between right and left lateral sides 2B of the front vehicle body 2, and right and left side wing portions 8B which are located on the right and left sides of the center panel 8A and projected respectively on the right and left lateral sides 2B of the front vehicle body 2 in the fashion of eaves. Extended transversely on and across a rear portion of the floor panel 8 is a bench 9 which supports thereon operator's seats 14 which will be described hereinafter.

[0072] Designated at 10 are right and left indented openings which are provided in the side wing portions 8B of the floor panel 8 in confronting positions relative to ascending/descending steps 20 which will be described hereinafter. The indented openings 10 are formed by indenting those portions of the side wing portions 8B which are located above the ascending/descending steps 20. These indented openings 10 are provided to ensure that an operator can get on and off the floor panel 8 smoothly without getting a leg or other body part of the operator caught by the projected side wing portion 8B of the floor panel 8 at the instant of getting on the floor panel 8 from the ascending/descending steps 20 or at the instant of getting on the ascending/descending steps 20 from the floor panel 8.

[0073] Indicated at 11 are movable floor panels which are pivotally connected to the side wing portions 8B of the floor panel 8 to open and close the indented openings 10. The movable floor panels 11 are each constituted by a steel plate of a shape which is substantially same as the same of the indented opening 10. Further, on the rear side, the movable floor panels 11 are pivotally connected to the side wing portions 8B of the floor panel 8 by hinge members 12, and are pivotally movable between an open position where each movable floor panel 11 is turned away from the floor panel 8 to open the indented opening 10 (as shown in Figs. 6 and 7) and a closed position where each movable floor panel 11 is turned toward the floor panel 8 to close the indented opening 10 (as shown in Figs. 2 and 3).

[0074] Denoted at 13 are gate lock levers which are provided on the right and left movable floor panels 11 as a manipulating or handle member. Each one of the gate lock levers 13 is constituted by a rod material which is bent substantially in U-shape, and securely fixed to the upper surface of the movable floor panel 11 at its lower end by welding or other suitable fixation means. Accordingly, the gate lock lever 13 is arranged as a handle which can be gripped at the time of turning the movable floor panel 11 into the open or closed position.

[0075] In this instance, each one of the gate lock levers 13 is provided with an arm portion 13A which is projected upward when the movable floor panel 11 is in the closed position. As the movable floor panel 11 is turned into the closed position, the arm portion 13A of the gate lock lever 13 is caused to stand up to block the passage between the floor panel 8 and an operator's seat 14 as shown in Fig. 2, thereby preventing the operator from inadvertently getting on or off through the passage between the floor panel 8 and the operator's seat 14 during a road paving work. On the other hand, when the movable floor panel 11 is turned into the open position, the gate lock lever 13 is turned into a receded position to open the passage between the floor panel 8 and an operator's seat 14 as shown in Fig 6, thereby permitting the operator to get on or off through the passage between the floor panel 8 and the operator's seat 14.

[0076] Indicated at 14 are a couple of operator's seat which are provided in transversely spaced positions on the bench 9. Correspondingly to the respective operator's seat 14, a couple of steering devices 16 are provided on an operating table15 which is transversely in front of the two operator's seats 14. When one of the steering devices 16 is turned by an operator, the aforementioned steering cylinder 5 is stretched or contracted to turn the rear vehicle body 4 about the couple 3 in the rightward or leftward direction relative to the front vehicle body 2 for controlling the travel direction of the road roller.

[0077] In this connection, when driving the road roller to tread on and compact paving material which is spread on road surfaces, the front pressing rollers 6 may ride onto and cause fracturing damages to curb stones which are laid along the opposite sides of the road under construction. Therefore, when paving along a right side of the road, for example, the operator can take the steering device 16 on the right side to watch for interference between the right side of the front pressing rollers 6 and curb stones while driving the road roller therealong. On the other hand, at the time of paving a left side of the road, the operator can take the steering device 16 on the left side to watch for interferences between the right side of the front pressing rollers 6 and curb stones while driving the road roller therealong.

[0078] Indicated at 17 are forward/reverse drive levers which are provided on the operating table 15 at positions in the vicinity of the right and left steering

devices 16. When one of the forward/reverse lever 17 is tilted to a forward or reverse drive position, the vehicle body 1 is put in a forward or reverse drive direction. Further, a canopy 18 is provided over the respective operator's seats 14.

[0079] Denoted at 19 are tanks which are attached to the opposite lateral sides of the front vehicle body 2 of the vehicle. As shown in Figs. 4 and 5, each one of these tanks 19 is in the form of a rectangular box-like structure including upper side 19A, lower or bottom side 19B, front side 19C, rear or back side 19D, and right and left sides 19E. These tanks 19 are used as reservoirs for fuel to be supplied to a prime mover (not shown) which is accommodated internally of the front vehicle body 2, or for operating oil to be supplied to the respective hydraulic motors which drive the front pressing rollers 6 and the rear pressing roller 7.

[0080] Designated at 20 are right and left ascending/descending steps (climbing-up/climbing-down steps) according to the present embodiment. The ascending/descending steps 20 are provided on the right and left lateral sides 2B of the front vehicle body 2 in such a way as to utilize the tanks 19.

[0081] In this instance, the ascending/descending steps 20 include three stepping plates which are attached to a lateral side 2B of the front vehicle body 2 through the tank 19, more specifically, a lower stepping plate 21 which is provided on the side of the lower end of the tank 19, an intermediate stepping plate 22 which is provided on a lateral side 19E of the tank 19 at a position over the lower stepping plate 21, and an upper stepping plate 23 which is provided on the top side 19A of the tank 18.

[0082] In this particular case, the lower stepping plate 21 is constituted by a rectangular frame body 21A which is securely fixed to the lateral side 19E of the tank 19 by welding or other fixation means, and three spaced cross bars 21B which are bridged across the frame body 21A in the back and forth direction of the vehicle. Namely, provided in the lower stepping plate 21 are four peeping openings 21C in total which are open in the vertical direction, i.e., peeping openings which are formed between the frame body 21A and a spaced cross bar 21B and peeping openings which are formed between the respective spaced cross bars 21B. The lower stepping plate 21 is projected by a predetermined projection length L1 to the left side from the lateral side 2B of the front vehicle body 2.

[0083] Substantially similarly to the lower stepping plate 21, the middle or intermediate stepping plate 22 is constituted by a frame body 22A which is securely fixed to a lateral side 19E of the tank 19, and a single spaced cross bar 22B which is bridged across the frame body 22A in the back and forth direction of the vehicle. A couple of peeping openings 22C which are open in the vertical direction are provided in the frame body 22A on the opposite sides of the spaced cross bar 22B. The intermediate stepping plate 22 is projected by a predetermined projection length L2 to the left side from the lateral side 2B of the front vehicle body 2. The projection length L2 of the intermediate stepping plate 22 is smaller than the projection length L1 of the lower stepping plate 21 (L2 < L1).

[0084] Further, substantially similarly to the lower stepping plate 22, the upper stepping plate 23 is constituted by a frame body 23A which is securely fixed to the top side 19A of the tank 19 by welding or other fixation means, and a single spaced cross bar 23B which is bridged across the frame body 23A in the back and forth direction of the vehicle body. A couple of peeping spacings 23C which are open in the vertical direction are provided in the upper stepping plate 23 on the opposite sides of the spaced cross bar 23B. Further, the upper stepping plate 23 is projected to the left side from the lateral side 2B of the front vehicle body 2 by a predetermined projection length L3 which is smaller than the projection length L2 of the middle stepping plate 22 (L3<L2). In the particular embodiment shown, the upper stepping plate 23 is securely fixed on the top side 19A of the tank 19, so that the peeping openings 23C in the upper stepping plate 23 are blocked by the top surface 19A of the tank 19.

[0085] Thus, the ascending/descending steps 20 are constituted by the lower, middle and upper stepping plates 21 to 23, which are gradually increased in projection length from the lateral side 2B of the front vehicle body 2 toward the lowest step (the lower stepping plate 21), in other words, gradually reduced toward the upper stepping plate 23 in projection length from the lateral side 2B of the front vehicle body 2. As a consequence, the projected outer ends of the lower stepping plates 21 are further projected to the right and left than the projected outer ends of the intermediate stepping plate 22 to provide broader footing surfaces. Similarly, the outer projected ends of the intermediate stepping plates 22 are further projected to the right and left than the outer projected ends of the upper stepping plates 23. Therefore, an operator can securely watch his or her footing on the stepping plates 21 to 23 as operator climbs up or down the steps.

[0086] Indicated at 24 are front handrails which are provided on the front side of the ascending/descending steps 20 at the opposite sides of the vehicle. As seen in Figs. 2 and 3, each one of these front handrails 24 includes a riser portion 24A which is fixed to the side wing portion 8B of the floor panel 8 through a mounter plate 25 and rises upward at a position on the front side of the steering device 16 and the forward/reverse lever 17, a horizontal portion 24B which is bent backward at the upper end of the riser portion 24A and extended in the horizontal direction to the floor panel 8, and a vertical pendant portion 24C which is bent downward at the rear end of the horizontal portion 24B and extended vertically downward from a point above the floor panel 8.

[0087] In this instance, at a vertically intermediate portion, the vertical pendant portion 24C is rigidly sup-

ported by a bracket 26 which is securely fixed to the floor panel 8. Further, a lower end portion of the vertical pendant portion 24C, beneath the bracket 26, is extended to a position between the front pressing roller 6 and the ascending/descending steps 20, more specifically, to an intermediate position between the middle stepping plate 22 and the upper stepping plate 23 where it would not have any possibility of hitting against a rear portion of the front pressing roller 6.

[0088] Designated at 27 are rear handrails which are provided on the rear side of the right and left ascending/descending steps 20. Each one of these rear handrails 27 is located in such a way as to confront the front handrail 24 across the ascending/descending steps 20. In this instance, the rear handrail 27 includes a riser portion 27A which is securely fixed to the bench 9 through a mounter plate 28 and rises upward at a position behind one of the operator's seats 14, a horizontal portion 27B which is bent forward from the upper end of the riser portion 27A and extended in a horizontal direction in parallel relation with the floor panel 8, a turned grip portion 27C which is bent downward from the fore end of the horizontal portion 27B, and a vertical pendant portion 27D which is pendant from a longitudinally intermediate position of the horizontal portion 27B and extended vertically downward through the floor panel 8.

[0089] In the particular embodiment shown, at a longitudinally intermediate portion, the vertical pendant portion 27D rigidly supported by a bracket 29 which is securely fixed to the floor panel 8. The lower end of the vertical pendant portion 27D, which is located beneath the bracket 29, is extended downward toward a position between the coupler 3 and the ascending/descending steps 20 and beneath the floor panel 8, more specifically, toward a position lower than the middle stepping plate 22, so that an operator can the vertical pendant portion instantly as he or she steps on the lower stepping plate 21.

[0090] Accordingly, when getting to the operator's seat 14, the operator can hold both the vertical pendant portion 24C of the front handrail 24 and the vertical pendant portion 27D of the rear handrail 27 easily in a natural posture as he or she successively steps onto the stepping plates 21 to 23 of the ascending/descending steps 20, without stretching his or her arm to a point above the floor panel 8. Further, should an operator slip on the lower stepping plate 21, he or she can instantly grip a lower end portion of the vertical pendant portion 24C of the front handrail 24 or a lower end portion of the vertical pendant portion 27D of the rear handrail 27.

[0091] With the arrangements as described above, the road roller according to the present embodiment is used for road paving work in the manner as follows. Firstly, an operator can easily get to one of the operator's seats 14 on the floor panel 8 by climbing up the steps 20 while holding the handrails 24 and 27.

[0092] Then, the operator who is seated on the operator's seat 14 takes the steering device 16 and operates the forward/reverse lever 17 or other control means to drive the road roller in the forward or reverse direction for treading on and compacting a paving material which is spread on the road surface by the front pressing rollers 6 and the rear pressing roller 7.

[0093] Thus, according to the present embodiment, an operator can quickly and safely climb up and down the machine at the time of getting on and off the operator's seat 14. Actions of an operator at the time of ascending or descending the machine are described more particularly below.

[0094] At the time of climbing up to the operator's seat 14, an operator firstly stands face to face with the ascending/descending steps 20, and then goes up the ascending/descending steps 20, gripping the vertical pendant portions 24C and 27D of the front and rear handrails 24 and 27 while advancing his or her step successively from the lower stepping plate 21 to the middle stepping plate 22 and from the middle stepping plate 22 to the upper stepping plate 23.

[0095] When the operator gets on the middle stepping plate 22, for example, the operator can open the indented opening 10 of the floor panel 8 by turning the movable floor panel 11 into the open position as shown in Figs. 6 and 7. At this time, the movable floor panel 11 can be easily turned into the open position by gripping the gate lock lever 13 which is provided on the movable floor panel 11, without possibilities of an operator's hand or fingers being pinched between the movable floor panel 11 and the indented opening 10.

[0096] Then, the operator advances onto the floor panel 8 from the upper stepping plate 23 through the indented opening 10. At this time, since the indented opening 10 is wide open, the operator can quickly get onto the operator's seat 14 without getting a leg or other body part caught on the wide wing portion 8B of the floor panel 8.

[0097] On the other hand, when getting off the operator's seat 14, what is required for the operator to do is just to stand up turning his or her back toward the operator's seat 14 and climb down the ascending/descending steps 20 successively from the upper stepping plate 23 to the middle stepping plate 22 and then to the lower stepping plate 21 while gripping the vertical pendant portions 24C and 27D of the front and rear handrails 24 and 27 until the operator finally reaches the road surface.

[0098] According the present embodiment, the projection length of the ascending/descending steps 20 on the lateral side of the front vehicle body 2 is gradually increased from a uppermost step (the stepping plate 23) toward a lowermost step (the lower stepping plate 21) or gradually reduced from a lowermost step toward an uppermost step in the fashion of staircase. Therefore, in acknowledging footing surfaces on the steps, an operator can clearly see the outer end of the middle stepping plate 22 which is projected further beyond the

outer end of the upper stepping plate 23 as well as the outer end of the lower stepping plate 21 which is projected further beyond the outer end of the middle stepping plate 22. Therefore, at the time of getting onto or getting off the operator's seat 14, the operator can quickly and safely climb up and down the ascending/descending steps 20 clearly seeing the positions of the respective stepping plates 21 to 23.

[0099] Further, as described above, the lower, middle and upper stepping plates 21, 22 and 23 of the ascending/descending steps 20 contain peeping openings 21C, 22C and 23C, respectively, which are open in the vertical direction. Therefore, in case asphalt or other paving material is dropped on the lower stepping plate 21, middle stepping plate 22 or upper stepping plate 23, it can be easily removed through these peeping openings 21C, 22C or 23C to prevent an operator from slipping on the stepping plate 21, 22 or 23 when going up or down the ascending/descending steps 20.

[0100] Further, as described above, the front and rear handrails 24 and 27 are provided on the front and rear sides of the ascending/descending steps 20, and both of the vertical pendant portions 24C and 27C of the front and rear handrails 24 and 27 are extended downward of the floor panel 8. Therefore, an operator can grip the vertical pendant portions 24C and 27D of the front and rear handrails 24 and 27 in a natural posture, so that operator can quickly get on or off the operator's seat 14 quickly in a safe manner, without being necessitated to stretch his or her arm above the floor panel 8. Further, when getting down to the ground from the operator's seat 14, the operator can turn his or her back toward the operator's seat 14 and keep gripping the vertical pendant portions 24C and 27D of the front and rear handrails 24 and 27 all the way until operator reaches the ground surface. Thus, the operator can get off the operator's seat 14 in a quite safe manner.

[0101] Therefore, if an operator slips on the stepping plate 21, 22 or 23 of the ascending/descending steps 20 at night time or in raining or snowing conditions, for example, operator can instantly grip the front and rear handrails 24 and 27 instantly to support his or her body and can watch out for safe footings.

[0102] Besides, the lower end of the vertical pendant portion 24C of the front handrail 24 is extended to a position intermediate between the front pressing roller 6 and the ascending/descending steps 20, more specifically, to a position between the middle and upper stepping plates 22 and 23 of the ascending/descending steps 20, and the lower end of the vertical pendant portion 27D of the rear handrail 27 is extended downward of the middle stepping plate 22 between the coupler 3 and the ascending/descending steps 20. Accordingly, should an operator fall off the ascending/descending steps 20 or should a leg of an operator be caught on the front pressing roller 6, these arrangements contribute to prevent the operator from getting between the front and rear bodies 2 and 4 which are connected with each other by the coupler 3 and to ensure safety of the operator on the ascending/descending steps all the more.

[0103] Nextly, when an operator takes the operator's seat 14 to drive the road roller for a road paving work, treading on and compacting asphalt or other paving material which is spread on road surfaces, operator firstly turns the movable floor panel 11 into the closed position shown in Fig. 2 to close the indented opening 10, and then operates the steering device 16, forward/reverse drive lever 17 etc. to drive the road roller in such a way as to tread on the spread paving material for compacting same under the weight of the front and rear pressing rollers 6 and 7.

[0104] In this instance, in case it becomes necessary for the operator to stand up on the floor panel 8 to look down and check for the conditions of paved road surfaces following the front and rear pressing rollers 6 and 7, a broader footing space can be secured by closing the indented opening 10 of the floor panel 8 with the movable floor panel 11.

[0105] Further, when it becomes necessary for the operator to check for the conditions of paved road surface from the floor panel 8, he or she can do this through the peeping openings 22C in the middle stepping plate 22 and/or the peeping openings 21C in the lower stepping plate 21. It follows that, while carrying out a paving work, the operator can view and check the conditions of paved road surfaces over a wide range from the operator's seat 14, and therefore can continue the road paving work in a remarkably efficient manner.

[0106] Further, when the movable floor panel 11 is in the closed position, the arm portion 13A of the gate lock lever 13 is projected upward from the movable floor panel 11 to assume an upwardly standing position for blocking the passage between the floor panel 8 and the operator's seat 14. Accordingly, the gate lock lever 13 can prevent an operator from inadvertently getting off the operator's seat 14 during a road paving work and at the same time can prevent a non-operator from getting on the operator's seat 14 during a road paving work, thereby to guarantee safety of road paving work.

[0107] Now, referring to Figs. 8 and 9, there is shown a second embodiment of the present invention, which is characterized in that the stepping plates of the ascending/descending steps are attached in such positions that rear ends of the respective stepping plates are shifted in the forward direction stepwise from the lower to upper stepping plate. In the following description of the second embodiment, those component parts which are common with the foregoing first embodiment are designated by common reference numerals and characters to avoid repetitions of same explanations.

[0108] In these figures, indicated at 31 are ascending/descending steps which are provided at the opposite lateral sides of the vehicle body in the present embodiment (only the ascending/descending steps on the left side of the vehicle body are shown in the drawings), in place of the ascending/descending steps 20 of

the above-described first embodiment. The ascending/descending steps 31 are provided on the opposite right and left lateral sides 2B of the front vehicle body 2 similarly by the use of the tank 19.

[0109] Each set of ascending/descending steps 31 includes three stepping plates which are provided on a lateral side of the front vehicle body 2, more specifically, a lower stepping plate 32 which is provided at the lower end of a lateral side surface 19E of the lower end of the tank 19, an intermediate or middle stepping plate 33 which is provided on the lateral side surface 19E of the tank 19 at an upwardly spaced position from the lower stepping plate 32, and an upper stepping plate 34 which provided at the upper end of the lateral side surface 19E of the tank 19 at an upwardly spaced position from the middle stepping plate 33.

[0110] In this instance, as shown in Fig. 9, the lower stepping plate 32 is constituted by a rectangular frame body 32A which is securely fixed to the lateral side 19E of the tank 19 by welding or by other suitable fixation means, and four spaced bars 32B which ate bridged across the frame body 32A in the back and forth direction of the road roller. Provided between the frame body 32A and the spaced bars 32B and between the adjacent spaced bars 32B are peeping spacings 32C which are open in the vertical direction. The lower stepping plate 32 is projected to the right from the lateral side 19E of the tank 19 by a projection length A1 which is a maximum projection length as compared with other stepping plates. The lower stepping plate 32 has a width B1 in the back and forth direction, which is substantially same as the width of the tank 19. The fore and rear ends 32A1 and 32A2 of the frame body 32 are located transversely in line with the front and rear sides 19C and 19D of the tank 19, respectively.

[0111] The middle stepping plate 33 is constituted by a rectangular frame body 33A which is securely fixed to the lateral side 19E of the tank 19 by welding or by other suitable fixation means in an upwardly spaced position from the lower stepping plate 32, and three spaced bars 33B which are bridged across the frame body 33A in the back and forth direction of the road roller. Formed between the frame body 33A and the spaced bars 33B and between the adjacent spaced bars 33B are four peeping spacings 33C in total which are open in the vertical direction.

[0112] Further, the middle stepping plate 33 is projected outward from the outer lateral side 19E of the tank 19 by a predetermined projection length A2, which is smaller than the projection length A1 of the lower stepping plate 32 (A2 < A1). The middle stepping plate 33 has a width B2 in the back and forth direction, which is smaller than the width B1 of the lower stepping plate 32 (B2 < B1). The front end 33A1 of the frame body 33A is located at a position which is shifted in the rearward direction by a distance C2 from the front side 19C of the tank 19, while the rear end 33A2 of the frame body 33 is located in a position which is shifted in the forward direction by a distance D2 from the rear side 19D of the tank 19.

[0113] The upper stepping plate 34 is constituted by a rectangular frame body 34A which is securely fixed to the lateral side 19E of the tank 19 by welding or by other suitable fixation means in an upwardly spaced position from the middle stepping plate 33, and a couple of spaced bars 34B which are bridged across the frame body 34A in the back and forth direction of the road roller. Formed between the frame body 34A and the spaced bars 34B and between the two spaced bars 34B are three peeping spacings 34C in total which are open in the vertical direction.

[0114] The upper stepping plate 34 is projected outward from the lateral side 19E of the tank 19 by a predetermined projection length A3, which is smaller than the projection length A2 of the middle stepping plate 33 (A3 < A2). The upper stepping plate 34 has a width B3 in the back and forth direction, which is substantially same as the width B2 of the middle stepping plate 33. The front end 34A1 of the frame body 34A is located substantially in line with the front side 19C of the tank 19 in the transverse direction. However, the rear end 34A2 of the frame body 34A is located in a position which is shifted in the forward direction by a distance D3 from the rear side 19D of the tank 19. The just-mentioned distance D3 is larger than the distance D2 of the rear end 33A2 of the frame body 33A of the middle stepping plate 33 from the rear side 19D of the tank 19 (D3 > D2).

[0115] Thus, the respective stepping plates 32 to 34 of the ascending/descending steps 31 are arranged such that they are reduced in projection length from the lateral side 19E of the tank 19 gradually from the lower stepping plate 32 toward the upper stepping plate 34, and are at the same time shifted in position in the forward direction sequentially from the lower stepping plate 32 toward the upper stepping plate 34.

[0116] Regarding fundamental actions in a road paving operation, that is to say, in treading on and compacting paving material spread on road surfaces, the road roller of the present embodiment, with the ascending/descending steps 31 arranged as described above, has no differences in particular from the foregoing first embodiment.

[0117] According to the present embodiment, the respective stepping plates 32 to 34 of the ascending/descending steps 31 are arranged such that the projection length from the lateral side 2B of the front vehicle body 2 is reduced gradually from a lower step (the lower stepping plate 32) toward an upper step (the upper stepping plate 34) in the fashion of staircase. Accordingly, the footing surfaces on the projected outer ends of the middle and lower stepping plates 33 and 32 can be directly viewed from the upper and middle stepping plates 34 and 33, respectively.

[0118] Therefore, at the time of climbing up or down the ascending/descending steps 31, an operator can see the stepping plates 32 to 34 all the time as operator

advances his or her step from one stepping plate to another, and therefore can quickly and safely climb up to or climb down from the operator's seat 14.

[0119] Besides, as mentioned above, the rear end positions of the stepping plates 32 to 34 of the ascending/descending steps 31 are shifted in the forward direction gradually from a lower step (the lower stepping plate 32) toward an upper step (the upper stepping plate 34) in the fashion of staircase. Accordingly, during a paving work on a relatively narrow road, for example, an operator can go up or down the ascending/descending steps 31 securely from behind the front vehicle body 2 even in a case where it is difficult to find a sufficient ascending/descending space on either side of the front vehicle body 2.

[0120] Furthermore, the peeping openings 32C, 33C and 34C which are open in the vertical direction are provided in the lower, middle and upper stepping plates 32 to 34 of the ascending/descending steps 31, respectively.

[0121] Therefore, even if asphalt or the like is dropped on the upper stepping plate 32, middle stepping plate 33 and/or lower stepping plate 34, it can be easily removed through the peeping openings 32C, 33C and/or 34C to preclude the possibilities of an operator slipping on either one of the stepping plates 32 to 34. In addition, in the course of a road paving work, an operator on the floor panel 8 can see the conditions of road surfaces through the peeping openings 34C in the upper stepping plate 34, peeping openings 33C in the middle stepping plate 33 and/or peeping openings 32C in the lower stepping plate 32. Therefore, the operator can check for conditions of paved road surfaces over a wide range from the operator's seat 14 while continuing the road paving work.

[0122] Referring now to Figs. 10 to 12, there is shown a third embodiment of the present invention, which is characterized by the provision of a sensor means which detects whether or not the movable floor panel is in the open or closed position, in combination with a driving power reduction means which is operatively associated with drive mechanisms of the pressing rollers and adapted to diminish the drive force of pressing rollers as soon as the movable floor panel is detected to be in the open position by the sensor means. In the following description of the third embodiment, those component parts which are common with the foregoing first embodiment are designated by common reference numerals and characters to avoid repetitions of same explanations.

[0123] In Figs. 10 and 12, indicated at 41 is a switch which is employed as a sensor means and provided on the lower side of each side wing portion 8B of the floor panel 8 to detect opening or closing of the movable floor panel 11. The switch 41 is mounted on an L-shaped bracket 42 which is bolted to the lower side of the side wing portion 8B on the rear side of the indented opening 10. On the other hand, provided on the lower side of the movable floor panel 11 is an L-shaped bracket 43 which is arranged to close the switch 41 when the movable floor panel 11 is moved into the closed position indicated by solid line, and to open the switch 41 when the movable floor panel 11 is moved into the open position indicated by two-dot chain line.

[0124] Upon closing the movable floor panel 11 is closed, the switch 41 is closed by the bracket 43 to produce a detection signal to an on-off valve 67 which will be described hereinafter. Indicated at 44 is a stopper which is provided on the bracket 42 in the vicinity of the switch 41. When the movable floor panel 11 is closed, this stopper 44 is brought into abutting engagement with the bracket 43 for protection of the switch 41.

[0125] Illustrated in Fig. 12 is a diagram of a roller drive system for the front and rear pressing rollers 6 and 7. The roller drive system is largely constituted by a hydraulic pump 51, hydraulic motor 53, tilted rotation actuator 61, directional control valve 63.

[0126] The hydraulic pump 51 is a variable displacement type pump which is driven by a motor 52. For example, the hydraulic pump 51 is constituted by a variable delivery section 51A which is provided with a swash plate or the like and which is put in tilted rotation to vary the delivery or discharge rate.

[0127] Indicated at 53 is the hydraulic motor which rotationally drives the front pressing rollers 6 and the rear pressing roller 7. This hydraulic motor 53 is connected to the hydraulic pump 51 through main conduits 54 and 55 in such a way as to form a closed hydraulic circuit along with the hydraulic pump 51.

[0128] As the variable delivery section 51A of the hydraulic pump 51 is tiled in the direction of arrow F from a neutral position shown in the drawing, the hydraulic motor 53 is rotated in the forward direction to drive the respective pressing rollers 6 and 7 also in the forward direction. When the variable delivery section 51A is tilted in the direction of arrow R, the hydraulic motor 53 is rotated in the reverse direction to drive the respective rollers 6 and 7 also in the reverse direction.

[0129] Denoted at 56 is a charging pump which is driven from the hydraulic pump 51 and the motor 52. This charging pump 56 functions to supply operating oil in the tank 19 to the main conduits 54 and 55 through conduit 57 and check valves 58 and 59 to prevent cavitations within the respective main conduits 54 and 55. Further, the charging pump 56 provides a pilot pressure source to supply pilot oil pressure to the tilted rotation actuator 61 which will be described hereinafter. A maximum oil pressure to be delivered from the charging pump 56 is set by a relief valve which is indicated at 60.

[0130] The tilted rotation actuator 61 functions to tilt the variable delivery section 51A of the hydraulic pump 51 to rotate the hydraulic motor 53 either in the forward or reverse direction. The tilted rotation actuator 61 is constituted by a cylinder 61A, a piston 61B which is slidably fitted in the cylinder 61A, a couple of oil chambers 61C and 61D which are defined within the cylinder 61A

by the piston 61B, and biasing springs 61E and 61F which are provided in the oil chambers 61C and 61D to urge the piston 61B toward a neutral position. The piston 61B is coupled with the variable delivery section 51A of the hydraulic pump 51 through a link 62.

[0131] Indicated at 63 is the directional control valve which is switched by manipulation of the forward/reverse drive lever 17 on the operating table 15. This control valve 63 functions to change the rotational direction of the hydraulic motor 53 by switching the direction of oil pressure to be supplied to and from the respective oil chambers 61C and 61D of the tilting actuator 61 by the charging pump 56. In this instance, a pump port of the directional control valve 63 is connected to the charging pump 55, and a tank port is connected to the tank 19. Further, one output port of the directional control valve 63 is connected to an oil chamber 61C of the tilting actuator 61 through a conduit 64, while the other output port is connected to an oil chamber 61D of the tilting actuator 61 through a conduit 65.

[0132] By manipulating the forward/reverse drive lever 17, the directional control valve 63 is switched either to a forward drive position (II) or to a reverse drive position (III) from a neutral position (I). Further, when the directional control valve 63 is in the neutral position (I), the variable delivery section 51A of the hydraulic pump 51 is held in the neutral position and the hydraulic motor 53 is de-activated.

[0133] When the directional control valve 63 is switched to the forward drive position (II), the oil pressure from the charging pump 56 is supplied to the oil chamber 61C of the tilting actuator 61, thereby causing the piston 61B to slide to the left in the drawing. As a result, the variable delivery section 51A of the hydraulic pump 51 is tilted in the direction of arrow F through the link 62, so that the hydraulic motor 53 is put in forward rotation to rotate the respective pressing rollers 6 and 7 in the forward direction.

[0134] On the other hand, when the directional control valve 63 is switched to the reverse drive position (III), this time the oil pressure from the charging pump 56 is supplied to the oil chamber 61D of the tilting actuator 61 to displace the piston 61B to the right in the drawing. As a consequence, the variable delivery section 51A of the hydraulic pump 51 is tilted in the direction of arrow R through the link 62 to put the hydraulic motor 53 in reverse rotation to rotate the respective pressing rollers 6 and 7 in the reverse direction.

[0135] Indicated at 66 is a bypass conduit which is connected between conduits 64 and 65 between the directional control valve 63 and each one of the oil chambers 61C and 61D of the tilting actuator 61. Along with a on-off valve 67 which will be described hereinafter, the bypass conduit 66 constitutes a driving power reduction means which operates to step down the driving power for the front and rear pressing rollers 6 and 7.

[0136] Denoted at 67 is the on-off valve which is provided within the length of the bypass conduit 66 to open and close same in response to a detection signal from the switch 41. In this case, the on-off valve 67 is constituted by a 2-port 2-position electromagnetic valve with a solenoid 67A and a biasing spring 67B.

[0137] When the movable floor panel 11 is in the opened position and the switch 41 is open, the on-off valve 67 is retained in an open position (a) by the action of the spring 67B, thereby holding the bypass conduit 66 in an open state to communicate the conduits 64 and 65 with each other. On the other hand, when the floor panel 11 is in the closed position and the switch 41 is closed, the on-off valve 67 is switched to a closed position (b) by a signal which is output to the solenoid from the switch 41, thereby holding the bypass conduit 66 in a closed state to block communication between the conduits 64 and 65.

[0138] With regard to fundamental actions in treading on and compacting asphalt or other paving material, the road roller according to the present embodiment, with the above-described arrangements, has no differences in particular as compared with the foregoing first embodiment.

[0139] The road roller according to the present embodiment, however, is improved to ensure that an operator can climb up to and climb down from the operator's seat 14 more quickly and safely, as explained below in connection with climb-up and climb-down actions of an operator.

[0140] Firstly, in order to get to the operator's seat 14, an operator advances his or her step successively from the lower stepping plate 21 to the middle stepping plate 22 and then the top stepping plate 23 of the ascending/descending steps 20 while gripping the vertical pendant portions 24C and 27C of the front and rear handrails 24 and 27. Further, upon reaching the middle stepping plate 22, for example, the operator can open the indented opening 10 in the floor panel 8 by turning the movable floor panel 11 into the open position. Therefore, the operator can step on the floor panel 8 through the indented opening 10 and get to the operator's seat 14 quickly without having a leg or other body part caught by the side wing portion 8B of the floor panel 8.

[0141] In this instance, as soon as the movable floor panel 11 is turned into the open position, the switch 41 is opened and the on-off valve 67 is retained in the open position (a), so that the conduits 64 and 65 are communicated with each other through the bypass conduit 66 to bring the oil pressures in the oil chambers 61C and 61D of the tilting actuator substantially to the same level. As a result, the piston 61B of the tilting actuator 61 is moved to a neutral position by the actions of the springs 61E and 61F to reduce the delivery rate from the hydraulic pump 51, that is to say, to lower the rotational driving force of the front and rear pressing rollers 6 and 7 by the hydraulic motor 53.

[0142] Therefore, in case the directional control valve 63 is erroneously switched from the forward drive

position (II) to the reverse drive position (III) by an operator inadvertently touching the forward/reverse drive lever 17 at the time of getting seated on the operator's seat 14, the tilting actuator 61 retains the neutral position, thereby preventing the road roller from abruptly starting contrary to the operator's will and thus ensuring safety at the time of getting on the operator's seat 14.

[0143] On the other hand, when an operator has seated on the operator's seat 14 to start the road roller for a road paving work, i.e., an operation of treading on and compacting asphalt which is spread on road surfaces, in the first place the operator turns the movable floor panel 11 into the closed position to close the indented opening 10 in the floor panel 8.

[0144] By so doing, the switch 41 is closed and the on-off valve 67 is switched to the closed position (b), whereupon the bypass conduit 66 is closed to block communication between the conduits 64 and 65. In this state, the operator tilts the forward/reverse drive lever 17 to the front side, for example, whereupon the directional control valve 63 is switched to the forward drive position (II), and oil pressure from the charging pump 56 is supplied to the oil chamber 61C of the tilting actuator 61 through the conduits 57 and 64. Consequently, the piston 61B is caused to slide to the left in the drawing, and the variable delivery section 51A of the hydraulic pump 51 is tilted in the direction of arrow F through the link 62, thereby putting the hydraulic motor 53 in forward rotation to drive the road roller in the forward direction.

[0145] Further, when the operator tilts the forward/reverse drive lever 17 to the proximal side to switch the directional control valve 63 to the reverse drive position (III), oil pressure from the charging pump 56 is supplied to the oil chamber 61D of the tilting actuator 61 through the conduits 57 and 65. As a result, the piston 61B is caused to slide to the right in the drawing, and the variable delivery section 51A of the hydraulic pump 51 is tilted in the direction of arrow R through the link 62, thereby putting the hydraulic motor 53 in reverse rotation to drive the road roller in the reverse direction.

[0146] Thus, as the road roller is driven in the forward and reverse directions and steered by way of the steering device 16, the asphalt which is spread on road surfaces is treaded on and paved by the front and rear pressing rollers 6 and 7.

[0147] Now, when getting off the operator's seat 14, the operator returns the forward/reverse drive lever 17 to the neutral position to stop the road roller and the operator turns the movable floor panel 11 to the opened position to open the indented opening 10 by manipulating the gate lock lever 13. Then, the operator can quickly get down to the road surface from the floor panel 8 by way of the ascending/descending steps 20, advancing his or her step successively from the upper stepping plate 23 to the middle and lower stepping plates 22 and 21 while gripping the vertical pendant portions 24C and 27D of the front and rear handrails 24 and 27.

[0148] In this instance, when the movable floor panel 11 in the open position, the switch 41 is opened to retain the on-off valve 67 in the open position (a). Therefore, similarly to the above-described case, even if the operator inadvertently touches the forward/reverse drive lever 17 at the time of descending from the operator's seat 14, thereby causing the directional control valve 63 to be switched erroneously to the forward drive position (II) or to the reverse drive position (III), the driving force on the front and rear pressing rollers 6 and 7 is at a diminished level to prevent the road roller from starting abruptly, namely, to ensure safety of the operator who is about to climb down the machine.

[0149] Referring now to Fig. 13, there is shown a modification of the above-described third embodiment. In this modification, the driving power reduction means is constituted by an on-off valve provided within a length of a conduit which connects the tilting actuator to a pilot pressure source.

[0150] In Fig. 13, denoted at 71 is an on-off valve which is provided within a length of the conduit 57 to serve as the driving power reduction means, located at a position between the charging pump 56 and the directional control valve 63 (at a position upstream of the directional control valve 63). The on-off valve 71 is constructed as a 3-port 2-position electromagnetic valve with a solenoid 71A and a biasing spring 71B.

[0151] When the movable floor panel 11 is in the open position and the switch 41 is likewise open, the on-off valve 71 is retained in a closed position (c) under the influence of the action of the biasing spring 71B. Therefore, in this state, if the directional control valve 63 is switched either to the forward drive position (II) or to the reverse drive position (III), oil pressure in the oil chamber 61C or 61D of the tilting actuator 61 is drained into the tank 19. On the other hand, when the movable floor panel 11 is in the closed position and the switch 41 is closed, the on-off valve 71 is switched to an open position (d) in response to a signal which is output to the solenoid 71A from the switch 41, thereby permitting to supply oil pressure to the oil chamber 61C or 61D of the tilting actuator 61 when the directional control valve 63 is switched to the forward drive position (II) or to the reverse drive position (III).

[0152] According to the present embodiment with the above-described arrangements, as soon as the movable floor panel 11 is moved to the open position by an operator at the time of climbing up to or climbing down from the operator's seat 14, the switch 41 is closed to retain the on-off valve 71 in the closed position (c).

[0153] Therefore, for example, even if the directional control valve 63 is erroneously switched to the forward drive position (II) or reverse drive position (III) by an operator inadvertently touching the forward/reverse drive lever 17 at the time of climbing up to or down from the operator's seat 14, the piston 61B of the tilting actuator 61 is moved to the neutral position by the springs

61E and 61F to reduce the delivery rate of the hydraulic pump 51 and step down the driving force of the front and rear pressing rollers 6 and 7 by the hydraulic motor 53. As a consequence, the road roller is prevented from abruptly starting contrary to the operator's intention, thereby ensuring the safety at the time of climbing up or down the machine.

[0154] As soon as an operator gets on the operator's seat 14 and turns the movable floor panel 11 to the closed position, the switch 41 is closed to switch the on-off valve 71 to the open position (d). In this state, if the operator switches the directional control valve 63 to the forward drive position (II) or to the reverse drive position (III) by manipulation of the forward/reverse drive lever 17, oil pressure from the charging pump 56 is supplied to the oil chamber 61C or 61D of the tilting actuator 61, thereby tilting the variable delivery section 51A of the hydraulic pump 51 in the direction of arrow F or in the direction of arrow R to drive the road roller in the forward or reverse direction.

[0155] Illustrated in Fig. 14 is another modification of the above-described third embodiment of the present invention. In this another modification, a parking brake is provided to apply braking force to the hydraulic motor, and a driving power reduction means is constituted by an on-off valve which is provided within a length of a conduit which supplies a brake canceling oil pressure to the parking brake.

[0156] More particularly, indicated at 81 in Fig. 14 is a negative type parking brake which is operatively connected to the hydraulic motor 53. The parking brake 81 is constituted by a brake cylinder 81A, a piston 81C which is slidably received in the brake cylinder 81A and defines a brake cancellation oil chamber 81B within the brake cylinder 81A, a friction plate 81D to be pushed into frictional engagement with an output shaft of the hydraulic motor 53 by the piston 81C, and a brake spring 81E which biases the friction plate 81D into pressed contact with the output shaft of the hydraulic motor 53.

[0157] When in a parking position, the parking brake 81 applies brakes to the hydraulic motor 53 through the brake spring 81E. On the other hand, when the hydraulic motor 53 is in operation, a brake canceling oil pressure is supplied to the brake cancellation oil chamber 81B of the parking brake 81 from the charging pump 56 through a bake conduit 82 which will be described hereinafter, thereby canceling the braking force on the hydraulic motor 53 against the action of the brake spring 81E.

[0158] Indicated at 82 is the brake conduit which is connected between the brake cancellation chamber 81B of the parking brake 81 and a conduit 57 which is in communication with the charging pump 56. The brake conduit 82 functions to supply oil pressure from the charging pump 56 to the brake cancellation chamber 81B as a brake canceling oil pressure.

[0159] Denoted at 83 is an on-off valve which is provided within the length of the brake conduit 82 as a driving power reduction means. In this case, the on-off valve 83 in the form of a 3-port 2-position electromagnetic valve with a solenoid 83A and a biasing spring 83B.

[0160] When the movable floor panel 11 is in the open position and the switch 41 is open, the on-off valve 83 is retained in a closed position (e) under the influence of the action of the biasing spring 83B. Therefore, oil pressure in the brake cancellation chamber 81B to be drained into the tank 19, thereby permitting the parking brake 81 to apply brakes to the hydraulic motor 53. On the other hand, when the movable floor panel 11 is in the closed position and the switch 41 is closed, the on-off valve 83 is switched to an open position (f) by a signal which is output to the solenoid 83A from the switch 41. Accordingly, oil pressure from the charging pump 56 is supplied to the brake cancellation chamber 81B through the brake conduit 82.

[0161] According to the present modification as described above, as soon as the movable floor panel 11 is moved to the open position by an operator who is getting on or off the road roller, the switch 41 is closed and the on-off valve 83 is retained in the closed position (e) to drain oil pressure in the brake cancellation chamber 81b to the tank 19, thereby permitting the parking brake 81 to apply brakes to the hydraulic motor 53.

[0162] Therefore, for example, even if an operator touches the forward/reverse drive lever 17 by mistake at the time of getting onto the driver's seat 14, and as a result the directional control valve 63 is switched to the forward drive position (II) or to the reverse drive position (III), thereby permitting supply of oil pressure from the hydraulic pump 51 to the hydraulic motor 53, the driving power on the front and rear pressing rollers 6 and 7 is suppressed to a low level because brakes are applied on the hydraulic motor 53 by the parking brake 81. Consequently, the road roller is prevented from abruptly starting contrary to the intention of the operator to guarantee the safety at the time of climbing up or down the machine.

[0163] Further, as soon as an operator who has seated on the operator's seat 14 turns the movable floor panel 11 into the closed position, the switch 41 is closed and the on-off valve 83 is switched to the open position (f), thereby supplying oil pressure from the charging pump 56 to the brake cancellation chamber 81B through the brake conduit 82 to relieve the hydraulic motor 53 of the braking force.

[0164] In this state, if the operator manipulates the forward/reverse drive lever 17 to switch the directional control valve 63 to the forward drive position (II) or to the reverse drive position (III), oil pressure from the charging pump 56 is supplied to the oil chamber 61C or 61D of the tilting actuator 61, whereupon the variable delivery section 51A of the hydraulic pump 51 is tilted in the direction of arrow F or in the direction of arrow R to drive the road roller in the forward or reverse direction.

[0165] Shown in Fig. 15 is a modification of the

ascending/descending steps. The ascending/descending steps 91 of this modification similarly include a lower stepping plate 92, a middle or intermediate stepping plate 93 and an upper stepping plate 94.

[0166] In this instance, the lower stepping plate 92 is constituted by a frame body 92A and spaced bars 92B, and projected from the lateral side 19E of the tank 19 by a predetermined projection length A11. Further, the lower stepping plate 92 has a width B11 which is substantially same as the length of the tank 19 in the back and forth direction of the vehicle. The frame body 92A has its front end 92A1 located transversely in line or flush with the front side 19C of the tank 19, and a rear end 92A2 located transversely in line with the rear side 19D of the tank 19.

[0167] The middle stepping plate 93 is constituted by a frame body 93a and spaced bars 93B, and projected from the lateral side 19E of the tank 19 by a predetermined projection length A12 which is smaller than the above-mentioned projection length A11 of the lower stepping plate 92. On the other hand, the middle stepping plate 93 has a width B12 in the back and forth direction, which is smaller than the above-mentioned width B11 of the lower stepping plate 92. The fore end 93A1 of the frame body 93A is located transversely in line with the front side 19C of the tank 19, while its rear end 93A2 is located in a position which is shifted in the forward direction by a distance D12 from the rear side 19D of the tank 19.

[0168] Further, the upper stepping plate 94 is constituted by a frame body 94A and spaced bars 94B, and projected from the lateral side 19E of the tank 19 by a predetermined projection length A13 which is smaller than the projection length A12 of the middle stepping plate 93. Further, the upper stepping plate 94 has a width B13 which is smaller than the width B12 of the middle stepping plate 93 in the back and forth direction. The front end 94A1 of the frame body 94A is located transversely in line with the front side 19C of the tank 19, while its rear end 94A2 is located in a position which is shifted in the forward direction from the rear side 19D of the tank 19 by a distance D13 which is larger than the above-mentioned distance D12.

[0169] Thus, the respective stepping plates 92 to 94 of the ascending/descending steps 91 are gradually reduced from the lower stepping plate 92 toward the upper stepping plate 94 in projection length from the lateral side 19E of the tank 19, and the positions of the rear ends of the respective stepping plates are successively shifted in the forward direction from the lower stepping plate 92 toward the upper stepping plate 94 in the fashion of staircase.

[0170] Turning now to Fig. 16, there is shown another modification of the ascending/descending steps. In this case, ascending/descending steps 95 are similarly constituted by a lower stepping plate 96, a middle stepping plate 97 and an upper stepping plate 98.

[0171] The lower stepping plate 96 is composed of a frame body 96A and spaced bars 96B, and projected from the lateral side 19E of the tank 19 by a predetermined length A21. The lower stepping plate 96 has a width B21 which is smaller than the width of the tank 19 in the back and forth direction of the road roller. The front end 96A1 of the frame body 96A is located in a position which is shifted by a distance C21 in the rearward direction from the front side 19C of the tank 19, while its rear end 96A2 is located transversely in line with the rear side 19D of the tank 19.

[0172] The middle stepping plate 97 is composed of a frame body 97A and spaced bars 97B, and projected from the lateral side 19E of the tank 19 by a predetermined length A22 which is smaller than the projection length A21 of the lower stepping plate 96. Further, the middle stepping plate 97 has a width B22 in the back and forth direction, which is equivalent with the above-mentioned width B21 of the lower stepping plate 96. The front end 97A1 of the frame body 97A is shifted in the rearward direction by a distance C22 from the front side 19C of the tank 19, while its rear end 97A2 is located in a position which is shifted in the forward direction by a distance D22 from the rear side 19D of the tank 19.

[0173] Further, the upper stepping plate 98 is composed of a frame body 98A and spaced bars 98B, and projected from the lateral side 19E of the tank 19 by a predetermined length A23 which is smaller than the projection length A22 of the middle stepping plate 97. The upper stepping plate 98 has a width B23 in the back and forth direction of the road roller, which is equivalent with the above-mentioned width B21. The front end 98A1 of the frame body 98A is located transversely in line with the front side 19C of the tank 19, while its rear end 98A2 is shifted in the forward direction from the rear side 19D of the tank 19 by a distance D23 which is larger than the above-mentioned distance D22.

[0174] Thus, the respective stepping plates 96 to 98 of the ascending/descending steps 95 are gradually reduced from the lower to upper side in projection length from the lateral side 19E of the tank 19, and the positions of the rear ends of the respective stepping plates are successively shifted in the fashion of staircase.

[0175] In the above-described embodiments, the present invention has been described by way of a road roller of the type having front and rear pressing rollers 6 and 7 mounted on front and rear vehicle bodies 2 and 4 which are swingably coupled with each other through the coupler 3. However, the present invention is not limited to road rollers of this type. For instance, the present invention can be similarly applied to road rollers of the type having front and rear pressing rollers 6 and 7 on a single vehicle body.

[0176] Further, in the above-described first embodiment of the invention, the stepping plates 21 to 23 of the ascending/descending steps 20 are fixedly provided on each lateral side 2B of the front vehicle body 2

through or by the use of the tank 19. However, the present invention is not limited to this particular arrangement. For example, the respective stepping plates 21 to 23 may be directly welded to the lateral side 2B of the front vehicle body 2 if desired. The same applies to the stepping plates 32 to 34 which constitute the ascending/descending steps 31 in the second embodiment.

[0177] Further, the above-described first embodiment employs the ascending/descending steps 20 which are composed of three stepping plates (the lower, middle and upper stepping plates 21 to 23). However, the present invention is not limited to this particular arrangement. For instance, the ascending/descending steps may be composed of two stepping plates or of four or more stepping plates if necessary. The same applies to the stepping plates 32 to 34 of the ascending/descending steps 31 of the second embodiment.

[0178] Furthermore, in the above-described first embodiment, the stepping plates 21 to 23 of the ascending/descending steps 20 are constituted by frame bodies 21A to 23A and spaced bars 21B to 23B, providing peeping openings 21C to 23C which are each open in the vertical direction. However, the present invention is not limited to this particular arrangement. Alternatively, for example, the stepping plates may be constituted by steel plates with peeping apertures which are punched out on a press like punching boards. The same applies to the ascending/descending steps 31 in the second embodiment.

[0179] Further, in each one of the foregoing embodiments, the movable floor panel 11 which opens and closes the indented opening 10 in the floor panel 8 is attached to the floor panel 8 by means of the hinge member 12. However, the present invention is not limited to this particular arrangement. For example, there may be provided a slide door type movable floor panel which is arranged to slide along the floor panel 8.

[0180] Moreover, in the foregoing embodiments, the front and rear handrails 24 and 27 are provided on the front and rear sides of the ascending/descending steps 20 (30), respectively. However, the present invention is not limited to this particular arrangement. For example, either the front handrail 24 or the rear handrail 27 alone may be provided at one side of the ascending/descending steps if desired.

[0181] Further, in the above-described third embodiment, the directional control valve 63 is connected with the oil chambers 61C and 61D of the tilting actuator 61 through conduits 64 and 65, and the bypass conduit 66 is provided between these conduits 64 and 65. However, the present invention is not limited to this particular arrangement. It is also possible to connect the bypass conduit 66 at a position which is as close to the oil chambers 61C and 61D of the tilting actuator 61 possible and in such a way as to connect the oil chambers 61C and 61D directly through the bypass passage 66.

INDUSTRIAL APPLICABILITY

[0182] As clear from the foregoing detailed description, according to the present invention, ascending/descending steps of a road roller are constituted by a plural number of stepping plates which are projected outward from the opposite lateral sides of a vehicle body and which are gradually reduced in projection length from a lower stepping plate to an upper stepping plate in the fashion of staircase. Therefore, the outer end of the lower stepping plate which is projected further outward of the outer end of the upper stepping plate can be clearly seen by the operator as a footing surface. That is to say, when going up to get on an operator's seat, an operator can advance his or her steps securely one after another without missing an upper stepping plate. Besides, when going down from the operator's seat, the operator can also advance his or her steps securely one after another withing missing a lower stepping plate.

[0183] Further, according to the present invention, rear end positions of the respective stepping plates are gradually shifted in the forward direction in the fashion of stair case. Since the rear end of a lower stepping plate is further projected in the forward direction from the rear end of an upper stepping plate, it can be clearly seen as a footing surface. Therefore, when going up to the operator's seat using the ascending/descending steps as footing surfaces, an operator can clearly and securely see the footing surface on each stepping plate as operator advances his or her step from one stepping plate to another. In addition, in the case of a road paving work on a narrow road where it is difficult to secure an ample climbing space on the lateral sides of the machine, for example, an operator can get on or get off an operator's seat in or from the back and forth direction.

Claims

1. A road roller having front and rear pressing rollers rotatably mounted on a vehicle body, an operator's seat located on a floor panel of said vehicle body, and ascending/descending steps fixed at a lateral side of said vehicle body to get on or off said operator's seat, characterized in that:

   said ascending/descending steps are constituted by a plural number of stepping plates, which stepping plates are projected outward from each lateral side of said vehicle body and gradually reduced in projection length from said lateral side of said vehicle body from a lower stepping plate to an upper stepping plate in the fashion of staircase.

2. A road roller as defined in claim 1, wherein said vehicle body is constituted by front and rear vehicle bodies having a front pressing roller and a rear

pressing roller rotatably provided thereon, respectively, said ascending/descending steps being provided at a lateral side of said front vehicle body.

3. A road roller as defined in claim 1, wherein rear end positions of said stepping plates are shifted in a forward direction gradually from a lower stepping plate toward an upper stepping plate.

4. A road roller as defined in claim 1, 2 or 3, wherein said stepping plates of said ascending/descending steps are provided with peeping openings, for permitting an operator on said floor panel of said vehicle body to check for road surface conditions through said peeping openings.

5. A road roller as defined in claim 1, 2 or 3, wherein a fuel tank or an operating oil tank is fixedly attached to said lateral side of said vehicle body, and at least plural stepping plates in lower position of said ascending/descending steps are fixed to a lateral side of said tank.

6. A road roller as defined in claim 1, 2 or 3, wherein a couple of operator's seats are provided in transversely spaced position on said floor panel of said vehicle body, and said ascending/descending steps are provided at each lateral side of said vehicle body.

7. A road roller as defined in claim 1, 2 or 3, wherein said vehicle body is provided with a vertically extending handrail at least on a front or rear side of said ascending/descending steps, said handrail having a lower end thereof extended as far as a point downward of said floor panel of said vehicle body.

8. A road roller as defined in claim 1, wherein said vehicle body is constituted by a front vehicle body and a rear vehicle body having a front pressing roller and a rear pressing roller rotatably provided thereon, respectively, and said front vehicle body is provided with vertically extending front and rear handrails on front and rear sides of said ascending/descending steps, said front handrail being extended as far as a point downward of said floor panel of said front vehicle body between said front pressing roller and said ascending/descending step, and said rear handrail being extended to a point downward of said floor panel of said front vehicle body between said ascending/descending steps and a coupler which couples said front and rear vehicle bodies with each other.

9. A road roller as defined in claim 1, 2 or 3, wherein said floor panel is provided with an indented opening at a confronting position relative to said ascending/descending steps, and, a movable floor panel which is movable between an open position and a closed position to open and close said indented opening.

10. A road roller as defined in claim 1, 2 or 3, wherein said floor panel of said vehicle body is provided with a side wing portion at least on the side of said ascending/descending steps, said side wing portion being extended on a lateral side of said vehicle body and provided with an indented opening at a position confronting said ascending/descending steps, and said floor panel is further provided with a movable floor panel adapted to be moved between an open position and a closed position to open and close said indented opening.

11. A road roller as defined in claim 1, 2 or 3, wherein said floor panel of said vehicle body is provided with an indented opening at a position confront said ascending/descending steps, a movable floor panel adapted to be moved between an open position and a closed position to open and close said indented opening, and a handle member attached to said movable floor to move the movable floor from said open position to said closed position or vice versa.

12. A road roller as defined in claim 11, wherein said handle member is realized in the form of a gate lock lever adapted to block a passage between said ascending/descending steps and said floor panel when said movable floor panel is in said closed position, and to open said passage when said floor panel is in said open position.

13. A road roller as defined in claim 1, 2 or 3, further comprising a vertically extending handrail fixedly provided on said vehicle body either on the front or rear side of or on both sides of said ascending/descending passage and having a lower end portion thereof extended as far as a point downward of said floor panel of said vehicle body, an indented opening provided in said floor panel at a position confronting said ascending/descending steps, a movable floor panel attached to said floor panel and adapted to be moved between an open position and a closed position to uncover and cover said indented opening, and a handle member attached to said movable floor panel to move the movable floor panel from said open position to said closed position or vice versa.

14. A road roller as defined in claim 9, further comprising a sensor means provided on said vehicle body to detect opening and closing of said movable floor panel, and a driving power reduction means operatively connected to a roller drive mechanism of said

pressing rollers and to said sensor means to reduce driving power of said roller drive mechanism as soon as opening of said movable floor panel is detected by said sensor means.

15. A road roller as defined in claim 14, wherein said roller drive mechanism includes a variable displacement hydraulic pump driven from a prime mover and having a tiltable variable delivery section, a hydraulic motor operated on operating oil pressure delivered from said hydraulic pump to rotate said pressing rollers, a tilting actuator having a piston slidably fitted in a cylinder in such a way as to define a couple of oil chambers on opposite sides thereof and adapted to put said hydraulic motor in forward or reverse rotation by tilting said variable delivery section of said hydraulic pump according to displacement of said piston, and a directional control valve provided in a conduit connected between said tilting actuator and a pilot oil pressure source to switch rotational direction of said hydraulic motor by switching direction of operating oil supply to and from said tilting actuator; and

said driving power reduction means includes a bypass conduit provided between a couple of conduits connecting said directional control valve with said oil chambers of said tilting actuator or between said oil chambers of said tilting actuator, and an on-off valve adapted to open said bypass conduit when opening of said movable floor panel is detected by said sensor means and to close said bypass conduit when closure of said movable floor panel is detected by said sensor means.

16. A road roller as defined in claim 14, wherein said roller drive mechanism includes a variable displacement type hydraulic pump driven from a prime mover and having a variable delivery section, a hydraulic motor operated on operating oil pressure supplied from said hydraulic pump to rotate said pressing rollers, a tilting actuator having a piston slidably fitted in a cylinder in such a way as to define a couple of oil chambers on opposite sides thereof and adapted to put said hydraulic motor in forward or reverse rotation by tilting said variable delivery section of said hydraulic pump according to displacement of said piston, and a directional control valve provided in a conduit connected between said tilting actuator and a pilot oil pressure source to switch rotational direction of said hydraulic motor by switching direction of operating oil supply to and from said tilting actuator; and

said driving power reduction means includes an on-off valve located in said conduit at a position upstream of said directional control valve and adapted to relief oil pressure out of said tilting actuator when opening of said movable floor panel is detected by said sensor means and to supply oil pressure to said tilting actuator when closure of said movable floor panel is detected by said sensor means.

17. A road roller as defined in claim 14, wherein said roller drive mechanism includes a variable displacement type hydraulic pump driven from a prime mover and having a variable delivery section, a hydraulic motor operated on operating oil pressure supplied from said hydraulic pump, and a parking brake adapted to apply brakes to said hydraulic motor when in a parking position and to relieve said hydraulic motor of a braking force when in operation; and

said driving power reduction means includes an on-off valve provided within a brake conduit which supplies brake cancellation oil pressure to said parking brake, said on-off valve being adapted to relief oil pressure out of said parking brake when opening of said movable floor panel is detected by said sensor means and to supply oil pressure to said parking brake when closure of said movable floor panel is detected by said sensor means.

18. A road roller having front and rear pressing rollers rotatably mounted on a vehicle body, an operator's seat located on a floor panel of said vehicle body, and ascending/descending steps fixedly provided at a lateral side of said vehicle body to get on or off said operator's seat, characterized in that:

said vehicle body is provided with a vertically extending handrail either on front or rear side of or on the opposite sides of said ascending/descending steps, said handrail having a lower end extended to a point downward of said floor panel of said vehicle body.

19. A road roller having front and rear pressing rollers rotatably mounted on a vehicle body, an operator's seat located on a floor panel of said vehicle body, and ascending/descending steps fixedly provided at a lateral side of said vehicle body to get on or off said operator's seat, characterized in that:

said vehicle body is provided with an indented opening in a floor panel portion confronting said ascending/descending steps, a movable floor panel attached to said floor panel and movable between an open position and a closed position to open and close said indented opening, and a handle member attached to said movable floor panel to move said floor

panel from said open position to said closed position or vice versa.

Fig. 1

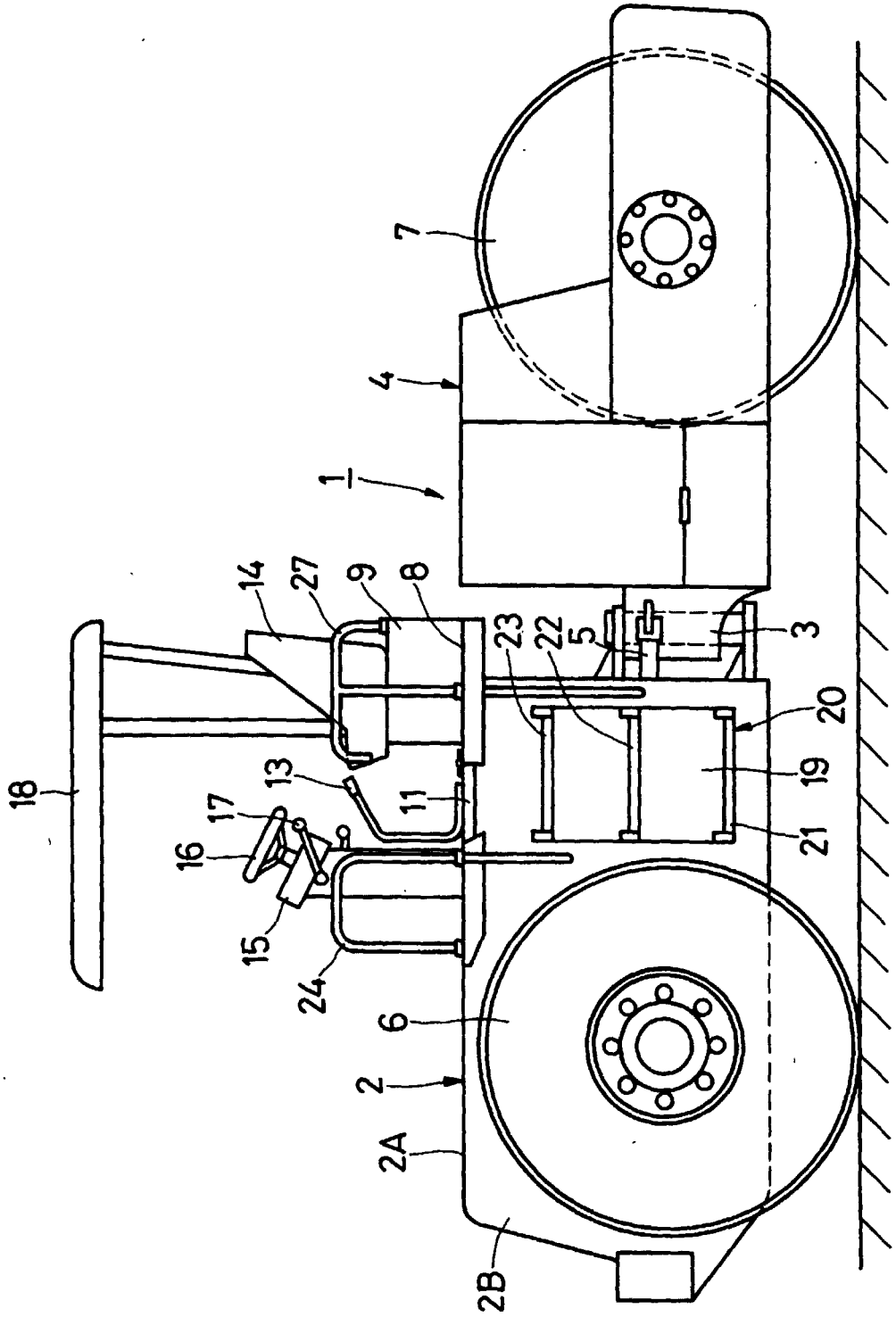
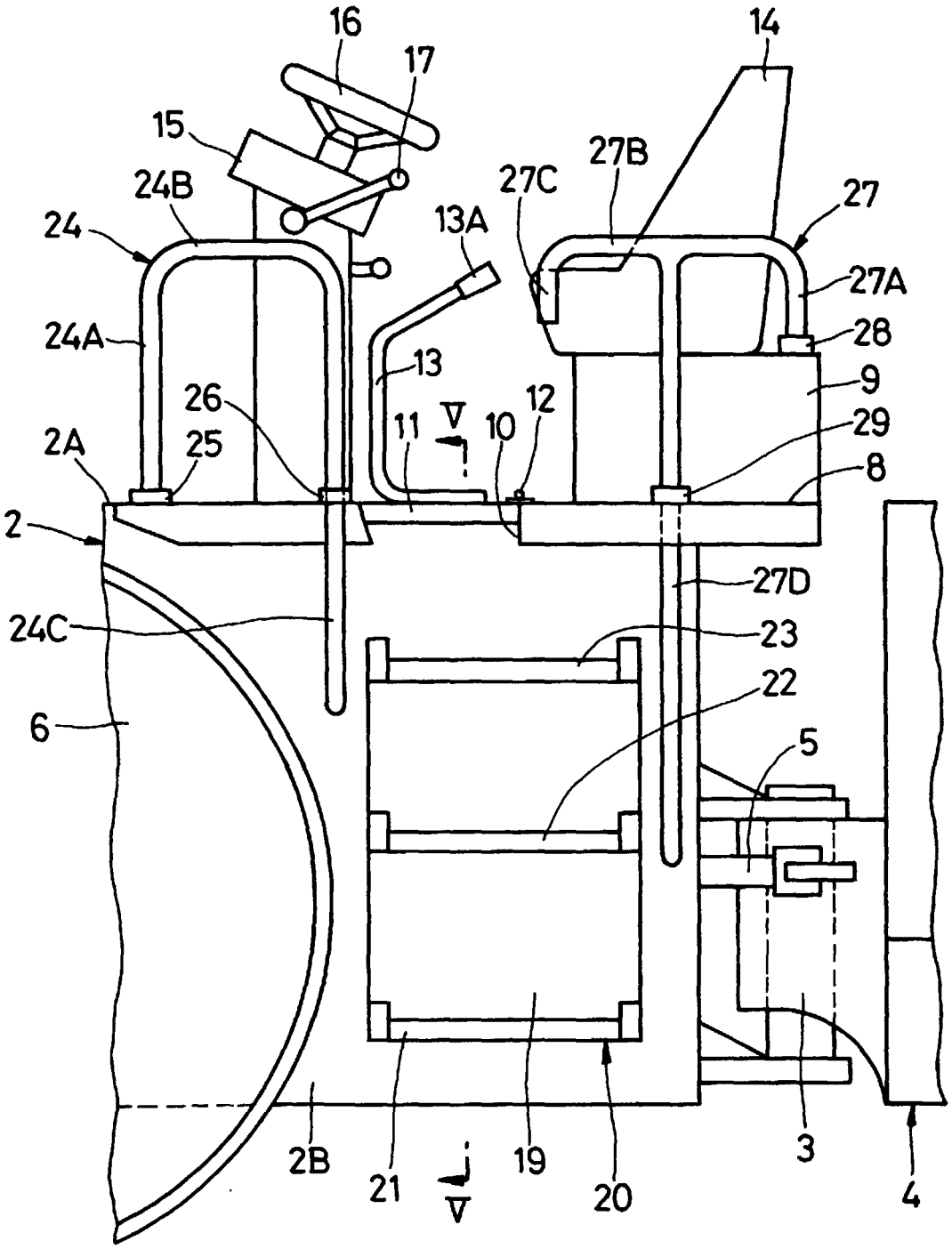


Fig. 2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3
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Fig. 3

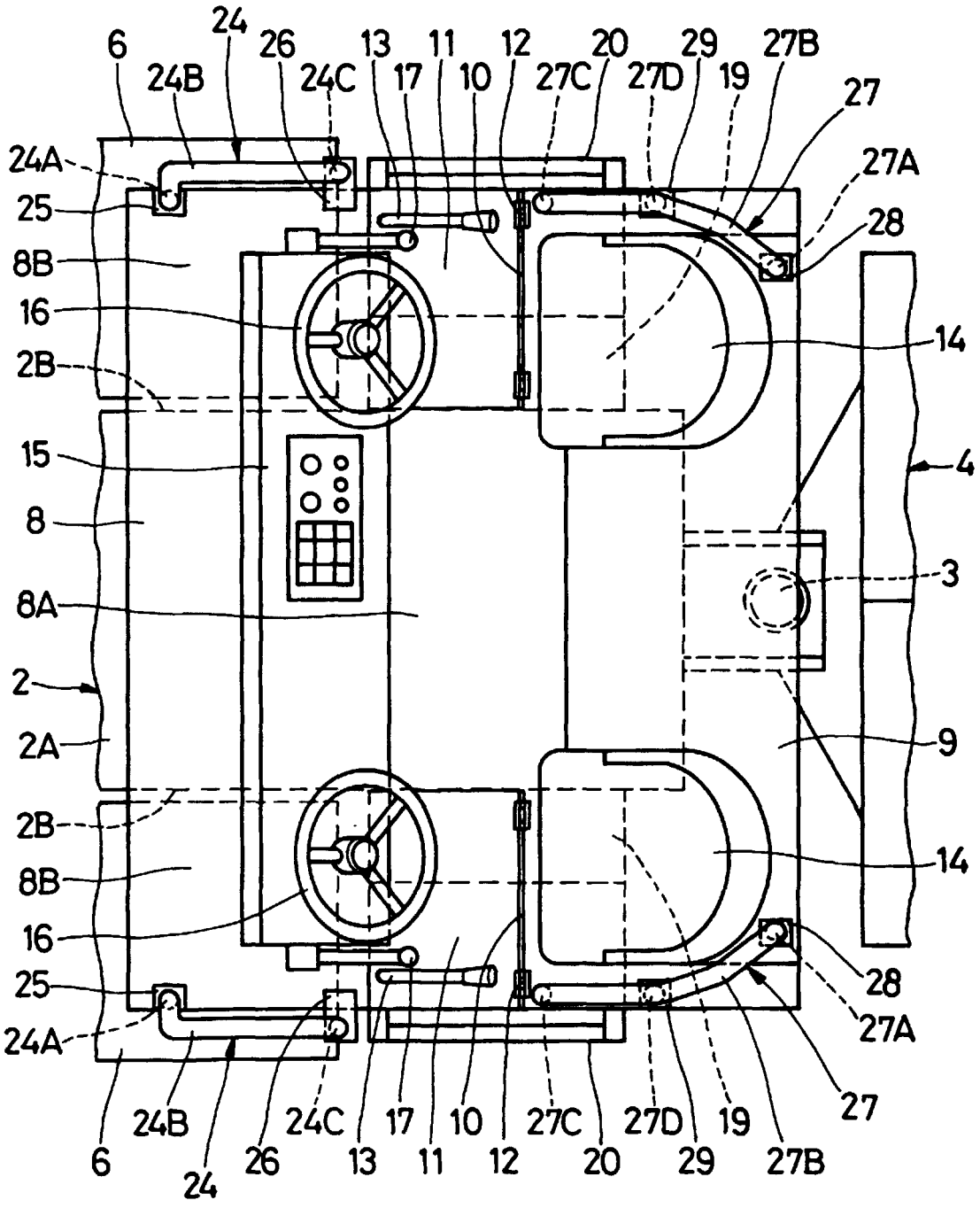
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Fig. 4

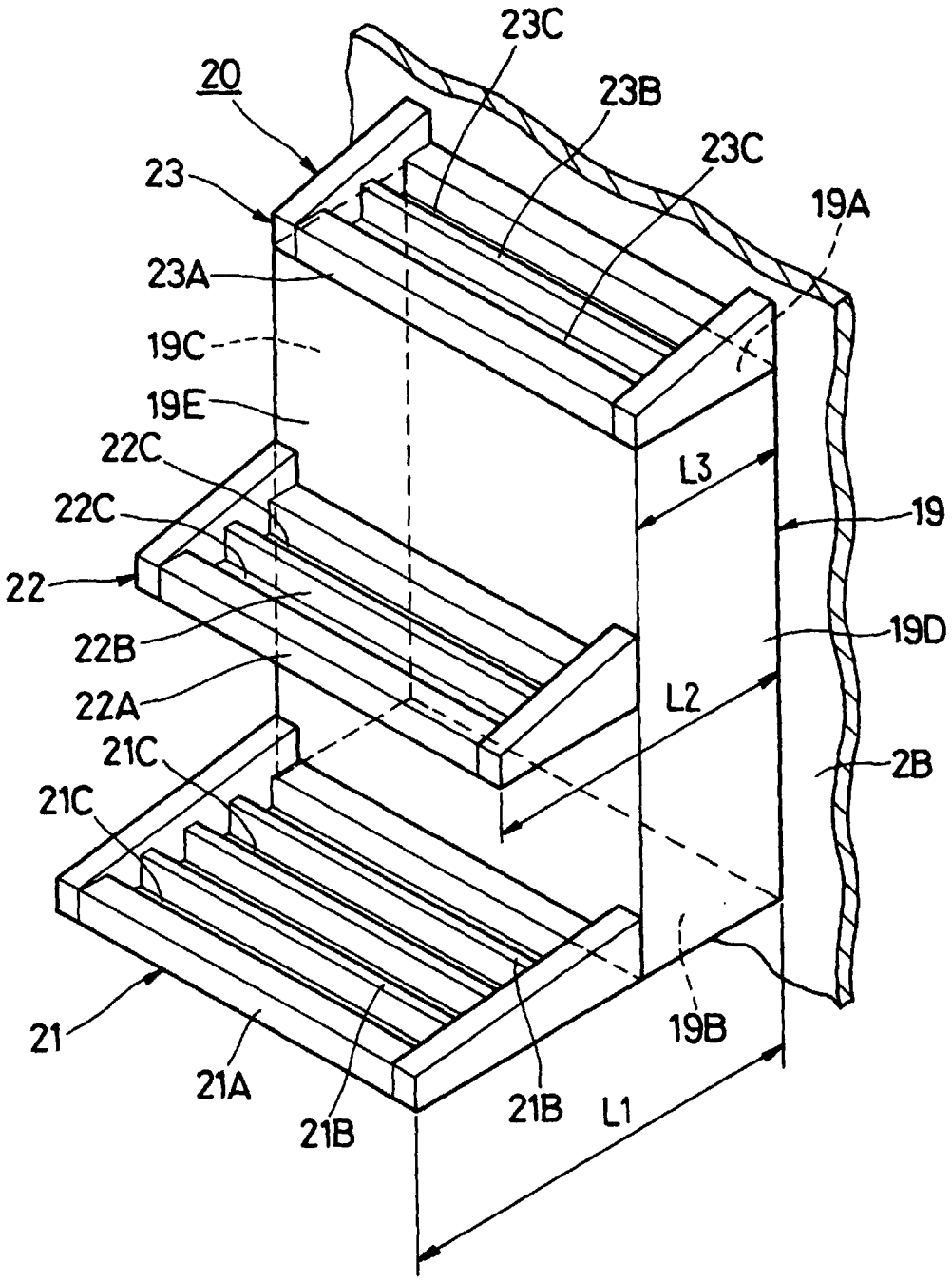
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Fig. 5

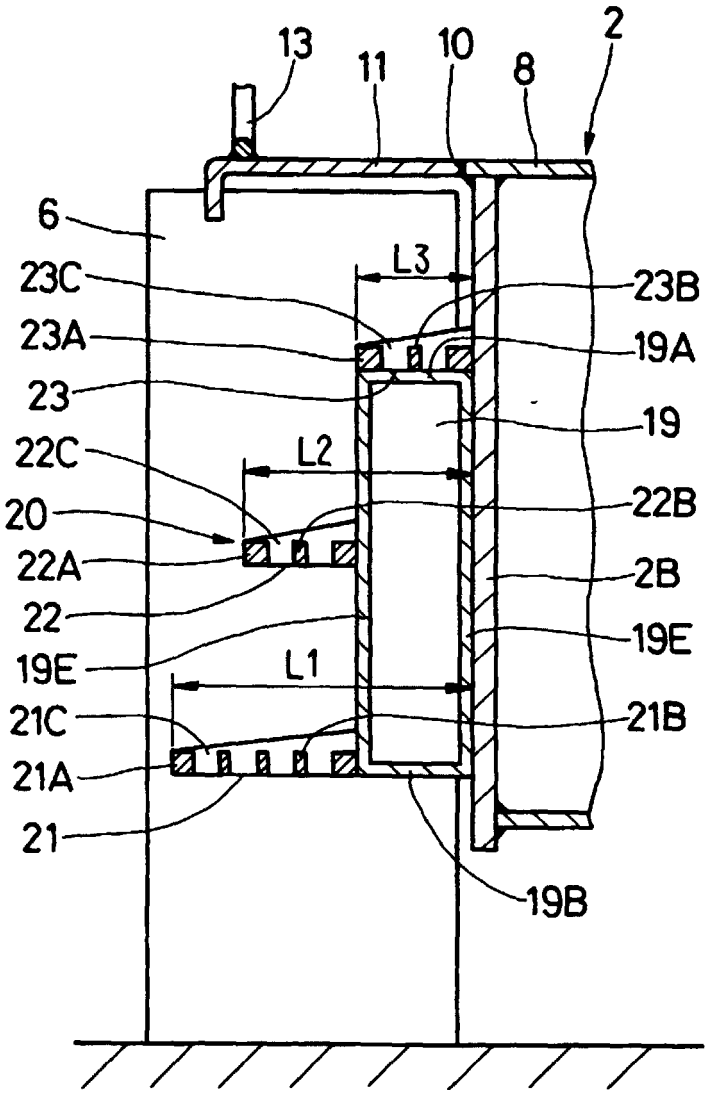
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Fig. 6

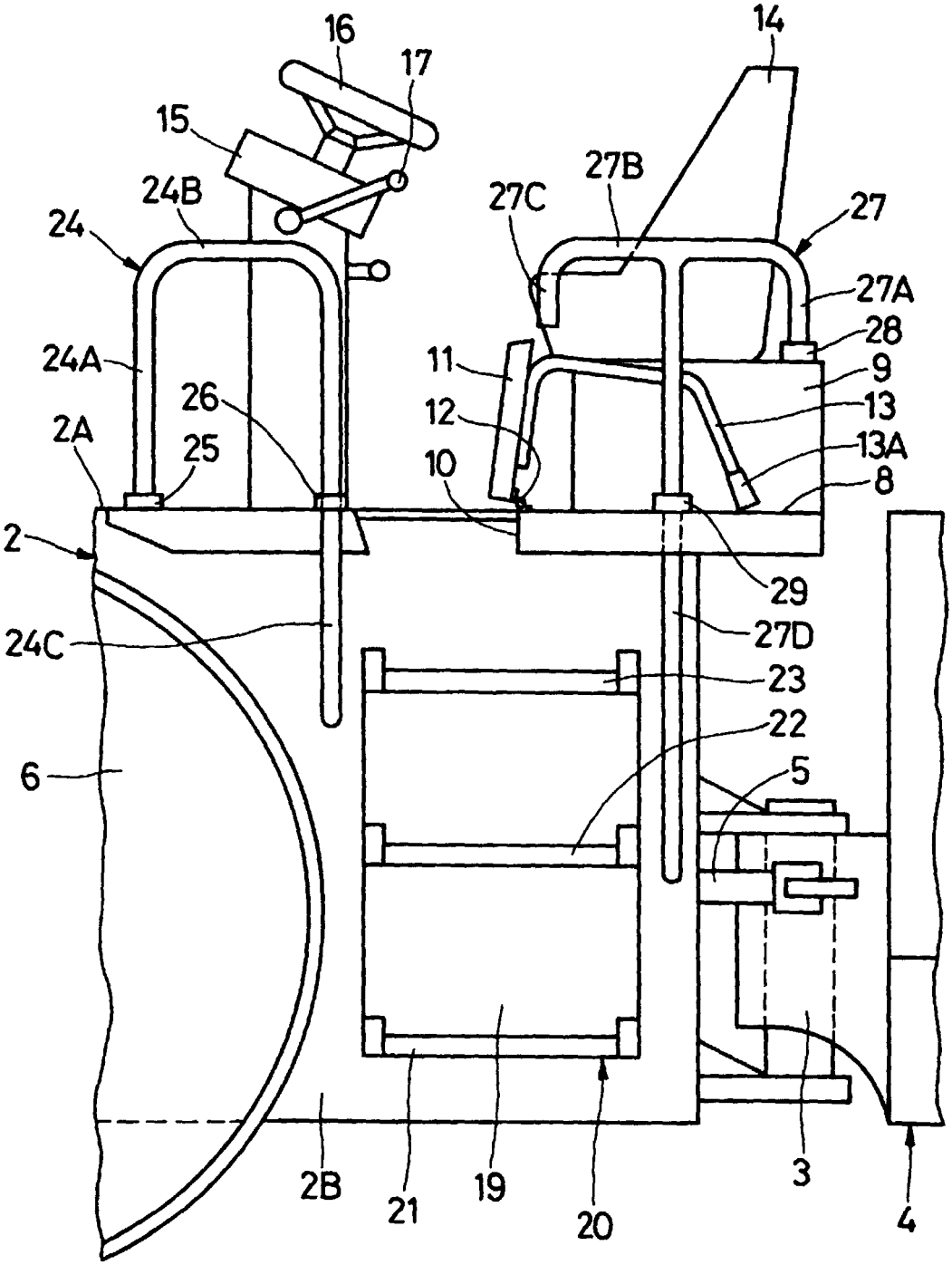
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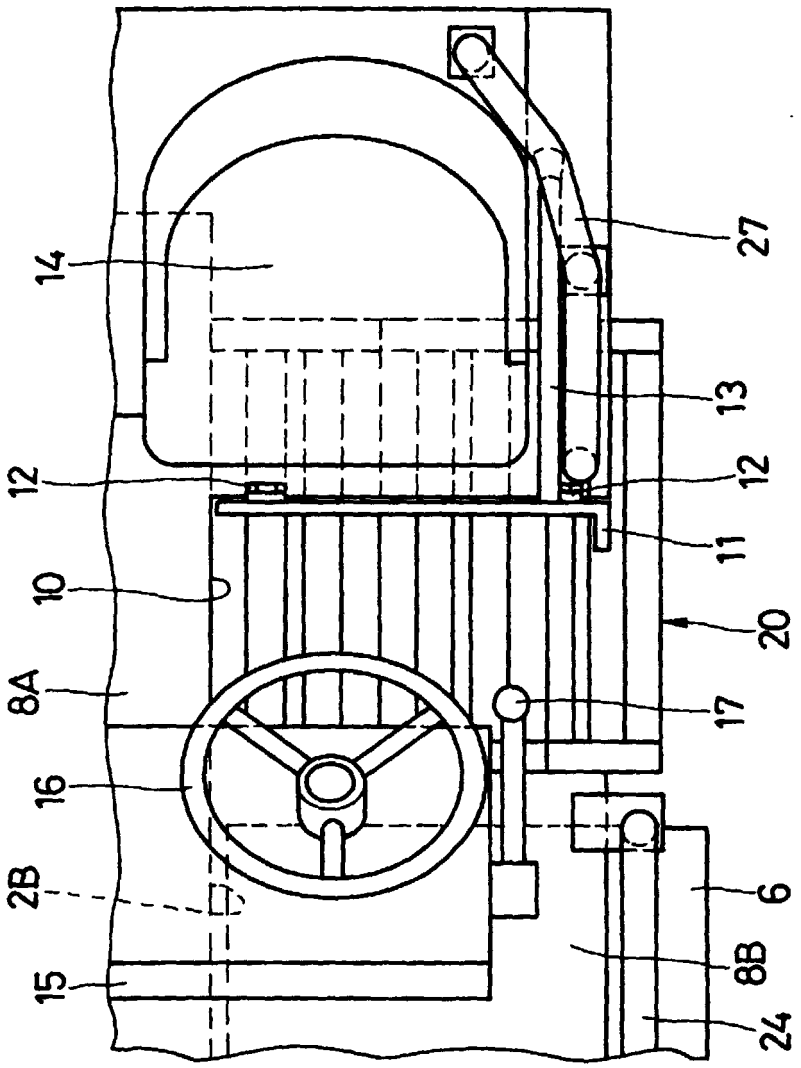
Fig. 7



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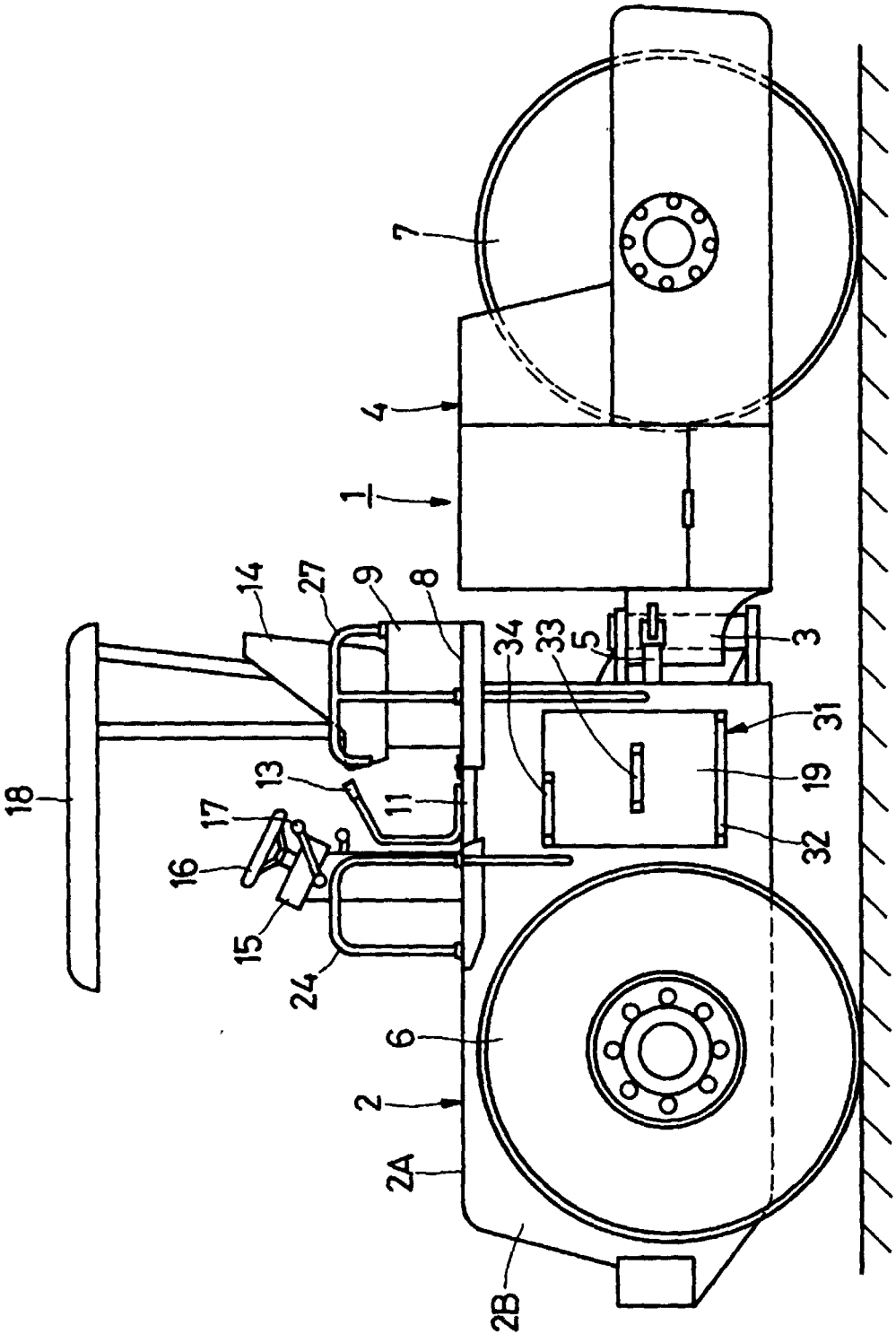

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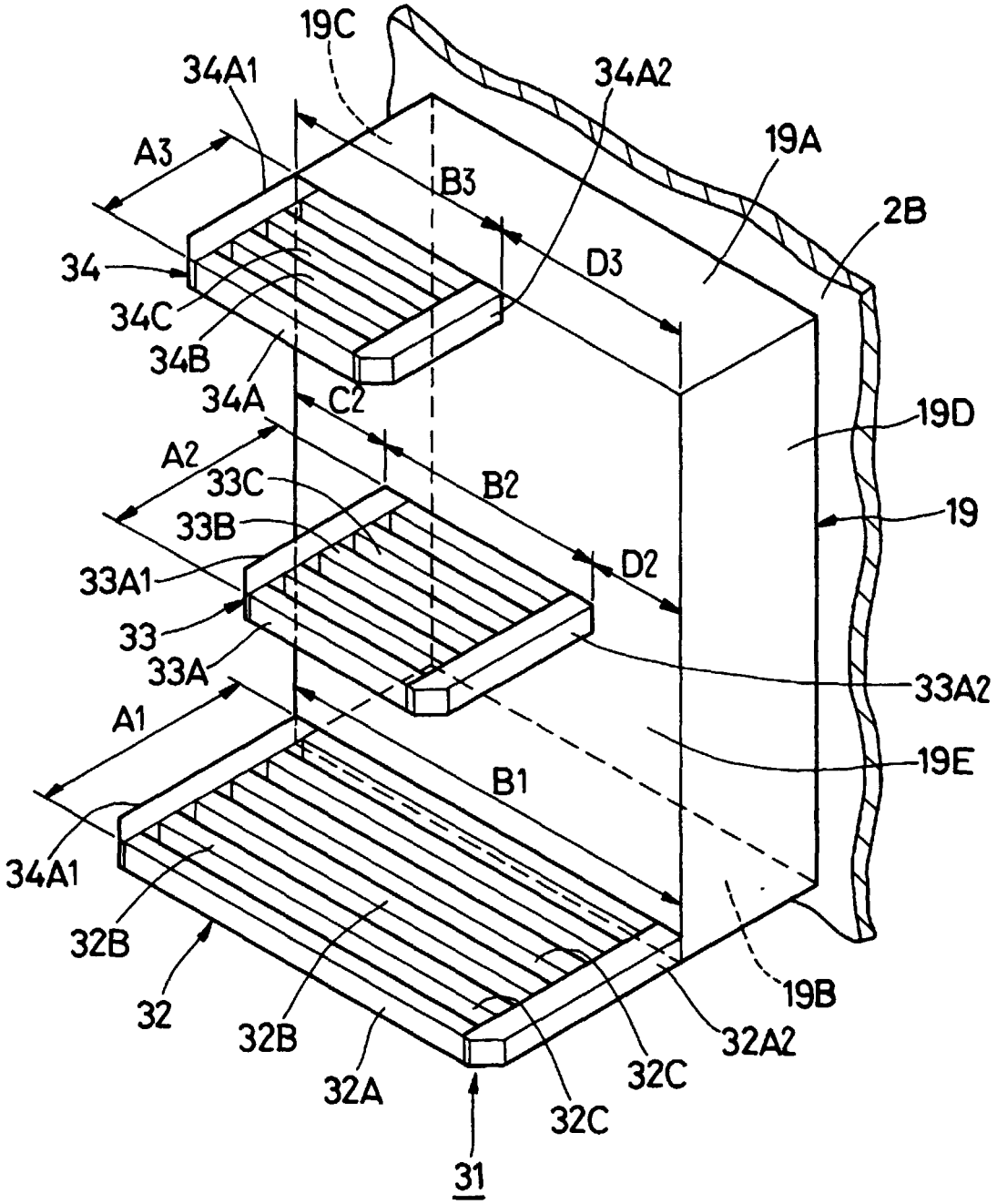
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Fig. 10

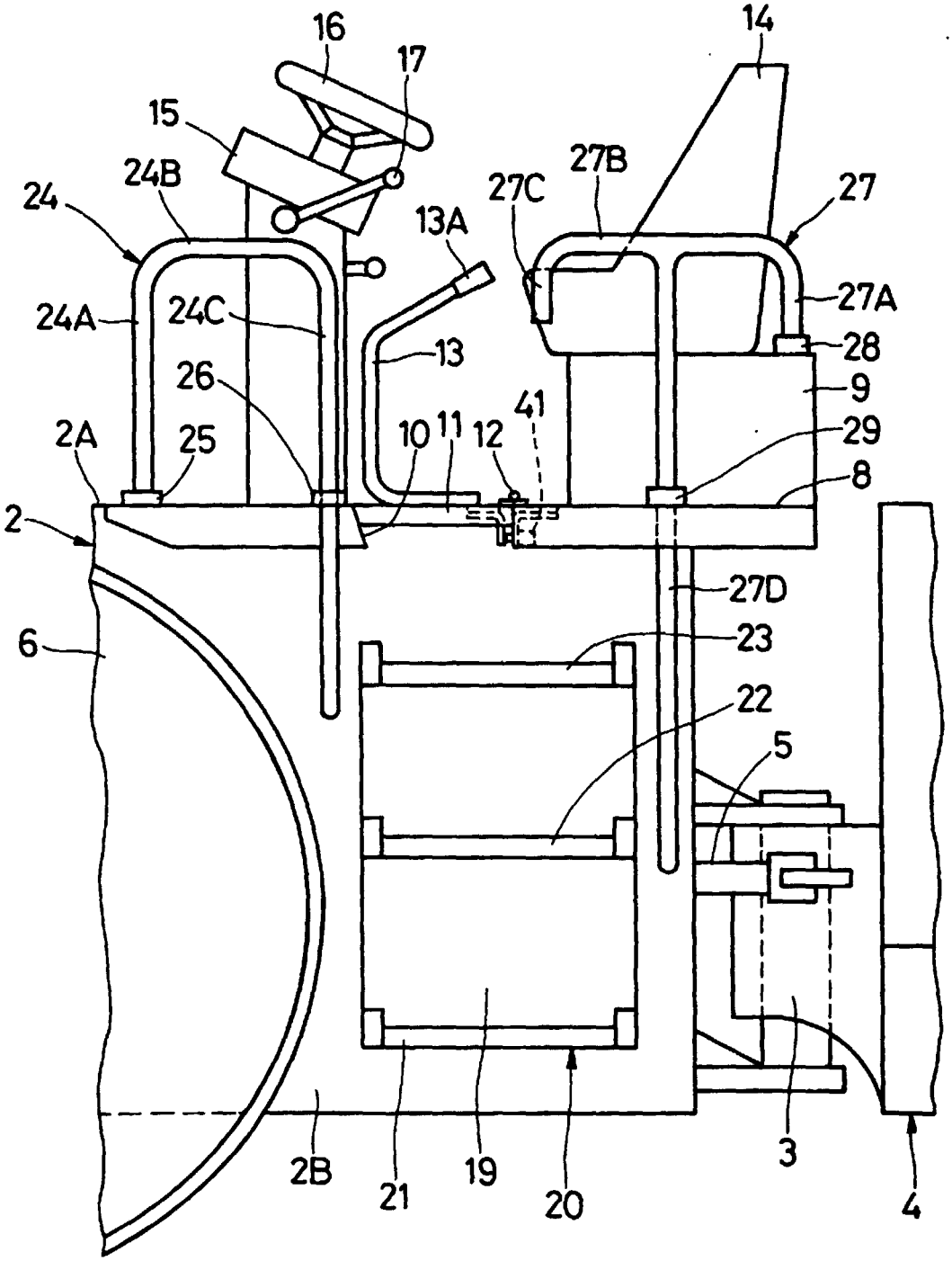
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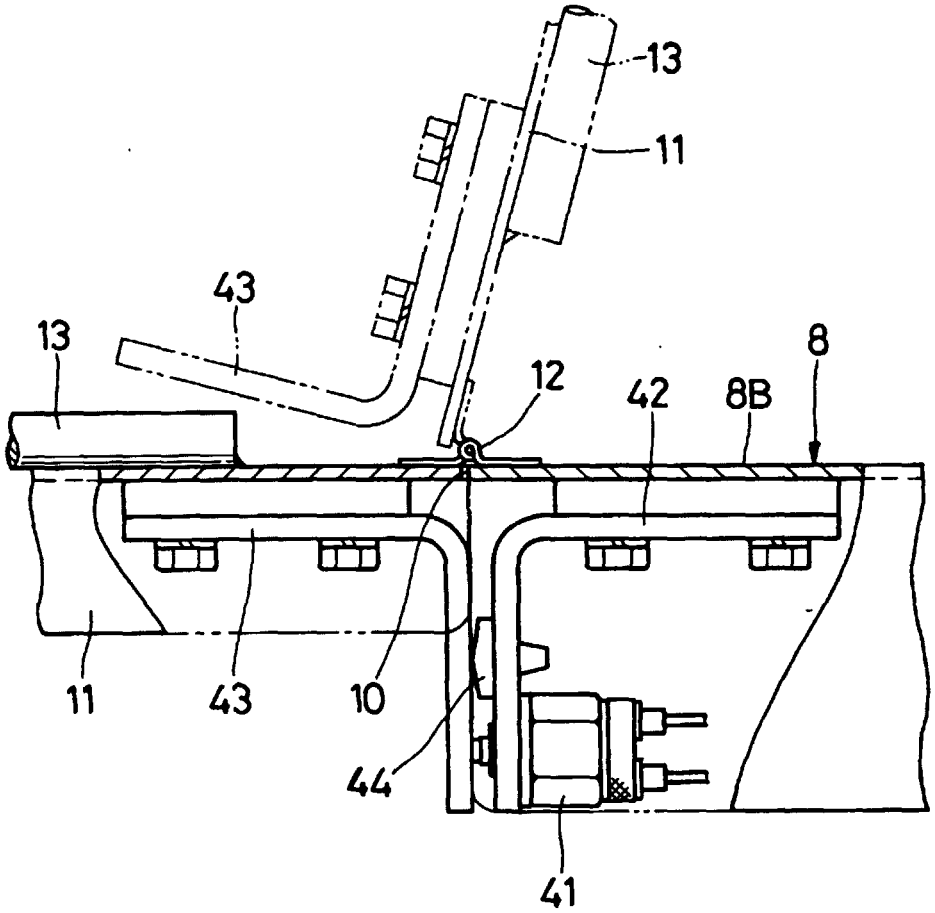
Fig. 11



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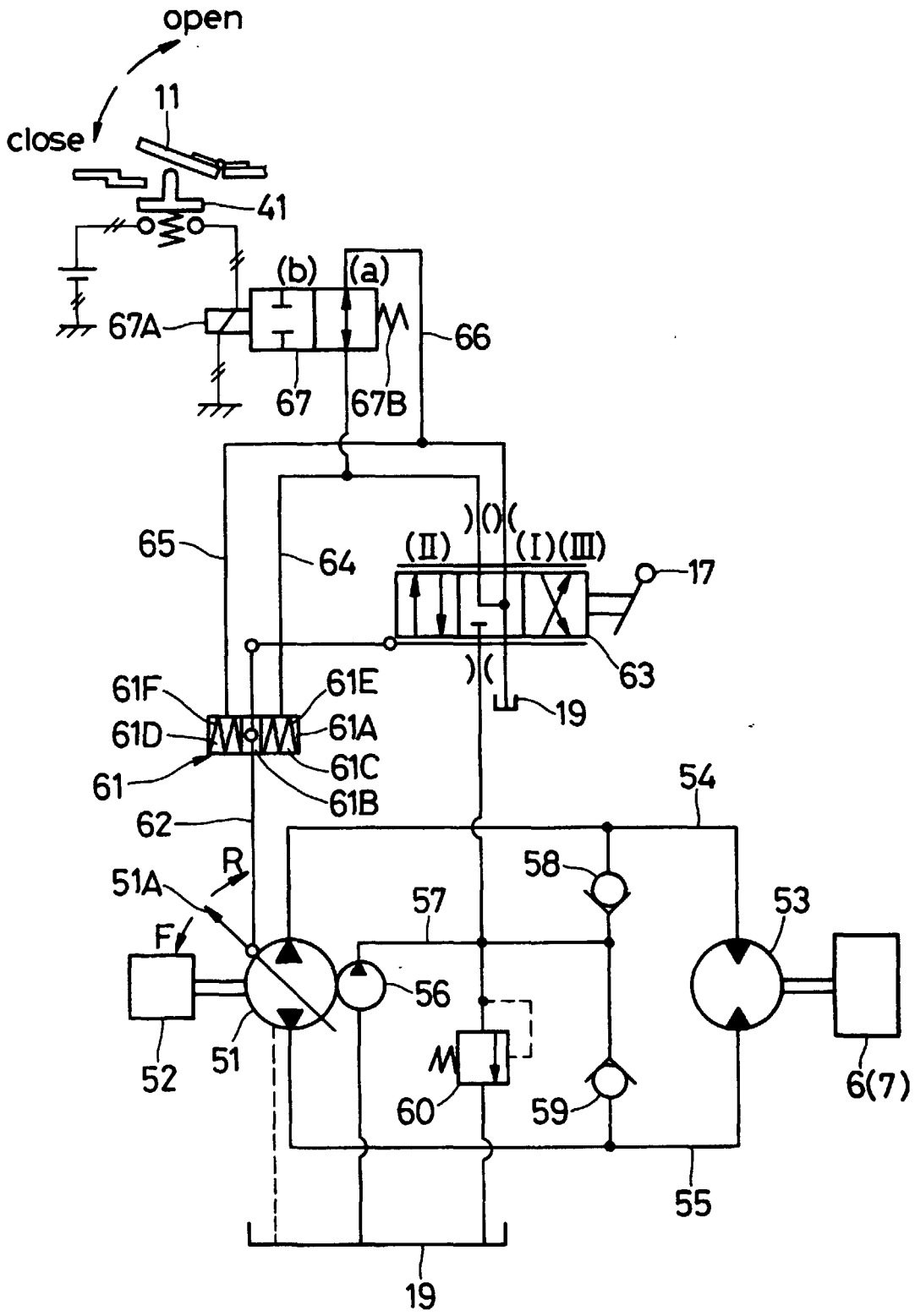
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Fig. 13

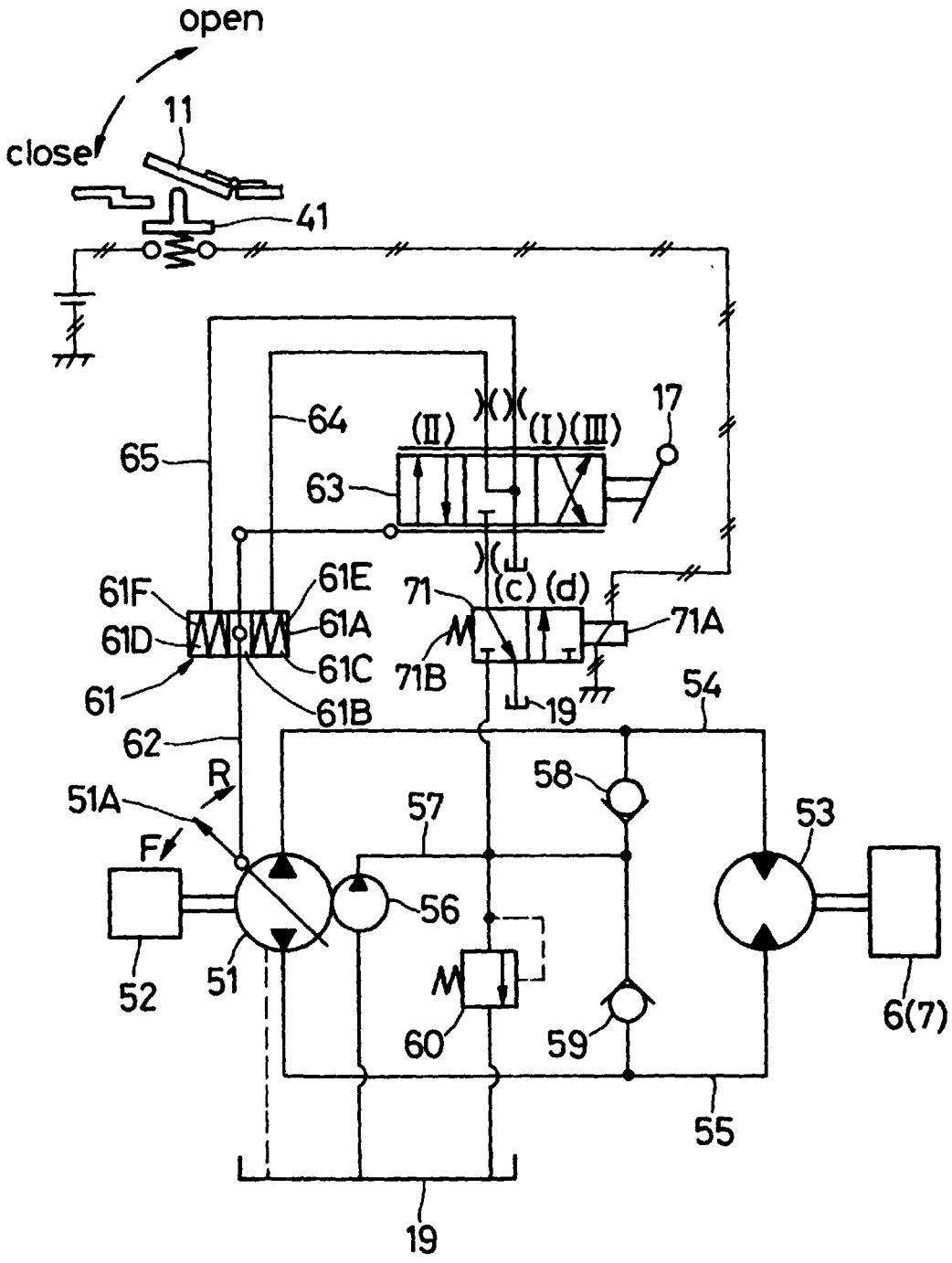
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Fig. 14

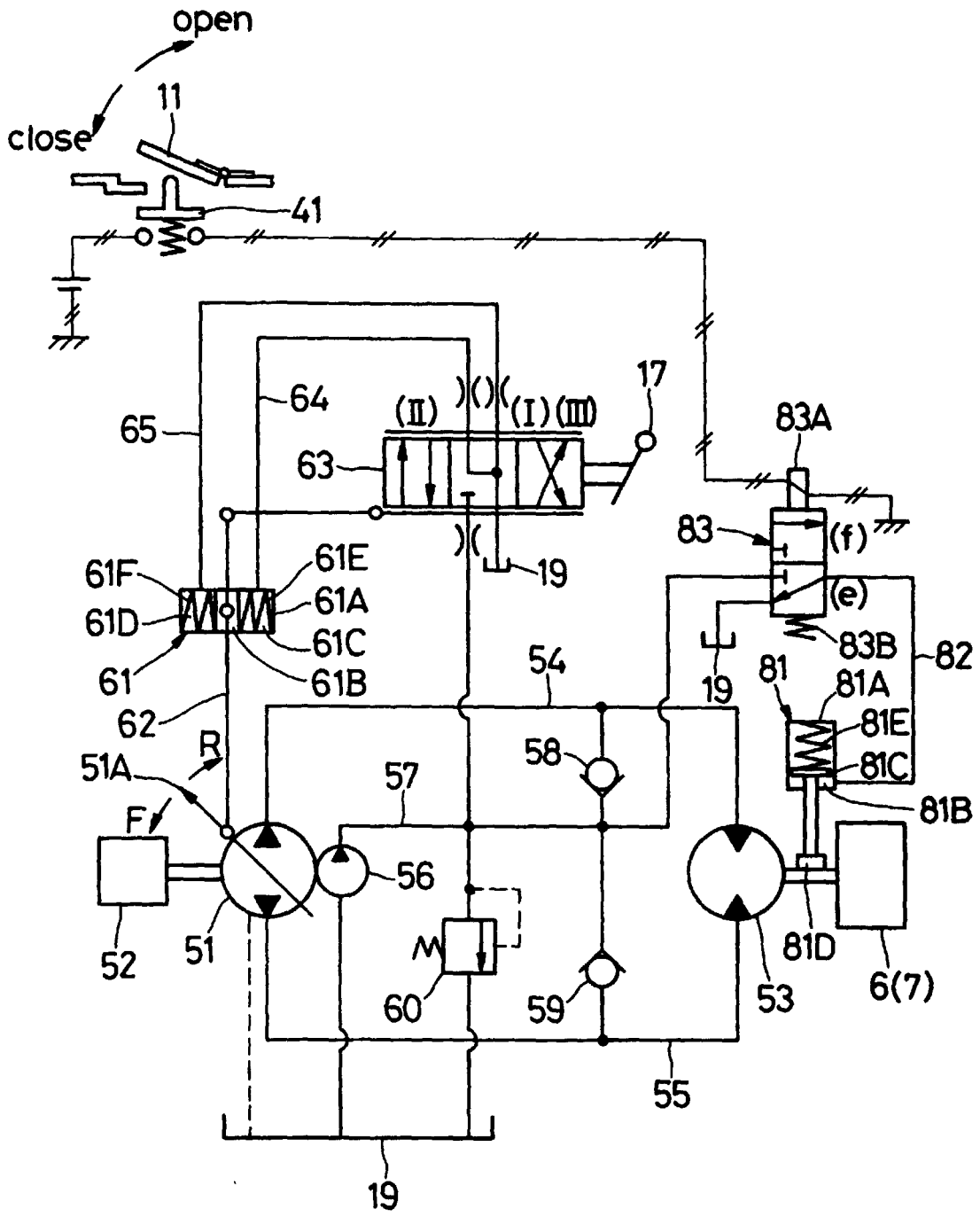
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Fig. 15

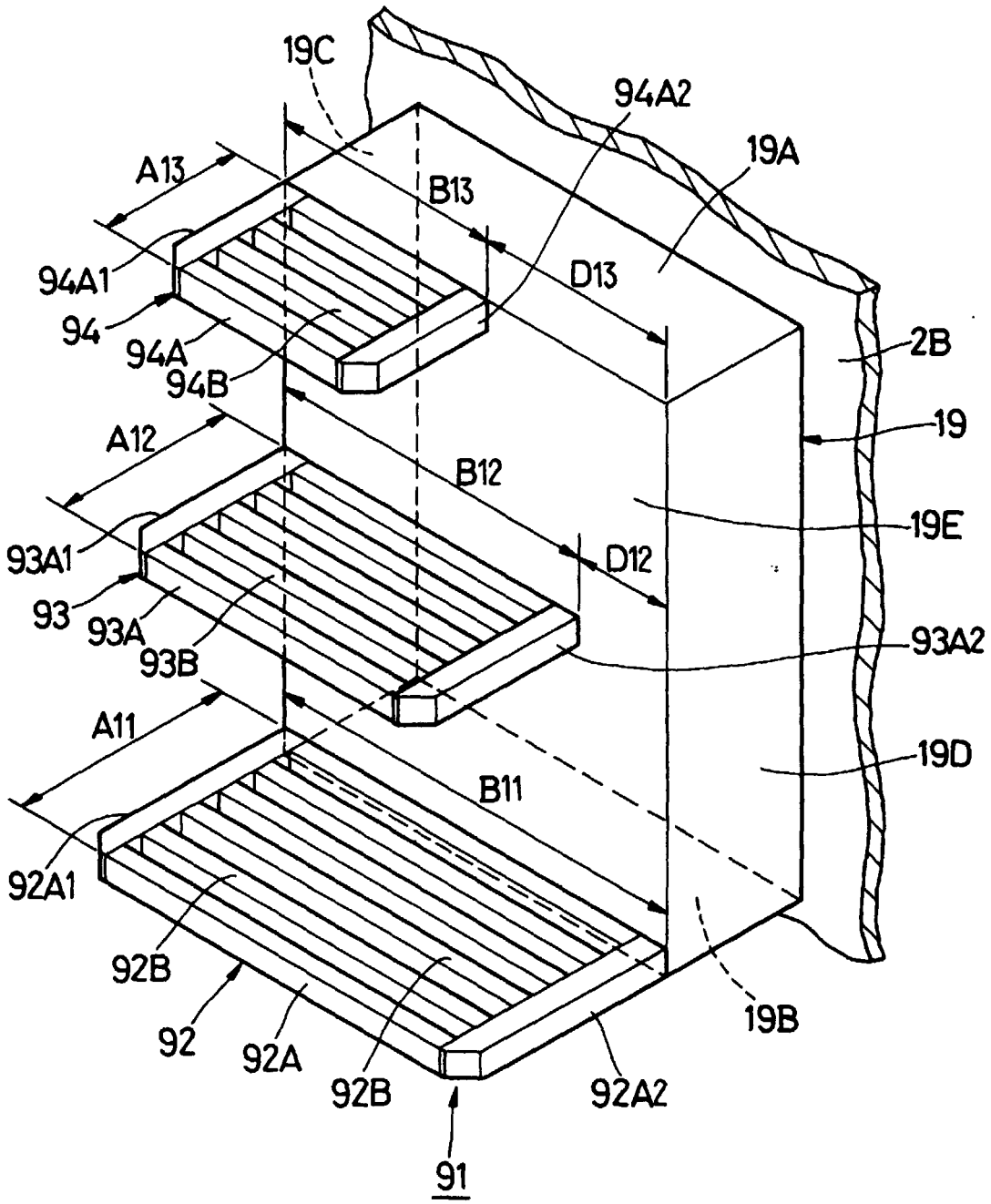
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Fig. 16

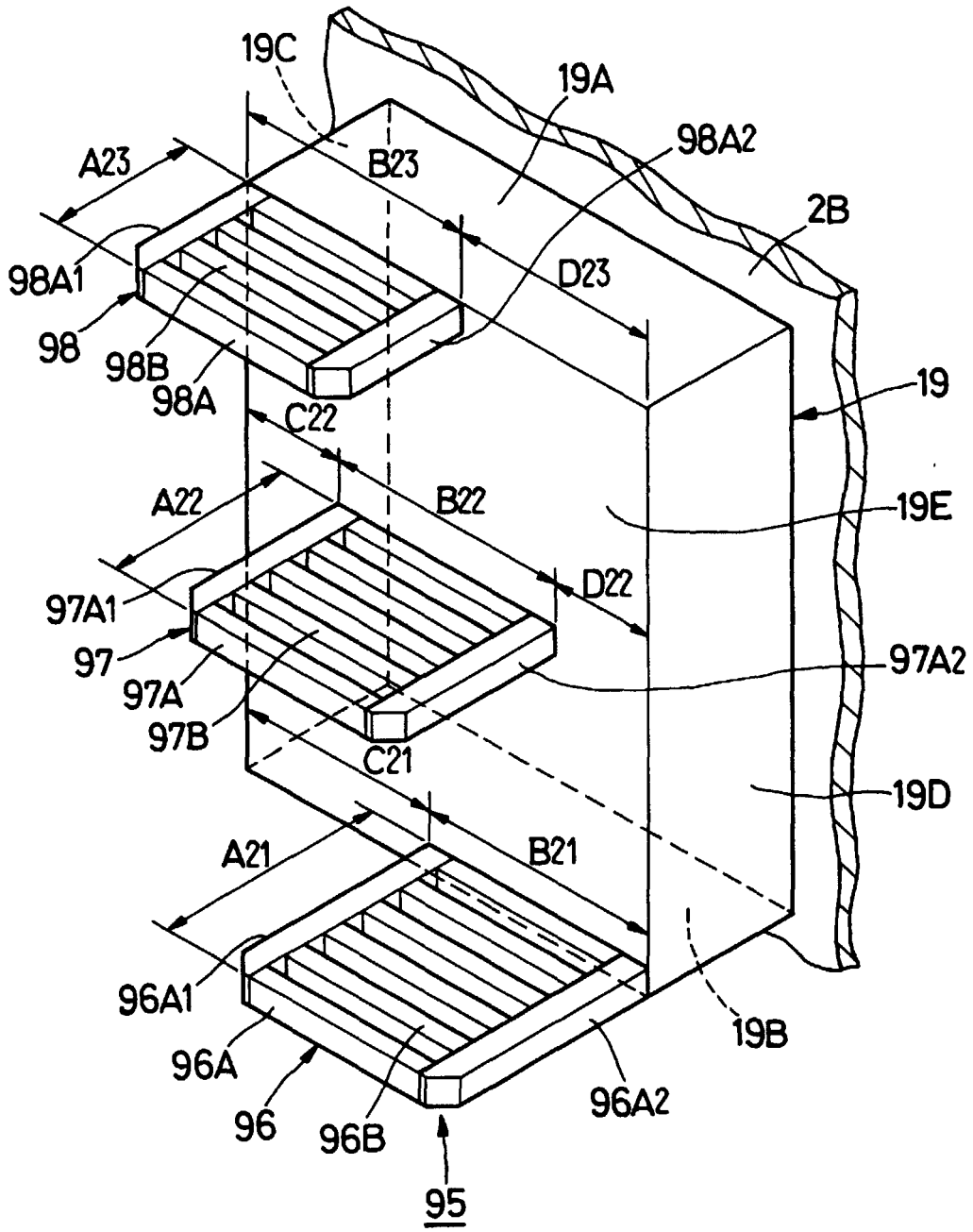
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Fig. 17

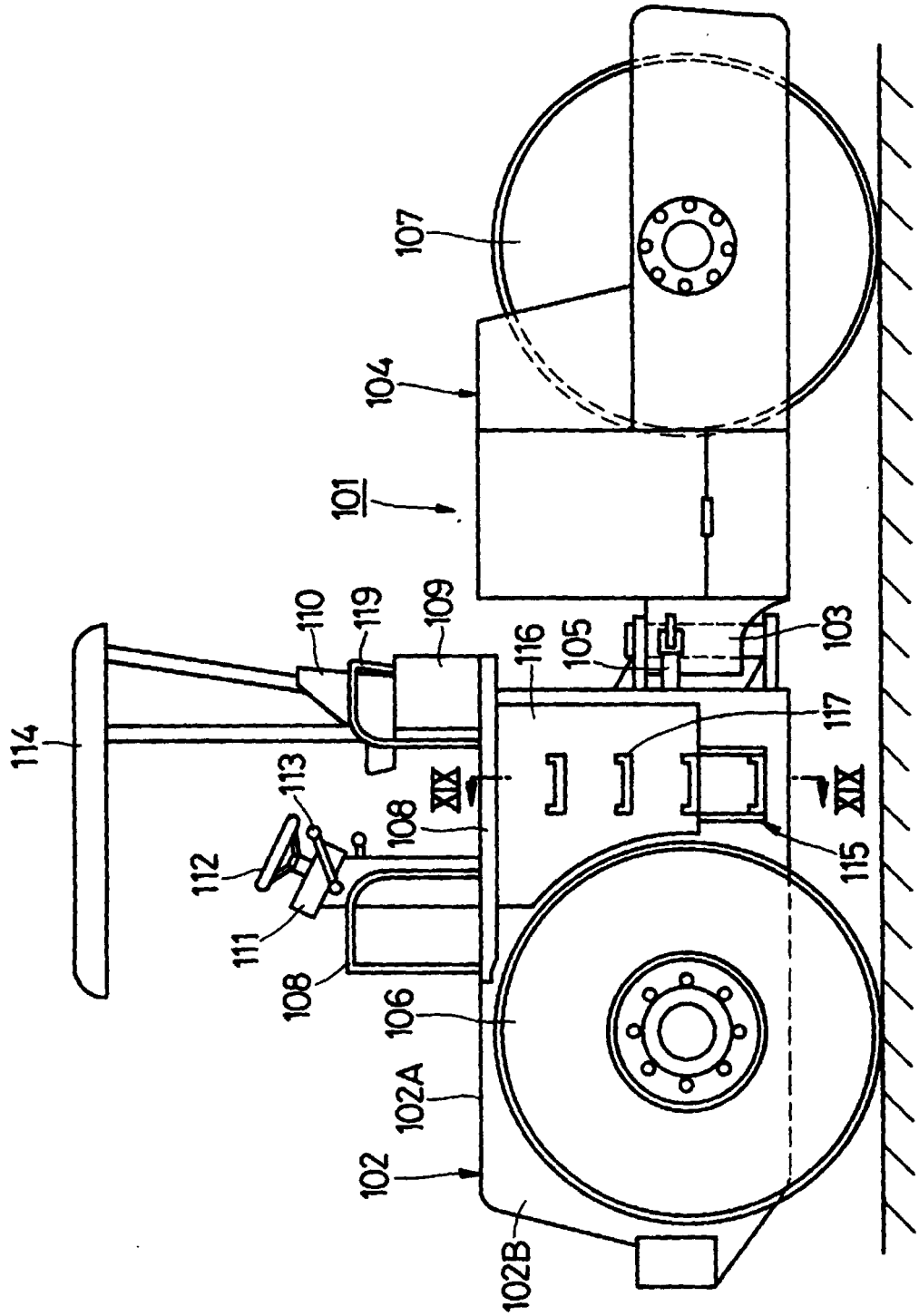
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Fig. 18

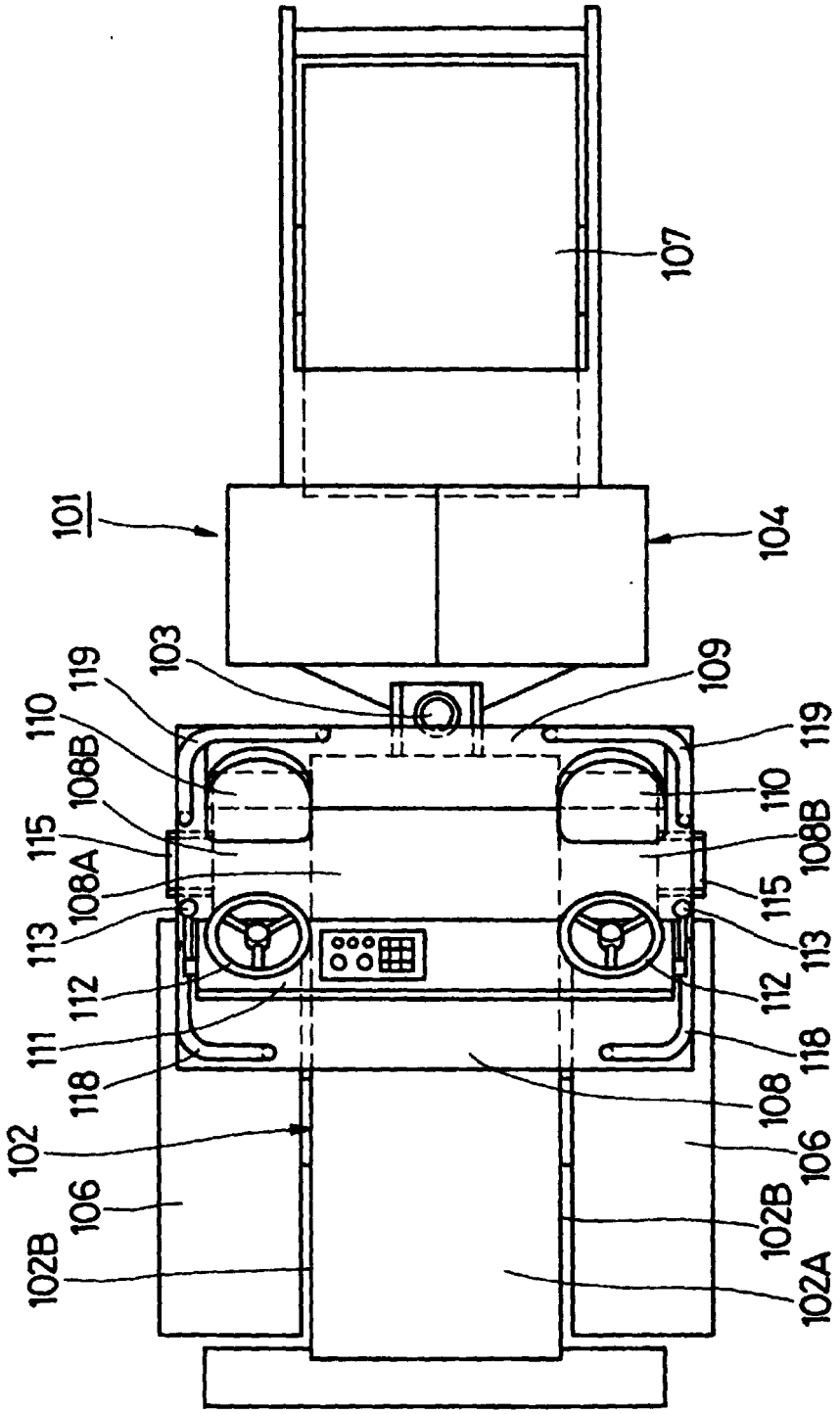
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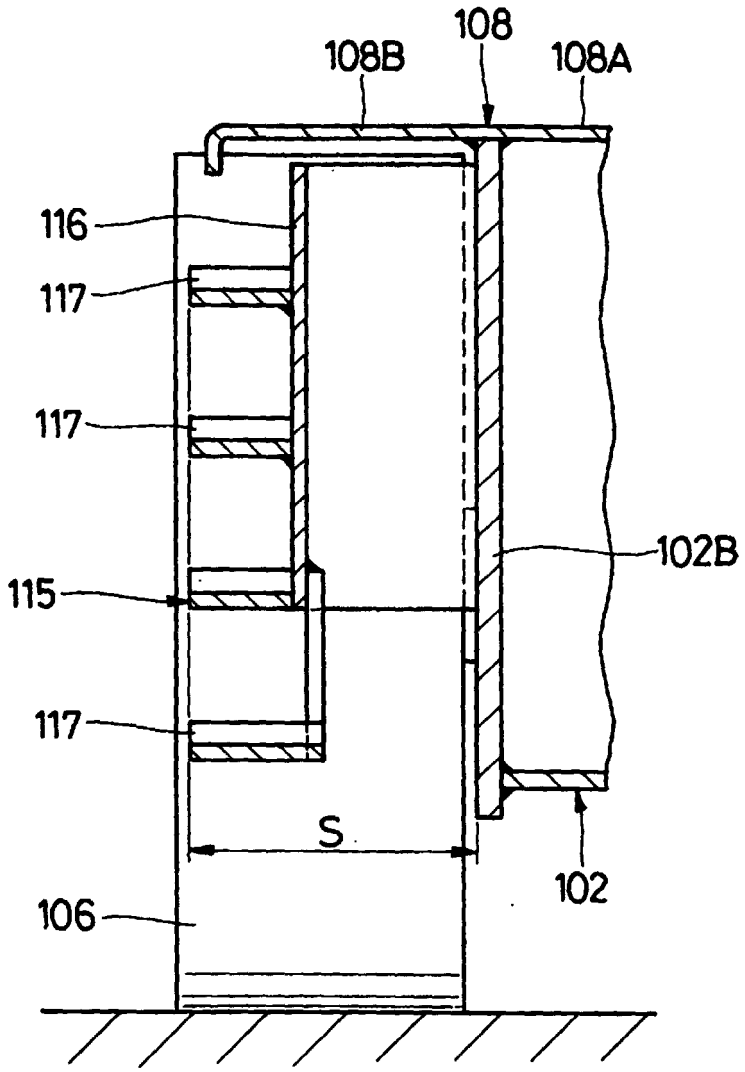
Fig. 19



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP99/04833

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl[6] E01C19/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int. Cl[6] E01C19/26, B60R3/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-1999
Kokai Jitsuyo Shinan Koho 1971-1999 Jitsuyo Shinan Toroku Koho 1996-1999

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y X	JP, 61-20092, Y (Kawasaki Heavy Industries, Ltd.), 17 June, 1986 (17.06.86), All drawings; column 3, lines 5 to 7 (Family: none)	1,2,6-8 18
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 79509/1978 (Laid-open No. 180524/1979) (Toyoda Automatic Loom Works, Ltd.), 20 December, 1979 (20.12.79), All Drawings (Family: none)	1-3,5
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No.134206/1979 (Laid-open No.51649/1981) (Toyoda Automatic Loom Works, Ltd.), 07 May, 1981 (07.05.81), Figs. 3 to 9 (Family: none)	4

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 November, 1999 (30.11.99)	07 December, 1999 (07.12.99)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP99/04833

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No.400/1981 (Laid-open No.113280/1982) (NISSAN MOTOR CO., LTD.), 13 July, 1982 (13.07.82), Figs. 4 to 14 (Family: none)	9-13,19
A	JP, 3-24690, Y (Yutani Heavy Ind. Ltd.), 29 May, 1991 (29.05.91), All drawings (Family: none)	14-17

Form PCT/ISA/210 (continuation of second sheet) (July 1992)