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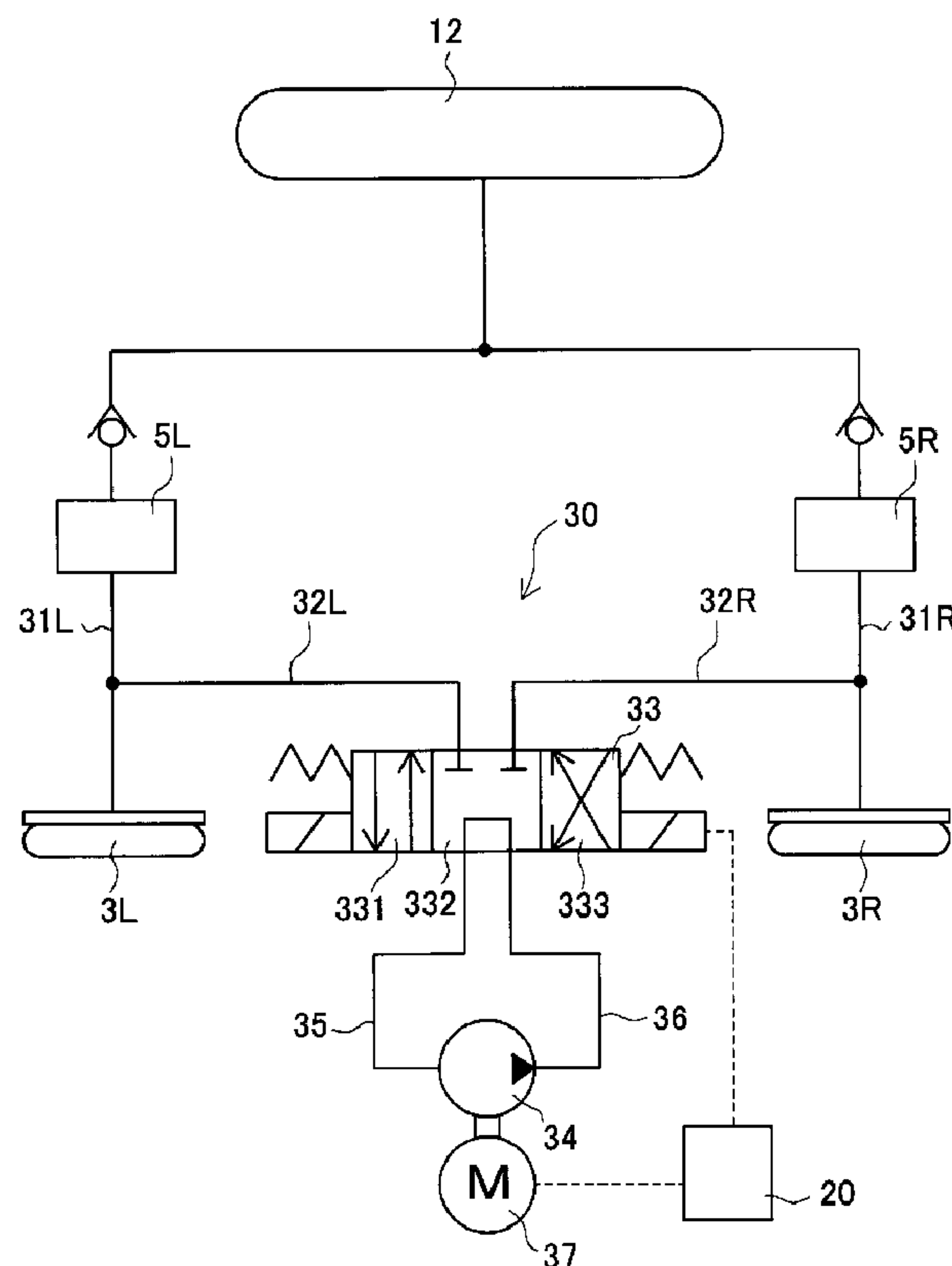
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(54) Titre : DISPOSITIF D'INCLINAISON DE CARROSSERIE DE VEHICULE POUR VEHICULE FERROVIAIRE
(54) Title: VEHICLE BODY TILTING DEVICE AND VEHICLE BODY TILTING METHOD FOR RAIL VEHICLE



(57) Abrégé/Abstract:

A vehicle body tilting device for railway vehicle is arranged to control the tilt of a vehicle body by exchanging compressed air between a pair of left and right air springs (3L, 3R). This device includes: a control valve (33) for tilt operation, connected between



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

the air springs (3L, 3R); a pump (34) for tilt operation, connected between the air springs (3L, 3R) through the control valve (33); and a control device (20) for controlling both the control valve (33) and the pump (34). The control valve (33) forms a circulation flow path (35, 36) for allowing compressed air, delivered by the pump (34), to circulate therethrough. Before controlling the tilt of the vehicle body, the control device (20) drives in advance the pump (34) to circulate the compressed air through the circulation flow path (35, 36) to provide a delivery standby state, changes over at predetermined timing the position of the control valve (33), and delivers the compressed air from one of the air springs (3L, 3R) to the other.

ABSTRACT

A vehicle body tilting device for railway vehicle is arranged to control the tilt of a vehicle body by exchanging compressed air between a pair of left and right air springs (3L, 3R). This device
5 includes: a control valve (33) for tilt operation, connected between the air springs (3L, 3R); a pump (34) for tilt operation, connected between the air springs (3L, 3R) through the control valve (33); and a control device (20) for controlling both the control valve (33) and the pump (34). The control valve (33) forms a circulation flow path (35, 36) for allowing compressed air, delivered by the pump (34), to circulate therethrough. Before controlling the tilt of the vehicle
10 body, the control device (20) drives in advance the pump (34) to circulate the compressed air through the circulation flow path (35, 36) to provide a delivery standby state, changes over at predetermined timing the position of the control valve (33), and delivers the compressed air from one of the air springs (3L, 3R) to the other.

DESCRIPTION

TITLE OF THE INVENTION

VEHICLE BODY TILTING DEVICE AND VEHICLE BODY TILTING METHOD FOR
5 RAIL VEHICLE

TECHNICAL FIELD

[0001] The present invention relates to a vehicle body tilting device and a vehicle body
tilting method for rail vehicle, arranged to transfer compressed air between a pair of left and
10 right air springs to control tilting of a vehicle body.

BACKGROUND ART

[0002] A rail or railway vehicle runs with its vehicle body mounted on a bogie or carriage.
At the time of running, air springs are placed between the vehicle body and the bogie to absorb
15 vibration and an amount of air in each air spring is regulated to adjust the height and the tilting
of the vehicle body. Patent Document 1 listed below discloses a device arranged to switch over
a control valve to supply and discharge compressed air with respect to a pair of left and right
air springs, so that the compressed air is discharged from one of the air springs while the
compressed air is supplied to the other air spring. By this forcibly changing the height of the
20 left and right air springs, the vehicle body is tilted, compensating cant deficiency during
running on a curved track to improve ride comfort.

[0003] Patent Document 2 listed below discloses a vehicle body tilting device for rail
vehicle arranged to compensate cant deficiency. In particular, this device is configured to
transfer compressed air back and forth between left and right air springs. FIG. 9 is a
25 conceptual diagram showing a rail vehicle provided with such a conventional vehicle body
tilting device, illustrating a state of the vehicle during running on a curved track. FIG. 10 is a
conceptual diagram showing a vehicle body tilting controller. An air pump 105 is placed
between left and right air springs 101 and 102 which are individually connected to pipes 106.

The air pump 105 used herein is a roots pump designed to provide a flow velocity and a flow rate which are substantially uniquely determined based on a rotation speed and the number of rotations and to rotate reversibly at variable speeds.

[0004] When the rail vehicle runs on a curved section where cant deficiency may occur, a reversible variable-speed motor 111 is controlled by a control unit 112 to drive the air pump 105 shown in FIG. 10. Accordingly, the air pump 105 serves to transfer compressed air from the air spring 101 located on the inside of a curve to the air spring 102 located on the outside of the curve. As shown in FIG. 9, the air spring 101 on the inside of the curve contracts, while the air spring 102 on the outside of the curve expands, thereby preventing tilting of a vehicle body 110 caused by a centrifugal force during curve-track running.

RELATED ART DOCUMENTS

PATENT DOCUMENTS

[0005] Patent Document 1: Japanese Patent No. 3814237
Patent Document 2: Japanese Patent No. 2635603

SUMMARY OF INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0006] Meanwhile, in the vehicle body tilting device disclosed in the above Patent Document 1, when the heights of the air springs are to be adjusted, the compressed air to expand and extend the air springs is stored in a main tank by a compressor mounted in the vehicle body and is supplied therefrom. On the other hand, when the air springs are to be contracted, the compressed air supplied thereto is released to atmosphere. In a railway section having successive curves in a mountain area for example, the heights of the air springs are adjusted a large number of times, resulting in increased consumption of compressed air. The conventional vehicle body tilting device employs a high-capacity compressor and a high-capacity air tank so as not to decrease the pressure of the compressed air or adopts a structure including a plurality of small-capacity compressors and a plurality of small-capacity air tanks.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

	1	Vehicle body
5	2	Bogie
	3L, 3R	Air spring
	4L, 4R	Height adjusting rod
	5L, 5R	Height control valve
	6L, 6R	Height adjusting cylinder
10	8L, 8R	Valve shaft
	9L, 9R	Lever
	12	Air tank
	18L, 18R	Stroke adjusting valve
	20	Control unit
15	30	Pump tilting mechanism
	32L, 32R	Pipe
	33	Control valve for tilt operation
	34	Pump for tilt operation
	35	Upstream pipe
20	36	Downstream pipe

MODE FOR CARRYING OUT THE INVENTION

[0017] A detailed description of a preferred embodiment of a vehicle body tilting device and a vehicle body tilting method for rail vehicle embodying the present invention will now be given referring to the accompanying drawings. FIG. 1 is a schematic view showing a vehicle body tilting device in the embodiment. A rail vehicle includes a vehicle body 1 mounted on a bogie 2 through left and right air springs 3L and 3R. The vehicle body tilting device in the present embodiment is designed so that the left and right air springs 3L and 3R are symmetric.

