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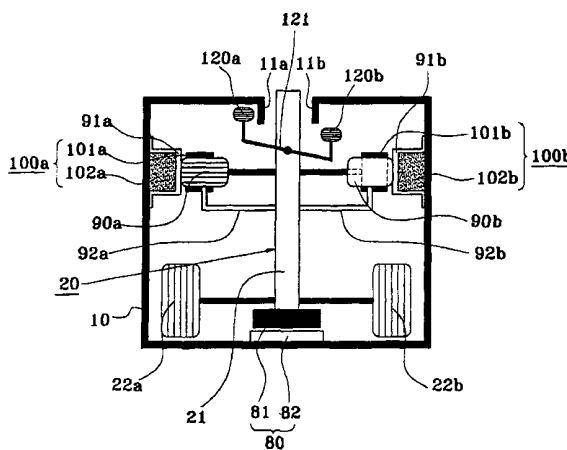
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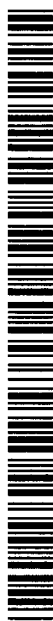
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- (71) Applicant (for all designated States except US): **SKYCAR CO., LTD.** [KR/KR]; Soongsil Univ. ISIE, 1-1 Sangdo-5 dong, Dongjak-gu, Seoul 156-743 (KR).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **KIM, Nam, Ho** [KR/KR]; 31-1105, Hyundai Apt., 369-1, Apgujung-dong, Gangnam-gu, Seoul 135-110 (KR). **KIM, Seong, Wan**
- (74) Agent: **JO, Eui, Je**; Top Patent & Law Firm, RM. 1405, Hyecheon Building, #831 Yuksam-dong, Gangnam-gu, Seoul 135-080 (KR).
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(54) Title: PERSONAL RAPID TRANSIT SYSTEM HAVING LINEAR INDUCTION MOTOR INSTALLED ON BOTTOM OF VEHICLE



(57) Abstract: A personal rapid transit (PRT) system having a linear induction motor installed on the bottom of a vehicle is provided. Since a linear induction motor is installed on the bottom of a vehicle, the structure of the personal rapid transit (PRT) system is simplified and the stable driving thereof is possible. Further, since an auxiliary ramification wheel is provided, an accident by the vehicle seceding from a track occurring during ramification can be prevented in advance. That is, since only a single linear induction motor is installed horizontally on the bottom of the vehicle and thus the vehicle is driven, the structure of the personal rapid transit (PRT) system is more simplified and becomes lighter, and a production cost can be reduced, in comparison with an existing system using a pair of linear induction motors. In addition, even if a ramification device is failed during ramification, a track secession can be suppressed with an auxiliary ramification wheel provided, to thereby guide a stable running. Further, since a ramification rail is received and installed in a guide rail, the size of the personal rapid transit (PRT) system can be compact. Also, since the ramification rail is installed only within a ramification section and need not be installed over the whole sections, the installation cost of the personal rapid transit (PRT) system can be also reduced.



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**PERSONAL RAPID TRANSIT SYSTEM HAVING LINEAR
INDUCTION MOTOR INSTALLED ON BOTTOM OF VEHICLE**

DESCRIPTION

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Technical Field

The present invention relates to a personal rapid transit (PRT) system running along a constructed track by a linear induction motor, and more particularly, to a personal rapid transit (PRT) system having a linear induction motor installed on the bottom of a vehicle, in which case the structure of the personal rapid transit (PRT) system is simplified and the stable driving thereof is possible, and moreover since an auxiliary ramification wheel is provided, an accident by the vehicle seceding from a track occurring during ramification can be prevented in advance.

15

Background Art

As scientific technologies are rapidly developed, automobiles having influenced no pollution upon the atmosphere will be commercialized in future. A representative automobile among a number of automobiles having no influence of pollution upon the atmosphere is a track automobile running along an elevated track installed at a predetermined height above the ground. A system using the track automobile is usually called a personal rapid transit (PRT) system. The personal rapid transit (PRT) system is designed to run along a predetermined track by means of a linear induction motor. A ramification device is provided on the body of the vehicle in the personal rapid transit (PRT) system, in order to ramify the vehicle to run into a branch at a junction. Also, a braking device is provided therein, in order to make the vehicle stop at a desired location. Such a personal rapid transit (PRT) system having an existing linear induction motor is shown in FIGs. 1 through 4.

FIG. 1 is a sectional view showing a personal rapid transit (PRT) system driven by an existing linear induction motor. FIG. 2 is a sectional view for

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explaining a braking device applied in the FIG. 1 system.

As shown, a vehicle body 20 is mounted in a guiding path constituted by guidance path walls 10 forming a substantially rectangular space whose upper portion is opened upward. Main wheels 22a and 22b are installed in the lower portion of a main frame 21 of the vehicle body 20. Also, a pair of motor driving members 31a and 31b are fixed on the respective sides of the upper portion of the main frame 21. The pair of motor driving members 31a and 31b are fixed by left and right horizontal supports 32a and 32b on the left and right sides of the main frame 21. Corresponding reaction rails 33a and 33b are installed on the guiding walls 10 opposing the motor driving members 31a and 31b. Accordingly, the reaction rails 33a and 33b and the motor driving members 31a and 31b react with each other, to thereby obtain a propulsive force. The motor driving members 31a and 31b and the reaction rails 33a and 33b for obtaining a propulsive force by the respective mutual reactions are called linear induction motors 30a and 30b. The linear induction motors 30a and 30b are designed in such a manner that the widths of the motor driving members and the reaction rails are narrowed in order to reduce the installation cost of the reaction rails 33a and 33b. Therefore, the lengths of the linear induction motors have been designed and fabricated very long in order to obtain a desired propulsive force with the narrow widths of the motor driving members and the reaction rails.

Also, ramification devices 40a and 40b are provided in the personal rapid transit (PRT) system, in which the ramification is performed by an attraction force generated between the motor driving members 31a and 31b provided on the vehicle body 20 and the reaction rails 33a and 33b attached on the guidance path walls 10. However, in preparation for the case that the magnetic attraction forces of the linear induction motors 30a and 30b lack, ramification electric magnets 41a and 41b are attached on the upper and lower sides of the motor driving members 31a and 31b. Ramification rails 42a and 42b are provided on the upper and lower sides of the reaction rails 33a and 33b, in correspondence to the ramification electric magnets 41a and 41b. The ramification rails 42a and 42b are made of soft iron, and guide

the vehicle in a desired direction by the magnetic attraction force with respect to the ramification electric magnets 41a and 41b. That is, if the ramification electric magnet 41a located in the left side of the main frame 21 is energized and magnetized, a magnetic attraction force is generated between the ramification electric magnet 41a and the corresponding ramification rail 42a, in which case the vehicle is ramified into the left-side rail at the junction. Inversely, if the ramification electric magnet 41b located in the right side of the main frame 21 is energized and magnetized, a magnetic attraction force is generated between the ramification electric magnet 41b and the corresponding ramification rail 42b, in which case the vehicle is ramified into the right-side rail at the junction.

In particular, guiding wheels 50a, 50b, 51a and 51b and guiding rails 60a, 60b, 61a and 61b are installed on the left and right sides of the upper and lower portion of the main frame 21 in the personal rapid transit (PRT) system, in order to smoothen a running of the vehicle and prevent shaking of the vehicle during running. The guiding wheels 50a, 50b, 51a and 51b are mounted on the left and right sides of supporting axes 52a, 52b, 53a and 53b axially installed around the main frame 21, and the guiding rails 60a, 60b, 61a and 61b are attached on the corresponding left and right guidance path walls 10, respectively.

Referring to FIG. 2, the personal rapid transit (PRT) system is provided with braking devices 60a and 60b in order to stop at a desired position during running. The braking devices 65a and 65b are provided with braking plates 62a and 62b on the respective sides of fixing bars 61a and 61b which are fixed horizontally on the left and right sides of the upper portion of the main frame 21, to thereby contract and expand the braking plates 62a and 62b composed of a pair of the opposing plates according to operations of moving bars 63a and 63b. Therefore, the opposing braking plates 62a and 62b depress and grasp both sides of the reaction rails 33a and 33b attached on the corresponding guidance path walls 10, to thereby stop the vehicle by friction.

The above-described existing personal rapid transit (PRT) system causes the following problems since a pair of linear induction motors are provided on the left

and right sides of the vehicle body.

FIGs. 3A and 3B are views for explaining the problems caused by the linear induction motor driving method applied to the existing personal rapid transit (PRT) system. As shown, a motor driving member 31 and a reaction rail 33 spaced by a predetermined interval from the motor driving member 31 both of which constitute a linear induction motor 30, maintain a constant gap "d" by means of gap retention wheels 34. Particularly, the driving force of the linear induction motor 30 is greatly influenced and changed by a little variation in distance between the motor driving member 31 and the reaction rail 33. In general, since the crookedness of a curved line in the left and right directions is much more greater than that of the ground hypothetically, it is difficult to maintain the distance between the motor driving member 31 and the reaction rail 33 constant in view of the line characteristic in the case that the vehicle runs along a curved line in the existing personal rapid transit (PRT) system. Thus, the driving force is unstable during running, to resultingly cause a big obstacle in constructing a stable system. In particular, as a line path is a sharp curve section having a small curvature, the problem cannot be solved easily. In order to solve the problem, the motor driving member 31 of the linear induction motor 30 is partitioned into two or more members as shown in FIG. 3B, and the members at the connection points have articular structures to connect with each other, in which case the complicated structure makes the maintenance and repair difficult and makes the production and repair costs increase.

In addition, two pairs of the linear induction motors are provided on the left and right sides of the vehicle body, which makes the weight of the whole system heavy, increases the power consumption necessary for driving the vehicle owing to the increase in the weight of the vehicle, and brings about a difficulty in construction that the running track, that is, the guidance path walls should be fabricated more firmly. Accordingly, the existing system has a demerit that the whole expenditure necessary for production and operation thereof increases.

FIG. 4 is a view for explaining a ramification driving problem at a junction

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point in the existing system, in which the black ones among the ramification electric magnets 41a and 41b denote the magnetized states and the white ones denote the non-magnetized states. In the case of the existing system, if a ramification device is out of order during ramification, the vehicle 1 runs a risk of colliding with the guidance path walls 10 at the junction. That is, if the ramification electric magnets 41a and 41b are not magnetized, an attraction force is not generated between a ramification rail (not shown) attached on the guidance path wall 10 located in a desired direction and the ramification electric magnets 41a and 41b, and the vehicle is misdirected. As shown in FIG. 4, the vehicle may induce an extremely dangerous accident that the vehicle collides with the guidance path wall at the junction. Also, since the ramification rail made of the soft iron is integrally fabricated with the reaction rail and installed in the whole sections, that is, since ramification rails are installed even in the sections other than the junction, the installation cost increases and the weight increases, to thus increase the weight of the vehicle body for supporting the ramification rails. As a result, the whole system weighs heavily and the production cost increases.

Besides, since the ramification rails are attached to the reaction rails and integrated with each other in the existing personal rapid transit (PRT) system, the widths of contracting and expanding the braking plates for grasping the upper and lower surfaces of the reaction rails become large, and resultingly the braking plates become large and heavy.

As described above, the existing system is uneconomic due to an increase in the energy required for running and an increase in the production and maintenance costs occurring since the two pairs of the linear induction motors and the ramification rails are installed in all the sections and thus the braking plates become larger, to accordingly cause the weight of the whole system to be heavy.

Disclosure of Invention

To solve the above problems, it is an object of the present invention to provide a personal rapid transit (PRT) system having a linear induction motor

installed on the bottom of a vehicle, in which case the structure of the personal rapid transit (PRT) system is simplified and the stable driving thereof is possible.

It is another object of the present invention to provide a personal rapid transit (PRT) system having a linear induction motor installed on the bottom of a vehicle, in which case since ramification auxiliary wheels are provided to prevent a vehicle from being out of track in advance during ramification, to thereby allow a system doubling stability of the personal rapid transit (PRT) system to be constructed.

To accomplish the above object of the present invention, there is provided a personal rapid transit (PRT) system having a linear induction motor installed on the bottom of a vehicle, in which a vehicle is installed in and runs along a guiding path constituted by guidance path walls forming a substantially rectangular space whose upper portion is opened upward, the personal rapid transit (PRT) system comprising: a motor driving member installed on the bottom of the vehicle; a linear induction motor having a reaction rail attached on the bottom of the guidance path in correspondence to the motor driving member; and a ramification device having a pair of left and right ramification rails attached on the inner upper portion of the guiding path and ramification electric magnets installed in the left and right sides of the upper portion of a vehicle body in the vehicle in correspondence to the ramification rails, for generating a magnetic attraction force between the ramification rails and the ramification electric magnets in order to switch the vehicle into a desired track at a junction by any one of magnetized ramification electric magnets.

Brief Description of Drawings

The above objects and other advantages of the present invention will become more apparent by describing the preferred embodiments thereof in more detail with reference to the accompanying drawings in which:

FIG. 1 is a sectional view showing a personal rapid transit (PRT) system driven by an existing linear induction motor:

FIG. 2 is a sectional view for explaining a braking device applied in the FIG.

l system:

FIGs. 3A and 3B are views for explaining the problems caused by the linear induction motor driving method applied to the existing personal rapid transit (PRT) system:

5 FIG. 4 is a view for explaining a ramification driving problem at a junction point in the existing system;

FIG. 5 is a sectional view showing a personal rapid transit (PRT) system having a linear induction motor installed on the bottom of a vehicle according to the present invention;

10 FIG. 6 is a sectional view showing a braking device in a personal rapid transit (PRT) system having a linear induction motor installed on the bottom of a vehicle according to the present invention;

FIG. 7 is a view showing an operational state according to a control state at the junction in the present invention system;

15 FIGs. 8A through 8C are sectional views cut along the lines A-A, B-B and C-C of FIG. 7; and

FIGs. 9A and 9B are views for explaining a switching method at the junction according to the present invention.

20 **Best Mode for Carrying Out the Invention**

A preferred embodiment of the present invention will be described with reference to the accompanying drawings.

FIG. 5 is a sectional view showing a personal rapid transit (PRT) system having a linear induction motor installed on the bottom of a vehicle according to the present invention. FIG. 6 is a sectional view showing a braking device in a
25 personal rapid transit (PRT) system having a linear induction motor installed on the bottom of a vehicle according to the present invention.

As shown in FIGs. 5 and 6, a guiding path constituted by guidance path walls
10 forms a substantially rectangular space whose upper portion is opened upward.
30 In particular, the opened upper-end portions of the guiding path constituted by the

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guidance path walls 10 are bent inwards and used as auxiliary rails 11a and 11b. A vehicle body 20 is mounted in the guiding path forming the rectangular space. Main wheels 22a and 22b are installed in the lower portion of a main frame 21 of the vehicle body 20. Also, a pair of motor driving member 81 is fixed on the lower portion of the main frame 21. The motor driving member 81 is fixed directly on the bottom of the main frame 21 and corresponding reaction rail 82 is installed on the bottom of the guidance path walls 10 opposing the motor driving member 81. Accordingly, the reaction rail 82 and the motor driving member 81 react with each other, to thereby obtain a propulsive force of the vehicle. The motor driving member 81 and the reaction rail 82 for obtaining a propulsive force by the mutual reactions constitute a linear induction motor 80. In the present invention, the linear induction motor 80 is composed of a pair of the motor driving member 81 and the reaction rail 82, in which the linear induction motor 80 is installed on the bottom of the vehicle. Thus, the production cost can be reduced and the structure is simplified. Also, since the pitch and roll phenomenon is little, a driving stability can be guaranteed.

In particular, guiding wheels 90a and 90b are installed on the left and right sides of the upper portion of the main frame 21 and guiding rails 91a and 91b are installed on the guidance path walls 10 corresponding to the guiding wheels 90a and 90b, in the personal rapid transit (PRT) system, in order to smoothen a running of the vehicle and prevent shaking of the vehicle during running. The guiding wheels 90a and 90b are mounted on the left and right sides of supporting axes 92a and 92b axially installed around the main frame 21, and the guiding rails 91a and 91b are attached on the corresponding left and right guidance path walls 10, respectively.

Also, ramification devices 100a and 100b are provided in the personal rapid transit (PRT) system, in which the ramification devices 100a and 100b include ramification electric magnets 101a and 101b attached on the upper and lower sides of the main frame 21 and ramification rails 102a and 102b provided in the reaction rails 91a and 91b, in correspondence to the ramification electric magnets 101a and

101b, respectively. The ramification rails 102a and 102b are made of soft iron, and guide the vehicle in a desired direction by the magnetic attraction force with respect to the ramification electric magnets 101a and 101b. That is, if the ramification electric magnet 101a located in the left side of the main frame 21 is energized and magnetized, a magnetic attraction force is generated between the
5 ramification electric magnet 101a and the corresponding ramification rail 102a, in which case the vehicle is ramified into the left-side rail at the junction. Inversely, if the ramification electric magnet 101b located in the right side of the main frame 21 is energized and magnetized, a magnetic attraction force is generated between
10 the ramification electric magnet 101b and the corresponding ramification rail 102b, in which case the vehicle is ramified into the right-side rail at the junction.

Referring to FIG. 6, the personal rapid transit (PRT) system is provided with braking devices 110a and 110b in order to stop at a desired position during running. The braking devices 110a and 110b are provided with braking plates 112a and 112b
15 on the respective sides of fixing bars 111a and 111b which are fixed horizontally on the left and right sides of the upper portion of the main frame 21, to thereby contract and expand the braking plates 112a and 112b composed of a pair of the opposing plates according to operations of moving bars 113a and 113b. Therefore, the opposing braking plates 112a and 112b depress and grasp both sides of the
20 guiding rails 91a and 91b attached on the corresponding guidance path walls 10, to thereby stop the vehicle by friction.

Referring back to FIG. 5, a pair of left and right ramification auxiliary wheels 120a and 120b are provided on the upper portion of the main frame 21. The ramification auxiliary wheels 120a and 120b are fixed on both sides of a driving
25 bar 121. Since the driving bar 121 is integrally formed, one end ascends and then the other end descends. Accordingly, in the case of the left and right ramification auxiliary wheels 120a and 120b fixed on both sides of the driving bar 121, the ramification auxiliary wheel 120a fixed to one end of the driving bar 121 ascends and then the ramification auxiliary wheel 120b fixed to the other end of the driving
30 bar 121 descends. The driving of the driving bar 121 is performed by a driving

motor or an actuator which is not shown in the drawing. The ramification auxiliary wheels 120a and 120b correspond to a pair of auxiliary rails 11a and 11b which are bent downwards from the upper opening of the guidance path walls 10, respectively. Therefore, when the vehicle is driven to the left, the left-side ramification auxiliary wheel 120a is close to and guided by the corresponding left-side auxiliary rail 11a, in addition to the magnetic attraction force of the ramification device 100a, to thereby prevent the vehicle from being out of track in the opposing side. Likewise, when the vehicle is driven to the right, the left-side ramification auxiliary wheel 120b is close to and guided by the corresponding left-side auxiliary rail 11b, in addition to the magnetic attraction force of the ramification device 100b, to thereby prevent the vehicle from being out of track in the opposing side. The detailed description will be described later with reference to FIGs. 7 and 8C.

FIG. 7 is a view showing an operational state according to a control state at the junction in the present invention system. FIGs. 8A through 8C are sectional views cut along the lines A-A, B-B and C-C of FIG. 7. In particular, in FIG. 7, a vehicle is simply shown in order to explain a ramification method according to a ramification device applied in the present invention, in which magnetized ones among the ramification electric magnets provided on the left and right sides of the vehicle body are illustrated in black and otherwise non-magnetized ones are illustrated in white.

In order to ramify a vehicle 2 at a junction, ramification electric magnets 101a and 101b which are located in the direction where the vehicle 2 is intended to move and in the forwarding front to a degree are magnetized and induced by a magnetic attraction force with respect to the ramification rails 102a and 102b. Accordingly, the vehicle 2 moves along the ramified guidance path walls 10. If the vehicle 2 which is intended to move to the right reaches a predetermined point (1) prior to a junction, the right-side ramification electric magnet 101b is magnetized and generates an attraction force with respect to the ramification rail 102b, to thereby make the vehicle 2 move along the left-side guidance path walls

10. In particular, as shown in FIG. 8A, the right-side ramification auxiliary wheel 120b located at a desired forwarding direction ascends among the pair of the ramification auxiliary wheels 120a and 120b provided in the upper portion of the main frame 21 at the I spot, in which the ascendent ramification auxiliary wheel
5 120b is regulated by the auxiliary rail 11b, to thereby guide the vehicle 2 to the right-side track. Likewise, as shown in FIG. 8B, when the vehicle 2 reaches the II spot, the vehicle 2 runs to the right along the guidance path walls 10 according to the attraction force between the right-side magnetized ramification electric magnet 101b and the right-side ramification rail 102b. Here, since the right-side
10 ramification auxiliary wheel 120b is regulated by and moves along the right-side auxiliary rail 11b, to thereby prevent the vehicle 2 from being out of track.

Meanwhile, if the vehicle 2 which is intended to move to the left reaches a predetermined point (I) prior to a junction, the left-side ramification electric magnet 101a is magnetized. Accordingly, the left-side ramification electric magnet 101a
15 generates an attraction force with respect to the ramification rail 11a, to thereby make the vehicle 2 move along the left-side guidance path walls 10, as shown in FIG. 8C. In particular, the left-side ramification auxiliary wheel 120a ascends among the ramification auxiliary wheels 120a and 120b in which the ascendent ramification auxiliary wheel 120a is regulated by the auxiliary rail 11a, to thereby
20 guide the vehicle 2 to the left-side track.

FIGs. 9A and 9B are views for explaining a switching method at the junction according to the present invention.

When the vehicle 2 is ramified to the left during ramification, as shown in FIG. 9A, the left-side ramification electric magnet 101a is magnetized and the
25 vehicle 2 moves along the left-side guidance path walls 10. When the vehicle 2 is ramified to the right, the right-side ramification electric magnet 101b is magnetized and the vehicle 2 moves along the left-side guidance path walls 10.

Meanwhile, when two tracks are merged as shown in FIG. 9B, the left-side ramification electric magnet 101a is magnetized in the case of the vehicle coming
30 from the left-side track, and thus the vehicle 2 moves along the left-side guidance

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path walls 10, while the left-side ramification electric magnet 101b is magnetized in the case of the vehicle coming from the right-side track, and thus the vehicle 2 moves along the right-side guidance path walls 10.

The present invention is not limited in the above-described embodiment. It is
5 apparent to a subject skilled in the art that there are many variations and modifications.

Industrial Applicability

As described above, the personal rapid transit (PRT) system having a linear
10 induction motor installed on the bottom of a vehicle according to the present invention is driven by a single linear induction motor horizontally mounted on the bottom of the vehicle. Accordingly, the structure of the personal rapid transit (PRT) system is simplified and fabricated in light weight, to thus reduce the production cost, in comparison with the existing system of using a pair of linear
15 induction motors. Also, although the crookedness in the vertical direction is much more smooth than that in the left and right direction in view of a track, the linear induction motor is mounted horizontally in the present invention. Therefore, the present invention can maintain the gap of the linear induction motor in comparison with the existing case that the linear induction motors are installed in the left and
20 right sides, to thereby secure a stable driving force.

Further, even if the ramification device in the personal rapid transit (PRT) system according to the present invention is out of order during ramification, a track secession can be suppressed with the mounted ramification auxiliary wheels, to thereby provide a stable run. Moreover, since a ramification rail is
25 accommodated in the guiding rail, the size of the ramification rail can be compact. Also, since the ramification rail is installed only in the ramification section and need not installed over the whole sections, the installation cost can be reduced which provides an economic merit.

In addition, the personal rapid transit (PRT) system according to the present
30 invention accommodates the ramification rail in the guiding rail to thereby reduce

the size of the ramification rail, and also reduces the size and weight of the braking plates which grasp and brake the guiding rails, to thereby facilitate the installation and maintenance thereof.

Claims

1. A personal rapid transit (PRT) system having a linear induction motor installed on the bottom of a vehicle, in which a vehicle is installed in and runs along a guiding path constituted by guidance path walls forming a substantially rectangular space whose upper portion is opened upward, the personal rapid transit (PRT) system comprising:

a motor driving member installed on the bottom of the vehicle;

a linear induction motor having a reaction rail attached on the bottom of the guidance path in correspondence to the motor driving member; and

a ramification device having a pair of left and right ramification rails attached on the inner upper portion of the guiding path and ramification electric magnets installed in the left and right sides of the upper portion of a vehicle body in the vehicle in correspondence to the ramification rails, for generating a magnetic attraction force between the ramification rails and the ramification electric magnets in order to switch the vehicle into a desired track at a junction by any one of magnetized ramification electric magnets.

2. The personal rapid transit (PRT) system of claim 1, further comprising:

a pair of auxiliary rails which are opposingly bent inwards from the opened upper portion of the guiding path constituted by the guidance path walls; and

a pair of left and right ramification auxiliary wheels installed on the left and right sides of the upper portion of the vehicle body, in which one of the ramification auxiliary wheels is driven upwards correspondingly in close to the auxiliary rail located toward a desired track to run.

3. The personal rapid transit (PRT) system of claim 1, further comprising:

a pair of left and right guiding wheels mounted on the upper portion of the main frame in the vehicle, for supporting and guiding the vehicle while moving along the left and right guidance path walls; and

guiding rails attached on the guidance path walls in correspondence to the guiding wheels, respectively.

4. The personal rapid transit (PRT) system of claim 1 or 3, wherein said

guiding rail is shaped in a substantially \subset shape, in which the ramification rail is accommodated.

5. The personal rapid transit (PRT) system of claim 4, wherein said ramification rail accommodated in said guiding rail is installed only in the
5 ramification section.

6. The personal rapid transit (PRT) system of claim 1, further comprising a braking device for grasping the upper and lower portions of the guiding rail and stopping the vehicle.

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DRAWINGS

FIG. 1

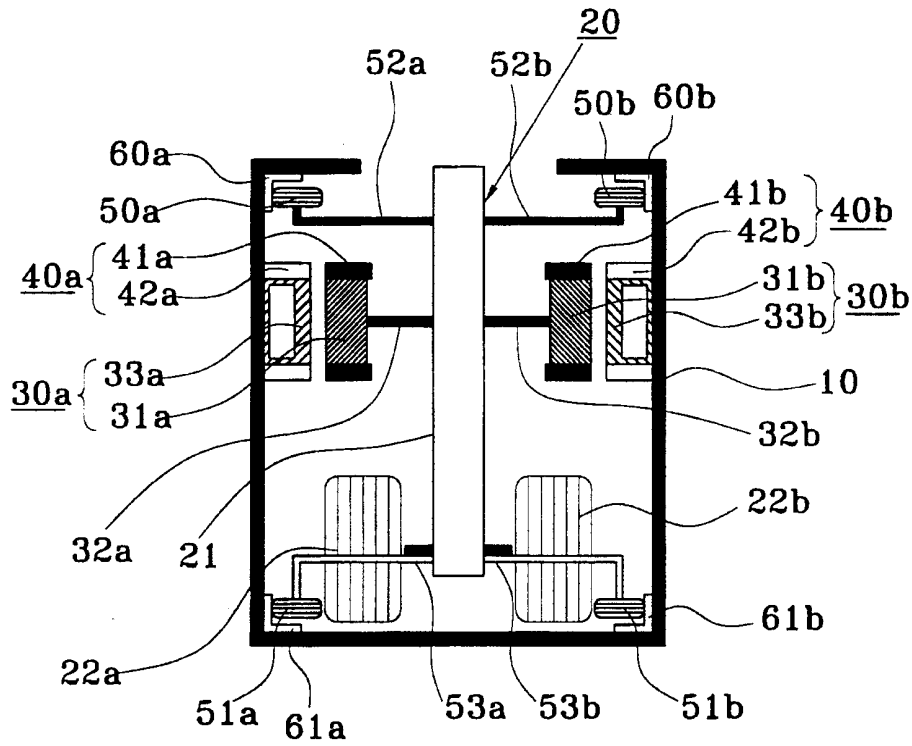


FIG. 2

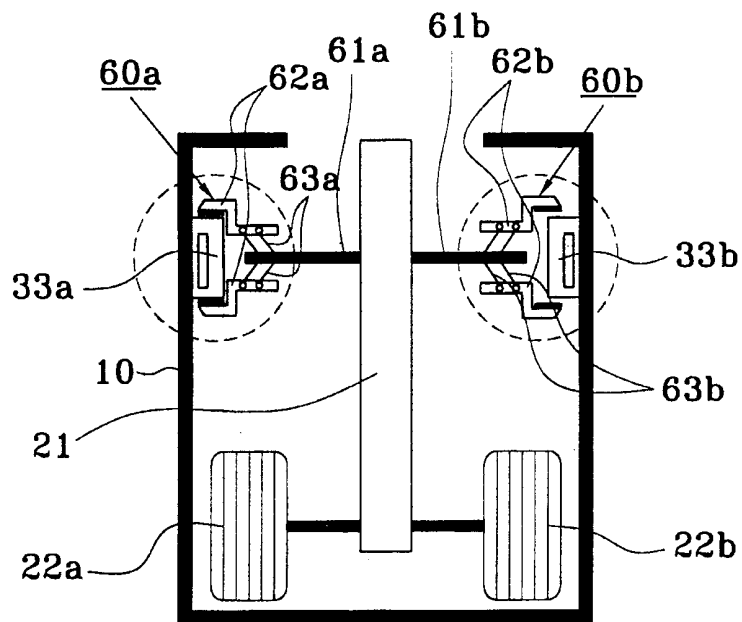


FIG. 3a

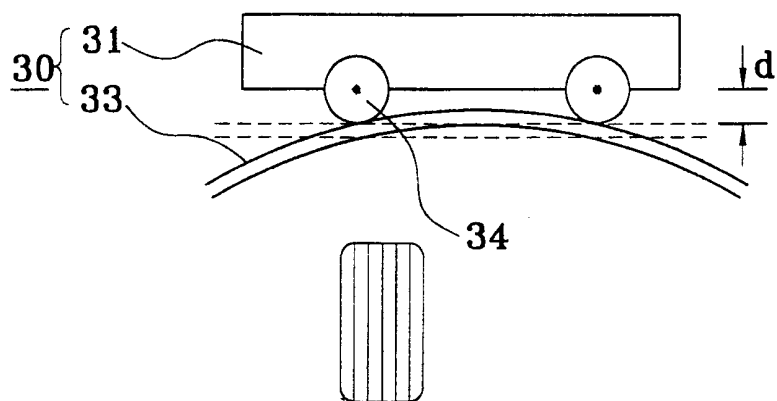


FIG. 3b

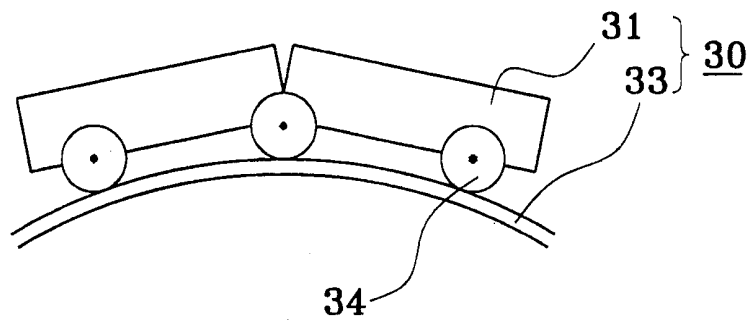
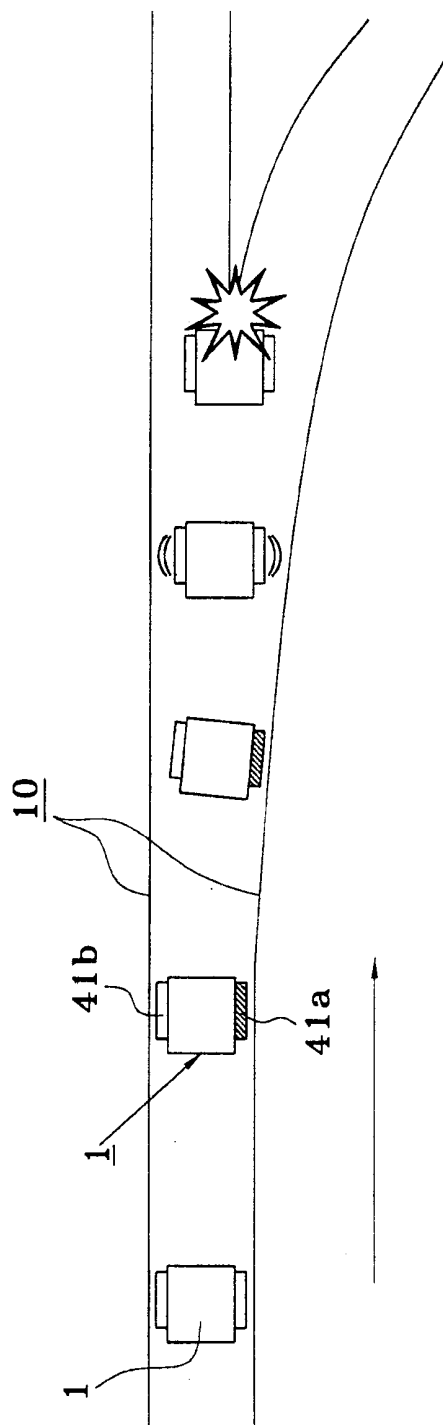


FIG. 4



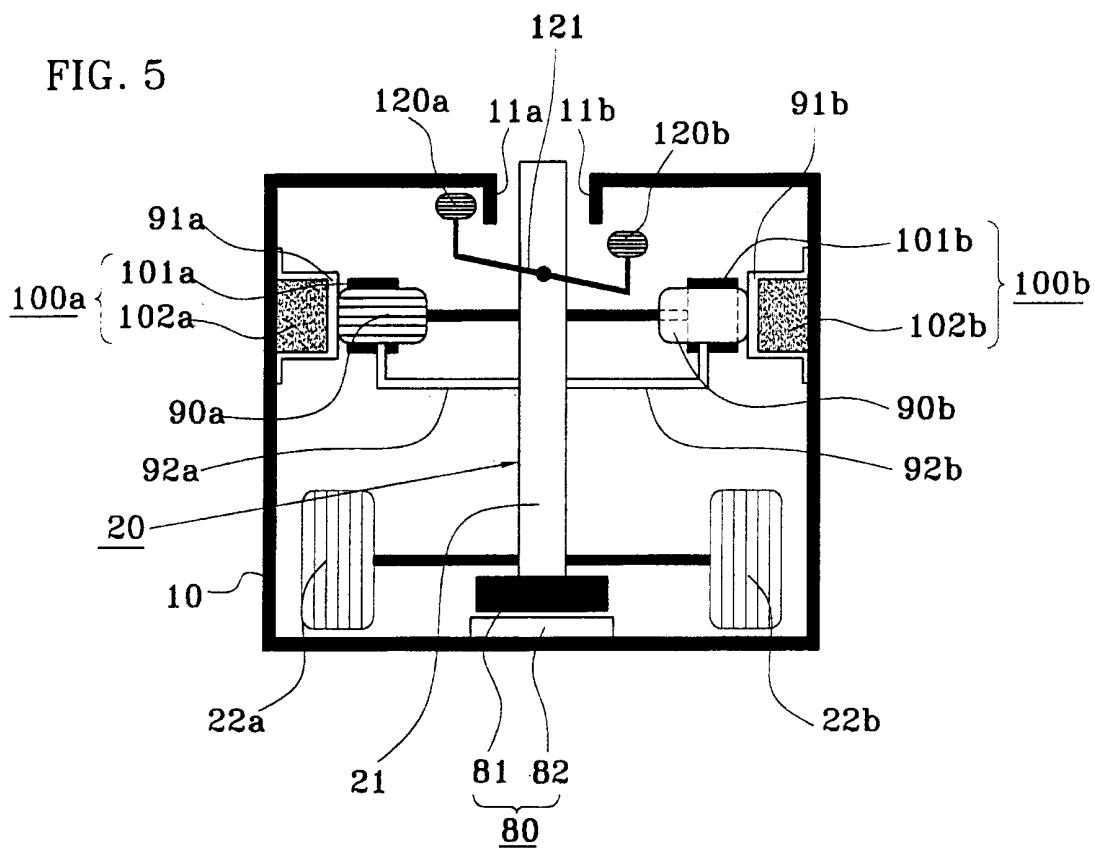


FIG. 6

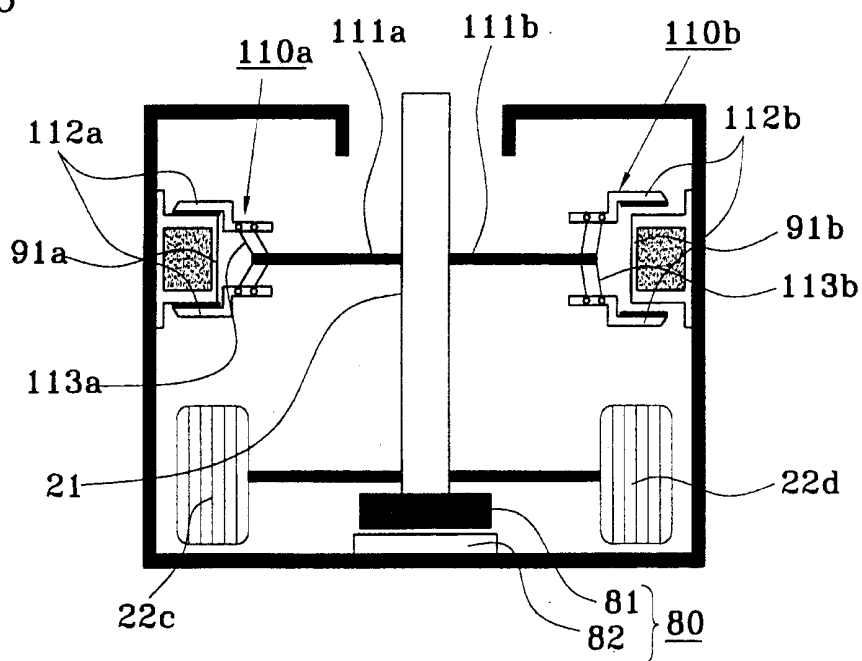


FIG. 8a

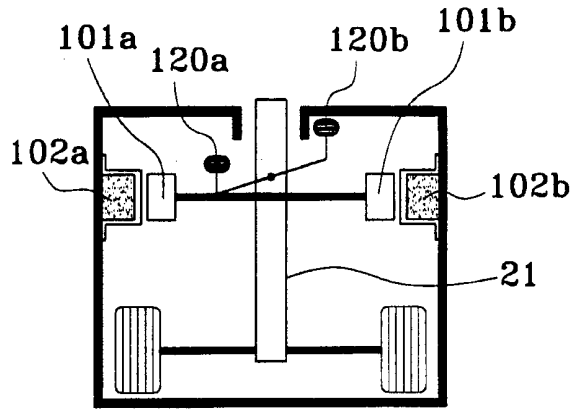


FIG. 8b

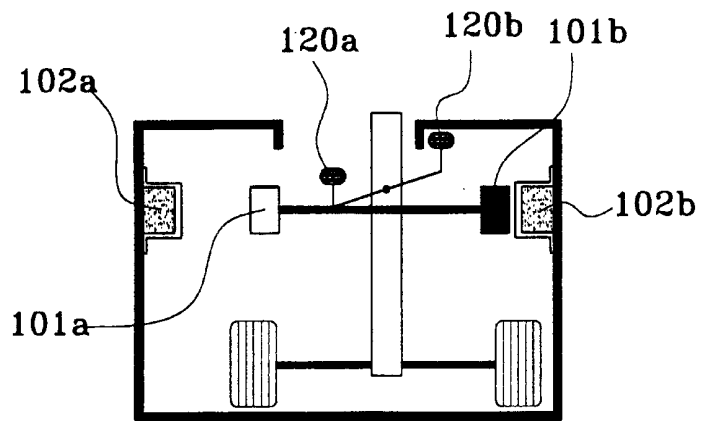


FIG. 8c

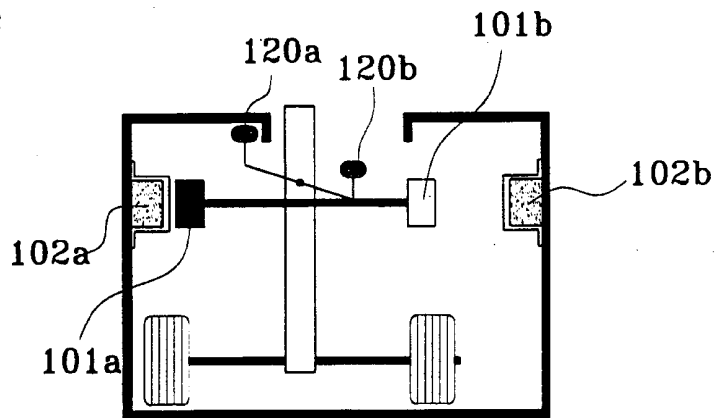


FIG. 9b

