Title: VEHICLE, SYSTEM AND METHOD FOR MASS TRANSIT TRANSPORTATION

Abstract: The present invention provides a vehicle, system, and method for mass transit transportation, the system according to one embodiment including a plurality of passenger vehicles configured such that each passenger vehicle includes a passenger module for transporting at least one passenger being attachable and detachable from a transport-base and a rail-base. At each of a plurality of transport-rail interchange hubs the passenger modules are transferred from transport-bases to the rail-bases. At each of a plurality of rail-transport interchange hubs the passenger modules are transferred from rail-bases to transport-bases. Each passenger vehicle is adapted to transport the at least one passenger on at least one of transport and rail without exiting the passenger module.


VEHICLE, SYSTEM AND METHOD FOR MASS TRANSIT TRANSPORTATION

Field of the Invention
The present invention relates generally to a private vehicle for use in conjunction with a mass transit transportation system. More specifically, the invention describes a private/public vehicle that can combine and make use of rail, road and other public transport systems and methods.

Background of the Invention
The Western World has not yet solved the problems associated with traffic congestion and pollution. In particular, during rush hours, large cities suffer from traffic jams, packed underground trains and overloaded buses. This situation results in mass loss of productivity hours. Some patent publications describe systems and methods for improving private/public transport. For example, US 2005247231A, to Fischer provides a track-guided transport system, and in particular a suspended monorail system, comprising a track network incorporating at least one node at which at least two track sections of the track network adjoin one another and also comprising a plurality of vehicles traveling along the track network and each of which comprises a control unit wherein the control of the movements of these vehicles can be effected in a simple and reliable manner even when there are a large number of vehicles, it is proposed that at least one successor or the information that the vehicle does not have a successor and/or at least one forerunner or the information that the vehicle does not have a forerunner be associated with each vehicle, wherein the information relating to the successor or the forerunner is stored in the control unit of the vehicle and is updated when the vehicle passes a node of the track network.
US 4632038A, to Delucia, describes a monorail vehicular system is provided, which uses an elevated track of multi-piece construction, with a central electrically insulated panel having a supporting lower metal rail, which acts as one side of an electrical supply system, and with an upper metal rail on top of the central panel for support, and to provide the other side of the electrical system. The lower rail is supported at intervals by clips, carried on spaced vertical poles which rest on bases on the ground or other supporting surface. A car used in the system rides on wide roller type wheels on top of the upper metal rail, has a resiliently urged collector in contact with the upper rail, and a pair of contacts which engage the lower metal rail, with a pair of horizontal stabilizing wheels extending downwardly from the car on each side of the central panel and in contact with it, and which wheels are unequally spaced from the upper rail.

US 5819189A, to Von Handorf et al., describes a monorail-vehicle used for material handling purposes comprises a number of cars which run on a track. The cars are linked together in one or more trains and each train has a master car and several slave cars. An embedded computer in the master car keeps track of the location on the train on the track by means of pulses from a Hall effect sensor in a brushless DC motor which powers the train. A central computer in an off board work station issues commands to the train and by monitoring its position on the track loop, the embedded computer in the master car of the train determines when to execute the command. A special jumper is used to connect the cars of the train together which distributes control signals to the various cars in the train without regard to the position of the cars in the train.

US 6,012,396, to Schulz, describes a transportation system which includes a rail system and a vehicle capable of traveling on a road surface or the rail system. The vehicle includes two sets of wheels, one for riding on a road surface and another for riding on the rail. The rail is provided at an
acute angle, and the rail adjusted wheels pivot, so that an outer flange on the rails lockingly engages an outer flange on the wheel.

US 7,127,999, to Roane, describes a rail system for transporting dual use vehicles that includes a network of multiple non-interconnected rails where each rail comprises a triangular shell. A system of support structures supports the rails, which in turn support the dual use passenger vehicles. The dual use passenger vehicles are adapted for roadway travel on wheels and rail travel upon a rail of triangular shape. The website: http://www.ruf.dk/ describes a mostly similar system.

Multiple ATC (Automatic Train Control) systems are known in the art that enable automatic control of a plurality of railed vehicles.

There is still a need for an improved public infrastructure that supports systems and methods for providing their private-user an optimized performance for green environment, timing efficiency, lowest cost and ease of use.

It is therefore an object of the present invention to provide a modular private/public transportation system that allows simple and easy replacement of the rail and other transport base of a vehicle.

It is another object of the present invention to provide a modular private/public transportation system that is capable of quickly transporting passengers on different transportation infrastructures.

It is another object of the present invention to provide a modular private/public transportation system that can avoid traffic congestion.
It is an object of some aspects of the present invention to provide a system and method for a modular-public/private-vehicle which can use the public transportation infrastructure with higher performance: less time to travel from origin to destination, lower cost and better energy efficiency.

It is another object of the present invention to provide a modular private/public transportation system that will reduce the risk of traffic accidents.

Other objects and advantages of the invention will become apparent as the description proceeds.

**Summary of the Invention**

The present invention is directed to a mass transit transportation system, comprising an uncontrolled, self-propelled chassis base for transportation along a user selected route; a controlled chassis base for transportation along a predetermined mass transit route; a plurality of passenger modules for seating at least one passenger, each of said passenger module being attachable to, and detachable from, a corresponding uncontrolled base or a corresponding controlled base; a first set of interface devices for releasably connecting, upon demand, one of said passenger modules and one of said uncontrolled bases; a second set of interface devices for releasably connecting, upon demand, one of said passenger modules and one of said controlled bases; and a plurality of mass transit interchange hubs for interchanging an uncontrolled base and a controlled base, at each of said interchange hubs one of said passenger modules is transferable from one of said uncontrolled bases to one of said controlled bases using said first set of interface devices and from one of said controlled bases to one of said uncontrolled bases using said second set of interface devices.
In order to implement the system of the present invention, the passenger module is adapted to detach from a base, whether a controlled base or an uncontrolled base, and to be transferred to another base for use in a different route type. A base with which the passenger module is to be attached may be selected according to the required destination, target distance and selected control (manual by user or automatic by the system) - thus maximizing the efficiency of use, cost and timing for the users of the system.

The predetermined and user selected routes are selected from the group of route types consisting of a route along a road, a route along a rail, a route along a track, a route in the air, and a route in water.

In one aspect, the passenger module is multifaceted and is operable in more than one route type.

The passenger module may be configured to seat one passenger, and in other embodiments of the present invention, the passenger module may be configured to seat multiple passengers.

Each uncontrolled base comprises propulsion means and steering means that are passenger adjustable, for generating and controlling a propulsion vector.

In one aspect, the uncontrolled base is operable along a road and comprises an internal combustion engine, a transmission, and wheels for engaging the road, and the controlled base is operable along a rail or track and comprises a member for engaging a rail or track surface.

In one aspect, the passenger module comprises a steering system interfaceable with the engine of the uncontrolled base.
In one aspect, the system further comprises a computer control system for controlling the movement of a plurality of passenger modules, uncontrolled bases, and controlled bases in the vicinity of an interchange hub, and the movement of a plurality of controlled bases along the mass transit route.

In one aspect, each controlled base comprises communication means for communicating with a computer control system and transportation means for controlling the speed and direction of the control base in response to commands from said control system.

In one aspect, the computer control system is operable to control one or more system features selected from the group consisting of a stock of controlled bases at each interchange hub; a stock of uncontrolled bases at each interchange hub; movement of controlled bases at each interchange hub; movement of uncontrolled bases at each interchange hub; synchronization of passenger module detachment from an uncontrolled base at each interchange hub; synchronization of passenger module attachment to a controlled base at each interchange hub; synchronization of passenger module detachment from a controlled base at each interchange hub; synchronization of passenger module attachment to an uncontrolled base at each interchange hub; a predetermined interval between controlled bases along a mass transit route; location of controlled bases along a mass transit route; distribution of controlled bases throughout the transportation system; preventative maintenance of passenger modules, controlled bases and uncontrolled bases; supply of spare parts for passenger modules, controlled bases and uncontrolled bases; distribution of spare parts for passenger modules, controlled bases and uncontrolled bases; client accounts for purchase of passenger vehicles;
client accounts for lease of passenger vehicles; smart card accounts for pay-as-you-use for passenger vehicles; and accident prevention systems for passenger vehicles.

In one aspect, the uncontrolled base further comprises means for initiating temporary computerized control along the user selected route. Thus the computer control system is further operable to control one or more system features selected from the group consisting of location of uncontrolled bases along a user selected route; a predetermined interval between uncontrolled bases along a user selected route; and distribution of uncontrolled bases throughout the transportation system.

In one aspect, one first set of interface devices and one first set of second interface devices is a releasable locking mechanism.

In one aspect, the locking mechanism comprises a female grooved member attached to the passenger module, a vertically displaceable rod housed within the controlled and uncontrolled bases, a contact element attached to a distal end of said rod, and engagement elements which are caused to be seated in the groove of said female member following application of a first controlled force to said contact element and subsequent upward displacement of said rod and to be disengaged from the groove following application of a second controlled force to said contact element.

A passenger module, for example, may be mounted on a transport-base-chassis and transferred to a rail-base-chassis and vice versa.

The passenger modules of the present invention are designed to be driven or otherwise moved from a person's home to a local first station or hub. At the station, the module is, preferably automatically, removed from the transport-vehicle-base and transferred onto a rail-vehicle-base. During the
exchange of bases at one of the hubs, the user does not leave his passenger module and switching is done automatically and seamlessly within up to one or two minutes. The user then travels by rail to a second station close to his requested destination. At the second station, the module is removed from the rail-base and transferred onto a second transport-vehicle-base and the user may then manually or automatically drive or otherwise transport the vehicle to his destination.

Upon return from his destination, the person drives back to the second station, where the second transport-vehicle-base is removed. While in the passenger module, it is transferred onto a rail-vehicle-base. The person travels in the rail-vehicle, comprising the passenger module and the rail-vehicle-base, back to the first station. At the first station, the rail-vehicle-base is removed and another transport-vehicle-base is attached to the passenger module.

It should be understood that the rail bases are adapted to travel on one or more rails and tracks. The one or more rails and tracks include mechanical rails and tracks, maglev rails and tracks, and air pressurized rails and tracks.

It should be understood that the transport bases of the present invention can be of various types wherein each type is adapted to travel on at least one of roads, water, and air.

Accordingly, the transport base can be: a road-base, a water-base, an air-base, or a hovering-base.

It should be understood that the transport bases of the present invention include at least the following: propulsion means, which provides propulsion to the transport base, and to a passenger module whenever it is
attached to said transport base; and steering means, for controlling the propulsion vector of the transport bases based on commands from one or both of: a user and an automatic computer controller. The transport bases optionally comprise communication means, for communicating with the computer systems that in some embodiments control the transport base at the exchange hub, and in some other embodiments further control it outside of the hub as well. Whenever the transport bases use propulsion methods based on interaction with their respective environments, such as road surface, water surface, and air, motion transmitters are provided for interaction with these environments, such as wheels, flaps, propellers, and other well known means.

It should be understood that the propulsion means may comprise a variety of known engine and motor types and combinations thereof, such as an internal combustion engine (coupled to a motion transmitter such as wheels, propellers, flaps and the like), a hybrid engine, an electromechanical motor, a jet engine, a water jet engine, and other known means.

It should be understood that the bases of the present invention may be run on gas, bio-fuel, petrol, jet-fuel, electricity, solar energy and any combinations thereof.

It should be understood that the rail base of the present invention includes at least the following: steering means, for controlling the propulsion vector of the transport bases based on commands from an automatic controller, e.g. a computer controller; communication means, for communicating with the controller that automatically controls the rail base; motion adjustors, for interaction of said rail base with the one or more rail and track surfaces, which comprise one or more from the group consisting of wheels and/or rollers for interaction with the one or more rails and tracks,
permanent magnets and/or electromagnets for interaction with magnetic and electromagnetic fields of one or more Maglev rails and tracks, and surfaces adapted to interact with air pressurized support track/s; optionally, propulsion means, whenever said rail base requires its own propulsion system, which may comprise: an electromechanical motor, an internal combustion engine, a hybrid engine and the like; and optionally, power transfer means, for power transfer to said rail base, via at least one of electrified rails, tracks and electrical cables.

It should be understood that the user can use only one of the bases, rail or road or air or water, without need to exchange the base, according to his travel route and requirements.

It should be understood that other types of transport bases, such as: water-jet-base, hovering-base, vacuum tunnel base, or even air-base can also be used for traveling in watery terrains or through air or through tunnels.

The passenger module and its bases are preferably externally shaped in a way that maximizes aerodynamic (or hydrodynamic for water environment) efficiency, thereby providing energy savings.

It should be further understood that many methods of operation of this transportation system are within the scope of the present invention. For example, according to one embodiment, individuals may not own their vehicles at all, but may lease a certain type of passenger module. Alternatively, they may pay for a monthly or annual membership to use any of the vehicles in the system. Alternatively, they may pay per usage, such as by credit card.
There can be a variety of business models to operate alternate-vehicle-base systems. Each model will be examined according to its area topography, amount of potential users and their commutation requirements.

The hub is the interchange area where the passenger modules switch to, from and between the transportation systems (for example and interchange between rail and road). Therefore, the hub will usually include part or all of the following functional areas: an uncontrolled interchange entrance through which the plurality of uncontrolled bases enter the hub from the user selected route before the corresponding passenger modules are transferred to a controlled base; an uncontrolled interchange exit through which the plurality of uncontrolled bases exit the hub to the user selected route after the corresponding passenger modules have been transferred from a controlled base; a controlled interchange entrance through which the plurality of controlled bases enter the hub from the predetermined mass transit route before the corresponding passenger modules are transferred to a controlled base; a controlled interchange exit through which the plurality of controlled bases exit the hub to the predetermined mass transit route after the corresponding passenger modules have been transferred from an uncontrolled base; one or more first switching stations at which a passenger module is detached from an uncontrolled base and re-attached to a controlled base; one or more second switching stations at which a passenger module is detached from a controlled base and re-attached to an uncontrolled base; a first storage area for storing unused controlled bases after becoming detached from a first passenger module and before being re-attached to a second passenger module, further comprising a first storage area exit through which an unused controlled base is delivered to a first switching station and a first storage area entrance through which an unused controlled base is delivered from a second switching station; and a second storage area for storing unused uncontrolled bases after becoming detached from a first
passenger module and before being re-attached to a second passenger module, further comprising a second storage area exit through which an unused uncontrolled base is delivered to a second switching station and a second storage area entrance through which an unused uncontrolled base is delivered from a first switching station.

Each interchange hub preferably comprises support means for suspending the passenger module following release of the locking mechanism and guide means by which the suspended passenger module is guided to a second location when being transferred from a controlled base to an uncontrolled base or from an uncontrolled base to a controlled base.

Please note that in another possible embodiment the transfer between the controlled and uncontrolled base may not require suspending, as the attachment of one base can be from the bottom, while the other base attachment can be from the top, hence the suspension is not needed. In this case, there is a time that both bases are attached until one base detaches.

In one embodiment, the guide means is at least one elongated guide connected to a post, each of said guides comprising a plurality of longitudinally spaced rollers for rollingly supporting a passenger module when being longitudinally displaced along said guide; a drive means housed within said guide; and one or more longitudinally displaceable pusher devices driven by said drive means, for pushing a passenger module along said guide to the second location.

Each pusher device comprises one or more permanent magnets or electromagnets which interact with permanent magnets that are attached to the passenger module or is an electromechanical or hydraulic device.
In one embodiment, the guide means comprises at least one conveyor belt and one or more motors for driving each of said conveyor belts, a projection extending from a passenger module body being supported by each conveyor belt while the passenger module is guided to the second location.

In one embodiment, the guide means comprises of several rolling rubber or other elastic wheels that push the passenger module to the second location.

In one embodiment, the support means have one or more perforated surfaces arranged such that pressurized gas is dischargeable through holes of said one or more perforated surfaces, whereby to levitate the passenger module above said support means.

In one aspect, at least some of the holes are inclined with respect to the one or more perforated surfaces so that the discharged gas will guide the passenger module to the second location.

In one embodiment, each interchange hub comprises a plurality of hydraulic cylinders for suspending the passenger module following release of the locking mechanism.

The hub of the present invention preferably comprises a computer system for controlling the movement, stock, maintenance and traffic congestion of the vehicles. The hub control system controls the flow of incoming and outgoing passenger modules to/from the rail/transport systems and the operation of the guide means. The computer system is generally autonomous, but it can be connected to all of the other hub control systems, to allow best system utilization and efficiency.

For that matter, the hub control systems can coordinate the travel of rail-bases between them (even without being loaded with a passenger module)
to optimize their rail-base buffers according to statistical information. Each hub control system can keep track of any incoming or outgoing bubbles (being the passenger modules) to/from it. Tracking is done via wired or wireless communication from the bubbles and bases and from rail and transport sensors. Each bubble reports its position according to self GPS unit, and each rail and transport sensor reports bubbles proximity to it.

During rail use, the passenger modules are controlled and navigated by the origin hub, until being handed-over to the destination hub. The rail-bases and the bubbles may be equipped with proximity sensors and transmitters for alarming and preventing collisions. One of the key differences between the other transport infrastructures and environments and the rail system is the control between a passenger module and base and the navigation method.

While the bubble is transported on a transport base, the end-user can choose to drive the bubble-transport-base vehicle manually. This means the user has a steering wheel (or a joystick) and gas/brake pedals (or a joystick) and he is driving the transport-based-vehicle to his desired destination in a similar method used by conventional vehicles on roads, or other types of vehicles that are conventional for their respective environments: air and water.

Some transport-base systems may be navigated and controlled by means of a computerized system. The vehicle may be controlled in the vicinity of the hubs in a manner similar to that of the rail bases, or make use of different known automatic navigation and control systems. For example, the vehicle may be controlled along a specific segment of a road during a period of traffic congestion upon initiation of the computerized system. Once the transport-based-vehicle becomes a temporarily controlled vehicle,
the user cannot manually drive it any more. The user may enter to the system computer his required destination. The system computer then assumes control of the bubble vehicle and guides it to the selected destination. The user cannot control the velocity of the vehicle. The user resumes manual control back once the bubble arrives at the selected destination.

In some of the system designs, the vehicle control exchange takes place while driving along a special transport-lane. In this lane (which leads to the transport-rail hub), the system-computer is allowed to "take over" the driving process. This non-standing-control-hand-over is one of the key elements that allow smooth transition into the hub, and very quick chassis exchange.

According to some embodiments, the passenger modules may have attachment means for attaching two or more passenger modules in the rail-vehicle forming a train of bubble modules, the passenger modules being attached by the rear end of a first module to a front end of a second module, and so on. This mode of connection of the modules is particularly useful for commuters who all travel from a suburb to a central city location.

There is thus provided according to some embodiments of the present invention, a system for private transportation using private/public transport infrastructures using vehicles that consist of passenger modules and bases for transporting these passenger modules, the system including a plurality of passenger modules, wherein each passenger module can transport at least one passenger and is attachable to and detachable from bases; a transport-base chassis for transporting said passenger module over at least one of the following of roads, air, and water; a first attachment/detachment mechanism that connects between said passenger
module and said transport base chassis; a rail-base chassis for transporting said passenger module on one or both of: rail/s and track/s; a second attachment/detachment mechanism that connects between said passenger module and said rail base chassis; a plurality of transport-rail interchange hubs for transferring said passenger modules from said transport-base chassis to said rail-base chassis using said first attachment/detachment mechanism; and a plurality of rail-transport interchange hubs for transferring said passenger modules from said rail-base chassis to said transport-base chassis using said second attachment/detachment mechanism, whereby each of said passenger modules is adapted to transport the at least one passenger without necessarily exiting the passenger module.

According to some embodiments, the system further includes a computer control system for controlling the plurality of vehicles on road/in the air/in the water, and a plurality of vehicles on rail. Additionally, according to some embodiments of the present invention, the computer control system is adapted to control at least one or any combination of: stock of rail-bases at transport-rail interchange hubs; stock of transport-bases at rail-transport interchange hubs; movement of rail-bases at transport-rail interchange hubs; movement of transport-bases at rail-transport interchange hubs; synchronization of passenger module detachment from transport-base at transport-rail interchange hubs; synchronization of passenger module attachment to rail-base at transport-rail interchange hubs; synchronization of passenger module detachment from rail-base at rail-transport interchange hubs; synchronization of passenger module attachment to transport-base at rail-transport interchange hubs; congestion of passenger vehicles on roads/in the air/in the water; congestion of passenger vehicles on rails; location of passenger vehicles on roads/in the air/in the water; location of passenger vehicles on rails; distribution of passenger vehicles on roads/in the air/in the water;
distribution of passenger vehicles on rails; preventative maintenance of passenger modules, transport-bases and rail-bases; supply of spare parts for passenger modules, transport-bases and rail-bases; distribution of spare parts for passenger modules, transport-bases and rail-bases; client accounts for purchase of passenger vehicles; client accounts for lease of passenger vehicles; smart card accounts for pay-as-you-use for passenger vehicles; and accident prevention systems for passenger vehicles.

Moreover, according to some further embodiments of the present invention, the passenger module includes a housing adapted to house at least one passenger. Additionally, according to some further embodiments of the present invention, the housing includes at least one attachment apparatus for attaching the housing to the transport-base or to the rail-base. Preferably according to a further embodiment, the transport-bases include 2, 3 or 4 wheels. According to some further embodiments of the present invention, the vehicle includes a steering and drive system in the module connected to a motor in the transport-base.

According to some further embodiments of the present invention, the housing includes at least one attachment apparatus for attaching the housing to the rail-base. According to some further embodiments of the present invention, the rail-base includes a mechanical means for movement along at least one rail. In some cases, the mechanical means includes upper and lower rollers.

The present invention is also directed to a modular vehicle, comprising an uncontrolled, self-propelled chassis base for transportation along a user selected route; a passenger module for seating at least one passenger attachable to, and detachable from said base; a set of interface devices releasably connecting said passenger module and said uncontrolled base; and passenger adjustable propulsion means and steering means, wherein
said passenger module is detachable from said uncontrolled base at an interchange hub and is transferable to a controlled chassis base for transportation along a predetermined mass transit route.

There is thus provided according to some additional embodiments of the present invention, a method for public/private transportation using public transport infrastructures, the method including enabling a passenger to travel on road or in the air or in the water, and on rail/s in a passenger vehicle without necessarily exiting a passenger module, wherein the passenger module is attachable and detachable from both a transport-base-chassis and a rail-base chassis.

Additionally, according to some further embodiments of the present invention, the method includes enabling the passenger to be transported on rail/s in the passenger module attached to the rail-base.

Additionally, according to some further embodiments of the present invention, the method includes enabling the passenger to drive on road in the passenger module attached to the transport-base which in such specific case can be called: a road-base.

Additionally, according to some further embodiments of the present invention, the method includes enabling the passenger to drive in the air in the passenger module attached to the transport-base which in such specific case can be called: an air-base.

Additionally, according to some further embodiments of the present invention, the method includes enabling the passenger to drive in water in the passenger module attached to the transport-base which in such specific case can be called: a water-base.
Moreover, according to some further embodiments of the present invention, the method further includes detaching the passenger module from the transport-base at a transport-rail interchange hub. Additionally, according to some further embodiments of the present invention, the method further includes attaching the passenger module to the rail-base at a transport-rail interchange hub.

Further, according to some further embodiments of the present invention, the method further includes detaching the passenger module from the rail-base at the rail-transport interchange hub. According to some further embodiments of the present invention, the method further includes attaching the passenger module to the transport-base at a rail-transport interchange hub. In some cases, the method further includes controlling a plurality of passenger vehicles that comprise a transport-base and a bubble module.

According to some further embodiments of the present invention, the method further includes controlling a plurality of passenger vehicles on rail. According to some further embodiments of the present invention, the method further includes controlling at least one or any combination of stock of rail-bases at transport-rail interchange hubs; stock of transport-bases at rail-transport interchange hubs; movement of rail-bases at transport-rail interchange hubs; movement of transport-bases at rail-transport interchange hubs; synchronization of passenger module detachment from transport-base at transport-rail interchange hubs; synchronization of passenger module attachment to rail-base at transport-rail interchange hubs; synchronization of passenger module detachment from rail-base at rail-transport interchange hubs; synchronization of passenger module attachment to transport-base at rail-transport interchange hubs; congestion of passenger vehicles on roads/in the air/in the water; congestion of passenger vehicles on rails; location of passenger
vehicles on roads/in the air/in the water; location of passenger vehicles on rails; distribution of passenger vehicles on roads/in the air/in the water; n. distribution of passenger vehicles on rails; preventative maintenance of passenger modules, transport-bases and rail-bases; supply of spare parts for passenger modules, transport-bases and rail-bases; distribution of spare parts for passenger modules, transport-bases and rail-bases; client accounts for purchase of passenger vehicles; client accounts for lease of passenger vehicles; smart card accounts for pay-as-you-use for passenger vehicles; and accident prevention systems for passenger vehicles.

There is thus provided according to some further embodiments of the present invention, a business method for public/private transportation using public transport infrastructures, the method including enabling a passenger to travel on road or in the air or in the water, and on rail/s in a passenger vehicle without exiting a passenger module; and charging the passenger for the travel on road or in the air or in the water, and on rail/s.

According to some further embodiments of the present invention, the charging step is performed on a basis of leasing the passenger vehicle or module.

According to some further embodiments of the present invention, the method includes charging the passenger for his mileage traveled in the passenger vehicle. According to some yet some further embodiments of the present invention, the method includes charging the passenger for purchase of the passenger module and/or passenger vehicle.

According to some further embodiments of the present invention, the method includes charging the passenger for purchase of the passenger module.
There is thus provided according to some further embodiments of the present invention, a computer software product for public/private transportation using public transport infrastructures, the software product including a computer-readable medium in which program instructions are stored, which instructions, when read by a computer, cause the computer to enable a passenger to travel on rail, and/or over roads/water/air in a passenger vehicle without exiting a passenger module, wherein the passenger module is attachable and detachable from both a transport-base and a rail-base (usually at an interchange area).

There is thus provided according to some further embodiments of the present invention, a method for private/public transportation using public transport infrastructures, the method including enabling a plurality of passengers to travel both on rail, and/or over roads and/or air and/or water, in a plurality of passenger vehicles, wherein each passenger vehicle includes a passenger module for transporting at least one passenger, which is attachable and detachable from bases; using a transport-base chassis for transporting said passenger module over one of the following of roads, air, and water; using a first attachment/detachment mechanism that connects between said passenger module and said transport base chassis; using a rail-base chassis for transporting said passenger module on rail/s; using a second attachment/detachment mechanism that connects between said passenger module and said rail base chassis; using a plurality of transport-rail interchange hubs for transferring said passenger modules from said transport-base chassis to said rail-base chassis using said first attachment/detachment mechanism; using a plurality of rail-transport interchange hubs for transferring said passenger modules from said rail-base chassis to said transport-base chassis using said second attachment/detachment mechanism; and enabling each passenger to travel in a passenger module without necessarily exiting said passenger module.
**Brief Description of the Drawings**

In the drawings:

- Figs. IA-D are side, rear, bottom, and perspective views, respectively, of a simplified pictorial illustration of a one-passenger uncontrolled vehicle comprising a detachable transport-base, in accordance with an embodiment of the present invention.

- Fig. 2 is a schematic diagram of a transport-rail hub for the transfer of a bubble module from a detachable base and the attachment of the bubble module to a rail-vehicle-base and vice versa, in accordance with an embodiment of the present invention.

- Fig. 3 is a flow chart of a method for transportation of an individual using a transport-rail combination, in accordance with an embodiment of the present invention.

- Figs. 4-7 are schematic layouts of a transport-rail hub station for transfer of a bubble module from a detachable base and attachment of the bubble module to a rail-vehicle-base and vice versa, in accordance with four embodiments of the present invention, respectively.

- Fig. 8 is perspective view of a one-passenger uncontrolled vehicle comprising a detachable transport-base, in accordance with an embodiment of the present invention.

- Fig. 9A is a perspective view of a one-passenger controlled vehicle comprising a detachable rail-base, in accordance with an embodiment of the present invention.

- Figs. 9B-E are perspective, bottom, rear, and side views, respectively, of a simplified pictorial illustration of a one-passenger controlled vehicle comprising a detachable rail-base, in accordance with an embodiment of the present invention.

- Fig. 10A is a vertical cross-sectional view of the female part of an exemplary locking mechanism.
-Fig. 1OB is a vertical cross-sectional view of the male part of the locking mechanism of Fig. 1OA.
-Figs. 1OC-D are vertical cross-sectional views of the locking mechanism of Fig. 1OA, schematically illustrating the attachment and detachment, respectively, of the male and female parts.
-Figs. 1HA-D schematically illustrate an embodiment for operating an exchange hub, wherein Fig. 1HA is a plan view of the exchange hub, Fig. 1HB is a perspective view of the exchange hub, Fig. 1HC is a magnified plan view of an exchange point whereat a bubble module is transferred from a transport-base to a rail-base, and Fig. 1HD is a front view of a bubble module being suspended by two guides.
-Figs. 12A-B schematically illustrate a first embodiment of apparatus for transferring a detached bubble module, wherein Fig. 12A is a perspective view of a guide and Fig. 12B is a magnified rear view, showing a bubble module being displaced by a pusher device operatively connected to the guide.
-Figs. 13A-B schematically illustrate a second embodiment of apparatus for transferring a detached bubble module, wherein Fig. 13A is a side view of the apparatus without the bubble module and Fig. 13B is a side view of the apparatus, showing a bubble module being supported by a conveyor belt.
-Figs. 14A-B schematically illustrate a third embodiment of apparatus for transferring a detached bubble module, wherein Fig. 14A is a perspective view of the apparatus without the bubble module and Fig. 14B is a perspective view of the apparatus, showing a bubble module being supported thereby.
-Fig. 15 is a schematic plan view of an exchange hub and of a transport base transferable thereby for transportation along a water route.
-Fig. 16 is a block diagram of a transportation system according to one embodiment of the present invention.
Detailed Description of Preferred Embodiments

The present invention provides a modular private or public transportation system and method that are capable of quickly transporting passengers on different transportation infrastructures, by enabling, among other features, the transfer of the same passenger modules between two bases (also interchangeably referred to herein as "base chassis", "detachable base", "undercarriage", and "vehicle base") that are transportable by two different transportation methods, respectively, without necessitating a passenger to switch from, or exit, these passenger modules.

The transportation system of the present invention more efficiently avoids traffic congestion and improves travel time efficiency with respect to prior art transportation systems by enabling, for example, the orderly movement of passenger modules on rails or tracks whenever required and providing exchange hubs that enable smooth and optionally on-the-move transition between road transportable bases and rail bases, and vice versa. Thus the public transportation infrastructure can be used with better energy efficiency, more compact infrastructure, and potentially associated lower costs when compared to other forms of travel. The risk of traffic accidents will be reduced by enabling, among other features, the decrease in amount of manually driven or otherwise moved and controlled road, water and air vehicles and enabling massive use of rails, tracks, or other compact vehicle public infrastructures for mostly private use that are conveniently privately or publicly owned.

Fig. 16 shows a block diagram of the transportation system of the present invention. Transportation system 50 is for the use of individual transport modules (also interchangeably referred to herein as "passenger modules", "bubbles", and "bubble modules") which are transferable from one means of transportation to another. In order to facilitate their transfer, the bubbles are configured to be easily interfaceable with one or two types of
vehicles: with a vehicle operable in conjunction with a mass transit system 40 along one or more predetermined routes, and with a passenger steerable vehicle for transportation along a user selected route 55. The predetermined or user selected routes may be along a road, a rail, a track, in the air, or in water. The first type of vehicle may be referred to as a "controlled base" as its route and speed are controlled by computer control system 60, or by any other suitable controller. When the controlled base travels on rails, it will be interchangeably referred to herein as a "rail-base", "rail base chassis", "rail platform", and "rail-vehicle-base". The second type of vehicle may be referred to as an "uncontrolled base" (or interchangeably used with the terms "transport-base", "transport base", "road platform", "transport base chassis", and "transport-vehicle-base") as it is self propelled and self steerable. The bubble is transferred from a controlled base to an uncontrolled base at an exchange hub 44 hub (also interchangeably referred to as a "bubble hub", "transport-rail hub", "transport-rail hub station", "rail-transport hub", "rail-transport hub station", "hub station", "exchange point", "interchange hub", and "interchange area") or from an uncontrolled base to a controlled base at an exchange hub 46, as will be explained hereinafter.

Reference is now made to Figs. IA-D, which schematically show a number of simplified pictorial illustrations of a one passenger uncontrolled vehicle 100 comprising a bubble module 110 and a detachable transport base 120 which in this specific embodiment is a road-base —adapted for traveling on roads, in accordance with an embodiment of the present invention. Typically, the vehicle comprises four wheels 130, two on a front axle 132 and two on a rear axle 134. Alternatively, the vehicle may comprise a different number of wheels and axles. In Fig. 8 is shown a perspective view of an exemplary one passenger vehicle 100 comprising a bubble module 110 and a detachable base 120, according to one embodiment of the present invention.
Uncontrolled vehicle 100 is designed to transport one passenger 176. Other embodiments are directed to multi-passenger modules (not shown). The bubble module is attached to transport base 120 with a mechanical attachment 150. In some embodiments, the attachment may not be mechanical. Additionally, steering and drive system 180 is connected to an engine 182. The engine is typically housed in the vehicle base 120 and is connected to axles 132, 134 to activate the rotation of the wheels 130, by methods known in the art.

The uncontrolled vehicle comprises at least one door 165 and may also comprise a number of windows. Alternatively, some parts of a bubble body 166 may be transparent. The vehicle typically comprises other external car parts and devices such as windshield wipers, mirrors, lamps, one or more radio antennas, as well as internal parts and devices, such as, but not limited to, a set of controls, a dashboard, a radio, a CD player, a mobile phone holder, an automatic gear or a manual gear, and a handbrake. It should be understood that these parts and devices are not shown in full for the sake of simplicity.

In addition to an attachment apparatus for attaching the bubble housing to the transport-base chassis or to the rail-base chassis, the bubble module may include a connection to the steering means of the transport-base and rail-base, thus providing the user with a steering system. In the case of the rail-base, the system may include only basic means such as for example emergency brakes, this is because the rail and track bases move under automatic control. Of course, if full automatic computer control is provided, it is also possible to implement bubble modules without any steering controls for controlling the movement of a bubble vehicle, or any connection of any type between the bubble module and the attached
transport or rail base, other than the one or more attachment mechanisms themselves.

For the transport bases, the system may include controls that are adapted for the respective environment in which the transport bases are designed to travel, such as: for road travel - a plurality of wheels and pedals (which may include gas, brakes, clutch and the like), for water travel —rudder and active propulsion power controls (for an engine or motor for example), for air environment —propulsion power control (e.g. for jet engines, internal combustion engines, or gas turbine powered propellers) and maneuvering controls such as flaps, slats, rudder, propeller attitudes for helicopters and others, as would be readily apparent to those skilled in the art.

The one or more connections between the controllers of the steering system and its active elements that are part of the transport or rail base may be in the form of a direct physical connection, wherein electrical signals and/or mechanical movements are transferred through appropriate wires, rods, levers and the like from the bubble module to the transport base or rail base, as would be understood by those skilled in the art. The physical connections may be formed through physical contact between the aforementioned elements when the bubble is attached to the transport base or rail base. For example, snap-on connectors may be used that are physically engaged with their separate physical interface parts when the bubble module is lowered, raised or slides onto the transport or rail base according to the various particular embodiments of the exchange hub and bubble-to-base attachment mechanism/s. The one or more connectors may also be part of the attachment mechanism for attaching the bubble module to the various base types, wherein parts of each attachment mechanism that comes in physical contact with each other in order to secure and provide support to the bubble module, include these connectors. As would
be apparent to those skilled in the art, a great variety of possible connections are possible that will automatically form the required electrical and/or physical links between the bubble module and the transport or rail base, when the latter are attached to each other. Also, separate means may be provided to attach said connectors on demand, for example a servo motor may be used to extend the connectors from the base to the bubble module so that they engage the respective matching connectors on the bubble module, and/or vice versa.

Alternatively, or in addition (possibly also as a back-up), one or more wireless connections may exist between the bubble module and either one or both the transport base and rail base. The one or more wireless connections can be of short range and low power because of the physical proximity between the base and the attached bubble module. Transfer of the relevant data between the steering controllers in the bubble module and the steering means in the base can take place in this manner. The wireless communication means may be separate or the same as the means used to communicate with the remote automatic computer controller, wherein such exists.

In either case, when a direct physical and/or a wireless data transfer connection exists between the bubble module and the base that is attached to it, other types of information may also be communicated of course. For example, control of various lights (indicator lights, headlights and the like), speedometer and fuel and other possible indications that may be useful to the driver or the one or more passengers, signals for activating emergency collision mitigating measures such as extending bumpers in a road or water base and air bags in the passenger module, and other basic parameters as would be apparent to those skilled in the art.
Furthermore, in some embodiments the bubble module may have its own power source, for example a battery to power lights, screens, communication means and other equipment that the one or more passengers may require. For such embodiments, the power source or batteries can be recharged through the above described connections to the base. Alternatively, the power source may be recharged/refueled from external sources or replaced (as in battery replacement for example). In still other embodiments, the bubble module can lack any power source and power is provided to its systems by the base through the above described connections.

Additionally, the air conditioning system for the passengers space in the bubble module, whenever such is used, may be located in the base and also be connected through various well known air duct connection types as the bubble module is attached to a base. In alternate embodiments, the air conditioning system may be located in the passenger module itself.

Reference is now made to Fig. 2, which is a schematic diagram of a transport-rail hub station 200 for transfer of the bubble module 110 from the detachable road base 120 and attachment to a rail-vehicle-base 220 and vice versa, in accordance with an embodiment of the present invention. The operation of the hub station is described in further detail with reference to Fig. 3 herein below. A vehicle 100 traveling on a road 202 enters the hub station at an entry 204. Vehicle 100 is split at a transport-rail point 240 into the bubble module 110 in which the passenger is seated and the detachable base 120. Detachable bases 120 are transferred by suitable means such as conveyor or rail to base storage area 270. The bubble module 110 is immediately placed on a rail-vehicle base 220 forming an active rail-vehicle 290. As is shown in this embodiment, the rail 230 used may be a monorail. The rail-vehicle exits the station on rail 260, for example.
Reference is now made to Fig. 9A, which is a perspective view of a one-passenger controlled vehicle 900 comprising a bubble module 110 and a detachable rail-base 220, in accordance with an embodiment of the present invention.

Fig. 9B through 9E show a number of simplified pictorial illustrations of a rail-base 220 that is detachable from one-passenger controlled vehicle 900, in accordance with an embodiment of the present invention. Rail-base 220 may be made out of metal or a fairly rigid plastic material. Housed inside rail-base 220 there are upper anterior rollers 904 and matching lower anterior rollers 906 for grasping rail or rails 920. Additionally, there are upper posterior rollers 908 with matching lower posterior rollers 912 for grasping the rail towards the rear of base 220. In some other embodiments, the rollers may be replaced by wheels, cogs or any other suitable means for enabling the movement of the vehicle forwards and backwards along the rail or rails.

Rail-base 220 may be activated electrically, mechanically or by any other means known in the art for rail-vehicles. Upon returning to station 200 (Fig. 2), the active rail-vehicle is split at a rail-transport point 250 into the bubble module 110 and the rail-base 220. The rail bases are transferred and stored in a rail-base storage area 280. It should be understood that there may be a number of rails exiting the station to different destinations. Furthermore, some systems may use double parallel rails as opposed to monorails.

Reference is now made to Fig. 3, which is a flow chart 300 of a method for transportation of an individual using a road-rail combination, in accordance with an embodiment of the present invention. Let us take the example of a London doctor traveling to give a lecture at Cambridge
University. The doctor plans to be at Cambridge University at 2 PM. He is currently at work at University College Hospital on Gower Street. His bubble is parked in the hospital car park. At 9 AM, he sends an SMS to the rail-transport system service provider that he needs to be at Cambridge University at 2 PM and chooses his destination in step 320 (in this case preceding step 310). At noon, the doctor receives an SMS reminder to enter his uncontrolled vehicle (car). In a first traveling step 310, he is guided by GPS instructions how to travel to King's Cross station, avoiding traffic on Euston Road. He follows the GPS instructions. In an arriving step 330, he reaches King's Cross station at 12:18. At King's Cross station, he remains in his uncontrolled vehicle and is given instructions of how to access the exchange point heading in the direction of Cambridge station. In a first detachment step 340, the bubble module is detached from the detachable road base 120. The doctor remains in his bubble module, which is transferred by conveying means onto a rail-vehicle-base 220 in an attachment step 350. These detachment and attachment steps each typically take a few seconds up to a few minutes. The doctor is now in an automated rail-vehicle 900 traveling towards the destination of Cambridge station. The travel time for this rail traveling step 360 is 40 minutes. The doctor works on his laptop and prepares his lecture. Upon reaching Cambridge station, his bubble module is detached from the rail-vehicle-base in a detachment step 370 and is mounted onto another road-vehicle-base 120 in step 380. It is now 13:05 PM. If required, the doctor now drives to Cambridge University and has nearly an hour for lunch and for his final preparations. As can be seen from the above example, the doctor has saved much time, relative to the other transport options. He has used the majority of his travel time for professional purposes, and arrives at his destination without any hassle. Had he traveled by underground, from Goodge St. to King's Cross, he would have had to change trains, wait for the lift (elevator) at Goodge St., run up the escalators at King's Cross, walk along many unpleasantly smelling
passages, go to the train station, pay for a ticket and then wait for a train which makes many stops being of no interest to him. He would also have to find a taxi at Cambridge station. His total travel time would probably have been double using conventional travel methods compared to using the rail-transport travel system of the present invention.

It should be understood that the rail-transport transportation system of the present invention may be fully computerized. A central computer controls the movements of individual and groups of passengers, plans the required stocks of bubble modules, detachable transport bases 120 (or for the above particular embodiment - road-bases) and rail-vehicle-bases 220. The computerized system also defines the track time for maintenance, stocks of spare parts, billing of the individual passengers and groups of passengers, vehicle lease terms for individuals, families, companies and corporations. Typically, an individual will request a journey up-front by electronic means, such as filing a request via the internet, by email, by SMS. Typically, up-front journey scheduling will cost less than ad-hoc journey request (once the bubble enters the transport-rail hub), as the system resources will be more efficiently used. However, the system will also support last-minute requests. Additionally, commuters may have a standardized route leaving a commencement point at the same time every day and reaching a destination at the same time every day. Similarly, their return journey may be predefined and pre-planned.

There may be one or more different companies running the rail-transport system of the present invention. There may be one or more transport companies and one or more rail companies. The companies are responsible for the tests and insurance of the bubble modules and bases, the maintenance thereof, accident prevention, collision prevention and the like. According to some embodiments, it may be possible to allow children to man the vehicles too.
The system of the present invention provides synchronized traffic management. The computer thereof will typically store customer IDs in a database. Additionally, the whereabouts of both the bubble modules and the bases may be known in real-time by means of GPS systems, as is known in the art. The computer may generate statistics on client movement and may predict shortages of bubbles or bases and move them, passenger-less as may be required to a suitable hub or storage area. The advantages of the system of the present invention include it being:

• Environmentally friendly;
• Energy saving;
• Time saving;
• Pollution reduction;
• Accident reduction or elimination;
• User-friendly (a commuter can use most of his travel time in the rail-vehicle for other purposes);
• Reduction in losing one's way;
• No requirement for individual large capital expense; and
• Individual may choose level of cost and vehicle brand, size, accessories and gadgets

Figs. 4-7 shows schematic diagrams of a layout of transport-rail hub stations 200A-D, respectively, for transfer of a bubble module from a detachable transport-base and attachment to a rail-vehicle-base and vice versa, in accordance with embodiments of the present invention. Storage areas of bubble modules and other vehicle parts are shown, in accordance with an embodiment of the present invention. The references cited herein teach many principles that are applicable to the present invention. Therefore, the full contents of these publications are incorporated by reference herein where appropriate for teachings of additional or alternative details, features and/or technical background.
An exemplary locking mechanism 1000 for attaching or detaching the bubble module from transport or rail bases according to one of the embodiments of the present invention is schematically illustrated in Figs 10A-D. Locking mechanism 1000 is preferably generally of the quick release pin type. Using a plurality of such locking mechanisms, the bubble module can be safely transported upon each type of base and attached or detached at will at the interchange hubs.

Fig. 10A schematically illustrates a vertical cross-sectional view of female part 1005 of the locking mechanism, which is attached to the bubble module. Female part 1005 comprises a vertical cylinder or tube 1003 having, at one point along its length, a circular groove 1001 which is formed on its inner wall 1002, and a flange 1004 substantially perpendicular to wall 1002.

Fig. 10B schematically illustrates a vertical cross-sectional view of male part 1010 of the locking mechanism, which is attached to the transport or rail base. Male part 1010 comprises a vertically displaceable rod 1012 having a circular cross-section which is formed with, at an upper region, a circular groove 1013. A wheel 1015 is rotatably mounted to the bottom portion 1021 of rod 1012. Rod 1012 is housed in a mostly cylindrical base 1011, and extends through an aperture 1024 formed in a bottom wall 1025 of base 1011, to allow for the vertical displacement of rod 1012. Cylindrical base 1011 may be part of, or is attached to, the chassis of a rail or transport base through dampening springs. The upper section 1017 of the cylindrical base 1011 has an outer radius just slightly smaller than that of the inner radius of tube 1003 of female part 1005. Base 1011 is configured with a flange 1026 that extends perpendicularly from, and below, upper section 1017. In addition, a circular protrusion 1014 extends radially outwardly from the perimeter of rod 1012, at a lower region thereof.
Protrusion 1014 is used for limiting the downward displacement of rod 1012 until contacting bottom wall 1025 upon cessation of an upwardly directed force, as shown in Fig. 10D.

Male part 1010 is provided with a plurality of balls 1018, e.g. ball bearings, which may be initially inserted from within the cylindrical base 1011 and are normally received in groove 1013. The periphery of upper section 1016 is formed at a common height with a number of apertures 1016, e.g. two or three, so that the plurality of balls 1018 are also received in a corresponding aperture 1016. Each aperture 1016 is also so shaped, for example by means of a variably shaped lip 1019 extending from the periphery of upper section 1017, such that a ball 1018 may partially protrude from the periphery of upper section 1017 when the ball 1018 is pushed in a radially outward direction, as shown in Fig. 10D.

Fig. 10C and Fig. 10D schematically illustrate the attachment process for this locking mechanism.

As can be seen in Fig. 10C, when a transport or a rail base carrying a passenger bubble module moves to an exchange hub, a raised track 1020 applies an upwardly directly force that urges wheel 1015 upwards, consequently raising rod 1012 together with base 1011. In the raised position of rod 1012, the walls of groove 1013 apply a dislodging force F onto the balls 1018. When base 1011 is fully raised such that flange 1026 thereof is in abutting relation with flange 1004 of female part 1005, as shown in Fig. 10D, each ball 1018 is dislodged from groove 1013 and is received in both an aperture 1016 of upper section 1017 and in groove 1001 of female part 1005, thereby locking together female part 1005 and male part 1010. Rod 1012 is then lowered after wheel 1015 passes over the edge of raised track 1020, and upper surface 1027 thereof applies a radially outwardly directed retaining force R onto the plurality of balls.
1018, to ensure a positive locking action between the bubble module and the base, whether a transport-base or a rail-base.

Male part 1010 becomes subsequently disengaged from female part 1005 when rod 1012 is vertically displaced again by means of a raised track 1020. Rod 1012 ceases to apply the radially outwardly directed retaining force R when being upwardly displaced. Lips 1019 may also apply a dislodging force F onto balls 1018 when upper surface 1029 of rod 1012 contacts upper section 1017 of base 1011. Each ball 1018 is therefore forced radially inward and then received in groove 1013 of base 1011, to couple together base 1011 and rod 1012, as shown in Fig. 10C.

It will be appreciated that the movement of rod 1012 and balls 1018 may be assisted by means of a spring based force.

Once male part 1010 is disengaged from female part 1005, the bubble module is no longer attached to the rail/transport base. The bubble module may therefore be lifted, or the transport/rail base may be lowered below the bubble module, to allow the rail-base and transport-base to be exchanged.

Wheel 1015 is preferably housed in an enclosure which is normally closed to prevent the wheel from being displaced upwardly by an impediment on an underlying road surface, yet which is openable in the vicinity of the exchange hub in order to detach the bubble module from the transport or rail base.

As previously mentioned, a plurality of such locking mechanisms can safely secure the bubble module to the transport or rail base. Groove 1001 may be circular, despite the fact that this still allows rotation of tube 1000 around cylindrical base 1011, because once at least two locking
mechanisms are used the rotational degree of freedom in the locked state is eliminated. Tube 1000 and the mail part 1011 of the locking mechanism may be attached with springs, which may also serve to dampen vibrations and sudden velocity changes, to the bubble module chassis and the rail or transport base chassis, respectively.

Other embodiments of a mechanical locking mechanism well known to those skilled in the art for safely attaching the bubble module to either a transport or a rail base may also be employed. In addition, electromechanical, magnetic, gas pressurized and other generally known locking mechanism types may also be used. For example, a possible modification of the locking mechanism described in Figs. 10A-D can make use of a servo motor to raise rod 1012. Furthermore, the entire male part 1010 of the locking mechanism may be vertically displaceable with respect to the transport or rail base upon which it is mounted, thus not necessarily requiring lifting of the bubble module or lowering of the transport/rail base with respect to each other in order to unlock it.

Fig. HA through HD schematically illustrate a first embodiment for operating an exchange hub, wherein rails 230 and transports 202 are positioned for easy drive-through or on-the-move type exchange of the bubble module 110 between a transport base 120 and a rail base 220. Posts 1101 support guides 1102 and may partially contain a drive system, which is primarily housed in guides 1102. Raised tracks 1020 are also shown and, as previously described, may be used to engage and lock or unlock the locking mechanisms, three for this exemplary embodiment, between the bubble module 110 and its undercarriage.

Fig. HA shows a plan view and Fig. HB shows a perspective view of the exchange hub. Fig. HC shows a magnified plan view of the center of the exchange hub where the exchange itself takes place and where the
transport base 120, rail base 220 and bubble module 110 travel separately, after the bubble module 120 is released from transport base 120 and has not yet become attached to rail base 220. Fig. 11D shows a front view of the bubble module 110 suspended from its sides by the guides 1102, during the transition from one type of undercarriage to another, with no undercarriage currently underneath it.

According to the above first embodiment for operating an exchange hub, the drive-through or on-the-move exchange is designed to maximize the traffic load that moves through the hub. The exchange itself, wherein the bubble module 110 is detached from one transport/rail base and then moved and attached to another rail/transport base, may be performed within several seconds according to the above embodiment and without even bringing the bubble module 110 to a full stop. All the vehicles at the interchange hub move in a continuous chain, closely following each other, and the entire process of entering the hub area and exchanging bases, prior to resuming travel to the required destination, is performed in less than one or two minutes. The speed of the bubble vehicles during this on-the-move exchange can even be as high as 20-30 km/hr, although even much higher speeds may be achieved with various efficient designs of the exchange hubs as can be understood by those skilled in the art.

A computerized automatic controller 60 (Fig. 16) remotely controls the movement of the rail and transport bases at the interchange area, preferably through an RF link, and directly controls the operation of motors 1203 through a wired connection, according to the predefined exchange parameters and possibly making further use of data received from distance measurement sensors installed at the exchange area, as is well known to those skilled in the art.
Fig. 12A and 12B schematically illustrate the apparatus for transferring a detached bubble module. As previously mentioned, during the transition from one type of base to another, the bubble module 110 is guided and suspended in the air by a pair of guides 1102. Fig 12A shows one of the guides 1102 at a closer look. Guide 1102 is preferably made of hollow metal beams having, in this particular embodiment, circular cross sections. Inside the guides, multiple rollers 1201 are assembled along the rail, with their upper and lower crest protruding outside of the guide 1102 profile. The rollers 1201 support the bubble module's 110 body weight while it is suspended by the guides, and enable the bubble module 110 easy motion along the length of guides 1102.

Guides 1102 are also adapted to move the bubble module 110 along their length by means of a drive system embedded therewithin, which may use a variety of standard and well known motion elements such as a chain, belt or helical screw coupled to a servo-motor, as well as electronic linear drive/actuator, a hydraulic or pneumatic motor and other drive systems well know to those skilled in the art. In Fig. 12A, pushers 1202 which outwardly protrude from the guide 1102 are connected to the drive system and interact with the bubble module's 110 body by pushing it from behind along the length of guide 1102. A magnified view from behind the bubble module 110 showing it being pushed along guide 1102 by pusher 1202 is shown in Fig. 12B. Guide 1102 also has along its length a double groove 1203 which enables movement of pushers 1202 along the length of the guide 1102 in one direction and then backwards in the opposite direction similar to a conveyor belt.

The rate at which pushers 1202 are displaced may be changed in response to the speed of the rail and transport bases in the vicinity of the exchange hub, to avoid interference with bubble module 110. Bubble module 110 is then pushed after being supported by the posts 1101 and guides 1102.
Alternatively, pushers 1202 may be folded towards guide 1102 when contacted by bubble module 110 and then displaced by the drive system.

Alternatively, pushers 1202 may for example be moved backwards and forwards along the same side of guides 1102 while pushing bubble module 110 in one of the directions or in opposite directions on each pass for a two-way exchange hub.

The above arrangement of guides 1102 enables a free separate selection of the proper drive system for moving the bubble module 110 along the guides, without the need for said drive system to support the bubble module's 110 weight, with and without a passenger, because this task is performed by rollers 1201 and guides 1102. The arrangement also enables pushing of the bubble module 110 along the guides 1102 by hand in the case of a mechanical or electrical malfunction of the drive system.

Pushers 1202 push bubble module 110 through simple physical contact. However, use can also be made of permanent magnets attached on pushers 1202 and on bubble module 110 that can repel each other's magnetic field to push the bubble module 110 from behind. Alternatively, the arms can make use of electromagnets.

As an alternative, the rollers may be part of the bubble module 110 and be mounted on guides that are also part of the bubble 110. The guides with roller will then move into geometrically corresponding framed supports at the exchange hub. The drive system and pushers will then be separately implemented in a similar manner to the above.

Alternatively, instead of using rollers 1201 and pushers 1202, a Maglev system may be used, wherein the bubble module 110 is made to levitate by means of permanent magnets or electromagnets mounted in both the
supports and, the bubble module 110, and electromagnets may further be used to provide a force vector parallel to the supports in order to move the bubble module 110, as is well known to persons skilled in the art.

Fig. 13A and 13B schematically illustrate a second embodiment of apparatus for transferring a detached bubble module. Fig. 13A shows a side view of the exchange hub area, which comprises a section of a rail 230 and a section of a road 202. Each guide is implemented in this embodiment as a horizontally oriented and longitudinally displaceable continuous conveyor belt 1302 that is driven by a plurality of motors 1303 being supported by corresponding posts 1304 on the relevant side of conveyor belt 1302 and raised tracks 1020. As previously described, a computerized automatic controller 60 (Fig. 16) remotely controls the movement of the rail and transport bases at the interchange area, preferably through an RF link, and directly controls the operation of motors 1303 through a wired connection, according to the predefined exchange parameters and possibly making further use of data received from distance measurement sensors installed at the exchange area, as would be apparent to those skilled in the art.

Fig. 13B schematically illustrates a side view of the exchange hub area on the side of the rails 230, this time including the bubble module 110 and the rail base 220, thus illustrating the exchange process. According to this embodiment, the bubble module 110 is configured with two horizontal projections 115 which extend laterally from each side of the bubble module. Each projection 115 slides onto, and is supported by, a corresponding conveyor belt 1302 while bubble module 110 is still attached to rail base 220. At this point, the conveyor belts 1302 are parallel to the rails 230. As rail base 220 drives over raised tracks 1020, the locking mechanisms are opened and the bubble module 110 is no longer physically attached to rail base 220, but rather only sits on top of it. As rails 230
decline relative to conveyor belts 1302, rail base 220 changes its orientation while it continues to move in unison with the bubble module 110 which is slowly lifted off of rail base 220, at least until the locking mechanism parts disengage from each other. As previously mentioned, the parts of the locking mechanism, as described in Figs. 10A-D, may also be connected to the bubble module 110 and/or the rail base 220 with springs, that can be used for dampening vibrations and velocity changes, as already described above, and also allow a small tilt of the locking mechanism parts relative to the vertical axis of the bubble module 110 and/or the rail or transport base, so that the two parts of each locking mechanism may more easily slide apart as the height between bubble module 110 and rail base 220 increases.

As is apparent from Fig. 13B, the illustrated procedure may also be carried out in reverse, wherein a rail base 220 rises to meet the bubble module 110, the locking mechanism parts engage each other and later lock together as they are driven off of raised tracks 1020, and rail base 220 continues to move away on rails 230 as bubble module 110 is safely secured upon it. Also apparent is that the same procedure and its opposite may be carried out in a similar way on the road 202 side of the exchange hub area, wherein rail base 220 is substituted by a transport base 120.

Conveyor belts 1302 may also move bubble module 110, for example, to a storage area for later use, maintenance and etc. as required.

In Fig. 13A and Fig. 13B the conveyor belts 1302 are straight. However, as would be apparent to those skilled in the art, conveyor belts 1302 may also rise in elevation while rails 230 and road 202 remain straight to allow the separation of bubble module 110 from either of the bases.
As an alternative to rollers or a conveyor belt, the bubble module 110 may be transported across supports that are perforated and pressurized air/gas is pumped through the holes, thus levitating the bubble module 110 above the surface. The holes can further be inclined relative to the surface of the supports so as to provide an additional force vector that is parallel to the surface of the supports —to push the bubble module 110 in the required direction.

Fig. 14A and Fig. 14B schematically illustrate a third embodiment of apparatus for transferring a detached bubble module. Fig. 14A shows rails 230 and road 202. Also shown are hydraulic pumps 1403 that are connected through hydraulic fluid tubes 1404 to telescopic hydraulic cylinders 1402 which may lift or lower parallel supports 1401.

Four small raised tracks 1020 are positioned so as to engage the respective locking mechanisms of either the transport or the rail base 220 and lock or unlock them accordingly, as required. Here too, a computerized automatic controller 60 (Fig. 16) remotely controls the movement of the rail and transport bases at the interchange area, and directly controls the operation of hydraulic pumps 1403, according to the predefined exchange parameters and also possibly making further use of distance measurement sensors, as would be apparent to those skilled in the art.

Fig. 14B schematically illustrates bubble module 110 sitting on supports 1401 that are raised by hydraulic cylinders 1402 that are actuated by hydraulic pumps 1403 through hydraulic fluid tubes 1404. The rail base 220 and transport base 120 are also shown with the upper sections of the male parts 1010 of the locking mechanisms protruding above their surfaces. From Fig. 14B the attachment and detachment process is easy to understand: transport base 120 drives the bubble module 110 over supports 1401 and raised tracks 1020 so that the locking mechanisms
1010 are opened, as previously described and illustrated in Figs. 10C and 10D, then hydraulic cylinders 1402 lift supports 1401 that in turn lift upon them the bubble module 110. Once the female parts of the locking mechanisms of bubble module 110 clear the male parts 1010 of the locking mechanisms of the transport base 120, transport base 120 can drive away without the bubble module 110 back onto road 202 from which it initially approached. Now the rail base 220 may move under the bubble module 110, as raised tracks 1020 engage the male parts 1010 of the locking mechanisms of the rail base 220 they are in the open state, hydraulic cylinders 1402 now lower supports 1401 with bubble module 110 sitting on them until the corresponding parts of the locking mechanisms engage each other, as previously described in Fig. 10C and 10D. The rail base 220 may now move away on rails 230 with bubble module 110 sitting upon it. As rail base 220 moves along the rail 230, raised tracks 1020 end and the locking mechanisms fully and safely lock the bubble module 110 and rail base 220 together.

In this case, the width between the wheels 130 of the wheeled transport base 120 is either larger or smaller than the width between the rails 230 used by the rail base 220. Thus, each exchange hub has tracks to enable the rail base 220 to move under the bubble module 110 same as the transport base 120 without interference between the wheels 130 and the rails 230.

In Fig. 14B the transport base 120 has to drive the bubble module 110 into the exchange point and then move backwards onto road 202, however, as would be clear to one skilled in the art, rails 230 may also be integrated in road 202 along a certain length so that transport base 120 could proceed forward along combined road 202 and rails 230 which may part from each other later at some point, as required.
In this case, the exchange is stationary rather than being on-the-move like in the first embodiment, that is - the rail base 220, transport base 120 and the bubble module 110 come to a complete stop during the exchange process. While this procedure may be less time efficient, as has previously been explained in regard to the first embodiment, it may be better suited in places where traffic is light and a simplified and more compact exchange hub structure is sufficient.

The above procedure needs to take place to allow a transport-to-rail base transfer of the bubble module 110. The same procedure, but in reverse, needs to take place to allow the opposite rail-to-transport base transfer of the bubble module 110. One small change would be the reverse orientation of the bubble module 110 and possibly the transport and rail bases in the case that they are not symmetrical around their middle vertical axis, this however is not a problem if the rail and transport bases are allowed easy approach to the exchange hub for each of the two configurations. Alternatively, it is possible to use transport and rail bases that are symmetrical in their driving abilities — both forward and backward, and a symmetrical bubble module 110 inside which the passenger seats and possibly the driving wheel assembly may rotate, if so required.

Of course, multiple alternative implementations of the locking mechanism between the bubble module 110 and transport and rail bases, as well as of the exchange hubs, may exist, as will be readily apparent to those skilled in the art. As an additional example of an embodiment with a stationary exchange process, the bubble module 110 may be attached to the transport or rail base 220 by means of at least one shaped rail that is part of the bubble module 110 which slides onto a corresponding at least one shaped rail that is part of either transport and rail bases. The rails may be shaped in different ways, as would be readily apparent to those skilled in the art, so that once they slide onto each other, only a single degree of freedom
remains between the bubble module 110 and the attached rail or transport base 120. The addition of a simple and compact locking mechanism in the form of a mechanically or electrically actuated stopper that slides into corresponding holes in the rails will eliminate this remaining degree of freedom. The rail that is part of the bubble module 110 may be longer than the rail that is part of the transport or rail base 220, so that at an interchange hub the excess length of the bubble module's 110 rail may slide onto a corresponding rail that is part of the hub and a motor may be used to force the bubble module 110 to slide from the rail of the transport or rail base 220 to the corresponding rail of the interchange hub. The motor may, for example, turn a cogwheel wherein the cogs correspond with holes or grooves in the rail of the bubble module 110 to pull it across the corresponding shaped rail of the transport or rail base 220 and the exchange hub. A similar but reversed process will need to take place for sliding the bubble module's 110 rail onto a corresponding rail of a new transport or rail base 220, as required.

The main embodiments and examples that have been described above mostly described a particular embodiment wherein the transport bases are road-vehicle-bases (or road bases) and the exchange hub has the form of a rail-road hub or vice versa. It should be clearly understood however, that according to the present invention the transport base may also be implemented as an air and water base in addition to a road base, as well as combinations thereof. For example, an air base that can land or takeoff and also drive on road/s, with or without the attached bubble module. In such embodiments, the air-base can for example be propelled by means of jet-engines, an internal combustion engine/s or a power turbine coupled to propellers, and other well known air transport propulsion means, and have various known wing and tail designs with flaps, ailerons and slats to enable flight control (or "steering"). Alternatively, an air-base may be propelled using a power turbine or an internal combustion engine that
rotate one or more helicopter rotors, and flight control is provided by an additional smaller propeller and tilting of the rotors similar to a helicopter.

Additionally, it should be clearly understood, that according to the present invention the exchange hubs may be implemented in ways that allow transfer of the bubble module to an air base or to a water base. For example:

- An air base may fly or hover above the bubble module and attach itself to a bubble module from above and then proceed to fly together as a single air-vehicle configuration (somewhat like a cargo helicopter), and vice versa — the air base may deliver the passenger module to an interchange hub and detach it before it is transferred to a rail-base.
- A bubble may be lowered onto a floating water base, become attached to it and this water-vehicle may proceed to move together on water, and vice versa.
- A passenger module may be transported on a hovering base - hover-base, which is generally defined as an air base because it travels in the air, and transported as well as exchanged by said hover base on both roads and water.

Fig. 15 schematically illustrates a transport base 1520, which in this particular embodiment is a water base, on water and the water side of the exchange hub. Transport base 1520 can have the lower side of a standard boat, including an engine with a propeller. Bubble module 110 slides on a single guide support 1502, after being disconnected from its rail base, having two rows of rollers and a central channel from which protrude pushers that push bubble module 110 along the guide support 1502. Guide support 1501 is itself supported by posts 1501. The guide support 1502 mechanism in this example is generally similar to the double guide
embodiment of Figs. 12A and 12B. Transport base 1520 approaches the area of the exchange hub in order to engage bubble module 110. Guides 1503 are used to assist transport base 1520 in correct positioning for the exchange. Transport base 1520 further includes locking mechanism parts 1504 on its sides. Matching locking mechanisms can be lowered from the undersides of bubble module 110 to engage locking mechanism parts 1504 in the water base and safely attach and secure bubble module 110 to transport base 1520. For example, servo or linear electrical motors coupled to the locking mechanism parts in bubble module 110 may be used to perform this task.

While some embodiments of the invention have been described by way of illustration, it will be apparent that the invention can be carried into practice with many modifications, variations and adaptations, and with the use of numerous equivalents or alternative solutions that are within the scope of persons skilled in the art, without departing from the spirit of the invention or exceeding the scope of the claims.
CLAIMS

1. A mass transit transportation system, comprising:
   a. an uncontrolled, self-propelled chassis base for transportation along a user selected route;
   b. a controlled chassis base for transportation along a predetermined mass transit route;
   c. a plurality of passenger modules for seating at least one passenger, each of said passenger module being attachable to, and detachable from, a corresponding uncontrolled base or a corresponding controlled base;
   d. a first set of interface devices for releasably connecting, upon demand, one of said passenger modules and one of said uncontrolled bases;
   e. a second set of interface devices for releasably connecting, upon demand, one of said passenger modules and one of said controlled bases; and
   f. a plurality of mass transit interchange hubs for interchanging an uncontrolled base and a controlled base, at each of said interchange hubs one of said passenger modules is transferable from one of said uncontrolled bases to one of said controlled bases using said first set of interface devices and from one of said controlled bases to one of said uncontrolled bases using said second set of interface devices.

2. The system according to claim 1, wherein each uncontrolled base comprises propulsion means and steering means that are passenger adjustable, for generating and controlling a propulsion vector.

3. The system according to claim 1, wherein each controlled base comprises communication means for communicating with a computer control system and transportation means for controlling the speed and
direction of the control base in response to commands from said control system.

4. The system according to claim 1, wherein an uncontrolled base and a controlled base are interchanged at one of the hubs while the at least one passenger remains in the passenger module.

5. The system according to claim 1, further comprising a computer control system for controlling the movement of a plurality of passenger modules, uncontrolled bases, and controlled bases in the vicinity of an interchange hub, and the movement of a plurality of controlled bases along the mass transit route.

6. The system according to claim 1, wherein one first set of interface devices and one first set of second interface devices is a releasable locking mechanism.

7. The system according to claim 6, wherein the locking mechanism comprises a female grooved member attached to the passenger module, a vertically displaceable rod housed within the controlled and uncontrolled bases, a contact element attached to a distal end of said rod, and engagement elements which are caused to be seated in the groove of said female member following application of a first controlled force to said contact element and subsequent upward displacement of said rod and to be disengaged from the groove following application of a second controlled force to said contact element.

8. The system according to claim 6, wherein each interchange hub comprises support means for suspending the passenger module following release of the locking mechanism.
9. The system according to claim 8, further comprising guide means by which the suspended passenger module is guided to a second location when being transferred from a controlled base to an uncontrolled base or from an uncontrolled base to a controlled base.

10. The system according to claim 9, wherein the guide means is at least one elongated guide connected to a post, each of said guides comprising:
   a. a plurality of longitudinally spaced rollers for rollingly supporting a passenger module when being longitudinally displaced along said guide;
   b. a drive means housed within said guide;
   c. one or more longitudinally displaceable pusher devices driven by said drive means, for pushing a passenger module along said guide to the second location.

11. The system according to claim 10, wherein the pusher devices are rubber made rollers/wheels that are placed at both sides of the module and propelled by an electric motor.

12. The system according to claim 10, wherein each pusher device comprises one or more permanent magnets or electromagnets which interact with permanent magnets that are attached to the passenger module.

13. The system according to claim 10, wherein each pusher device is an electromechanical or hydraulic device.

14. The system according to claim 10, wherein the guide means comprises at least one conveyor belt and one or more motors for driving each of said conveyor belts, a projection extending from a passenger module body being
supported by each conveyor belt while the passenger module is guided to the second location.

15. The system according to claim 10, wherein the support means have one or more perforated surfaces arranged such that pressurized gas is dischargeable through holes of said one or more perforated surfaces, whereby to levitate the passenger module above said support means.

16. The system according to claim 15, wherein at least some of the holes are inclined with respect to the one or more perforated surfaces so that the discharged gas will guide the passenger module to the second location.

17. The system according to claim 6, wherein each interchange hub comprises a plurality of hydraulic cylinders for suspending the passenger module following release of the locking mechanism.

18. The system according to claim 8, further comprising a computer control system for controlling the operation of the guide means.

19. The system according to claim 1, wherein each interchange hub further comprises one or more of the following features:
   a. an uncontrolled interchange entrance through which the plurality of uncontrolled bases enter the hub from the user selected route before the corresponding passenger modules are transferred to a controlled base;
   b. an uncontrolled interchange exit through which the plurality of uncontrolled bases exit the hub to the user selected route after the corresponding passenger modules have been transferred from a controlled base;
   c. a controlled interchange entrance through which the plurality of controlled bases enter the hub from the predetermined mass transit
route before the corresponding passenger modules are transferred to a controlled base;

d. a controlled interchange exit through which the plurality of controlled bases exit the hub to the predetermined mass transit route after the corresponding passenger modules have been transferred from an uncontrolled base;

e. one or more first switching stations at which a passenger module is detached from an uncontrolled base and re-attached to a controlled base;

f. one or more second switching stations at which a passenger module is detached from a controlled base and re-attached to an uncontrolled base;

g. a first storage area for storing unused controlled bases after becoming detached from a first passenger module and before being re-attached to a second passenger module, further comprising a first storage area exit through which an unused controlled base is delivered to a first switching station and a first storage area entrance through which an unused controlled base is delivered from a second switching station; and

h. a second storage area for storing unused uncontrolled bases after becoming detached from a first passenger module and before being re-attached to a second passenger module, further comprising a second storage area exit through which an unused uncontrolled base is delivered to a second switching station and a second storage area entrance through which an unused uncontrolled base is delivered from a first switching station.

20. The system according to claim 1, wherein the predetermined and user selected routes are selected from the group of route types consisting of a route along a road, a route along a rail, a route along a track, a route in the air, and a route in water.
21. The system according to claim 20, wherein the passenger module is multifaceted and is operable in more than one route type.

22. The system according to claim 5, wherein the computer control system is operable to control one or more system features selected from the group consisting of:
   a. a stock of controlled bases at each interchange hub;
   b. a stock of uncontrolled bases at each interchange hub;
   c. movement of controlled bases at each interchange hub;
   d. movement of uncontrolled bases at each interchange hub;
   e. synchronization of passenger module detachment from an uncontrolled base at each interchange hub;
   f. synchronization of passenger module attachment to a controlled base at each interchange hub;
   g. synchronization of passenger module detachment from a controlled base at each interchange hub;
   h. synchronization of passenger module attachment to an uncontrolled base at each interchange hub;
   i. a predetermined interval between controlled bases along a mass transit route;
   j. location of controlled bases along a mass transit route;
   k. distribution of controlled bases throughout the transportation system;
   l. preventative maintenance of passenger modules, controlled bases and uncontrolled bases;
   m. supply of spare parts for passenger modules, controlled bases and uncontrolled bases;
   n. distribution of spare parts for passenger modules, controlled bases and uncontrolled bases;
   o. client accounts for purchase of passenger vehicles;
p. client accounts for lease of passenger vehicles;
q. smart card accounts for pay-as-you-use for passenger vehicles; and
r. accident prevention systems for passenger vehicles.

23. The system according to claim 22 wherein the uncontrolled base further comprises means for initiating temporary computerized control along the user selected route.

24. The system according to claim 23, wherein the computer control system is further operable to control one or more system features selected from the group consisting of:
   a. location of uncontrolled bases along a user selected route;
   b. a predetermined interval between uncontrolled bases along a user selected route; and
   c. distribution of uncontrolled bases throughout the transportation system.

25. The system according to claim 1, wherein the passenger module is configured to seat one passenger.

26. The system according to claim 20, wherein the uncontrolled base is operable along a road and comprises an internal combustion engine, a transmission, and wheels for engaging the road, and the controlled base is operable along a rail or track and comprises a member for engaging a rail or track surface.

27. The system according to claim 26, wherein the passenger module comprises a steering system interfaceable with the engine of the uncontrolled base.
28. A method for private or public transportation using public transport infrastructures, the method comprising enabling a passenger to travel along both a road and a rail in a passenger vehicle without exiting a passenger module, wherein the passenger module is attachable to, and detachable from, both a transport-base and a rail-base.


30. A method according to claim 28 or 29, comprising enabling the passenger to steer the passenger module attached to the transport-base.

31. A method according to claim 28 or 29, comprising enabling the passenger to be transported on rail in the passenger module attached to the rail-base.

32. A method according to claim 28 or 29, further comprising detaching the passenger module from the transport-base at a transport-rail interchange hub.

33. A method according to claim 31, further comprising attaching the passenger module to the rail-base at a transport-rail interchange hub.

34. A method according to claim 27 or 28, further comprising detaching the passenger module from the rail-base at the rail-transport interchange hub.

35. A method according to claim 34, further comprising attaching the passenger module to the transport-base at a rail-transport interchange hub.
36. A method according to claim 28 or 29, further comprising controlling a plurality of passenger vehicles on transports.

37. A method according to claim 35, further comprising controlling a plurality of passenger vehicles on rail.

38. A method according to claim 37, further comprising controlling at least one or any combination of:
   a. stock of rail-bases at transport-rail interchange hubs;
   b. stock of transport-bases at rail-transport interchange hubs;
   c. movement of rail-bases at transport-rail interchange hubs;
   d. movement of transport-bases at rail-transport interchange hubs;
   e. synchronization of passenger module detachment from transport-base at transport-rail interchange hubs;
   f. synchronization of passenger module attachment to rail-base at transport-rail interchange hubs;
   g. synchronization of passenger module detachment from rail-base at rail-transport interchange hubs;
   h. synchronization of passenger module attachment to transport-base at rail-transport interchange hubs;
   i. congestion of passenger vehicles on roads/in the air/in the water;
   j. congestion of passenger vehicles on rails;
   k. location of passenger vehicles on roads/in the air/in the water;
   l. location of passenger vehicles on rails;
   m. distribution of passenger vehicles on roads/in the air/in the water;
   n. distribution of passenger vehicles on rails;
   o. preventative maintenance of passenger modules, transport-bases and rail-bases;
   p. supply of spare parts for passenger modules, transport-bases and rail-bases;
q. distribution of spare parts for passenger modules, transport-bases and rail-bases;
r. client accounts for purchase of passenger vehicles;
s. client accounts for lease of passenger vehicles;
t. smart card accounts for pay-as-you-use for passenger vehicles; and
u. accident prevention systems for passenger vehicles.

39. A business method for private individual transportation using public transport infrastructures, the method comprising:
   a. enabling a passenger to travel on both transport and rail in a passenger vehicle without exiting a passenger module;
   b. charging the passenger for the travel on both transport and rail.

40. A method according to claim 39, wherein said charging step is performed on a basis of leasing the passenger vehicle.

41. A method according to claim 39, comprising charging said passenger for his mileage traveled in said passenger vehicle.

42. A method according to claim 39, comprising charging said passenger for purchase of the passenger module.

43. A method according to claim 39, comprising charging said passenger for purchase of the passenger vehicle.

44. A computer software product for public/private transportation using public transport infrastructures, the software product comprising a computer-readable medium in which program instructions are stored, which instructions, when read by a computer, cause the computer to:
   a. enable a passenger to travel on rail, and/or over roads/water/air in a passenger vehicle without exiting a passenger module, wherein the
passenger module is attachable and detachable from both a transport-base and a rail-base.

45. A method for private/public transportation using public transport infrastructures, the method including:
   a. enabling a plurality of passengers to travel both on rail, and/or over roads and/or air and/or water, in a plurality of passenger vehicles, wherein each passenger vehicle includes a passenger module for transporting at least one passenger, which is attachable and detachable from bases;
   b. using a transport-base chassis for transporting said passenger module over one of the following:
      roads;
      air; and
      water;
   c. using a first attachment/detachment mechanism that connects between said passenger module and said transport base chassis;
   d. using a rail-base chassis for transporting said passenger module on rail/s;
   e. using a second attachment/detachment mechanism that connects between said passenger module and said rail base chassis;
   f. using a plurality of transport-rail interchange hubs for transferring said passenger modules from said transport-base chassis to said rail-base chassis using said first attachment/detachment mechanism;
   g. using a plurality of rail-transport interchange hubs for transferring said passenger modules from said rail-base chassis to said transport-base chassis using said second attachment/detachment mechanism; and
   h. enabling each passenger to travel in a passenger module without necessarily exiting said passenger module.
46. A modular vehicle, comprising:

a. an uncontrolled, self-propelled chassis base for transportation along a user selected route;

b. a passenger module for seating at least one passenger attachable to, and detachable from said base;

c. a set of interface devices releasably connecting said passenger module and said uncontrolled base; and

d. passenger adjustable propulsion means and steering means, wherein said passenger module is detachable from said uncontrolled base at an interchange hub and is transferable to a controlled chassis base for transportation along a predetermined mass transit route.
USER TRAVELS IN BUBBLE VEHICLE FROM SOURCE TO LOCAL BUBBLE HUB SYSTEM

USER Chooses DESTINATION

USER ARRIVES AT EXCHANGE POINT

DETACHMENT OF BUBBLE FROM TRANSPORT BASE

ATTACHMENT OF BUBBLE TO RAIL BASE

USER TRAVELS FROM LOCAL BUBBLE HUB SYSTEM TO DESTINATION BUBBLE HUB SYSTEM

DETACH BUBBLE FROM RAIL BASE

ATTACH BUBBLE TO SECOND TRANSPORT BASE

Fig. 3
Fig. 10D