

[54] **INTEGRATED METHOD AND APPARATUS FOR CONTINUOUS PASSENGER OR FREIGHT TRANSPORT**

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[22] Filed: **June 8, 1970**

[57] **ABSTRACT**

[21] Appl. No.: **43,991**

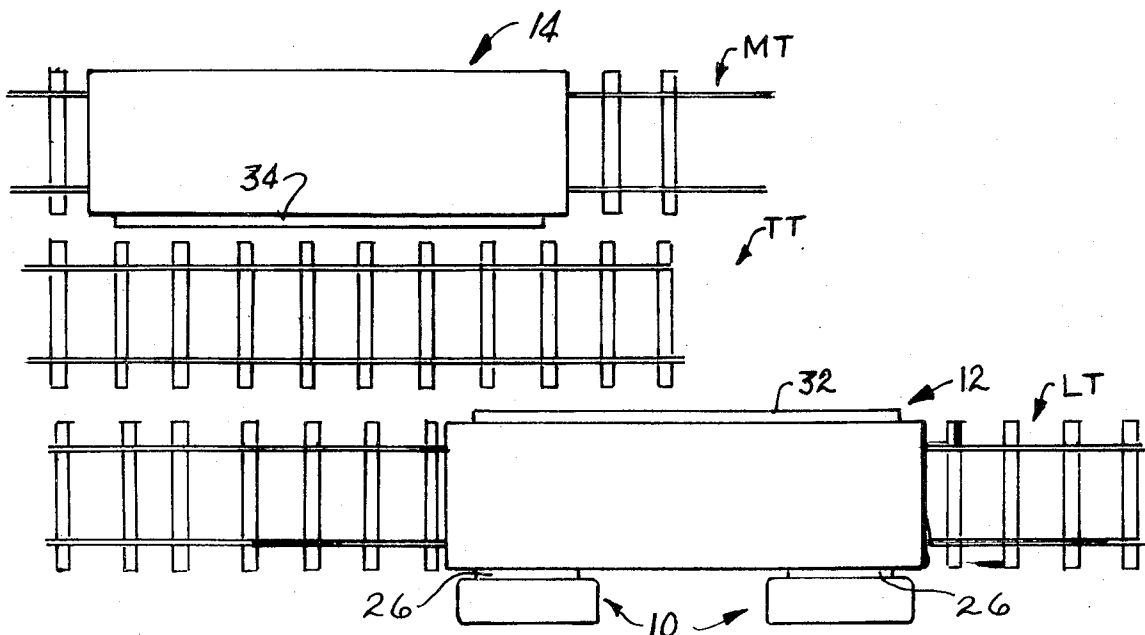
Method and apparatus for continuous movement of passengers or containerized freight at a substantially uniform rate of speed over a roadbed, either rail or highway, comprising a completely integrated system of pick up and delivery service in designated, adjacent roadbed areas, of origin and destination trip recording, and of in motion side-by-side transfer of passengers or freight between transfer vehicles and through transport vehicles at any or all established service areas along the main roadbed.

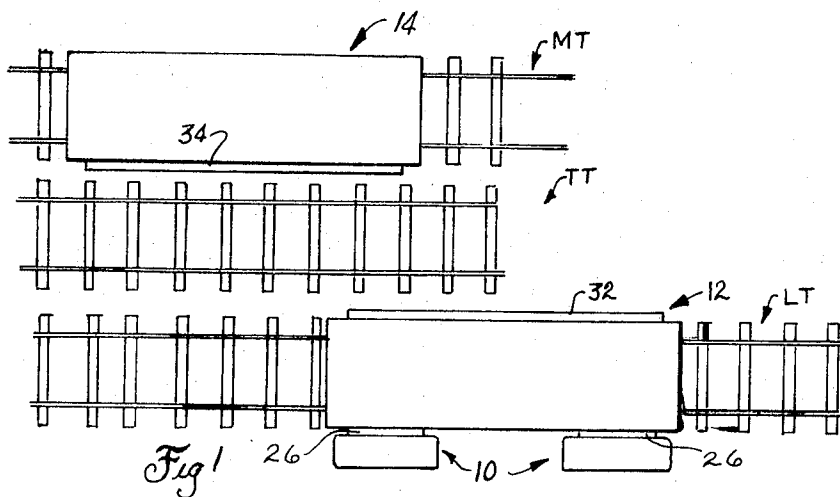
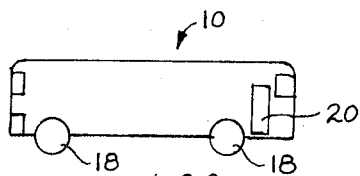
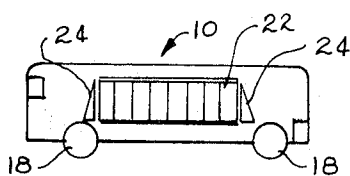
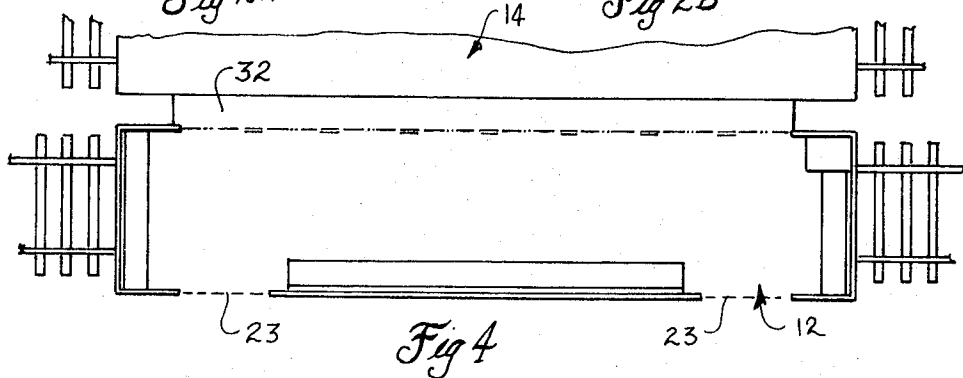
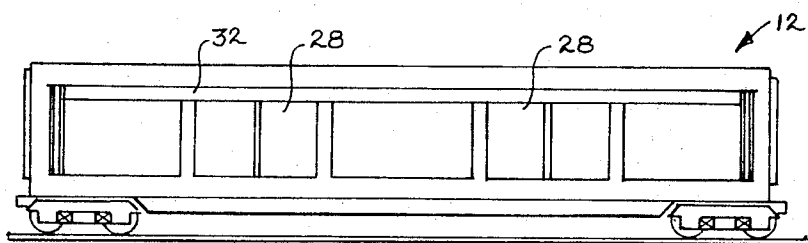
[52] U.S. Cl.....104/88, 104/18
[51] Int. Cl.B61k 1/00
[58] Field of Search.....104/18, 19, 20, 88; 214/38 C; 198/105

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12 Claims, 24 Drawing Figures





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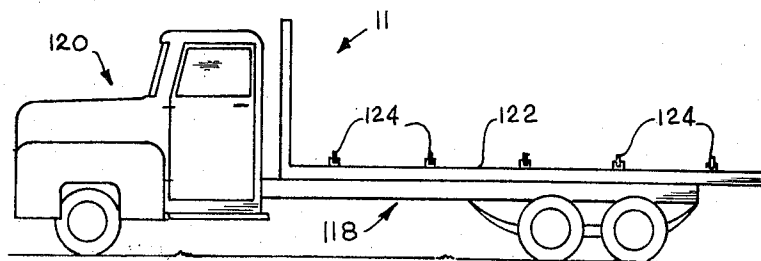


Fig 3

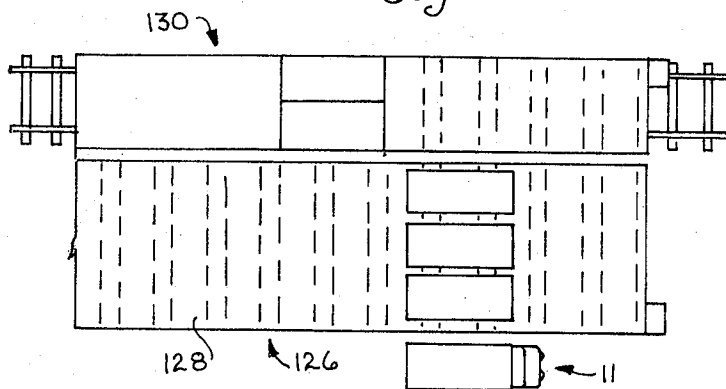


Fig 20

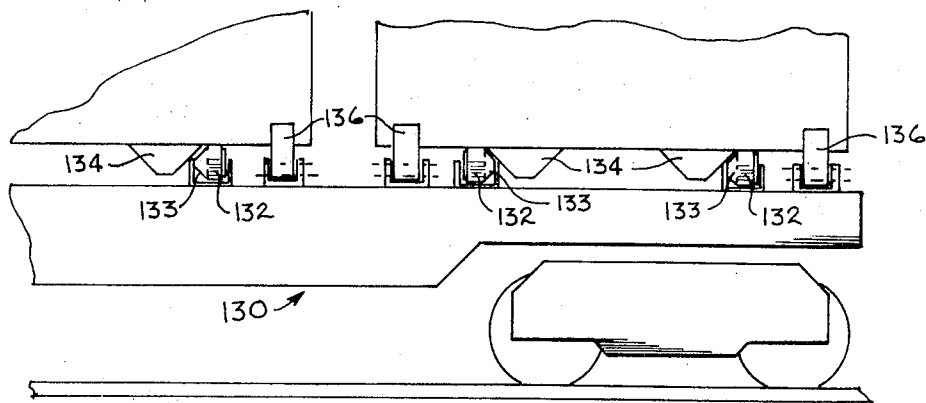


Fig 21

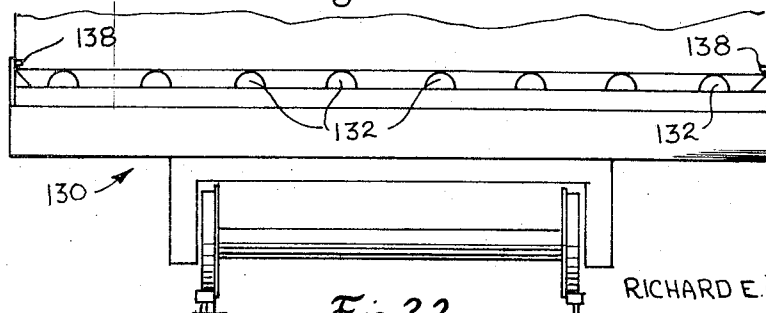
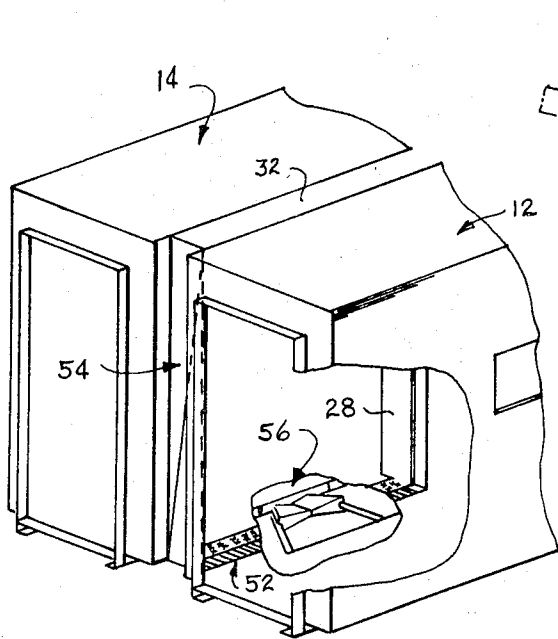
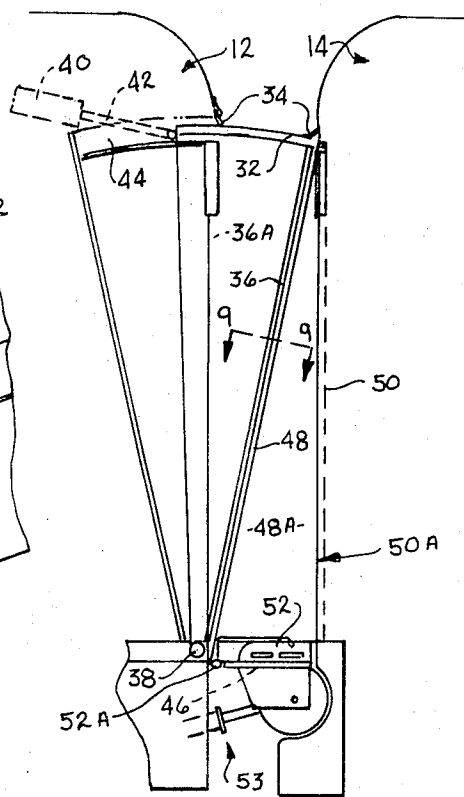
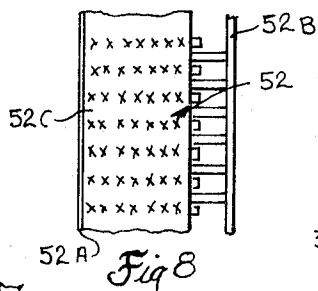
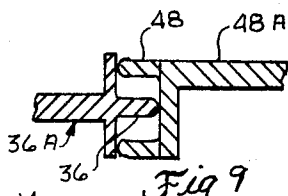
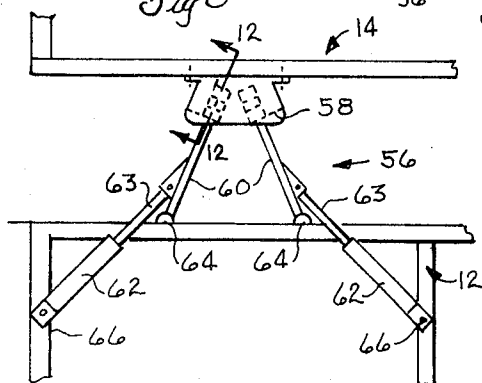
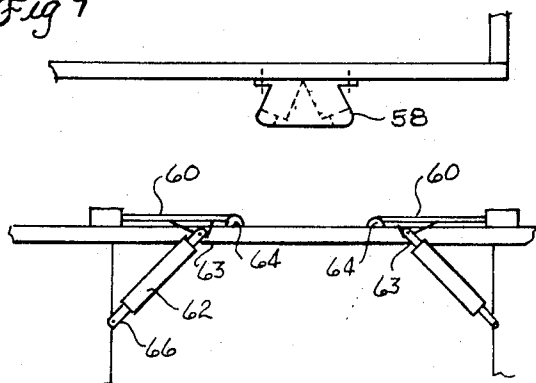


Fig 22

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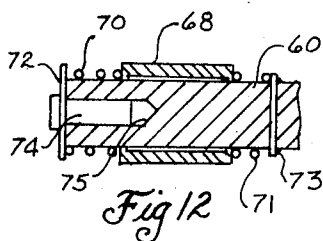


Fig 12

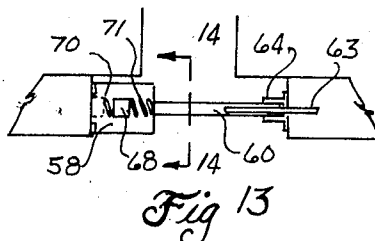


Fig 13

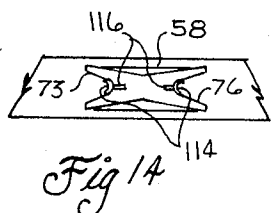


Fig 14

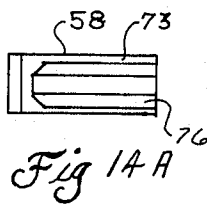


Fig 14A

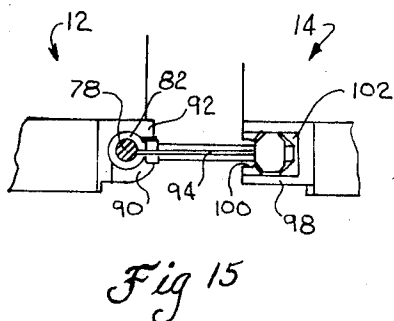


Fig 15

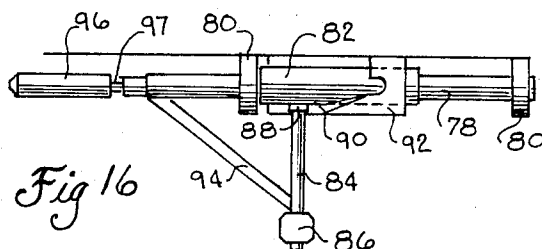


Fig 16

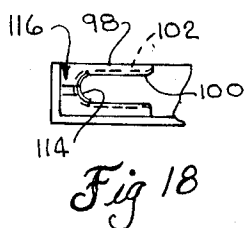


Fig 18

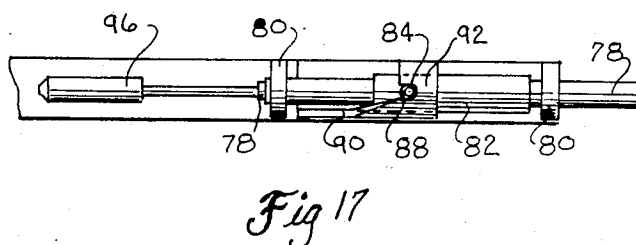


Fig 17

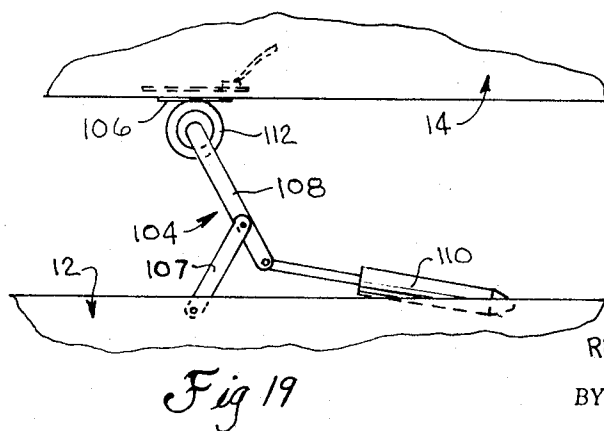


Fig 19

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INTEGRATED METHOD AND APPARATUS FOR CONTINUOUS PASSENGER OR FREIGHT TRANSPORT

BACKGROUND OF THE INVENTION

As anyone who has traveled in the eastern corridor of the United States, or many other parts of the United States and the world, can tell you, there is a great need for a completely integrated transportation system which is available to pick up passengers or freight and deliver them to their desired destination with a minimum of delay and effort. Presently, even under the best of today's transport conditions, mass transit systems, be they plane, bus, or train, can only move you to the vicinity of your ultimate destination. There is no known system which will operate to pick passengers or freight up at a home, office or place of business and deliver them to the ultimate destination. In all cases of mass transit today, the potential passenger must fight his way to a terminal location, find a place to park, fight his way through a crowded terminal; wait and board the transport vehicle and be taken to another terminal location as close as possible to the final destination. Having once arrived in the terminal, preparations must be made to begin to fight from that point to get to the location initially sought.

Before beginning the trip, it is a usual requirement that detailed reservations be made to assure that space and equipment will be available. It is also necessary to arrange for the purchase and pick up of the proper tickets. Any change in plans once the trip has started would cause additional problems, with requirements to re-write tickets, etc., before the journey could be resumed. All in all, considerable problems are involved and often needless delays are experienced.

All these problems are ground related problems. They do not take into account the delays encountered in the air because of overcrowded airports. This presents another whole set of problems which are expected to get worse before they get better. An integrated ground transportation system could serve more people better and save travel time, too.

SUMMARY OF THE INVENTION

Accordingly, in this invention, continuous movement of passengers or freight is produced by a through main transport vehicle which is met at designated points by a transfer vehicle temporarily traveling parallel to the through transport vehicle, between which in motion transfer of passengers or freight is effected by locks, canopies, bridges, doors, switches, controls or cross roller assemblies to be described in the preferred embodiment. The transfer vehicle functions either to take the passengers or freight to a second transfer point where passengers or freight are picked up or delivered in a designated area remote from the main roadbed, or passengers or freight are moved from the transfer vehicle to a waiting pick up/delivery vehicle. Freight may be moved either to a freight transfer platform or to a waiting pick up/delivery vehicle. The pick up/delivery vehicle then moves in a selected area receiving and discharging the cargo (passengers or freight) at an ultimate destination near homes, offices and places of business, the pick up/delivery vehicle being the principal means of entering or leaving the integrated transportation system. To facilitate smooth operation of the system, data related to individual fair collection is re-

corded for each person or piece of freight being received or discharged.

The main object of the invention is then to provide continuous mainline movement of passengers or freight from origin to destination by integrating the movement and functions of the various transport vehicles.

Another object of the invention is to provide vehicles which will pick up or deliver passengers or freight at a location remote from the final destination and deliver the passengers or freight through moving transfers to that destination without intermediate mainline stops.

Another object of the invention is to provide a means on the pick up/delivery vehicle for recording data related to fare for all uses of the system by insertion of a card in the fare recording means on the pick up and delivery vehicles which is automatically code punched or stamped for later fare calculation and billing.

A further object of the invention is to provide means for permitting transfer of passengers or freight from one vehicle to another.

A still further object of the invention is to provide a main or through vehicle having a plurality of transfer cars in its makeup to permit transfer of passengers or freight.

Another object of the invention is to provide transfer cars with improved locking mechanisms for coupling the cars in side-by-side relation to perform the transfer operation.

Another object of the invention is to provide improved enclosure and bridging mechanism between coupled transfer vehicles.

A still further object is to provide means for transferring freight containers from one vehicle to another and to provide means for locking the containers during transit.

These and other objects of the invention will become more apparent from the detailed description of the system to follow.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the three vehicles comprising the transportation system of the present invention;

FIG. 2A is a side view of the passenger pick up/delivery vehicle showing the entrance side;

FIG. 2B is a side view of the same vehicle shown in FIG. 2A showing the transfer side;

FIG. 3 is a side view of the freight pick up/delivery vehicle;

FIG. 4 is a partial plan view of the two high speed guided vehicles in the passenger transfer position;

FIG. 5 is a side view of a typical car of the system;

FIG. 6 is a partial prospective view of the high speed cars in the passenger-freight transfer position with a partial broken away portion to show the coupling member;

FIG. 7 is an end view of the cars in the side-by-side relation;

FIG. 8 is a top view of the expandable platform formed between the cars during transfer;

FIG. 9 is a section view of the end seals taken on the line 9-9 in FIG. 7;

FIG. 10 is a detail view of the car coupling members in the locked position;

FIG. 11 is a detail view of the coupling members in the unlocked position;

FIG. 12 is a section view of the coupling shaft taken on the line 12-12 of FIG. 10;

FIG. 13 is a side view of the coupling member in the locked position;

FIG. 14 is a section view taken along the line 14—14 in FIG. 13;

FIG. 14A is an enlarged side view of the coupling bracket;

FIG. 15 is an end view of an alternate, direct acting coupling unit;

FIG. 16 is a plan view of the alternate coupling design;

FIG. 17 is a side view of the alternate coupling design;

FIG. 18 is a side view of the coupling bracket;

FIG. 19 is a schematic view showing a pressure switch and contact wheel for car coupling;

FIG. 20 is a schematic view showing a typical freight or cargo transfer yard;

FIG. 21 is a partial side view of a typical cargo carrying car; and

FIG. 22 is an end view of the cargo car shown in FIG. 21.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the drawings with specific reference to the numerals, 10 generally designates a first vehicle for picking up passengers, hereinafter referred to, along with freight generally, as cargo, at specific points in any given area served by the vehicle. This pick up and discharge vehicle is shown generally as a bus, but it may be any type of vehicle of a construction of the general type to be described. The bus 10 is adapted to serve certain specific stops or it may be on call to serve any point in its area similar to a taxi service. The bus 10 is comprised of a chassis having wheels 18 thereon and a standard power source (not shown) to propel the vehicle over a roadbed. As shown in FIG. 2A, the bus 10 has an entrance door 20 on one side thereof. It is understood that this door 20 would be large enough to accept luggage as well as passengers. The other side of the bus 10, shown in FIG. 2B, is outfitted with a relatively wide bifolding, sliding or roll-up type doors 22 which extend over a major portion of the bus length to permit easy exit of the cargo. Movable panels 24 are stored in vertical side wall and are movable to an extended position outwardly of the bus side. Appropriate power means (not shown) are provided within the bus to move the doors and side panels. These means, while not specifically shown, might be hydraulic cylinders, electric motors, air cylinders, or other appropriate devices.

The bus picks up cargo along the way and then transports the cargo to a waiting movable station or transfer car 12, shown in FIG. 1. Each person getting on the bus would have an access card having personal information similar to a credit card, imprinted thereon for billing purposes. The traveler puts his card in an appropriate punch or stamping device which registers the origin of ride. Each person would punch, stamp his card at end of ride, as he leaves door 20 on bus.

The card would be for a given number of rides and the person would turn in his used card to the vehicle operator for a new card. The person's identification card would be used to stamp the personal information on the new card. The bus driver turns in the used card to the transport company which runs it through their computer and sends statement to user. In this way, the

person has the freedom of using any section or point that the system serves, just like he uses any amount of water or electricity during the month and pays for it when he gets his statement. The vehicle operator does not need a supply of tickets or transfers. He only has a given number of standard cards. He will have the same number of cards at the end of the day which he seals in his envelop and sends to the company. Of course, some of them will remain unused, while others are used.

A clerk takes out the used cards, checks the total number of cards, sends back a new envelop with a given number of new cards which the driver uses for the following day. The only other item the operator needs is a pad of statements, one of which a person would need to sign if he lost his card and didn't have a used card to turn in.

The computer is the only thing that must know where the person went and the costs involved. The computer knows the pick up charge at each point, which need not be the same at every point, depending on usage, equipment, hours of service, costs, etc. Also, it knows the distance between all points from code marks printed or punched on the card each time it is used. Also, it knows the mainline mileage charge. From the card it makes two sums; one, the sum of the differences between each punch, stamp mark on card which is multiplied by the mileage charge; two, the sum of each pick up delivery charge, both of which make the total statement usage charge.

Once the bus had made its pick ups, the passengers would be transported to transfer vehicle 12 where the bus 10 would pull along side the car 12, as shown in FIG. 1, which would be sitting on a siding or other roadbed LT and into registry with doors 23 on the side of the car. The bus is stopped and platform 26 on car 12 is extended outwardly to form a walk way between the bus and the car. A canopy (not shown) would also be stored on the transfer car 12 and they too extend outwardly to engage bus 10 to cover platform 26. The doors 22 on bus 10 and doors 23 on vehicle 12 are opened and the passengers and their luggage transfer from the bus to the car 12. If any cargo is awaiting the arrival of the bus, it would be transferred into the bus and then taken to its final destination.

Once aboard car 12 the cargo is located in positions which would permit easy exit from the car at a subsequent time. This car would serve as a station at each of its stopping points, receiving and discharging passengers to and from the shuttle busses 10. At specified times the car 12 would move by a conventional self-contained power source or by an engine vehicle as part of a train, along a roadbed to several other predetermined intermediate points and in a similar manner passengers or freight would be received and discharged to and from the shuttle busses serving the new area.

After the local stops are completed, the movable station car 12 is switched to another roadbed TT where it begins to move parallel to roadbed MT at an ever increasing rate of speed. This acceleration would continue until the car 12 reached the speed of a passing through or mainline train so that car 12 is opposite a car 14 on the through train traveling on the other of the parallel roadbed. The speeds of the two transfer cars 12 and 14 would be matched. The speed may be moderately fast or very high, in excess of 100 M.P.H., or more, on improved track. At predetermined locations

along the parallel roadbeds, the two high speed cars forming parts of trains, would be in a side-by-side relation with the relative speeds them being nearly zero. A pressure switch and contact wheel 104, shown in FIG. 19, is provided on the cars of the side-by-side train. A pressure switch 106 is disposed on the through train 14 and a contact wheel device comprising a first arm 107, pivotally connected by one end to car 12 and by the other end to an intermediate portion of an arm 108. Arm 108 is pivotally connected to an operating cylinder 110, pinned at one end to car 12. A wheel 112 is rotatably connected to the outer end of arm 108 and is adapted to be brought into contact with switch 106 by actuation of cylinder 110. The purpose of assembly 104 is to make sure that the cars are in exact side-by-side relation and the relative speeds are within range to trigger a suitable sequence circuit (not shown) on the through or main train. If the roller 112 is in contact with the switch for a given time period, a sequence is begun to lock the two trains together, and to later actuate the platform, the canopy and finally the doors. If the roller does not contact the switch for the specified time period, then nothing happens in the sequence circuit and the speed of the transfer car must be modified to bring the roller into contact with switch 106 for the proper amount of time. At this point, the trains would lock together in a manner similar to that shown in FIGS. 4 and 6, and which will be more completely described in detail hereinafter. The relative motion between the coupled trains is zero or nearly zero. Passengers or freight are then transferred between the two cars, with passengers being directed from the station or transfer car 12 into the through train and vice-versa. In this manner, the continuously moving main train is sped on its way between remote points on a route without delay and the local or transfer car and the shuttle busses assist in the final deployment of the passengers or freight to a plurality of intermediate points.

Turning now to a more specific description of the vehicles and devices needed to accomplish this high speed transfer, refer to FIGS. 5, 6 and 7. Each car 12 is provided with at least one side which is comprised of a plurality of doors 28. They may be either pairs of bi-fold doors, vertical roll-up doors, or any other suitable type which will permit easy efficient passenger transfer. Each of these door sets 28 are actuated by appropriate means (not shown) either manually or automatically at the proper times. Before the doors open, a canopy 32 is activated to the open position from a stored position. As can be seen in FIG. 4, when two high speed transfer cars 12 and 14 come together, the canopy 32 extends from car 12 and its storage pocket to the outer surface of car 14 to completely cover the area between the two cars.

As shown in FIG. 7, canopy 32 extends from storage pocket 44 formed in the upper portion of car 12 by means of several pivotally mounted support arms 36. Each of the several arms 36 are pivotally connected at their lower ends 38 to the car 12. The canopy 12 is forced into and out of the pocket 44 by means of appropriate power means 40 which may be a hydraulic or an air cylinder, a spring, or the like. Upon actuation of the power means 40 by either manual or automatic control means (not shown), the canopy moves toward or away from the outer surface of car 14 and the weather seal strips 34 disposed along the upper portion of each transfer car and extending longitudinally

thereof, to assure that the area between the two cars is completely protected from wind, rain, or the like when the canopy is extended. The ends of the canopy are supported by panels 36A.

A lower seal 46 is simultaneously swung out adjacent the bottom of the transfer cars, as shown in FIG. 7. The lower seal 46 is supported by and is part of an expandable platform 52, shown in FIG. 8. It is in position when platform 52 is in position. End seals 48A are hinged about a vertical line 50 which is shown in FIG. 7 adjacent to the wall of the car 14. The panels 36A and 48A come together on an approximate diagonal, as shown in FIG. 7, and together they make a weather seal. Panels 36A and 48A, each having resilient faces 36 and 48, respectively, form a portion of a sealing means shown in cross-sectional detail in FIG. 9 as a loose tongue and groove arrangement which creates an end seal 54 when the panels 36A and 48A come together. In this manner, the canopy 32, lower seal 46 and the end seals 54 completely enclose the space between the two high speed transfer cars when they are traveling along parallel tracks in preparation to make the passenger transfer.

The expanding platform or floor 52, shown in FIGS. 6, 7 and 8 is pivoted into position about pivot points 52A and 52B between the cars 12 and 14 to form a walk way between the cars. During the transfer operation passengers walk over a covering treadle portion 52C and pass between the cars. Appropriate actuating means 53, such as a hydraulic cylinder, is provided at spaced intervals along the car to pivot the platform 52 into position from a retracted position. Coupling serves 2 purposes. The first to complete side-by-side alignment and the second to maintain side-by-side alignment during transfer.

To safely perform the transfer operation once the cars 12 and 14 have been brought side-by-side, it is necessary to provide some sort of coupling means to complete side-by-side alignment of the cars and to maintain the side-by-side alignment during the transfer operation such as those shown generally by the numeral 56 in FIGS. 6 and 7. As can be seen in the detail drawings FIGS. 10 - 14, the coupling member 56 is comprised of a coupling bracket 58 which may be disposed on high speed car 14 of the main train, a pair of retractable coupling arms 60 and operating means 62. Each of the coupling arms 60 are pivotally connected by their inward ends 64 to the transfer car 12. The outer ends of each arm 60 are provided with a floating sleeve 68 which is cylindrical and concentric with the arm 60. The sleeve 68 is held in place on the arm adjacent the outer end thereof by means of springs 70 and 71, as shown in FIG. 12. The springs 70 and 71 are confined between washers 72 and 73. Washer 73 is fixed to shaft 60 while washer 72 is held in place by means of a fastening device 74. In this instance, a threaded bore 75 is provided in the end of shaft or arm 60 and a screw or bolt is threaded into the bore 75 through a hole in washer 72 to retain the washer, spring 70, sleeve 68 and spring 71 in place on the coupling arms. By this arrangement, the sleeve 68 is free to move both axially along arm 60 against the bias of the springs 70 and 71 and rotate on the arm.

The coupling bracket 58, shown in more detail in FIG. 14, is comprised of a pair of rearwardly converging cylindrical openings, each of said openings having side opening mouth portions 76. The side mouths 76 are provided with inwardly inclined side members. The

side members terminate in the converging cylindrical openings and these openings are adapted to receive and guide the outer ends of each arm 60 therein. The sleeve 68 and bracket 58 form the actual coupling means. Since the sleeve is free to move within certain limitations, movement between the cars is taken up and the connection is not, strictly speaking, rigid.

Cylinders 62 are adapted to power the arms 60 and hold the arms in the extended position, engaging the coupling bracket 58, or in the retracted position, shown in FIG. 11. The operating cylinders 62 are connected by one end through a cylinder arm 63 to the arms 60, intermediate the ends thereof, and by the other end by the cylinder housing to the transfer car frame. The connection between the cylinder and the car frame is a pivotal connection 64, shown in FIGS. 10 and 11. When the cylinders 62 are activated in response to actuation of the sequence circuit, the cylinder and arms 60 are caused to pivot about their respective connections 66 and 64, to or from the retracted position to or from the engaged position. In the engaged position, the arms 60 are forced outwardly of transfer car 12 and the floating sleeves 68 of each arm are received and engaged by the coupling brackets 58. In this way, a yieldable connection is formed between the two cars at the point of connection. A similar connection is made at the other end of the side-by-side cars and other connections may be made at spaced intervals therebetween. The connections are yieldable within the limits of the floating sleeve 68 to take up shock loads and relative movement between the cars due to uneven roadbeds or non-parallel portions thereof. When the passenger transfer is complete, the cylinders 62 are actuated and the arms 60 are retracted from the coupling bracket 58 and pivoted or rotated back toward the side of the transfer car 12, as shown in FIG. 11.

It will be understood by those skilled in the art that some means of power control and speed control will be needed to assure that the forces on these locking mechanisms are kept at moderate levels. A resilient pad 114 inserted in the coupling bracket with a pressure sensor 116 disposed behind the pad will produce an output when activated to drive a servo control (not shown) which, in turn, will control the power to the transfer car. A nominal power level would be established for the main train speed rate. This control would increase or decrease the power level of the main train.

An alternate coupling embodiment is shown in FIGS. 15, 16, 17 and 18 of the drawings. The alternate device is comprised of a longitudinally extending shaft 78, suitably supported in spaced bearings 80 on the underside of main vehicle 14, a sleeve 82 fixed to shaft 78, a coupling arm 84 extending outwardly of sleeve 82, a roller or bearing 86 at the outer end of arm 84, a roller 88 at the inner end of arm 84, a roller guide 90, a bracket 92, a brace 94, a hydraulic actuating means 96 and a coupling bracket 98 fixed to the underside of the transfer car 12. To rotate the coupling member from the retracted or disengaged position shown in FIG. 16 to the engaged position shown in FIG. 17, the hydraulic cylinder 96 is actuated again in response to activation of the sequence circuit causing the cylinder arm 97 to extend forcing the shaft 78 axially rearwardly. As this axial movement continues, the roller 88 on the inward end coupling arm 84 engages the roller surface 90 as it moves along. Because of the profile of the roller guide surface, the shaft 78 and coupling arm 84 are caused

to rotate upwardly so that arm 84 begins to extend outwardly from the car 12. Since the two high speed cars 12 and 14 are in close proximity, the bearing or roller 86 adjacent the outer end of arm 84 is brought into close proximity to the coupling bracket 98 on car 14. Continued extension of the cylinder arm 97 causes the coupling arm 86 to rotate further upwardly until the bearing or roller 86 reaches the entrance of opening 100 in bracket 98. Guide ways 102 formed in the coupling bracket 98 receive and guide the bearing 86 so that as the arm 78 moves in an axial direction and the bearing is forced into the throat of the coupling bracket. The brace 94 extending between the coupling arm 84 and the shaft 78 provides stability. It will be understood that at least two of these coupling means operating in opposite directions will be necessary to lock the cars in a side-by-side relation to prevent relative motion therebetween other than normal movement as the cars move over the tracks. It should also be understood that when pairs of such devices are employed, the cylinders 96 are capable of moving two arms 97 at once.

When the entire integrated system is in operation, passengers and their baggage are picked up at points coinciding with or close to their starting point, whether it be home or store or warehouse, by the first passenger pick up/discharge vehicle 10 which operates in a localized area at points remote from the high speed transport vehicles. Once this first vehicle has made its stops, then the loaded vehicle begins to travel to a predetermined location to rendezvous with a transfer vehicle or directly with the main vehicle in some instances.

All the passengers moving in the pick up/discharge vehicle are checked in by an on board registry device. The card is stamped or punched in the code of the point of origin and later with the destination point. The data on the card forms and constitutes a record of trip. Once the card has been completely used, it is turned in and the recorded information is fed into a central computer where charges are figured and entered on a statement issued monthly or at some other convenient time interval.

Upon arrival of the pick up vehicle at the predetermined rendezvous, the pick up vehicle pulls along side the parked transfer car which is at rest on a roadbed LT. The transfer car is provided, as shown in FIG. 4, with two doorways 23 in one side which are similar to and are adapted to match with the door openings 22 in the pick up vehicles. As the vehicles 10 come to a stop next to transfer car 12, the walkway or platform 26 is extended by appropriate power means (not shown) from its storage position under the transfer car floor to an extended position in engagement with the side of vehicle 10. In a similar fashion, the canopy, similar to the canopy 32 formed between the transfer and main train vehicles is extended from transfer car to cover the walkway 26. Immediately following the walkway and canopy extension the doors on the vehicles 10 and 12 are opened and the passengers walk from one vehicle to the next. Passenger's baggage is carried along for easy subsequent relocation aboard the through train car 14.

In the same manner, the pick up and delivery vehicle is capable of meeting with and coupling to a main vehicle, bypassing the intermediate transfer step.

While in the transfer car, the passengers are seated on seats 25 or stand as in a subway car until such time

as the transfer car meets with and is securely locked to the main train. As the transfer operation begins passengers move from the transfer car 12 through doors 27 into the main train.

Immediately following the transfer, car 12 moves along the track LT to another location to meet other pick up vehicles. The relocation of the transfer car continues from time to time until it is time to switch to roadbed TT to begin acceleration along the roadbed TT which runs parallel to the main line track MT to rendezvous with a generally uniformly moving through car 14. As the two cars draw along side one another, the sensing means 104 is extended between the cars and if they are travelling at the same rate of speed, the coupling devices 56 carried by car 14, are actuated and the two cars are locked together so that they move down the parallel track in side-by-side relation as a unit. Following the link up, the upper canopy 32, lower seals 52 and 46, and end seals 36A and 48A are activated so that the space between the two cars is completely enclosed. The side-by-side doors 28 of the two cars are then opened and immediately passengers, baggage and freight are transferred from one car to the other. The main train is arranged such that a transfer car is positioned near the center of the train, for instance, and locker or baggage cars are located at either end of the transfer car. Next, conventional coach cars and club cars are positioned on the train on either side of the baggage cars. Dining cars may also be positioned in the train and in engine or other prime mover vehicle is placed at the head of the train to move it along the track. As passengers enter the transfer car of the main train, they immediately take their baggage or luggage to one of the baggage cars where they place it in lockers provided for that purpose and then they proceed to the coach or club cars for the trip.

The elapsed time between the time the cars come together and couple and the doors are opened is very short, taking only several seconds to complete. The parallel roadbeds TT and MT are designed to run along a straight parallel course for several miles so that the transfer can be made.

Once the transfer process between cars 12 and 14 is complete, the doors close, the canopies, seals and platform retract and, finally, the coupling members disengage. The through car 14 continues on its way between remote points on the main roadbed uninterrupted and the transfer car begins to decelerate, to a speed at which it may be safely switched from the roadbed TT back to a service roadbed LT where it will again begin the transfer process to permit passengers or freight to move to an ultimate destination.

The freight transport operation is similar in most respects to the passenger transport operation. Referring to FIGS. 3, 20, 21 and 22, the freight operation is described as follows:

A pick up vehicle 11 for containerized freight is comprised of a standard wheel supported truck frame 118 and cab 120, a flat bed cargo carrying device 122 and powered cross transfer rollers 124. This vehicle 11 is adapted to pick or discharge containerized cargo at particular locations and transport the cargo to and from a freight transfer location 126. The transfer location 126 is a cargo transfer yard having a transfer and storage dock 128 which is provided with a plurality of powered rollers on its surface similar to the rollers 124 of the pick up/discharge vehicle 11. Containers of

cargo C are moved from the truck 11 to the dock 128 where they may be sorted for loading upon the proper cars.

The cargo transport or transfer units 130 are essentially flat bed units which carry a plurality of driven cross rollers 132 for receiving and moving the cargo containers C from platform 128 to car 130. Each roller 132 is provided with a tapered surface 133 which is adapted to engage the combination container guides and skids 134. The angled skids 134 and bevelled rollers 132 form a vital part of the whole freight handling system inasmuch as the skids and rollers cooperate to make allowances for tolerances in side-by-side mismatch during the transfer operations, pick up vehicle to platform, platform to transfer vehicle, transfer vehicle to main or through train or vehicle, by reason of the fact that the skid can ride up on the bevelled roller and still be guided and supported.

A plurality of end locks 136 are provided on vehicle 130 to prevent transverse motion and to hold the container down during transit. Each of the locks 136 is pivotally mounted on the vehicle bed so that they can be moved into and out of engagement with containers C with a clamping sort of motion. The upper end of each lock is provided with a pin 138 which is received in recesses provided in the containers for the purpose. Appropriate power means (not shown) would be provided for the end locks to move them into and out of engagement with the vehicle containers.

The main car or vehicle (not shown) would be of similar design. During the transfer operation between the two vehicles, the end locks would be disengaged as the two vehicles couple together in a manner similar to that described in the passenger operation. The rollers which would be powered by appropriate means (not specifically shown) would then move the containers from one car to the next. When the transfer is complete, the end locks are activated, the cars uncouple and the through train continues on its way while the transfer car decelerates to deliver its cargo to a storage dock or directly to a waiting pick up/discharge vehicle 11.

While the description here has been limited to single car trains, it will be understood that actual trains would have a plurality of cars. There would be several of the transfer cars among all the cars which make up the through train and the transfer train would be made up of one or more transfer cars coupled together, end to end, in the conventional manner. Such systems will permit the most effective transfer of large volumes of passengers and freight.

While this invention has been described in connection with several embodiments thereof, it will be understood that these embodiments are capable of modification and that this application is intended to cover any variations, uses, or adaptations following, in general, the principles of the invention and including such departures from the present disclosure as come within the known or customary practice in the art to which the invention pertains, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention, what I claim is:

1. Transport apparatus comprising in combination: a first vehicle for transporting cargo from a point to a first transfer point, said vehicle having means for automatically recording transport data and means for receiving and discharging cargo when said cargo has been delivered to said first transfer point;

a second vehicle having a first operative mode at said first transfer point for receiving and discharging cargo to and from said first vehicle and a second operative mode for moving the cargo to a second transfer point remote from said first point, said second vehicle comprising means cooperable with said first vehicle receiving and discharging means for receiving and discharging cargo at said first transfer point and separate means for receiving and discharging cargo at said second transfer point; and a third vehicle continuously moving over a roadbed between two remote points at a relatively uniform rate of speed, for transporting cargo between two remote points, said third vehicle having means for receiving and discharging cargo to and from said second vehicle at said second transfer point while said second and third vehicles move in side-by-side relation over the roadbed with zero relative speed between said second and third vehicles; and coupling means extending between said second and third vehicles at said second transfer point for locking said vehicles together during the transfer operation, said coupling means including a pair of swingable arms mounted on one vehicle and adopted to converge toward each other in an outwardly extended position to engage a coupling bracket mounted on another of said vehicles thereby connecting said vehicles together.

2. Transport apparatus, as recited in claim 1, wherein said means for receiving and discharging cargo from said first vehicle at said first transfer point comprises door means formed in one side of said vehicle, extensible and retractable floor means adjacent said door means and extensible and retractable canopy means covering said door and floor means at said first transfer point.

3. Transport apparatus, as recited in claim 1, wherein said second vehicle means is cooperable with said first vehicle receiving and discharge means for receiving and discharging cargo comprises door means in one side of said vehicle and said separate means for receiving and discharging at said second moving transfer point comprises door means in said other side of said car, extensible and retractable floor means and extensible and retractable seal means.

4. Transport apparatus, as recited in claim 3, wherein said extensible and retractable seal means comprises an upper canopy and end seal and a lower canopy and end seal, said seal means and said floor means forming a passageway between said second and third vehicles at said second transfer point.

5. Transport apparatus, as recited in claim 1, wherein said coupling means further includes power means on said one vehicle connected to said arms for swinging said arms between said extended position and a retracted position and said coupling bracket having sensing means associated therewith for sensing relative movement between said two vehicles, said bracket adopted to receive the outward end of said arms when said arms are in the extended position.

6. Transport apparatus, as recited in claim 5, wherein a pair of spaced apart springs are disposed on the outward end of said arms and a sleeve member is disposed on said arms between said springs, said sleeves being receivable in said coupling bracket.

7. Transport apparatus, comprising in combination:

a first vehicle for transporting cargo from a point to a first transfer point, said vehicle having means for automatically recording transport data and means for receiving and discharging cargo when said cargo has been delivered to said first transfer point;

a second vehicle having a first operative mode at said first transfer point for receiving and discharging cargo to and from said first vehicle and a second operative mode for moving the cargo to a second transfer point remote from said first transfer point, said second vehicle comprising means cooperable with said first vehicle receiving and discharging means for receiving and discharging cargo at said first transfer point and separate means for receiving and discharging cargo at said second transfer point;

a third vehicle continuously moving over a roadbed between two remote points at a relatively uniform rate of speed, for transporting cargo between the two remote points, said third vehicle having means for receiving and discharging cargo to and from said second vehicle at said second transfer point while said second and third vehicles move in side-by-side relation over the roadbed; and

coupling means extending between said vehicles at said second transfer point, said coupling means comprises a longitudinally movable rotatable coupling arm mounted on one of said vehicles, means for moving and rotating said arm between an outwardly extended position and a retracted position and a coupling bracket on the other of said vehicles for receiving and engaging said coupling arm when said arm is in said extended position locking said vehicles together until a complete cargo transfer is made.

8. Transport apparatus comprising, in combination: a first vehicle for transporting cargo from a remote point to a first transfer point, said vehicle having means for receiving and discharging cargo when said cargo has been delivered to said first transfer point;

a second vehicle having a first operative mode at said first transfer point for receiving and discharging cargo to and from said first vehicle and a second operative mode for transporting cargo to a second moving transfer point remote from said first point, said second vehicle having means cooperable with said first vehicle receiving and discharge means for receiving and discharging cargo at said first transfer point and separate means for receiving and discharging cargo at said second transfer point;

a third vehicle for transporting cargo between two remote points at a relatively uniform high rate of speed, said third vehicle having means for receiving and discharging cargo to and from said second vehicle at said second transfer point;

coupling means extending between said second and third vehicles at said second transfer point for locking said vehicles together; and

said means on said second vehicle for receiving and discharging cargo at said second transfer point comprises extensible and retractable seal means including an upper canopy pivotally mounted on said second vehicle and a lower seal pivotally mounted on said third vehicle, said canopy and lower seal cooperating to form end seals to completely enclose the area between the two vehicles

during the transfer operation an extensible and retractable platform and door means.

9. Transport apparatus, as recited in claim 8, wherein said coupling means comprises arm means mounted on one of said coupled vehicles for rotatable movement between a retracted position and outwardly extended position and means at the outward end of said arm means receivable and engagable with bracket means on the other of said coupled vehicles when said arm means is in said extended position.

10. An integrated transportation system comprising in combination: a main vehicle continuously moving over a roadbed at a relatively uniform rate of speed between two remote points and having means for receiving and discharging cargo while in motion to a transfer vehicle coupled in side-by-side relation to said main vehicle and travelling over a parallel roadbed, said transfer vehicle coupling and uncoupling from said main vehicle from time to time for transporting cargo to a plurality of intermediate points between said two remote points and a pick up and discharge vehicle for receiving and discharging cargo from said transfer vehicle for subsequent transport from said transfer vehicle to an ultimate destination, said main vehicle and said transfer vehicle being coupled together by arm means comprised of a pair of outwardly converging arms mounted on one of said vehicles and rotatable from a retracted position to an outwardly extended position, each of said arms having bearing means at the outward end

thereof receivable and engagable with bracket means disposed on the other of said vehicles when said arm means is in the outwardly extended position.

11. An integrated transportation system, as recited in claim 10, wherein canopy and platform means extend between said coupled vehicles to form a passageway for receipt and discharge of cargo between said vehicles.

12. An integrated transportation system comprising in combination: a main vehicle continuously moving over a roadbed at a relatively uniform rate of speed between two remote points and having means for receiving and discharging cargo while in motion to a transfer vehicle coupled in side-by-side relation to said main vehicle and travelling over a parallel roadbed, said transfer vehicle coupling and uncoupling from said main vehicle from time to time for transporting cargo to a plurality of intermediate points between two remote points and a pick up and discharge vehicle for receiving and discharging cargo from said transfer vehicle for subsequent transport from said transfer vehicle to an ultimate destination, said main vehicle and said transfer vehicle being coupled together by arm means mounted on one of said vehicles, said arm means comprises a longitudinally movable rotatable coupling arm having a bearing means at the outward end thereof adapted for engagement with bracket means disposed on the other of said vehicles.

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