United States Patent [19]

Bacon

[11] **3,865,041**

[45] **Feb. 11, 1975**

[54] **ROTARY PLATFORM VEHICLE PASSENGER LOADING SYSTEM**

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[73] Assignee: **Arrow Development Co., Inc.,** Mountain View, Calif.

[22] Filed: **Apr. 16, 1973**

[21] Appl. No.: **351,509**

[52] U.S. Cl. **104/20,** 104/18, 104/73, 404/1

[51] **Int. Cl.** **B61k 1/00**

[58] **Field of Search** 14/1; 104/20, 21, 73; 198/167; 214/42, 58; 272/29, 48; 404/1

[56] **References Cited**

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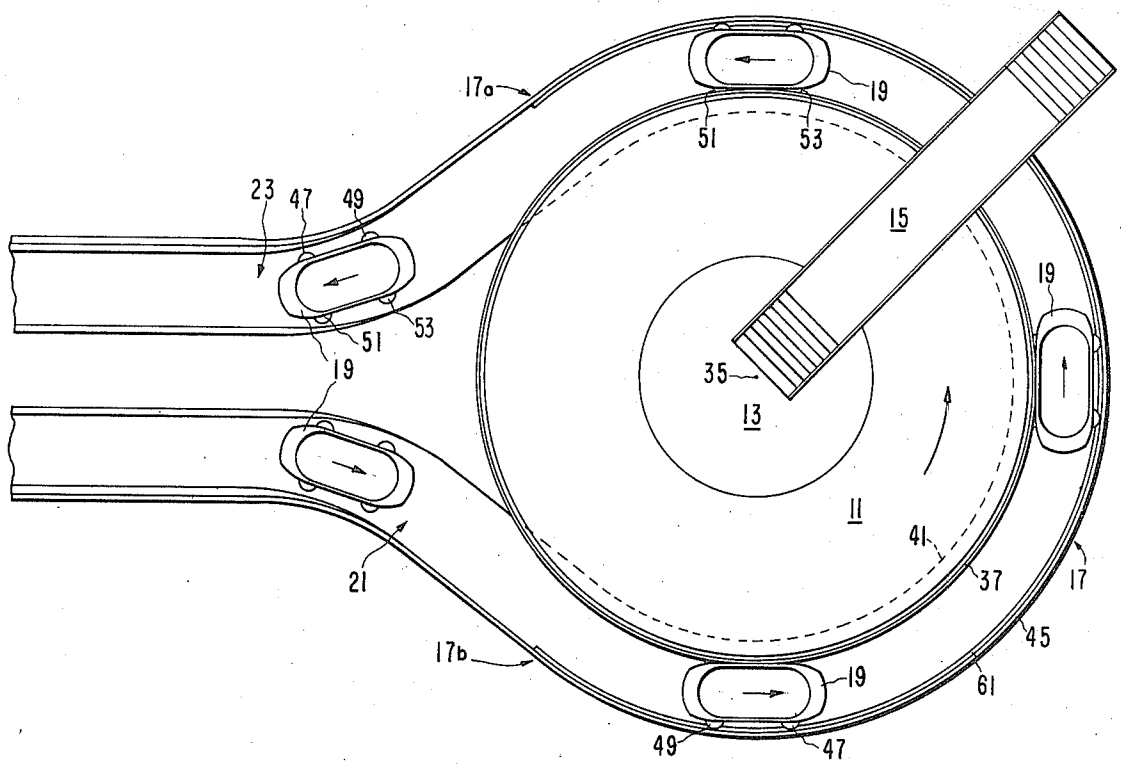
3,339,494	9/1967	Lauber	104/20
3,404,635	10/1968	Bacon	104/73 X
3,727,558	4/1973	Winkle	104/21

Primary Examiner—Nile C. Byers, Jr.
Attorney, Agent, or Firm—Limbach, Limbach & Sutton

[57] **ABSTRACT**

A central stationary platform is surrounded by a rotatable annular platform and a vehicle guiding means surrounds at least a portion of the outside circumference of the rotating platform. Vehicles are guided into frictional engagement with an outside edge of the rotating platform in a manner that there is no relative motion between the vehicle and the rotating platform, thus permitting loading and unloading of people therefrom. In one embodiment, vehicles are boats and in another embodiment are passenger cars riding on rails.

17 Claims, 8 Drawing Figures



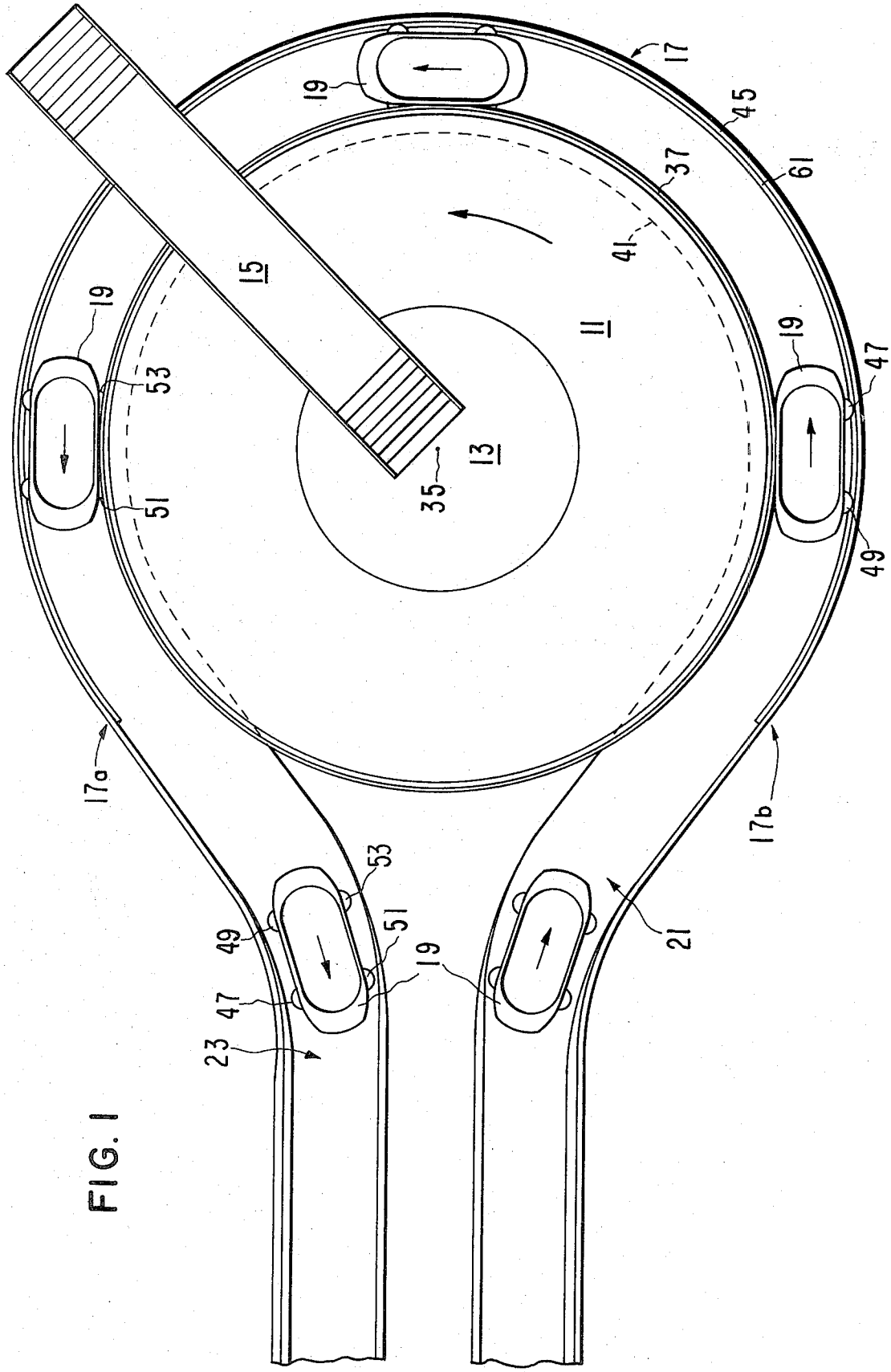

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FIG. 1

FIG. 2

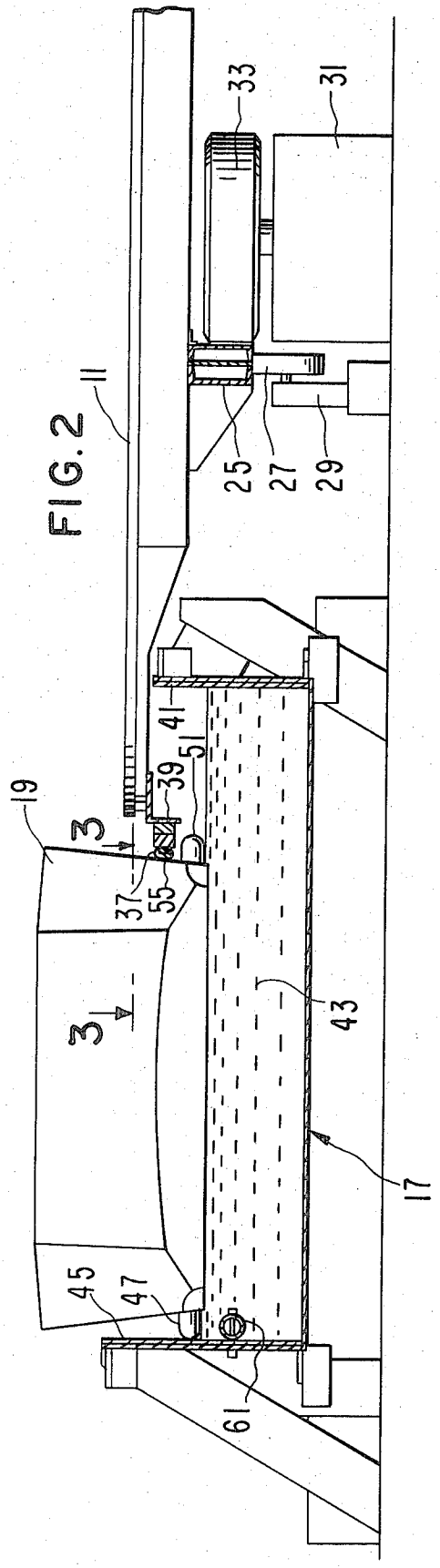

FIG. 2A

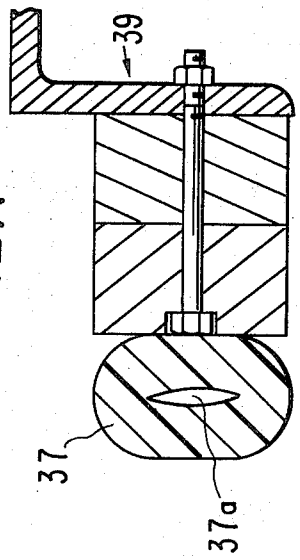

FIG. 3

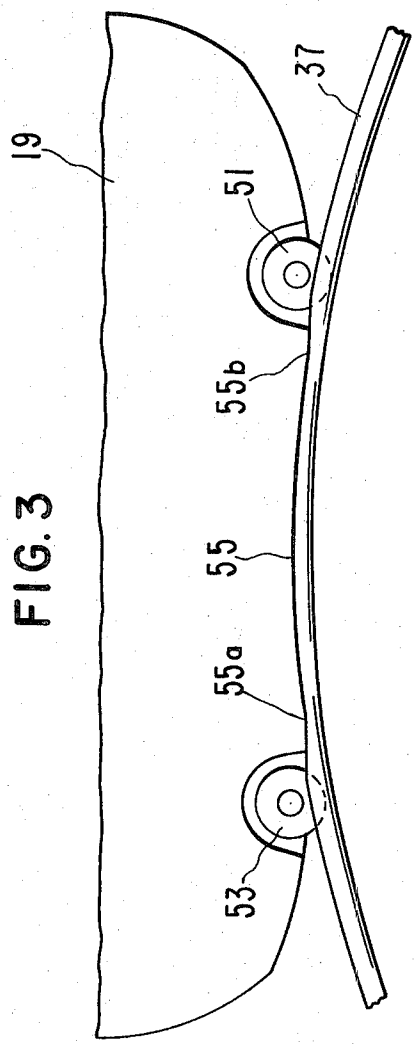

FIG. 4

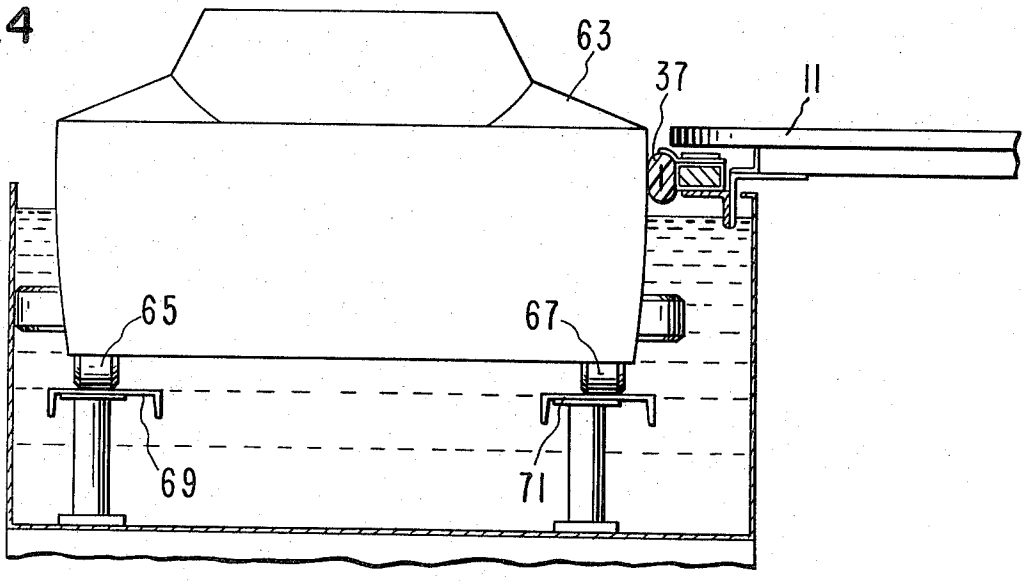

FIG. 5

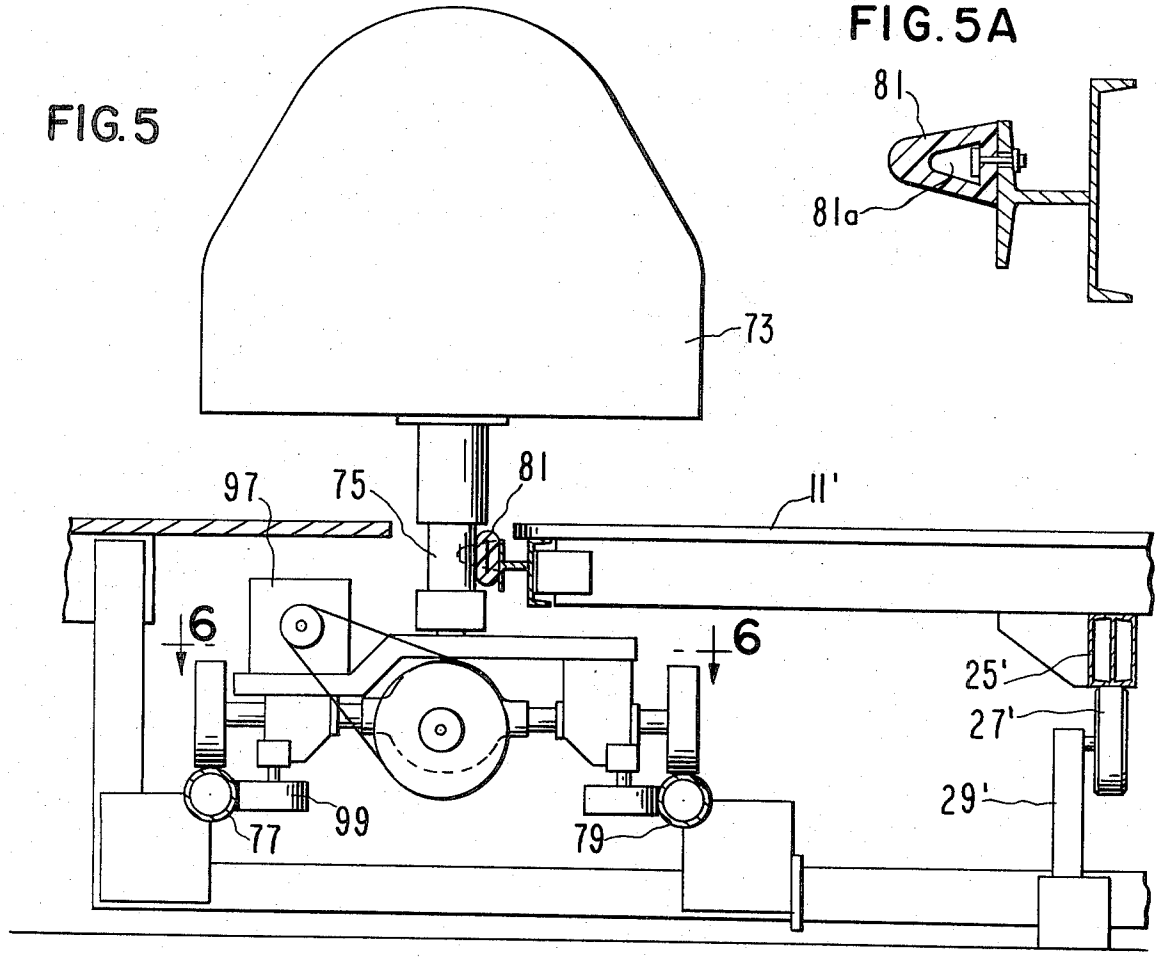

FIG. 5A

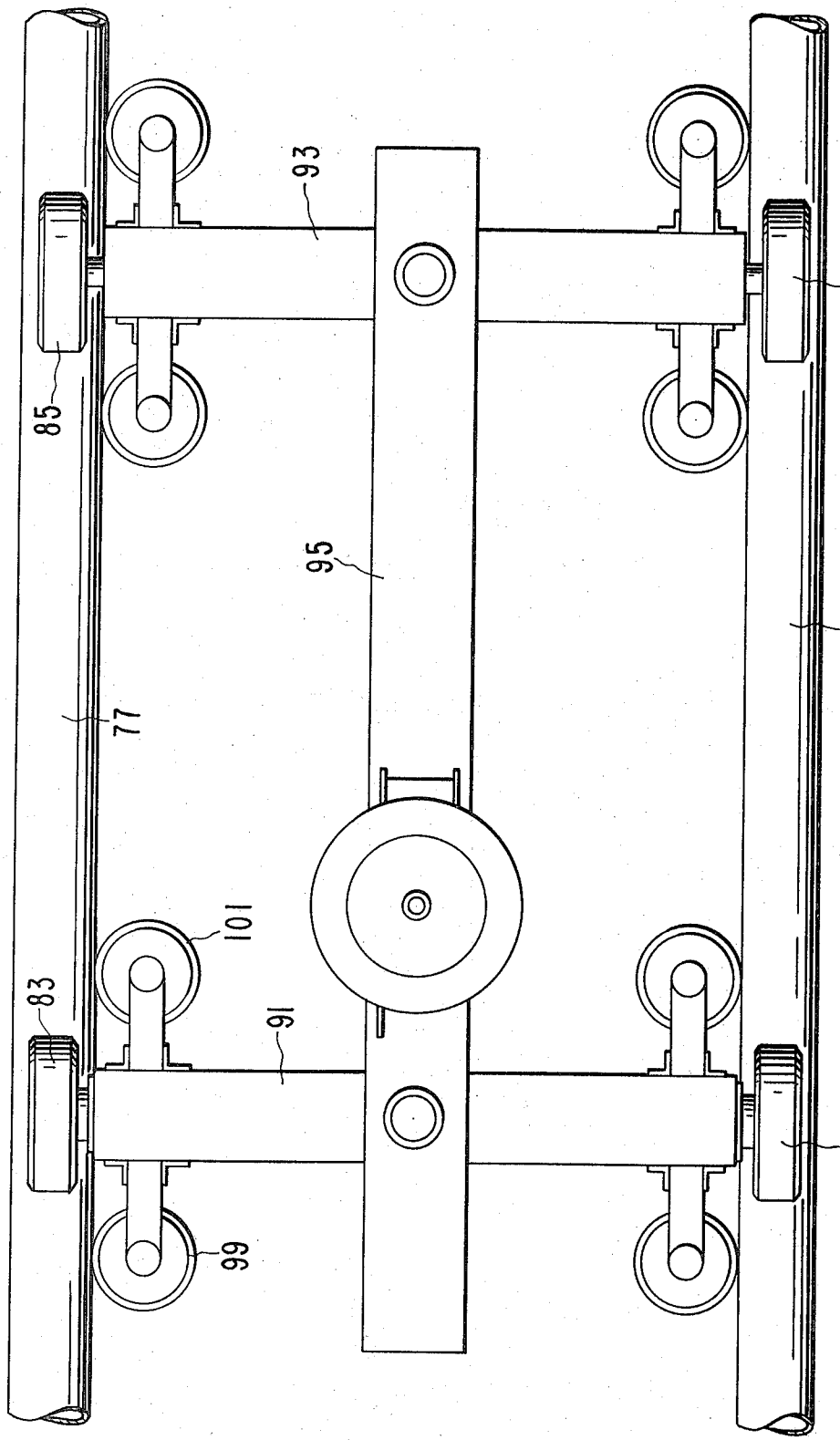

FIG. 6

ROTARY PLATFORM VEHICLE PASSENGER LOADING SYSTEM

BACKGROUND OF THE INVENTION

This invention relates generally to a vehicle passenger loading arrangement and more particularly relates to a structure permitting passenger loading and unloading without having to stop the vehicles.

U.S. Pat. No. 3,339,494 — Lauber (1967) describes a rotating railroad station loading platform wherein a train track is positioned around a portion of the outside circumference of a rotating platform and adjacent thereto. The rotating platform surrounds a stationary center platform to which passengers have access by a tunnel or an elevated walkway. The trains are disclosed to travel at the same speed as the outside circumferential surface of the rotating platform. Passengers are then accelerated to the speed of the train as they walk outward from the stationary platform to moving train cars.

The difficulty with the aforementioned Lauber patent is that no positive means is provided for assuring that the train cars are moving at exactly the same speed as the outside circumference of the rotating platform. As a result, there is a possibility of passenger inconvenience and injury if the speeds of the rotating platform outside circumference and adjoining train cars are not exactly the same. U.S. Pat. Nos. 368,420, 474,657 and 780,268 suggest mechanically connecting vehicles in the loading area to a rotating platform but their systems for accomplishing this are awkward and complex.

Accordingly, it is a primary object of the present invention to provide a rotating platform assembly that assures that adjacent vehicles are traveling at the same speed as the outside circumference of the rotating platform with a simple mechanism that permits smooth engagement and disengagement of the vehicle with the rotating platform.

It is a more general object of the present invention to provide a vehicle guiding assembly about a portion of an outside circumference of a rotating passenger loading platform that permits passenger loading and unloading with increased comfort and safety.

SUMMARY OF THE INVENTION

These and additional objects are accomplished by the various aspects of the present invention wherein a segment along the length of a vehicle guide that is adjacent an outer circumferential segment of a rotating platform and the outer circumferential edge of the rotating platform itself are provided with cooperating means for positively holding a vehicle positioned in the guide segment to the rotating platform outside edge by friction alone to prevent motion therebetween. The positive attachment of the vehicle to the rotating platform outside edge assures convenient and safe passenger loading and unloading therefrom without the need for an expensive and fallible electronic control system to maintain the relative speed therebetween at zero.

Although a positive mechanical latching system may be provided between the rotating platform and the vehicles, fabrication and operating problems to effect a smooth engagement and disengagement of the vehicles from the rotating platform make it preferable to use a frictional engagement. A frictional element such as an extruded rubber ring is provided around the outside

circumference of the loading platform. The vehicle guide means urges the vehicle firmly against the loading platform in the loading area to establish frictional engagement therewith. No other positive mechanical latching mechanism is required. By using only a frictional engagement, the mechanism is simple, reliable and has a further advantage of holding the vehicle firmly against the rotating platform outside circumference. The vehicle thus does not move back and forth with respect to the loading platform in the loading area and there is no gap for a passenger to step over when moving between the vehicle and the rotating platform. Engagement and disengagement of the vehicle to the loading platform as it enters and leaves the loading area is also very smooth with the frictional engagement system of the present invention. The result is a convenient, safe and mechanically troublefree passenger loading arrangement which can handle very large numbers of passengers per unit of time.

In one specific embodiment of the present invention, the vehicles are boats and the guide means is a water trough with a loading segment extending partially around the outer circumference of the rotating platform. The radially extreme wall of the water trough is reinforced and positioned a distance from the outer circumferential edge of the rotating platform so that a boat is squeezed tightly therebetween when it moves into the loading area. Horizontally extending wheels are provided on the radially extreme edge of the boat to contact this outside water channel wall and ride therealong. The radially inside edge of the boat in the loading area thus contacts the outside circumference of the rotating platform. The rotating platform edge is preferably provided with a ring of soft, resilient material that is compressed when the boat is pressed thereagainst, thereby assuring positive frictional engagement therewith. An appropriate motor is provided for the rotating passenger platform at a constant angular velocity which thereby moves boats through the loading area as well.

In another embodiment of the present invention, the vehicle guiding means is a track arrangement which carries the weight of and guides the motion of a vehicle through the loading area around a portion of the circumference of the rotating platform. The track portion of the loading area urges the vehicle against a resilient material ring attached to the outside circumference of the rotating platform to establish a frictional engagement therebetween. In a specific example described hereinafter, a number of vehicles are linked together in a chain with one or more vehicles in a given coupled unit having a self-contained electric motor. The rotating platform in this embodiment need not be powered but is rotated by the cars themselves.

Many other types of vehicles and associated guide elements may also be utilized with the platform engagement technique of this invention, such as automobiles riding on a roadway and guided by a single guide rail, a suspended vehicle and overhead track structure, etc.

Additional objects, advantages and features of the present invention will become apparent from the following description of its preferred embodiments which should be taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic plan view of an overall rotating

platform passenger loading system embodiment according to the present invention;

FIG. 2 is a sectional view of the rotating platform and a vehicle taken across section 2—2 of FIG. 1;

FIG. 2A is an enlarged view of an element of FIG. 2;

FIG. 3 illustrates a frictional engagement between the vehicle and the rotating platform of FIG. 2 taken across section 3—3 thereof;

FIG. 4 illustrates a variation in the embodiment of FIGS. 1–3 in the same general view thereof as FIG. 2;

FIG. 5 illustrates another embodiment of the present invention wherein a track supported and guided vehicle is employed;

FIG. 5A is an enlarged view of an element of FIG. 5; and

FIG. 6 shows the wheel arrangement of the track supported vehicle of FIG. 5 taken across section 6—6 thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring initially to FIG. 1, a rotating passenger platform 11 surrounds a stationary platform 13. The passengers walk to and from the stationary platform 13 over a bridge 15 having stairs at each end. A passenger loading vehicle guide segment 17 surrounds the outer circumference of the rotating platform 11 in a circular arc between positions 17*a* and 17*b*. In the embodiment of FIG. 1, the vehicle guide 17 is a trough for containing a water flow in which boats, such as the boat 19, float. A vehicle guide water trough portion 21 leads into the loading segment 17 and a vehicle guiding water trough 23 leads away from the loading segment 17. The water trough segments 17, 21 and 23 are portions of a continuous loop amusement ride, in a specific application of the various aspects of the present invention, in which paying passengers are loaded into and out of the boats for the ride from the loading platform 11. The rotary platform 11 has the advantage that a passenger's linear velocity increases gradually as he walks radially outward on the platform 11 toward a boat. Such a rotating platform can handle a very large number of passengers per unit time with a reduced number of attendants as compared with conventional techniques where the vehicles such as boats are stopped at a stationary loading dock.

Referring to FIGS. 1 and 2, the rotating loading platform 11 has a circular structural beam 25 on its underside which in turn is supported against gravity by a plurality of rollers such as the roller 27 that is supported by a mechanism 29. A motor source 31 of a convenient type such as an electric motor rotatably drives a driving wheel 33 which frictionally engages the inside surface of the beam 25 to rotate the platform 11 at substantially a constant angular velocity about a center of rotation 35.

The outside circumference of the rotating platform 11 has fixedly attached thereto a bumper 37 for contacting the boats such as the boat 19 in the loading area of the boat guiding water trough segment 17. The bumper 37 is attached as a ring complete around the extreme outside of the rotating platform 11 at a fixed radius from the center of rotation 35 by an annular attaching element 39. A radially inward wall 41 of the water trough segment 17 extends in the loading area a fixed radius from the center of rotation 35, that radius being less than the radial distance of the bumper 37 from the center of rotation 35. The bumper 3 thus extends outward over water 43 within the trough 17 of the loading segment. A radially outward wall 45 also has a center of curvature in the loading vehicle guide segment 17 at the axis 35. Each of the boats is substantially identical in construction as illustrated with the representative boat 19 in FIGS. 2 and 3. A pair of wheels 47 and 49 on the radially outward side of the boat 19 intermittently contacts one wall of the water trough throughout the ride so that the boat follows the path of the water trough. A pair of wheels 51 and 53 are provided on the opposite side of the boat 19 for intermittently contacting the opposite wall of the water trough to serve a boat guiding function throughout the ride. Each of the guide wheels 47, 49, 51 and 53 are rotatably attached to the boat body to rotate about a vertical axis with respect thereto.

In the region of the boat loading segment 17 of the boat guiding trough, the inward wheels 51 and 53 serve no function in guiding the boat, since, as shown in FIG. 2, they ride under the bumper 37. That side of the boat 19 rides against the bumper 37. The opposite set of wheels 47 and 49, however, ride against the extreme outer edge 45 of the water trough in the loading segment 17. The differences in radii of the extreme edge of the bumper 37 and the curvature of the outer wall 45 is made to be slightly less than the distance between a bumper contacting surface 55 of the boat 19 and the outer periphery of the guiding wheels 47 and 49. The result is that the boat 19 is urged tightly against the bumper 37 by the wheels 47 and 49 which are pressing against the outer circular wall 45. Therefore, the outer circular wall 45 is structurally reinforced in an appropriate manner in order to withstand these forces as the boats are pressed thereagainst in the passenger loading trough segment 17.

FIG. 2A shows an enlarged cross-sectional view of the bumper 37 showing a hollow region 37*a*. As the boats such as the boat 19 are pressed against the bumper 37, the opening 37*a* collapses and a strong frictional bond between the boat and the bumper 37 occurs. The bumper 37 is preferably made of a resilient material, such as an extruded rubber, so that the boat surface 55 may be pushed thereinto by the force of its outer wheels 47 and 49 riding along the fixed outer circular trough wall 45. In order to increase the frictional attachment between the boat and the bumper 37, the boat 19 has an inwardly curving side section forming its contacting surface 55. The contacting surface 55 has a radius of curvature between its extreme portions 55*a* and 55*b* substantially the same as that of the bumper 37, as shown in FIG. 3. The surface 55 thus pushes against the bumper 37 and compresses it in order to form a strong frictional bond therewith. The boat 19, as well as any other boats in the loading water through segment 17, are driven by the rotating platform 11.

In the loading region, the water 43 is also moving in the direction of the travel of the boats and helps carry them along. The frictional engagement of the boats with the rotating platform 11, however, assures that the boats have no relative speed with respect to the platform 11. In the rest of the ride, such as in the incoming and outgoing water trough segments 21 and 23, the moving water is the sole source of boat motive power. Alternatively, the boats may be self propelled and/or may be linked together. In any case, the boats are urged

against the platform bumper for engagement therewith in the loading area.

It will be noted that the frictional engagement technique for a boat loading area as illustrated in FIGS. 1–3 has the advantage that when a boat reaches the point 17*b* where the loading area begins, it smoothly engages the bumper 37. Similarly, when the boat is about to leave the loading area at the point 17*a*, the boat smoothly disengages from the bumper 37. Abrupt passenger jarring motions of the boats are thus avoided as well as preventing sudden excessive loads to the motor power of the rotating platform 11.

Another advantage of the bumper/boat engagement technique illustrated in FIGS. 1–3 is that the frictional engagement between the boat surface 55 and the bumper 37 also supports the boat vertically when passengers are getting into and out of the boat. Such stability is a great convenience to passengers. On the opposite side of the boat, wheels 47 and 49 may not provide the necessary frictional force to prevent tipping of the boat downward into the water as the passenger load increases suddenly. Therefore, a supporting ledge 61 is provided in the loading trough segment 17 firmly attached to the outer wall 45 thereof at a position to be below the top surface of the water 43. When the load in the boat 19 increases suddenly, the boat tips until its wheels 47 and 49 are depressed into the water and contact the supporting protrusion 61. The combination of the firm rest 61 for the boat within the loading area and its tight frictional engagement against the bumper 37 gives the boat 19 very good stability against dropping vertically and rolling in the face changing passenger loads during loading and unloading thereof.

Referring to FIG. 4, a modification of the embodiment of FIGS. 1–3 is illustrated in the form of a modified version of the FIG. 2 trough and boat. A boat 63 contains, in addition to the structure described above with respect to the boat 19, four vertical supporting wheels in the bottom thereof, including wheels 65 and 67 shown in the view of FIG. 4. These four wheels are held to rotate about a fixed horizontal axis for supporting the boat 63 in the loading area against vertical and rolling movement as people get into and out of the boat. A pair of tracks 69 and 71 as shown in FIG. 4 are added, in this variation, to the water trough loading segment 17 of FIG. 1. Everywhere else in the ride the boat 63 floats on the water, but in the loading area, the tracks 69 and 71 are provided to hold the boat firmly against rolling in the water as people get into and out of the boat from the loading platform 11.

FIGS. 5, 5A and 6 show another embodiment of the passagenger loading station as used with a train of rail riding cars that are linked together and self-powered. A rotating platform 11′ is supported in a similar manner to the boat embodiment described above, except that the rotary platform is not powered. There is no motor directly operating on the passenger platform 11′ but rather it is rotated from the motive power in the rail cars themselves. Each of the cars includes a passenger compartment 73 which holds several people. The passenger compartment 73 is supported by a post assembly 75 on wheels which ride on a pair of tracks 77 and 79. Each of the tracks 79 and 77 is circular in cross-section as shown in FIG. 5, and further is curved in a horizontal plane to have a constant radius about an axis of rotation of the rotating platform, the circular rail segment forming the passenger loading segment. Rails are connected to either end of the curved passenger loading segment for leading cars into and out of the passenger loading segment. A bumper 81 is provided on the outside circumference of the loading platform 11′ and has a constant radius with respect to the axis of rotation of the platform 11′ that lies intermediate of the radii of the two tracks 77 and 79.

Each of the rail cars is supported by four wheels 83, 85, 87 and 89, each of these wheels not requiring a flange. The wheels 83–89 are fixed to each of the rail cars for rotation about a horizontal axis that is parallel to the plane of the tracks 77 and 79 which is also substantially parallel with the top surface of the passenger loading platform 11′. The wheels 83–89 are carried by axle assembles 91 and 93, these axle assemblies being pinned to a body support assembly 95 for rotation therewith when the car travels over curved track sections. The post 75 which holds the passenger compartment 73 is carried by the main body support member 95.

In a specific example, about one out of ten cars in a linked train of cars has its own power source. An electric motor 97 is shown in FIG. 5 with operable coupling to one pair of wheels. The view of FIG. 6 does not show this motor and represents an axle and wheel assembly which is substantially common to both those cars which are powered and those which are not.

Since the supporting wheels 83–89 are not flanged and especially since the rails are circular in cross-section, some means are required to hold the train cars on the tracks. Each of the wheels 83–89 has associated therewith a pair of guide wheels which are held to the car in a manner to rotate about an axis that is substantially vertical; that is, to rotate about an axis that is orthogonal to the axis of rotation of the load supporting wheels. For instance, the load supporting wheel 83 has associated therewith such an adjacent pair of guide wheels 99 and 101. The guide wheels 99 and 101 are placed on either side of the wheel 83 along the track 77 and on the inside surface thereof.

The bumper 81 is of a resilient material and is provided with an opening 81*a* in its middle as shown in FIG. 5A. The radii of the track 77 and 79 with respect to the axis of rotation of the passenger platform 11′ are adjusted so that the post 75 of each car compresses the resilient bumper 81. The inside edge of the post 75 that contacts the bumper 81 thus travels in a path about the rotary platform axis of rotation that has a radius slightly less than the outside radius of the bumper 81 in a non-compressed state. The support post 75 of each rail car thus frictionally engages the bumper 81 and additionally temporarily forms a depression therein for tight engagement therewith. As the car leaves the loading area and disengages with the platform, the resilient nature of the bumper eliminates the groove. In a given train situation, there will be a number of posts 75 that contact the bumper 81 at any one time at different positions around the bumper. Power is thus transferred from a plurality of coupled rail cars to the rotary platform 11′. The frictional engaging force at each car required against the bumper in such a multiple car train situation is thus reduced.

Many of the aspects of the present invention can also be applied to a passenger platform that travels linearly rather than in a circular path. Vehicles may be frictionally coupled to a bumper on the edge of a platform moving in a straight line just as they are to a bumper on

the outside of a rotary platform. However, the rotary platform is preferred because of its capability of handling more passengers per unit of time and additionally it is safer and more convenient.

Although a few specific examples of the various aspects of the present invention have been described in detail above, it will be understood that the invention is entitled to protection within the full scope of the appended claims.

I claim:

1. A passenger loading station for passenger carrying vehicles, comprising:

an annular passenger platform rotatable about a fixed axis and having a resilient compressible bumper attached thereto around its outside circumferential edge,

a fixed circular vehicle guide segment positioned around the outside of a portion of the platform circumference and guide portions leading toward and away from said circular guide segment, and

means for urging said vehicles against said platform bumper in a manner that the frictional engagement of the vehicle with the bumper prevents relative movement therebetween when a vehicle is in said circular guide segment.

2. A passenger loading station and vehicle, comprising:

a movable passenger platform having a bumper attached to one edge thereof,

at least one passenger carrying vehicle,

a fixed segment cooperatively constructed with said vehicle to guide said vehicle along the bumper carrying edge of said movable passenger platform, and transition guide portions leading toward and away from said segment, and

means as part of said vehicle and said guide segment for urging said vehicle tightly against said bumper in a manner to provide only frictional engagement therebetween for causing the platform and vehicles within said segment to move without relative velocity therebetween.

3. The passenger loading station of claim **2** which additionally includes a motor as part of a passenger platform assembly for moving the passenger platform at substantially a uniform speed.

4. A passenger loading station of claim **3** wherein said at least one vehicle is a boat and said guide segment and transition guide portions include a continuous water carrying trough with upright sides for guiding the path of boats traveling therealong.

5. The passenger loading station of claim **4** wherein said boat vehicle contain a roller means for cooperating with the side of the water channel of the guide segment that is furthest removed from the moving platform, the distance from the moving platform bumper to said furthest removed channel edge and the dimensions of the boat cooperating so that the boat tightly engages said bumper as said rollers roll along said opposite sidewall of said water channel.

6. The passenger loading station of claim **2** wherein said at least one vehicle includes a source of motor power while the platform has no source of motor power, whereby the movement of said vehicle in said guide segment causes movement of said passenger platform without relative velocity with said vehicle.

7. The passenger loading station of claim **2** wherein said bumper includes an elongated strip of resilient material that normally has a smooth outside surface that is depressed upon contact with said vehicle within said guide segment.

8. A passenger loading station and cooperating vehicle, comprising:

an annular passenger platform rotatable about a fixed axis and having a resilient bumper attached to its outside circumferential edge a first radius from the axis of rotation,

a fixed water channel segment extending in a circular path around the outside of a portion of the platform circumference and water channel portions leading toward and away from said circular segment, said water channel segment including two sides with an extreme side located a second radius from said axis, and

at least one passenger carrying boat having at least a portion of one side inwardly curving with a radius of curvature substantially equal to said first radius, said boat additionally having rollers extending from an opposite side of said boat and pivotally mounted thereon in a manner that the dimension between the extremity of said wheels and said curved portion is slightly less than the difference between said first and second radii, whereby said boat firmly pushes against and compresses said bumper along the curved side region of contact therewith.

9. The passenger loading station of claim **8** which additionally comprises an inward extension within said water channel attached to said water channel extreme side and positioned at an elevation for supporting a weight of the boat under a loaded condition, whereby the boat is stabilized against extreme tipping during passenger loading and unloading.

10. The passenger loading station of claim **8** wherein said boat includes at least one wheel pivotally mounted on the bottom thereof for supporting the boat weight, and wherein said water channel segment includes at least one track upon which the boat bottom wheel rides when the boat is in the loading area, whereby the boat is stabilized for passenger loading and unloading.

11. A passenger loading station and cooperating vehicle, comprising:

an annular passenger platform rotatable about a fixed axis and having a resilient bumper attached to its outside circumferential edge a first radial distance from the axis of rotation, said rotatable platform not having its own internal source of power,

a fixed pair of rails extending in a circular path segment around the outside of a portion of the platform circumference and rail portions leading toward and away from the circular rail segment, said pair of rails in the circular segment having second and third radial distances from said axis of rotation, said rails additionally being substantially circular in cross-section, and

at least one self-powered passenger carrying rail car having a plurality of load supporting wheels attached to the bottom thereof rotatable about axes that are parallel to a plane of said pair of rails for riding on the tops of said rails and having a plurality of stabilizing wheels rotatable about axes substantially perpendicular to said rail plane for riding on the inside surfaces of said rails, said rail car additionally having a surface positioned above said wheels for contacting said resilient bumper, said first, second and third radial distances being posi-

tioned relative to the bumper contacting surface of the car to provide tight engagement of said bumper contacting surface with said bumper when the car is in the passenger loading area.

12. A station for loading passengers into at least one vehicle, comprising:

a platform in the shape of a circle held to be rotatable about an axis at the center of the circle,

a resilient compressible bumper attached completely around the outside circumference of said platform and having a cross-sectional shape that is normally uniform therearound, and

means fixed with respect to said axis for guiding said vehicle in a path segment that is a portion of a circle having a center of curvature coincident with said axis and a radius such that when in said path segment said vehicle is firmly urged against and compresses a portion of said bumper contacted by said vehicle, thereby to cause a vehicle traveling along said path segment to be rotatably fixed to said platform.

13. The passenger loading station of claim **12** which additionally includes a motor coupled to the passenger platform assembly for moving the passenger platform at substantially a uniform speed.

14. A passenger loading station of claim **13** wherein said at least one vehicle is a boat and said guiding means include a continuous water carrying trough with upright sides for guiding the path of boats traveling therealong.

15. The passenger loading station of claim **12** wherein said at least one vehicle includes a source of motor power while the platform has no source of motor power, whereby the movement of said vehicle in said guiding path causes movement of said passenger platform without relative velocity with said vehicle.

16. The passenger loading station of claim **15** wherein said guiding path includes a pair of rails upon which said vehicle is adapted to travel.

17. A passenger loading station and cooperating vehicle, comprising:

an annular passenger platform rotatable about a fixed axis and having a resilient bumper attached to its outside circumferential edge a first radial distance from the axis of rotation, said rotatable platform not having its own internal source of power,

a fixed pair of rails extending in a circular path segment around the outside of a portion of the platform circumference, said segment being a portion of a longer rail path, said pair of rails in the circular segment having second and third radii of curvature with respect to said axis of rotation, and

at least one self-powered passenger carrying rail car having a plurality of load supporting wheels attached to the bottom thereof for riding on the tops of said rails and having means to maintain said wheels on the rails against lateral forces on the vehicle, said rail car additionally having a surface positioned above said wheels for contacting said resilient bumper, said first, second and third radial distances being positioned relative to the bumper contacting surface of the car to provide tight engagement of said bumper contacting surface with said bumper when the car is in said circular path segment.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,865,041 Dated February 11, 1975

Inventor(s) Karl W. Bacon

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 1, "bumper 3" should read -- bumper 37 --.

Column 9, line 7, the words -- having an outside circumference -- should be added after the word "platform".

Column 9, line 7 the word -- and -- should be added before the word "circle".

Column 9, line 8 the word "the" should be deleted and the word -- a -- should be inserted before the word "center".

Signed and Sealed this

twenty-ninth Day of July 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks

FORM PO-1050 (10-69)

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