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(54) **WATER RIDE WITH WATER PROPULSION DEVICES**
WASSERRUTSCHBAHN MIT WASSERTREIBSTRAHLVORRICHTUNGEN
TOBOGGAN A PROPULSION AQUATIQUE

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Description

BACKGROUND:

[0001] This invention relates in general to water rides, specifically a mechanism and process that: 1) will safely transfer the kinetic energy of a high speed water flow to participants riding/sliding (with or without a vehicle) upon a low-friction surface and enable them to accelerate in a downhill, horizontal or uphill straight or curvilinear direction; 2) will safely stabilize and equalize the coefficients of friction and trajectory of differently sized and weighted participants on a water ride with a steep downhill portion followed by a subsequent significant uphill portion; and 3) will permit self-clearing of the transitory surge/hydraulic jump that may occur on a horizontal or upwardly inclined water ride flume.

[0002] The 80's decade has witnessed phenomenal growth in the participatory family water recreation facility, i.e., the waterpark, and in water oriented ride attractions in the traditional themed amusement parks. The current genre of water ride attractions, e.g., waterslides, river rapid rides, and log flumes, require participants to walk or be mechanically lifted and water to be pumped to a high point, wherein, gravity enables water rider(s), and riding vehicle (if appropriate) to slide down a chute or incline to a lower elevation splash pool, whereafter the cycle repeats. Gravity or gravity induced rider momentum is the prime driving force that powers the participant down and through these traditional water ride attractions. A novel aspect of the subject invention is the employment of a high speed jet of water to propel a participant in lieu of, or in opposition to, or in augmentation with the force of gravity. With the exception of the start area, water ride attractions have not utilized the water that is pumped in a horizontal or downward direction as the object and driving mechanism for accelerating a rider down or along a run. Likewise, water ride attractions to date have not used jetted water to propel a rider up an incline to a higher elevation. By means of the aforementioned high speed water jets, the subject invention will enable the creation of water oriented amusement rides and ride experiences that have heretofore been unavailable in the recreation industry. In particular, the embodiments of the invention described herein will permit a rider(s) on the surface of a water attraction: to accelerate downhill in excess of the acceleration attributable to the force of gravity (said embodiment is hereinafter referred to as the "Downward Accelerator"); or to accelerate in a horizontal direction, (said embodiment is hereinafter referred to as the "Horizontal Accelerator"); or to accelerate in an uphill direction (said embodiment is hereinafter referred to as the "Upward Accelerator"; or to slide downward on a conventional slide and enter a flow of water of equal or slower speed and yet return in an upward direction to a higher elevation that is equal to or less than that which could be achieved through using gravity alone (said embodiment is hereinafter referred to as the "Stabilization/Equalization Process" ,or to slide downward on a conventional water ride attraction and return in an upward direction to an elevation higher than that which could be achieved through using gravity alone (said embodiment is hereinafter referred to as the "Elevation Enhancement Process"; or through combination of the above described embodiments with a standard downslope waterslide to create an embodiment hereinafter referred to as a "Water Coaster".

[0003] The amusement field is replete with inventions that utilize water as the means for generating rider motion and experience, however, none to date describe the improvements contemplated by the subject invention, as an examination of some representative references will reveal.

[0004] Meyers U.S. Pat. No. 3,923,301, issued Dec. 2, 1975 discloses a method of adapting a hill to provide a waterslide dug into the ground wherein a rider from an upper start pool slides by way of gravity passage upon recycled water to a lower landing pool. The structure and operation of Meyers has no relevance to the present invention.

[0005] Timbes U.S. Pat. No. 4,198,043 issued Apr. 15, 1980 discloses a modular molded plastic water slide wherein a rider from an upper start pool slides by way of gravity passage upon recycled water to a lower landing pool. The structure and operation of Timbes has no relevance to the present invention.

[0006] Becker, et al. U.S. Pat. NO. 4,196,900 issued Apr. 8, 1980 discloses a conventional downslope waterslide with simplified support construction involving a reduced number of parts at reduced cost with a conventional water pipe leading from a pump to the beginning of each slide. Becker goes on to suggest that such water pipe may include thrust nozzles at the top giving an extra push component to a person sitting there, thus making sure that a person, once boarded, does not block the slide by remaining in place. (Column 2, Lines 34 - 39). Becker's suggestion is customary to the entry tub of most conventional waterslides. Becker's suggestion does not contemplate the performance characteristics as described by the present invention, i.e., downhill acceleration in excess of the acceleration attributable to the force of gravity, or acceleration in a horizontal direction in excess of that force which is necessary to prevent entry tub blockage, or acceleration in an uphill direction, or elevation recovery, or multiple propulsion locations, etc. The "extra push" suggested by Becker is limited in location to the start of a slide, and limited in force to that which is necessary to avoid slide blockage by a starting slider. Conversely, the flow of water as injected by the subject invention is preferably located downstream of the conventional start as suggested by Becker. Furthermore, a preferred function of the subject invention is acceleration of a rider who is already in motion, not one who is blocking the slide by remaining in place. The suggestions of Becker are limited to existing conventional waterslide start basins, and as such, have no relevance to the present invention.

[0007] Goldfarb et al. U.S. Pat. No. 4,778,430 issued Oct. 18, 1988 discloses a waterslide toy wherein a mechanically powered conveyor lifts humanoid slide-objects from a lower slide section to the upper end of the slide section whereupon the slide-objects slide downward by way of gravity passage upon recycled water to the start point of the conveyor. The structure and operation of Goldfarb et. al. has no relevance to the present invention.

[0008] Dürwald et al. U.S. Pat. No. 4,392,434 issued Jul. 12, 1983 discloses a turbulent waterway having boats guided in a trough between an uphill starting point and a downhill terminus and a chain conveyor that prohibits slippage as it carries the boats from terminus to start. The structure and operation of Dürwald et. al. has no relevance to the present invention.

[0009] Moody U.S. Pat. No. 4,805,896 issued Feb. 21, 1989 discloses a water ride for swimmers which utilizes the linear (predominantly horizontal or downward) movement of a large quantity of water of swimming depth. Moody shares an attribute of the "Downward or Horizontal Accelerator" embodiments of the subject invention, i.e., the ability to move a participant in a predominantly horizontal or downward direction wherein the participant is moved by the water rather than through it. However, Moody can be distinguished from the subject invention as follows: The entire thrust of Moody is to provide a massive weight of water with very gradual downhill slopes to create desired swimmer movement. The ride, specifically limited to swimmers, is comprised of a large quantity of water of with a weight substantially greater than the weight of the participant and at depth sufficient to prevent the floating or swimming participant from contacting the bottom of the water channel. To move such large quantities of water, Moody specifies "High volume pumps at low water heads", (Column 3 Line 27). Conversely, the preferred embodiment for the subject invention utilizes lower volume pumps at higher water heads. Such high head pumps in concert with properly configured nozzles produce powerful focused water flows that can function at less than one inch deep. A fortiori, swimming is not a requirement, and the participant will inherently touch the bottom surface over which he/she is sliding. Additionally, the volume of water required to move a participant per Moody is ten to twenty times greater than that which would be required by a preferred embodiment of the subject invention. As to the issue of friction reduction, Moody uses a sufficient quantity of water to partially float the rider who can then accelerate by the relatively low kinetic energy of the slow moving mass of water. Conversely, the subject invention allows for acceleration by water impact (i.e., extreme momentum transfer), and does not require rider flotation to reduce the friction force. A further significant point of differentiation includes the ability to propel the participant in an upward direction (such ability was not contemplated by Moody). As a result of these differences, it is respectfully submitted that Moody teaches away from the propulsion mechanism as taught by the subject invention.

[0010] Barber U.S. Pat. No. 4,836,521 issued Jun. 6, 1989 discloses an amusement device that incorporates a circular pond in which water is rotated by jets to form a vortex and wherein a rotating member with resultant centrifugal force gives the rider the sensation of traversing the edge of a giant whirlpool. The structure and operation of Barber has no relevance to the present invention.

[0011] Dubeta U.S. Pat. No. 4,805,897 issued Feb. 21, 1989 discloses improvements to water slide systems, wherein a vertically rising water reservoir located at the upstream end of a waterslide (preferably at the beginning of the run) is properly valved to discharge a sudden quantity of water at selected intervals into the chute of the downwardly inclined waterslide. Similar to Moody (supra), Dubeta shares an attribute of several embodiments of the subject Invention, i.e., the ability to move a participant in a predominantly downrun direction wherein the participant is moved by the water rather than through it. However, Dubeta can be distinguished from the subject invention as follows: The entire thrust of Dubeta is to increase rider safety by providing intermittent floods of water that assures proper spacing for riders on a downhill waterslide run. Dubeta clarifies;

"because the flood occurs with each rider and the rider is carried thereby in a positive manner for the entire run of the slide...the riders on the slide are maintained at a spaced relation relative to one another on the slide as they proceed down the same. This overcomes many of the accidents that occur with the constant flow rate system as previously discussed." (Column 6, Lines 57 - 64).

[0012] It is important to note that the flood of water released by Dubeta is intended to move at substantially the same rate as the design speed of the rider sliding down the flume (see also Column 5, Line 14 - 18). Structurally, Dubeta's preferred embodiment utilizes a storage reservoir with seven feed of head (Column 5, Line 31). Functionally, this low head flood of water insures that the rider is carried by the flood "in a positive manner for the entire run of the slide". Conversely, the preferred embodiment of the subject invention does not require any mechanism or need to release gushes of water that flow in spaced relation one after the other down the slide, rather, constant flows of water can also function to perform the intended objectives. Furthermore, the subject invention's accelerator embodiments preferably utilize head pressures in the range of 1.5 to 15 times as large as Dubeta. Such head pressure in concert with properly configured nozzles produce powerful focused water flows that result in an acceleration and in velocities that are greater than one could ever achieve by just sliding down a flume (with or without a Dubeta gush of water). Additional significant points of differentiation include the subject invention's ability to function without Dubeta's requirement of a vertically rising water tower reservoir at some location upstream from the end of the slide, and, the subject invention's ability to propel the participant in a horizontal or upward direction (such ability was not contemplated by Dubeta). As a final point of distinction, a participant in a Dubeta improvement will always be positioned downstream of the flood releasing valve prior to valve opening and gush production. In the subject invention the propellant water is already flowing at such time that the participant enters its stream. It is respectfully submitted that Dubeta, for the above stated reasons, teaches away from the propulsion mechanism as claimed by the subject invention.

[0013] Atlantic Bridge Company, British Pat. No. 1,204,629 discloses a conveyance device for fragile articles, e.g., fish or produce, wherein said articles are moved at a high rate of speed by way of suction and gravity and are decelerated with minimal damage by introducing said articles into a liquid bath at an acute angle so that the articles meet the liquid surface obliquely with reduced shock of impact. The structure and operation of Atlantic Bridge Company has no relevance to the present invention.

[0014] Frenzl U.S. Pat. No. 3,598,402 issued Aug. 10, 1971 is perhaps more closely related in structure to the "Upward Accelerator" embodiment of the present invention than any of the previously discussed references. Frenzl discloses an appliance for practicing aquatic sports such as surf-riding, water-skiing and swimming comprised of a vat, the bottom of which is upwardly sloping and has a longitudinal section which shows a concavity facing upwards while a stream of water is caused to flow upslope over said bottom as produced by a nozzle discharging water unto the surface of the lower end of said bottom. Provision is made for adjustment of the slope of the vat bottom around a pivotal horizontal axis to permit the appliance to be adjusted for that sport which has been selected for practice, e.g., water skiing reduced slope or surf-riding increased slope. Provision is also made for varying the speed of the water from a "torrential flow" for water skimming activities, e.g. surfboard riding, to a "river type flow" wherein the speed of the water is matched to the speed of an exercising swimmer.

[0015] However, Frenzl '402 does not recognize, either explicitly or implicitly some of the problems solved by the present invention, among which is the use of the upwardly flowing water as the means to thrust a rider up an incline and beyond the flow generating apparatus. Frenzl teaches in the instance of "torrential flow" that the function of his structure,

"allow(s) the practicing of surf-riding and other similar sports, as the sloping of the vat bottom results in the possibility for the water skier to keep his balance in an equilibrium position depending on the one hand, on an upwardly directed force ascribable to the drag or resistance of the carrier board or boards dipped into the stream of water and, on the other hand, on a downwardly directed force produced by the component of the weight of the water skier in a direction parallel with the vat bottom." (Frenzl, Col. 1 lines 49 - 57).

[0016] In the instance of a "river type flow", Frenzl teaches that the function of his structure,

"allows also practicing swimming. To this end, the swimmer sets the bottom 1 into a slightly sloping position... and he fills the vat almost up to its upper edge. He resorts then to low speeds for the water stream... The stream of water may be adjusted, so as to match the speed of the swimmer..." (Frenzl, Col. 4 lines 14 - 22).

[0017] In both flow descriptions, the entire teaching of Frenzl is for the user of the apparatus to be in equilibrium so that the aquatic sport can be practiced by the user. Either a user is in static equilibrium while skimming the surface of the water or in static equilibrium when swimming through the water. All adjustments to the appliance are directed at creating or sustaining this equilibrium.

[0018] Conversely, the teaching of the present invention is to avoid equilibrium. A rider who achieves equilibrium would oppose the objective for which the ride was designed, i.e., to propel its user up an incline and beyond. Furthermore, in this instance equilibrium is a safety hazard in that other riders who enter the device and are propelled upward could collide with a rider who is in equilibrium. It is respectfully submitted that Frenzl's structure was designed for equilibrium, and as such, teaches away from the propulsion mechanism as claimed by the subject invention.

[0019] Frenzi U.S. Pat. No. 4,905,987 issued Mar. 6, 1990 shows improvements to the appliance disclosed in the Frenzl '402 patent (described above) and in addition shows connected areas for swimming, non-swimming and a whirlpool so that water from the Frenzl '402 appliance is further utilized after outflow thereof. The primary objective of the Frenzi '987 patent is to improve the start and exit characteristics of the Frenzl '402 appliance by providing a means whereby a user can enter, ride, and exit the appliance to avoid breakdown of the torrential flow. There is, however, no suggestion in the Frenzi '987 patent that the user of the '402 portion of the structure should desire propulsion (by reason of water flow) up the floor's incline, rather, the express purpose of the '402 portion of the structure is "to carry out water gliding sports" on top of the upwardly sheeting flow. Furthermore, a Frenzi participant enters the appliance and starts his ride subsequent to the flow directing nozzle, whereas in the subject invention a participant always enters and starts the ride prior to encountering the flow directing nozzle. Finally, Frenzi does not contemplate user movement from the '402 portion of the structure to other portions (e.g., swim channel or whirlpool) of his device. In fact, Frenzi describes a catch grate as a vertical terminator that prohibits movement of a user and his riding equipment to other portions of the flow system. For the above stated reasons, it is respectfully submitted that Frenzi teaches away from the subject invention.

[0020] Frenzl U.S. Pat. No. 4,564,190 issued Jan. 14, 1986 shows improvements to the appliance for practicing aquatic sports using gliding devices (as disclosed in the Frenzl '402 patent) by introduction of a device that removes water from an upwardly sloping bottom surface which has been slowed down by friction at the boundary faces and returns the water to a pumping system to thereby increase the flow rate and thus eliminate the deleterious effects of slowed down water. Frenzl '190 is quickly distinguished from the subject invention on two bases. First, the structure and operation of Frenzl '190 is limited to an appliance for practicing aquatic sports using gliding devices. Consequently, the desired function of a Frenzl participant is to glide over the water that is re-injected into the uphill flow. Conversely, it is desired by a participant in the subject invention to be embraced by the re-injected water and either be accelerated or de-accelerated to approach the flow of this re-injected water. To glide over such re-injected water is to thwart this "embracing" objective. Secondly, a Frenzl '190 participant can enter and start his ride subsequent to the apertures that reinject accelerated water, whereas in the subject invention a participant always enters and starts the ride prior to encountering the re-injected accelerated water. For the above stated reasons, it is respectfully submitted that Frenzl '190 teaches away from the subject invention.

[0021] Bacon U.S. Pat. No. 3,830,161 issued Aug. 20, 1974 discloses a flume amusement ride wherein water is pumped to a channel at the top of the ride, passengers in boats are mechanically conveyed to this top water channel, the boats guided by the walls of the water channel proceed to a steep down chute portion which includes two adjacent water channels into which boats are alternately directed by a gate, thus, safely increasing the dispatch interval between boats in the flume ride. After an initial descent, provision is made to use the speed attained to encounter a jump which permits the boat to climb upward upon a track over the jump and then back down to a channel splash down. As the boat rides up on the tracks the water flowing in the channel passes under these tracks in a trough. The boat does not contact the water until in comes down from the jump. The similarity of Bacon '161 to the subject invention is limited to ride profile. In function, the boat is not even in contact with the water when it begins its upward incline, rather, the boat is on a track and its operation is analogous to a gravity driven roller coaster. Consequently, Bacon '161 has no relevance to the present invention.

[0022] Bacon U.S. Pat. No. 3,853,067 issued Dec. 10, 1974 discloses a boat amusement ride wherein water is pumped to a channel at the top of the ride, passengers in boats are mechanically conveyed to this top water channel, the boats guided by the walls of the water channel float to a steep down chute portion, the boats individually descend to the rides low point and then recover significant elevation within a common trough with the water. To facilitate start-up, a dam is provided at the top of the downchute. When enough water is accumulated behind the dam it is opened and the mass of water travels along the downchute and up the subsequent rise portion, thus "priming" the ride.

[0023] On the surface, Bacon '067 appears very similar to the "Stabilization/Equalization Process", "Elevation Enhancement Process" and "WaterCoaster" embodiments of the subject invention, however, there are four significant structural and functional distinctions. First, Bacon '067 is limited to a "boat amusement ride". The subject invention has no such limitation, riders sliding in bathing suits without the aid of a "boat" type riding device will also function admirably. Second, the water in Bacon '067 is introduced only at the "top at the beginning of the ride" (see column 2 line 36). In the subject invention, water is introduced after the rider has attained an initial start velocity in the conventional manner as known to those skilled in the art. Such introduction is by definition not at the beginning of the ride. Thirdly, Bacon '067 teaches that once being lifted to the top most portion of the ride, the water and the passenger carrying boats thereon, "will move only by gravity" (see column 2 lines 37 through 40). The subject invention teaches that rider and vehicle motion can be augmented by high speed jets of water, and that such augmentation can be in addition or in opposition to the force of gravity. Furthermore, if such augmentation occurs as the result of one of the acceleration embodiments as described herein, one may (a) ride faster downhill, (b) ride further in distance horizontally, and (c) ride uphill a greater distance than had the subject invention not been used. Fourth, Bacon identifies and proposes a solution to the problem of carrying water through the rising portion of the trough especially during she rides start mode Bacon introduces a cam at the top/start of the ride. When enough water has accumulated behind this dam it is opened and the mass of water travels along the downchute and up the subsequent rise portion, thus 'priming' the ride. The subject invention solves the problem associated with upward water flow during the start mode by either introducing vents or reconfiguring the riding surface to facilitate water clearing in the subsequent rise portion of the ride. For the above stated reasons it is respectfully submitted that Bacon 067 teaches away from the subject invention.

[0024] JP-A-63-309 290 discloses an amusement device having a trough shaped waterway wherein at least a bottom surface thereof is smooth. Jet parts are provided at the bottom surface for ejecting a jet stream, for impelling a human body that can be moved into the water stream. The jet stream is ejected into the waterway obliquely in connection with the flowing direction.

BRIEF DESCRIPTION OF THE PRESENT INVENTION

[0025] The primary objective of the present invention is to provide a safe, entertaining and functional water ride in which participants are propelled in a downward, horizontal or upward direction by means of a high velocity flow of water.

[0026] The above object is achieved with the features of the water ride in accordance with the independent claim 1 and 2 and with the method as recited in claim 21. Preferred embodiments are recited in the dependent claims.

[0027] The advantages of such an attraction are numerous. First, in the instance of accelerating propulsion devices, it will enable a whole range of water ride activities that have as yet been unavailable to the public. Specifically, participants will be able to experience the thrill of riding in a downward direction at a rate of acceleration in excess of that afforded by the force of gravity.

[0028] Additionally, participants will be able to ride in a horizontal direction and accelerate without the requirement of losing one's vertical elevation. More uniquely, a participant will be able to slide uphill, akin to a waterslide in reverse. Furthermore, due to the force of the propellant water, the participant can be made to achieve a height that is in excess of the initial start height. Such an embodiment will enable the advantage of creating a water powered escalator, ie. enabling participants to move to higher elevations without the need of climbing stairs (as is currently the norm in most water recreation facilities). Additionally, this embodiment could be configured to permit handicapped individuals who cannot climb stairs to enter and ride a water oriented sliding attraction starting from the ground level.

[0029] A second objective of the present invention is to inject non-accelerating flows of water into a water ride that recovers in elevation following the bottom of a downchute portion. Such injection has the advantage of providing a stabilizing influence for the rider/vehicle, especially those instances where rider/vehicle coefficients of friction may vary.

[0030] A third objective of the present invention is the design of a water ride flume that will not only allow upward rider/vehicle movement, but will concurrently function to solve the transient surge problems associated with ride start-up and slow rider transitioning upon upwardly inclined riding surfaces.

[0031] A fourth objective of the present invention is to connect the present invention with a standard water slide/ride; and, in series to create a water slide/ride configuration that is akin to a rollercoaster. This "Water Coaster" attraction has advantage over existing water slides (and even existing roller coaster rides), in that the continuation (kinetic energy) of a slider's ride is not limited to the initial potential energy gained from climbing to the top of the slide. Rather, by timely interjection of a properly configured high speed jet of water, the kinetic energy of said jetted water can transfer and accelerate a rider to enable the rider to attain an altitude (increased potential energy) in excess of an altitude that would be achieved absent said jetted flow. The degree to which a rider will achieve "excess altitude" is a function of the velocity and amount of water that contacts and remains in contact with the rider during the course of his ascent. Upon reaching his apogee a rider transitions and either is blasted by another jet to continue his ascent, or is blasted horizontally, or, the rider descends along a path and in the manner of a standard water slide/ride to either a standard splash pool/transition zone, or to another jetted flow of stabilizing or accelerating water. Furthermore, the Water Coaster embodiment can include all the standard twists, turns, jumps, and loops normally associated with a Roller Coaster.

[0032] A fifth objective of the present invention is to create a ride out of water that is ordinarily pumped uphill in an enclosed pipe. The advantage of such an improvement is that it more efficiently makes use of an existing condition, i.e., if water is going to be pumped uphill in any event, (e.g., to service a fountain, waterslide or other gravity enhanced water attraction), then, one can obtain the benefit of riding (at minimal extra cost) such water that is already being upwardly pumped.

[0033] Other objectives and goals will be apparent from the following description taken in conjunction with the drawings included herewith.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034]

FIG. 1A is a top view of a propulsion module.
FIG. 1B is a side view of a propulsion module.
FIG. 1C is a side view of a series of connected propulsion modules and a rider theron.
FIG. 2 depicts a nozzle with adjusting aperture sized to perform for a single participant waterslide propulsion module.
FIG. 3A is a top view of of a module with right angle channel walls.
FIG. 3B is a perspective view of a module with right angle channel walls.
FIG. 3C illustrates a module with riding surface integrated with channel walls into a parabolic half-pipe configuration.
FIG. 4 depicts a rider in a half-pipe shaped module negotiating a turn.
FIG. 5A depicts a module with channel walls and a "porous vent" mechanism.
FIG. 5B is a perspective view of an "overflow vent" mechanism, further described as a Triple Flume.
FIG. 5C shows in cross section the Triple Flume.
FIG. 5D depicts a rider in the Triple Flume.
FIG 5E is one in a series of three illustrations that depicts in time-lapse sequence the self-clearing capability of an upwardly inclined Triple Flume.
FIG 5F is the second in a series of three illustrations that depicts in time-lapse sequence the self-clearing capability

of an upwardly inclined Triple Flume.

FIG 5G is third in a series of three illustrations that depicts in time-lapse sequence the self-clearing capability of an upwardly inclined Triple Flume.

FIG 5H is a perspective view of an "overflow vent" mechanism, further described as a Double Flume.

FIG 5I shows in cross section the Double Flume.

FIG 5J shows a rider during various stages of a turn on the Double Flume.

FIG 5K is one in a series of three illustrations that depicts in time-lapse sequence the self-clearing capability of an upwardly inclined Double Flume.

FIG 5L is the second in a series of three illustrations that depicts in time-lapse sequence the self-clearing capability of an upwardly inclined Double Flume.

FIG 5M is third in a series of three illustrations that depicts in time-lapse sequence the self-clearing capability of an upwardly inclined Double Flume.

FIG. 6A depicts a generalized view of a three module Horizontal Accelerator with rider.

FIG. 6B depicts a Horizontal Accelerator in operation.

FIG. 7A depicts a generalized view of a three module Upward Accelerator with rider.

FIG. 7B depicts a Upward Accelerator in operation.

FIG. 8A depicts a generalized view of a three module Downward Accelerator with rider.

FIG. 8B depicts a Downward Accelerator in operation.

FIG. 9 shows a generalized view of the Horizontal Non-Accelerating Propulsor.

FIG. 10 shows a generalized view of the Upward Non-Accelerating Propulsor.

FIG. 11 shows a generalized view of the Downward Non-Accelerating Propulsor.

FIG. 12 illustrates the problems that occurred in the prior art when varying riders encountered a section profile of a water amusement ride wherein partial altitude recoupment occurs.

FIG. 13 is a generalized view of a section profile of a water amusement ride that solves the problems as illustrated in FIG. 12 and is described as the Stabilization/Equalization Process.

FIG. 14 illustrates the limitations that occurred in the prior art when varying riders encountered a section profile of a water amusement ride wherein partial altitude recoupment occurs.

FIG. 15 is a generalized view of a section profile of a water amusement ride that overcomes the limitations as illustrated in FIG. 14 and is described as the Elevation Enhancement Process.

FIG. 16 depicts the Water Coaster embodiment of the subject invention highfighting Accelerator technology and the Elevation Enhancement Process.

FIG. 17 depicts the Water Coaster embodiment of the subject invention highlighting Propulsor technology and the Stabilization/Equalization Process.

REFERENCE NUMERALS IN DRAWINGS

21	Module	22	Water Source
23	Flow Control Valve	24	Flow Forming Nozzle
25	Smooth Riding Surface	26	Module Connection
27	Channel Wall	28	Adjustable Nozzle Aperture
29	Rider	30	Jet-Water Flow
31	Aperture Plate	32	Tunnel Arch
33	Transient Surge	34	Porous Vent
35	Triple Flume	36	Overflow Flume
37	Overflow Water	38	Porous Overflow Vent
39	Double Flume	40	Horizontal Accelerator
41	End of Horizontal Accelerator	42	Upward Accelerator
43	End of Upward Accelerator	44	Downward Accelerator
45	End of Downward Accelerator	46	Horizontal Non-Accelerating Propulsor
47	End of Horizontal Non-Accelerating Propulsor		
48	Ride Continuation Path (Horizontal Non-Accelerating Propulsor)		

49	Upward Non-Accelerating Propulsor
50	End of Upward Non-Accelerating Propulsor
51	Ride Continuation Path (Upward Non-Accelerating Propulsor)
52	Downward Non-Accelerating Propulsor
53	End of Downward Non-Accelerating Propulsor
54	Ride Continuation Path (Downward Non-Accelerating Propulsor)
55	Start Basin (prior art)
56	Attraction Surface (prior art)
57	Preferred Trajectory
58	Airborne Trajectory
59	Failed Trajectory
60	Attraction Surface (Stabilization/Equalization)
61	Start Basin (without Elevation Enhancement Process)
62	Attraction Surface (without Elevation Enhancement Process)
63	Unaided Trajectory
64	Unaided Zenith
65	Attraction Surface (Elevation Enhancement Process)
66	Zenith (Elevation Enhancement Process)

69 Water Coaster

70 Attraction Surface (Water Coaster)

71 Structural Supports

72 Start Basin (Water Coaster)

73 End Basin (Water Coaster)

74 Surge Tank

[0035] The subject invention is comprised of several embodiments that can stand alone or be combined to function for the recreational purposes as described herein.

DETAILED DESCRIPTION OF PRESENT INVENTION

[0036] To facilitate a concise description of the multiplicity of embodiments set forth in this invention, and to avoid burdensome repetition, a modular approach has been taken to define a set of common elements that are central to each embodiment. The module is only grouped for purposes of convenience and is not intended to limit the scope of the invention, or the structure or function of the respective components that comprise the module. Furthermore, the size of the components that comprise a module is a function of intended use. The preferred embodiments as hereafter described are intended for single participant use, akin to the common waterslide. It is understood by those schooled in the art that with proper upsizing the subject invention could also accommodate multiple riders simultaneously. Likewise, with suitable adjustment for weight, friction and surface shape, the subject invention could service single or multi-passenger sliding vehicles, wheeled vehicles, or boats, thus allowing participants to become bathing suit wet or remain street clothes dry.

[0037] Turning now to Fig. 1A (top view) and Fig. 1B (side view) there is illustrated a propulsion module **21** comprised of a high flow / high pressure water source **22**; a flow control valve **23**; a flow forming nozzle **24** with adjustable aperture **28**; a discrete jet-water flow **30** with arrow indicating the predetermined direction of motion; and a substantially smooth riding surface **25** over which jet-water flow **30** flows. Module **21** is made of suitable materials, for example, resin impregnated fiberglass, concrete, gunite, sealed wood, vinyl, acrylic, metal or the like, and is joined by appropriate water-tight seals in end to end relation. FIG.1C (side view) depicts a rider **29** (with arrow indicating the predetermined direction of motion) sliding upon a series of connected modules. Connections **26a**, **26b** and **26c** between modules **21a**, **21b**, and **21c** permit an increase in overall length of the subject invention as operationally, spatially, and financially desired. Connection **26** can result from bolting, gluing, or continuous casting of module **21** in an end to end fashion. When connected, the riding surface **25** of each module need be substantially in-line with and flush to its connecting module to permit a rider **29** who is sliding thereon and the jet-water **30** which flows thereon to respectively transition in a safe and smooth manner. When a module has nozzles **24** that emerge from a position along the length of the riding surface **25** (as depicted in FIG. 1C), it is preferred that the non-nozzle end of the riding surface **25** extend to and overlap the top of a connecting nozzle **24** at connection **26**. Further to this configuration, it is also preferred that the bottom of nozzle **24** extend and serve as riding surface **25**. Module **21** can also be connected in the conventional manner to standard waterslide or water-ride attraction flumes as currently exist in the art.

[0038] Module **21** length can vary depending on desired operational performance characteristics and desired construction techniques or shipping parameters. Module **21** width can be as narrow as will permit one participant to ride in a seated or prone position with legs aligned with the direction of water flow [roughly .5 meters (20 inches)], and as wide as will permit multiple participants to simultaneously ride abreast or a passenger vehicle to function. The driving mechanism which generates the water pressure for the water source **22** can either be a pump or an elevated reservoir. Where a series of modules are connected, a single high pressure source or pump with a properly designed manifold could provide the requisite service, or in the alternative, a separate pump for each module could be configured. The line size of the water source **22** need be of sufficient capacity to permit the requisite configuration and pressure of jet-water flow **30** to issue from nozzle **24**. The water pressure at nozzle aperture can vary depending upon desired operational characteristics. In a single participant waterslide setting, nozzle pressure can range from approximately 0.345 bar to 17.241 bar (5 psi to 250 psi) depending upon the following factors: (1) size and configuration of nozzle opening; (2) the weight and friction of rider relative to the riding surface; (3) the consistency of riding surface friction; (4) the speed at which the rider enters the flow; (5) the physical orientation of the rider relative to the flow; (6) the angle of incline or decline of the riding surface; and (7) the desired increase or decrease in speed of rider due to flow-to-rider kinetic energy transfer. In a water ride attraction that utilizes vehicles, nozzle pressure range can be higher or lower given that vehicles can be designed to withstand higher pressures than the human body and can be configured for greater efficiency in kinetic energy transfer. The flow control valve **23** is used to adjust pressure and flow as operational parameters dictate and can be remotely controlled and programmed. Nozzle **24** is formed and positioned to emit jet-water flow **30** in a direction substantially parallel to and in the lengthwise direction of riding surface **25** through adjustable aperture **28**. To enable continuity in rider throughput and water flow, when modules are connected in series for a given attraction, all nozzles should be aligned in the same relative direction to augment rider movement. Riding surface **25** need be of sufficient structural integrity to support the weight of a human rider(s), vehicle, and water moving thereupon. It is also preferred that Riding surface **25** have a low-coefficient of friction to enable jet-water **30** to flow and rider **29** to move with minimal loss of speed due to drag. The condition of jet-water flow **30** (i.e., temperature, turbidity, Ph, residual chlorine count, salinity, etc.) is standard pool, lake, or ocean condition water suitable for human swimming.

[0039] Nozzle **24** dimensions are a function of available water flow and pressure and the desired performance and capacity characteristics of the module as further described herein. FIG. 2 shows a perspective of the preferred embodiment for a nozzle **24** sized to perform for a single participant flat bottomed waterslide module. Curved bottom riding surfaces would perform more efficiently with bottom originating nozzle **24** and Aperture **28** conformed to the cross-sectional curvature of the curved riding surface. Aperture **28** of nozzle **24** can either be fixed or adjustable. The preferred embodiment uses an aperture capable of adjustment. Ideally, adjustment should allow for variations in thickness and width of jet-water flow **30**. For example, but not by way of limitation, the breadth ***c*** of nozzle aperture **28** can range from 1/2 cm to 40 cm. The width ***d*** of nozzle aperture **28** can range from 20 cm to 200 cm. A multiplicity of adjustment devices are capable of effecting proper aperture control, e.g., screw or bolt fastened plates, welded plates, valves, moveable weirs or slots, etc. Many of such devices are capable of automatic remote control and programming. FIG. 2 shows in exploded view bolted aperture plate **31** fastened to adjust aperture opening to operational requirements. Although just one large nozzle **24** is illustrated, multiple smaller nozzles can be packaged to achieve similar flow and aperture size characteristics with satisfactory results. For multiple participant or large vehicle configurations, additional nozzles can be placed side by side to increase the horizontal flow area, or one large nozzle can function. It is also possible to vary the number and relative location of nozzle(s) **24** within a given module, so long as they serve to propel a rider or vehicle as contemplated herein.

[0040] Module **21** can function with or without channel walls. Furthermore, channel walls are capable of multiple configurations and can at times act as a riding surface. FIG. 1A, FIG. 1B, and FIG. 1C depicted module **21** without channel walls. FIG. 3A (top view) and FIG. 3B (perspective view) illustrates module **21** with right angle channel walls **27a** and **27b**. FIG. 3C shows module **21** with channel walls **27c** and **27d** in a half-pipe configuration, with riding surface **25** and channel walls **27** integrated into the shape of a parabola. Conventional channel wall shapes vary substantially between the ranges as described in FIG. 1A-C and FIG. 3 A-C. Functionally, when compared to a flat riding surface the addition of channel walls has three important advantages: First, as shown in FIG. 4A, module **21** with properly configured channel walls **27e** and **27f** will allow the introduction of compound curves to the riding surface **25** that permit rider **29** and jet-water flow **30** to ride-up the side of the channel wall in a banking turn, oscillate between walls when coming out of the turn, yet stay within the riding surface region defined by the flume channel walls **27e** and **27f**. Without channel walls, a rider is limited to his initial direction of motion and would not be able to negotiate a turn unless acted upon by some outside force. The second advantage for channel walls is their safety function, i.e., they keep a rider within the confines of the flume and prevent untimely rider exits and injury sustaining falls from an elevated riding surface.

[0041] In counterpoint to the previously described channel wall advantage of tracking rider and water within the region defined by the flume channel walls, channel walls can have the disadvantage of confining excess water and allowing an undesirable build-up that can adversely effect the operation of module **21**. This undesirable build-up is particularly acute in an upward directed flow and occasionally a problem in a horizontally directed flow. In both cases, this build-up will most likely occur during three stages of operation, (1) water flow start-up with no rider present; (2) transferring the kinetic energy of the operating high speed flow of water to a slower speed rider; and (3) cumulative build-up of injected water from a series of nozzles along a ride course. In the start-up situation (1), due to the gradual build up of water flow associated with pump/motor phase in or valve opening, the initial water flow is often of less volume, velocity or pressure than that which issues later. Consequently, this initial start water is pushed by the stronger flow, higher pressure, or faster water that issues thereafter. Such pushing results in a build-up of water (a hydraulic jump or transient surge) at the leading edge of the flow. An upward incline of the riding surface serves only to compound the problem, since the greater the transient surge, the greater the energy that is required to continue pushing such surge in an upward fashion. Consequently, the transient surge will continue to build and if unrelieved will result in overall flow velocity decay, i.e., the slowed water causes additional water to pile up and ultimately collapse back onto itself into a turbulent mass of bubbling white water that marks the termination of the predominantly unidirectional jet-water flow. In the situation of kinetic energy transfer (2), when a slow rider encounters the faster flowing water, a transient surge builds behind the rider. Likewise, if this transient surge grows to large it will choke the flow of higher speed unidirectional jetted water, thus, causing flow decay. In the situation of an excessive build up of water over time from a series of nozzles along the course of a ride (3), the interference of a preceding flow with a subsequent flow can result in an undesired transient surge and flow decay at a point near where the two flows meet. Under all three conditions, it is possible to eliminate the transient surge by immediately increasing the flow pressure and over-powering or washing the transient surge off the riding surface. However, there comes a point where the build-up of water volume is so great that for all practical purposes over-powering is either impossible, or at best a costly solution to a problem capable of less expensive solution. Such less expensive solution is possible by the introduction of vents. Modules with no (or relatively low height) channel walls are self-venting, i.e., the slower water will escape to the sides. By introducing vents to channel wall situations, one can combine the aforementioned advantages of channel walls (i.e., tracking, structure and safety) with the self-venting properties of no channel walls and simultaneously solve the start-up, rider induced, and excessive accumulation transient surge problems.

[0042] Two classes of vent mechanisms are identifiable for use in module **21**. The first class, "porous vents", is illustrated in FIG. 5A wherein rider **29** is in an inclined module **21** with channel walls **27a** and **27b**. Jet-water flow **30** is already issuing from nozzle **24** when rider **29** enters its flow. Since the velocity of jet-water flow **30** is moving at a rate greater than the speed of the entering rider, a transient surge **33** will build behind the rider. This build-up can be eliminated by draining the slowed water through a porous vent **34a**, **34b**, **34c**, or **34d** along the sides of channel **27a** and **27b** or through porous vent **34e** along the bottom of riding surface **25**. Porous vents **34** must large enough to permit transient surge **33** to vent, yet not too large so as to adversely affect the safety or performance of a rider or riding vehicle that is moving over the surface **25**. Acceptable types of porous vent openings include a multiplicity of small holes, a porous fabric, slots, grids, etc. The water once vented can be recirculated to the water source **22**.

[0043] The second class of vent mechanism to be used in module **21** can be described as an overflow vent or a "flume within a flume". Two preferred embodiments specific to this class are hereinafter referred to as the Triple Flume and the Double Flume. The Triple Flume has the advantage of permitting higher degrees of predominantly straight upward incline than the Double Flume, while the Double Flume has the advantage of permitting radical uphill curves that are not available to the Triple Flume. Although the Triple Flume and the Double Flume are described in the context of module **21**, they are both capable of individual attachment to conventional non-injected water tides for the self-clearing purposes as previously described.

[0044] FIG. 5B shows a perspective view of a Triple Flume **35** self-venting improvement to module **21**. FIG. 5C shows a cross-sectional Triple Flume **35** profile. Structurally, Triple Flume **35** is comprised of riding surface **25** and two adjacent overflow flumes **36a** and **36b**. Riding surface **25** is integrated with or connected to two low rise channel walls **27f** and **27g** of approximately equal height. Overflow flume **36a** abuts and integrates, connects, or shares low rise channel wall **27f** and on its opposite side integrates or connects to high channel wall **27h**. Overflow flume **36b** abuts and integrates, connects, or shares low rise channel wall **27g** and on its opposite side integrates or connects to high channel wall **27i**. The orientation of Triple Flume **35** is predominantly at an upward incline with jet-water flow and rider moving in an upward direction on riding surface **25**, and any overflow water that spills into overflow flume **36a** and **36b** moving in a downward direction due to the force of gravity. Horizontal application of Triple Flume **35** is also appropriate in those circumstances where transient surge build up interferes with the smooth jet-water flow. However, during any horizontal application overflow flume **36a** and **36b** must maintain a sufficient degree of slope to permit overflow water to properly drain. In Triple Flume **35**, the heights of low channel walls **27f** and **27g** are variable depending upon a number of factors, e.g., the initial start-up water pressure and flow; the time required to achieve full operating water pressure and flow; the volume of riding surface **25** (i.e., riding surface width multiplied by wall height); the length and degree of incline of riding surface **25**; the disparity of velocity between a slow entering rider and the higher speed flow; the flow volume of accumulating water; and design preference as to whether rider transfer from one flume to another is to be encouraged, etc. At a minimum, as shown in FIG. 5D, the height of low channel walls **27f** and **27g** must be sufficient to separate the upward jet-water flow **30** from the downward overflow water **37** , as well as, facilitate tracking of a rider **29** substantially upon riding surface **25**. At a maximum, low channel walls **27f** and **27g** must not exceed such height that will prevent the clearing of transient surge **33**. From a practical view point to avoid redundancy, low channel walls **27f** and **27g** will always be less than that which would be required for high channel wall **27h** and **27i**. Overflow flumes **36a** and **36b** are of at least sufficient size to accommodate any overflow water **37**, and may also be increased in size to function as traditional downward oriented participant riding surfaces. In this latter instance, it would be possible to have a rider moving upward on primary riding surface **25** and two riders moving downward in overflow flumes **36a** and **36b**. High channel walls **27h** and **27i** are of standard ride height to prevent unwanted rider exits from Triple Flume **35**.

[0045] As previously discussed, one of the operational benefits of Triple Flume **35** unique design occurs primarily in the context of horizontal or upward directed flows during either the water flow start-up procedure with no rider present, or when a lower speed rider encounters a higher speed water flow, or in the situation of an excessive accumulation of injected water. In the standard start up procedure, a time lag usually exists between initial start-up operating flow and pressure and full operating flow and pressure. This delay exists due to the time it takes to get a flow control valve **23** fully open, or if already open, the time it takes to get the pump or other means of water supply up to full operating speed or efficiency. FIG. 5E, 5F, and 5G show in time lapse sequence how the design of Triple Flume **35** operates to solve the problem of a pressure/flow lag during start-up. In FIG. 5E jet-water flow **30** has commenced issue in an uphill direction from nozzle **24**. As jet-water flow **30** moves up riding surface **25** the leading edge of water flow is slowed down bye combination of the downward force of gravity and friction with riding surface **25**, whereupon, it is overtaken and pushed by the faster and stronger flow of water that subsequently issues from nozzle **24**. The result of this flow dynamic is that a transient surge **33** begins to build. However, as transient surge **33** builds, it reaches the height of low channel walls **27f** and **27g** and commences to spill into overflow flumes **36a** and **36b**. Since overflow flumes **36a** and **36b** are at an incline, overflow water **37a** and **37b** flows downhill attributable to the force of gravity to porous overflow vents **38a** and **38b**, whereupon, it will drain and either be pump recycled to the water source **22** or used in some other fashion. FIG 5F shows this start procedure moments later wherein the water pressure/flow rate from water source **22** or flow control valve **23** has increased and transient surge **33** has moved further up the incline. Overflow water **37a** and **37b** continues to pour in and run down to porous overflow vents **38a** and **38b**. FIG 5G shows the final stage of start-up wherein the transient surge **33** has been pushed over the top of rising riding surface **25** and jet-water flow **30** now runs clear. Similar to the start-up procedure, when a lower speed rider encounters the higher speed water, or when an accumulative build-up of water results from a series of injected water flows, a transient surge may occur. In like manner, the transient surge will clear by spilling off to the overflow flumes and draining accordingly. Operationally, Triple Flume **35** is limited to predominantly straight sections since the height of the low channel walls **27f** and **27g** are insufficient to contain rider **29** to the inside slope of any significant arc's radius of curvature due to the centrifugal acceleration of rider **29**. Consequently, if one attempted to significantly curve Triple Flume **35**, the centrifugal force associated with high velocity water would cause rider and water to jump the outside low rise channel wall into the overflow flume. Despite the inability of Triple Flume **35** to allow significant changes in direction, the principal advantage that Triple Flume **35** has over existing art is its ability to achieve a smooth upward jet-water flow and retain this smooth jetted flow at high degrees of incline under a broad range of operating water flow variables.

[0046] FIG. 5H shows a perspective view and FIG. 5I shows a cross-section of a modified design of the overflow vent or "flume within a flume" self-venting embodiment, hereafter referred to as a Double Flume **39**. Structurally, Double Flume **39** is comprised of riding surface **25** and a overflow flume **36c**. Riding surface **25** is integrated or connected on one side to a low rise channel wall **27j** and on the other side to a high channel wall **27k**. Overflow flume **36c** abuts and integrates, connects or shares low rise channel wall **27j** and on its opposite side integrates or connects to a high channel wall **27L**. On the one hand, as a consequence of having only one side to vent from, Double Flume **39** does not vent as efficiently as Triple Flume **35**, and accordingly, is unable to achieve the high degrees of inclined steepness as Triple Flume **35**. On the other hand, because of the integration of high channel wall **27k** with riding surface **25**, Double Flume **39** can be configured to permit high degrees of curvature with rider **29** being safely contained on the inside slope of high channel wall **27k**. FIG. 5J illustrates this ability of Double Flume **39** to allow upwardly inclined turns. FIG. 5J shows rider **29** in varying stages of a turn on Double Flume **39** with portions of transient surge **33** spilling into overflow flume **36c**, whereupon this overflow water **37c** gravity drains to porous overflow vent **38c**. The ability of Double Flume **39** to allow uphill turns as well as self-vent is a unique and significant advantage over the existing art. The radius of arc, degrees of curvature, left or right orientation and turn-to-turn connectivity/oscillation that is attainable by Double Flume **39** is substantially similar to that which is currently in use by those skilled in the art of building and operating conventional downhill water rides. However, as distinct from conventional downhill water rides, the orientation of Double Flume **39** is predominantly at an upward incline with jet-water flow and rider moving in an upward direction on riding surface **25**, and any overflow water that spills into overflow flume **36c** moving in a downward direction due to the force of gravity. Horizontal application of Double Flume may also be appropriate in those circumstances where transient surge build up interferes with the smooth jet-water flow. However, during any horizontal application overflow flume **36c** must maintain a sufficient degree of slope to permit overflow water to properly drain. Operationally Double Flume **39** functions in a similar manner to solve the transient surge problems associated with ride start-up, rider transition, and water accumulation as Triple Flume **35** with the exception that overflow water **37c** vents only on the one low rise side. FIG. 5K, FIG. 5L and FIG. 5M illustrates in time lapse sequence how Double Flume **39** operates in the start-up situation to allow self-venting and facilitate the desired clear smooth flow. In this sequence, it can be observed that as jet-water flow **30** progresses up riding surface **25**, transient surge **33** builds and spills into overflow flume **36c**, whereupon overflow water **37c** gravity drains to vent **38c**.

[0047] To safely take advantage of the functional propulsive benefits offered by module **21**, it is preferred that an entering vehicle or rider **29** attain an initial start velocity prior to module **21** entry. Numerous techniques are available in the existing art to achieve such initial start velocity, for example, a conventional gravity powered declining waterslide or dry slide, or, a mechanized spring or hydraulic/pneumatic powered ram, etc. It is also preferred that the direction of entry for the vehicle or rider **29** is substantially aligned with the direction of jet-water flow **30**. Such alignment is particularly important in the Accelerator emodiments as described herein, so as to insure the most efficient water-to-rider momentum transfer. It is possible for a rider or vehicle to enter jet-water flow **30** in an unaligned manner or in direct opposition to its flow. Such entry will result in a larger transient surge and greater velocity reduction, however, care must be taken to avoid tumbling and injury that could result from the angled and impacting jetted water.

[0048] The final element of module **21** that requires description is the velocity of jet-water flow **30** as issued from nozzle **24** relative to the velocity of any object (e.g., a vehicle or rider **29**) that slides into or enters jet-water flow **30**. This "relative" velocity will vary depending upon the functional purpose of module **21**. If acceleration of an entering object is desired, then, the velocity of the water will be in excess of the object in the pre-determined direction of flow. This instance is further described in the following Horizontal, Upward and Downward Accelerator embodiments. If no acceleration or de-acceleration is desired, then, the velocity of jet-water flow **30** will be equal to or less than the velocity of the entering object. This instance is later described in the Non-Accelerating Propulsor embodiments herein.

DESCRIPTION OF HORIZONTAL ACCELERATOR:

[0049] Turning now to FIG. 6A, there is illustrated a preferred embodiment hereinafter referred to as Horizontal Accelerator **40** comprised of one or more modules **21a**, **21b**, and **21c**, **et seq**. The extreme ends **41a** and **41b** of the Horizontal Accelerator **40** can be joined to known water attraction rides (e.g., a standard waterslide or flume ride) to serve as a continuation thereof and as an improvement thereto. The extreme ends **41a** and **41b** can also be joined to other embodiments of the invention disclosed herein. As further illustrated in FIG. 6B, the two distinguishing features of the Horizontal Accelerator **40** are that: (1) the orientation of each module **21** is substantially normal to the force of gravity with nozzle **24** and aperture **28** directing jet-water flow **30** substantially parallel to riding surface **25**, and at least that portion of riding surface **25** positioned closest to nozzle **24** laying horizontal and normal to the force of gravity; and (2) that jet-water flow **30** that issues from nozzle **24** moves at a velocity in excess of the velocity of rider **29** in the predetermined direction of flow. It should be noted that riding surface **25** subsequent to that portion closest to nozzle **24** can gradually vary in incline so as to facilitate connection to other embodiments of the invention disclosed herein or to other known water attraction rides.

[0050] From the description above, a number of advantages of Horizontal Accelerator **40** becomes evident:

(a) Contrary to conventional attractions, the horizontal layout of the embodiment eliminates the need for a loss of elevation in order to accelerate a participant over a given distance.
(b) The sight, sound, and sensation of horizontal acceleration induced by high speed jets of water impacting a rider is a thrilling participant and observer experience. Furthermore, the rider can gain speed for increased thrill and in set up for subsequent conventional waterslide maneuvers, e.g., twists, turns, jumps, drops, finale, etc.
(c) Increased rider velocity due to acceleration by the high speed jets of water will result in higher through-put capacity over a given period of time. Higher through-put capacity results in higher participant satisfaction and increased revenue for ride operators.
(d) For those installations where rider acceleration is a function of increased attraction elevation, the present embodiment will permit acceleration without the cost of building to the higher elevation.

OPERATION OF HORIZONTAL ACCELERATOR

[0051] For purposes of operating Horizontal Accelerator **40**, it is assumed that a rider (or rider with vehicle) has attained an initial start velocity in the conventional manner as known to those skilled in the art. Upon achieving this initial start velocity, rider **29** first enters the Horizontal Accelerator **40** at that end which is nearest nozzle **24** and moves along its length as shown in FIG. 6B. Jet-water flow **30** originating from water source **22**, is already issuing from nozzle **24** when rider **29** enters its flow. Since the velocity of jet-water flow **30** is moving at a rate greater than the speed of the entering rider **29**, a transfer of momentum from the higher speed water to the lower speed rider causes the rider to accelerate and approach the speed of the more rapidly moving water. Flow control valve **23** and adjustable aperture **28** permits adjustment to water flow velocity, thickness, width, and pressure thus ensuring proper rider acceleration. During this process of transferred momentum, a small transient surge **33** will build behind the rider. Transient surge **33** build-up can be minimized (if desired) by allowing excess build-up to flow over and off the sides of the riding surface **25**. If rider **29** is in a channel, this build up can either be eliminated by venting transient surge **33** through porous vents **34a** and **34b** along channel walls **27a** and **27b**; or by way of porous vent **34e** that is incorporated into riding surface **25**. Other vent mechanisms, e.g., Triple Flume or Double Flume, could also serve to solve the transient surge problem.

Since Horizontal Accelerator **40** can be comprised of one or more modules **21a**, **21b**, **21c**, **et seq**., (as shown in FIG. 6A) and assuming these modules are properly aligned in substantially the same direction, rider **29** can move from module **21a** to module **21b** to module **21c**, **et seq**. with corresponding increases in acceleration caused by the progressive increase in water velocity issued from each subsequent nozzle **24a**, **24b**, **24c**, **et seq**., until a desired maximum acceleration is reached. It will be obvious to those skilled in the art that the Horizontal Accelerator can be connected at both ends to known water attraction rides as a continuation thereof, and as an improvement thereto. Furthermore, the extreme ends can also be joined to other embodiments of the invention disclosed herein.

[0052] Accordingly, it should now be apparent that the Horizontal Accelerator embodiment of this invention can be used in a water ride attraction to accelerate a rider in lieu of the force of gravity and without a loss of vertical altitude. It should also be noted, that water build-up and the transient surge that results from the impact of high speed jetted water with a slow speed rider can be removed through proper design of the riding surface and/or channel wall. In addition, the Horizontal Accelerator has the following advantages:

- it permits acceleration without the requisite cost of building to a higher elevation.
- it allows a rider to experience the sight, sound, and sensation of horizontal acceleration induced by high speed jets of water. This experience is exciting for participant and observer. Furthermore, it permits a participant to gain speed for increased thrill and in set up for subsequent conventional waterslide maneuvers, e.g., twists, turns, jumps, drops, finale, etc.
- it allows increases to rider velocity which results in higher participant through-put and ride capacity, thus, resulting in greater rider satisfaction and enhanced operator revenue.

DESCRIPTION OF UPWARD ACCELERATOR

[0053] Turning now to FIG. 7A, we see an illustration of a preferred embodiment hereinafter referred to as an Upward Accelerator **42** comprised of one or more modules **21a**, **21b**, and **21c**, **et seq**. The extreme ends **43a** and **43b** of Upward Accelerator **42** can be joined to known water attraction rides (e.g., a standard waterslide or flume ride) to serve as a continuation thereof and as an improvement thereto. The extreme ends **43a** and **43b** can also be joined to other embodiments of the invention disclosed herein. As further illustrated in FIG. 7B the two distinguishing features of Upward Accelerator **42** are that: (1) the orientation of module **21** is at substantially an upward incline with that portion of riding surface **25** positioned closest to nozzle **24** being inclined upwardly from the horizontal, and nozzle **24** and aperture **28** directing jet-water flow **30** substantially parallel to riding surface **25** and at an angle directed with nozzle **24** and aperture **28** pointing upwardly from the horizontal; and (2) that jet-water flow **30** that issues from nozzle **24** moves at a velocity in excess of the velocity of rider **29** in the predetermined direction of flow. It should be noted that riding surface **25** subsequent to that portion closest to nozzle **24** can gradually vary in incline so as to facilitate connection to other embodiments of the invention disclosed herein or to other known water attraction rides.

[0054] From the description above, a number of advantages of Upward Accelerator **42** become evident:

(a) The upwardly inclined layout of the embodiment permits acceleration in an upward direction. Such performance reduces or eliminates the traditional need for a loss of elevation in order to accelerate a participant over a given distance.

(b) The sight, sound, and sensation of upward acceleration induced by high speed jets of water impacting a rider is a thrilling participant and observer experience. Furthermore, the rider can gain speed for increased thrill and in set up for subsequent conventional waterslide maneuvers, e.g., twists, turns, jumps, drops, finale, etc.

(c) Increased rider velocity due to acceleration by the high speed jets of water will result in higher through-put capacity over a given period of time.

(d) Acceleration in the upward direction can reduce or eliminate the need for participants to walk to a higher elevation before boarding the attraction. Such reduction can reduce costs for associated stairs, walkways, elevators and other participant or vehicle conveyance systems.

OPERATION OF UPWARD ACCELERATOR

[0055] For purposes of operating Upward Accelerator **42**, it is assumed that a rider (or rider with vehicle) has attained an initial start velocity in the conventional manner as known to those skilled in the art. Upon achieving this initial start velocity, rider **29** first enters Upward Accelerator **42** at that end which is nearest nozzle **24** and moves along its length as shown in FIG. 7B. Jet-water flow **30** originating from water source **22**, is already issuing from nozzle **24** through adjustable aperture **28** when rider **29** enters its flow. Since the velocity of jet-water flow **30** is moving at a rate greater than the speed of the entering rider **29**, a transfer of momentum from the higher speed water to the lower speed rider causes the rider to accelerate and approach the speed of the more rapidly moving water. Flow control valve **23**

and adjustable aperture **28** permits adjustment to water flow velocity, thickness, width, and pressure thus ensuring proper rider acceleration. During this process of transferred momentum, a small transient surge **33** will build behind the rider. Transient surge **33** can be minimized by allowing excess build-up to flow over and off the sides of the riding surface **25**. If rider **29** is in Double Flume **39** as illustrated, this build up can be eliminated by venting transient surge **33** over the low channel wall **27j** and down overflow flume **36c** to drain. Other vent mechanisms, e.g., Triple Flume or porous vents, could also serve to solve the transient surge problem. Since Upward Accelerator **42** can be comprised of one or more modules **21a**, **21b**, **21c**, **et seq**., (as shown in FIG. 7A) rider **29** can move from module **21a** to module **21b** to module **21c**, **et seq**. with corresponding increases in acceleration caused by the progressive increase in water velocity issued from each subsequent nozzle **24a**, **24b**, **24c**, **et seq**., until a desired maximum acceleration is reached. It will be obvious to those versed in the art that Upward Accelerator **42**, as an improvement thereto, can be connected at both ends to conventional water attraction rides and to other embodiments of the invention disclosed herein.

[0056] Accordingly, it should be apparent that the Upward Accelerator embodiment of this invention can be used in a water ride attraction to accelerate a rider in opposition to the force of gravity and in an upward direction. Water that was conventionally pumped upward in enclosed pipes to a higher elevation can now be ridden for the amusement of the participant and the economy of the attraction operator. It should also be noted that the transient surge that results from the impact of high speed jetted water with a slow speed rider can be removed through proper design of the riding surface and/or channel wall. In addition, the Upward Accelerator has the following advantages:

- its upwardly inclined layout permits acceleration in an upward direction. Such performance eliminates the traditional need for a loss of elevation in order to accelerate a participant over a given distance.
- it allows a rider to experience the sight, sound, and sensation of upward acceleration induced by high speed jets of water. This experience is exciting for participant and observer. Furthermore, the rider can gain speed for increased thrill and in set up for subsequent conventional waterslide maneuvers, e.g., twists, turns, jumps, drops, finale, etc.
- it allows increases to rider velocity which results in higher participant through-put and ride capacity, thus, resulting in greater rider satisfaction and enhanced operator revenue..
- it permits rider ascent to higher elevations without the requisite cost of building stairs, walkways, elevators, or other conveyance structures or mechanisms to such higher elevations.

DESCRIPTION OF DOWNWARD ACCELERATOR

[0057] Turning now to FIG. 8A, we see an illustration of a preferred embodiment hereinafter referred to as a Downward Accelerator **44** comprised of one or more modules **21a**, **21b**, and **21c**, **et seq**. The extreme ends **45a** and **45b** of the Downward Accelerator can be joined to known water attraction rides (e.g., a standard waterslide or flume ride) to serve as a continuation thereof and as an improvement thereto. The extreme ends **45a** and **45b** can also be joined to other embodiments of the invention disclosed herein. As further illustrated in 7B, the two distinguishing features of Downward Accelerator **44** are that: (1) the orientation of each module **21** is at substantially a downward incline with that portion of riding surface **25** positioned closest to nozzle **24** being inclined downwardly from the horizontal, and nozzle **24** and aperture **28** directing jet-water flow **30** substantially parallel to riding surface **25** and at an angle directed with nozzle **24** and aperture **28** pointing downwardly from the horizontal; and (2) that jet-water flow **30** that issues from nozzle **24** moves at a velocity in excess of the velocity of rider **29** in the predetermined direction of flow. It should be noted that riding surface **25** subsequent to that portion closest to nozzle **24** can gradually vary in incline so as to facilitate connection to other embodiments of the invention disclosed herein or to other known water attraction rides.

[0058] From the description above, a number of advantages of Downward Accelerator **44** become evident:

(a) The downwardly inclined layout of the embodiment permits acceleration in a downward direction in excess of the acceleration due to the force of gravity. Such performance enhances the traditional ride characteristics of conventional water ride attractions.

(b) The sight, sound, and sensation of downward acceleration induced by high speed jets of water impacting a rider is a thrilling participant and observer experience. Furthermore, the rider can gain speed for increased thrill and in set up for subsequent conventional waterslide maneuvers, e.g., twists, turns, jumps, drops, finale, etc.

(c) Increased rider velocity due to acceleration by the invention will result in higher through-put capacity over a given period of time.

OPERATION OF DOWNWARD ACCELERATOR

[0059] For purposes of operating Downward Accelerator **44**, it is assumed that a rider (or rider with vehicle) has attained an initial start velocity in the conventional manner as known to those skilled in the art. Upon achieving this initial start velocity, rider **29** first enters Downward Accelerator **44** at that end which is nearest nozzle **24** and moves along its length as shown in FIG. 8B. Jet-water flow **30** originating from water source **22**, is already issuing from nozzle **24** and aperture **28** when rider **29** enters its flow. Flow control valve **23** and adjustable aperture **28** permits adjustment to water flow velocity, thickness, width, and pressure thus ensuring proper rider acceleration. Since the velocity of jet-water flow **30** is moving at a rate greater than the speed of the entering rider **29**, a transfer of momentum from the higher speed water to the lower speed rider causes the rider to accelerate and approach the speed of the more rapidly moving water. During this process of transferred momentum, a small transient surge **33** may build behind the rider. Transient surge **33** can be minimized (if desired) by allowing excess build-up to flow over and off the sides of the riding surface **25**. If the rider **29** is in a channel this build up can either be eliminated by venting transient surge **33** through porous vents **34a** and **34b** along channel walls **27a** and **27b**; or by way of porous vent **34e** that is incorporated into riding surface **25**. Other vent mechanisms, e.g., Triple Flume or Double Flume, could also serve to solve the transient surge problem. Since Downward Accelerator **44** can be comprised of one or more modules **21a**, **21b**, **21c**, **et seq**., (as shown in FIG. 8A) rider **29** can move from module **21a** to module **21b** to module **21c**, **et seq**. with corresponding increases in acceleration caused by the progressive increase in water velocity issued from each subsequent nozzle **24a**, **24b**, **24c**, **et seq**., until a desired maximum acceleration is reached. It will be obvious to those versed in the art that Downward Accelerator **44**, as an improvement thereto, can be connected at both ends to conventional water attraction rides and to other embodiments of the invention disclosed herein.

[0060] Accordingly, it will be apparent that the Downward Accelerator embodiment of this invention can be used in a water ride attraction to augment the force of gravity in the downward direction. In addition, the Downward Accelerator has the following advantages:

- its downward inclined layout permits acceleration in the downward direction in excess of the force of gravity. Such performance can minimize the linear distance required in order to accelerate a participant to a desired velocity. Reductions in required linear distance can reduce overall costs by reducing the amount of materials and requisite structural height normally associated with conventional "gravity powered" systems.
- it allows a rider to experience the sight, sound, and sensation of a dramatic change in downward acceleration induced by high speed jets of water. This experience is exciting for participant and observer. Furthermore, the rider can gain speed for increased thrill and in set up for subsequent conventional waterslide maneuvers, e.g., twists, turns, jumps, drops, finale, etc.
- it allows increases to rider velocity which results in higher participant through-put and ride capacity, thus, resulting in greater rider satisfaction and enhanced operator revenue.

DESCRIPTION OF HORIZONTAL, UPWARD, AND DOWNWARD NON-ACCELERATING PROPULSORS

[0061] In the context of a water ride that incorporates a riding surface with downward incline followed by an upward incline with subsequent leveling or down-curve of the same riding surface, problems arise when a rider's kinetic energy at the bottom of the rise is insufficient to overcome the forces of drag on a riders travel from this bottom portion to the top of the upward incline. In this situation, a rider cannot make it over the rise and either stops in route to the top, or slides back down to settle at the bottom. Conversely, if the kinetic energy of the rider at the bottom of a rise is substantially in excess of any drag force that the rider may encounter from the bottom of the rise to its top, and if the subsequent flattening or down-curve occurs with a sufficiently short radius of arc, then, the rider may attain an airborne trajectory that is potentially unsafe. Since the forces of drag on water ride attractions are not always constant, e.g., changing ride surface conditions, changing rider/vehicle conditions, changing water conditions, etc., it is desirable in the interest of ride safety, consistency, capacity and fun, to introduce a mechanism that promotes rider stabilization as well as equalization of differing rider's coefficients of friction. The following Non-accelerating Propulsor Embodiments serve to accomplish these stated objectives. Similar to its "Accelerator" counterpart, Non-accelerating Propulsor embodiments utilize module **21** format. Consequently, Non-accelerating Propulsor modules can be connected in series as desired.

[0062] Turning now to FIG. 9, there is illustrated a preferred embodiment hereinafter referred to as a Horizontal Non-Accelerating Propulsor **46**. Extreme ends **47a** and **47b** of Horizontal Non-Accelerating Propulsor **46** can be joined to known water attraction rides (e.g., a standard waterslide or flume ride) or to other embodiments of the invention disclosed herein to serve as a continuation thereof and as an improvement thereto. A ride continuation path **48** is indicated by corresponding dashed lines **48a** and **48b** with arrows pointing in the predetermined direction of motion. Four distinguishing features of Horizontal Non-Accelerating Propulsor **46** are: (1) the location of Horizontal Non-Accelerating Propulsor **46** is subsequent to the start of rider **29**; (2) the orientation of Horizontal Non-Accelerating Propulsor **46** is substantially normal to the force of gravity with nozzle **24** and aperture **28** directing jet-water flow **30** substantially parallel to riding surface **25**, and at least that portion of riding surface **25** positioned closest to nozzle **24** laying horizontal and normal to the force of gravity; (3) that jet-water flow **30** that issues from nozzle **24** moves at a velocity equal to or less than the velocity of rider **29** in the predetermined direction of flow; and (4) that riding surface **25** subsequent to that portion closest to nozzle **24** will eventually curve to an upward incline. It should be noted that riding surface **25** subsequent to its upward curvature can gradually vary in incline along its length so as to facilitate connection to other embodiments of the invention disclosed herein or to other known water attraction rides.

[0063] Turning now to FIG. 10, there is illustrated a preferred embodiment hereinafter referred to as an Upward Non-Accelerating Propulsor **49**. The extreme ends **50a** and **50b** of Upward Non-Accelerating Propulsor **49** can be joined to known water attraction rides (e.g., a standard waterslide or flume ride) or to other embodiments of the invention disclosed herein to serve as a continuation thereof and as an improvement thereto. A ride continuation path **51** is indicated by corresponding dashed lines **51a** and **51b** with arrows pointing in the predetermined direction of motion. Three distinguishing features of Upward Non-Accelerating Propulsor **49** are: (1) the location of Upward Non-Accelerating Propulsor **49** is subsequent to the start of rider **29**; (2) the orientation of Upward Non-Accelerating Propulsor **49** is at substantially an upward incline with that portion of riding surface **25** positioned closest to nozzle **24** being inclined upwardly from the horizontal, and nozzle **24** and aperture **28** directing jet-water flow **30** substantially parallel to riding surface **25**; (3) that jet-water flow **30** that issues from nozzle **24** moves at a velocity equal to or less than the velocity of rider **29** in the predetermined direction of flow. It should be noted that riding surface **25** subsequent to that portion closest to nozzle **24** can gradually vary in incline along its length so as to facilitate connection to other embodiments of the invention disclosed herein or to other known water attraction rides.

[0064] Turning now to FIG. 11, there is illustrated a preferred embodiment hereinafter referred to as a Downward Non-Accelerating Propulsor **52**. The extreme ends **53a** and **53b** of Downward Non-Accelerating Propulsor **52** can be joined to known water attraction rides (e.g., a standard waterslide or flume ride) or to other embodiments of the invention disclosed herein to serve as a continuation thereof and as an improvement thereto. A ride continuation path **54** is indicated by corresponding dashed lines **54a** and **54b** with arrows pointing in the predetermined direction of motion. Four distinguishing features of Downward Non-Accelerating Propulsor **52** are: (1) the location of Downward Non-Accelerating Propulsor **52** is subsequent to the start of rider **29**; (2) the orientation of Downward Non-Accelerating Propulsor **52** is at substantially a downward incline with that portion of riding surface **25** positioned closest to nozzle **24** being inclined downwardly from the horizontal, and nozzle **24** and aperture **28** directing jet-water flow **30** substantially parallel to riding surface **25**; (3) that jet-water flow **30** that issues from nozzle **24** moves at a velocity equal to or less than the velocity of rider **29** in the predetermined direction of flow; and (4) that riding surface **25** subsequent to that portion closest to nozzle **24** will eventually curve to an upward incline. It should be noted that riding surface **25** subsequent to its upward curvature can gradually vary in incline along its length so as to facilitate connection to other embodiments of the invention disclosed herein or to other known water attraction rides.

[0065] From the description above, a number of advantages of the Horizontal, Upward, and Downward Non-Accelerating Propulsors become evident:

(a) The injection of additional water flow to the riding surface acts to stabilize a rider who eventually moves in an uphill direction. Furthermore, under circumstances where rider/vehicle coefficients of friction vary the injection of additional water flow will tend to equalize the performance standard for a broader spectrum of riders/vehicles that eventually move in an upward direction.

(b) The sight, sound, and sensation of a rider encountering an injected flow of water is a thrilling participant and observer experience. Furthermore, the rider can stabilize his position for safety and in set up for subsequent conventional waterslide maneuvers, e.g., twists, turns, jumps, drops, finale, etc.

(c) Increased rider stabilization and coefficient of friction equalization due to injected water flows will result in higher through-put capacity over a given period of time due to elimination of aberrant rider performance. Higher through-put capacity results in higher participant satisfaction and increased revenue for ride operators.

OPERATION OF HORIZONTAL, UPWARD, AND DOWNWARD NON-ACCELERATING PROPULSORS

[0066] For purposes of operating the Horizontal, Upward, and Downward Non-Accelerating Propulsors, it is assumed that a rider(s) (or rider(s) and vehicle) has attained an initial start velocity in the conventional manner as known to those skilled in the art.

[0067] FIG. 9 illustrates Horizontal Non-Accelerating Propulsor **46** in operation, with rider **29** first entering the module at that end which is nearest nozzle **24**, moving along its length, and eventually rising in elevation as indicated by dashed path **48b**.

[0068] FIG. 10 illustrates Upward Non-Accelerating Propulsor **49** in operation, with rider **29** first entering the module at that end which is nearest nozzle **24**, moving along its length, and continuing a rise in elevation as indicated by dashed path **51b**.

[0069] FIG. 11 illustrates Downward Non-Accelerating **52** in operation, with rider **29** first entering the module at that end which is nearest nozzle **24**, moving along its length, and eventually rising in elevation as indicated by dashed path **54b**.

[0070] For all three Propulsor embodiments, jet-water flow **30** is already issuing from nozzle **24** when rider **29**

enters its flow. The velocity of jet-water flow **30** originating from water source **22**, is moving at a rate equal to or less than the speed of the entering rider **29**. If rider **29** is moving at a velocity in excess of jet-water flow **30**, a transfer of momentum from the lower speed water to the higher speed rider causes the rider to de-accelerate and approach the speed of the slower moving water. Flow control valve **23** and adjustable aperture **28** permits adjustment to water flow velocity, thickness, width, and pressure thus ensuring proper rider stabilization and coefficient of friction equalization. During the process of transferred momentum or during ride start-up as previously described, a small transient surge may build. Transient surge can be minimized (if desired) by allowing excess build-up to flow over and off the sides of the riding surface **25**. If the transient surge builds within a channel, this build up can either be eliminated by venting the transient surge through porous vents along the sides and bottom of the channel, or by way of Double Flume or Triple Flume , all as previously described. It will be obvious to those skilled in the art that the Horizontal, Upward, and Downward Non-Accelerating Propulsors can be connected at both ends to known water attraction rides as a continuation thereof, and as an improvement thereto. Furthermore, the extreme ends can also be joined to other embodiments of the invention disclosed herein.

[0071] Accordingly, it should now be apparent that the Horizontal, Upward, and Downward Non-Accelerating Propulsor embodiments of this invention can be used in a water ride attraction to stabilize and equalize a wide range of rider/vehicles that have varying coefficients of friction. It should also be noted, that the transient surge that results from the impact of a higher speed rider with a lower speed jet-water flow can be removed through proper design of the riding surface and/or channel wall. In addition, the Horizontal, Upward, and Downward Non-Accelerating Propulsors have the following advantages:

- it allows a rider to experience the sight, sound, and sensation of encountering an injected flow of water. This experience is a thrilling for participant and observer alike. Furthermore, it permits a rider to stabilize his position for safety and in set up for subsequent conventional waterslide maneuvers, e.g., twists, turns, jumps, drops, finale, etc.
- it allows increased rider stabilization and coefficient of friction equalization due to injected water flows which result in higher through-put capacity over a given period of time due to elimination of aberrant rider performance, thus, resulting in greater rider satisfaction and enhanced operator revenue.

DESCRIPTION AND OPERATION OF THE STABILIZATION/EQUALIZATION PROCESS

[0072] To understand the function and solutions offered by the Stabilization/Equalization Process, one first needs to understand a context in which the process can arise. FIG. 12 illustrates a representative section profile of the prior art in water amusement rides wherein partial altitude recovery occurs but the Stabilization/Equalization Process is not employed. Rider **29** (with or without vehicle) enters a conventional start basin **55** and commences a descent in the conventional (gravity only) manner on the prior art attraction surface **56**. Attraction surface **56** although continuous, may be sectionalized for the purposes of description into a top of downchute portion **56a**, a downchute portion **56b**, a bottom of downchute portion **56c**, a rising portion **56d** that extends upward from the downchute bottom **56c**, and a top **56e** of the rising portion **56d**. Given a conventional water ride start, a certain average velocity of rider **29** at the top of downchute portion **56a**, and a certain average loss of energy due to the forces of drag associated with rider **29** sliding through portions **56a**, **56b**, **56c**, and **56d**, it will be observed that rider **29** will follow a preferred trajectory **57** as indicated in FIG. 12 by a solid arrow line. Where the velocity of rider **29** at top of downchute portion **56a** is greater than the average planned for in design, and/or, loss of energy due to the forces of drag associated with rider **29** sliding through portions **56a**, **56b**, **56c**, and **56d** is less than average, rider **29** would follow an airborne trajectory **58** as show in FIG. 12 by the dashed line. Conversely, where the velocity of rider **29** at top of downchute portion **56a** is less than the average planned for in design, and/or, loss of energy due to the forces of drag associated with rider **29** sliding through portions **56a**, **56b**, **56c**, and **56d** is greater than average, rider **29** would follow a failed trajectory **59** as show in FIG. 12 by the dotted arrow line.

[0073] Rider instability, or unequal coefficients of friction for a broad spectrum of differing riders or ride conditions will inevitably lead to delays in rider dispatch due to rider inability to successfully traverse the uphill altitude recovery section as typified by failed trajectory **59**. Furthermore, such instability or inequality may lead to rider injury in the event the curve of the uphill altitude recovery section enables a high velocity rider to follow the path of airborne trajectory **58**, or in the event a second rider sliding along downchute portion **56b** should collide with a prior failed trajectory rider at bottom of downchute portion **56c**. Consequently, it is desired for purposes of ride safety, consistency, capacity and fun to introduce injected flows of water subsequent to a riders start to stabilize a rider, or equalize differing riders coefficients of friction during rider travel from top of downchute portion **56a** through to top **56e** and beyond as typified by preferred trajectory **57**.

[0074] The Stabilization/Equalization Process, whereby such additional injections of water may safely be introduced, is illustrated in FIG. 13. FIG. 13 shows a similar ride profile to FIG. 12, however, the FIG. 13 water amusement ride section profile indicates potential locations for Downward Non-Accelerating Propulsor **52**, Horizontal Non-Accelerating Propulsor **46**, and Upward Non-Accelerating Propulsor **49** thus enabling the Stabilization/Equalization Process.

[0075] The Stabilization/Equalization Process is comprised of properly locating and activating at least one or more of the Propulsors **52**, **46**, or **49** along an appropriately configured attraction surface **60** at a point just prior to top **60e**; and passing rider **29** through one or more of the injected water flows generated by Propulsors **52**, **46**, or **49** in route from top of downchute portion **60a** to top **60e**; and causing the injected water to have a velocity equal to or less than the velocity of the rider **29**; and causing sufficient amounts of injected water to remain in contact with rider **29** during the course of travel from top of downchute portion **60a** to top **60e**, such flowing water acting to stabilize rider **29** and equalize the coefficients of friction for a broad spectrum of ride variables, e.g., ride surface, vehicle surface, water flow consistency, rider bathing attire, rider skill or lack thereof, etc.

[0076] Accordingly, it should be apparent that the Stabilization/Equalization Process as envisioned by this invention can be used in a water ride attraction to allow participants to consistently enjoy altitude recovery in a manner that is superior to recovery absent injected flows of water. Furthermore, once the destination elevation is achieved a participant can use regained potential energy to travel to other downhill rides in the conventional manner, or be powered by one of the other embodiments as contemplated herein.

DESCRIPTION AND OPERATION OF THE ELEVATION ENHANCEMENT PROCESS

[0077] To understand the function and solutions offered by the Elevation Enhancement Process, one first needs to understand a context in which the process can arise. FIG. 14 illustrates a section profile of a water ride wherein partial altitude recovery occurs but the Elevation Enhancement Process is not employed. Rider **29** (with or without vehicle) enters the start basin **61** and commences a descent in the conventional (gravity only) manner on attraction surface **62**. Attraction surface **62** although continuous, may be sectionalized for the purposes of description into a top of downchute portion **62a**, a downchute portion **62b**, a bottom of downchute portion **62c**, a rising portion **62d** that extends upward from downchute bottom **62c**, and a top **62e** of rising portion **62d**. Given a conventional water ride start, a certain average velocity of rider **29** at the top of downchute portion **62a**, and a certain average loss of energy due to the forces of drag associated with rider **29** sliding through portions **62a**, **62b**, **62c**, and **62d**, it will be observed that rider **29** will follow an unaided trajectory **63** as shown in FIG. 14 by dotted the line, whereupon, rider **29** will reach an unaided zenith **64**. Absent any other outside influence, the maximum recovery of elevation as indicated by unaided zenith **64** will always be less than the starting elevation as indicated by start basin **61** due to the aforementioned drag forces. This is a significant limitation that is intrinsic to conventional water rides. Consequently, if the profile of attraction surface **62** was altered by extending rising portion **62d** and raising top **62e** as indicated by a dashed extension of rising portion **62d'** and a raised top **62e'**, rider **29** would still be limited to the recovery elevation as indicated by an unaided zenith **64'**. In order for rider **29** to overcome this limitation on recovery elevation and to reach raised top **62e'**, additional energy need be introduced to offset the energy lost due to the forces of drag. An Elevation Enhancement Process, whereby such additional energy may safely be introduced by way of Horizontal, Upward or Downward Accelerators, is illustrated in FIG. 15.

[0078] The Elevation Enhancement Process as depicted in FIG. 15, is comprised of properly locating and activating at least one or more of the Accelerators, i.e., Downward Accelerator **44**, or Horizontal Accelerator **40**, or Upward Accelerator **42**, along an appropriately configured attraction surface **65** at a point just prior to the elevation of unaided zenith **64'**; and rider **29** passing through and being accelerated by one or more of the high speed jet-water flows generated by Accelerators **44**, **40**, or **42** in route from top of downchute portion **65a** to top **65e**; and rider **29** receiving a transfer of momentum (additional kinetic energy) from the issuing high speed water flow(s) that is at a minimum sufficient to propel rider **29** to the top **62e** and achieve zenith **66**.

[0079] Accordingly, it will be apparent that the Elevation Enhancement Process as envisioned by this invention can be used in a water ride attraction to raise the destination elevation of water attraction participants in excess of that which can be achieved from gravity alone. Furthermore, once this destination elevation is achieved a participant can use regained or newly gained potential energy to travel to other downhill rides, or be powered by yet another Accelerator to additional heights or to greater speeds, or just exit the ride at substantially the same elevation as started. In addition, the Elevation Enhancement Process has the following advantages:

(1) The Elevation Enhancement Process permits riders and vehicles to safely attain heights in excess of those available under conventional gravity driven systems.
(2) Increased participant thrill by allowing rider(s) to enjoy greater and more rapid changes in angular momentum.
(3) Extended ride length.

DESCRIPTION OF WATER COASTER

[0080] The Water Coaster embodiment combines existing water slide and water ride attraction technology with new technology disclosed by the Horizontal Accelerator, Upward Accelerator, Downward Accelerator, Downward Non-Accelerating Propulsor, Horizontal Non-Accelerating Propulsor, Upward Non-Accelerating Propulsor, the Stabilization/Equalization Process, and the Elevation Enhancement Process. To avoid cluttered drawings and facilitate a written description that is more easily understood, two drawings of the Water Coaster are included herein. FIG. 16 highlights Accelerator technology and the Elevation Enhancement Process as incorporated into a Water Coaster **69a**, and FIG. 17 highlights Propulsor technology and the Stabilization/Equalization Process as incorporated into a Water Coaster **69b**.

[0081] Turning to FIG. 16, a Water Coaster **69b** commences with a conventional start basin **72** followed by an attraction surface **70** made of suitable material, for example, resin impregnated fiberglass, concrete, gunite, sealed wood, vinyl, acrylic, metal or the like, which can be made into segments and joined by appropriate water-tight seals in end to end relation. Attraction surface **70** is supported by suitable structural supports **71**, for example, wood, metal, fiberglass, cable, earth, concrete or the like. Attraction surface **70** although continuous, may be sectionalized for the purposes of description into a first horizontal top of a downchute portion **70a'** to which conventional start basin **72** is connected, a first downchute portion **70b'**, a first bottom of downchute portion **70c'**, a first rising portion **70d'** that extends upward from the downchute bottom **70c'**, and a first top **70e'** of rising portion **70d'**; thereafter, attraction surface **70** continues into a second top of downchute portion **70a''**, a second downchute portion **70b''**, a second bottom of downchute portion **70c''**, a second rising portion **70d''** that extends upward from downchute bottom **70c''**, and a second top **70e''** of rising portion **70d''**; thereafter, attraction surface **70** continues into a third top of downchute portion **70a'''**, a third downchute portion **70b'''**, a third bottom of downchute portion **70c'''**, a third rising portion **70d'''** that extends upward from downchute bottom **70c'''**, and a third top **70e'''** of rising portion **70d'''**; thereafter, attraction surface **70** continues into a fourth top of downchute portion **70a''''**, a fourth downchute portion **70b''''**, a fourth bottom of downchute portion **70c''''**, a fourth rising portion **70d''''** that extends upward from downchute bottom **70c''''**, and a fourth top **70e''''** of rising portion **70d''''** which connects to ending basin **73** in an area adjacent start basin **72** and the first top of downchute portion **70a'**.

[0082] Upward Accelerator **42** is located in and made a part of attraction surface **70** at first rising portion **70d'** that extends upward from the downchute bottom **70c'**; Horizontal Accelerator **40a** is located in and made a part of attraction surface **70** at the second bottom of the downchute portion **70c''**; Downward Accelerator **44** is located and made a part of attraction surface **70** at third downchute portion **70b'**; and Horizontal Accelerator **40b** is located in and made a part of attraction surface **70** at the fourth top of downchute portion **70a''''**. Structural supports **71** provide foundation for Water Coaster **69a**.

[0083] Water Source **22** provides high pressure water to Accelerators **40**, **42**, and **44** as well as a normal water flow to conventional start basin **72**. Start overflow and rider transient surge build up is eliminated by venting the slowed water over the outside edge of the riding surface; or through openings along the bottom and sides of the channel; or by Triple Flume or Double Flume all as previously described. A surge tank **74** acts as a low point reservoir to collect and facilitate re-pumping of vented water as well as hold water on system shut-down.

[0084] Turning to FIG. 17, a Water Coaster **69b** commences with a conventional start basin 72 followed by a first top of a downchute portion **70a'**, a first downchute portion **70b'**, a first bottom of downchute portion **70c'**, a first rising portion **70d'** that extends upward from downchute bottom **70c'**, and a first top **70e'** of the rising portion **70d'**; thereafter, attraction surface **70** continues onto a second top of downchute portion **70a''**, a second downchute portion **70b''**, a second bottom of downchute portion **70c''**, a second rising portion **70d''** that extends upward from downchute bottom **70c''**, and a second top **70e''** of rising portion **70d''**; thereafter, attraction surface **70** continues into a third top of downchute portion **70a'''**, a third downchute portion **70b'''**, a third bottom of downchute portion **70c'''**, a third rising portion **70d'''** that extends upward from downchute bottom **70c'''**, and a third top **70e'''** of rising portion **70d'''**; thereafter, attraction surface **70** continues into a fourth top of downchute portion **70a''''**, a fourth downchute portion **70b''''**, a fourth bottom of downchute portion **70c''''**, a fourth rising portion **70d''''** that extends upward from downchute bottom **70c''''**, and a fourth top **70e''''** of rising portion **70d''''**; thereafter, attraction surface **70** continues into a fifth top of downchute portion **70a'''''**, a fifth downchute portion **70b'''''** and a final bottom of the down chute portion **70c'''''** which connects to ending basin **73** in an area below start basin **72**.

[0085] Two Upward Accelerators **42a** and **42b** are located in and made a part of attraction surface **70** at first rising portion **70d'**; Upward Non-Accelerating Propulsor **49** is located in and made a part of attraction surface **70** at second rising portion **70d''**; Horizontal Non-Accelerating Propulsor **46** is located in and made a part of attraction surface **70** at the third bottom of downchute portion **70c'''**; Downward Non-Accelerating Propulsor **52** is located and made a part of attraction surface **70** at fourth downchute portion **70b''''**. Structural supports **71** provide foundation for Water Coaster **69b**.

[0086] Water Source **22** provides high pressure water to Accelerators **42a** and **42b**, and Non-Accelerating Propulsors **49**, **46** and **52**, as well as a normal water flow to conventional start basin **72**. Start overflow and rider transient surge build up is eliminated by venting the slowed water over the outside edge of the riding surface; or through openings along the bottom and sides of the channel; or by Triple Flume of Double Flume all as previously described. A surge tank

74 acts as a low point reservoir to collect and facilitate re-pumping of vented water as well as hold water on system shut-down. Analogous to the traditional roller coaster, there are numerous possibilities regarding the layout and design of the Water Coaster as illustrated herein including reconfiguring ride surface profile; reconfiguring the length, width, height and angle of the ride surface; repositioning and recombination of Accelerators or Propulsors as functionally adjusted to the newly configured ride surface and profile; repositioning the start and ending basins; connecting the start and end to form a continuous loop; permitting the use of riding vehicles and multiple riders; connecting to other rides or attractions; and adding special light, sound and themeing effects. All such possibilities are subject to the design, construction and operational guidelines as currently exist in the industry and as limited or expanded by the disclosures herein.

[0087] From the description above, a number of advantages of the Water Coaster becomes evident:

(1) The physical profile of "gravity only" water ride attractions is no longer limited by functional necessity to a gradual decline from the top of the attraction to its bottom. Rather, through combination of the Downward, Horizontal, or Upward Accelerators or Propulsors with the conventional water ride attraction, and through utilization of the Elevation Recovery and Stabilization/Equalization Processes, the Water Coaster permits a functional physical profile that is akin to a standard roller coaster and capable of the ups, downs, overs, unders, twists, loops and rolls associated therewith.
(2) Length of ride is no longer dependent upon starting elevation.
(2) Ride profile elevation changes can exceed the initial start height.
(3) Connection of the start and end points can provide an "endless loop" ride, or connection can be to another attraction.
(4) The ride start basin and the ride end basin can be adjacent or connected at substantially the same elevation; or the end basin can be at a higher elevation than the start.
(5) Multiple riders, riding vehicles, and special effects can be accommodated.

OPERATION OF WATER COASTER

[0088] Referring to Fig. 16, with water source **22** in operation, rider **29** (with or without vehicle) enters the start basin **72** and commences a descent in the conventional manner over the top of downchute portion **70a'** and thereafter to a first downchute portion **70b'**, and a first bottom of downchute portion **70c'**. Upon entering a first rising portion **70d'** that extends upward from downchute bottom **70c'**, rider **29** encounters an Upward Accelerator **42** that accelerates and enhances the elevation of rider **29** to a first top **70e'** of rising portion **70d'**; thereafter, rider **29** continues onto a second top of downchute portion **70a''**, and a second downchute portion **70b''**. Upon entering a second bottom of downchute portion **70c''**, rider **29** encounters a Horizontal Accelerator **40a** that accelerates and enhances the elevation of rider **29** to a second rising portion **70d''** that extends upward from downchute bottom **70c''**, and to a second top **70e''** of rising portion **70d''**; thereafter, rider **29** continues onto a third top of downchute portion **70a'''**. Upon entering a third downchute portion **70b'''**, rider **29** encounters Downward Accelerator **44** that accelerates (and eventually enhances the elevation of)rider **29** to a third bottom of downchute portion **70c'''**, to a third rising portion **70d'''** that extends upward from downchute bottom **70c'''**, and to a third top **70e'''** of rising portion **70d'''**. Upon entering a fourth top of downchute portion **70a''''**, rider **29** encounters a Horizontal Accelerator **40b** that accelerates (and eventually enhances the elevation of) rider **29** to a fourth downchute portion **70b''''**, a fourth bottom of downchute portion **70c''''**, a fourth rising portion **70d''''** that extends upward from downchute bottom **70c''''**, and a fourth top **70e''''** of rising portion **70d''''**, wherein rider **29** terminates his ride in a conventional ending basin **73** and exits.

[0089] Water Source **22** provides high pressure water to Accelerators **42, 40a**, **40b**, and **44** as well as a normal water flow to conventional start basin **72**. The velocity of water that issues from each respective Accelerator **42**, **40a**, **40b**, or **44** can be different depending upon the flow required to overcome friction, transfer momentum and propel rider **29** to the top of a successive rise. Start overflow and rider transient surge build up is eliminated by venting the slowed water over the outside edge of the riding surface; or through openings along the bottom and sides of the channel; or by Triple Flume or Double Flume all as previously described. A surge tank **74** acts as a low point reservoir to collect and facilitate re-pumping of vented water as well as hold water on system shut-down.

[0090] Turning to the variation of the Water Coaster as depicted in FIG. 17 with water source **22** in operation, rider **29** (with or without vehicle) enters the start basin. **72** and commences a descent in the conventional manner over a top of downchute portion **70a'** and thereafter to a first downchute portion **70b'**, and a first bottom of downchute portion **70c'**. Upon entering a first rising portion **70d'** that extends upward from downchute bottom **70c'**, rider **29** encounters two Upward Accelerators **42a** and **42b** that accelerates and enhances the elevation of rider **29** to a first top **70e'** of rising portion **70d'**; thereafter, rider **29** continues onto a second top of downchute portion **70a''**, a second downchute portion **70b''**, and a second bottom of downchute portion **70c''**. Upon entering a second rising portion **70d''** that extends upward from downchute bottom **70c''** rider **29** encounters an Upward Non-Accelerating Propulsor **49** that stabilises/equalizes rider **29** over a second top **70e''** of rising portion **70d''**. Thereafter, rider **29** continues onto a third top of downchute portion **70a'''**, and a third downchute portion **70b'''**. Upon entering a third bottom of downchute portion **70c'''** rider **29** encounters a Horizontal Non-Accelerating Propulsor **46** which stabilizes/equalizes rider **29** onto a third rising portion **70d'''** that extends upward from downchute bottom **70c'''**, and a third top **70e'''** of rising portion **70d'''**; thereafter, rider **29** continues into a fourth top of downchute portion **70a''''** and encounters a Downward Non-Accelerating Propulsor **52** which stabilizes/equalizes rider **29** on a fourth downchute portion **70b''''** and onward to a fourth bottom of downchute portion **70c''''**, a fourth rising portion **70d''''** that extends upward from downchute bottom **70c''''**, and a fourth top **70e''''** of rising portion **70d''''**; thereafter, rider **29** continues into a fifth top of downchute portion **70a'''''**, a fifth downchute portion **70b'''''** and a final bottom of down chute portion **70c'''''** which connects to ending basin **73** whereupon rider **29** exits.

[0091] Water Source **22** provides high pressure water to Accelerators **42a** and **42b**, and Non-Accelerating Propulsors **49**, **46** and **52**, as well as a normal water flow to conventional start basin **72**. The velocity of water that issues from each respective Non-Accelerating Propulsors **49**, **46**, and **52** can be different depending upon the flow required to stabilize/equalize rider **29** to the top of a successive rise. Start overflow and rider transient surge build up is eliminated by venting the slowed water over the outside edge of the riding surface; or through openings along the bottom and sides of the channel; or by way of Triple Flume or Double Flume all as previously described. A surge tank **74** acts as a low point reservoir to collect and facilitate re-pumping of vented water as well as hold water on system shut-down.

[0092] Analogous to a roller coaster or a conventional flume ride, there are various ramifications regarding the operation of Water Coaster **69** described herein, including: the use of single or multi-passenger riding vehicles or boats that allow the rider to get wet or stay dry; increasing the capacity of Water Coaster **69** to permit multiple riders; connecting Water Coaster **69** to other amusement attractions; and enhancing Water Coaster **69** through the addition of special light, sound and themeing effects. All such possibilities are subject to the design, construction and operational guidelines as currently exist in the industry and as expanded by the disclosures herein.

[0093] Accordingly, it is now apparent that Water Coaster **69** as envisioned by this invention will permit a participant to ride a water attraction that has the profile and ride characteristics akin to a roller coaster. In addition, Water Coaster **69** has the following advantages:

- it allows a rider to experience within one ride the sight, sound, and sensation of upward, downward and horizontal acceleration induced by high speed jets of water. This experience is exciting for participant and observer. Furthermore, the rider can gain speed for increased thrill and in set up for subsequent conventional waterslide maneuvers, e.g., twists, turns, jumps, drops, finale, etc.
- it permits riders and vehicles to safely attain elevation recovery in excess of that available under conventional gravity driven systems through the Elevation Enhancement Process.
- it engenders rider safety and consistency in performance through the Stabilization and Equalization Process.
- it increases participant thrill by allowing rider(s) to enjoy greater and more rapid changes in angular momentum, and;
- it can, if desired create an endless loop.

[0094] Although the description above contains many specifications, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention. For example, the module(s) which comprise the Horizontal, Upward, and Downhill Accelerators or Propulsors can have multiple nozzles instead of one; the Water Coaster can be shaped, proportioned and profiled substantially different than illustrated, such as serpentine, circular, convoluted, helical, parabolic, sinusoidal, etc.; the vehicles used within a water ride can have wheels or be on a track; a rider can enter the flow of water at an angle other than parallel to the line of flow; the flow of water could be cycled off/on at appropriate times to take advantage of the spacing that occurs between riders and effect a more efficient use of water flow.

[0095] Thus, the scope of the invention should be determined by the appended claims, rather than by the examples given.

Claims

1. A water ride for amusement parks, water parks and the like, of the type having a ride surface (25) that follows an elongated curvilinear path (57) having inclining and declining portions thereon and is adapted to receive and support a rider (29) or a ride vehicle (29a) travelling alone the surface (25) in a predetermined direction, said ride comprising at least one flow-forming nozzle (24) disposed in the bottom of said ride surface (25) and positioned along said ride surface (25) in a preselected location, said flow-forming nozzle (24) having an elongate aperture (28) extending substantially transverse to said ride direction, said nozzle being formed and positioned to emit a focused water flow (30) in a direction substantially parallel to the bottom of the ride surface (25) and in said predetermined direction and having a predetermined thickness, velocity, volume and direction, said focused water flow (30) being injected along said bottom of said ride surface as a discrete high speed jet of water which provides a sliding effect to said rider (29) or said ride vehicle (29a) and which operatively contacts said rider and/or ride vehicle, propelling said rider (29) or said ride vehicle (29a) by a transfer of momentum such that said ride (29) or ride vehicle (29a) travels along said ride surface (25) including up said inclining portion(s) with an acceleration and velocity which is different from the acceleration and velocity achieved by travelling on a ride unassisted by jet water flow, wherein a portion of said ride surface (25) adjacent said water flow (30) is self-venting so that slower water is allowed to escape to one or both sides of the ride surface (25), thereby preventing build-up of water or transient surges behind the rider (29) or ride vehicle (29a) that would otherwise choke said water flow (30).

2. A water ride for amusement parks, water parks and the like, of the type having a ride surface (25) that follows an elongated curvilinear path (57) having inclining and declining portions thereon and is adapted to receive and support a rider (29) or a ride vehicle (29a) travelling along the surface (25) in a predetermined direction, said ride comprising at least one flow-forming nozzle (24) disposed in the bottom of said ride surface (25) and positioned along said ride surface (25) in a preselected location, said flow-forming nozzle (24) comprises multiple smaller nozzles being packaged to extend substantially transverse to said ride direction, said nozzle being formed and positioned to emit a focused water flow (30) in a direction substantially parallel to the bottom of the ride surface (25) and in said predetermined direction and having a predetermined thickness velocity, volume and direction, said focused water flow (30) being injected along said bottom of said ride surface as a discrete high speed jet of water which provides a sliding effect to said rider (29) or said ride vehicle (29a) and which operatively contacts said rider and/or ride vehicle, propelling said rider (29) or said ride vehicle (29a) by a transfer of momentum, such that said rider (29) or ride vehicle (29a) travels along said ride surface (25) including up said inclining portion(s) with an acceleration and velocity which is different from the acceleration and velocity achieved by travelling on a ride unassisted by jet water flow, wherein a portion of said ride surface (25) adjacent said water flow (30) is self-venting so that slower water is allowed to escape to one or both sides of the ride surface (25), thereby preventing build-up of water or transient surges behind the rider (29) or ride vehicle (29a) that would otherwise choke said water flow (30).

3. The water ride of claim 1 or 2 characterized in that said jet water flow (30) is provided having a velocity and/or volume sufficient to propel said rider (29) or ride vehicle (29a) by a transfer of momentum such that said rider (29) or ride vehicle (29a) travels along said ride surface (25) in a horizontal, upward or downward direction with an acceleration and velocity which is greater than the acceleration and velocity achieved by traveling on a ride unassisted by jet water flow.

4. The water ride of claim 1 or 2 characterized in that said jet water flow (30) is provided having a velocity and/or volume sufficient to propel said rider (29) or ride vehicle (29a) by a transfer of momentum such that said rider (29) or ride vehicle (29a) travels along said ride surface (25) in a horizontal, upward and downward direction with an acceleration and velocity which is less than the acceleration and velocity achieved by traveling on a ride unassisted by jet water flow.

5. The water ride of any preceding claim characterized in that said ride comprises a plurality of structural supports (71) for supporting said ride surface (25).

6. The water ride of any of claims 1 to 5, wherein a further jet water flow (30) is provided having a velocity and/or volume sufficient to decrease the velocity of said rider (29) or ride vehicle (29a) whereby said rider (29) or ride vehicle (29a) maintains contact with said ride surface (25) in order to avoid becoming airborne over said inclining or declining portions thereof.

7. The water ride of any preceding claim wherein said ride surface (25) is adapted to permit said rider (29) to travel in a predetermined direction on said ride surface (25) in a prone or seated position.

8. The water ride of any of claims 1 to 6 wherein said ride surface (25) is adapted to permit said rider (29) to travel on said ride surface (25) in a sliding ride vehicle.

9. The water ride of any of claims 1 to 6 wherein said ride surface (25) is adapted to permit said rider (29) to travel on said ride surface (25) in a wheeled vehicle.

10. The water ride of any of claims 1 to 6 wherein said ride surface (25) is adapted to allow said rider (29) to travel in said predetermined direction along the said ride surface (25) in a boat.

11. The water ride of any of claims 1 to 6 wherein said ride surface (25) is adapted to allow said rider (29) to travel in said predetermined direction along the said ride surface (25) in a multi-passenger sliding vehicle.

12. The water ride of any preceding claim wherein said jet water flow (30) is injected by an adjustable nozzle aperture (28) where said jet water flow (30) is powered by a water source (22) under pressure coupled to said adjustable nozzle aperture (28).

13. The water ride of any preceding claim wherein said jet water flow (30) is injected by a pump as a water source (22).

14. The water ride of any of claims 1 to 13 wherein said ride surface (25) includes porous vents (34e) of a predetermined length and width to provide a self-clearing exit of excess water that builds up on said ride surface (25) as said water is injected onto said ride surface.

15. The water ride of any preceding claim further comprising an overflow channel (36a) located parallel and adjacent said ride surface (25) adapted to receive and vent a slower moving excess water overflowing from said ride surface (25) into said overflow channel (36a).

16. The water ride of claim 15 wherein said ride surface (25) and said overflow channel (36a) are separated by a common wall (27) of a predetermined height, said height being adapted to allow aid excess water to overflow and exit from said ride surface (25) into said overflow channel (36a) so that said velocity of said jet water flow (30) and said rider (29) or ride vehicle along the said ride surface (25) is not substantially impeded by said slower moving excess water.

17. The water ride of claim 15 or 16 wherein a second overflow channel (36b) is provided parallel with and adjacent said ride surface (25), said second overflow channel (36b) being located such that said ride surface (25) is located between said overflow channel (36a) and said second overflow channel (36b) being adapted to receive said water overflowing said ride surface (25) in substantially the same manner as said first overflow channel (36a).

18. The water ride of any preceding claim further comprising a surge tank (74) for collecting and temporarily storing vented water.

19. The water ride of any preceding claim wherein said jet water flow is directed along the said ride surface (25) in a direction substantially tangential to said predetermined direction of said rider or ride vehicle and in a direction that will impact said rider or ride vehicle as it travels past said flow-forming nozzle (24).

20. The water ride of any of claims 1 to 19 wherein said jet water flow (30) has a velocity and volume sufficient to increase the velocity of said rider (29) or ride vehicle as said rider (29) or ride vehicle travels past said flow-forming nozzle (24), whereby said rider or ride vehicle is propelled to reach and pass over the apex of said inclining portions of said ride surface (25).

21. A method of propelling a rider (29) along a water ride surface (25) of the type adapted to receive and support a rider (29) or ride vehicle travelling along the ride surface (25) in a predetermined direction, the method comprises a step of injecting a focused discrete high speed jet water flow (30) along the bottom of said ride surface (25) and substantially parallel to said bottom at a predetermined thickness, velocity, volume and direction such that said jet water flow (30) is injected between said ride surface (25) and said rider (29) and/or ride vehicle (29a) at a pressure in the range from approximately 0,345 bar to 17,241 bar, providing a sliding effect to said rider (29) or said ride vehicle (29a) and which operatively contacts and propels said rider (29) or ride vehicle as said rider (29) or ride vehicle travels along said ride surface so as to transfer momentum to said rider (29) or ride vehicle such that said rider (29) or ride vehicle travels along said ride surface with an acceleration and velocity that is different from the acceleration and velocity achieved by travelling on a ride unassisted by jet water flow.

Patentansprüche

1. Wasserrutschbahn für Vergnügungsparks, Wasserparks und dergleichen mit einer Rutschfläche (25), die einer langgestreckten gekrümmten Bahn (57) folgt, die ansteigende und sich senkende Abschnitte hat und die für die Aufnahme und das Tragen eines Rutschers (29) oder eines Rutschfahrzeugs (29a) geeignet ist, der bzw. das sich längs der Oberfläche (25) in einer vorher festgelegten Richtung bewegt, und mit Wenigstens einer Strombildungsdüse (24), die am Boden der Rutschfläche (25) und längs der Rutschfläche (25) an einer vorgewählten Stelle angeordnet ist und mit einer länglichen Öffnung (28) versehen ist, die sich im wesentlichen quer zur Rutschrichtung erstreckt und die derart ausgebildet und angeordnet ist, daß sie einen gebündelten Wasserstrom (30) in eine im wesentlichen zum Boden der Rutschfläche (25) parallele Richtung und in die vorher festgelegte Richtung mit einer vorher festgelegten Dicke, einer vorher festgelegten Geschwindigkeit, einem vorher festgelegten Volumen und einer vorher festgelegten Richtung ausstößt, wobei der gebündelte Wasserstrom (30) längs des Bodens der Rutschfläche als ein einzelner Hochgeschwindigkeitswasserstrahl eingespritzt wird, der für den Rutscher (29) oder das Rutschfahrzeug (29a) einen Gleiteffekt bewirkt und den Rutscher und/oder das Rutschfahrzeug wirkungsvoll berührt, wodurch der Rutscher (29) oder das Rutschfahrzeug (29a) durch Übertragung eines solchen Impulses vorwärtsgetrieben wird, daß sich der Rutscher (29) oder das Rutschfahrzeug (29a) längs der Rutschfläche (25) einschließlich ihres ansteigenden Abschnitts/ihrer ansteigenden Abschnitte mit einer Beschleunigung und einer Geschwindigkeit bewegt, die von der Beschleunigung und Geschwindigkeit verschieden sind, die durch Bewegen auf einer Rutsche ohne Unterstützung durch einen Strahl-Wasserstrom erreicht werden, wobei ein Abschnitt der Rutschfläche (25) angrenzend an den Wasserstrom (30) abführend ausgebildet ist, damit langsameres Wasser an eine oder beide Seiten der Rutschfläche (25) abfließen kann und dadurch ein Wasseranstieg oder vorübergehender Schwall hinter dem Rutscher (29) oder dem Rutschfahrzeug (29a) verhindert wird, der ansonsten den Wasserstrom (30) verstopfen würde.

2. Wasserrutschbahn für Vergnügungsparks, Wasserparks und dergleichen mit einer Rutschfläche (25), die einer langgestreckten gekrümmten Bahn (57) folgt, die ansteigende und sich senkende Abschnitte hat und die für die Aufnahme und das Tragen eines Rutschers (29) oder eines Rutschfahrzeugs (29a) geeignet ist, der bzw. das sich längs der Oberfläche (25) in einer vorher festgelegeten Richtung bewegt, und mit wenigstens einer Strombildungsdüse (24), die am Boden der Rutschfläche (25) und längs der Rutschfläche (25) an einer vorgewählten Stelle angeordnet ist und mit mehreren kleineren gebündelten Düsen, die sich im wesentlichen quer zur Rutschrichtung erstrecken und die derart ausgebildet und angeordnet sind, daß sie einen gebündelten Wasserstrom (30) in eine im wesentlichen zum Boden der Rutschfläche (25) parallele Richtung und in die vorher festgelegte Richtung mit einer vorher festgelegten Dicke, einer vorher festgelegten Geschwindigkeit, einem vorher festgelegten Volumen und einer vorher festgelegten Richtung ausstoßen, wobei der gebündelte Wasserstrom (30) längs des Bodens der Rutschfläche als ein einzelner Hochgeschwindigkeitswasserstrahl eingespritzt wird, der für den Rutscher (29) oder das Rutschfahrzeug (29a) einen Gleiteffekt bewirkt und den Rutscher und/oder das Rutschfahrzeug wirkungsvoll berührt, wodurch der Rutscher (29) oder das Rutschfahrzeug (29a) durch Übertragung eines solchen Impulses vorwärtsgetrieben wird, daß sich der Rutscher (29) oder das Rutschfahrzeug (29a) längs der Rutschfläche (25) einschließlich ihres ansteigenden Abschnittes/ihrer ansteigenden Abschnitte mit einer Beschleunigung und einer Geschwindigkeit bewegt, die von der Beschleunigung und Geschwindigkeit verschieden sind, die durch Bewegen auf einer Rutsche ohne Unterstützung durch einen Strahl-Wasserstrom erreicht werden, wobei ein Abschnitt der Rutschfläche (25) angrenzend an den Wasserstrom (30) abführend ausgebildet ist, damit langsameres Wasser an einer oder beiden Seiten der Rutschfläche (25) abfließen kann und dadurch ein Wasseranstieg oder vorübergehender Schwall hinter dem Rutscher (29) oder dem Rutschfahrzeug (29a) verhindert wird, der ansonsten den Wasserstrom (30) verstopfen würde.

3. Wasserrutschbahn nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Strahl-Wasserstrom (30) mit einer Geschwindigkeit und/oder einem Volumen bereitgestellt wird, die für ein Vorwärtstreiben des Rutschers (29) oder des Rutschfahrzeugs (29a) durch Übertragung eines solchen Impulses ausreichen, daß sich der Rutscher (29) oder das Rutschfahrzeug (29a) längs der Rutschfläche (25) in einer Horizontal-, Aufwärts- oder Abwärtsrichtung mit einer Beschleunigung und einer Geschwindigkeit bewegt, die größer sind als die Beschleunigung und die Geschwindigkeit, die durch Bewegen auf einer Rutsche ohne Unterstützung durch einen Strahl-Wasserstrom erreicht werden.

4. Wasserrutschbahn nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Strahl-Wasserstrom (30) mit einer Geschwindigkeit und/oder einem Volumen bereitgestellt wird, die für das Vorwärtstreiben des Rutschers (29) oder des Rutschfahrzeugs (29a) durch Übertragung eines solchen Impulses ausreichen, daß der Rutscher (29) oder das Rutschfahrzeug (29a) sich längs der Rutschfläche (25) in einer Horizontal-, Aufwärts- und Abwärtsrichtung mit einer Beschleunigung und Geschwindigkeit bewegt, die kleiner sind als die Beschleunigung und die Geschwindigkeit, die durch Bewegen auf einer Rutsche ohne Unterstützung durch einen Strahl-Wasserstrom erreicht werden.

5. Wasserrutschbahn nach einem vorhergehenden Anspruch, dadurch gekennzeichnet, daß die Rutschbahn eine Vielzahl von Baustützen (71) zum Abstützen der Rutschfläche (25) aufweist.

6. Wasserrutschbahn nach einem der Ansprüche 1 bis 5, bei welcher ein weiterer Strahl-Wasserstrom (30) mit einer Geschwindigkeit und/oder einem Volumen bereitgestellt wird, die für ein Verringern der Geschwindigkeit des Rutschers (29) oder des Rutschfahrzeugs (29a) ausreichen, wodurch der Rutscher (29) oder das Rutschfahrzeug (29a) Kontakt mit der Rutschfläche (25) halten, um zu vermeiden, daß sie auf den ansteigenden oder sich senkenden Abschnitten abheben.

7. Wasserrutschbahn nach einem vorhergehenden Anspruch, bei welcher die Rutschfläche (25) es dem Rutscher (29) ermöglichen kann, sich in einer vorgegebenen Richtung auf der Rutschfläche (25) in einer Liege- oder Sitzstellung zu bewegen.

8. Wasserrutschbahn nach einem der Ansprüche 1 bis 6, bei welcher die Rutschfläche (25) es dem Rutscher (29) ermöglichen kann, sich auf der Rutschfläche (25) in einem gleitenden Rutschfahrzeug zu bewegen.

9. Wasserrutschbahn nach einem der Ansprüche 1 bis 6, bei welcher die Rutschfläche (25) es dem Rutscher (29) ermöglichen kann, sich auf der Rutschfläche (25) in einem mit Rädern versehenen Fahrzeug zu bewegen.

10. Wasserrutschbahn nach einem der Ansprüche 1 bis 6, bei welcher die Rutschfläche (25) es dem Rutscher (29) ermöglichen kann, sich in einer vorgegebenen Richtung längs der Rutschfläche (25) in einem Boot zu bewegen.

11. Wasserrutschbahn nach einem der Ansprüche 1 bis 6, bei welcher die Rutschfläche (25) es dem Rutscher (29) ermöglichen kann, sich in der vorgegebenen Richtung längs der Rutschfläche (25) in einem Gleitfahrzeug für mehrere Passagiere zu bewegen.

12. Wasserrutschbahn nach einem vorhergehenden Anspruch, bei welcher der Strahl-Wasserstrom (30) durch eine einstellbare Düsenöffnung (28) eingespritzt wird, wobei der Strahl-Wasserstrom (30) durch eine unter Druck stehende Wasserquelle (22) angetrieben wird, die mit der einstellbaren Düsenöffnung (28) verbunden ist.

13. Wasserrutschbahn nach einem vorhergehenden Anspruch, bei welcher der Strahl-Wasserstrom (30) durch eine Pumpe als Wasserquelle (22) eingespritzt wird.

14. Wasserrutschbahn nach einem der Ansprüche 1 bis 13, bei welcher die Rutschfläche (25) durchlässige Öffnungen (34e) mit einer vorgegebenen Länge und Breite zur Schaffung eines Selbstentleerungsauslasses von Überschußwasser aufweist, das sich auf der Rutschfläche (25) sammelt, wenn das Wasser auf die Rutschfläche gespritzt wird.

15. Wasserrutschbahn nach einem vorhergehenden Anspruch, welche weiterhin einen Überströmkanal (36a) hat, der parallel und angrenzend an die Rutschfläche (25) für die Aufnahme und das Abführen von sich langsamer bewegendem Überschußwasser angeordnet ist, das von der Rutschfläche (25) in den Überströmkanal (36a) überströmt.

16. Wasserrutschbahn nach Anspruch 15, bei welcher die Rutschfläche (25) und der Überströmkanal (36a) durch eine gemeinsame Wand (27) mit einer vorgegebenen Höhe getrennt sind, die es dem Überschußwasser ermöglichen kann, überzuströmen und von der Rutschfläche (25) in den Überströmkanal (36a) auszutreten, so daß die Geschwindigkeit des Strahl-Wasserstroms (30) und des Rutschers (29) oder Rutschfahrzeugs längs der Rutschfläche (25) durch das sich langsamer bewegende Überschußwasser nicht wesentlich beeinträchtigt wird.

17. Wasserrutschbahn nach Anspruch 15 oder 16, bei welcher ein zweiter Überströmkanal (36b) parallel zu und angrenzend an die Rutschfläche (25) vorgesehen ist, der so angeordnet ist, daß die Rutschfläche (25) sich zwischen dem Überströmkanal (36a) und dem zweiten Überströmkanal (36b) befindet, der das Wasser aufnehmen kann, das über die Rutschfläche (25) im wesentlichen auf die gleiche Weise wie bei dem ersten Überströmkanal (36a) überströmt.

18. Wasserrutschbahn nach einem vorhergehenden Anspruch, welche weiterhin einen Fluttank (74) zum Sammeln und vorübergehenden Speichern des abgeführten Wassers aufweist.

19. Wasserrutschbahn nach einem vorhergehenden Anspruch, bei welcher der Strahl-Wasserstrom längs der Rutschfläche (25) in eine zu der vorgegebenen Richtung des Rutschers oder des Rutschfahrzeugs im wesentlichen tangentiale Richtung und in eine Richtung gerichtet wird, in der er auf den Rutscher oder das Rutschfahrzeug trifft, wenn er bzw. es sich an der Strombildungsdüse (24) vorbeibewegt.

20. Wasserrutschbahn nach einem der Ansprüche 1 bis 19, bei welcher der Strahl-Wasserstrom (30) eine Geschwindigkeit und ein Volumen hat, die ausreichen, um die Geschwindigkeit des Rutschers (29) oder eines Rutschfahrzeugs zu steigern, wenn sich der Rutscher (29) oder das Rutschfahrzeug an der Strombildungsdüse (24) vorbeibewegt, wodurch der Rutscher oder das Rutschfahrzeug vorwärtsgetrieben wird, um den Scheitel der ansteigenden Abschnitte der Rutschfläche (25) zu erreichen und zu passieren.

21. Verfahren zum Vorwärtstreiben eines Rutschers (29) längs einer Wasserrutschfläche (25) in der Bauweise, die für die Aufnahme und das Tragen eines Rutschers (29) oder eines Rutschfahrzeugs geeignet ist, der bzw. das sich längs der Rutschfläche (25) in einer vorher festgelegten Richtung bewegt, wobei das Verfahren einen Schritt aufweist, einen gebündelten diskreten Hochgeschwindigkeitswasserstrom (30) längs und im wesentlichen parallel zum Boden der Rutschfläche (25) mit einer vorher festgelegten Dicke, einer vorher festgelegten Geschwindigkeit, einem vorher festgelegten Volumen und mit einer vorher festgelegten Richtung zwischen der Rutschoberfläche und dem Rutscher (29) und/oder dem Rutschfahrzeug (29a) mit einem Druck im Bereich von etwa 0,345 bar bis 17,241 bar einzuspritzen, der einen Gleiteffekt für den Rutscher (29) oder das Rutschfahrzeug (29a) bewirkt und den Rutscher (29) oder das Rutschfahrzeug wirkungsvoll berührt und vorwärts treibt, während sich der Rutscher (29) oder das Rutschfahrzeug längs der Rutschfläche bewegt, so daß auf den Rutscher (29) oder das Rutschfahrzeug ein Impuls übertragen wird und sich der Rutscher (29) oder das Rutschfahrzeug entlang der Rutschfläche mit einer Beschleunigung und Geschwindigkeit bewegt, die von der Beschleunigung und Geschwindigkeit verschieden sind, die durch Bewegen auf einer Rutsche ohne Unterstützung durch einen Strahl-Wasserstrom erreicht werden.

Revendications

1. Toboggan aquatique pour parcs d'attractions, parcs aquatiques et analogues, du type ayant une surface porteuse (25) qui suit un chemin curviligne allongé (57) comprenant des parties montantes et des parties descendantes, et qui est adaptée pour recevoir et supporter un utilisateur (29) ou un véhicule de transport (29a) se déplaçant le long de la surface (25) dans une direction prédéterminée, ledit toboggan comprenant au moins une buse de production d'écoulement (24) disposée dans le fond de ladite surface porteuse (25) et placée le long de ladite surface porteuse (25) dans un endroit prédéterminé, ladite buse de production d'écoulement (24) ayant une ouverture allonge (28) qui s'étend sensiblement transversalement à ladite direction porteuse, ladite buse étant réalisée et positionnée de manière à émettre un écoulement d'eau dirigé (30) dans une direction sensiblement parallèle au fond de ladite surface porteuse (25) et dans ladite direction prédéterminée, et ayant une épaisseur, une vitesse, un volume et une direction prédéterminés, ledit écoulement d'eau dirigé (30) étant injecté le long du fond de ladite surface porteuse sous la forme d'un écoulement d'eau à jet séparé et à vitesse élevée qui assure un effet de glissage dudit utilisateur (29) ou dudit véhicule de transport (29a) et qui vient fonctionnellement en contact avec ledit utilisateur (29) ou ledit véhicule de transport (29a), pour propulser ledit utilisateur (29) ou ledit véhicule de transport (29a) par transfert de moment d'inertie de sorte que ledit utilisateur (29) ou ledit véhicule de transport (29a) se déplace le long de ladite surface porteuse (25) y compris la ou les parties montantes avec une accélération et une vitesse qui diffèrent de l'accélération et de la vitesse obtenues par déplacement sur un toboggan non aidé par un écoulement d'eau à jet, dans lequel une partie de ladite surface porteuse (25) qui est adjacente audit écoulement d'eau (30) est auto-évacuatrice de sorte que l'eau plus lente peut être évacuée sur un ou les deux côtés de la surface porteuse (25), en empêchant ainsi la formation d'une accumulation d'eau ou de surépaisseurs transitoires derrière l'utilisateur (29) ou le véhicule (29a) qui pourraient autrement empêcher ledit écoulement d'eau (30).

2. Toboggan aquatique pour parcs d'attractions, parcs aquatiques et analogues, du type ayant une surface porteuse (25) qui suit un chemin curviligne allongé (57) comprenant des parties montantes et des parties descendantes, et qui est adaptée pour recevoir et supporter un utilisateur (29) ou un véhicule de transport (29a) se déplaçant le long de la surface (25) dans une direction prédéterminée, ledit toboggan comprenant au moins une buse de production d'écoulement (24) disposée dans le fond de ladite surface porteuse (25) et placée le long de ladite surface porteuse (25) dans un endroit prédéterminé, ladite buse de production d'écoulement (24) comprenant une pluralité de petites buses assemblées de manière à s'étendre sensiblement transversalement à ladite direction porteuse, lesdites buses étant réalisées et positionnées pour émettre un écoulement d'eau dirigé (30) dans une direction sensiblement parallèle au fond de ladite surface porteuse (25) et dans ladite direction prédéterminée, et ayant une épaisseur, une vitesse, un volume et une direction prédéterminés, ledit écoulement d'eau dirigé (30) étant injecté le long dudit fond de la surface porteuse sous la forme d'un écoulement d'eau à jet séparé et à vitesse élevée qui assure un effet de glissade dudit utilisateur (29) ou dudit véhicule de transport (29a) et qui vient fonctionnellement en contact avec ledit utilisateur (29) ou ledit véhicule de transport (29a), pour propulser ledit utilisateur (29) ou ledit véhicule de transport (29a) par transfert de moment d'inertie de sorte que ledit utilisateur (29) ou ledit véhicule de transport (29a) se déplace le long de ladite surface porteuse (25) y compris la ou les parties montantes avec une accélération et une vitesse qui diffèrent de l'accélération et de la vitesse obtenues par déplacement sur un toboggan non aidé par un écoulement d'eau à jet, dans lequel une partie de ladite surface porteuse (25) qui est adjacente audit écoulement d'eau (30) est auto-évacuatrice de sorte que l'eau plus lente peut être évacuée sur un ou les deux côtés de la surface porteuse (25), en empêchant ainsi la formation d'une accumulation d'eau ou de surépaisseurs transitoires derrière l'utilisateur (29) ou le véhicule (29a) qui pourraient autrement empêcher ledit écoulement d'eau (30).

3. Toboggan suivant la revendication 1 ou 2, caractérisé en ce que ledit écoulement d'eau à jet (30) est créé à une vitesse et/ou un volume qui suffisent pour propulser ledit utilisateur (29) ou ledit véhicule de transport (29a) par un transfert de moment d'inertie de sorte que ledit utilisateur (29) ou ledit v »véhicule de transport (29a) se déplace le long de ladite surface porteuse (25) dans une direction horizontale, montante ou descendante avec une accélération et une vitesse qui sont plus grandes que l'accélération et la vitesse obtenues par déplacement sur un toboggan non aidé par un écoulement d'eau à jet.

4. Toboggan suivant la revendication 1 ou 2, caractérisé en ce que ledit écoulement d'eau à jet (30) est créé à une vitesse et/ou un volume qui suffisent pour propulser ledit utilisateur (29) ou ledit véhicule de transport (29a) par transfert de moment d'inertie de sorte que ledit utilisateur (29) ou ledit véhicule de transport (29a) se déplace le long de ladite surface porteuse (25) dans une direction horizontale, montante et descendante avec une accélération et une vitesse qui sont plus faibles que l'accélération et la vitesse obtenues par déplacement sur un toboggan non aidé par un écoulement d'eau à jet.

5. Toboggan suivant une quelconque des revendications précédentes, caractérisé en ce que ledit toboggan comprend une pluralité de supports structurels (71) pour supporter ladite surface porteuse (25).

6. Toboggan suivant une quelconque des revendications 1 à 5, dans lequel un écoulement supplémentaire d'eau à jet (30) est créé à une vitesse et/ou un volume qui suffisent pour diminuer la vitesse dudit utilisateur (29) ou dudit véhicule de transport (29a) de sorte que ledit utilisateur (29) ou ledit véhicule de transport (29a) reste en contact avec ladite surface porteuse (25), afin d'éviter la formation d'une couche d'air porteuse sur lesdites parties montantes ou descendantes du toboggan.

7. Toboggan suivant une quelconque des revendications précédentes, dans lequel ladite surface porteuse (25) est configurée pour permettre audit utilisateur (29) de se déplacer dans une direction prédéterminée sur la dite surface porteuse (25) en position couchée ou assise.

8. Toboggan suivant une quelconque des revendications 1 à 6, dans lequel ladite surface porteuse (25) est prévue pour permettre audit utilisateur (29) de se déplacer sur ladite surface porteuse (25) dans un véhicule de transport glissant.

9. Toboggan suivant une quelconque des revendications 1 à 6, dans lequel ladite surface porteuse (25) est prévue pour permettre audit utilisateur (29) de se déplacer sur ladite surface porteuse (25) dans un véhicule à roues.

10. Toboggan suivant une quelconque des revendications 1 à 6, dans lequel ladite surface porteuse (25) est prévue pour permettre audit utilisateur (29) de se déplacer dans ladite direction prédéterminée le long de ladite surface porteuse (25) dans un bateau.

11. Toboggan suivant une quelconque des revendications 1 à 6, dans lequel ladite surface porteuse (25) est prévue pour permettre audit utilisateur (29) de se déplacer dans ladite direction prédéterminée le long de ladite surface porteuse (25) dans un véhicule glissant à plusieurs passagers.

12. Toboggan suivant une quelconque des revendications précédentes, dans lequel ledit écoulement d'eau à jet (30) est injecté par un orifice de buse réglable (28) et ledit écoulement d'eau à jet (30) est alimenté par une source d'eau sous pression (22) raccordée audit orifice de buse réglable (28).

13. Toboggan suivant une quelconque des revendications précédentes, dans lequel ledit écoulement d'eau à jet (30) est injecté par une pompe comme source d'eau (22).

14. Toboggan suivant une quelconque des revendications 1 à 13, dans lequel ladite surface porteuse (25) comporte des évacuations poreuses (34e) d'une longueur et d'une largeur prédéterminée pour constituer une sortie d'auto-évacuation de l'eau en excès qui s'accumule sur ladite surface porteuse (25) lorsque ladite eau est injectée sur

ladite surface porteuse.

15. Toboggan suivant une quelconque des revendications précédentes, comprenant en outre un canal de débordement (36a) parallèle et adjacent à ladite surface porteuse (25), prévu pour recevoir et évacuer de l'eau en excès se déplaçant plus lentement qui déborde de ladite surface porteuse (25) dans ledit canal de débordement (36a).

16. Toboggan suivant la revendication 15, dans lequel ladite surface porteuse (25) et ledit canal de débordement (36a) sont séparés par une paroi commune (27) de hauteur prédéterminée, ladite hauteur étant prévue pour permettre à ladite eau en excès de déborder et de quitter ladite surface porteuse (25) vers ledit canal de débordement (36a) de sorte que ladite vitesse dudit écoulement d'eau à jet (30) et dudit utilisateur (29) ou dudit véhicule de transport le long de ladite surface porteuse (25) ne soit pas sensiblement diminuée par ladite eau en excès se déplaçant plus lentement.

17. Toboggan suivant la revendication 15 ou 16, dans lequel un deuxième canal de débordement (36b) est prévu parallèlement et de façon adjacente à ladite surface porteuse (25), ledit deuxième canal de débordement (36b) étant placé de sorte que ladite surface porteuse (25) se trouve entre ledit canal de débordement (36b) qui est prévu pour recevoir ladite eau débordant de ladite surface porteuse (25) sensiblement de la même manière que ledit premier canal de débordement (36a).

18. Toboggan suivant une quelconque des revendications précédentes, comprenant en outre une cuve en tampon (74) pour collecter et stocker temporairement l'eau évacuée.

19. Toboggan suivant une quelconque des revendications précédentes, dans lequel ledit écoulement d'eau à jet est dirigé le long de ladite surface porteuse (25) dans une direction sensiblement tangentielle à ladite direction prédéterminée dudit utilisateur ou dudit véhicule de transport, et dans une direction qui rencontre ledit passager ou ledit véhicule de transport lorsqu'il se déplace devant ladite buse de production d'écoulement (24).

20. Toboggan suivant une quelconque des revendications 1 à 19, dans lequel ledit écoulement d'eau à jet (30) a une vitesse et un volume suffisants pour augmenter la vitesse dudit utilisateur (29) ou dudit véhicule de transport lorsque ledit utilisateur (29) ou ledit véhicule de transport se déplace devant ladite buse de production d'écoulement (24), de sorte que ledit utilisateur ou ledit véhicule de transport est propulsé pour atteindre et franchir le sommet desdites parties montantes de ladite surface porteuse (25).

21. Une méthode de propulsion d'un utilisateur (29) le long d'une surface de toboggan aquatique (25) du type prévu pour recevoir et supporter un utilisateur (29) ou un véhicule de transport se déplaçant le long de la surface porteuse (25) dans une direction prédéterminée, cette méthode comprenant une étape consistant à injecter un écoulement d'eau dirigé à jet séparé (30) et à vitesse élevée le long du fond de ladite surface porteuse (25) et sensiblement parallèlement audit fond avec une épaisseur, une vitesse, un volume et une direction prédéterminés, de sorte que ledit écoulement d'eau (30) est injecté entre ladite surface porteuse (25) et l'utilisateur (29) et/ou ledit véhicule de transport (29a) à une pression comprise dans une gamme allant approximativement de 0,345 bar à 17,241 bars, pour produire un effet de glissade dudit utilisateur (29) ou dudit véhicule de transport (29a), et qui rencontre activement et déplace ledit utilisateur (29) ou ledit véhicule de transport (29a) lorsque ledit utilisateur (29) ou ledit véhicule de transport se déplace le long de ladite surface porteuse, de manière à transférer le moment d'inertie audit utilisateur (29) ou audit véhicule de sorte que ledit utilisateur (29) ou ledit véhicule (29a) se déplace le long de ladite surface porteuse avec une accélération et une vitesse qui diffèrent de l'accélération et de la vitesse obtenues par déplacement sur un toboggan non aidé par un écoulement d'eau à jet.

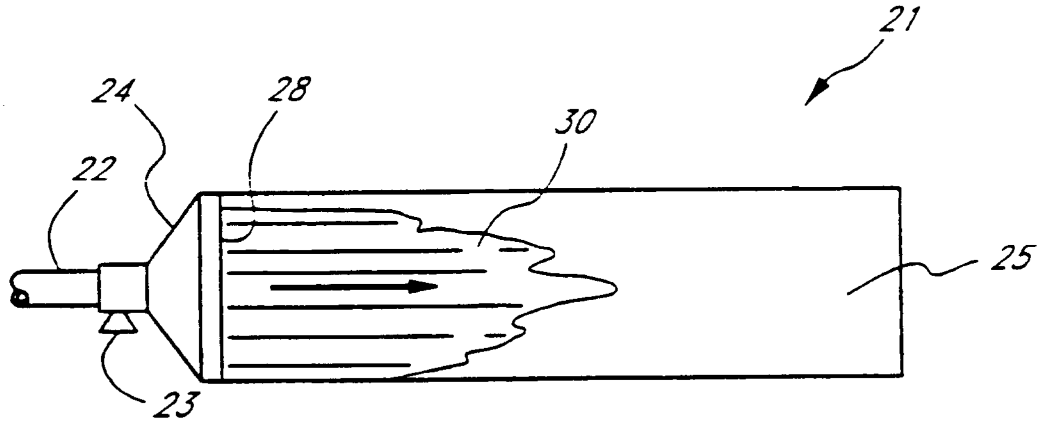

FIG. 1a

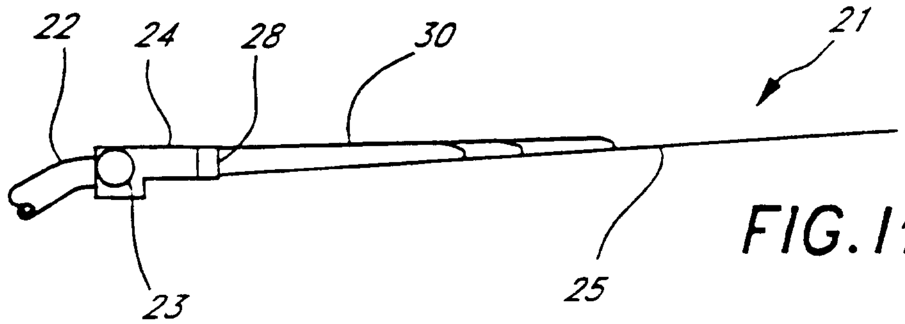

FIG. 1b

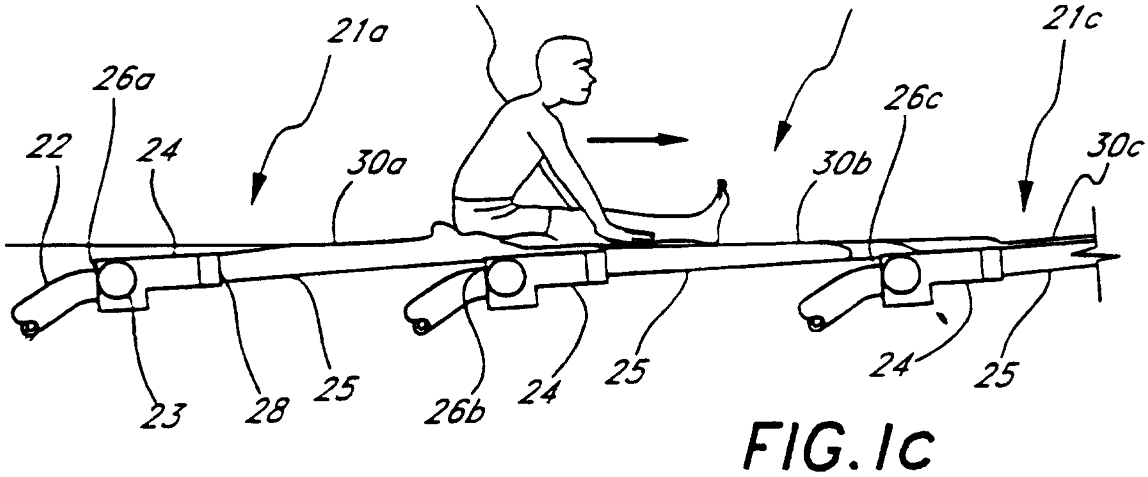

FIG. 1c

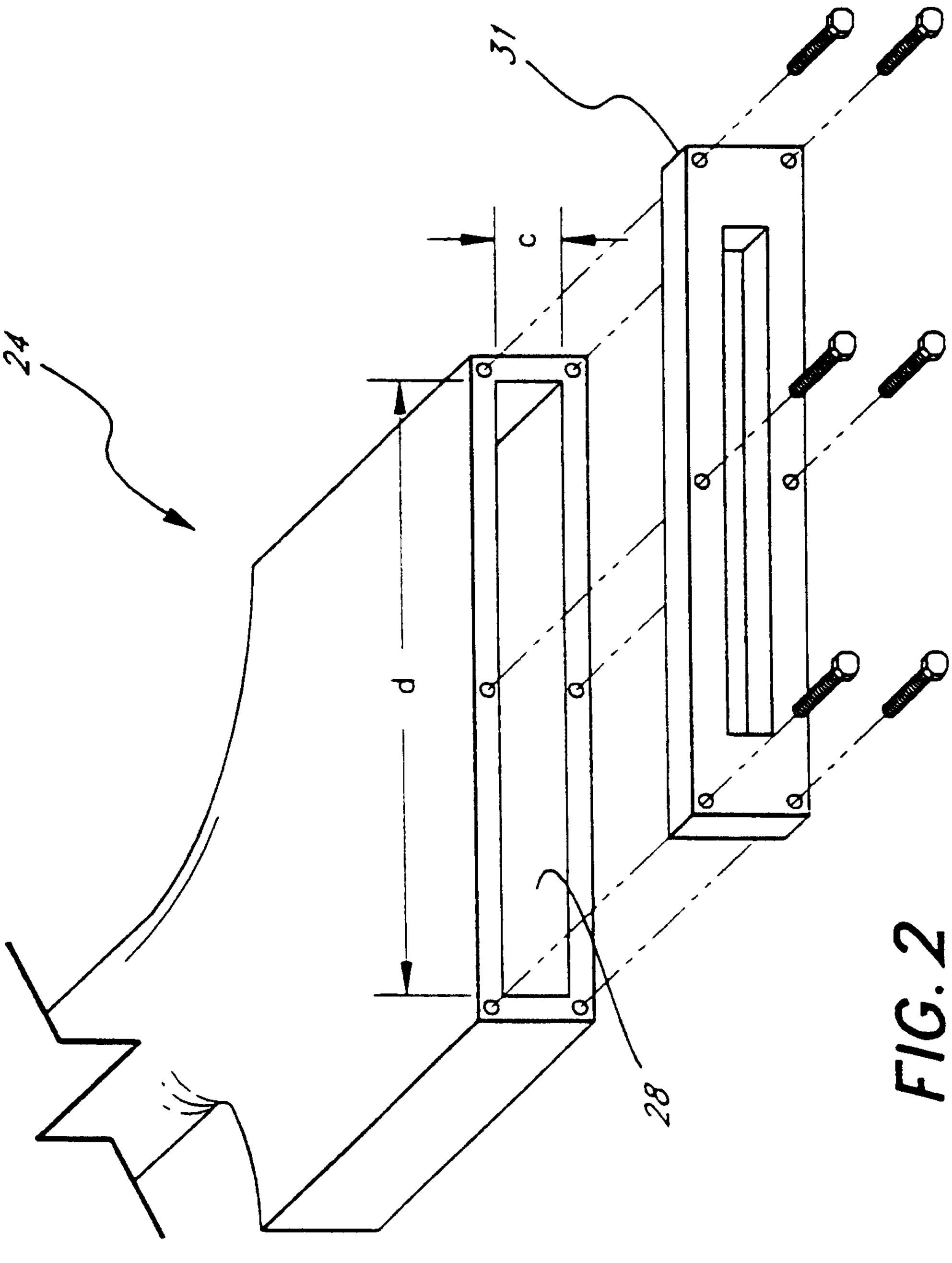

FIG. 2

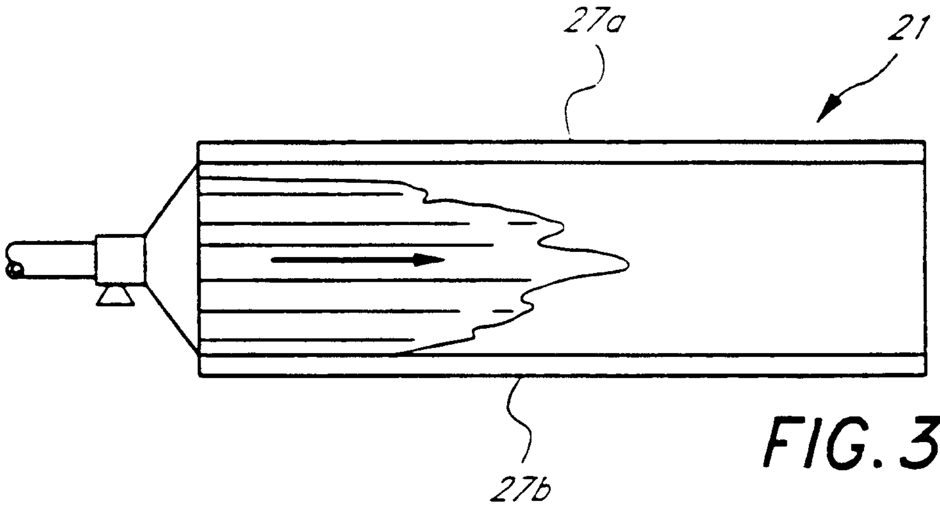

FIG. 3a

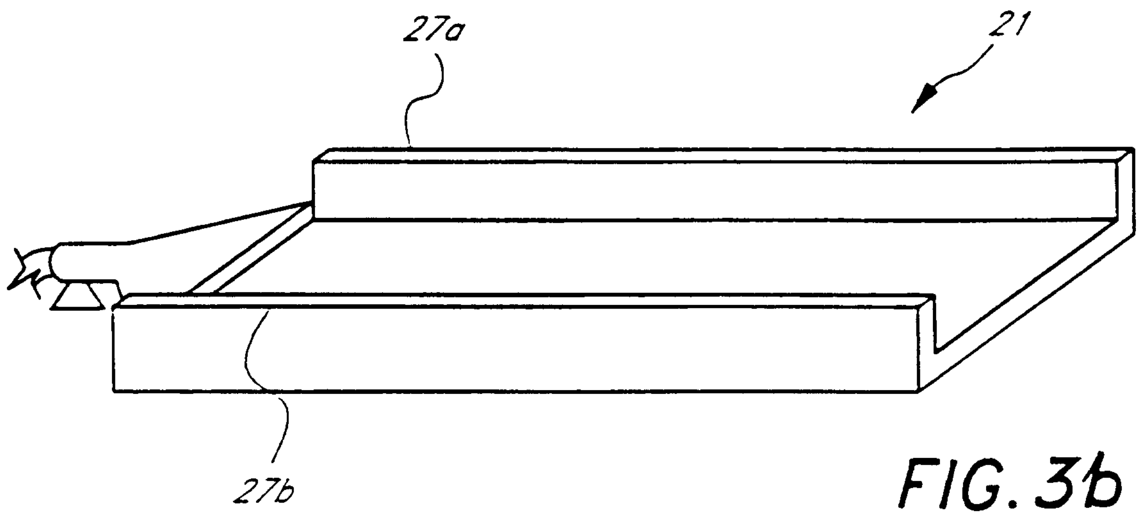

FIG. 3b

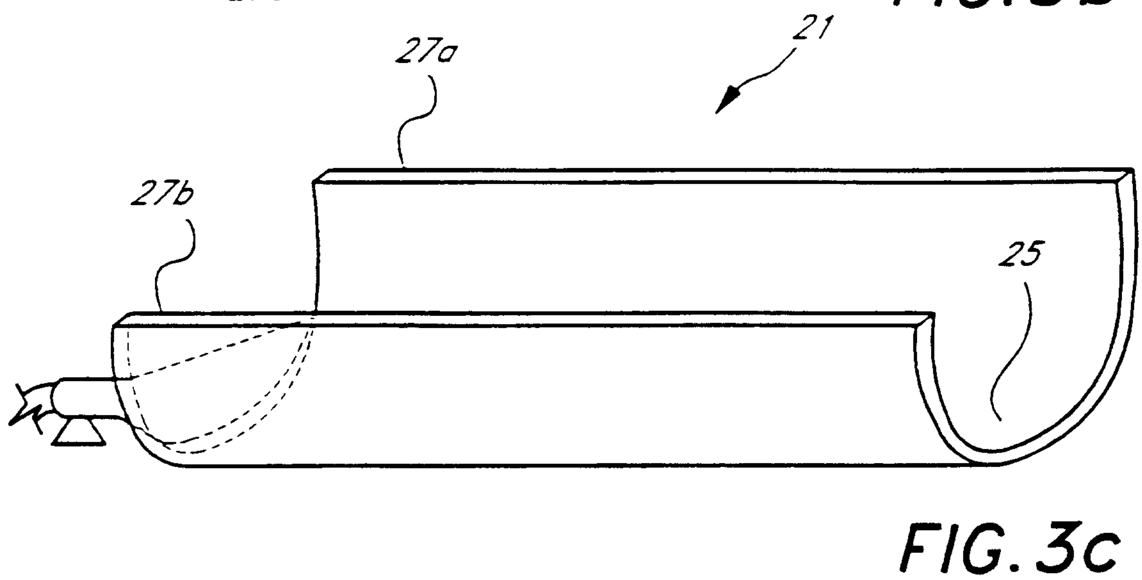

FIG. 3c

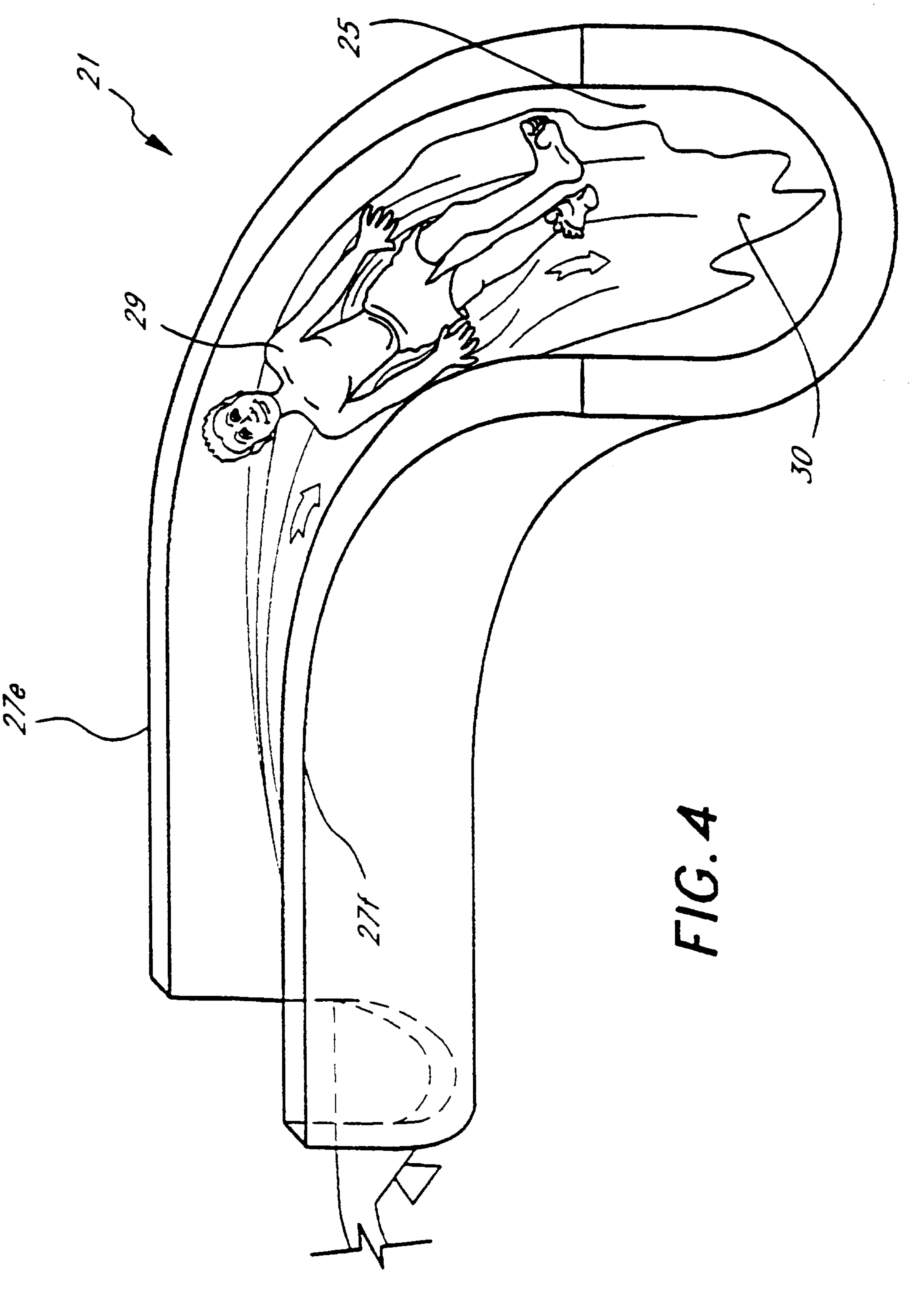

FIG. 4

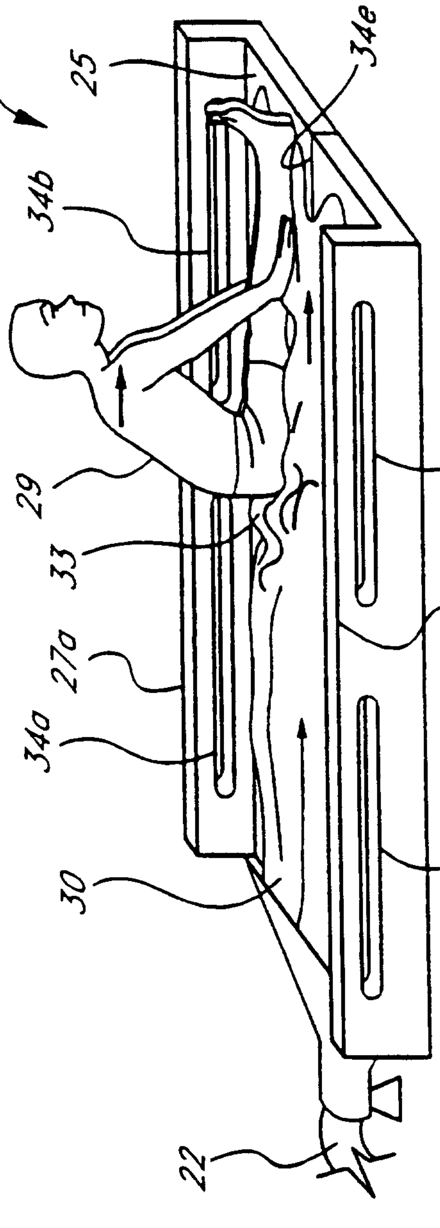

FIG. 5a

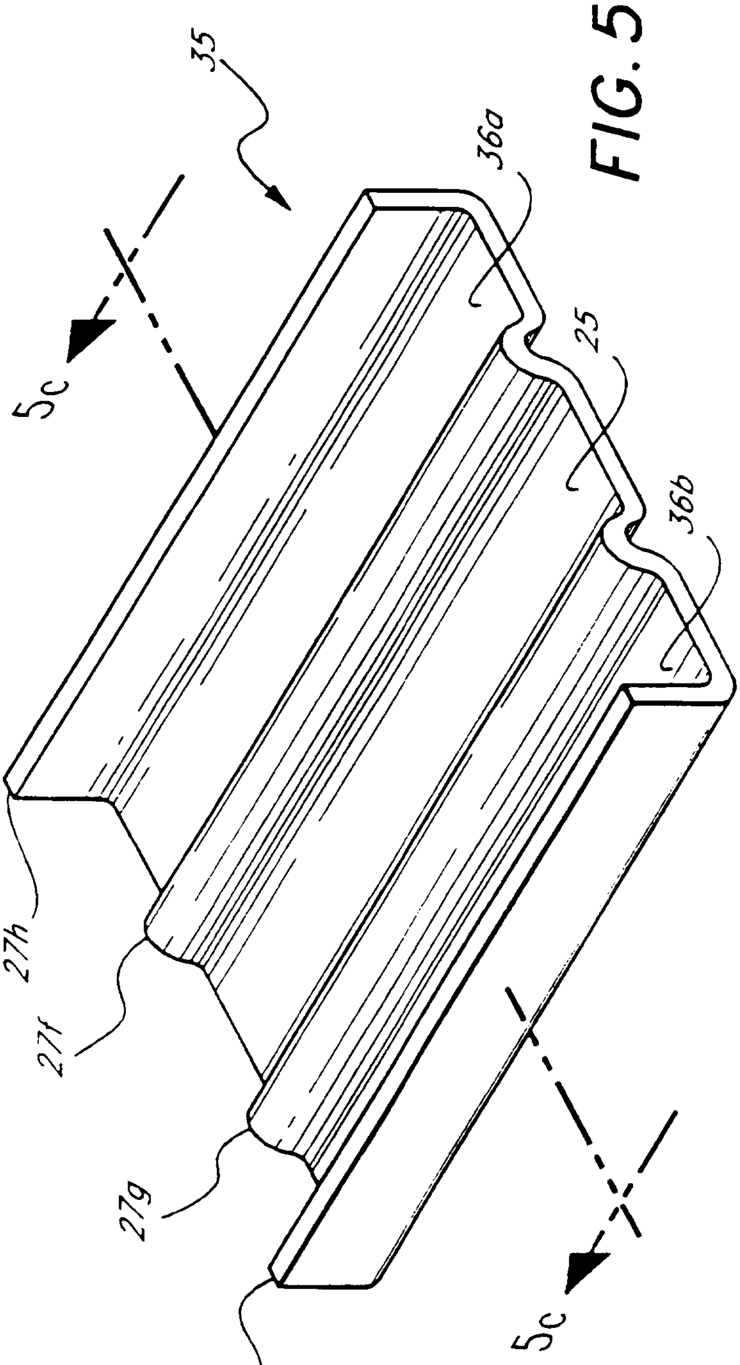

FIG. 5b

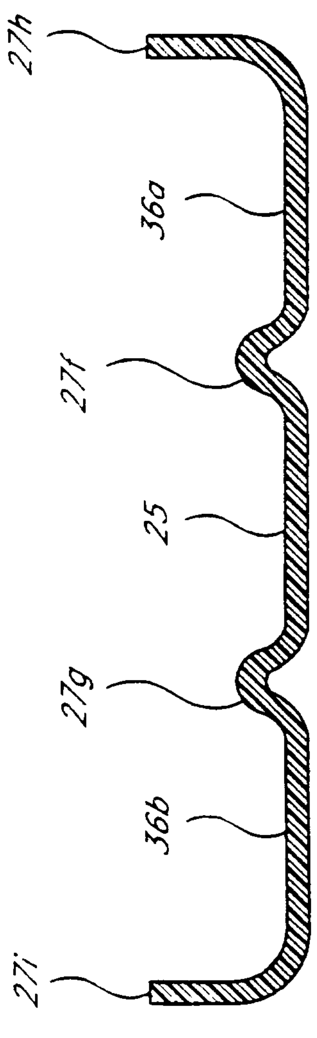

FIG. 5c

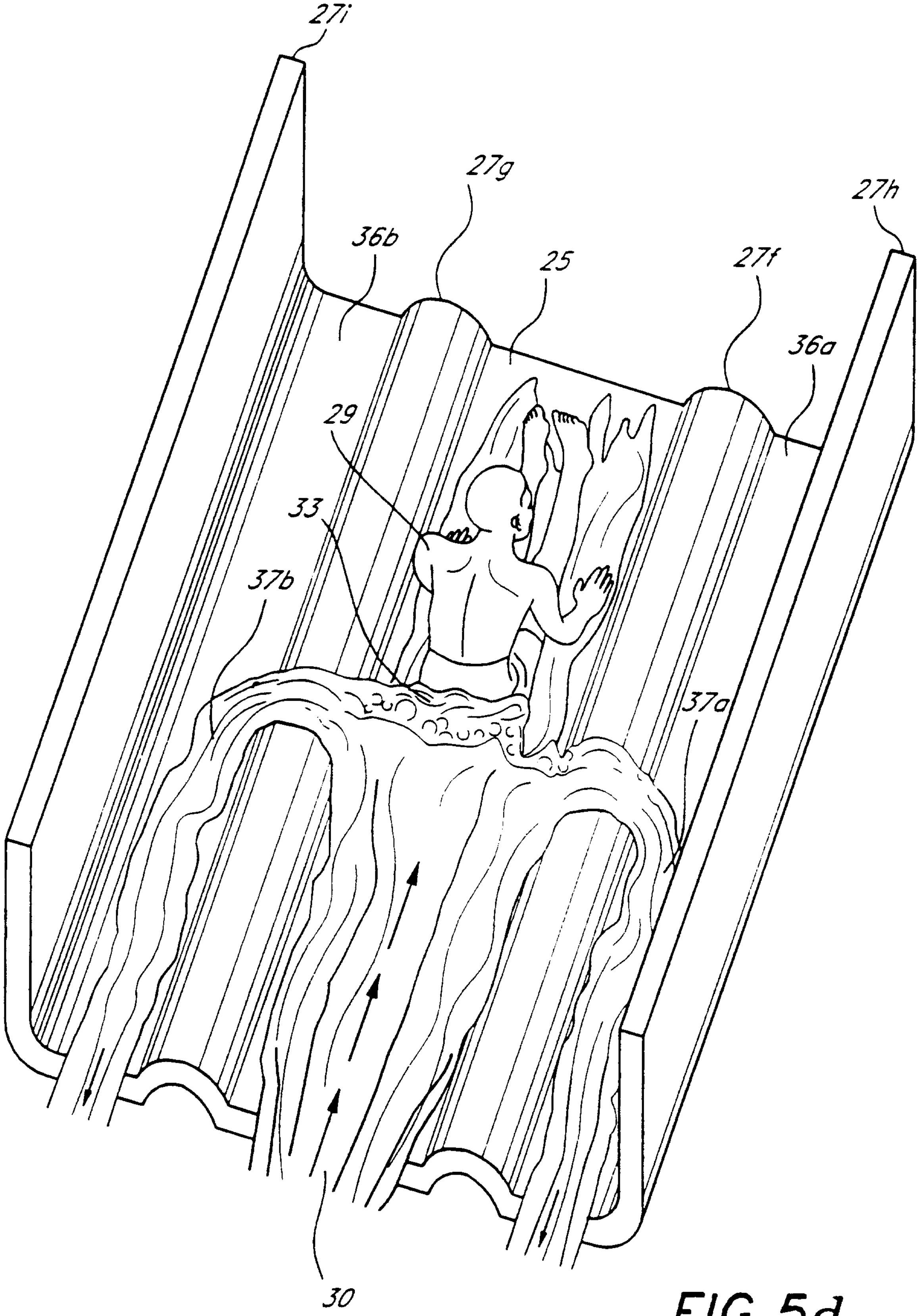

FIG. 5d

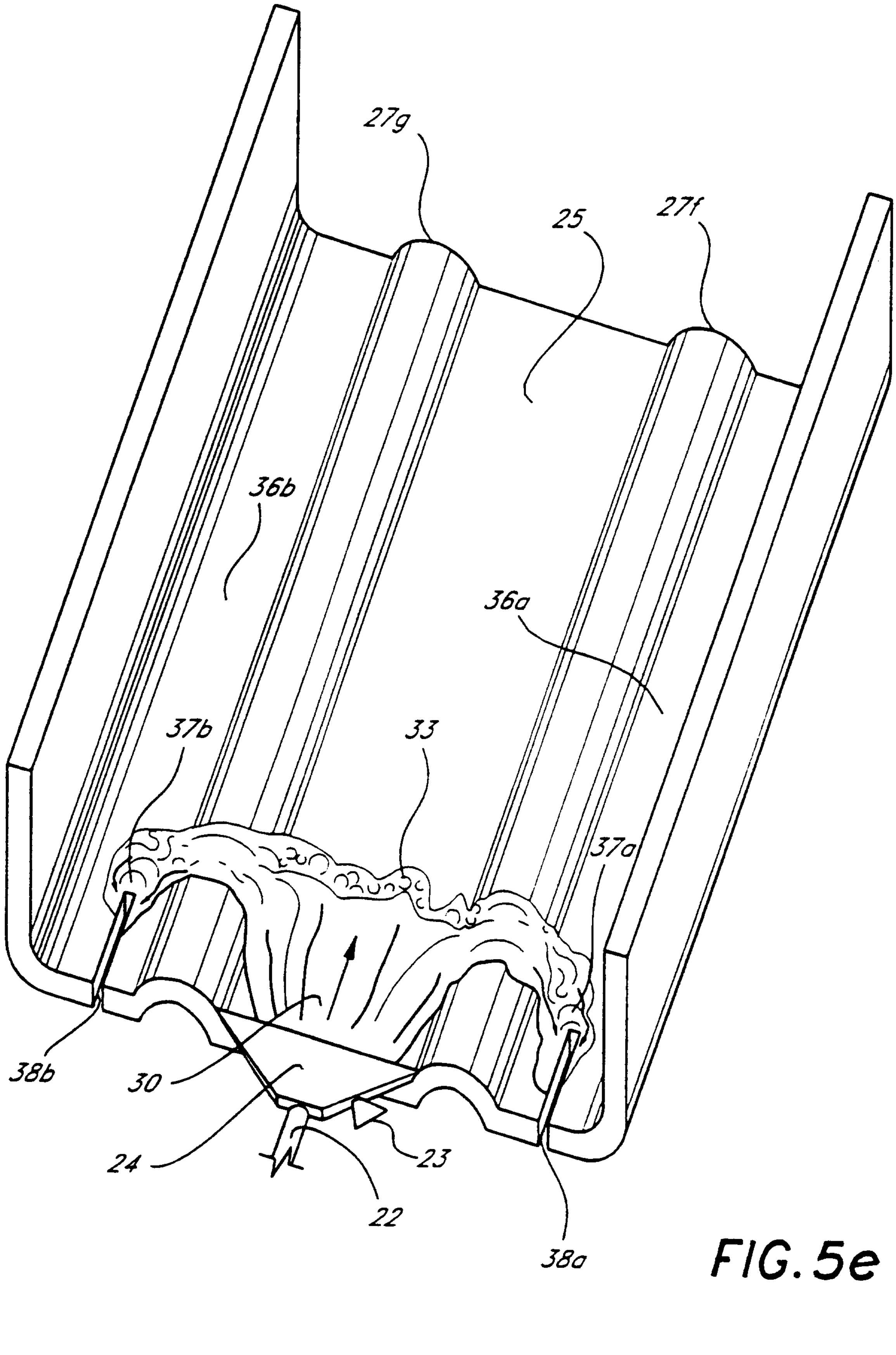

FIG. 5e

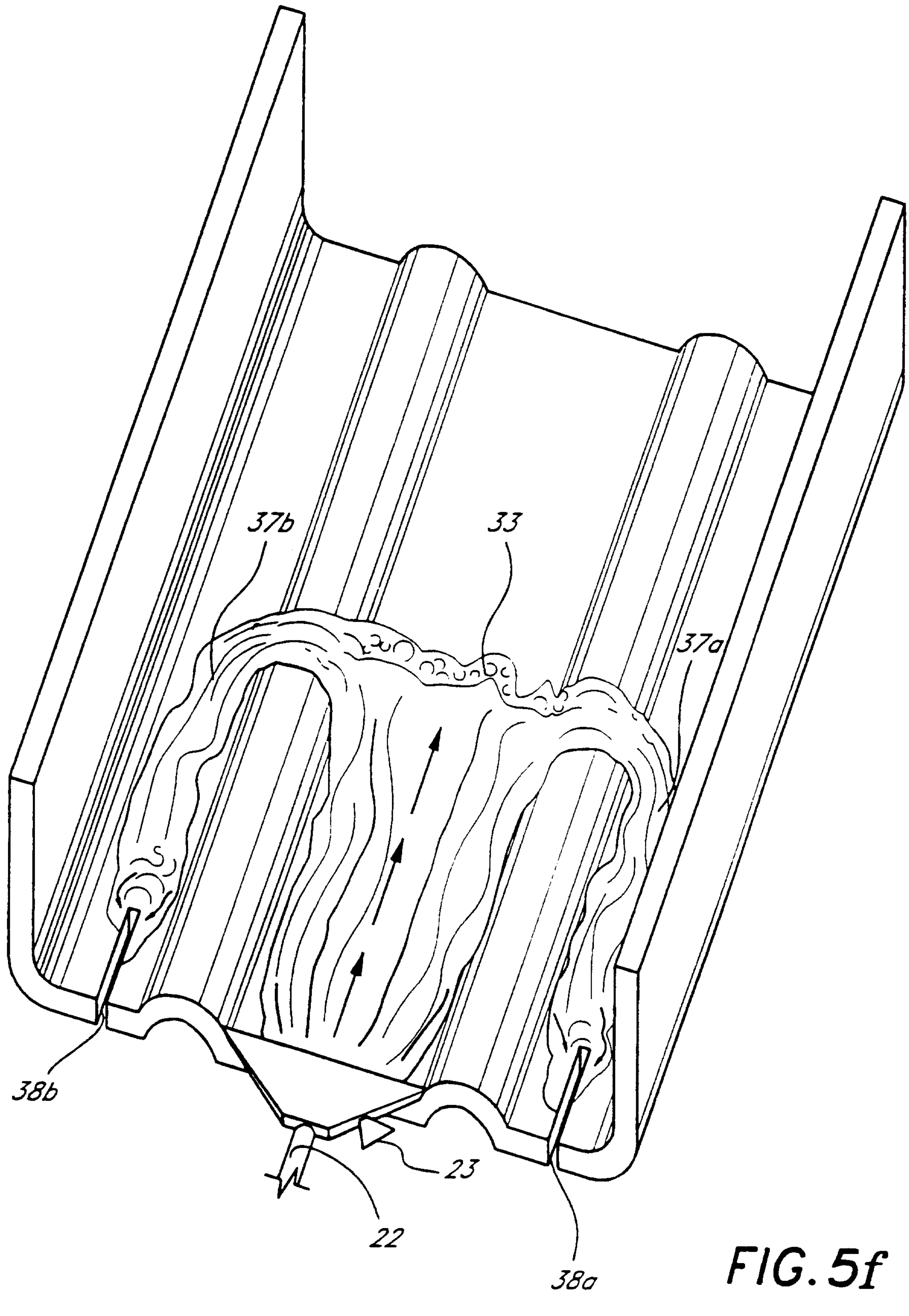

FIG. 5f

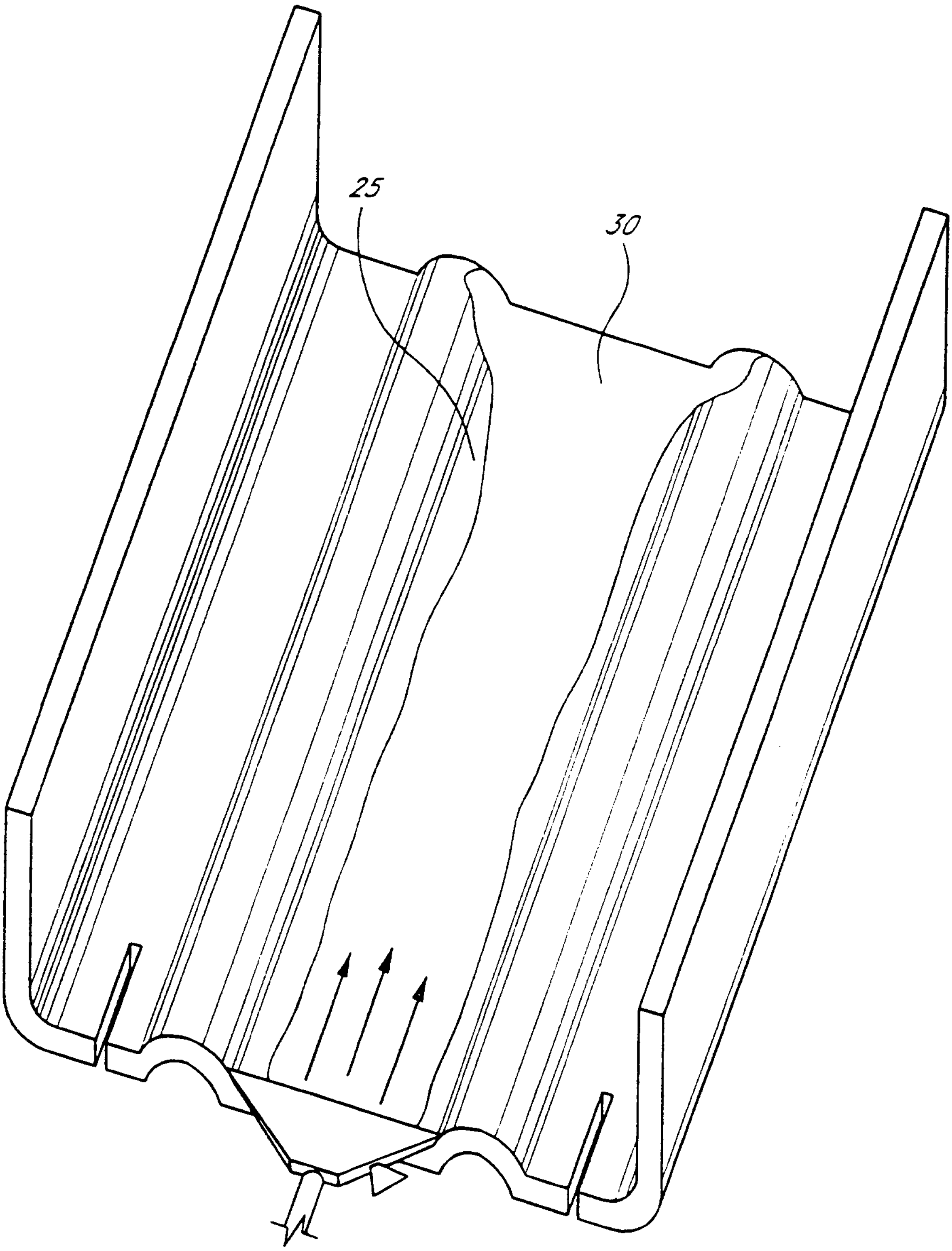

FIG. 5g

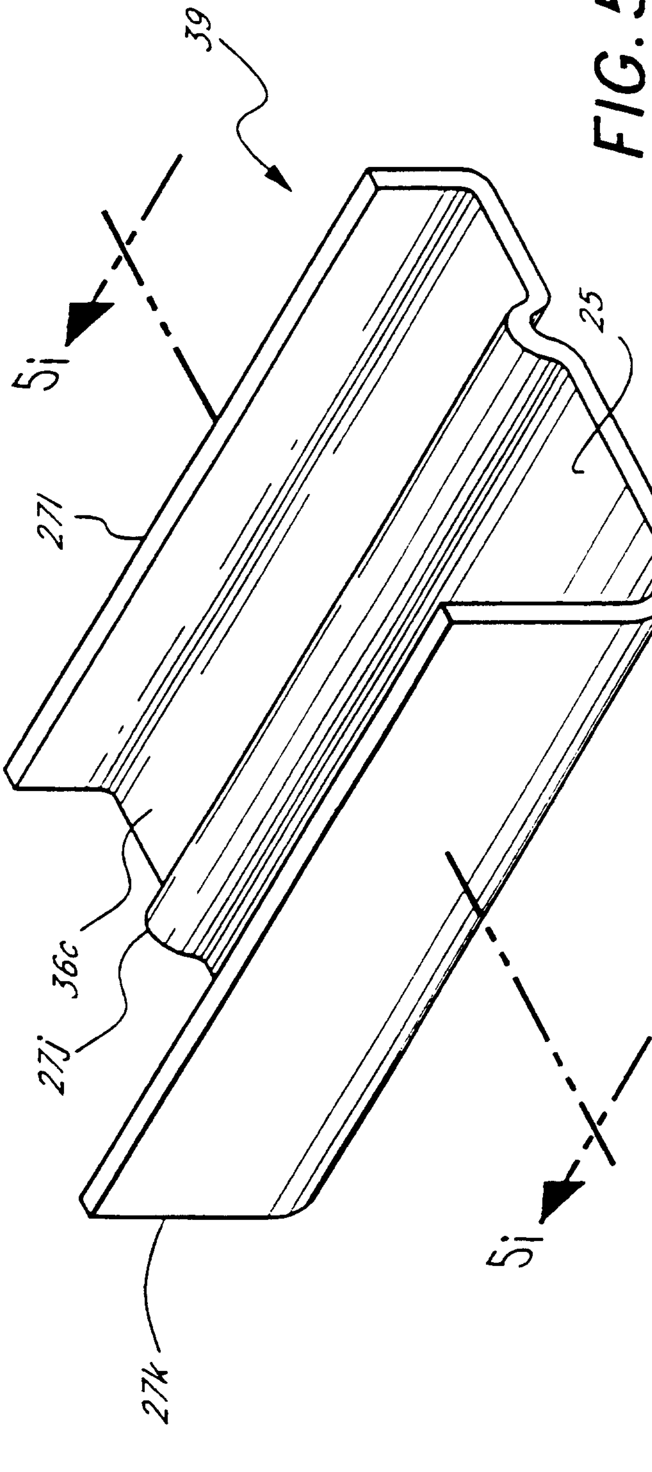

FIG. 5h

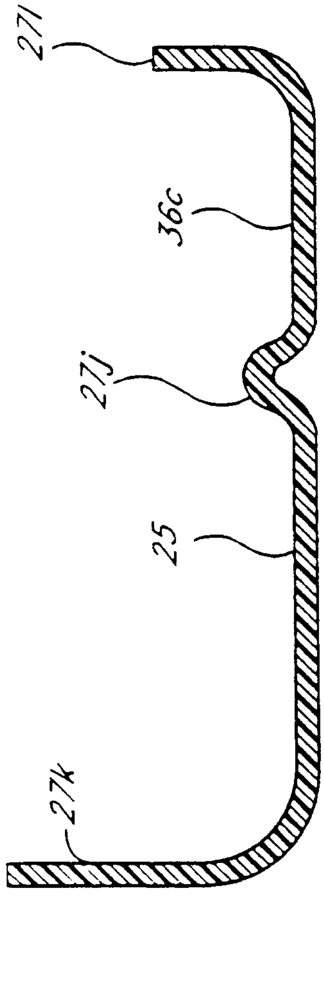

FIG. 5i

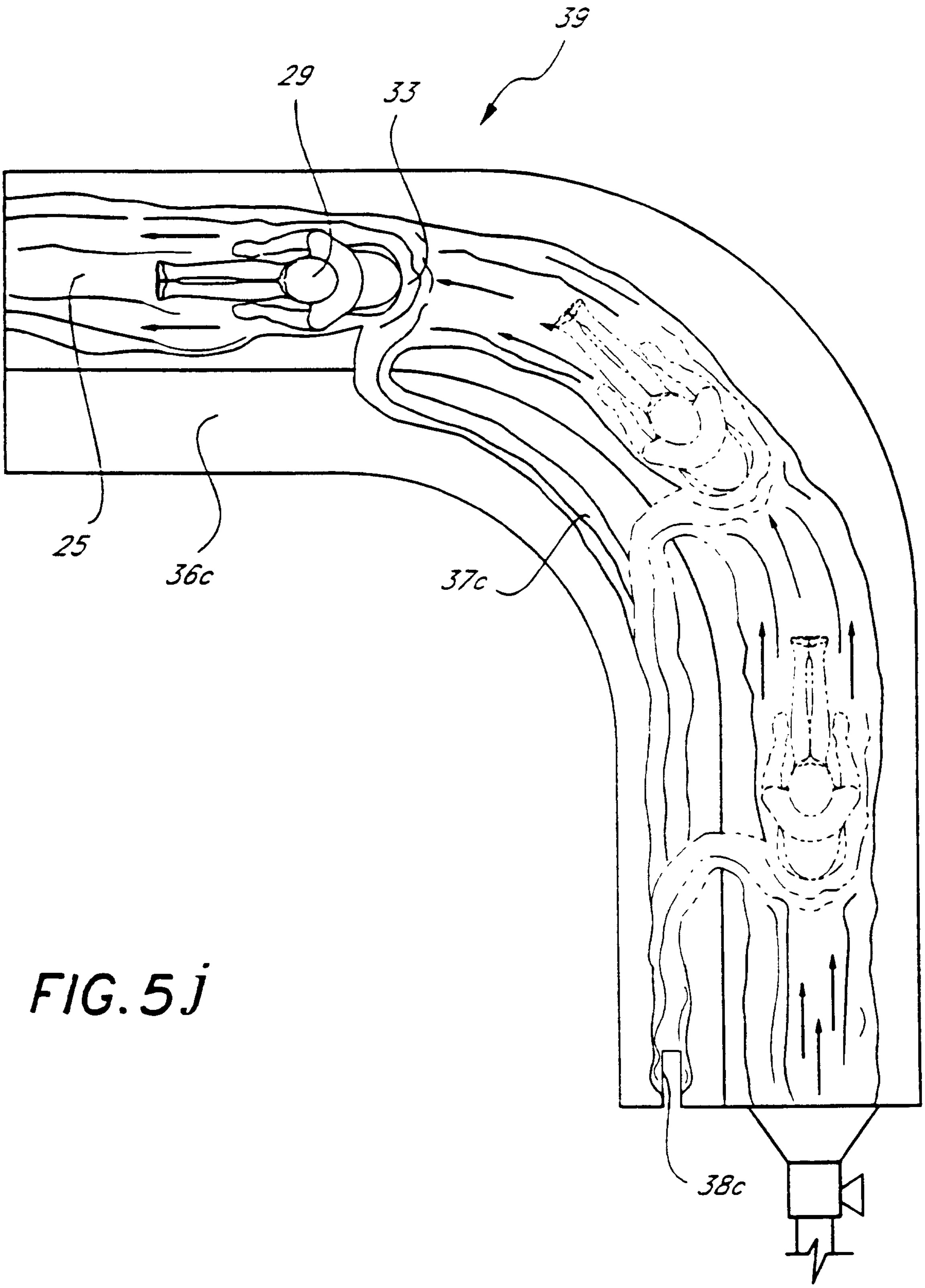

FIG. 5j

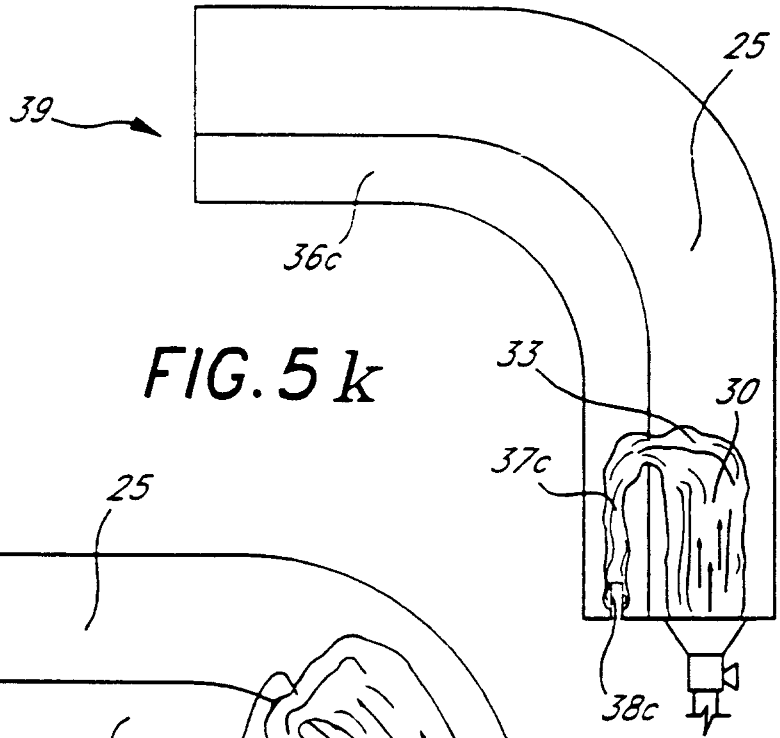

FIG. 5k

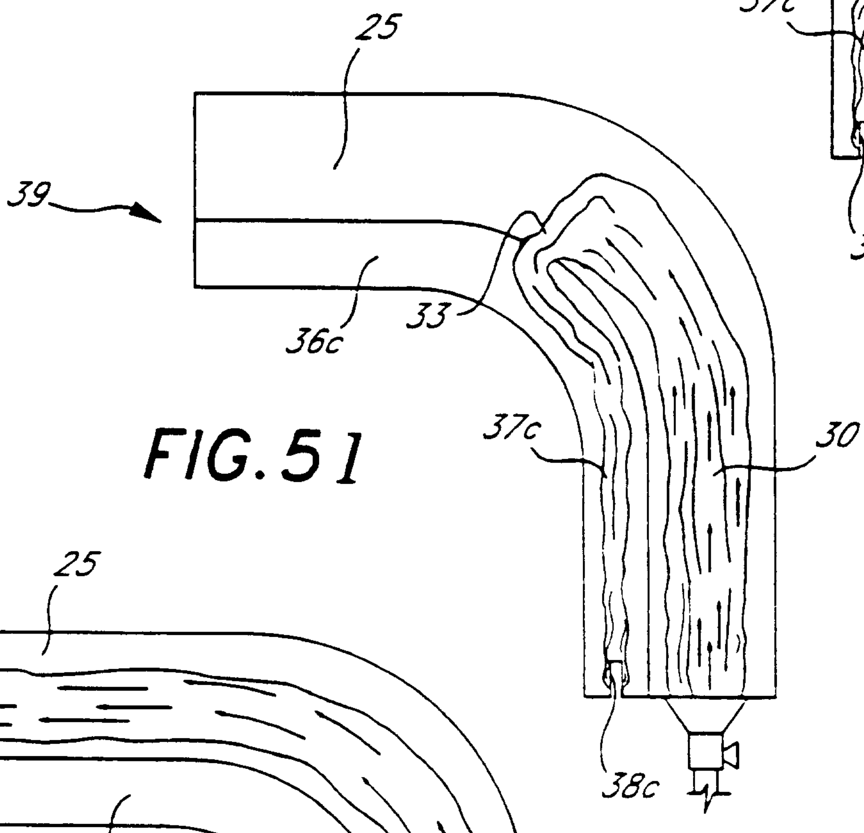

FIG. 5l

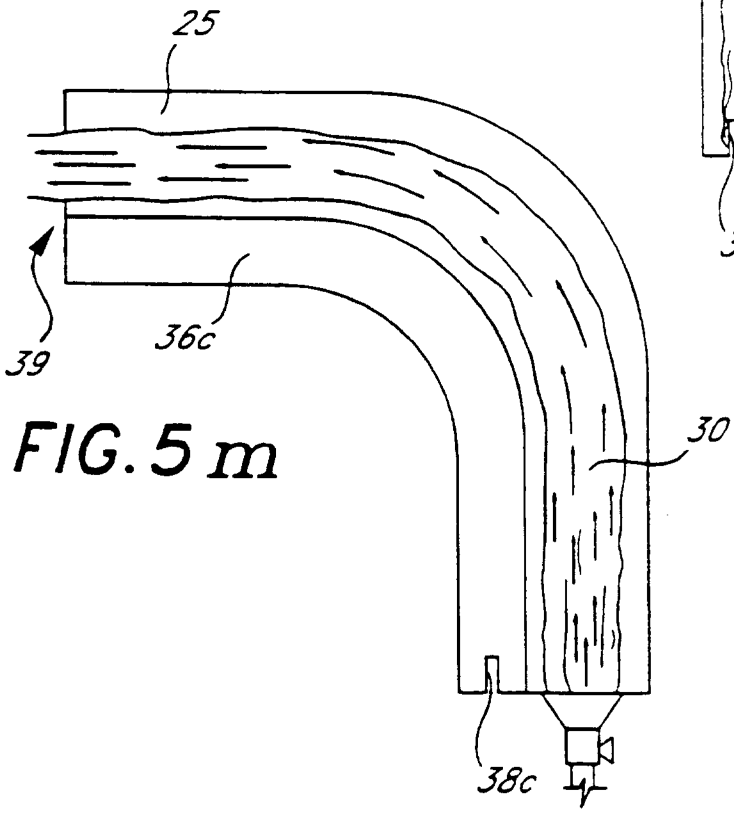

FIG. 5m

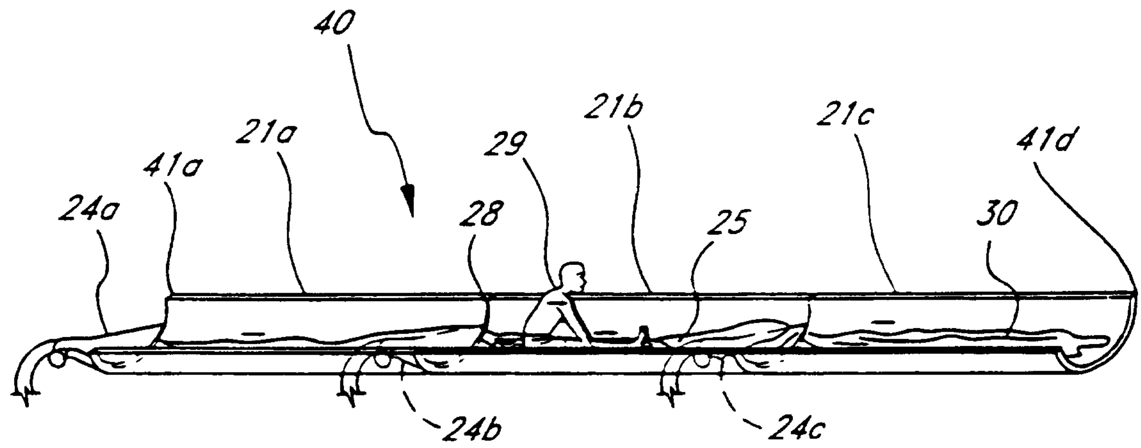
40
21a
21b
21c
41d
41a
29
24a
28
25
30
24b
24c

FIG. 6a

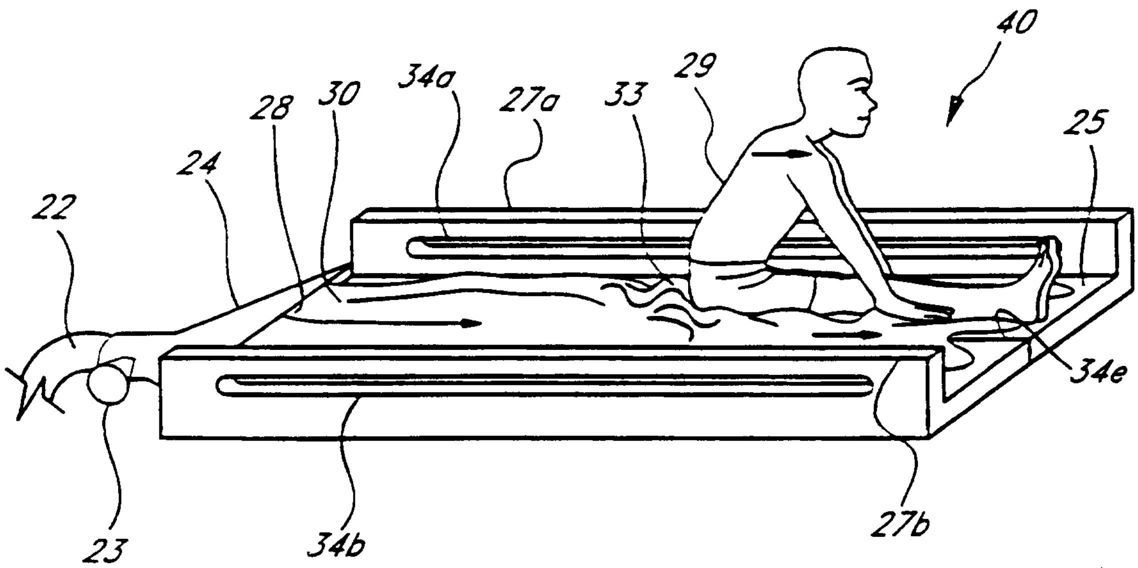
40
29
34a
27a
33
30
28
25
24
22
34e
23
34b
27b

FIG. 6b

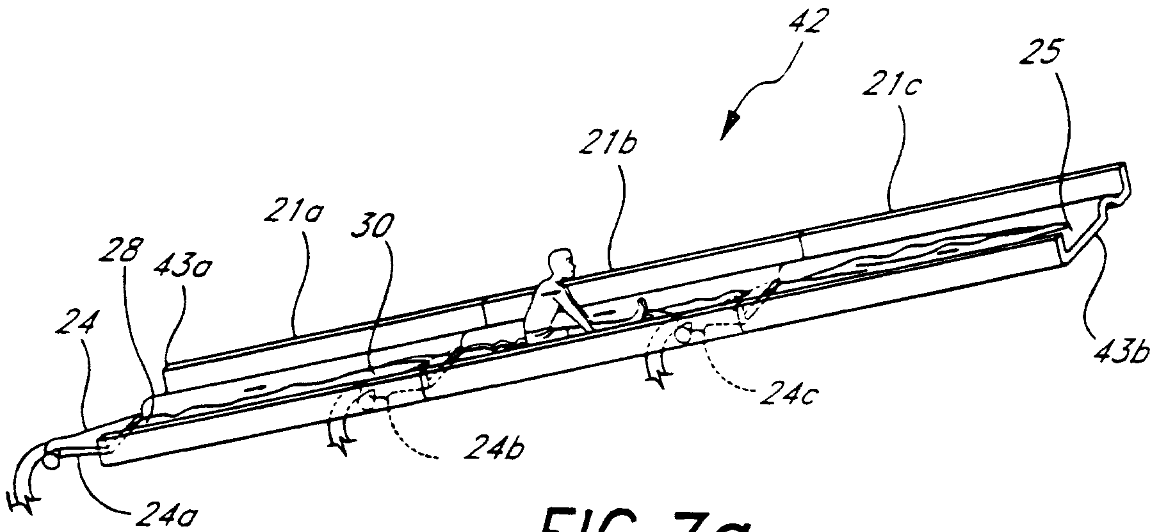
42
25
21c
21b
21a
30
28
43a
24
43b
24c
24b
24a

FIG. 7a

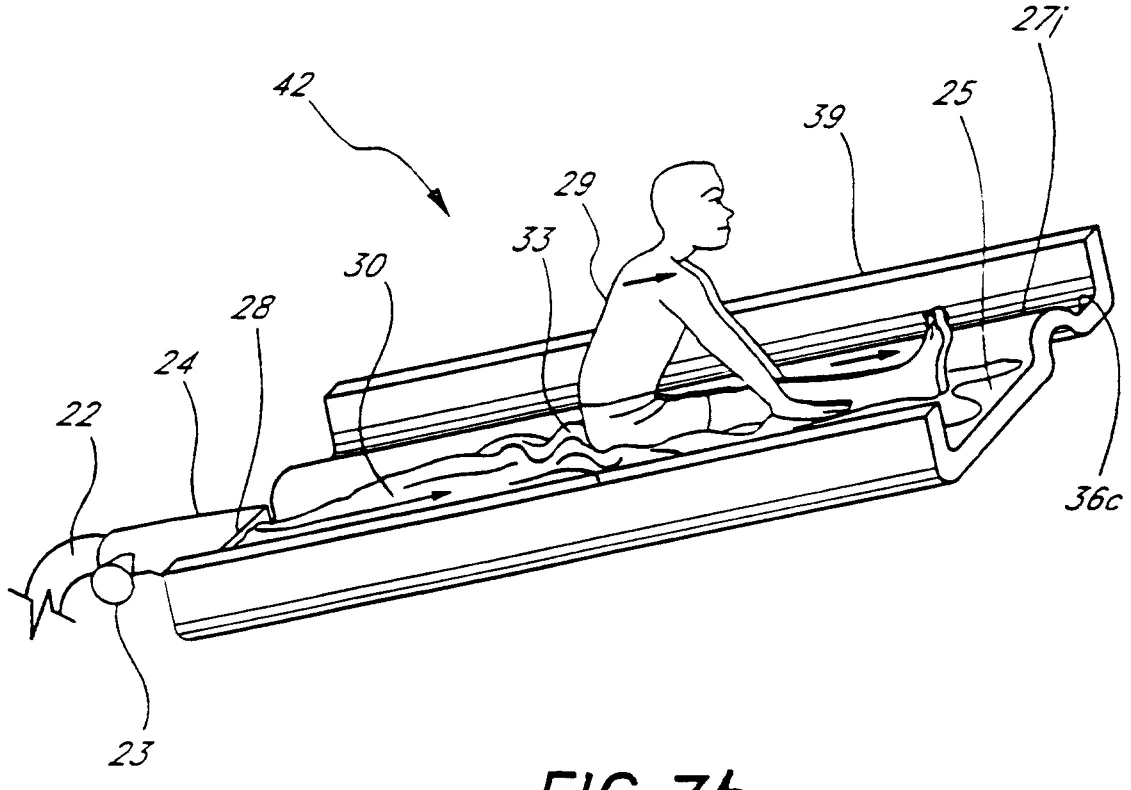
27j
42
39
25
29
33
30
28
24
22
36c
23

FIG. 7b

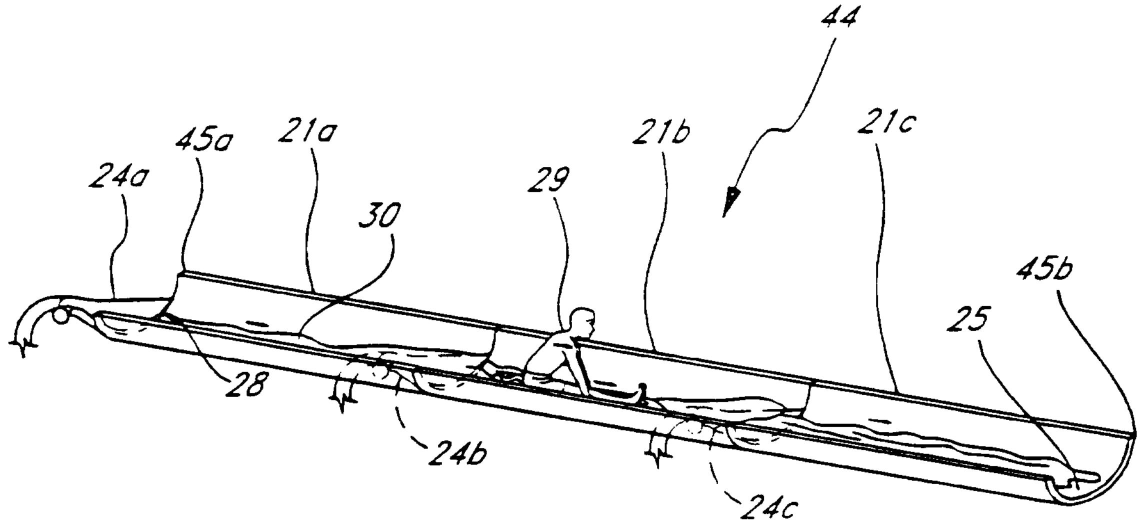
44
45a
21a
21b
21c
24a
29
30
45b
25
28
24b
24c

FIG. 8a

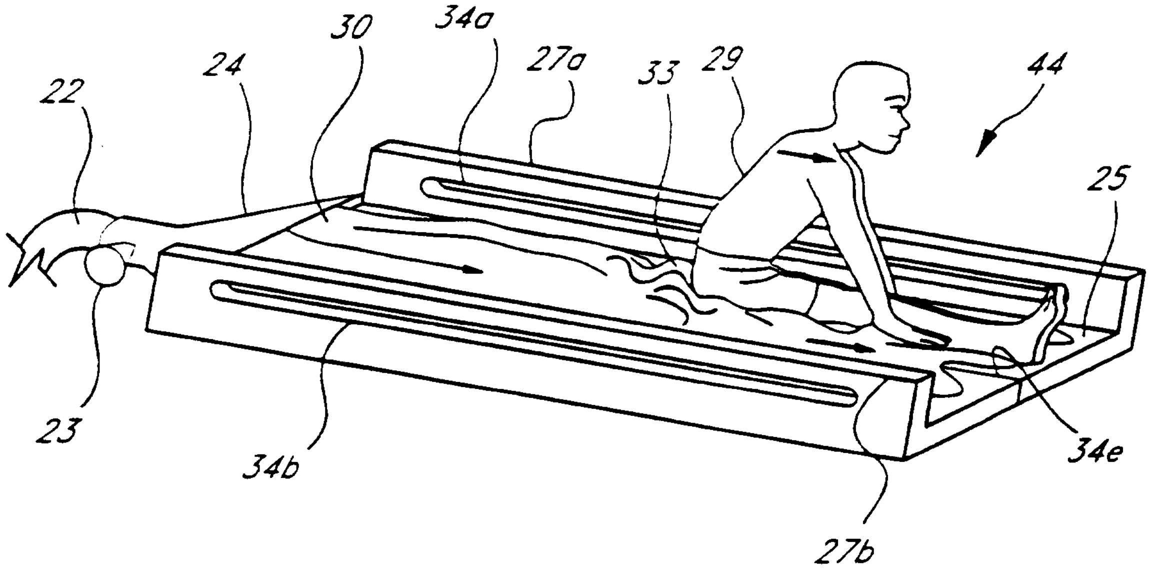
30
34a
27a
33
29
44
22
24
25
23
34b
34e
27b

FIG. 8b

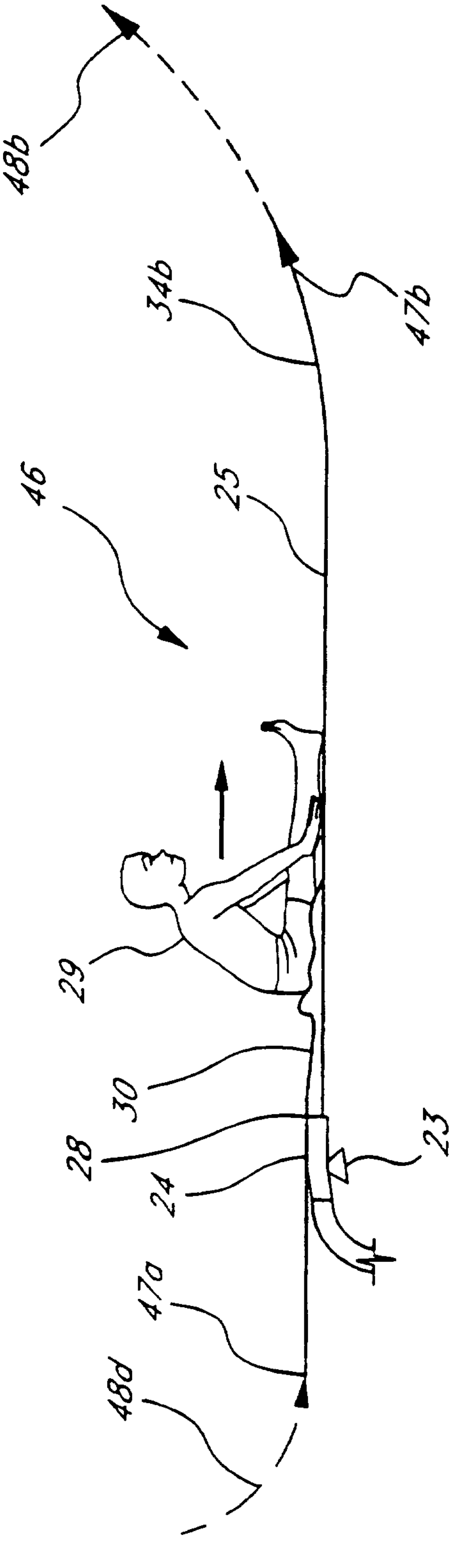

FIG. 9

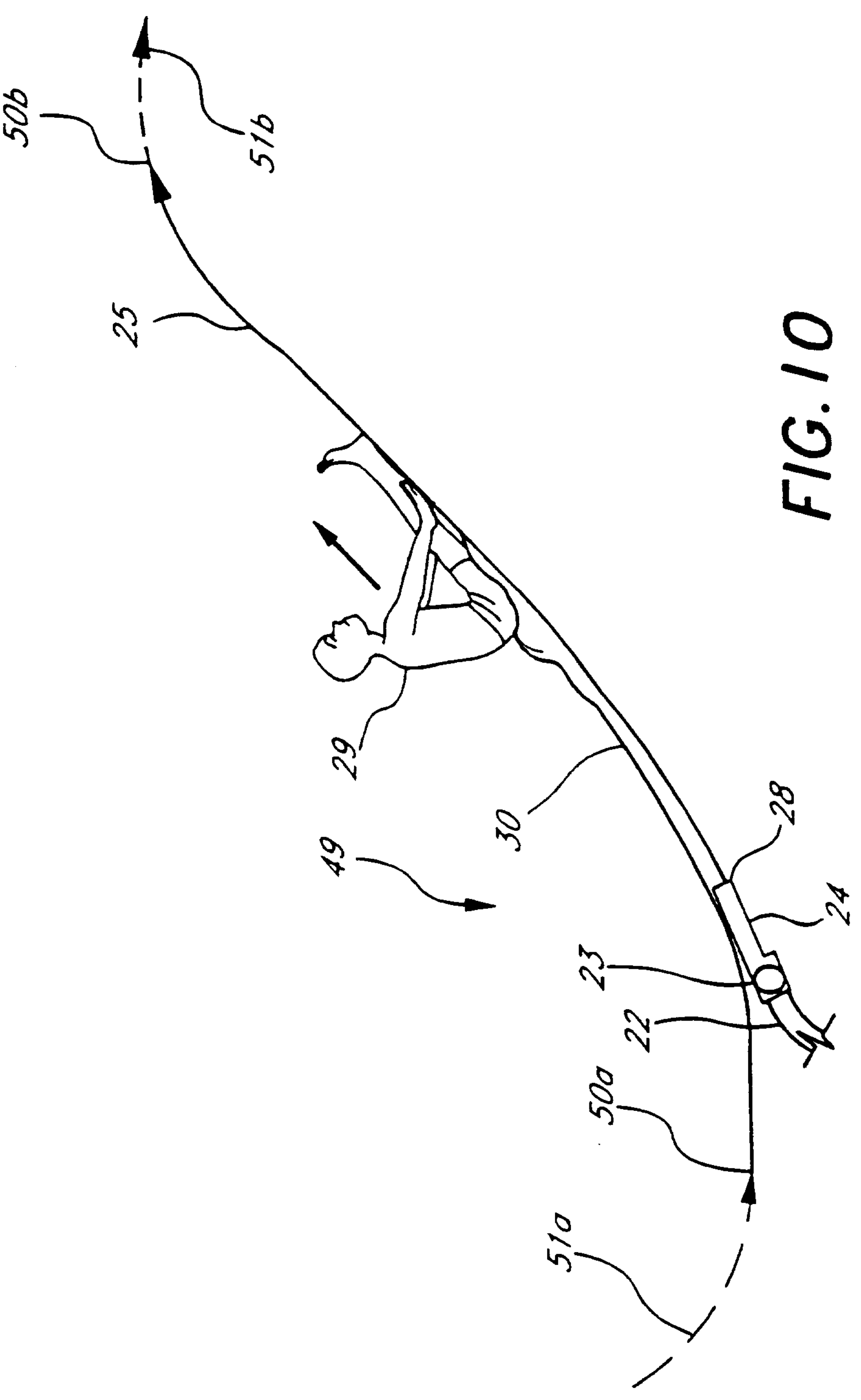

FIG. 10

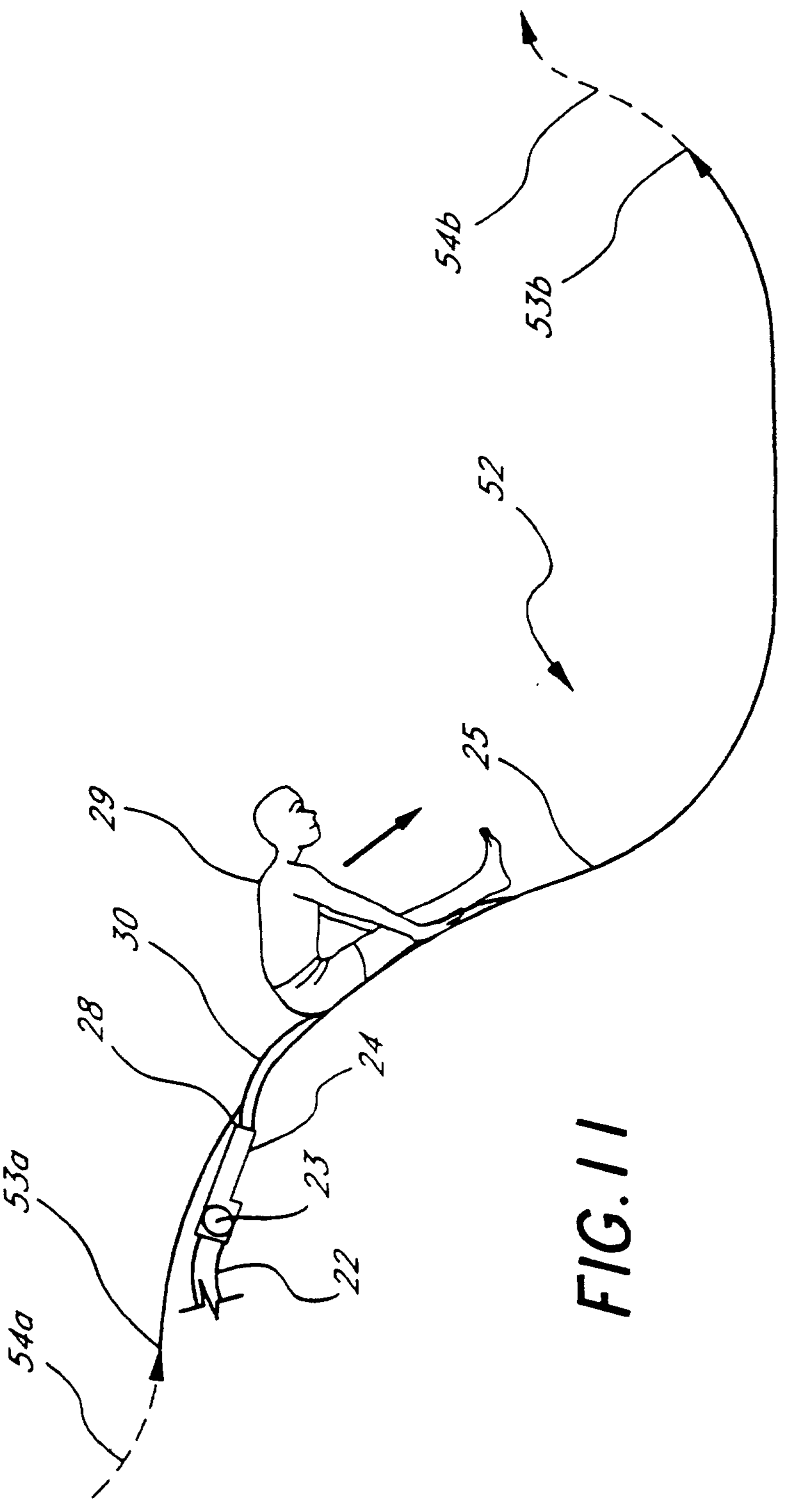

FIG. 11

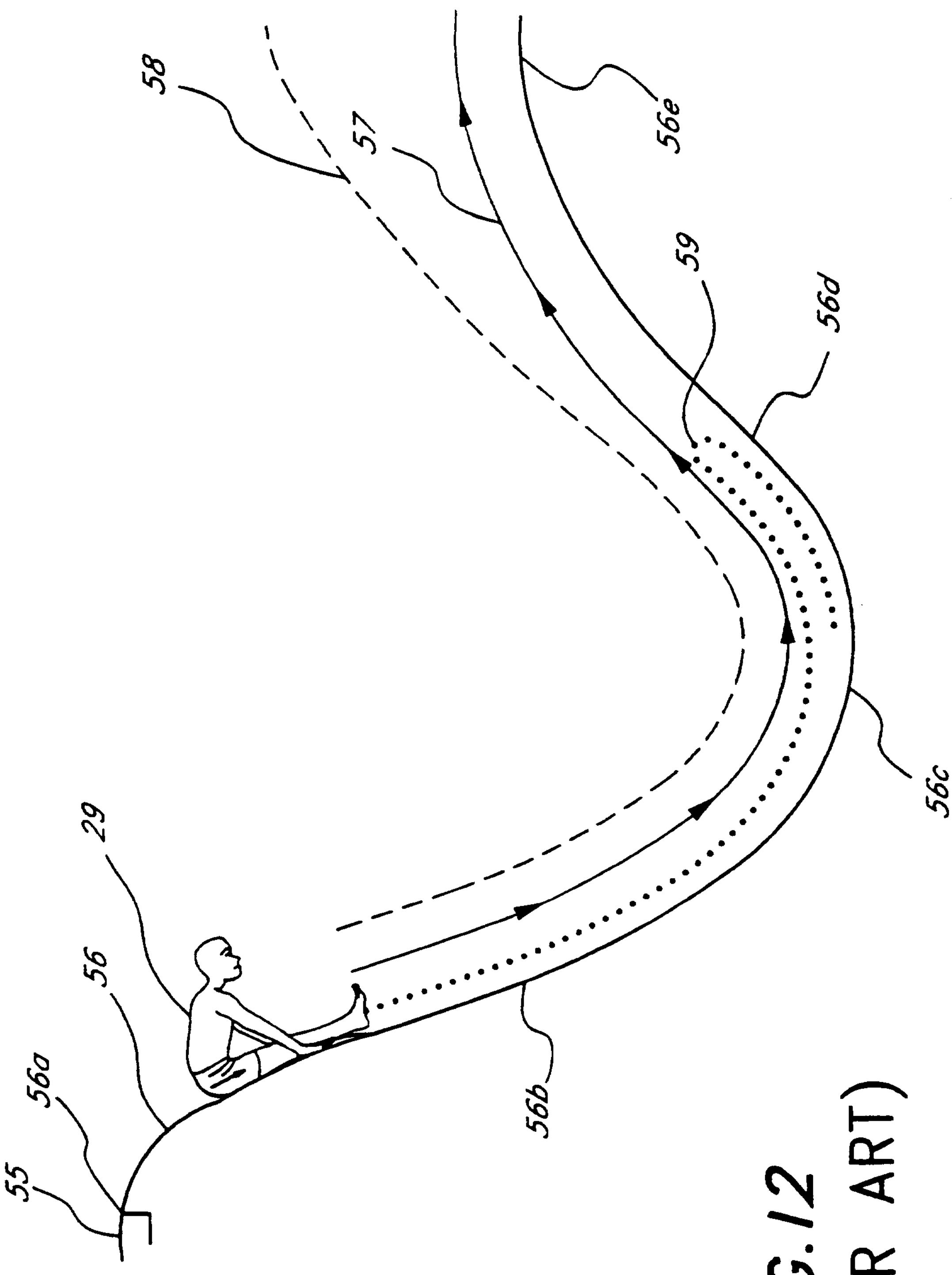

FIG. 12
(PRIOR ART)

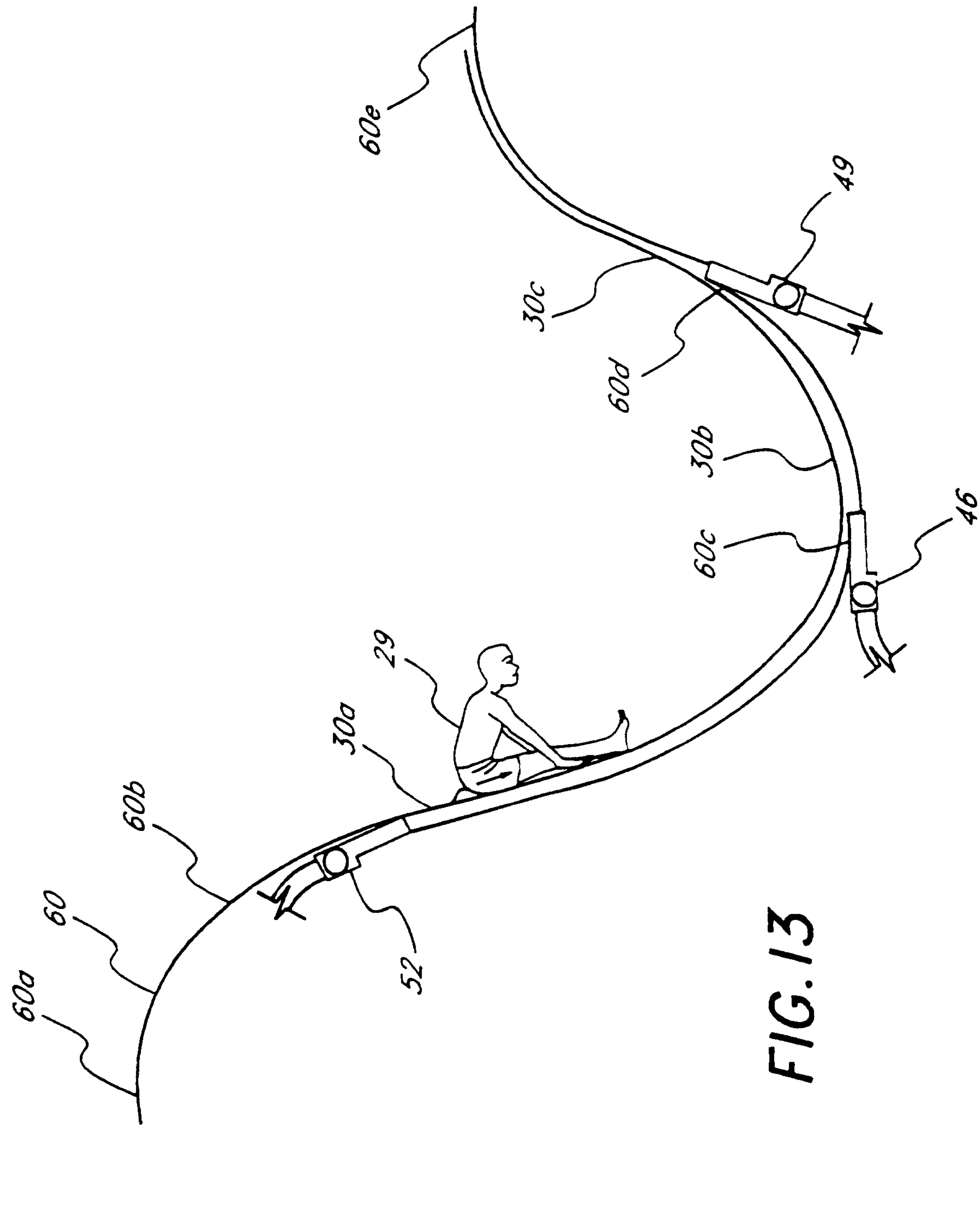

FIG. 13

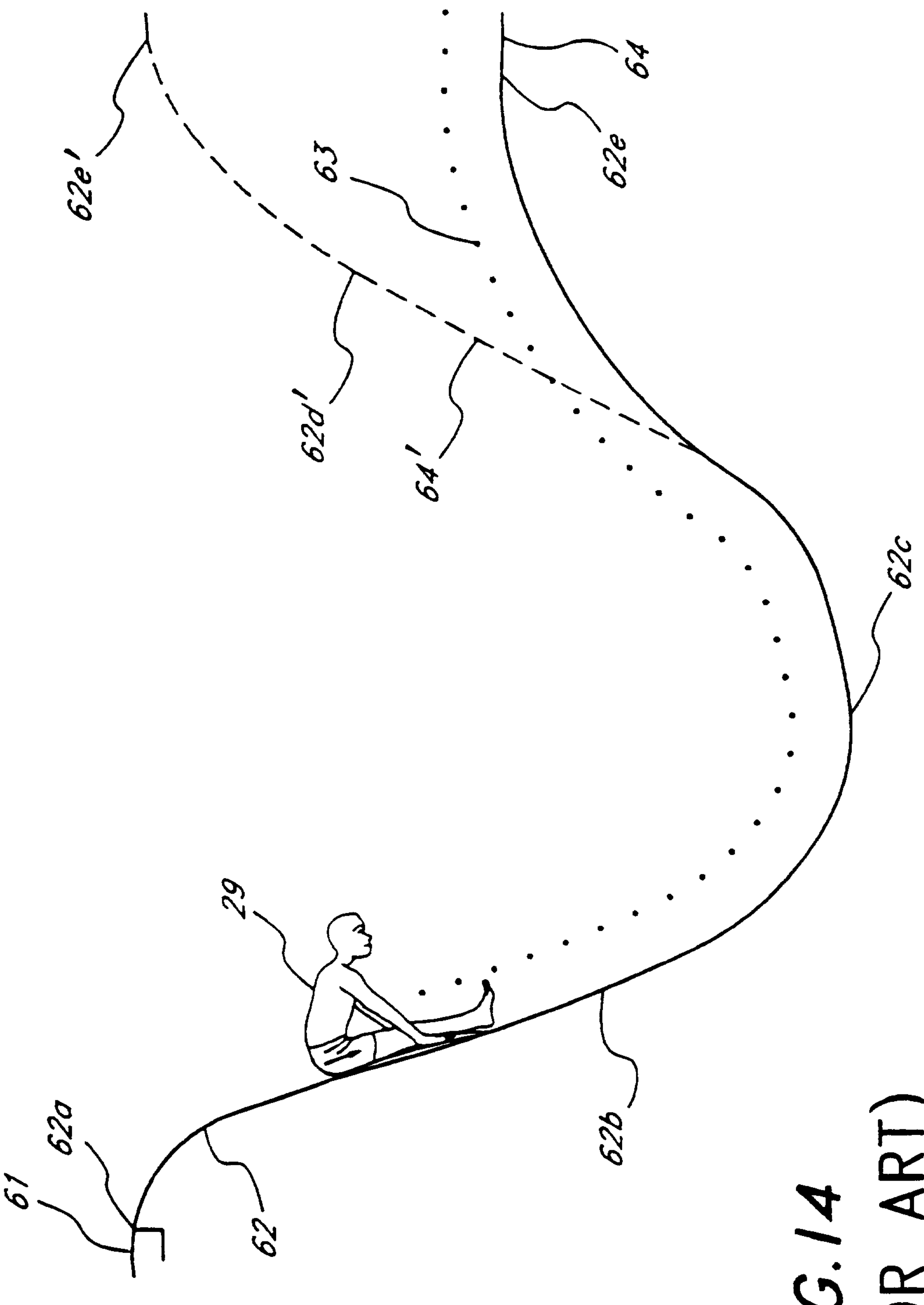

FIG. 14
(PRIOR ART)

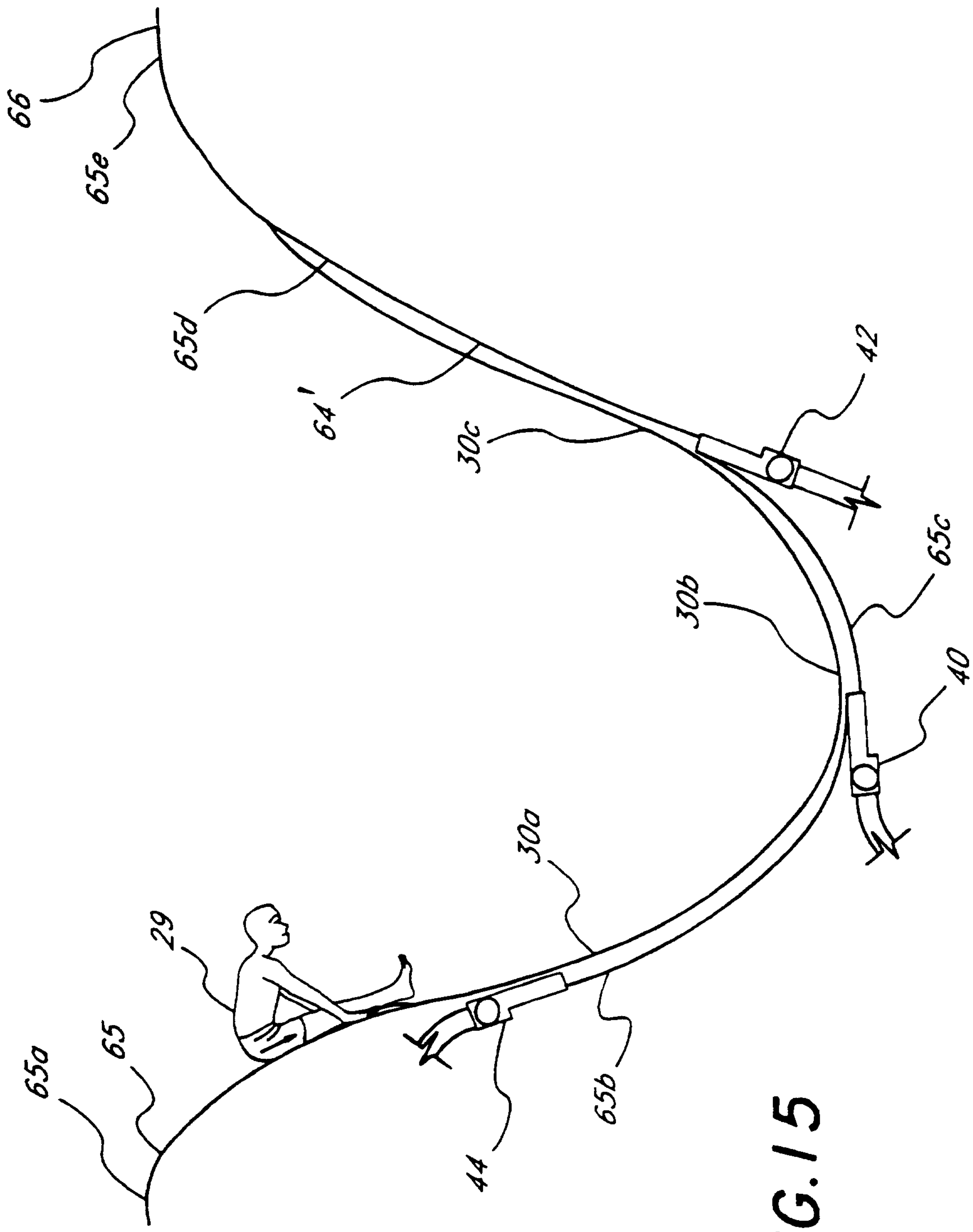

FIG. 15

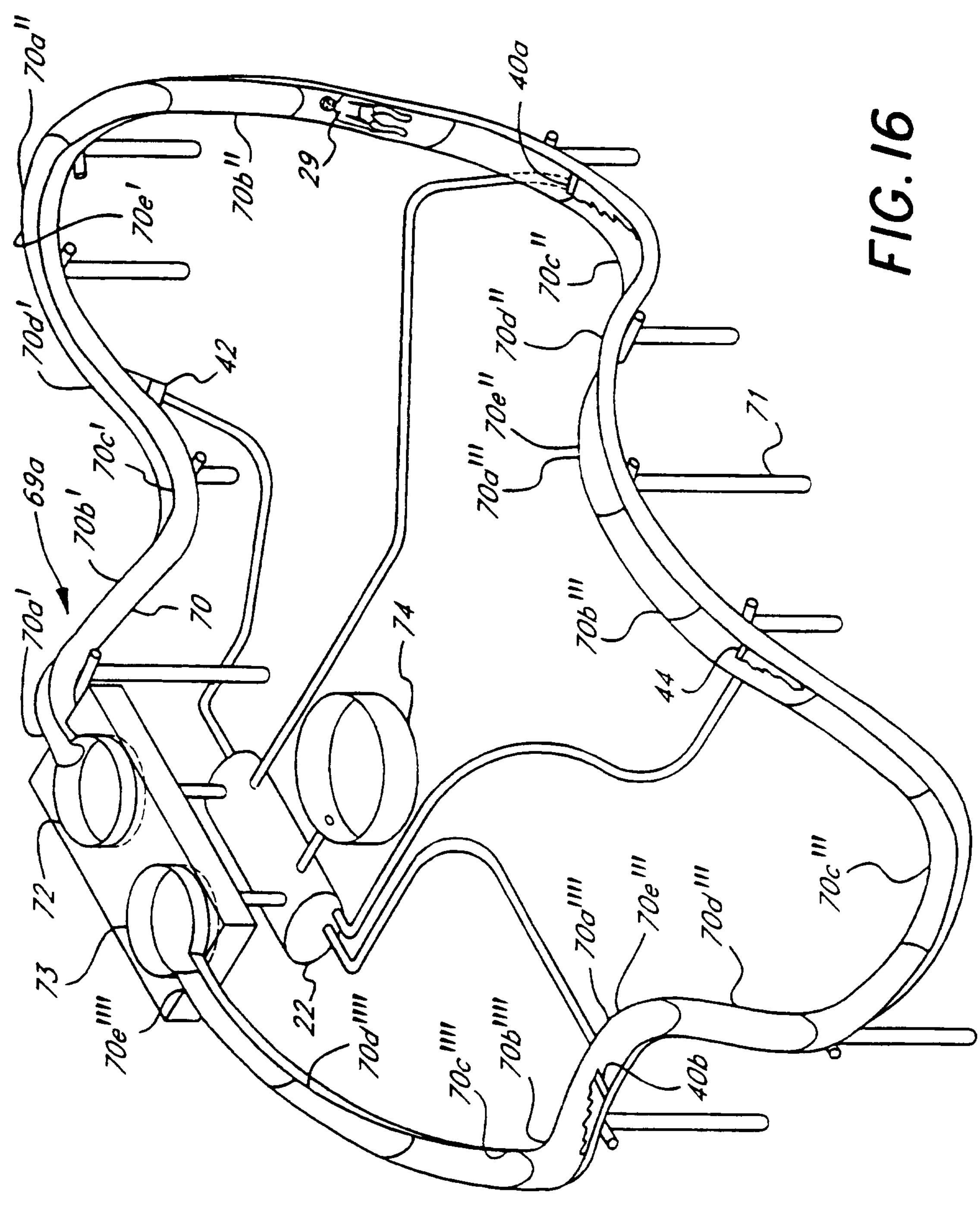
70a''
70e'
70b''
29
40a
70d'
42
70c''
70d''
70e''
70a'''
71
69a
70b'
70c'
70a'
70
74
70b'''
44
72
73
70e''''
22
70d''''
70c''''
70b''''
40b
70a''''
70e'''
70d'''
70c'''

FIG. 16

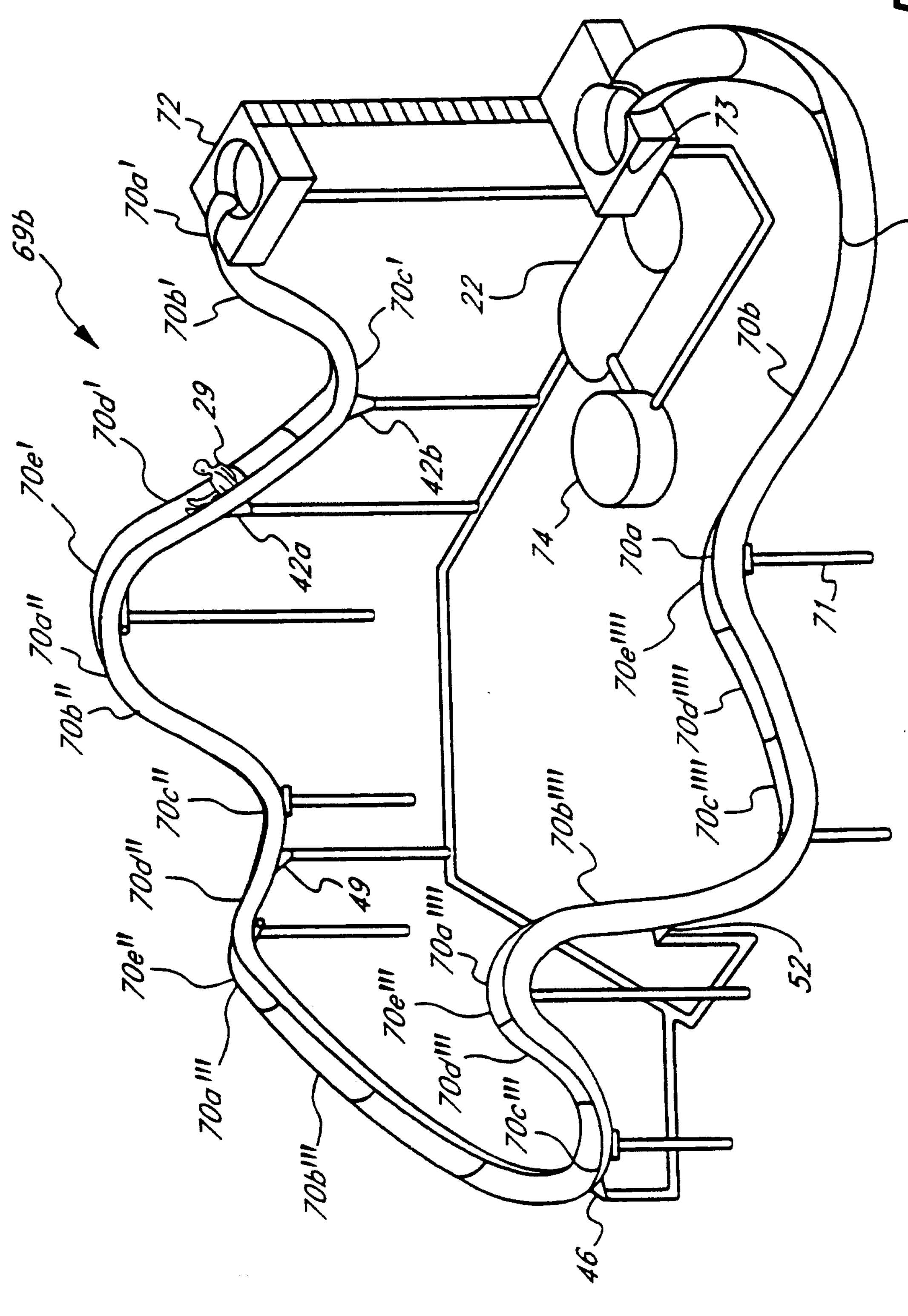
69b
72
73
70a'
70b'
70c'
70d'
70e'
22
29
42a
42b
74
70a
70b
70c
71
70a''
70b''
70c''
70d''
70e''
49
70e''''
70d''''
70c''''
70b''''
70a''''
52
70a'''
70b'''
70c'''
70d'''
70e'''
46

FIG. 17