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(54) INTERCHANGEABLE MULTI-COMPONENT EXERCISE SYSTEM

(57) There is disclosed a system for engaging in exercise. The system includes a removable resistance device suitable for temporary installation into multiple, separate exercise devices. When installed in the separate exercise device, the resistance device is operable under control of a computing device to selectively increase or decrease resistance applied to the separate exercise device and to thereby selectively increase or decrease the difficulty of an exercise associated with the separate exercise device.

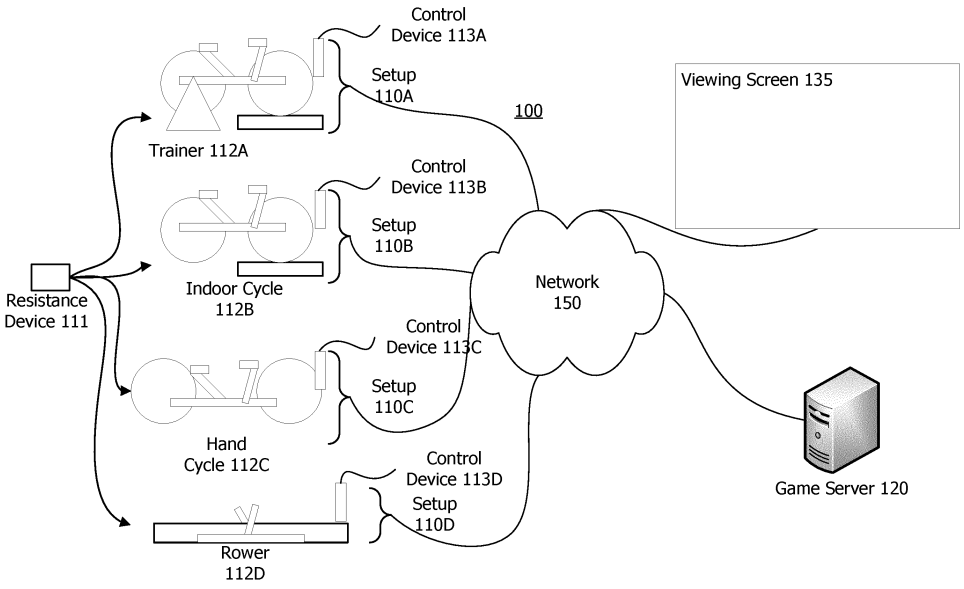

FIG. 1

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Description

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RELATED APPLICATION INFORMATION

[0002] This patent claims priority from the following provisional patent application:

[0003] U.S. Provisional Patent Appl. No. 63/063,924 filed August 10, 2020 entitled "Interchangeable Multi-Component Exercise System."

BACKGROUND

Field

[0004] This disclosure relates to exercise systems and, more particularly, to a multi-functional combined resistance device and motor and interchangeable exercise devices for simulating exercise as a part of a combined exercise system.

Description of the Related Art

[0005] There exist various types of exercise devices, many of which provide resistance to increase the power of the exercise. For example, weight systems enable users to add or reduce the amount of weight to increase or decrease resistance during exercise. Similarly, dedicated indoor cycles and road cycles fixed to training devices (so-called "trainers") enable a user to control or implement systems whereby resistance is added to the pedals by any number of methods to increase endurance, power, and speed. Rowing machines operate with similar resistance to the user rowing.

[0006] Some systems rely upon manual addition of resistance through gearing, the application of a fixed brake, or even wind-based resistance (e.g., blower-style flywheels on wheels of old-style exercise cycles). More complex systems began enabling computer control of electronic resistance devices in the 1980s and 1990s. These systems typically enabled users to run through pre-programmed courses of simulated hills and flats and valleys with the associated increases and decreases in resistance controlled by a computer controller. Eventually, these systems led to still other systems where video tapes of exercise were synchronized with the computer-controlled resistance or with on-screen games.

[0007] These electronic controlled resistance devices were often magnetic combined with a small or sometimes large flywheel. The most realistic feeling trainers and bicycles utilize large flywheels to simulate the mass of the rider and bike. Even more modern resistance devices rely almost exclusively on carefully controlled magnets. They do spin, so in some sense they can act as flywheels, but virtually all of the added resistance and momentum is simulated by software through electromagnetic application of current on the spinning axle.

DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is an overview of a system for exercise including an interchangeable resistance device.

FIG. 2 is a block diagram of a system for exercise including an interchangeable resistance device.

FIG. 3 is a functional diagram of a computing device.

FIG. 4 is an example of a game world in which an exerciser's avatar may move as exercise is performed.

FIG. 5 is an example of an interchangeable resistance device suitable for insertion into an exercise device.

FIG. 6 is a flowchart of interchangeability of a resistance device for exercise devices.

FIG. 7 is a flowchart of use of a resistance device within an exercise device.

[0009] Throughout this description, elements appearing in figures are assigned three-digit reference designators, where the most significant digit is the figure number and the two least significant digits are specific to the element. An element that is not described in conjunction with a figure may be presumed to have the same characteristics and function as a previously-described element having a reference designator with the same least significant digits.

ASPECTS OF THE DISCLOSURE

[0010] Non-limiting aspects of the disclosure are set out in the following numbered clauses.

1. A system for engaging in exercise, the system comprising:

a removable resistance device suitable for temporary installation into a separate exercise device, when installed in the separate exercise de-

vice, the resistance device operable under control of a computing device to selectively increase or decrease resistance applied to the separate exercise device and to thereby selectively increase or decrease the difficulty of an exercise associated with the separate exercise device;
the separate exercise device for engaging in a selected exercise from a group comprising cycling, rowing, running, and resistance weight training, into which the removable resistance device may be temporarily installed to provide resistance for the selected exercise; and
a second separate exercise device for engaging in a second selected exercise selected from the group comprising cycling, rowing, running, and resistance weight training, but excluding the selected exercise for the separate exercise device, and into which the removable resistance device may be temporarily installed to provide resistance for the second selected exercise.

2. The system of clause 1 wherein the removable resistance device is used as a motor to provide supplemental motive power to some aspect of the second separate exercise device to make the second selected exercise less difficult for a user.

3. The system of clause 2 wherein the second separate exercise device is an electronic bike intended for usage outdoors.

4. The system of clause 3 wherein the removable resistance device both adds resistance and provides supplemental motive power interchangeably, dependent upon the control directed by the computing device instructing the removable resistance device.

5. The system of any of clauses 1 to 4 wherein the removable resistance device further comprises:
an electronic communications interface for enabling the removable resistance device to communicate with the separate exercise device or the second separate exercise device to enable the separate exercise device or the second separate exercise device to select an amount of resistance applied as directed by the computing device.

6. The system of clause 5 wherein the electronic communications interface further comprises an electrical junction wherein electrical contact is automatically made when the resistance device is installed within the separate exercise device or the second separate exercise device, and wherein the electronic communications interface is within the frame of at least one of the separate exercise device or the second separate exercise device.

7. The system of any of clauses 1 to 6 wherein the computing device comprises software that directs the removable resistance device to increase or decrease resistance in response to player avatar movement within a virtual world presented to a user on a display screen by the computing device.

8. Apparatus comprising non-volatile machine-readable medium storing a program having instructions which when executed by a processor will cause the processor to:

control operation of a removable resistance device removably installed into a separate exercise device, when installed in the separate exercise device, the resistance device operable under control of a computing device to selectively increase or decrease resistance applied to the separate exercise device and to thereby selectively increase or decrease the difficulty of an exercise associated with the separate exercise device;
control operation of the removable resistance device removably installed in the separate exercise device for engaging in a selected exercise from a group comprising cycling, rowing, running, and resistance weight training, to provide resistance for the selected exercise; and
control operation of the removable resistance device removably installed in a second separate exercise device for engaging in a second selected exercise selected from the group comprising cycling, rowing, running, and resistance weight training, but excluding the selected exercise for the separate exercise device, to provide resistance for the second selected exercise.

9. The apparatus of clause 8 wherein the removable resistance device is used as a motor to provide supplemental motive powerto some aspect of the second separate exercise device to make the second selected exercise less difficult for a user.

10. The apparatus of clause 9 wherein the second separate exercise device is an electronic bike intended for usage outdoors.

11. The apparatus of clause 10 wherein the removable resistance device both adds resistance and provides supplemental motive power interchangeably, dependent upon the control directed by the computing device instructing the removable resistance device.

12. The apparatus of any of clauses 8 to 11 wherein the instructions further cause the processor to:
communicate with the removable resistance device using an electronic communications interface through the separate exercise device or the second

separate exercise device to enable the separate exercise device or the second separate exercise device to select an amount of resistance applied as directed by the computing device.

13. The apparatus of clause 12 wherein the electronic communications interface further comprises an electrical junction wherein electrical contact is automatically made when the resistance device is installed within the separate exercise device or the second separate exercise device and wherein the electronic communications interface is within the frame of at least one of the separate exercise device or the second separate exercise device.

14. The apparatus of any of clauses 8 to 13 wherein the computing device comprises software that directs the removable resistance device to increase or decrease resistance in response to player avatar movement within a virtual world presented to a user on a display screen by the computing device.

15. The apparatus of any of clauses 8 to 14 further comprising:

the processor; and
a memory;
wherein the processor and the memory comprise circuits and software for performing the instructions on the storage medium.

16. A method for engaging in exercise, the method comprising:

controlling operation of a removable resistance device suitable for temporary installation into a separate exercise device, when installed in the separate exercise device, the resistance device operable under control of a computing device to selectively increase or decrease resistance applied to the separate exercise device and to thereby selectively increase or decrease the difficulty of an exercise associated with the separate exercise device;
controlling operation of the removable resistance device temporarily installed in the separate exercise device for engaging in a selected exercise from a group comprising cycling, rowing, running, and resistance weight training, to provide resistance for the selected exercise; and
controlling operation of the removable resistance device temporarily installed in a second separate exercise device for engaging in a second selected exercise selected from the group comprising cycling, rowing, running, and resistance weight training, but excluding the selected exercise for the separate exercise device, to provide resistance for the second selected exercise.

17. The method of clause 16 wherein the removable resistance device is used as a motor to provide supplemental motive powerto some aspect of the second separate exercise device to make the second selected exercise less difficult for a user.

18. The method of clause 17 wherein the second separate exercise device is an electronic bike intended for usage outdoors.

19. The method of clause 18 wherein the removable resistance device both adds resistance and provides supplemental motive power interchangeably, dependent upon the control directed by the computing device instructing the removable resistance device.

20. The method of any of clauses 16 to 19 further comprising:

communicating with the removable resistance device using an electronic communications interface through the separate exercise device or the second separate exercise device to enable the separate exercise device or the second separate exercise device to select an amount of resistance applied as directed by the computing device,
wherein the electronic communications interface comprises an electrical junction, wherein electrical contact is automatically made when the resistance device is installed within the separate exercise device or the second separate exercise device, and wherein the electronic communications interface is within the frame of at least one of the separate exercise device or the second separate exercise device.

DETAILED DESCRIPTION

[0011] One unique characteristic of these exercise devices is that virtually all rely upon a computer-controlled electromagnetic motor. An electromagnetic motor that provides resistance to cycling may also provide resistance for any number of exercise devices. The motors for resistance are remarkably similar across devices. The electricity is simply run with more or less power to provide more or less resistance. All of this may be software-controlled by the associated exercise device or a connected software system for exercise (e.g. a game or integrated class software system).

[0012] Atypical cyclist who lives in a location with cold climes may own multiple outdoor cycles (with some mounted to trainers), an indoor cycle, a hand bicycle, a weight training system, and one or more trainers. Each of those devices may have electrical components, an electrical motor, and other associated computers, con-

trollers, displays or devices. It would be better for the environment and reduce overall electronic waste if at least some of those components could be re-used or used in multiple components at different times for different purposes.

[0013] Accordingly, it would be beneficial if an electromagnetic motor could be used to provide resistance against exercise interchangeably in a number of potential exercise devices. Each of those functions could be computer controlled so as to operate as directed in a given exercise device.

Description of Apparatus

[0014] FIG. 1 is an overview of a system 100 for exercise including an interchangeable resistance device. The system 100 includes a series of representative setups 110A-110E, including exercise devices such as a trainer 112A, an indoor bicycle 112B, an hand cycle 112C, and a rower 112D, each having a control device 113A-113D, a resistance device 111 may be used in any one of the setups 110A-110D, which may be connected by a network 150 to a game server 120. A viewing screen 135 maybe used by any one of the setups or by a spectator.

[0015] The setups 110A-110D are exercise devices of various kinds. The options include, at least, indoor cycles, outdoor cycles, road cycles, mountain bikes, hand bikes, upper body ergometers, any kind of bicycle mounted to a trainer (e.g., trainer 112A), rowers, weight machines that rely upon resistance rather than free weights, elliptical machines, stair stepper machines, and virtually any resistance exercise device. The trainer 112A, indoor cycle 112B (which is representative of integrated indoor cycles including computer-controlled resistance systems), hand cycle 112C, and a rower 112Dare shown merely as examples. Each includes an electromagnetic motor/resistance device.

[0016] Each of the setups 110A-110D includes a control device 113A-113D. In the case of the setups 110A-110D, the control devices 113A-113D may instruct an associated resistance device 111 to provide resistance for a given exercise.

[0017] The resistance device 111 is an interchangeable device that provides resistance in response to electric current. Preferably, the resistance device 111 is or includes an electric (electromagnetic) motor, but other types of electronically-controlled motors or resistance devices may be used (e.g. an electronically controlled fan brake). The resistance device 111 is interchangeable in the sense that it may be easily swapped into and out of an associated fitting, compartment, attachment point, or dock with an exercise device such as trainer 112A or hand cycle 112D to act as a resistance device therein.

[0018] The resistance device 111 receives current in varying amounts and converts that into resistance in opposition to or in conjunction with an exercising individual. When that power is applied against the rider, runner, or operator; then that is "resistance." Examples include trainers, indoor cycles or rowing machines.

[0019] The resistance device 111 may be merely the motor itself, with a mechanical and electrical coupling to an associated exercise device. Preferably the coupling is such that insertion causes mechanical engagement of the motor as well as electrical coupling so as to enable the control devices 213A-213D to control the resistance device 211 without separately connecting the resistance device mechanically or electrically. In addition, the coupling or mount-point is preferably designed in such a way that the device may easily be joined, then may be engaged with a lever, clip, socket, or similar mechanism such that when inserted, some user action other than force against insertion is required to release the resistance device 211 from the exercise device.

[0020] Though the resistance device 211 is shown as a small device that may be inserted into a corresponding dock or void in an exercise device, the resistance device 211 may take many forms. It may be merely a motor with electrical and mechanical couplings. However, the resistance device may be an integrated form much like the trainers currently available (e.g. having an electric motor, a wheel, a base for holding up the resistance device when placed on a floor or mount, a flywheel, and/or associated mount points for electrical and mechanical coupling to an exercise device). The resistance device 211 itself may take many forms while otherwise meeting the other requirements such as interchangability between exercise devices.

[0021] The control devices 113A-113D may be or include computing devices which are programmed to control the temporarily installed resistance device 111. The control device may be or include a display screen for, for example, displaying a game world, virtual world, and/or information regarding the workout (e.g. wattage, speed, total distance, information about upcoming changes in the workout or resistance applied, etc.). The control devices 113A-113D are shown as a single device, but may be multiple devices, such as a computing device, and a separate display or so-called smart TV that acts as both. In some cases, the control devices 113A-113D may be Apple® iPads or Android® or other tablet personal computing devices. Regardless, the control devices 113A-113D operate to adjust the resistance supplied by the resistance device.

[0022] The game server 120 may connect to the control devices 113A-113D through a network 150 (discussed below). The game server 120 may be a persistent online multiplayer game that enables users to engage in exercise with one another. In such a case, the game server 120 will serve a location, information about other users and associated graphics and avatars to a user of that software, while the user's control device 113A-113D provides to the game server 120 information about the user's speed, power, cadence, and the like. The Zwift® software is one such virtual game world. The game server 120 may instruct the control devices 113A-113D to alter the resistance applied by the resistance device 111, for ex-

ample, in view of a virtual, in-game avatar climbing up a hill or descending a hill, so that the resistance matches the exertion necessary for a user's avatar in the virtual game world.

[0023] Alternatively, the game server 120 may not operate a game at all. The game server 120 may be a server that enables users to engage in exercise classes remotely from their homes or other locations using indoor or outdoor cycles. In such a case, the game server 120 may provide instruction to the control devices 113A-113D to alter the resistance applied by the resistance device 111 as directed by a class instructor. That instruction may be provided over the network 150 and may be directed or controlled (at least partially) by a class instructor.

[0024] Still further alternatively, the game server 120 may simply be a source of a routine or exercise instruction that is partially or wholly automated. In such a case, a user may be engaging in an exercise routine that is programmatically created or pre-created by a human, and that a user may progress through while the game server 120 actively controls the resistance (or power) applied at each part or the game server 120 provides an entire program that alters the resistance (or power) applied throughout an exercise routine.

[0025] The viewing screen 135 is a display for showing some or all of the game world and/or exercise routine details and/or performance statistics to a user or users. The viewing screen 135 may be present either for multiple users (e.g. in a group class) or for a single user (e.g. as a display under the direction of the control device 113B). So, for example, a group class may be presented with information about the exercise routine and their performance in the routine as it progresses. Or, for example, a user of the rower 112D may see an on-screen avatar moving through a virtual game world on the viewing screen 135 as directed by the control device 113D. The network 150 may or may not be involved in that communication, depending on the relative location of the control devices (nearby or over the internet) and the situation (group class, online race, single individual exercising outdoors or in his or her gym). Multiple viewing screens may be used, one by each user and/or one in each location.

[0026] The network 150 is a communications system that enables communication of data between the control devices 113A-113D, the game server 120, and, potentially, the viewing screen 135. The network 150 may be or include the internet. However, the network 150 may include 802.11x wireless networks, Bluetooth®, ANT+ connections, as well as other wireless protocols. The network 150 may also include wired connections such as ethernet.

[0027] FIG. 2 is a block diagram of a system 200 for exercise including an interchangeable resistance device. The system 200 includes two example setups 210A and 210C, including a trainer 212A and an outdoor cycle 212C, respectively, as well as a game server 220, and a resistance device 211.

[0028] The setup 210A includes a trainer 212A, and the control device 213A, as well as a resistance device dock 216A. The trainer 212A is a resistance device that mounts to a wheel or a hub (e.g. on the cassette) or an axle of a bicycle intended to operate as an outdoor cycle. Once connected, the trainer 212A operates as an electrically controlled brake on the wheel, axle or hub to thereby provide resistance to pedaling by a rider of the bicycle. The setup 210A preferably includes the cycle as well, but its function is well known so it is not discussed here.

[0029] The control device 213A includes a game engine 214A and data generation / integration 215A which are combined hardware and software components that perform instruction under the direction of the control device 213A and the game server 220. The game engine 214A is software, operating on a computing device (FIG. 3) that is or is a part of the control device 213A. The game engine 214A stores computer models, computer graphical textures, maps, settings, and animations as well as the game software itself that enables the game to operate on the control device 213A. One such game is the Zwift® software, for example, operating on a control device that may be an Apple® iPad.

[0030] The data generation / integration 215A is software and/or hardware the interacts with the trainer 212A to capture data about the exercising rider of the associated cycle. That data may include the power level the rider is cycling, the speed at which the associated trainer is turning, and any changes in those data inputs. The data generation / integration 215A obtains that information from the trainer 212A, generates associated signals and data that is provide over a network to the game server 220 to enable the game engine 214A to function. The data generation / integration 215A also interacts with the game engine 214A upon receipt of data from the game server 220 to show to a given rider the game world itself.

[0031] The resistance device dock 216A is a coupling, dock, receptacle or other detachable connection into which the resistance device 211 may mate. Preferably, the resistance device dock 216A is an actual dock into which the resistance device may "snap" or "couple" or otherwise engage with limited interaction of a user. The coupling or docking itself preferably also causes electrical connections between the control device 213A and the resistance device 211 to be connected. Similar examples include snap-in batteries designed for digital, portable cameras wherein the act of properly inserting the resistance device 211 simultaneously causes an electrical coupling to provide power to the resistance device 211.

[0032] In addition, the act of inserting the resistance device 211 preferably causes the device to mechanically join to the resistance device dock 216A for the trainer 212A such that the resistance device 211 is both electrically and mechanically coupled. Once those two elements are completed, then the resistance device 211 can be powered to provide resistance, and the application of power as directed by the control device 213A can mechanically engage the trainer 212A to provide physical

resistance to the associated cycle, through the axle, the cassette, or through a hub.

[0033] Preferably, the mere insertion of the resistance device 211 into the resistance device dock 216A couples the resistance device 211 in such a way that it can provide resistance to the trainer 212A without any further connection (e.g. to a power source, or to a separate gear or axle). In this way, the user experience is substantially improved, by enabling easy, and quick insertion and removal of the resistance device 211 so that it may be reused in other exercise devices. Preferably, the insertion is of a "snap in" type so that a user may insert the resistance device 211 by snapping it into place, providing positive feedback for a user that it is in place and ready to function. Likewise, the resistance device 211 is preferably easily user ejectable through the operation of a lever, clip, pull, handle or other mechanism to enable the resistance device to easily and quickly be dislodged from the resistance device dock 216A, but not without specific intent and action to do so. By requiring some specific action (e.g. pulling a lever), accidental dislodgement can be avoided, while still enabling easy insertion and removal of the resistance device 211 so as to encourage users to utilize the resistance device 211 in multiple exercise devices.

[0034] All of the foregoing regarding setup 210A is discussed with reference to a game world. However, the "game world" may not exist in some implementations as discussed above. In such cases, the game engine 214A may simply be a system for delivering an exercise routine or class to a user, and the game server 220 may be a server that provides that routine or class. Data generation / integration 215A serves much the same function, enabling interaction with the game server and capturing and providing data from the trainer 212A to the game server 220 and from the game server 220 to the game engine 214A. That data may be captured and provided to the game server 220 in real time, as it is created, or may be stored until a given routine or class is completed. Likewise, a given routine or class may be provided by the game server 220 to the control device 213A in real time or prior to beginning the class or routine, depending on the particular implementation.

[0035] The setup 210C includes an hand cycle 212C (which may be an upper body ergometer) and the control device 213C, as well as a resistance device dock 216C. The functions here are identical to those in setup 210A, so only the differences will be discussed here. The hand cycle 212C may be a purpose-built cycle with pedals (handgrips) intended for operation by human hands. Commonly, outdoor versions of these hand cycles are tricycles, with a seat mounted between the two back wheels and the one front wheel. The hand grips often act as a handlebar as well. The indoor versions, as described for use in connection with a resistance device herein are typical single wheel or single flywheel (or trainer) systems with movable seats, and associated hand grips. No steering is necessary because they are fixed in a location. A computing device (e.g. control device 213C) may control the resistance applied by the resistance device to the hand grips.

[0036] As with the trainer 212A, the hand cycle 212C includes the resistance device dock 216C may replace or be an empty receptacle designed to hold the resistance device 211 and may be mounted otherwise much as an e-bike motor would be mounted. The only difference being that the motor itself is the resistance device 211 that may be removably connected within the receptacle. As with the trainer 212A, it is preferable, but not required, that the insertion of the resistance device 211 into the resistance device dock 216C causes the resistance device 211 to electrically and mechanically couple with the control device 213C and/or the hand cycle 212 so that it may be provided power by the control device 213C and controlled by the control device 213C while it provides resistance to the hand cycle 212C. The mechanical coupling occurs within the crank itself in a crank-mounted resistance device 211 or by causing movement of the wheel hub in a wheel-mounted resistance device 211.

[0037] The resistance device 211 is in most cases, in essence, an electric motor. When it is installed into the trainer 212A it is useful to provide motive power in opposition to a rider of the associated cycle. That resistance can be used to simulate wind, hills, or different types of roads (e.g. mud is harder than asphalt to ride upon). However, in an electronic bike, the same resistance device 211 may be used to provide motive power to assist a rider. The application of current to the resistance device 211 in one direction, as opposed to another, is typically all that is necessary to cause the resistance device 211 to alternate between assisting and providing resistance. The amount of current alters how much resistance or assistance. As a result, the same resistance device 211 may be used both in the trainer 212A to provide resistance, and later may be used in the hand cycle 212C to provide similar resistance. The resistance device 211 may be removably docked in or with one device or the other at a given moment.

[0038] The control device 213C is still a computing device, at least in part. There may or may not be a display associated with the device. However, the control device 213C still interacts with the resistance device 211 to provide power (or resistance) to the hand cycle 212C. That may be under the control of the rider (e.g. through a user interface enabling direct control), through a routine or programming, or through detection of pedaling whereby pedal assist engages automatically. The control device 213C may be connected to a network and reflect a user's exercise in a game world using the game engine 214C.

[0039] The game engine 214C also may operate differently on the control device 213C for the hand cycle 212C. For example, the hand cycle 212C being connected to the game engine 214C may result in the in-game avatar of the rider appearing as a rider on a hand cycle, as opposed to an upright bicycle. The associated statistics generated may vary as well, with a focus on the upper

body (e.g. the hands and arms). Accordingly, the control device 213C may do many things with the game engine 214C while that is taking place.

[0040] The data generation / integration 215C may act to gather and store data about any exercises taking place while operating the hand cycle 212C for later integration into the game world, online or personally stored statistics, or online workout routines. The control device 213C and data generation / integration 215C may offload the generated data (e.g. using a mobile device and Bluetooth® connectivity).

[0041] The resistance device dock 216C preferably functions almost exactly or exactly like that in setup 210A. This similar or exact functioning enables the resistance device 211 to be interchangeably used in each.

[0042] The resistance device 211 is an electrically-controlled motor for providing resistance to either the trainer 212A or the hand cycle 212C or to any other exercise device that may rely upon resistance or the addition of power. The trainer 212A and hand cycle 212C are shown only by way of example. The resistance device is preferably an electric motor that may operate on direct current (e.g. batteries).

[0043] In some cases, the entire resistance device 211 may be a wheel, hub, axle and resistance device in one, physical package. That resistance device 211 may mount to any one of the exercise devices 212A-212D or any other exercise device in much the same way. Preferably, a mount point is designed for use with the resistance device 211 such that it may be easily mounted on to and off of a given exercise device without significant effort or time expended in doing so. Preferably this coupling simultaneously causes mechanical and electrical coupling of the resistance device 211 to the exercise device so that a single connection point results in the ability of the resistance device 211 to provide resistance and to receive electricity and control signals from, for example, the control device 213A. In some cases, a separate cord for electricity to the resistance device 211 itself may be required. Likewise, it is preferable for the resistance device 211 to be sufficiently light that a typical user can easily carry it and move it from device to device into which it may be integrated.

[0044] The game server 220 is a computing device (and may be many computing devices) that includes a client API 222, data storage 224, a world server 226, and a login function 228. The game server 220 is a computing device running software that enables the functions discussed herein. The game server 220 may be implemented in whole or in part as hardware or software.

[0045] The client API 222 is an application programming interface that enables sharing of data and communication from the game server 220 with other devices (e.g. the control device 213A and 213C) and vice versa. The client API 222 enables the control devices 213A and 213C to connect with the game server 220 to implement the game world and/or the exercise routines or other controls of the resistance device 211. The client API 222 may pass data back and forth and accept data sent to it from authorized sources.

[0046] The data storage 224 is preferably a database operating on the game server 220 that stores data. The data stored therein may be game data files for the game server 220 to operate, but may also include data about ongoing exercise (e.g. speeds, locations, power being applied, etc.) for exercisers who are engaged with the game server 220 using the trainer 212A and the hand cycle 212C and other, similar devices. The data storage 224 may retain historical records and statistics for users.

[0047] The world server 226 is game server software that operates on the game server 220 to enable the game engines 214A and 214C to present a game world to a rider, user, or exercising individual. As discussed above, this may be a game world like Zwift® with in-game avatars and exercise taking place simultaneously with many users. Alternatively, the world server 226 may instead be a service from which exercise classes are obtained or exercise routines are downloaded (or connected to in real-time). The world server 226 may take many forms, but it is a server service to which the control devices 213A and 213C (and others) can connect to enable interaction with one another. Data provided by the world server 226 may be used by the control devices 213A and 213C (and others) to adjust the resistance based upon data passed between devices using the client API 222 (e.g. a rider is on a hill, so the resistance should be increased or the class is in a sprint section, so resistance should be increased, etc.).

[0048] The login function 228 enables users of the control devices 213A and 213C to connect to the game server 220 to engage in exercise or otherwise download or upload data.

[0049] Turning now to FIG. 3, a block diagram of a computing device 300 is shown. The computing device 300 may be representative of the server computers, client devices, mobile devices and other computing devices discussed herein. The computing device 300 may include software and/or hardware for providing functionality and features described herein. The computing device 300 may therefore include one or more of: logic arrays, memories, analog circuits, digital circuits, software, firmware and processors. The hardware and firmware components of the computing device 300 may include various specialized units, circuits, software and interfaces for providing the functionality and features described herein.

[0050] The computing device 300 may have a processor 310 coupled to a memory 312, storage 314, a network interface 316 and an I/O interface 318. The processor 310 may be or include one or more microprocessors and application specific integrated circuits (ASICs).

[0051] The memory 312 may be or include RAM, ROM, DRAM, SRAM and MRAM, and may include firmware, such as static data or fixed instructions, BIOS, system functions, configuration data, and other routines used during the operation of the computing device 300 and processor 310. The memory 312 also provides a storage

area for data and instructions associated with applications and data handled by the processor 310. As used herein, the word memory specifically excludes transitory medium such as signals and propagating waveforms.

[0052] The storage 314 may provide non-volatile, bulk or long-term storage of data or instructions in the computing device 300. The storage 314 may take the form of a disk, tape, CD, DVD, SSD, or other reasonably high capacity addressable or serial storage medium. Multiple storage devices may be provided or available to the computing device 300. Some of these storage devices may be external to the computing device 300, such as network storage or cloud-based storage. As used herein, the word storage specifically excludes transitory medium such as signals and propagating waveforms.

[0053] The network interface 316 is responsible for communications with external devices using wired and wireless connections reliant upon protocols such as 802.11x, Bluetooth®, Ethernet, satellite communications, and other protocols. The network interface 316 may be or include the internet.

[0054] The I/O interface 318 may be or include one or more busses or interfaces for communicating with computer peripherals such as mice, keyboards, cameras, displays, microphones, and the like.

[0055] FIG. 4 is an example of a game world in which an exerciser's avatar may move as exercise is performed. The game world may be a computer-generated, persistent game world in which riders (or runners, or rowers, or the like) may see one another, interact, and in which exercise may take place using a trainer, indoor cycle, rower, etc. In FIG. 4, two participants 460 and 462 are shown as avatars riding bicycles. The avatars may be rowing or running or performing any other exercise. This is presented as a game world, but other cases may be online classes with videos of participants in real-time or merely with information about the status of exercise taking place (e.g. statistics on speed, cadence, watts, power, etc). In the game world, hills may cause a control device 213A (see FIG. 2, above) to increase the resistance applied to the trainer 212A to simulate that hill.

[0056] FIG. 5 is an example of an interchangeable resistance device 511 suitable for insertion into an exercise device. Here, the exercise device is indoorcycle 512B. The indoor cycle 512B has a resistance device dock 516B into which the resistance device 511 may fit. As shown, the indoor cycle 512B is designed so that the resistance device 511 will be hub mounted (e.g. mounted on the wheel hub) when it is installed into the resistance device dock 516B. Thereafter, the resistance device may provide resistance for the indoor cycle 512. Preferably, the dock 516B enables both electrical and mechanical coupling of the motor for control and providing the resistance to the indoor cycle 512B.

[0057] The exercise device of FIG. 5 is merely an example. The resistance device may be installed similarly in any other exercise device into which a suitable resistance device dock 516B is integrated. Even resistance-based weight systems may rely upon the insertion of a resistance device 211 in a suitable dock.

Description of Processes

[0058] Referring now to FIG. 6, a flowchart of interchangeability of a resistance device for exercise devices is shown. The flowchart begins at 605 and ends at 695, but may continue indefinitely as long as a user is swapping the resistance device between exercise devices.

[0059] Following the start at 605, the process begins with installation of the resistance device into a first exercise device at 610. This is preferably installation into a custom-designed dock to engage the electrical and mechanical coupling necessary for control and to provide power or resistance. However, in some cases, it may involve separate processes of mechanical coupling (e.g. joining a cassette or gear) and electrical coupling (e.g. with a wire).

[0060] Next, the user exercises with the resistance applied by the resistance device at 620. As discussed above, this is generally resistance to exercise (e.g. resistance to rowing or cycling). The user may engage in that exercise and the associated resistance may be variable, as controlled by a control device.

[0061] Next, a determination is made whether the given exercise is over at 625. This may be completion of an online ride using a trainer. If it is not complete ("no" at 625), then the process of exercise will continue at 620.

[0062] If the exercise is complete ("yes" at 625), then the process continues with the optional step (shown in dashed lines) of integrating exercise data into game service 630. This step may involve joining the data from the exercise with other data for prior exercises. This may be stored locally, but preferably is stored on a game server 220 (FIG. 2).

[0063] Thereafter, the resistance device may be swapped to another exercise device at 640. Here, this may be transferring the resistance device from an indoor cycle to an rower or from a trainer to a resistance-based weight machine. Alternatively, it may be moving the resistance device from an hand cycle to a rower.

[0064] Next, the exercise device into which the resistance device was inserted is used by a user to engage in exercise at 650. Here, the resistance device may now provide resistance to the user of the second exercise device. So, the resistance device may resist rowing to simulate power necessary to move oars in water or may resist movement of the wheels of an indoor cycle to simulate hills or other difficult terrain.

[0065] Next, a determination is made whether the given exercise is over at 655. This may be completion of a commute home or may be terminating an online ride using a trainer. If it is not complete ("no" at 655), then the process of exercise will continue at 620.

[0066] If the exercise is complete ("yes" at 655), then the process continues with the optional step (shown in dashed lines) of integrating exercise data into game serv-

ice 660. This step may involve joining the data from the exercise with other data for prior exercises. This may be stored locally, but preferably is stored on a game server 220 (FIG. 2).

[0067] Thereafter, the process ends at 695.

[0068] FIG. 7 is a flowchart of use of a resistance device within an exercise device. The flowchart begins at 705 and ends at 795, but may continue indefinitely as long as a user is engaged in exercise reliant upon the resistance.

[0069] Following the start 705, the process begins with installation of the resistance device in an exercise device at 710. This preferably involves insertion of the resistance device into a suitable receptacle or mounting point within the exercise device. Alternatively, the resistance device may be self-contained as a trainer-style device that may be joined using a mechanically and electrically connected socket, mount-point, or similar connection such that it may be easily joined to and removed from a given exercise device. The same socket, mount-point, or similar connection may be integrated into a family of exercise devices such that the resistance device may be mounted to any one of them for providing resistance to that device for various exercises. The resistance device may be an entire trainer, wheel, connective mount-point, and stand integrated into a single package.

[0070] Thereafter, a determination is made whether an instruction is received from the associated control device and/or a game server or other control system, to alter the exercise 725. In particular, this may be to increase resistance or decrease resistance or to make no change.

[0071] If the instruction is to increase the resistance, then current may be increased to the associated resistance device so that it may provide more resistance at 730. This may be carefully calibrated by the control device and associated resistance device to provide a precise level of resistance.

[0072] If the instruction is to decrease resistance, then decreased resistance may be provided at 740. Typically, this would be merely reducing the power applied against movement of a given exerciser.

[0073] If no change is desired at 725, or once resistance is increased at 730 or resistance is decreased at 740, the process continues with enabling the user to engage in the exercise at the desired resistance level at 750

[0074] A determination is made at 755 whether the exercise is complete. If not ("no" at 755), then the process continues with a determination whether there is an alteration to the exercise at 725.

[0075] If the exercise is complete ("yes" at 755), then the process ends at 795.

Closing Comments

[0076] Throughout this description, the embodiments and examples shown should be considered as exemplars, rather than limitations on the apparatus and procedures disclosed or claimed. Although many of the examples presented herein involve specific combinations of method acts or system elements, it should be understood that those acts and those elements may be combined in other ways to accomplish the same objectives. With regard to flowcharts, additional and fewer steps may be taken, and the steps as shown may be combined or further refined to achieve the methods described herein. Acts, elements and features discussed only in connection with one embodiment are not intended to be excluded from a similar role in other embodiments.

[0077] As used herein, "plurality" means two or more. As used herein, a "set" of items may include one or more of such items. As used herein, whether in the written description or the claims, the terms "comprising", "including", "carrying", "having", "containing", "involving", and the like are to be understood to be open-ended, i.e., to mean including but not limited to. Only the transitional phrases "consisting of" and "consisting essentially of", respectively, are closed or semi-closed transitional phrases with respect to claims. Use of ordinal terms such as "first", "second", "third", etc., in the claims to modify a claim element does not by itself connote any priority, precedence, or order of one claim element over another or the temporal order in which acts of a method are performed, but are used merely as labels to distinguish one claim element having a certain name from another element having a same name (but for use of the ordinal term) to distinguish the claim elements. As used herein, "and/or" means that the listed items are alternatives, but the alternatives also include any combination of the listed items.

Claims

1. A system for engaging in exercise, the system comprising:

   a removable resistance device suitable for temporary installation into a separate exercise device, when installed in the separate exercise device, the resistance device operable under control of a computing device to selectively increase or decrease resistance applied to the separate exercise device and to thereby selectively increase or decrease the difficulty of an exercise associated with the separate exercise device;
   the separate exercise device for engaging in a selected exercise from a group comprising cycling, rowing, running, and resistance weight training, into which the removable resistance device may be temporarily installed to provide resistance for the selected exercise; and
   a second separate exercise device for engaging in a second selected exercise selected from the group comprising cycling, rowing, running, and resistance weight training, but excluding the selected exercise for the separate exercise device,

and into which the removable resistance device may be temporarily installed to provide resistance for the second selected exercise.

2. The system of claim 1 wherein the removable resistance device is used as a motor to provide supplemental motive power to some aspect of the second separate exercise device to make the second selected exercise less difficult for a user.

3. The system of claim 2 wherein the second separate exercise device is an electronic bike intended for usage outdoors.

4. The system of claim 3 wherein the removable resistance device both adds resistance and provides supplemental motive power interchangeably, dependent upon the control directed by the computing device instructing the removable resistance device.

5. The system of any preceding claim wherein the removable resistance device further comprises:
an electronic communications interface for enabling the removable resistance device to communicate with the separate exercise device or the second separate exercise device to enable the separate exercise device or the second separate exercise device to select an amount of resistance applied as directed by the computing device.

6. The system of claim 5 wherein the electronic communications interface further comprises an electrical junction wherein electrical contact is automatically made when the resistance device is installed within the separate exercise device or the second separate exercise device, and wherein the electronic communications interface is within the frame of at least one of the separate exercise device or the second separate exercise device.

7. The system of any preceding claim wherein the computing device comprises software that directs the removable resistance device to increase or decrease resistance in response to player avatar movement within a virtual world presented to a user on a display screen by the computing device.

8. Apparatus comprising non-volatile machine-readable medium storing a program having instructions which when executed by a processor will cause the processor to:

control operation of a removable resistance device removably installed into a separate exercise device, when installed in the separate exercise device, the resistance device operable under control of a computing device to selectively increase or decrease resistance applied to the separate exercise device and to thereby selectively increase or decrease the difficulty of an exercise associated with the separate exercise device;
control operation of the removable resistance device removably installed in the separate exercise device for engaging in a selected exercise from a group comprising cycling, rowing, running, and resistance weight training, to provide resistance for the selected exercise; and
control operation of the removable resistance device removably installed in a second separate exercise device for engaging in a second selected exercise selected from the group comprising cycling, rowing, running, and resistance weight training, but excluding the selected exercise for the separate exercise device, to provide resistance for the second selected exercise.

9. The apparatus of claim 8 wherein the removable resistance device is used as a motor to provide supplemental motive powerto some aspect of the second separate exercise device to make the second selected exercise less difficult for a user,
and optionally wherein the second separate exercise device is an electronic bike intended for usage outdoors.

10. The apparatus of either claim 8 or claim 9 wherein the instructions further cause the processor to communicate with the removable resistance device using an electronic communications interface through the separate exercise device or the second separate exercise device to enable the separate exercise device or the second separate exercise device to select an amount of resistance applied as directed by the computing device,
and optionally wherein the electronic communications interface further comprises an electrical junction wherein electrical contact is automatically made when the resistance device is installed within the separate exercise device or the second separate exercise device and wherein the electronic communications interface is within the frame of at least one of the separate exercise device or the second separate exercise device.

11. The apparatus of any of claims 8 to 10 further comprising:

the processor; and
a memory;
wherein the processor and the memory comprise circuits and software for performing the instructions on the storage medium.

12. A method for engaging in exercise, the method comprising:

controlling operation of a removable resistance device suitable for temporary installation into a separate exercise device, when installed in the separate exercise device, the resistance device operable under control of a computing device to selectively increase or decrease resistance applied to the separate exercise device and to thereby selectively increase or decrease the difficulty of an exercise associated with the separate exercise device;
controlling operation of the removable resistance device temporarily installed in the separate exercise device for engaging in a selected exercise from a group comprising cycling, rowing, running, and resistance weight training, to provide resistance for the selected exercise; and
controlling operation of the removable resistance device temporarily installed in a second separate exercise device for engaging in a second selected exercise selected from the group comprising cycling, rowing, running, and resistance weight training, but excluding the selected exercise for the separate exercise device, to provide resistance for the second selected exercise.

13. The method of claim 12 wherein the removable resistance device is used as a motor to provide supplemental motive powerto some aspect of the second separate exercise device to make the second selected exercise less difficult for a user.

14. The method of claim 13 wherein the second separate exercise device is an electronic bike intended for usage outdoors,
and optionally wherein the removable resistance device both adds resistance and provides supplemental motive power interchangeably, dependent upon the control directed by the computing device instructing the removable resistance device.

15. The method of any of claims 12 to 14 further comprising:

communicating with the removable resistance device using an electronic communications interface through the separate exercise device or the second separate exercise device to enable the separate exercise device or the second separate exercise device to select an amount of resistance applied as directed by the computing device,
wherein the electronic communications interface comprises an electrical junction, wherein electrical contact is automatically made when the resistance device is installed within the separate exercise device or the second separate exercise device, and wherein the electronic communications interface is within the frame of at least one of the separate exercise device or the second separate exercise device.

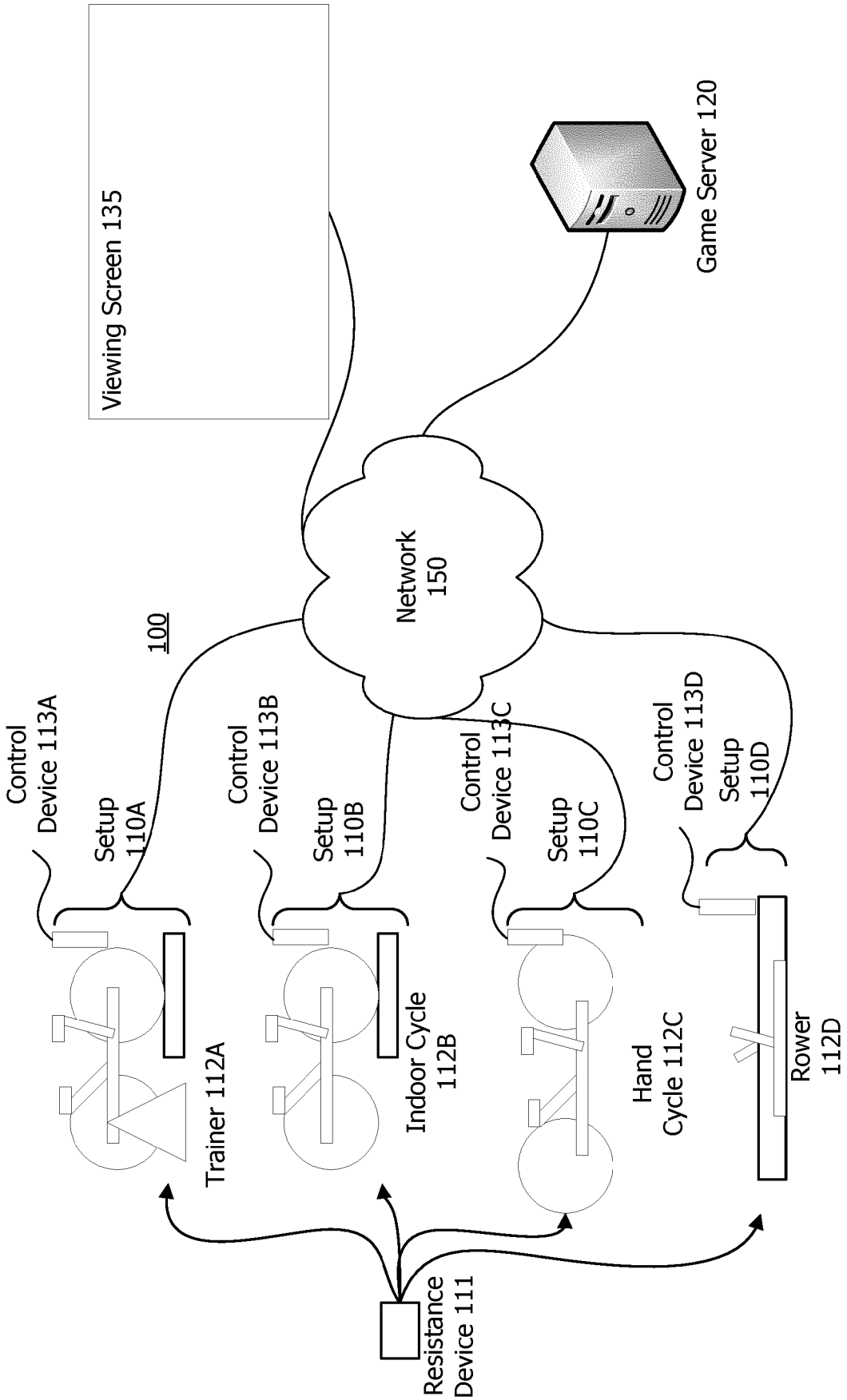
Viewing Screen 135
Game Server 120
Network 150
100
Control Device 113A
Setup 110A
Control Device 113B
Setup 110B
Control Device 113C
Setup 110C
Control Device 113D
Setup 110D
Trainer 112A
Indoor Cycle 112B
Hand Cycle 112C
Rower 112D
Resistance Device 111

FIG. 1

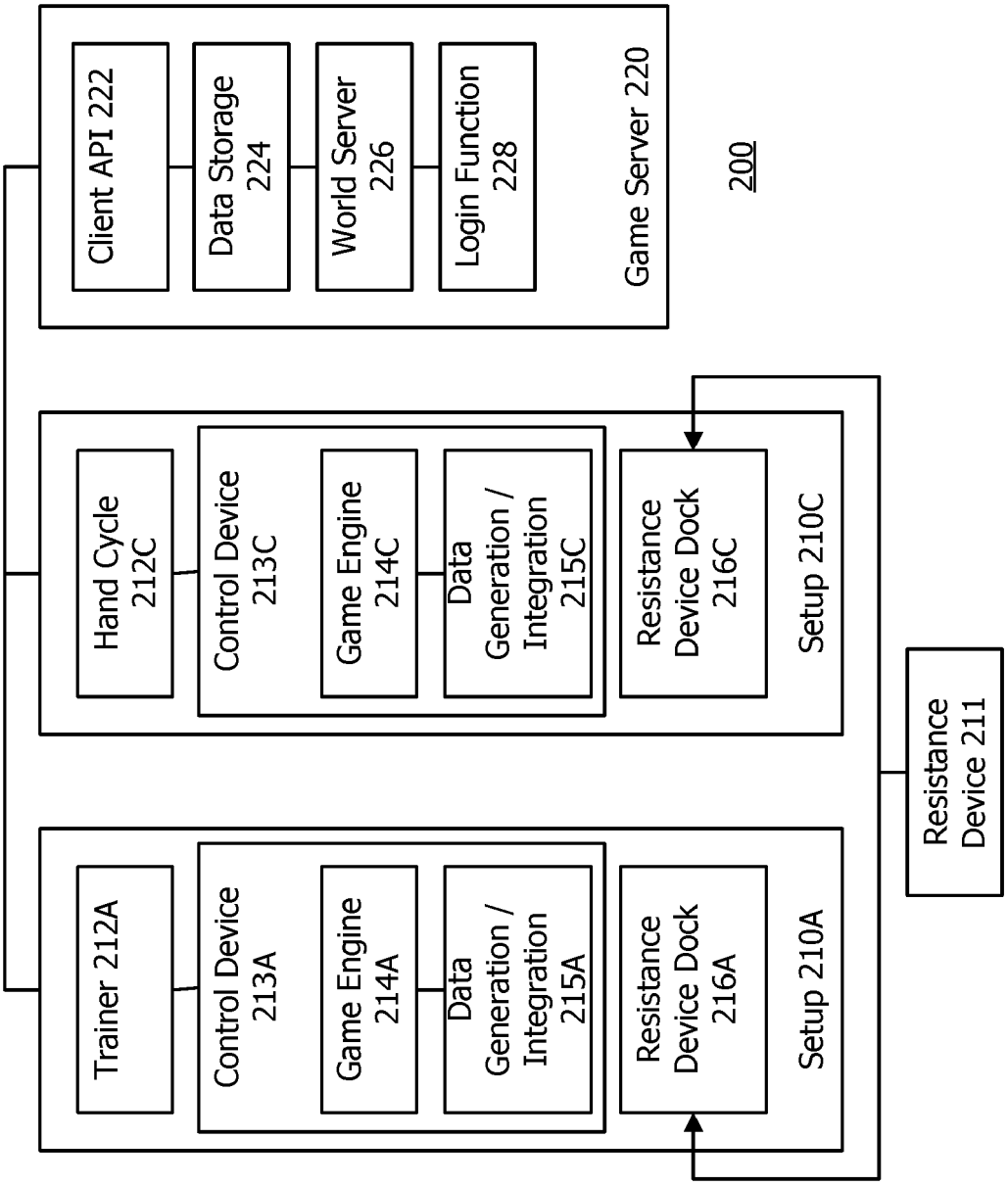
Client API 222
Data Storage 224
World Server 226
Login Function 228
Game Server 220
200
Hand Cycle 212C
Control Device 213C
Game Engine 214C
Data Generation / Integration 215C
Resistance Device Dock 216C
Setup 210C
Trainer 212A
Control Device 213A
Game Engine 214A
Data Generation / Integration 215A
Resistance Device Dock 216A
Setup 210A
Resistance Device 211

FIG. 2

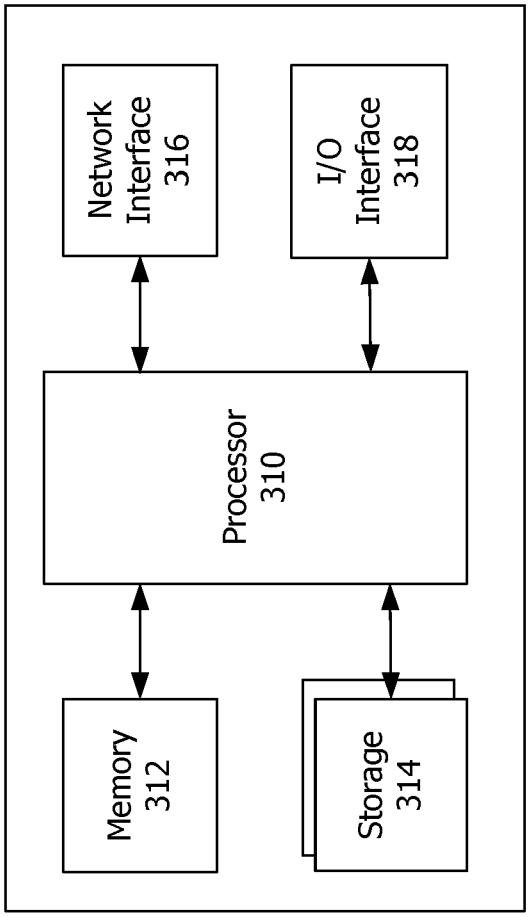
Network Interface 316
I/O Interface 318
Processor 310
Memory 312
Storage 314
300

FIG. 3

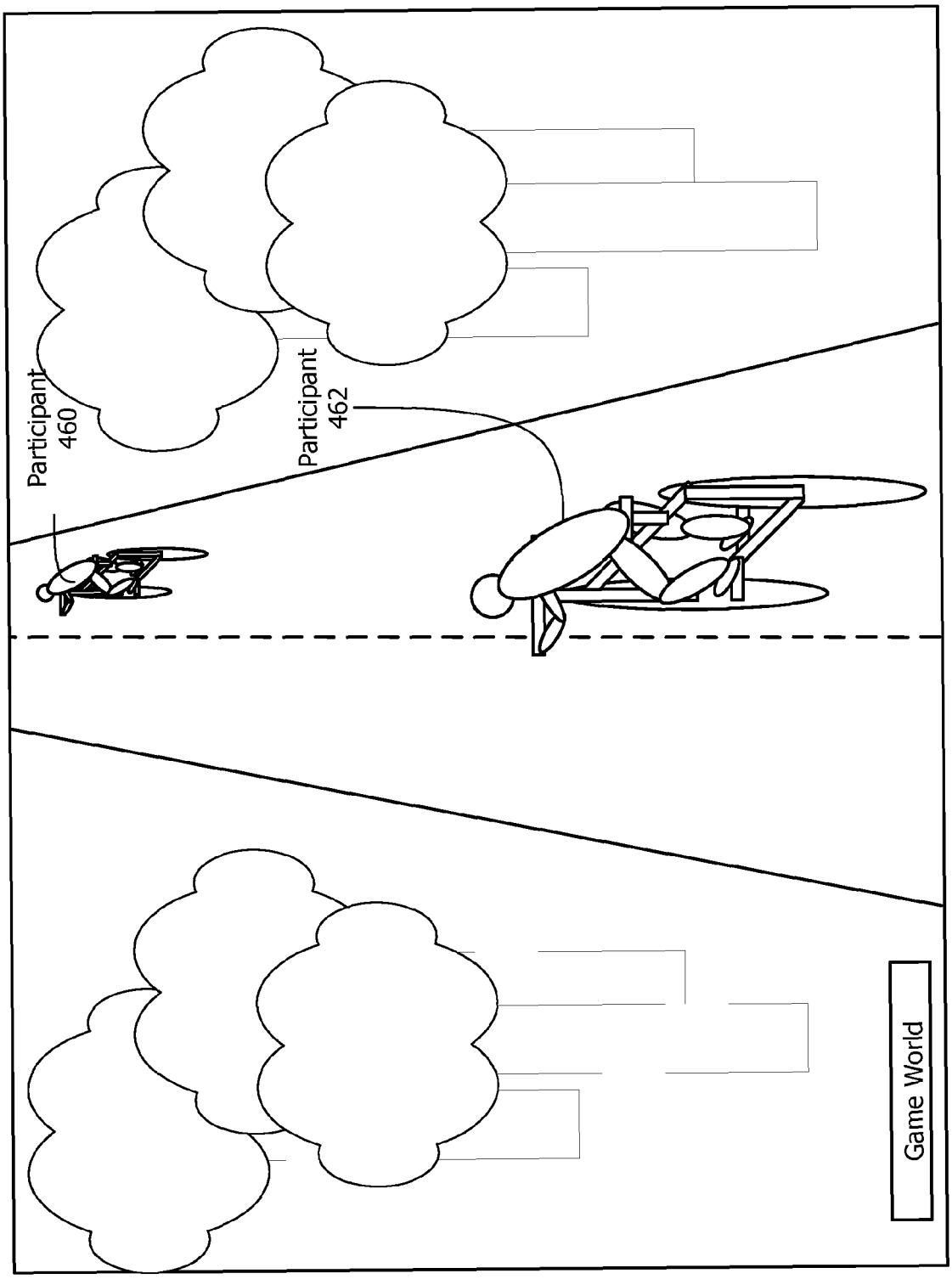

FIG. 4

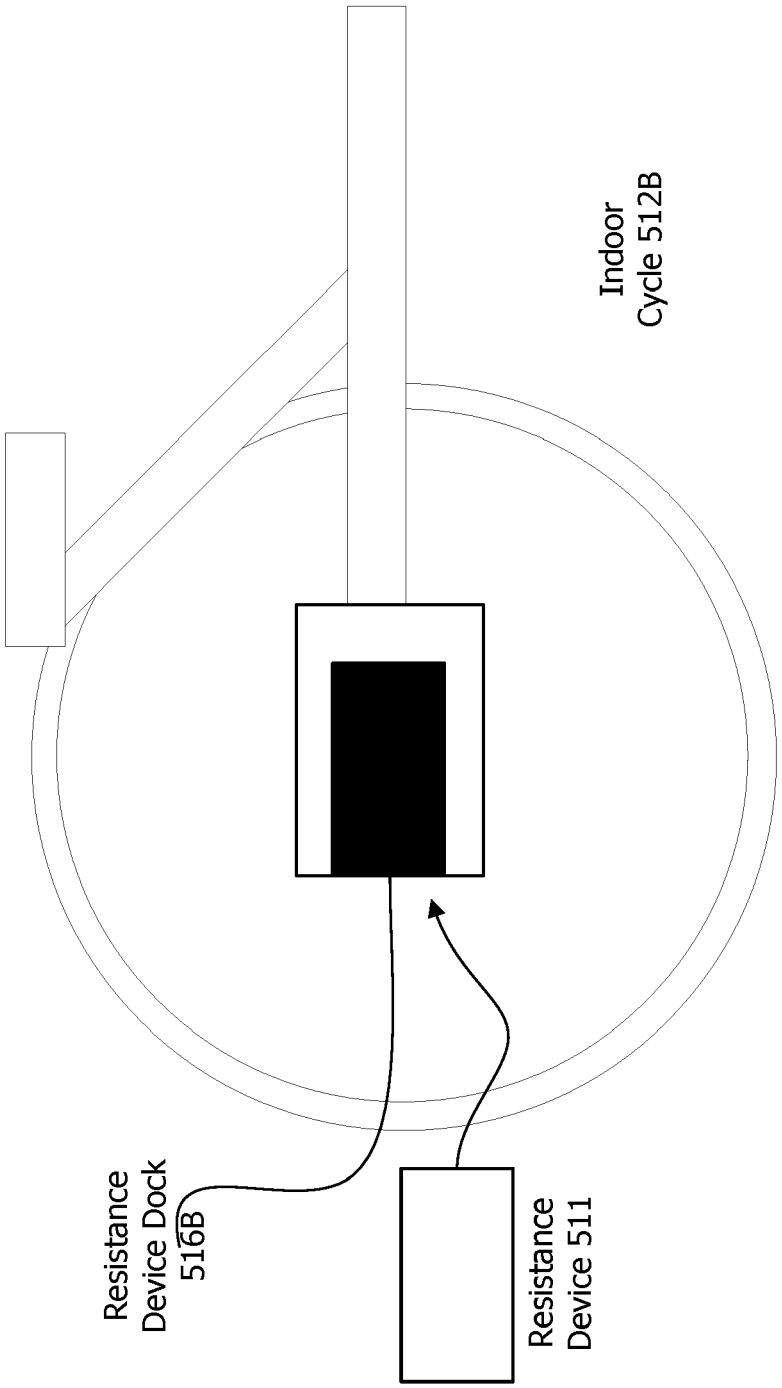
Indoor
Cycle 512B
Resistance
Device Dock
516B
Resistance
Device 511

FIG. 5

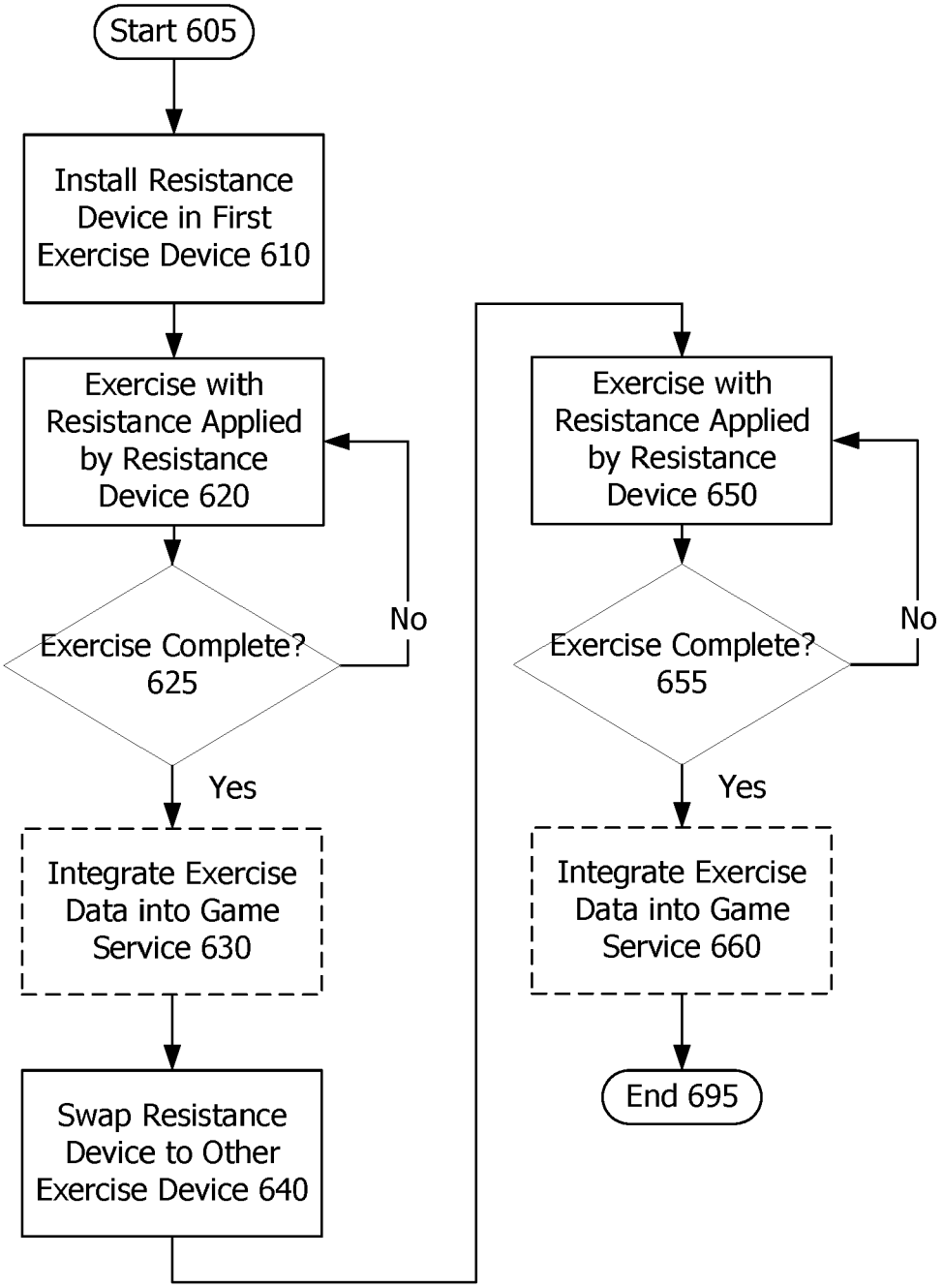
Start 605
Install Resistance Device in First Exercise Device 610
Exercise with Resistance Applied by Resistance Device 620
Exercise Complete? 625
No
Yes
Integrate Exercise Data into Game Service 630
Swap Resistance Device to Other Exercise Device 640
Exercise with Resistance Applied by Resistance Device 650
Exercise Complete? 655
No
Yes
Integrate Exercise Data into Game Service 660
End 695

FIG. 6

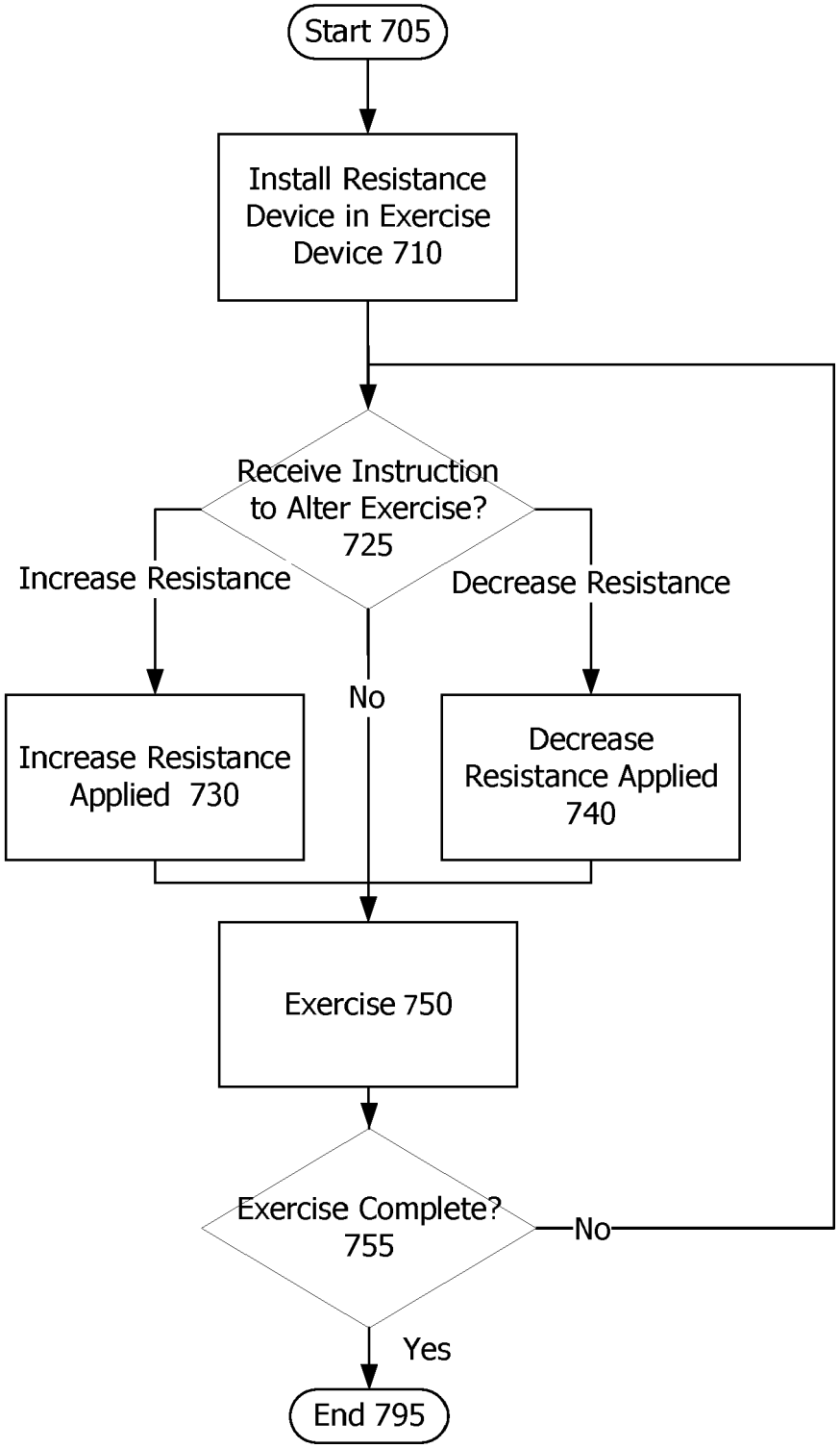
Start 705
Install Resistance Device in Exercise Device 710
Receive Instruction to Alter Exercise? 725
Increase Resistance
Decrease Resistance
No
Increase Resistance Applied 730
Decrease Resistance Applied 740
Exercise 750
Exercise Complete? 755
No
Yes
End 795

FIG. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 21 19 0697

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	WO 2014/196866 A1 (BADARNEH ZIAD [NO]) 11 December 2014 (2014-12-11) * page 2, line 25 - line 33 * * page 4, line 36 - page 5, line 10 * * page 9, line 7 - page 10, line 7 * * page 11, line 15 - line 33; claims 1,5; figures *	1,5-8, 11,12,15 2-4,9, 10,13,14	INV. A63B21/005 A63B22/06 A63B24/00 A63B22/00 A63B22/04 A63B71/06 A63B69/16
A	US 2002/086779 A1 (WILKINSON WILLIAM T [US]) 4 July 2002 (2002-07-04) * paragraph [0091] * * paragraph [0071] * * paragraph [0011] - paragraph [0012] *	1	
A	US 4 822 032 A (WHITMORE HENRY B [US] ET AL) 18 April 1989 (1989-04-18) * figures *	1	
A	FR 2 719 489 A1 (MANNET EMILE [FR]) 10 November 1995 (1995-11-10) * figures *	1	
			TECHNICAL FIELDS SEARCHED (IPC) A63B

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 December 2021	Lundblad, Hampus

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 19 0697

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30-12-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014196866 A1	11-12-2014	NONE	
US 2002086779 A1	04-07-2002	AU 2002232894 A1	16-07-2002
		CA 2434165 A1	11-07-2002
		EP 1575676 A2	21-09-2005
		MX PA03006551 A	15-10-2004
		US 2002086779 A1	04-07-2002
		WO 02053234 A2	11-07-2002
US 4822032 A	18-04-1989	NONE	
FR 2719489 A1	10-11-1995	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 63063924 **[0003]**