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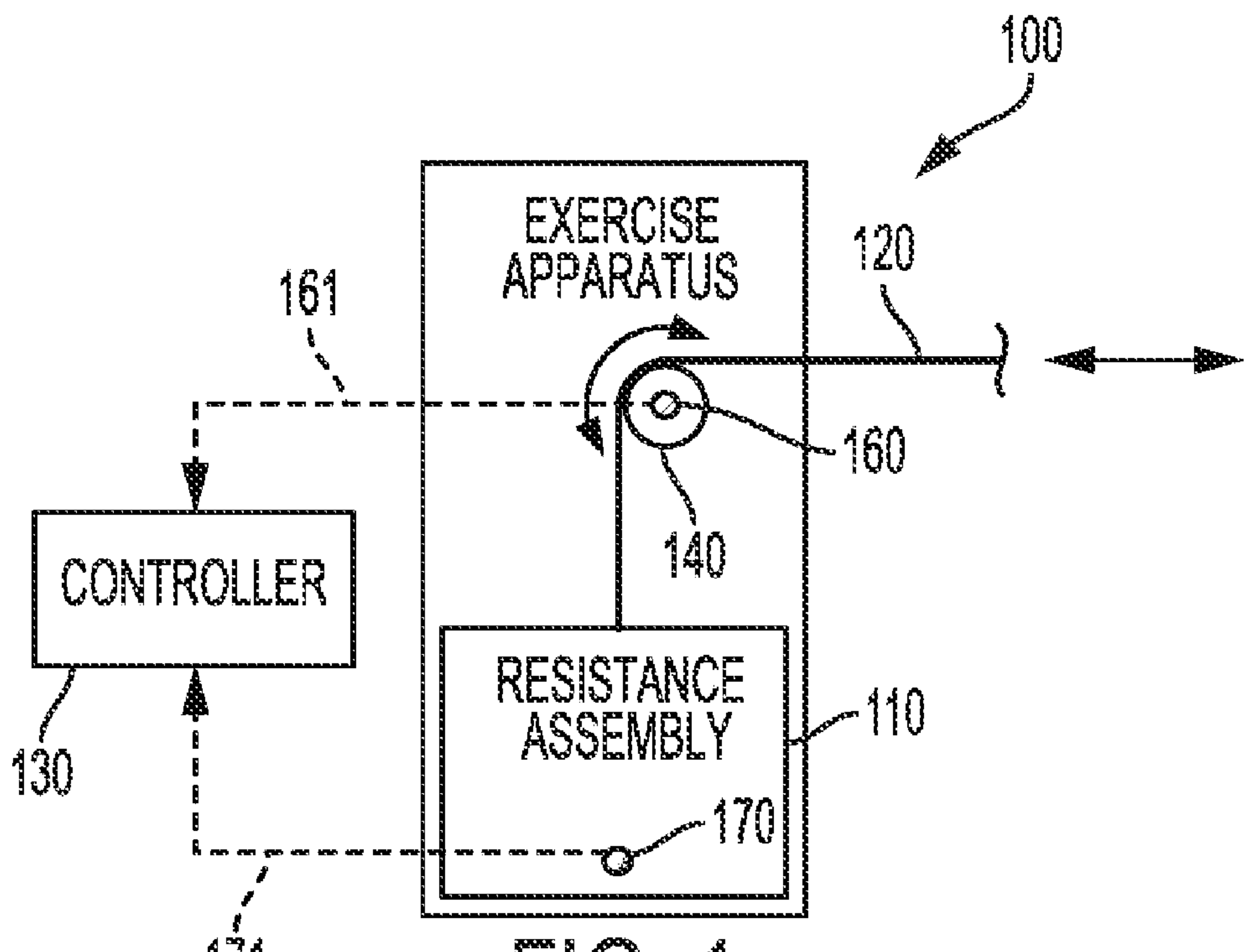

FIG. 1

(57) Abrégé/Abstract:
An exercise apparatus includes a resistance assembly, a flexible member, and a sensor network. The sensor network includes sensors that generate signals responsive to the amount of resistance selected by a user of the exercise apparatus and the user's interaction with the flexible member.

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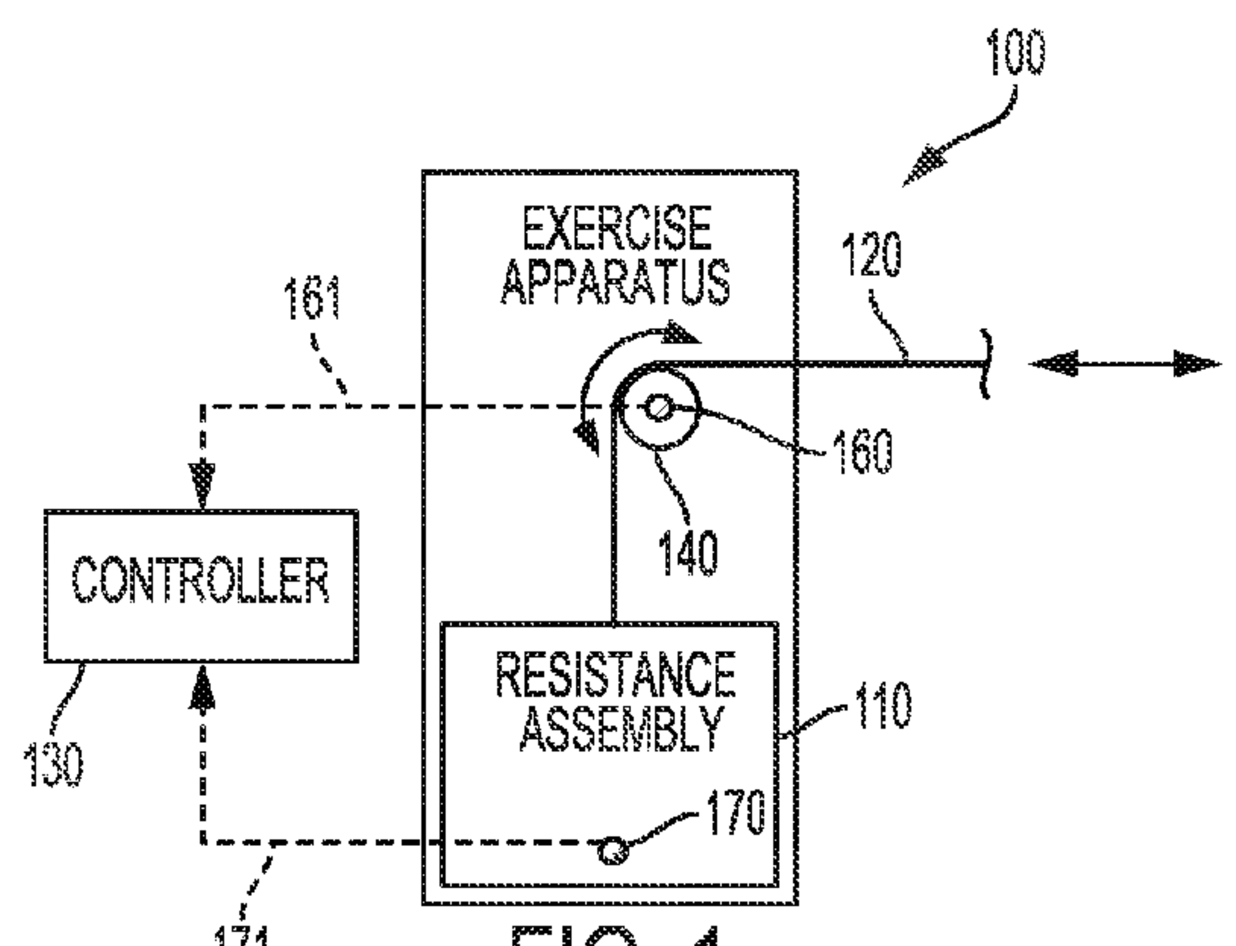

FIG. 1

(57) Abstract: An exercise apparatus includes a resistance assembly, a flexible member, and a sensor network. The sensor network includes sensors that generate signals responsive to the amount of resistance selected by a user of the exercise apparatus and the user's interaction with the flexible member.

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EXERCISE APPARATUS WITH SENSORS AND METHODS THEREOF

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to U.S. Provisional Patent Application No. 62/406,053, entitled EXERCISE APPARATUS WITH SENSORS AND METHODS THEREOF, filed October 10, 2016, which is incorporated by reference.

BACKGROUND

[0002] Many pieces of exercise equipment, when utilized regularly, are very useful for weight loss, for improving cardiovascular stamina, and for strengthening various muscles. Some exercise equipment can be used for rehabilitative or therapeutic purposes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] It is believed that certain embodiments will be better understood from the following description taken in conjunction with the accompanying drawings, in which like references indicate similar elements and in which:

[0004] FIG. 1 schematically depicts an example exercise apparatus in accordance with one non-limiting embodiment.

[0005] FIG. 2 schematically depicts an example exercise apparatus in accordance with one non-limiting embodiment.

[0006] FIG. 3 schematically depicts an example exercise apparatus in accordance with one non-limiting embodiment.

[0007] FIG. 4 schematically depicts an example exercise apparatus in accordance with one non-limiting embodiment.

[0008] FIG. 5 schematically depicts an example exercise apparatus in accordance with one non-limiting embodiment.

[0009] FIG. 6 schematically depicts an example exercise apparatus in accordance with one non-limiting embodiment.

[0010] FIG. 7 schematically depicts an example exercise apparatus in accordance with one non-limiting embodiment.

[0011] FIG. 8 depicts an example weight stack in three operational states.

[0012] FIG. 9 is a chart depicting the signal generated by the load cell shown in FIG. 8 over time.

[0013] FIGS. 10-12 schematically depict example exercise apparatuses in accordance with varying embodiments.

DETAILED DESCRIPTION

[0014] Various non-limiting embodiments of the present disclosure will now be described to provide an overall understanding of the principles of the structure, function, and use of systems, apparatuses, devices, and methods disclosed. One or more examples of these non-limiting embodiments are illustrated in the selected examples disclosed and described in detail with reference made to FIGS. 1 – 12 in the accompanying drawings. Those of ordinary skill in the art will understand that systems, apparatuses, devices, and methods specifically described herein and illustrated in the accompanying drawings are non-limiting embodiments. The features illustrated or described in connection with one non-limiting embodiment may be combined with the features of other non-limiting embodiments. Such modifications and variations are intended to be included within the scope of the present disclosure.

[0015] The systems, apparatuses, devices, and methods disclosed herein are described in detail by way of examples and with reference to the figures. The examples discussed herein are examples only and are provided to assist in the explanation of the apparatuses, devices, systems and methods described herein. None of the features or components shown in the drawings or discussed below should be taken as mandatory for any specific implementation of any of these the apparatuses, devices, systems or methods unless specifically designated as mandatory. For ease of reading and clarity, certain components, modules, or methods may be described solely in connection with a specific figure. In this disclosure, any identification of specific techniques, arrangements, etc. are either related to a specific example presented or are merely a general description of such a technique, arrangement, etc. Identifications of specific details or examples are not intended to be, and should not be, construed as mandatory or limiting unless specifically designated as such. Any failure to specifically describe a combination or sub-combination of components should not be understood as an indication that any combination or sub-combination is not possible. It will be appreciated that modifications to disclosed and described examples, arrangements, configurations, components, elements, apparatuses, devices, systems, methods, etc. can be made and may be desired for a specific application. Also, for any methods described, regardless of whether the method is described in conjunction with a flow diagram, it should be understood that unless otherwise specified or required by context, any explicit or implicit ordering of steps performed in the execution of a method does not imply that those steps must be performed in the order presented but instead may be performed in a different order or in parallel.

[0016] Reference throughout the specification to "various embodiments," "some embodiments," "one embodiment," "some example embodiments," "one example embodiment," or "an embodiment" means that a particular feature, structure, or characteristic described in connection with any embodiment is included in at least one embodiment. Thus, appearances of the phrases "in various embodiments," "in some embodiments," "in one embodiment," "some example embodiments," "one example embodiment, or "in an embodiment" in places throughout the specification are not necessarily all referring to the same embodiment. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner in one or more embodiments.

[0017] Throughout this disclosure, references to components or modules generally refer to items that logically can be grouped together to perform a function or group of related functions. Like reference numerals are generally intended to refer to the same or similar components. Components and modules can be implemented in software, hardware, or a combination of software and hardware. The term “software” is used expansively to include not only executable code, for example machine-executable or machine-interpretable instructions, but also data structures, data stores and computing instructions stored in any suitable electronic format, including firmware, and embedded software. The terms “information” and “data” are used expansively and includes a wide variety of electronic information, including executable code; content such as text, video data, and audio data, among others; and various codes or flags. The terms “information,” “data,” and “content” are sometimes used interchangeably when permitted by context. It should be noted that although for clarity and to aid in understanding some examples discussed herein might describe specific features or functions as part of a specific component or module, or as occurring at a specific layer of a computing device (for example, a hardware layer, operating system layer, or application layer), those features or functions may be implemented as part of a different component or module or operated at a different layer of a communication protocol stack. Those of ordinary skill in the art will recognize that the systems, apparatuses, devices, and methods described herein can be applied to, or easily modified for use with, other types of equipment, can use other arrangements of computing systems, and can use other protocols, or operate at other layers in communication protocol stacks, than are described.

[0018] The systems, apparatuses, devices, and methods disclosed herein generally relate to providing tracking of an individual's interaction with an exercise apparatus using one or more sensors incorporated therein. As used herein , the term exercise apparatuses is to broadly include any type of exercise or fitness machine, system, or device in which a user selects a resistance amount and then interacts with one or more interaction members, such as a handle, bar, lever, or pedals, to perform an exercise. The exercise apparatuses described herein are not limited to any particular style or type of apparatus and can include apparatuses that are single-station or multi-station devices.

[0019] As is to be appreciated upon consideration of the present disclosure, various aspects of an individual's interaction can be tracked, such as, without limitation, an amount of weight/resistance selected, a number of repetitions, a number of sets, duration of repetition, duration of sets, duration of workout, length of stroke, muscle group used, type of exercise, and so forth. Based on the data collected from the individual's interaction, various metrics can be captured by systems, apparatuses, devices, and methods described herein, such as calories burned, and so forth. The particular types of interactions that can be tracked may vary based on the type and location of sensors incorporated into the exercise apparatus.

[0020] As described in more detail below, the systems, apparatuses, devices, and methods can facilitate user recognition to aid in tracking a user's interaction with the exercise apparatus. In some embodiments, based on the recognition of the user, appropriate information is pulled from a data store and provided to the user. Data can include, for instance, a list of routines can be displayed on a visual display at the exercise apparatus, either on a networked connected client device or on the exercise apparatus itself. In some embodiments, exercise data can be collected, transmitted and stored to a profile of the user in a fitness tracking computing system, which may be local or remote to the exercise device. Based on a user profile, the individual's interaction with the exercise device can then be tracked over multiple interactions with the exercise device. Example fitness tracking computing systems are described in U.S. Pat. No. 9,669,261, issued June 6, 2017, and U.S. Pat. App. Pub. No. 2015/0335951, filed on May 20, 2015, the disclosures of which are herein incorporated by reference in their entireties.

[0021] FIG. 1 schematically depicts an example exercise apparatus 100 in accordance with one non-limiting embodiment. The exercise apparatus 100 has a resistance assembly 110 which has a selective resistance. For instance, the resistance assembly 110 can include a weight stack having a plurality of weight plates that can be selected by a locking pin. The resistance assembly 110 is linked to a flexible member 120 which extends to an interaction member (not shown), such as a handle, bar, lever, etc. The flexible member 120 can be formed of nylon cable, although various other flexible members including metal cables, ropes, cords, and chains of suitable tensile strength are contemplated. The flexible member 120 operatively engages at least one pulley 140 which can be positioned at any suitable position, such as within a housing of the exercise apparatus 100 or outside the housing (i.e., proximate to an interaction member). The configuration of the pulley 140 causes any force that is transmitted through the flexible member 120 to be directed toward upwardly lifting a predetermined number of weight plates of a corresponding weight stack, or otherwise interacting with the resistance device.

[0022] The exercise apparatus 100 also includes a sensor network comprised of one or more sensors for tracking a user's interaction. In the illustrated embodiment, a first sensor 160 is positioned proximate to the pulley 140 and second sensor 170 is positioned proximate to the resistance assembly 110. Referring to the first sensor 160, any suitable sensor can be used that generates an output based on rotational movement of the pulley 140. For instance, in some configurations the first sensor 160 is an optical sensor or a magnetic sensor. With regard to optical sensors, any suitable sensing technique can be used, such as reflective optical sensor or an interrupter sensor. Furthermore, the first sensor 160 (or another sensor associated therewith) can provide rotation direction information, such as through an optical encoder. The first sensor 160 can be in communication with a controller 130 through a communication coupling 161. The communication coupling 161 can be a wired or wireless.

[0023] Referring to the second sensor 170, any suitable sensor can be used that generates an output based on the amount of resistance selected by the user. For the purposes of illustration, the amount of resistance will be described herein in terms of weight. It is to be appreciated that other forms of resistance can be used, such as pneumatic resistance, frictional resistance, and so forth, and the second sensor 170 can be configured to generate a signal indicative of the amount of resistance selected by the user. With reference to embodiments using a weight stack, the second sensor 170 can be, for example, a load cell positioned beneath the weight stack. As portions of the weight stack are lifted off the stack, the load cell generates a corresponding signal and provides it to the controller 130 via a communication coupling 171. The communication coupling 171 can be a wired or wireless. The second sensor 170 can therefore generate a signal at a first level when the entire weight stack is static based on the force of the entire weight stack applied to the second sensor 170. When any number of plates are lifted off the weight stack during an exercise, only the remaining portion of the weight stack applies force to the second sensor 170. The signal generated by the second senor 170 will therefor vary based on the weight of the plates that are lifted off the weight stack and can be used to ascertain the amount of weight used for a particular exercise. Additional example of load cell signaling is provided below in FIGS. 8-9.

[0024] The controller 130 can be configured with a profile for the exercise apparatus 100 so that proper exercise tracking can be performed. For example, the controller 130 can be configured to interpret the signals received from the first and second sensors 160, 170 to convert the signals into quantified exercise data, such as weight amount, number of repetitions, number of sets, stroke distance, stroke speed, etc. The controller 140 can also be configured with the ratio (i.e., 4:1, 2:1, 1:1, etc.) of the exercise apparatus 100 so that movements of the pulley 140 and the resistance assembly 110 can be properly correlated.

[0025] While FIG. 1 depicts an exercise apparatus 100 having two sensors, any number of sensors may be used to provide the desired optics into a user's interaction with the apparatus. FIG. 2 illustrates a non-limiting embodiment of an exercise apparatus 200, the exercise apparatus 200 being similar to, or the same as in many respects as, the exercise apparatus 200 illustrated in FIG. 1. For example, the exercise apparatus 200 has a resistance assembly 210 with an associated sensor 270 that provides signaling to a controller 230 via communication coupling 271. The exercise apparatus 200 also has a pulley 240 for routing a flexible member 220, with the rotation of the pulley 240 being tracked by a sensor 260. The sensor 260 provides signaling to the controller 230 via communication coupling 261. However, in this embodiment, the exercise apparatus 200 has another flexible member 222 that is coupled to the resistance assembly 210 and is routed through a pulley 242. It is to be appreciated, that additional pulleys beyond those shown in FIG. 2 may be utilized without departing from the scope of the current disclosure. A sensor 262 is associated with the pulley 242 that provides rotational information to the controller 230 via a communication coupling 262. In some configurations, a user's right arm may be used to apply force to the flexible member 220 and a user's left arm may be used to apply force to the flexible member 222. Such forces may be applied concurrently or sequentially. In any event, the movement of the pulley 240 associated with the right arm and the movement of the pulley 242 associated with the left arm can be provided to the controller 230. Using the information obtained from the sensors 240, 242, 270, the controller 230 can track the user's performance. More specifically, based on the separate signals received from the pulley 240 and the pulley 242, the user's performance of one arm can be tracked independently of the user's performance of the other arm.

[0026] FIG. 3 illustrates another non-limiting embodiment of an exercise apparatus 300, the exercise apparatus 300 being similar to, or the same as in many respects as, the exercise apparatus 200 illustrated in FIG. 2. For example, the exercise apparatus 300 has a resistance assembly 310 with an associated sensor 370 that provides signaling to a controller 330 via communication coupling 371. The exercise apparatus 300 also has pulleys 340, 342 for routing flexible members 320, 322. The rotation of each of the pulleys 340, 342 is tracked by sensors 360, 362, with signaling provided to the controller 330 via communication couplings 361, 363. However, in this embodiment, the exercise apparatus 300 has another resistance assembly 312. The resistance assembly 312 in the illustrated embodiment is coupled to the flexible member 322. Multiple resistance assemblies may be used, for example, in multi-station exercise machines. A sensor 372 is associated with the resistance assembly 312 that generates an output based on the amount of resistance selected by the user. Similar to the embodiments described above, the sensor 372 can be a load cell positioned beneath a weight stack, such that as portions of the weight stack are lifted off the stack, the load cell generates a corresponding signal and provides it to the controller 330 via a communication coupling 373. The communication coupling 373 can be a wired or wireless.

[0027] Referring now to FIG. 4, an exercise apparatus 400 is depicted having a resistance assembly 410 that includes a plurality of weight plates. The exercise apparatus 400 is similar to, or the same as in many respects as, the exercise apparatus 200 illustrated in FIG. 2. For example, the exercise apparatus 400 has a sensor 470 associated with the resistance assembly 410 that provides signaling to a controller 430 via communication coupling 471. The exercise apparatus 400 also has pulleys 440, 442 for routing flexible members 420, 422. The rotation of each of the pulleys 440, 442 is tracked by sensors 460, 462, with signaling provided to the controller 430 via communication couplings 461, 463. The exercise apparatus 400 is shown in-use, with a first portion 410A of the weight plates being lifted off the weight stack. As such, the remaining portion 410B exerts a certain force on the sensor 470 which is provided to the controller 430 and can be correlated to a particular weight. FIG. 4 also schematically depicts that the controller 430 can be in networked communication with various devices, which may be local devices and/or remote devices. Furthermore, the networked communications may utilized wired communication protocols or wireless communication protocols. In the illustrated embodiment, the controller 430 is shown to be in communication with a client device 432. The client device 432 can be for example, without limitation, a smart phone, a tablet computer, a laptop, a wearable, and so forth. The controller 430 is also shown to be in communication with a data store 436 through a network 434. The network 434 can be an electronic communications network and can include, but is not limited to, the Internet, LANs, WANs, GPRS networks, other networks, or combinations thereof. The network 434 can include wired, wireless, fiber optic, other connections, or combinations thereof. In general, the network 434 can be any combination of connections and protocols that will support communications between the controller 430 and the data store 436. The data store 436 can store information associated with the user's past interaction with the exercise apparatus 400.

[0028] FIG. 5 depicts another example exercise apparatus 500. The exercise apparatus 500 is similar to, or the same as in many respects as, the exercise apparatus 400 illustrated in FIG. 4. For example, the exercise apparatus 500 has a sensor 570 associated with the resistance assembly 510 that provides signaling to a controller 530 via communication coupling 571. The exercise apparatus 500 also has a pulley 540 for routing a flexible member 520. The rotation of the pulley 540 is tracked by a sensor 560, with signaling provided to the controller 530 via communication coupling 561. A client device 532 is shown in communication with the controller 530. The exercise apparatus 500 also has a movable member 580, which is movable between a first position (shown as 580A) and a second position (shown as 580B). While the movable member 580 is schematically shown as an extension arm, it is to be appreciated that the movable member 580 can be any of a variety of movement components of an exercise apparatus. Non-limiting examples of movable members include shuttles, seat backs, seat bottoms, pins, levers, lap bars, etc. In some embodiments, a moveable member may be included on another moveable member (such as a shuttle that is configured to translate along a track of a movable extension arm assembly). In any event, a sensor 562 can be associated with the moveable member(s) 580 such that the position of the moveable member(s) 580 can be provided to the controller 530 via a communication coupling 563. Using the information from the sensor 562, the controller 530 can determined, for instance, a type of exercise being performed on the exercise apparatus 500, as well as other quantified exercise data. The type of sensor 562 can vary based on the moveable member, but in some embodiments, the sensor 562 is a hall-effect sensor.

[0029] Referring now to FIG. 6, an example exercise apparatus 600 is depicting having a sensor 670 associated with the resistance assembly 610 that provides signaling to a controller 630 via communication coupling 671. The exercise apparatus 600 also has a pulley 640 for routing a flexible member 620. The rotation of the pulley 640 is tracked by a sensor 660, with signaling provided to the controller 630 via communication coupling 661. A client device 632 is shown in communication with the controller 630. In this embodiment, the exercise apparatus 600 has an identification module 639 that is used to receive identifying data from the user, referred to as user indicia. The identification module 639 can include, for example, a non-contacting sensor and a wireless communication identification module. For example, when a user approaches the exercise apparatus 600 the non-contacting sensor can generate a signal instructing the wireless communication identification module to transmit a polling signal. In some embodiments the wireless communication identification module comprises any of a radio frequency identifier (RFID) module, an 802.11 wireless module, a Bluetooth module, or combinations thereof. Once user identifying information has been received by the exercise apparatus 600, a user indicia message can be provided a display 638, as illustrated in FIG. 6. Based on signals generated by the one or more sensors, exercise data is provided to the controller 630. Subsequent to a user exercising, or in substantially real-time, one or more messages comprising exercise event data can be displayed on the display 638 and/or transmitted to the client device 632.

[0030] Referring now to FIG. 7, an example exercise apparatus 700 is depicted, the exercise apparatus 700 being similar to, or the same as in many respects as, the exercise apparatus 300 illustrated in FIG. 3. For example, the exercise apparatus 700 has a resistance assemblies 710, 712 that are each associated with a respective sensor 770, 772. The sensors 770, 772 provide signaling to a controller 730 via communication couplings 771, 773. The exercise apparatus 700 also has pulleys 740, 742 for routing flexible members 720, 722. The rotation of each of the pulleys 740, 742 is tracked by sensors 760, 762, with signaling provided to the controller 730 via communication couplings 761, 763. However, in this embodiment, additional sensors 790 are illustrated to depict that the exercise apparatus 700 can simultaneously track a variety of data, such as positions of multiple components. The additional sensor 790 can each be placed at appropriate positions on the exercise apparatus 700 to generate signaling for processing by the controller 730 to determine quantified exercise data.

[0031] Referring now to FIG. 8. an example weight stack 810 of an exercise apparatus in accordance with the present disclosure is depicted in three different operational states. A load cell 870 is positioned between the weight stack 810 and a frame (not shown) and generates a signal based on the amount of force applied thereto, as described above. State A depicts the weight stack 810 in a static position, such as when no one is using the exercise apparatus or the user is in the process of selecting a weight about. In State A, the entire weight stack 810 exerts force upon the load cell 870. State B depicts the weight stack 810 in an in-use position, with a first portion of weight plates 810A lifted away from the second portion of weight plates 810B. In State B, the second portion of weight plates 810B is exerting force upon the load cell 870. State C depicts the weight stack 810 in another in-use position, with a first portion of weight plates 810A lifted away from the second portion of weight plates 810B, such that the second portion of weight plates 810B is exerting force upon the load cell 870. State C has a larger number of weights in the first portion of weight plates 810A than State B (i.e., the user is lifting more weight in State C than State B).

[0032] FIG. 9 is a chart 900 depicting the signal generated by the load cell 870 of FIG. 8 over time. The level of the signal is shown to vary in response to the states of the weight stack 810. In particular the signal level in zones 902 corresponds with State A, the signal level in zone 904 corresponds with State B, and the signal level in zone 906 corresponds with State C. A controller interpreting the signals received from the load cell 870 can be configured such that the signal level in zone 904 is indicative of a certain selected weight and the signal level in zone 906 is indicative of another certain selected weight.

[0033] Referring now to FIG. 10, an example exercise apparatus 1000 is depicted, the exercise apparatus 1000 being similar to, or the same as in many respects as, the exercise apparatus 600 illustrated in FIG. 6. For example, the exercise apparatus 1000 has a resistance assembly 1010 that is associated with a sensor 1070. The sensor 1070 provides signaling to a controller 1030 via communication coupling 1071. The exercise apparatus 1000 also has a flexible member 1020 that is coupled to the resistance assembly 1010. In this configuration, the movement of the resistance assembly 1010 during an exercise is tracked by a sensor 1060, with signaling provided to the controller 1030 via communication coupling 1031. The sensor 1060 can be, for instance, an optical sensor that transmits a beacon 1064 that is reflected off a portion of the resistance assembly 1010, such as a reflector on a surface 1066. Using the data extrapolated from the reflected beacon, the relative distance between the sensor 1060 and the surface 1066 can be determined. Thus, the controller 1030 can use information from collected by the sensor 1060 to determine the linear motion of the flexible member 1020 during an exercise.

[0034] Referring now to FIG. 11, an example exercise apparatus 1100 is depicted, the exercise apparatus 1100 being similar to, or the same as in many respects as, the exercise apparatus 1000 illustrated in FIG. 10. The exercise apparatus 1100 has a resistance assembly 1110 that is associated with a sensor 1170. The sensor 1170 provides signaling to a controller 1130 via communication coupling 1171. The exercise apparatus 1100 also has a flexible member 1120 that is coupled to the resistance assembly 1110. In this configuration, the motion of the flexible member 1120 is tracked by a sensor 1160, with signaling provided to the controller 1130 via communication coupling 1131. The sensor 1160 is an optical sensor, which is positioned proximate to the flexible member 1120, such that motion of the flexible member 1120 can be optically tracked. For instance, the flexible member 1120 can have graphical indicia that are tracked by the sensor 1160 when they are within the optical detection zone 1164. Based on the graphical indicia, the controller 1130 can determine speed, distance traveled, and in some cases, direction of travel.

[0035] Referring now to FIG. 12, an example exercise apparatus 1200 is depicted, the exercise apparatus 1200 being similar to, or the same as in many respects as, the exercise apparatus 1100 illustrated in FIG. 11. The exercise apparatus 1200 has a resistance assembly 1210 that is associated with a sensor 1270. The sensor 1270 provides signaling to a controller 1230 via communication coupling 1271. The exercise apparatus 1200 also has a flexible member 1220 that is coupled to the resistance assembly 1210. In this configuration, the motion of the flexible member 1220 comprises a plurality of tags 1228 that are linearly spaced along a length of the flexible member 1220. In some embodiments, the tags 1228 are RFID tags that are embedded into the flexible member 1220, although this disclosure is not so limited. A sensor 1260, with signaling provided to the controller 1230 via communication coupling 1231, is positioned proximate to the flexible member 1220. Tags 1228 with a tag detection zone 1164 can be detected by the sensor 1264, such that motion of the flexible member 1120 can be tracked as the tags 1228 sequentially pass by the sensor 1260 during movement of the flexible member 1220. In some embodiments, the tags 1228 can each have a unique signature, such that the controller 1230 can determine which direction the flexible member 1220 is moving, and which portion of the flexible member 1220 is within the tag detection zone 1164, based on the signature of the tag(s) within the tag detection zone 1164.

[0036] The systems, methods, and apparatuses described herein can be used in combination with a wide variety of exercise apparatuses, including cardio training exercise apparatuses and strength training exercise apparatuses. Cardio training exercise apparatuses can include, without limitation, stationary bikes, treadmills, elliptical machines, stair climbers, rowing machines and the like. Strength training exercise apparatuses can include, without limitation, multi-station machines, circuit machines, home-gym machines, universal machines, and the like.

[0037] It is to be understood that the figures and descriptions of the present invention have been simplified to illustrate elements that are relevant for a clear understanding of the present invention, while eliminating, for purposes of clarity, other elements. Those of ordinary skill in the art will recognize, however, that these sorts of focused discussions would not facilitate a better understanding of the present invention, and therefore, a more detailed description of such elements is not provided herein.

[0038] Any element expressed herein as a means for performing a specified function is intended to encompass any way of performing that function including, for example, a combination of elements that performs that function. Furthermore the invention, as may be defined by such means-plus-function claims, resides in the fact that the functionalities provided by the various recited means are combined and brought together in a manner as defined by the appended claims. Therefore, any means that can provide such functionalities may be considered equivalents to the means shown herein. Moreover, the processes associated with the present embodiments may be executed by programmable equipment, such as computers. Software or other sets of instructions that may be employed to cause programmable equipment to execute the processes may be stored in any storage device, such as, for example, a computer system (non-volatile) memory, an optical disk, magnetic tape, or magnetic disk. Furthermore, some of the processes may be programmed when the computer system is manufactured or via a computer-readable memory medium.

[0039] It can also be appreciated that certain process aspects described herein may be performed using instructions stored on a computer-readable memory medium or media that direct a computer or computer system to perform process steps. A computer-readable medium may include, for example, memory devices such as diskettes, compact discs of both read-only and read/write varieties, optical disk drives, and hard disk drives. A non-transitory computer-readable medium may also include memory storage that may be physical, virtual, permanent, temporary, semi-permanent and/or semi-temporary.

[0040] These and other embodiments of the systems and methods can be used as would be recognized by those skilled in the art. The above descriptions of various systems and methods are intended to illustrate specific examples and describe certain ways of making and using the systems disclosed and described here. These descriptions are neither intended to be nor should be taken as an exhaustive list of the possible ways in which these systems can be made and used. A number of modifications, including substitutions of systems between or among examples and variations among combinations can be made. Those modifications and variations should be apparent to those of ordinary skill in this area after having read this disclosure.

WHAT IS CLAIMED IS:

1. An exercise apparatus, comprising:

a resistance assembly, wherein the resistance assembly has a user-selective resistance;

a flexible member coupled to the resistance assembly;

an interaction member coupled to the flexible member;

a sensor network, wherein the sensor network comprises:

a controller;

a first sensor in electrical communication with the controller, the first sensor configured to generate a first signal responsive to movement of the flexible member;

a second sensor in electrical communication with the controller, the second sensor configured to generate a second signal indicative of an amount of user-selected resistance;

wherein the controller, based on the first signal and the second signal, is configured to determine quantified exercise data.

2. An exercise apparatus according to claim 1, wherein the first sensor is in electrical communication with the controller via any of a wired communication coupling and a wireless communication coupling, and the second sensor is in electrical communication with the controller via any of a wired communication coupling and a wireless communication coupling.

3. An exercise apparatus according to any of the preceding claims, wherein the controller is local to the exercise apparatus.

4. An exercise apparatus according to any of the preceding claims, wherein the resistance assembly comprises a weight stack comprising a plurality of weight plates and a locking pin.

5. An exercise apparatus according to claim 4, wherein the second sensor is a load cell, wherein the second signal generated by the load cell is indicative of an amount weight plates resting on the load cell.

6. An exercise apparatus according to claim 4, wherein the second sensor is an optical sensor, wherein the second signal generated by the optical sensor is responsive to a visual inspection of an amount of selected weight plates.

7. An exercise apparatus according to any of the preceding claims, further comprising:

a pulley, wherein the flexible member is operatively coupled to the pulley, and first sensor is positioned to sense rotation of the pulley.

8. An exercise apparatus according to claim 7, wherein the first sensor is any of an optical sensor and a magnetic sensor.

9. An exercise apparatus according to claim 8, wherein the first signal generated by the first sensor is indicative of a rotational direction of the pulley.

10. An exercise apparatus according to claim 7, wherein the first sensor is an optical sensor, and wherein the flexible member comprises graphical indicia trackable by the optical sensor.

11. An exercise apparatus according to claim 7, wherein the first sensor is an RFID reader, and wherein the flexible member comprises a plurality of RFID tags trackable by the RFID reader.

12. An exercise apparatus according to any of the preceding claims, further comprising:

an adjustable member; and

a third sensor in electrical communication with the controller, the third sensor configured to generate a third signal responsive to a position of the adjustable member.

13. An exercise apparatus according to claim 12, wherein the adjustable member is any of a shuttle, a seat back, a seat bottom, a pin, a lever, and a lap bars.

14. An exercise apparatus according to any of the preceding claims, wherein the interaction member is any of a handle, a bar, a lever, and a pedal.

15. An exercise apparatus, comprising:

a weight stack comprising a plurality of weight plates;

a first flexible member coupled to the weight stack;

a first pulley operatively coupled to the first flexible member;

a first interaction member coupled to the first flexible member; wherein movement of the first interaction member away from the first pulley causes rotation of the first pulley in a first direction and a selected portion of the weight stack to be lifted from a remaining portion of the weight stack;

a sensor network, wherein the sensor network comprises:

a controller;

a first sensor in electrical communication with the controller, the first sensor configured to generate a first signal responsive to rotational movement of the first pulley;

a second sensor in electrical communication with the controller, the second sensor configured to generate a second signal responsive to a weight of the weight stack; and

wherein the controller, based on the first signal and the second signal, is configured to determine quantified exercise data.

16. An exercise apparatus according to claim 15, further comprising:

a second flexible member;

a second pulley operatively coupled to the second flexible member;

a second interaction member coupled to the second flexible member; wherein movement of the second interaction member away from the second pulley causes rotation of the second pulley in a second direction;

wherein the sensor network further comprises:

a third sensor in electrical communication with the controller, the third sensor configured to generate a third signal responsive to rotational movement of the second pulley.

17. An exercise apparatus of claim 16, wherein the second flexible member is coupled to the weight stack.

18. An exercise apparatus of claim 16, further comprising a second weight stack, wherein the second flexible member is coupled to the second weight stack.

19. An exercise apparatus, comprising:

a resistance assembly, wherein the resistance assembly has a selective resistance;

a flexible member coupled to the resistance assembly;

a sensor network, wherein the sensor network comprises:

a controller;

a first sensor in electrical communication with the controller, the first sensor configured to generate a first signal responsive to movement of the flexible member;

a second sensor in electrical communication with the controller, the second sensor configured to generate a second signal indicative of an amount of selected resistance;

wherein the controller, based on the first signal and the second signal, is configured to determine quantified exercise data; and a graphical user display, wherein based on the quantified exercise data, exercise event data is displayable on the graphical user display.

20. An exercise apparatus of claim 19, further comprising an identification module configured to receiving user indicia from a user.

21. An exercise apparatus of claim 20, wherein the controller is in communication with a data store, and wherein the quantified exercise data is stored in the data store.

22. An exercise apparatus of claim 21, wherein the data store is remote from the controller and is in communication with the controller via networked communications.

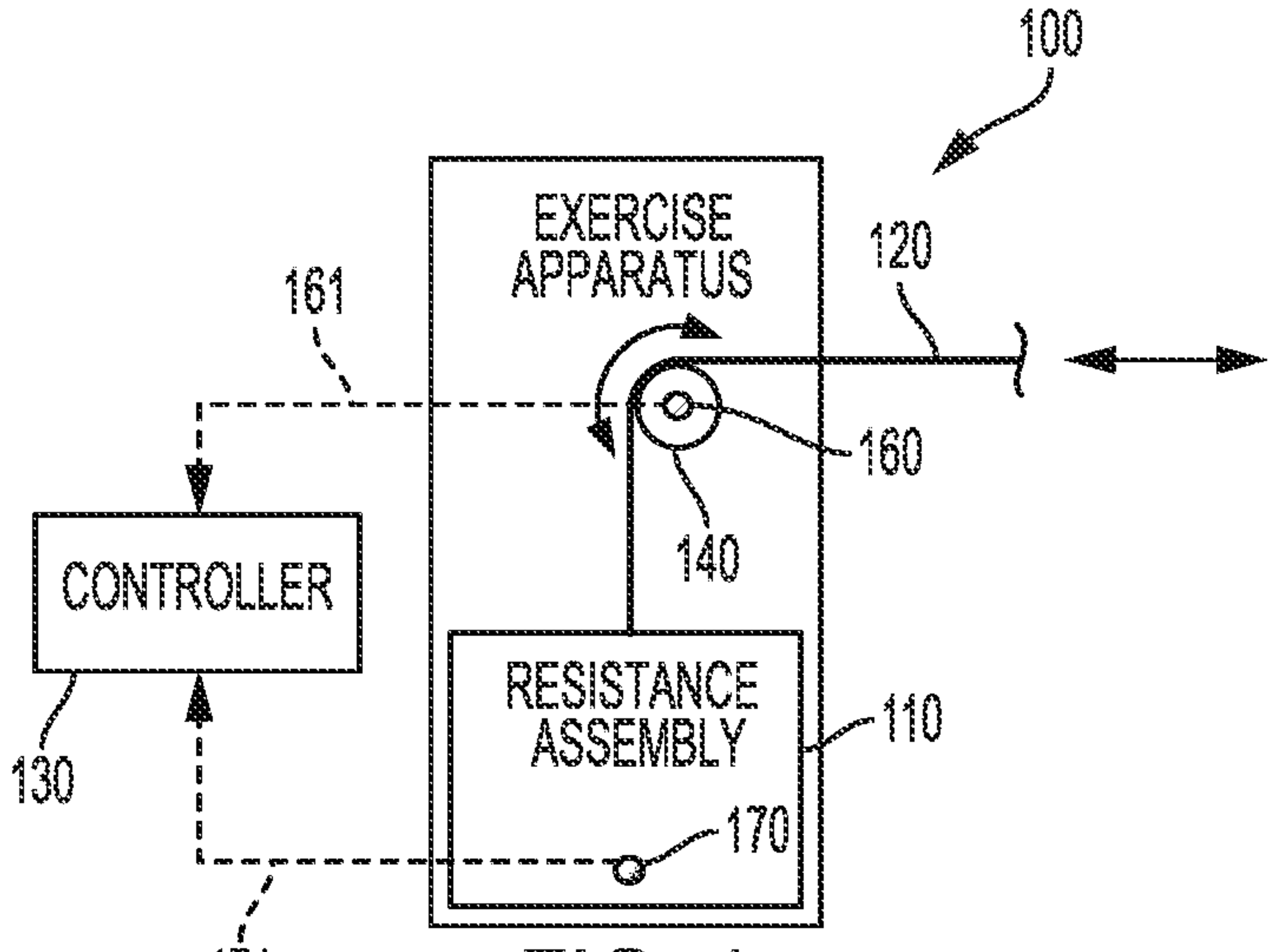


FIG. 1

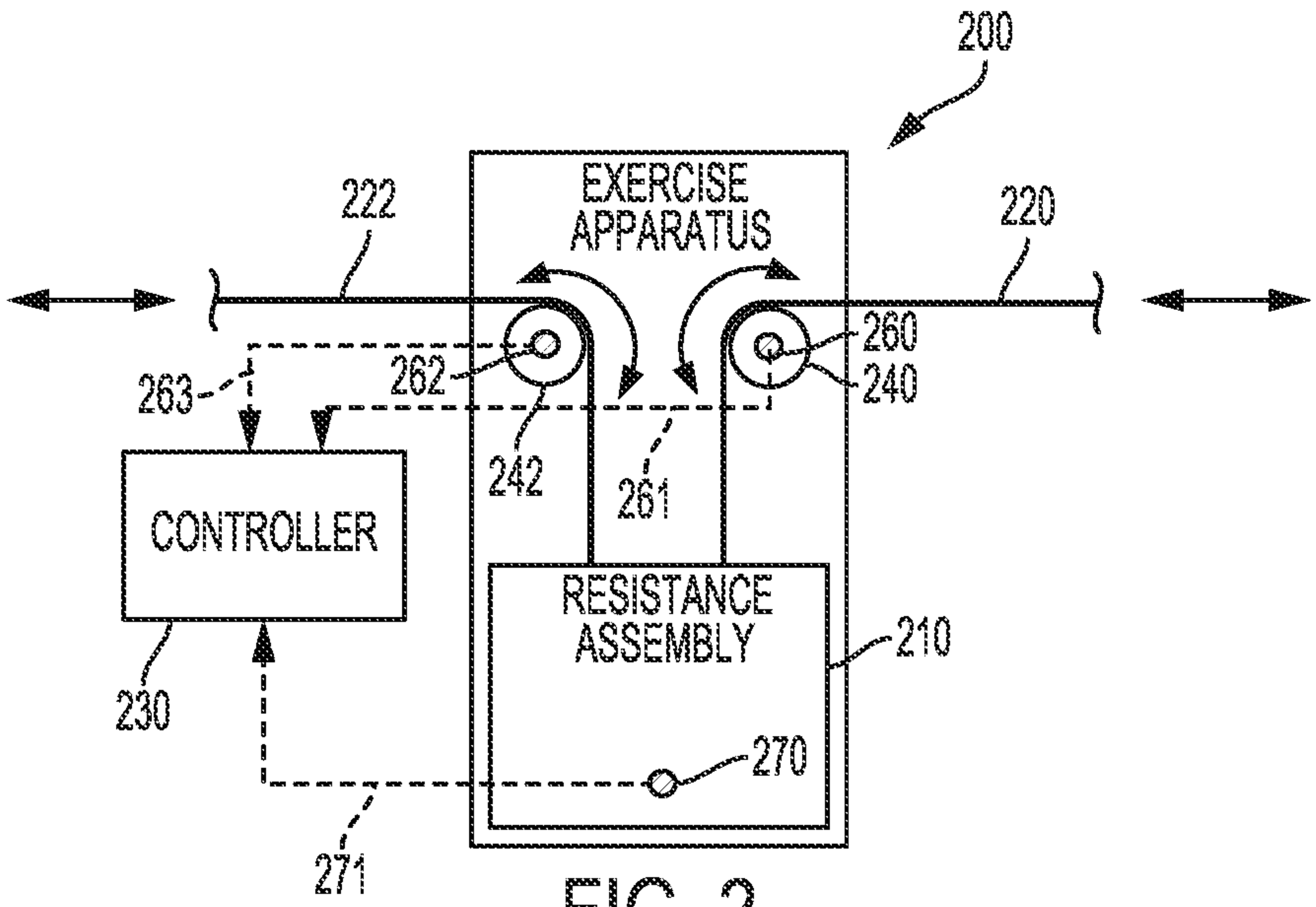


FIG. 2

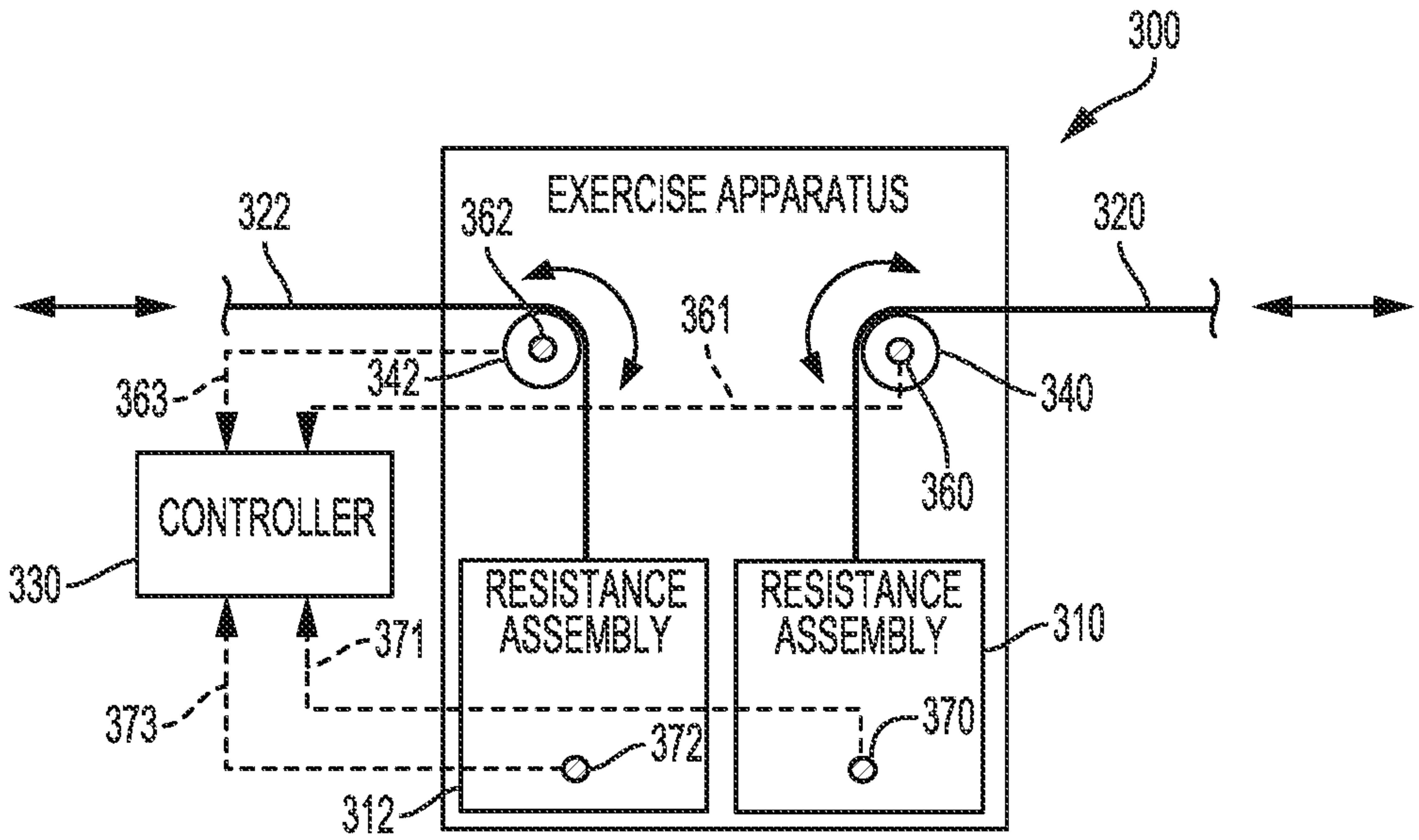


FIG. 3

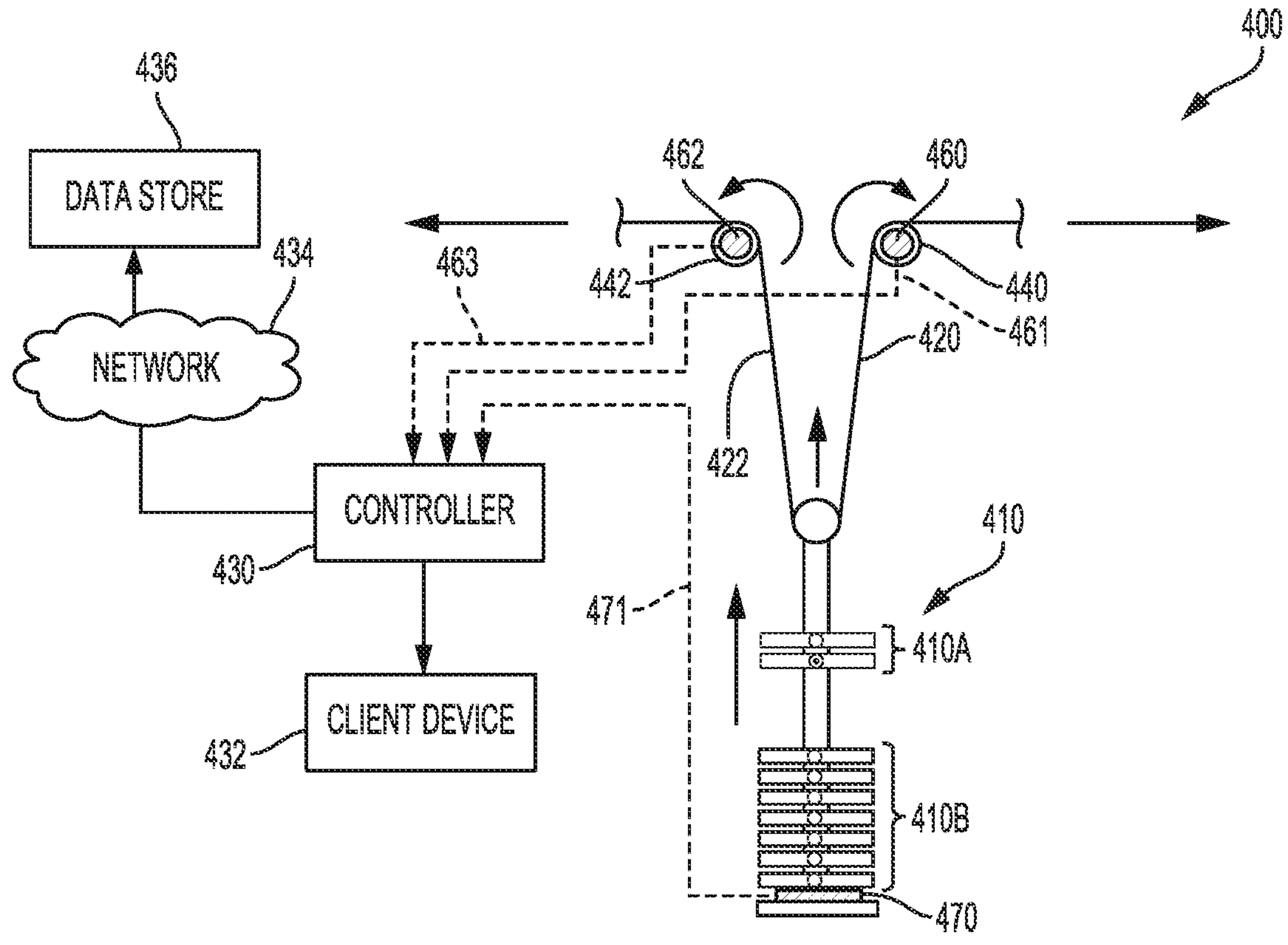
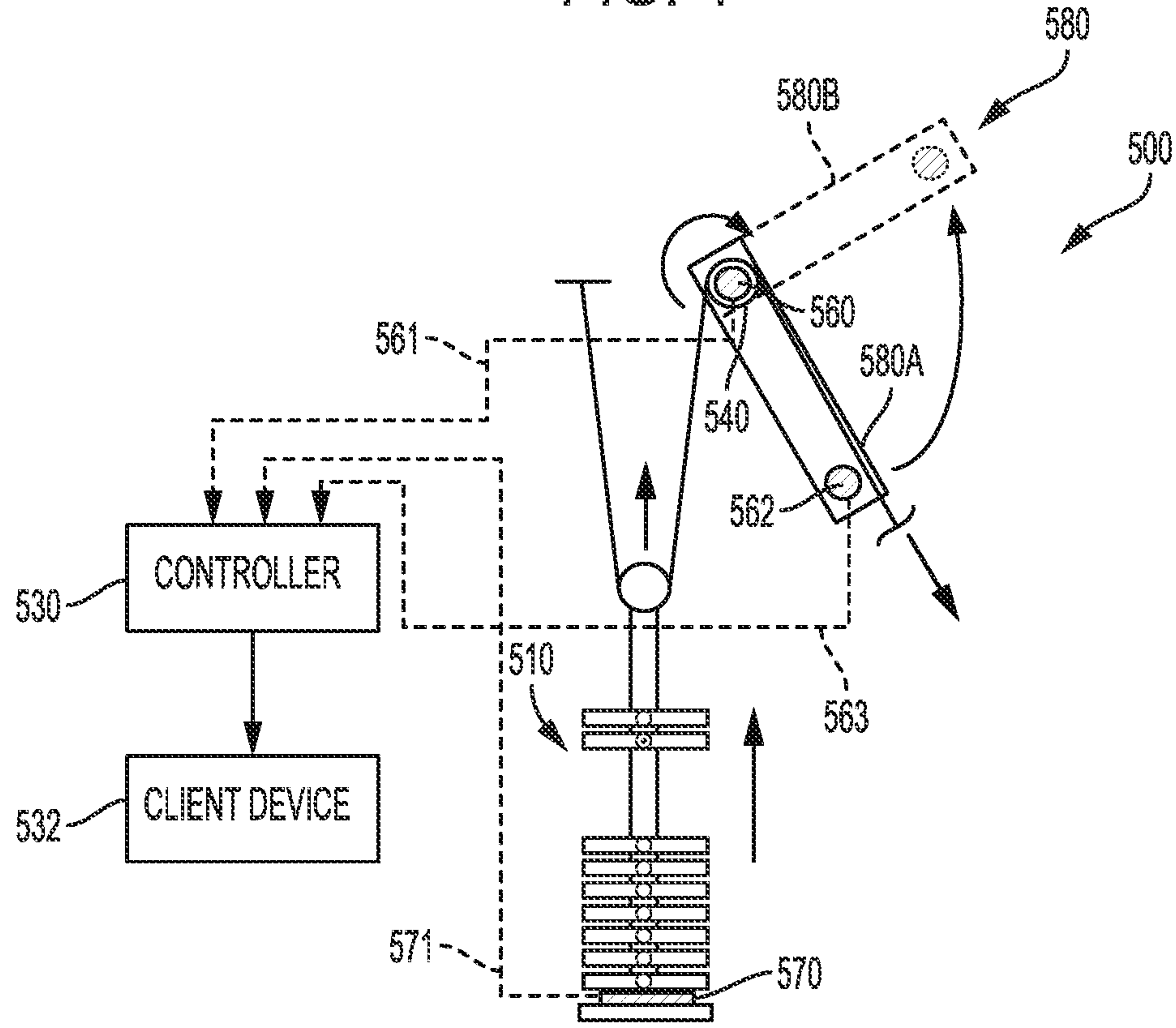

400
436
DATA STORE
434
NETWORK
462
460
463
442
440
461
420
422
CONTROLLER
430
410
471
410A
CLIENT DEVICE
432
410B
470

FIG. 4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580B
500
560
561
540
580A
562
CONTROLLER
530
563
510
CLIENT DEVICE
532
571
570

FIG. 5

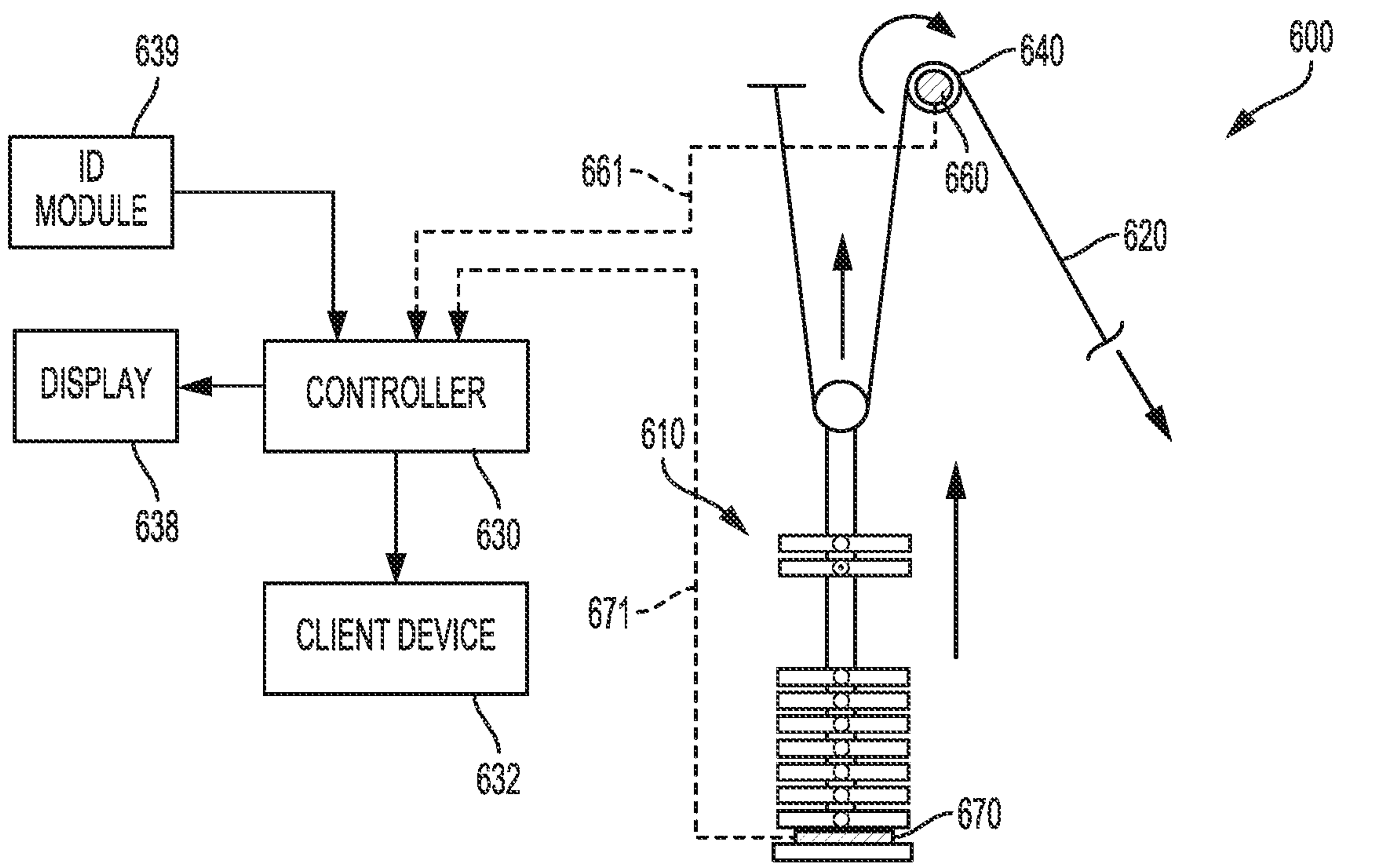
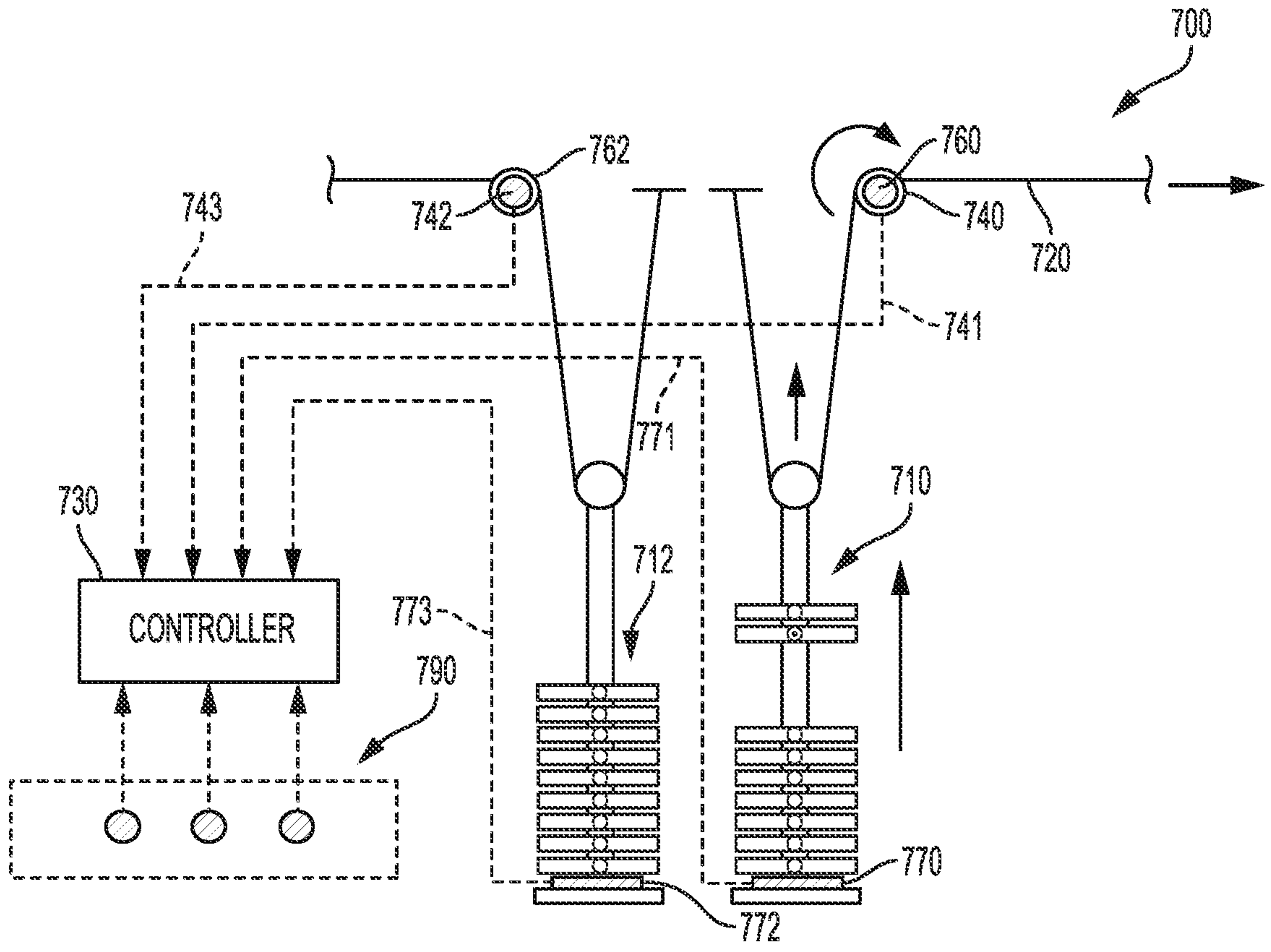

639
ID
MODULE
DISPLAY
CONTROLLER
CLIENT DEVICE
638
630
632
661
671
610
640
660
620
600
670

FIG. 6


700
762
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743
760
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720
741
771
730
CONTROLLER
773
712
710
790
770
772

FIG. 7

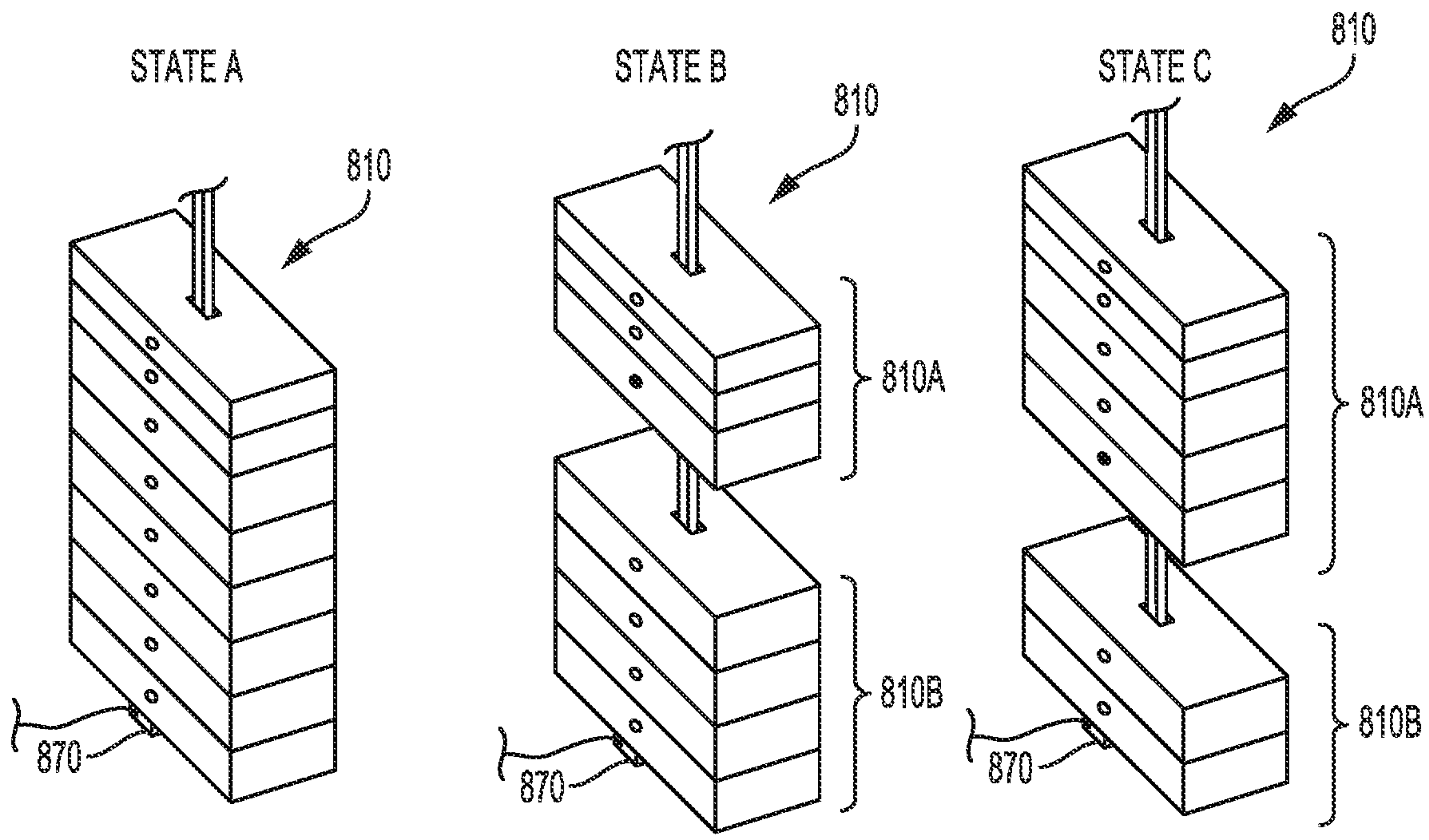

STATE A
STATE B
STATE C
810
810
810
810A
810A
810B
810B
870
870
870

FIG. 8

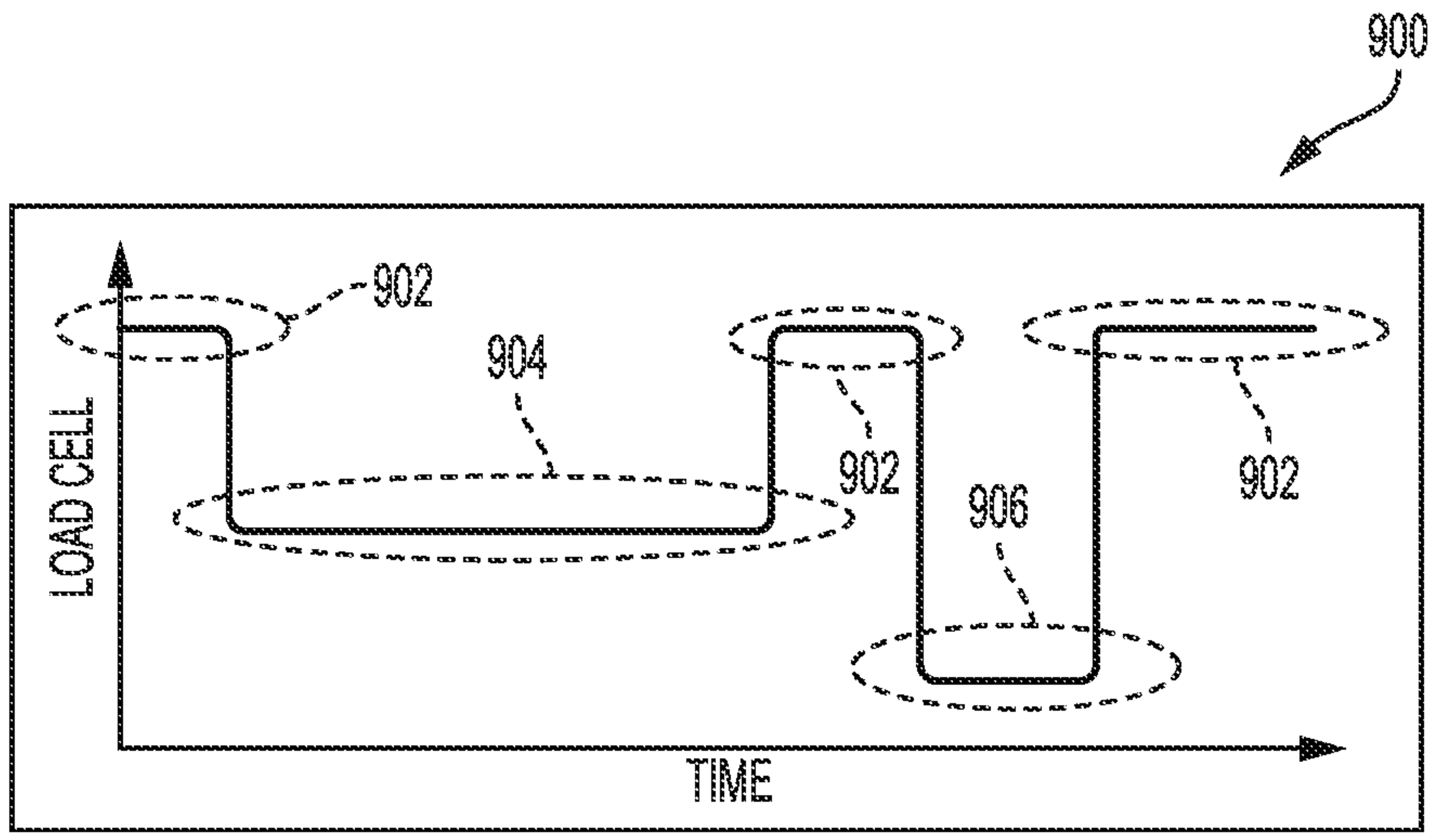
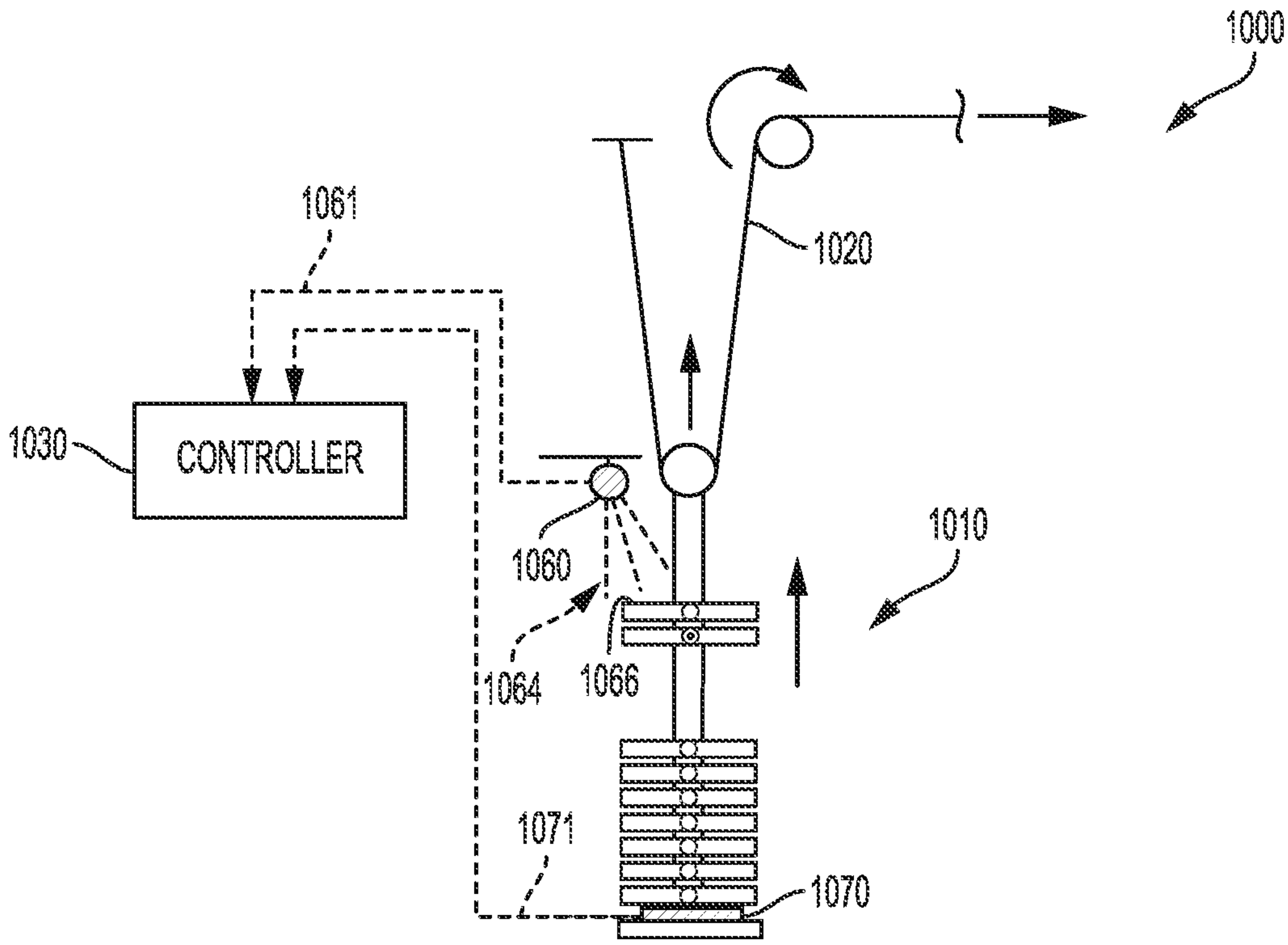

900
902
904
902
906
902
LOAD CELL
TIME

FIG. 9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1061
1020
1030
CONTROLLER
1060
1010
1064
1066
1071
1070

FIG. 10

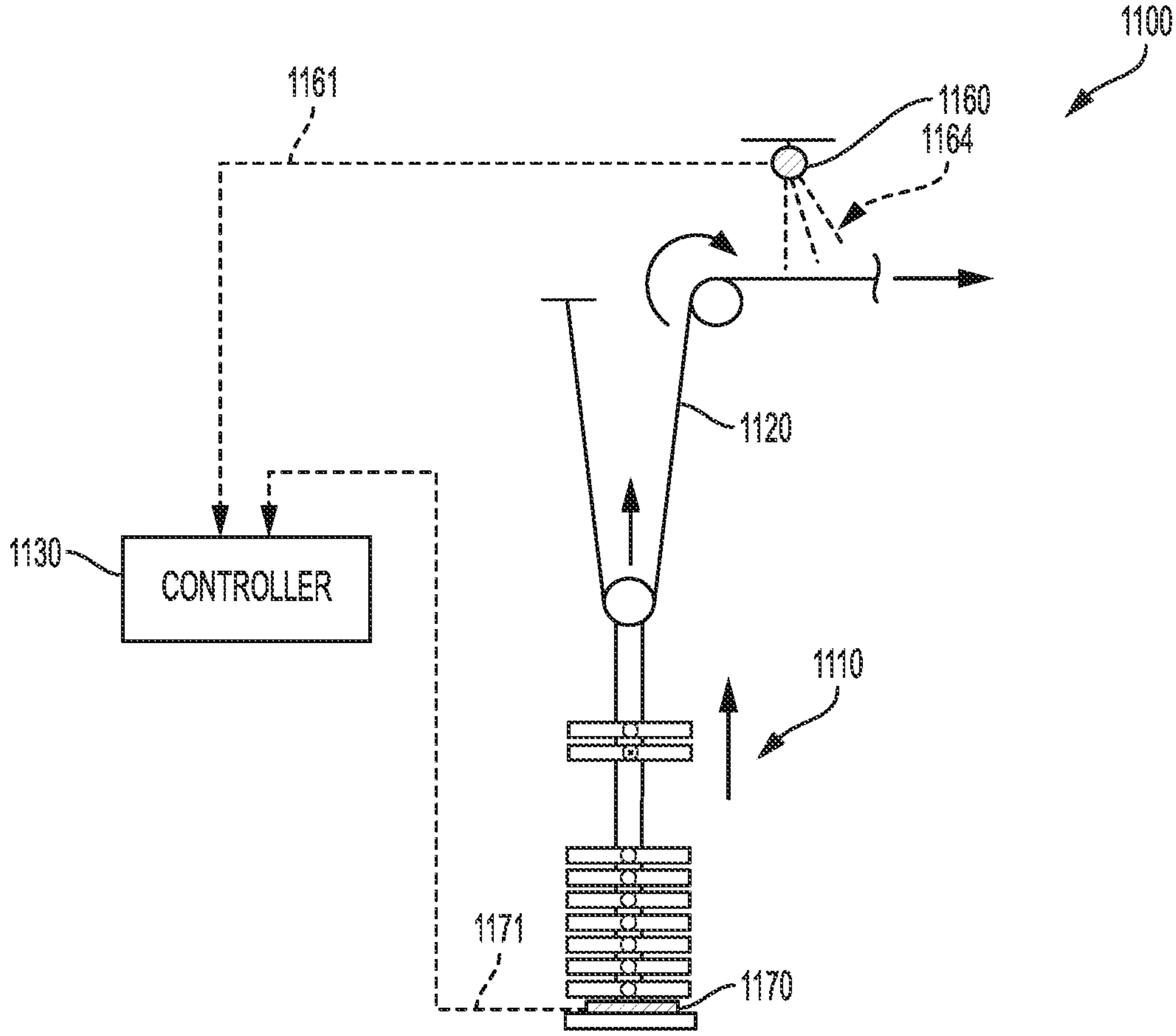
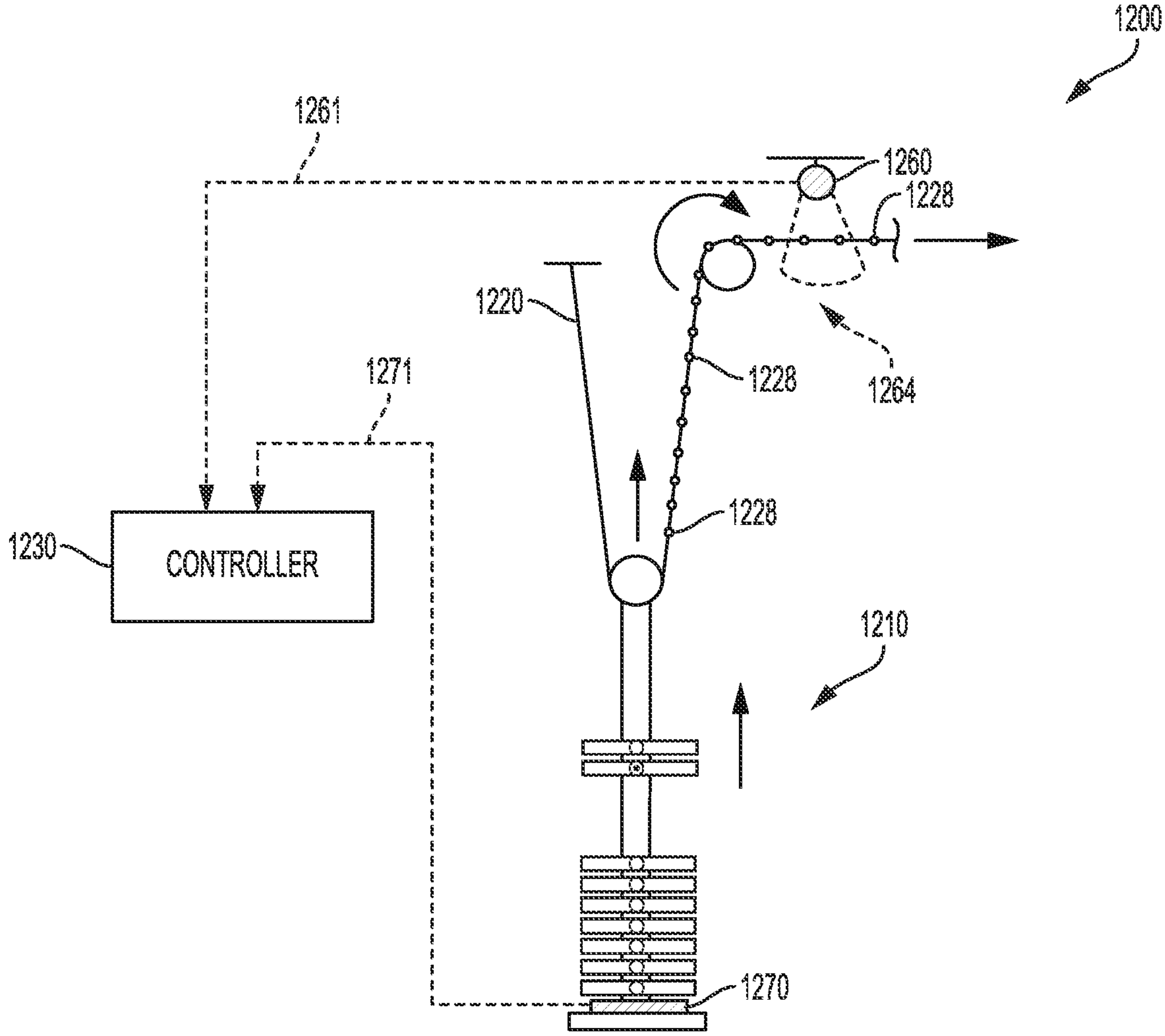

1100
1161
1160
1164
1120
1130
CONTROLLER
1110
1171
1170

FIG. 11


1200
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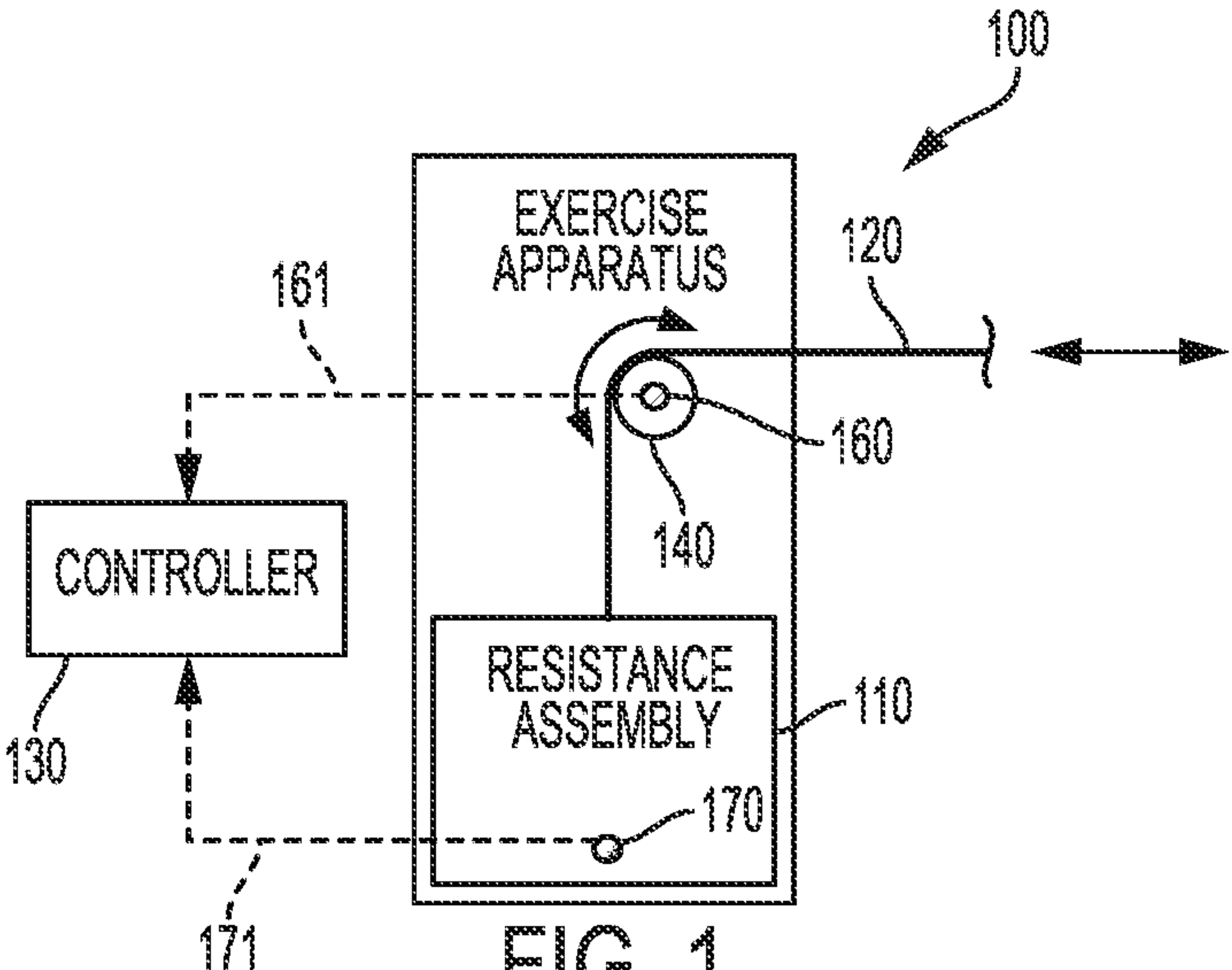
1220
1228
1264
1271
1228
1230
CONTROLLER
1210
1270

FIG. 12


100
EXERCISE APPARATUS
120
161
160
140
CONTROLLER
RESISTANCE ASSEMBLY
110
130
170
171
FIG. 1