(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 215 241 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
14.08.2019 Bulletin 2019/33

(21) Application number: **14809171.3**

(22) Date of filing: **11.11.2014**

(51) Int Cl.:
A63B 21/22 *(2006.01)* ***A63B 22/00*** *(2006.01)*
A63B 71/06 *(2006.01)* ***A63B 22/06*** *(2006.01)*
A63B 23/04 *(2006.01)* ***A63B 71/02*** *(2006.01)*
A63B 21/008 *(2006.01)* ***A63B 21/00*** *(2006.01)*

(86) International application number:
PCT/US2014/064965

(87) International publication number:
WO 2016/076836 (19.05.2016 Gazette 2016/20)

(54) **EXERCISE APPARATUS**

ÜBUNGSVORRICHTUNG

APPAREIL D'EXERCICE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
13.09.2017 Bulletin 2017/37

(60) Divisional application:
18186701.1 / 3 417 917

(73) Proprietor: **Cybex International, Inc.**
Medway, MA 02053 (US)

(72) Inventors:
- **GIANNELLI, Raymond**
Franklin, MA 02038 (US)
- **BUONTEMPO, Mark**
Millville, MA 01529 (US)

(74) Representative: **Driver, Virginia Rozanne**
Page White & Farrer
Bedford House
John Street
London WC1N 2BF (GB)

(56) References cited:
US-A- 267 042
US-A- 287 891
US-A- 4 344 616
US-A- 4 776 582
US-A- 5 626 538
US-A1- 2002 091 042
US-A1- 2004 224 825
US-A1- 2006 172 864
US-A1- 2010 267 524
US-B1- 7 547 267

EP 3 215 241 B1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to physical exercise machines and more particularly to an exercise apparatus that enables users to perform simulated walking, running or other back and forth leg movement exercise that is resisted by a resistance mechanism.

BACKGROUND OF THE INVENTION

[0002] Exercise machines for simulating walking or running are known and used for directing the movement of a user's legs and feet in a variety of repetitive paths of travel. The user typically performs an exercise using such a walking or running machine for an extended period of time such as one to 30 minutes without interruption and without stopping to perform a different exercise using a different machine such as a user might perform in a circuit protocol of exercise. The machines typically include an electrically powered mechanism that the user can activate to adjust some aspect of the machine such as degree of resistance. Running or walking simulation machines commonly referred to as elliptical path machines have been designed to pivot the foot pedals on which the user's feet reside guiding the pedals and the user's feet to travel in an elliptical or arcuate path. The degree of resistance to performance of the exercise in such prior art machines typically varies linearly with the degree of force or speed exerted by the user to a moving mechanical component of the apparatus. The path of travel of the foot pedal in such prior machines is not adjustable other than to change the shape of the ellipse. The foot travels along a different path from back to front than from front to back in such elliptical machines.

[0003] US2004224825 discloses an apparatus and method for simulating a back and forth leg or foot movement, the apparatus comprising: a pair of pivotable support mechanisms supported on a frame, a pair of foot pedals mounted on the support mechanisms for back and forth movement along an arcuate path of translation movement, the foot pedals being adjustable to a selected segment of an overall arcuate path of translation movement.

SUMMARY OF THE INVENTION

[0004] In accordance with the invention there is provided an exercise apparatus according to claim 1. In another aspect, the present invention provides a method according to claim 4. In a still further aspect, the present invention provides a method according to claim 5.

FURTHER ASPECTS OF THE DISCLOSURE

[0005] Also disclosed is an exercise apparatus comprising:

a foot support suspended from above by a suspension assembly on a frame, the foot support being adapted to support a user in an upright position with the user's foot disposed on the foot support.

the foot support being movable by the user on the frame back and forth between a rearwardmost downward position and a forwardmost upward position through any one of a plurality of complete, reproducible and different arc segments of a master arcuate path that has the same path of travel from the rearwardmost downward position to the forwardmost upward position and back to the rearwardmost downward position, each different arc segment being individually selectable by the user,

each said different arc segment being defined by movement of the foot support between a corresponding different forwardmost upward position and different rearwardmost downward position, each of said different arc segments having a different degree of incline corresponding to each different forwardmost upward and rearwardmost downward position of the foot support,

wherein movement of the foot support between the rearwardmost downward position and the forwardmost upward position and back to the rearwardmost downward position defines a complete exercise cycle,

a resistance assembly interconnected to the foot support, the resistance assembly being adapted to exert a resistance to movement of the foot support by the user,

an arc segment selection device interconnected to the foot support, the arc segment selection device being manually actuatable by the user to enable the user to move the arc segment selection device to any selectable one of a plurality of different fixed mechanical positions that fix or limit travel of the foot support via interconnection to the arc segment selection device to a corresponding one of the plurality of different arc segments, the user selecting one of the plurality of different arc segments by exerting a selected amount or
degree of manual force on the arc segment selection device that corresponds to a selected one of the plurality of different fixed mechanical positions.

[0006] The manual force exerted by the user on the arc segment selection device typically comprises an initial impetus force to move the arc segment selection device from a resting position and a driving force to complete movement of the arc segment selection device from the resting position to a selected one of the plurality of different fixed mechanical positions.

[0007] The arc segment selection device is preferably interconnected to the resistance assembly, the resistance assembly being movable to one of a plurality of different fixed resistance assembly positions corresponding to the selected amount or degree of manual force exerted by the user on the selection device.

[0008] The manual force typically includes a termination force to lock the selection device into place when selection of an arc segment has been completed.

[0009] The arc segment selection device can comprises a screw having a handle adapted for ready manual engagement by the user to turn the screw a selectable rotational degree, the screw being screwably mounted to the frame such that the screw is translationally movable a corresponding selectable distance relative to the frame on manual turning of the screw by the selectable rotational degree by the user, the screw being interconnected to the foot support such that translational movement of the screw the selectable distance fixes or limits travel of the foot support to a corresponding one of the plurality of different arc segments.

[0010] The arc segment selection device can comprises a pivotable lever pivotably mounted to the frame and interconnected to the foot support, the lever having a proximal handle readily manually accessible by a user standing on the foot support such that the user can selectively pivot the lever a selected arcuate degree, the pivoting of the lever the selected arcuate degree limiting travel of the foot support through corresponding one of the plurality of different arc segments.

[0011] The pivotable lever is preferably interconnected to the resistance assembly and the resistance assembly is interconnected to the foot support such that manual pivoting of the lever a selected arcuate degree moves the resistance assembly to selected one of a plurality of different resistance assembly positions that correspond to one of the plurality of different arc segments.

[0012] The pivotable lever typically includes a manually actuatable detent that is manually actuatable to unlock the detent such that lever is freely pivotable to the selected arcute degree and is manually actuatable to lock the detent into one of a plurality of complementary tooth receptacles disposed in a bracket mounted to the frame that correspond to selected ones of the plurality of different arc segments.

[0013] The arc segment selection device can comprise a fluid driven piston mounted in a fluid sealed cylinder having a drive axis, the piston being manually drivable by application of the manual force applied by the user to drive fluid contained within the cylinder to translationally drive the piston along the drive axis of the cylinder to a selectable one of a plurality of translation positions that correspond to one of the plurality of different arc segments.

[0014] The piston can be interconnected to the resistance assembly and the resistance assembly is interconnected to the foot support such that manual driving of the piston to a selected translation position moves the resistance assembly to selected one of a plurality of different resistance assembly positions that correspond to one of the plurality of different arc segments.

[0015] In another aspect of the disclosure there is provided a method of performing a simulated walking or running exercise using an apparatus as described immediately above, the method comprising:

selecting one of the different arc segments and,
manually actuating the arc segment selection device to move the arc segment selection device to one of the plurality of different fixed mechanical positions that fix or limit travel of the foot support to the selected one of the plurality of different arc segments.

[0016] In another aspect of the disclosure there is provided a method of performing multiple different exercises in time sequential manner by an exerciser, the method comprising:

the exerciser's selecting at least first and second different exercise regimes that require exercise of different muscle groups,
the exerciser's performing and completing a selected one of the first or second exercise regimes,
substantially immediately after the step of performing and completing the selected one of the first or second exercise regimes, the exerciser's performing and completing the other of the first or second exercise regimes,
wherein the first exercise regime comprises performing a walking or running exercise as described immediately above.

[0017] In another aspect of the disclosure there is provided an exercise apparatus comprising:

a foot support suspended from above by a suspension assembly on a frame, the foot support being adapted to support a user in an upright position with the user's foot disposed on the foot support.

the foot support being movable by the user on the frame back and forth between a rearwardmost downward position and a forwardmost upward position through any one of a plurality of complete, reproducible and different arc segments of a master arcuate path that has the same path of travel from the rearwardmost downward position to the forwardmost upward position and back to the rearwardmost downward position, each different arc segment being individually selectable by the user,

each said different arc segment being defined by movement of the foot support between a corresponding different forwardmost upward position and different rearwardmost downward position, each of said different arc segments having a different degree of

incline corresponding to each different forwardmost upward and rearwardmost downward position of the foot support,

wherein movement of the foot support between the rearwardmost downward position and the forwardmost upward position and back to the rearwardmost downward position defines a complete exercise cycle,

an arc segment selection device interconnected to the foot support, the arc segment selection device being manually actuatable by the user to enable the user to move the arc segment selection device to any selectable one of a plurality of different fixed mechanical positions that fix or limit travel of the foot support via interconnection to the arc segment selection device to a corresponding one of the plurality of different arc segments, the user selecting one of the plurality of different arc segments by exerting a selected amount or degree of manual force on the arc segment selection device that corresponds to a selected one of the plurality of different fixed mechanical positions of the arc segment selection device,

a resistance assembly interconnected to the foot support and the arc segment selection device in an arrangement such that the resistance assembly is manually movable to one of a plurality of different fixed resistance assembly positions that correspond to the selected amount or degree of manual force exerted by the user on the selection device and a corresponding one of the plurality of fixed mechanical positions of the arc segment selection device.

[0018] In another aspect of the disclosure there is provided a method of performing a simulated walking or running exercise using an apparatus as described immediately above, the method comprising:

selecting one of the different arc segments and,
manually actuating the arc segment selection device to move the arc segment selection device to one of the plurality of different fixed mechanical positions that fix or limit travel of the foot support to the selected one of the plurality of different arc segments.

[0019] In another aspect of the disclosure there is provided an exercise apparatus comprising:

a foot support suspended from above by a suspension assembly on a frame, the foot support being adapted to support a user in an upright position with the user's foot disposed on the foot support.

the foot support being movable by the user on the frame back and forth between a rearwardmost downward position and a forwardmost upward position through any one of a plurality of complete, reproducible and different arc segments of a master arcuate path that has the same path of travel from the rearwardmost downward position to the forwardmost upward position and back to the rearwardmost downward position, each different arc segment being individually selectable by the user,

each said different arc segment being defined by movement of the foot support between a corresponding different forwardmost upward position and different rearwardmost downward position, each of said different arc segments having a different degree of incline corresponding to each different forwardmost upward and rearwardmost downward position of the foot support,

wherein movement of the foot support between the rearwardmost downward position and the forwardmost upward position and back to the rearwardmost downward position defines a complete exercise cycle,

a resistance assembly interconnected to the foot support, the resistance assembly being adapted to exert a resistance to movement of the foot support by the user,

an arc segment selection device interconnected to the foot support, the arc segment selection device being manually actuatable by the user to enable the user to move the arc segment selection device to any selectable one of a plurality of different fixed mechanical positions that fix or limit travel of the foot support via interconnection to the arc segment selection device to a corresponding one of the plurality of different arc segments,

the user selecting one of the plurality of different arc segments by exerting a selected amount or degree of manual force comprising an initial impetus force to move the arc segment selection device from a resting position and a driving force to complete movement of the arc segment selection device from the resting position to a selected one of the plurality of different fixed mechanical positions.

[0020] The arc segment selection device is preferably interconnected to the resistance assembly, the resistance assembly being movable to one of a plurality of different fixed resistance assembly positions corresponding to the selected amount or degree of manual force exerted by the user on the selection device.

[0021] In another aspect of the disclosure there is provided a method of performing a simulated walking or running exercise using the apparatus, comprising:

selecting one of the different arc segments and,
manually actuating the arc segment selection device to move the arc segment selection device to one of the plurality of different fixed mechanical positions that fix or limit travel of the foot support to the selected one of the plurality of different arc segments.

[0022] In another aspect of the disclosure, there is provided an exercise apparatus comprising:

a foot support supported by a linkage system on a frame having a laterally forward end and a laterally rearward end,
the foot support being supported on the frame by the linkage system for reciprocal movement along a master arcuate path of travel having a furthest forward to furthest rearward position,
the foot support being arranged on the frame in a disposition for receiving a user's foot to support the user in a standing upright position,
the foot support being interconnected to a non-linearly force dependent resistance mechanism,
the interconnection of the foot support and the non-linearly force dependent resistance mechanism comprising an adjustment device that is actuatable by the user to selectively adjust positioning of the force resistance mechanism in or to any one of a plurality of predetermined fixed mechanical positions relative to the foot support,
wherein actuation of the adjustment device to position the non-linearly force dependent resistance mechanism in or to one of the predetermined fixed mechanical positions of the non-linearly dependent force resistance mechanism limits travel of the foot support to a selectable segment of the master arcuate path of travel having a forwardmost segment position and rearwardmost segment position that are defined by and peculiar to the fixed position of the non-linearly dependent resistance mechanism,
the foot support being mechanically movable along any selectable segment by a user standing in an upright position and exerting a laterally forward to rearward directed force of selected degree on the foot support with the foot of the user,
the non-linearly force dependent resistance mechanism being adapted to mechanically vary resistance to movement of the foot support to a degree that varies non-linearly with the selected degree of speed, velocity, force, work or power exerted by the user on the foot support or the resistance assembly.

[0023] The term "non-linear" or "non-linearly" is meant to encompass and include an exponential or geometric relationship between the degree of increase in resistance and the degree of increase in velocity or speed of movement of a mechanical component of the apparatus as a result of force exerted by the user on the mechanical component such as the translational movement of a foot pedal or the rotational movement of a fan wheel. Also, as discussed below, the term "force" is intended to encompass and include user exerted power, energy or work which are all directly proportional to force. As shown generically in Fig. 3B, in embodiments described herein where the resistance assembly includes a fan such as wheel 200, the degree of resistance or opposing force OF that the finned or fan wheel 200 exerts in response to a user's input of force, work or power increases non-linearly 310, Fig. 3B, with increasing speed or rate of rotation SR of the wheel 200. Typically the degree of such resistance increases exponentially or geometrically and more specifically by a cube or cubed factor of or with the degree of speed of rotation SR of a fan wheel. The degree of increase in resistance may vary in another or different mathematically determinable non-linear manner with respect to a translational, sliding, arcuate or pivoting movement of another or different mechanical component of the apparatus such as a lever or tie bar or the like. Other resistance mechanisms other than a finned 210 wheel 200 such as an Eddy current controlled brake mechanism with programmable controls that can be employed that increase, decrease or vary in degree of resistance relative to the force F exerted by the user in a non-linear, geometric or exponential manner or relationship.

[0024] In such an apparatus the non-linearly force dependent resistance mechanism preferably includes a mechanical member that mechanically moves in response to force exerted by the user on the foot support, the movement of the mechanical member mechanically generating a resistance that varies non-linearly with the speed, velocity, force, work or power exerted by the user on the foot support or the resistance assembly.

[0025] The non-linearly force dependent resistance mechanism preferably mechanically varies resistance to movement of the foot support to a degree that varies either exponentially or geometrically with the selected speed, velocity, force, work or power exerted by the user on the foot support or the resistance assembly.

[0026] The foot support is preferably adapted to move upwardly and downwardly on movement of the foot support along a segment, the user exerting a force directed in an upward, downward direction during movement of the foot support along a selected segment.

[0027] Each segment preferably has forwardmost upward segment position and a rearwardmost downward segment position that define a complete cycle, each segment having a different forwardmost upward segment position and a different rearwardmost downward segment position.

[0028] Most preferably the non-linearly force dependent resistance mechanism comprises a wheel having a drivably rotatable axle interconnected to one or more blades that forcibly engage against air on rotation of the axle. The axle of the wheel is typically fixedly interconnected to a crank arm that is interconnected to the foot support such that forward and backward movement of the foot support turns the crank arm.

[0029] The foot support is typically mechanically interconnected to the non-linearly force dependent resistance mechanism,
the mechanical interconnection of the foot support and the non-linearly force dependent resistance mechanism comprising a mechanical adjustment device that is manually actuatable by the user to selectively adjust positioning of the non-linearly force dependent resistance mechanism in or to any one of a plurality of fixed positions relative to the foot support,
wherein manual actuation of the mechanical adjustment device to position the non-linearly force dependent resistance mechanism in or to one of the fixed positions of the mechanical resistance mechanism limits travel of the foot support to a selectable segment of the master arcuate path of travel having a forwardmost segment position and rearwardmost segment position that are defined by and peculiar to the fixed position of the force resistance mechanism.

[0030] The apparatus can further comprise:

a vibration generation device that is interconnected to a support component of the apparatus such that activation of the vibration generation device transmits vibration force or energy to the user,
a sound generator that generates audio signals that are converted to sound that is audible to the user while performing the selected exercise using the apparatus,
a controller interconnected to the sound generator and the vibration generation device, the controller including instructions that activate the vibration generation to generate and transmit a selected degree of vibration force or energy to the one or more interconnected transmission components according a predetermined algorithm,
the controller receiving the audio signals for input of one or more components of the audio signals to the predetermined algorithm ,
the predetermined algorithm including instructions that utilize the one or more components of the received audio signals as variables in a program that instructs the vibration generation device to activate and transmit vibration force or energy to the one or more transmission components of the apparatus to a controlled degree, intensity, amplitude, duration and frequency that varies according to the one or more components of the received audio signals.

[0031] In another aspect of the disclosure there is provided a method of varying the degree of resistance in a non-linear relationship to a the degree of force exerted by a user in performance of an exercise on an exercise apparatus comprised of a foot support supported by a linkage system on a frame having a laterally forward end and a laterally rearward end, the foot support being supported on the frame by the linkage system for reciprocal movement along a master arcuate path of travel having a furthest forward to furthest rearward position, the foot support being supported on the frame for receiving a user's foot to support the user in a standing upright position, the method comprising:

interconnecting the foot support to a non-linearly force dependent resistance mechanism,
interconnecting the foot support and the non-linearly force dependent resistance mechanism via an adjustment device that is actuatable by the user to selectively adjust positioning of the force resistance mechanism in or to any one of a plurality of fixed positions relative to the foot support,
actuating the adjustment device to position the non-linearly force dependent resistance mechanism in or to one of the fixed positions of the non-linearly dependent force resistance mechanism,
adapting the interconnection of the foot support and the non-linearly force dependent resistance mechanism to limit travel of the foot support to selectable segments of the master arcuate path of travel each having a forwardmost segment position and rearwardmost segment position that are defined by and peculiar to the fixed position of the non-linearly dependent resistance mechanism,
disposing a user in a standing upright position on the foot support and forcibly exerting a selectable degree of laterally forward to rearward directed force on the foot support with the foot of the user,
adapting the non-linearly force dependent resistance mechanism to mechanically vary resistance to movement of the foot support to a degree that varies non-linearly with the selected degree of speed, velocity, force, work or power exerted by the user on the foot support or the resistance assembly.

[0032] Such a method typically further comprises adapting the non-linearly force dependent resistance mechanism to generate resistance in response to movement of a mechanical member wherein the resistance varies non-linearly with the degree of speed, velocity, force, work or power exerted by the user on the foot support or the resistance assembly.

[0033] The non-linearly force dependent resistance mechanism preferably mechanically varies resistance to movement of the foot support to a degree that varies either exponentially or geometrically with the selected degree of speed, velocity, force, work or power exerted by the user on the foot support or the resistance assembly.

[0034] Such a method can further comprise adapting the foot support to move upwardly and downwardly on movement of the foot support along a segment, the user exerting a force directed in an upward, downward direction during movement of the foot support along a selected segment.

[0035] Such a method can further comprise adapting the foot support to be supported such that each segment

has forwardmost upward segment position and a rearwardmost downward segment position that define a complete cycle, each segment having a different forwardmost upward segment position and a different rearwardmost downward segment position.

[0036] Such a method can further comprise adapting the non-linearly force dependent resistance mechanism to comprise a wheel having a drivably rotatable axle interconnected to one or more blades that forcibly engage against air on rotation of the axle.

[0037] Such a method can further comprise adapting the axle of the wheel to be fixedly interconnected to a crank arm that is interconnected to the foot support such that forward and backward movement of the foot support turns the crank arm.

[0038] In another aspect of the disclosure there is provided an exercise apparatus comprising:

a foot support supported by a linkage system on a frame having a laterally forward end and a laterally rearward end,
the foot support being supported on the frame by the linkage system for reciprocal movement along a master arcuate path of travel having a furthest forward to furthest rearward position,
the foot support being arranged on the frame in a disposition for receiving a user's foot to support the user in a standing upright position,
the foot support being interconnected to a non-linearly force dependent resistance mechanism,
the foot support being mechanically movable along the master arcuate path of travel by a user standing in an upright position and exerting a laterally forward to rearward directed force of selected degree on the foot support with the foot of the user,
the non-linearly force dependent resistance mechanism being adapted to mechanically vary resistance to movement of the foot support to a degree that varies non-linearly with the selected degree of speed, velocity, force, work or power exerted by the user on the foot support or the resistance assembly.

[0039] In such an apparatus the non-linearly force dependent resistance mechanism typically includes a mechanical member that mechanically moves in response to force exerted by the user on the foot support, the movement of the mechanical member mechanically generating a resistance that varies non-linearly with the degree of speed, velocity, force, work or power exerted by the user on the foot support or the resistance assembly.

[0040] The non-linearly force dependent resistance mechanism preferably mechanically varies resistance to movement of the foot support to a degree that varies either exponentially or geometrically with the selected degree of speed, velocity, force, work or power exerted by the user on the foot support or the resistance assembly.

[0041] The foot support is preferably adapted to move upwardly and downwardly on movement of the foot support along a segment, the user exerting a force directed in an upward, downward direction during movement of the foot support along a selected segment.

[0042] The non-linearly force dependent resistance mechanism preferably comprises a wheel having a drivably rotatable axle interconnected to one or more blades that forcibly engage against air on rotation of the axle. The axle of the wheel is preferably fixedly interconnected to a crank arm that is interconnected to the foot support such that forward and backward movement of the foot support turns the crank arm.

[0043] Each segment typically has forwardmost upward segment position and a rearwardmost downward segment position that define a complete cycle, each segment having a different forwardmost upward segment position and a different rearwardmost downward segment position.

[0044] In another aspect of the disclosure there is provided an exercise apparatus comprising:

a foot support suspended from above by a suspension assembly on a frame,

the foot support being movable by the user on the frame back and forth between a rearwardmost downward position and a forwardmost upward position through any one of a plurality of complete, reproducible and different arc segments of a master arcuate path that is the same path from the rearwardmost downward position to the forwardmost upward position and back to the rearwardmost downward position, each different arc segment being individually selectable by the user,

each said different arc segment being defined by movement of the foot support between a corresponding different forwardmost upward position and different rearwardmost downward position, each of said different arc segments having a different degree of incline corresponding to each different forwardmost upward and rearwardmost downward position of the foot support,

wherein movement of the foot support between the rearwardmost downward position and the forwardmost upward position and back to the rearwardmost downward position defines a complete exercise cycle,

a resistance assembly interconnected to the foot support, the resistance assembly being adapted to exert a resistance to movement of the foot support by the user that a resistance assembly interconnected to the foot support, the resistance assembly being adapted to exert a resistance to movement of the foot support by the user that varies non-linearly with the degree of speed, velocity, force, work or energy

exerted by the user on the foot support or the resistance assembly, the foot support being adapted to support the user in an upright position with the user's foot disposed on the foot support,

the foot support being interconnected to a selection device that enables the user to select any one of the plurality of arc segments.

[0045] In such an apparatus the selection device can be manually actuatable by the user to exert a selectable amount of manual force on the selection device that operates to selectively position the resistance assembly in one of a plurality of predetermined fixed mechanical positions according to the selectable amount of manual force exerted by the user on the selection device.

[0046] In such an apparatus the resistance assembly preferably comprises a fan interconnected to the foot support for rotation in response to back and forth movement of the foot support.

[0047] In another aspect of the disclosure there is provided an exercise apparatus comprising:

a foot support suspended from above by a suspension assembly on a frame and interconnected to a resistance assembly that exerts a resistance to movement of the foot support by a user, the foot support being adapted to support the user in an upright position with the user's foot disposed on the foot support,

a user interface that includes a visual display readily visually observable and manually accessible by the user when the user's foot is disposed on the foot support,

the foot support being movable by the user on the frame back and forth between a rearwardmost downward position and a forwardmost upward position through any one of a plurality of complete, reproducible and different arc segments of a master arcuate path that is the same path from the rearwardmost downward position to the forwardmost upward position and back to the rearwardmost downward position, each different arc segment being individually selectable by the user,

each said different arc segment being defined by movement of the foot support between a corresponding different forwardmost upward position and different rearwardmost downward position, each of said different arc segments having a different degree of incline corresponding to each different forwardmost upward and rearwardmost downward position of the foot support,

wherein movement of the foot support between the rearwardmost downward position and the forwardmost upward position and back to the rearwardmost downward position defines a complete exercise cycle,

the foot support being interconnected to a selection device that enables the user to select any one of the plurality of arc segments,

one or more detectors adapted to detect one or more of force, energy or power exerted by the user over time on the foot support or to detect distance or velocity of travel of the foot support or of the resistance assembly during the course of the user's performance of all or a portion of an exercise cycle,

the one or more detectors sending signals that are indicative of one or more of the detected force, energy, power, time, distance or velocity to a processor,

the processor receiving the signals from the one or more detectors and processing the signals according to a predetermined algorithm to generate a visually recognizable output format of one or more of said force, energy, power, time, distance, velocity or other result calculable from said signals,

the processor being interconnected to and sending the processed signals to the visual display, the visual display being arranged and displaying the processed signals to the user in the visually recognizable output format in a location on the apparatus that is readily observable by the user.

[0048] In such an apparatus the foot support and the resistance assembly are typically interconnected by the selection device, the selection device being operable by the user to selectively position the resistance assembly in any one of a plurality of predetermined fixed mechanical positions that respectively correspond to a selectable one of the plurality of arc segments.

[0049] The selection device is preferably manually actuatable by the user to exert a selectable amount of manual force on the selection device that operates to selectively position the resistance assembly in a one of the plurality of predetermined fixed mechanical positions according to the selectable amount of manual force exerted by the user on the selection device.

[0050] The resistance assembly can exert a degree of resistance that increases non-linearly with the degree of increase of force, energy or velocity of travel exerted by the user on the foot support.

[0051] The resistance assembly can exert a degree of resistance that increases exponentially or geometrically with the degree of increase of force, energy or velocity of travel exerted by the user on the foot support.

[0052] The resistance assembly can comprise a rotatable fan or blade adapted to rotate in response to movement of the foot support such ambient air impinges on and resists rotation of the fan or blade.

[0053] In such an apparatus the user interface can include a start button manually actuatable by the user to initiate detection of movement of the foot support by the one or more detectors upon manual actuation of the start button by the user.

[0054] The user interface can include a stop button manually actuatable by the user to stop detection of movement of the foot support by the one or more detec-

tors upon manual actuation of the stop button by the user.

[0055] The processor can include control instructions that instruct the processor to send processed signals to the visual display during a preselected interval of exercise time and to stop receiving signals from the detector or to stop sending the processed signals to the visual display on expiration of the preselected interval of exercise time, the user interface including an interval button interconnected to the processor that is manually actuatable by the user to input and send a signal to the processor that is indicative of the preselected interval of exercise time.

[0056] The control instructions can include instructions that define a preselected interval of rest time immediately subsequent to the preselected interval of exercise time, wherein during said preselected interval of the rest time the processor does not receive signals from the detector or does not send the processed signals to the visual display, the control instructions further including instructions that instruct the processor to repeat the preselected interval of exercise time and the preselected interval of rest time a preselected number of times following expiration of a first preselected interval of exercise time and a first preselected interval of rest time.

[0057] In another aspect of the disclosure there is provided a method of performing multiple different exercises in time sequential manner by an exerciser, the method comprising:

the exerciser's selecting at least first and second different exercise regimes that require exercise of different muscle groups,
the exerciser's performing and completing a selected one of the first or second exercise regimes,
substantially immediately after the step of performing and completing the selected one of the first or second exercise regimes, the exerciser's performing and completing the other of the first or second exercise regimes,
wherein the first exercise regime comprises performing an exercise by the exerciser using an apparatus comprising:

a foot support suspended from above by a suspension assembly on a frame and interconnected to a resistance assembly that exerts a resistance to movement of the foot support by a user, the foot support being adapted to support the user in an upright position with the user's foot disposed on the foot support,

a user interface that includes a visual display readily visually observable and manually accessible by the user when the user's foot is disposed on the foot support,

the foot support being movable by the user on the frame back and forth through any one of a plurality of complete, reproducible and different arc segments of a master arcuate path defined by the suspension assembly, each different arc segment being individually selectable by the user,
each said different arc segment being defined by movement of the foot support between a corresponding different forwardmost upward position and different rearwardmost downward position, each of said different arc segments having a different degree of incline corresponding to each different forwardmost upward and rearwardmost downward position of the foot support,

wherein movement of the foot support between a rearwardmost downward position and a forwardmost upward position and back to the rearwardmost downward position defines a complete exercise cycle,

the foot support being interconnected to a selection device that enables the user to select any one of the plurality of arc segments,
one or more detectors adapted to detect one or more of force, energy or power exerted by the user over time on the foot support or to detect distance or velocity of travel of the foot support or of the resistance assembly during the course of the user's performance of all or a portion of an exercise cycle,
the one or more detectors sending signals that are indicative of one or more of the detected force, energy, power, time, distance or velocity to a processor,
the processor receiving the signals from the one or more detectors and processing the signals according to a predetermined algorithm to generate a visually recognizable output format of one or more of said force, energy, power, time, distance, velocity or other result calculable from said signals,

the processor being interconnected to and sending the processed signals to the visual display, the visual display being arranged and displaying the processed signals to the user in the visually recognizable output format in a location on the apparatus that is readily observable by the user.

[0058] In another aspect of the disclosure there is provided an exercise apparatus comprising:

a foot support suspended from above by a suspension assembly on a frame and adapted to support a user in an upright position with the user's foot disposed on the foot support, the foot support being interconnected to a resistance assembly,

a user interface that includes a visual display readily visually observable and manually accessible by the user when the user's foot is disposed on the foot support,

the foot support being movable by the user on the frame back and forth through any one of a plurality of complete, reproducible and different arc segments of a master arcuate path defined by the suspension assembly, each different arc segment being individually selectable by actuation of a selection device that is interconnected to the foot pedal and is operable by the user to mechanically limit travel of the foot pedal to a selectable one of the plurality of arc segments,

wherein the selection device is manually actuatable by the user to enable the user to exert a selectable amount of manual force on the selection device that operates to selectively limit travel of the foot pedal to a selectable one of the plurality of arc segments according to the selectable amount of manual force exerted by the user on the selection device,

each said different arc segment being defined by movement of the foot support between a corresponding different forwardmost upward position and different rearwardmost downward position, each of said different arc segments having a different degree of incline corresponding to each different forwardmost upward and rearwardmost downward position of the foot support,

wherein movement of the foot support between a rearwardmost downward position and a forwardmost upward position and back to the rearwardmost downward position defines a complete exercise cycle,
one or more detectors adapted to detect one or more of force, energy or power exerted by the user over time on the foot support or to detect distance or velocity of travel of the foot support or of the resistance assembly during the course of the user's performance of all or a portion of an exercise cycle,
the one or more detectors sending signals that are indicative of one or more of the detected force, energy, power, time, distance or velocity to a processor, the processor receiving the signals from the one or more detectors and processing the signals according to a predetermined algorithm to generate a visually recognizable output format of one or more of said force, energy, power, time, distance, velocity or other result calculable from said signals,

the processor being interconnected to and sending the processed signals to the visual display, the visual display being arranged and displaying the processed signals to the user in the visually recognizable output format in a location on the apparatus that is readily observable by the user.

[0059] In such an apparatus the foot support and the resistance assembly are typically interconnected by the selection device, the selection device being operable by the user to selectively position the resistance assembly in any one of a plurality of predetermined fixed mechanical positions that respectively correspond to a selectable one of the plurality of arc segments.

[0060] In another aspect of the disclosure there is provided a method of performing multiple different exercises in time sequential manner by an exerciser, the method comprising:

the exerciser's selecting at least first and second different exercise regimes that require exercise of different muscle groups,
the exerciser's performing and completing a selected one of the first or second exercise regimes,
substantially immediately after the step of performing and completing the selected one of the first or second exercise regimes, the exerciser's performing and completing the other of the first or second exercise regimes,
wherein the first exercise regime comprises performing an exercise by the exerciser using an apparatus as described immediately above.

[0061] In another aspect of the disclosure there is provided an exercise apparatus comprising:

a foot support suspended from above by a suspension assembly on a frame and interconnected to a resistance assembly that exerts a resistance to movement of the foot support by a user, the foot support being adapted to support the user in an upright position with the user's foot disposed on the foot support,
a user interface that includes a visual display readily visually observable and manually accessible by the user when the user's foot is disposed on the foot support, the foot support being movable by the user on the frame back and forth through any one of a plurality of complete, reproducible and different arc segments of a master arcuate path defined by the suspension assembly, each different arc segment being individually selectable by the user,
each said different arc segment being defined by movement of the foot support between a corresponding different forwardmost upward position and different rearwardmost downward position, each of said different arc segments having a different degree of incline corresponding to each different forwardmost upward and rearwardmost downward position of the foot support,
wherein movement of the foot support between a rearwardmost downward position and a forwardmost upward position and back to the rearwardmost down-

ward position defines a complete exercise cycle,
the foot support being interconnected to a selection device that enables the user to select any one of the plurality of arc segments,
one or more detectors adapted to detect one or more of force, energy or power exerted by the user over time on the foot support or to detect distance or velocity of travel of the foot support or of the resistance assembly during the course of the user's performance of all or a portion of an exercise cycle,
the one or more detectors sending signals that are indicative of one or more of the detected force, energy, power, time, distance or velocity to a processor,
the processor receiving the signals from the one or more detectors and processing the signals according to a predetermined algorithm to generate a visually recognizable output format of one or more of said force, energy, power, time, distance, velocity or other result calculable from said signals,
the resistance assembly comprising a fan, the algorithm including instructions that receive and process an environment value indicative of at least one of air temperature and air pressure, the environment value being used by the instructions as a variable to generate the visually recognizable output format of said force, energy, power, time, distance, velocity or other result calculable from said signals,
the processor being interconnected to and sending the processed signals to the visual display, the visual display being arranged and displaying the processed signals to the user in the visually recognizable output format in a location on the apparatus that is readily observable by the user.

[0062] In another aspect of the disclosure there is provided a method of performing multiple different exercises in time sequential manner by an exerciser, the method comprising:

the exerciser's selecting at least first and second different exercise regimes that require exercise of different muscle groups,
the exerciser's performing and completing a selected one of the first or second exercise regimes,
substantially immediately after the step of performing and completing the selected one of the first or second exercise regimes, the exerciser's performing and completing the other of the first or second exercise regimes,
wherein the first exercise regime comprises performing an exercise by the exerciser using the apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

[0063] The above and further advantages of the invention may be better understood by referring to the following description in conjunction with the accompanying drawings in which:

FIG. 1 is a rear perspective view of a device in accordance with a reference example having a manual screw selection or adjustment device for selecting an arc segment.
FIG. 2 is a front perspective view of the FIG. 1 apparatus showing the resistance assembly without a housing.
FIG. 3 is a right side view of the Fig. 1 apparatus showing the resistance assembly without a housing.
FIG. 3A is an enlarged right side view of a portion Fig. 3 showing the resistance assembly in a forwardly pivoted position relative to the position of the resistance assembly as shown in Fig. 3.
Fig. 3B is a plot showing the non-linearly increasing relationship between the degree of opposing force exerted by a fan wheel against the user's exertion of input force and the rotational speed of the fan.
FIG. 4 is a left side view of the FIG. 1 apparatus.
FIG. 5 is a right side view of an embodiment of an apparatus according to the invention having a manually actuatable pneumatic or hydraulic selection or adjustment device for selecting an arc segment.
FIG. 6 is a right side view similar to Fig. 5 showing the resistance assembly and arc segment selection device in a forwardly disposed position relative to the position shown in Fig. 5.
Fig. 7 is a right side perspective view of the Figs. 5-6 apparati having a pair of pivotable handles pivotably attached to the forward four bar linkage legs 26a, 26b and to the frame.
Fig. 8 is a right side view of the Fig. 7 apparatus.
Fig. 9 is a right side perspective view of another reference example of an apparatus having a manually actuatable U-shaped handle as the selection or adjustment device for selecting an arc segment.
Fig. 10 is a right side view of the Fig. 9 apparatus.
Fig. 11 is a left side perspective view of another reference example of an apparatus having a manually actuatable handle as the selection or adjustment device for selecting an arc segment.
Fig. 12 is a right side enlarged view of the front end of the Fig. 11 apparatus showing additional components of the resistance assembly and selection device including rotation increasing pulleys and drive belts interconnected between the primary crank drive shaft and the axle of the resistance fan wheel.
Fig. 13 is a generic left side view of the front ends of the Figs. 1-12 apparatuses showing in exploded format for purposes of illustration a typical arrangement of rotation increasing pulleys and drive belts that can be interconnected between the primary crank drive shaft and the axle of the fan wheel.
Fig. 14 is a schematic front view of a user interface interconnected to a processor that can be mounted and arranged on the console region of any of the Figs. 1-13 apparatuses such that a user can readily manually engage buttons and observe visual displays that are disposed on the user interface.

Fig. 15 is a view of the Fig. 14 interface showing an example of the appearance of various displays of the interface after the "circuit" and GO buttons have been actuated and a user has begun an exercise routine.

Fig. 16 is a view of the Fig. 14 interface showing an example of the appearance of various displays of the interface after the "circuit," GO and STOP review buttons have all been actuated and a user has ended an exercise routine.

Fig. 17 is a view of the Fig. 14 interface showing an example of the appearance of the various displays appearing on the first of three input interfaces which are presented to the user prior to the beginning of an interval workout routine calling for the user to manually engage certain up, down and enter buttons to set a work or exercise time as part of the interval routine.

Fig. 18 is a view of the Fig. 14 interface showing an example of the appearance of the various displays appearing on the second of three input interfaces which are presented to a user prior to the beginning of an interval workout routine calling for the user to manually engage certain up, down and enter buttons to set a rest time as part of the interval routine.

Fig. 19 is a view of the Fig. 14 interface showing an example of the appearance of the various displays appearing on the third of three input interfaces which are presented to a user prior to the beginning of an interval workout routine calling for the user to manually engage certain up, down and enter buttons to set a number of total intervals as part of the interval routine.

Fig. 20 is a view of the Fig. 14 interface showing an example of the appearance of the various displays presented while an interval training workout is ongoing after a user has input the control data shown in Figs. 17-19.

Fig. 21 is a view of the Fig. 14 interface showing an example of the appearance of the various displays presented either after a user actuates the STOP button after an interval routine has begun or after the number of user selected and input intervals of an interval routine have expired on their own showing the results of an interval routine.

DETAILED DESCRIPTION

[0064] Figs. 1-13 illustrate various arc segment selectable exercise apparatuses 10 that can be used in conjunction with a user interface 20 and associated processor 500 and sensor(s) or detector(s) D, Fig. 14-21, to enable a user to perform a variety of circuit or interval exercise routines or regimes. The processor 500 is typically mounted within the housing 20h of the user interface but can alternatively be mounted remotely from the interface 20 and apparatus communicating wirelessly or via cables or wires with the visual display components of the user interface. A "processor," as used herein, refers to electrical, electromechanical and electronic control apparati that can comprise a single box or multiple boxes (typically interconnected and communicating with each other) that contain(s) all of the separate electronic processing, memory and electrical or electronic signal generating components that are necessary or desirable for carrying out, creating, enabling and implementing the methods, functions and apparatuses described herein. Such electronic and electrical components include RAM, ROM and solid state or non-solid state memory devices, programs, algorithms, chips, chipsets, programs, processors, microprocessors, computers, PID controllers, voltage regulators, current regulators, circuit boards, motors, batteries and instructions for controlling any variable element discussed herein such as length of time, degree of electrical signal output and the like. For example a component of a processor, as that term is used herein, includes programs, data, algorithms, controllers and the like that perform functions such as storing and processing data, sending and receiving signals from sensors or detectors, or sending and receiving signals that instruct, and functions such as monitoring, alerting, initiating, executing or instructing an LCD or other visual display to display numbers, data or other information in a visually observable format by a human user.

[0065] Figs. 14-21 illustrate a user interface component 20 of an apparatus according to the present disclosure that serves to facilitate certain forms of cardiovascular training that have recently emerged: circuit training and interval training. Both workout techniques use a cycle of brief, high energy activity, followed by a rest period of similar length, as the fundamental building block for all workout routines. Interval training consists of a user or group of users repeatedly performing cycles of a single exercise, alternating between exercise and rest, while maintaining some form of timing scheme or plan. Circuit training consists of a user or group of users consecutively performing cycles of different exercises that each exercise different muscle groups, "circling" from one exercise station to the next while maintaining some form of timing scheme or plan. At any given step, different users with different body sizes and fitness levels will operate the same given device, making ease of use and speed of configuration important factors for any circuit training device.

[0066] As shown in Figs. 12, 14 a detector D can be used to detect any one or more movements or properties of the apparatus 10 or the user or a component of the apparatus 10 such as the speed and time of rotation or other movement of the resistance assembly, in the case of the Figs. 2-3A, 5-12 apparatuses a fan 200. The speed detector can comprise an optical detector, a magnetic field detector, a Hall effect sensor, a potentiometer, one or more limit switches or any other detector that is capable of sensing a relevant measurable movement (rotational, translational or the like) of a mechanical element

or component of a relevant mechanical element such as a wheel like fan wheel 200, an axle like crankshaft 32, 252h, a belt like belts 251, 253, a pulley like pulleys 250, 252, a foot support like supports 24a, 24b, a support pivot arm like arms 26a-26c or any other moving element of the apparatus, the rate of movement of which can be converted by an algorithm to the output results desired to be displayed on a visual display on the display area 20a of the user interface 20. The rate of movement or property detected by the detector D is generically designated as FR in Figs. 12, 14 for purposes of explanation, it being understood that FR can alternatively comprise a value indicative of a movement other than the rotational speed of the fan wheel that can be used in an algorithm to generate a calculation of a result indicative the mechanical power or work input into the resistance assembly, a result such as power, energy, velocity, strides per minute, distance of movement by foot or by a bicycle of predetermined configuration.

[0067] As shown, the detector D sends a signal indicative of FR to the processor 500 which processes the signal according to a predetermined algorithm to calculate a value indicative of any desired aspect of the user's performance of exercise or the result of the user's exertion of force or energy in performance of the back and forth movement of the foot pedals 24a, 24b of the apparatuses shown in Figs. 1-13. In the examples of Figs. 14-21, the algorithm included in the processor is designed to use the variable input of FR to calculate for example, the number of watts of power exerted by the user, the number of meters that the user would have travelled if riding a bicycle having a preselected configuration while generating such power as calculated from FR and the number of strides per minute that the user would have achieved exerting the power or force calculated by the algorithm based on the FR input as a variable to the algorithm. Where the rotational speed of the fan wheel 200 is sensed and used in an algorithm, other values or parameters peculiar to the wheel 200, such as the number, size and shape of fan blades, are included in the algorithm in order to generate a value for the moment of inertia of fan wheel 200 (alternatively, the value for the moment of inertia may be provided to the algorithm in advance, in the form of a static variable) the moment of inertia being used to calculate the desired result such as watts, power, energy, work, distance travelled, number of strides and the like. As can be readily imagined, one or more additional or different detectors could alternatively be used to sense a rotational or translational movement and send a signal to processor 500 that is indicative of the speed or velocity of such movement such as of a shaft 32, 252h, a belt 251, 253, a pulley 250, 252, a foot support 24a, 24b, a support pivot arm 26a-26d and, a signal indicative of such movements could be used in an appropriate algorithm to generate and display one or more visual results indicative of watts, energy or power exerted by the user, number of meters that the user would have travelled if riding a bicycle, number of strides per minute and the like.

[0068] The aforementioned algorithm can include instructions that carry out a mathematical compensation that accounts for the effects of air temperature and pressure dependencies in the determination of the mechanical power expressed by the rotation of fan wheel 200. While the derivation of a power figure based on a measurement of the angular, or rotational, velocity of a spinning fan is generally known in the art, such calculations assume a constant value for the density of the surrounding air. Pressure and temperature sensors (not shown) can provide additional inputs to the processor 500, allowing a real-time and accurate measurement of air density to be made and used in the algorithm that generates the desired output results for display on the user interface. For a gas, such as air, the relationship between the pressure (P), volume (V), and temperature (T) exhibits a known and mathematically predictable relationship, generally approximated via the Ideal Gas Law. It may be further derived that density is directly proportional to the pressure of the gas, and inversely proportional to the temperature of the gas. Therefore, the use of temperature and pressure sensor readings and inputs to processor 500 can enable a calculation of air density for purposes of calculating a more accurate value for the power generated by rotation of fan blade 200.

[0069] Figs. 1-13 illustrate a typical back and forth stride-like foot and leg driven apparatus that provides a user-exerciser with a low impact workout yet offers the potential for an intensive cardiovascular workout by eliminating the unnatural motion and awkward foot alignments typical of many stair-climbing and elliptical training devices. The apparatus 10 provides one or more foot supports 24a, 24b movable along an arcuate path defined around a point P of rotation. The arcuate path is selectively divisible into machine defined, user selectable arc segments. The apparatus 10 includes a frame 16a, 16b, 16c, 16d, a frame linkage 26a, 26b, 26c, 26d movably engaged with the frame, one or more foot supports 24a, 24b movably engaged with the frame linkage, a crank 40a, 40b movably engaged with the frame, and in the apparatuses shown, an arc segment selection or adjustment mechanism that pivots the location of the crank assembly with respect to the frame, and a drive linkage 28a, 28b movably engaging the frame linkage.

[0070] In alternative apparatuses (not shown), the arc segment selection device or assembly can comprise an assembly of mechanical components that enable the user to select an arc segment without pivoting or moving the crank or resistance assembly relative to the frame.

[0071] Figs. 14-21 illustrate a user interface 20 that is mounted and arranged on the frame 16 of the apparatus 10 such that a visual display and manually actuatable or engageable interface area 20a of the interface 20 is both readily manually accessible by a user and readily visually observable by a user when a user is standing on a foot support 24a, 24b in particular when standing upright on a foot support.

[0072] FIG. 1-3, 4-11 are views of various arc segment selectable exercise devices that include a frame 10 having a front region 12, a rear user disposition region 14, frame legs 16a, 16b, 16c and 16d, and frame upper supports 18a, 18b, 18c, and 18d. Upper supports 18c and 18d comprise the upper links of a pair of four bar linkages and part of the arcuate portion of the frame, terminate in legs 16c and 16b respectively and are an integral part of frame 10. A display/control panel 20 and hand grips 22a and 22b are secured to the upper supports 18a and 18b.

[0073] Foot supports 24a and 24b are sized to receive the foot of a user. Foot supports 24a and 24b are movably connected to, and supported by, forward linkages or legs 26a and 26b, and rear linkages 26c and 26d. Linkages 26a-26d are movably connected to the rear region 14 of frame 10 by upper supports or links 18d and 18c. Although the device is shown with opposing pairs of linkages supporting each foot support, other devices are contemplated having fewer or more linkages supporting and controlling the range and path of motion of foot supports 24a and 24b associated with the linkage(s).

[0074] The foot supports 24a and 24b approximate a shoed human foot in size and shape. They can include a non-skid surface and be bounded by one or more low lips to help a shoe remain in place on the foot supports during use. Alternately, straps may maintain each foot within the foot support to further retain the user's foot in place during use. However, as used herein, a "foot support" can also encompass any designated support such as a pedal, a pad, a toe clip, or other foot/toe/leg and device interface structure as is known in the art.

[0075] The forward linkages or legs 26a and 26b are movably connected to drive linkages 28a and 28b; and the drive linkages are in turn connected to the resistance mechanism (illustrated in FIGS. 2A, 3 and 4 and described below) concealed by a housing 30. In other aspects of the disclosure, the drive linkages 28a and 28b can be connected directly to the foot supports 24a and 24b. Additionally, foot supports can be on or integral to either the forward linkages or to the one or more linkages joined to the frame.

[0076] As illustrated in Figs. 1-3, 4-11, representative movable connectors 31a, 31b, 31c, and 31d include pivot assemblies, as known in the art, that provide smooth and easy relative rotation or reciprocal motion by elements joined by the pivot assemblies. Movable connectors 31b and 31d rotatably couple forward linkages or legs 26b and 26a, respectively, to upper supports or links 18c and 18d. Movable connectors 31c and 31a rotatably couple rear linkages 26c and 26d, respectively, to upper supports or links 18c and 18d. Other connection assemblies that permit similar motion are contemplated by the invention. The movable connectors allow for a smooth and controlled swinging of foot supports 24a and 24b in an arcuate path.

[0077] FIG. 2 is a front perspective view of a reference example of an apparatus 10 as shown in FIG. 1 illustrating the elements described above from a different angle and showing in addition a manually engageable and actuatable screwable arc segment selectable mechanism 225 that is mechanically interconnected between the frame component 17 and the pivotable resistance assembly mounting bracket or arm 38. This illustration shows the device from the front region 12 perspective. Once again it can be seen that foot supports 24a and 24b are suspended from their respective linkages. Drive linkages 28a and 28b (not shown in FIG. 2) are coupled at their first ends to the substantial mid-point of front linkages or legs 26a and 26b, respectively. Drive linkages 28a and 28b are coupled at their second ends to a crank assembly 40a, 40b, 40c, 40d contained within housing 30, which contains the resistance assembly shown in FIG. 4 and described in greater detail below.

[0078] As shown in Figs. 2, 3, 3A, the screw 225 has a crank or wheel handle 227 connected to a proximal end of the screw 225 that is mounted so as to be readily manually accessible and engageable by a user located in the user disposition region 14 of the apparatus 10. The handle is readily rotatable or turnable by hand by a typical human user so as enable the user to readily effect rotation T of the screw 225 to any desired degree of rotation quickly and immediately upon manual engagement. The screw 225 is screwably engaged at distal position with a screw receiving bracket or nut 38a, Fig. 3, that is attached to the mounting bracket or arm 38 that is mounted to the frame 10 such that when the screw 225 is rotated either counterclockwise or clockwise by a user by a selected degree SR, the screw 225 is translationally moved a corresponding selected distance FBD, Figs. 3, 3A, relative to the frame 10 on manual turning of the screw 225 by the selectable rotational degree SR by the user. The screw 225 is interconnected to the foot support such that translational movement of the screw the selectable distance FBD fixes or limits travel of the foot support to a corresponding one of the plurality of different arc segments. The mounting bracket or arm 38 will pivot back and forth FB and move a corresponding selectable distance depending on the degree of rotation T and length of translational movement FBD of the screw 225. In the same manner as described below with reference to the manually drivable piston embodiments of Figs. 5-8 the degree of such pivoting back and forth FB of mounting bracket or arm 38 as determined by the degree and direction of rotation T of screw 225 enables the user to selectively change the identity of the particular arc segment through which the foot pedals will travel when the pedals are driven between a forwardmost upward and rearwardmost downward position. Depending on the particular arc segment chosen by the user, the degree of incline of the foot pedals and thus the degree of difficulty of driving the foot pedals 24a, 24b back and forth will vary. As shown in Fig. 3 the mounting bracket or arm 38 is disposed in a first generally vertical disposition similar to the disposition shown in Fig. 5 where the horizontal component of the force F required is FH1 and vertical component of the force F required to move the foot pedals

is FV1. As shown in Fig. 3A, the screw has been turned T such that the mounting bracket or arm 38 is now disposed at an angle A relative to the position of Fig. 3 (similar to the difference in arm and foot pedal positions between Fig. 6 and Fig. 5) and the horizontal FH2 and FV2 components of force required to drive the foot pedals 24a, 24b through the new arc segment associated with the new pivoted position A of the mounting bracket or arm 38 has changed relative to the position of the arm in Fig. 3 and thus degree of difficulty of the force F needed to perform an exercise cycle has been selectively changed by the user.

[0079] In each of the apparatuses described herein the arc segment selection device is manually actuatable by the user to exert a selectable amount of manual force on the selection device that operates to selectively position, vary or adjust the resistance assembly in or to any one of a plurality of predetermined fixed mechanical positions that vary according to the selectable amount of manual force exerted by the user on the selection device. Such user force or energy exerted, manually driven arc segment selection systems are preferred so that a user can immediately without delay change an arc segment during the course of performing a circuit of different exercises in rapid sequential succession using different machines or otherwise performing different exercises that exercise different muscle groups at different periods of time during the course of the entire circuit of sequential different exercises.

[0080] In reference examples, the selection device can be controllably driven by a motor or other electrically or electronically powered device rather than via exertion of a user's manual energy or force.

[0081] As shown in Figs. 3, 3A, 5-9, 11-13, the resistance assembly can comprise a rotatably drivable R wheel 200 having fan blades 210 having surfaces 210a that engage against ambient air when the wheel is driven R. The degree of resistance to rotation R of the finned 210 wheel 200 increases or varies exponentially or non-linearly with the degree of speed of rotation R of the finned 210 wheel 200. Typically the degree of resistance RES, Figs. 3A, 12 to rotation R of a fan or finned wheel 200 increases or varies by a cube or cubed factor of or with the degree of speed of rotation R. Other resistance mechanisms other than a finned 210 wheel 200 such as an Eddy current controlled brake mechanism can be employed that increase, decrease or vary in degree of resistance relative to the force F exerted by the user in a non-linear, geometric or exponential manner or relationship.

[0082] In the devices shown in Figs. 2, 3, 3A, 5-8, 11 the axis of the resistance wheel 200 is connected directly to the axle 32 of a crankshaft such that the wheel 200 rotates R at the same speed of rotation as the crankshaft. Crank arms 40a and 40b are secured to each end of the crankshaft 32 and are movably coupled to the drive linkages 28a and 28b, respectively. As linkages 28a, 28b are driven back and forth as a result of back and forth foot driven movement of pedals 24a, 24b, crank arms 40a, 40b are rotatably R driven which in turn via their interconnection to shaft 32 rotatably R drive shaft 32 around its axis.

[0083] In alternative devices shown in Figs. 9, 10, 12, 13 intermediate drive pulleys or wheels 250, 252 and associated belts 251, 253 are typically employed whereby the hub 200h of wheel 200 is not directly connected to and does not rotate in unison with shaft 32 but instead is rotatably driven at a higher rate XR than shaft 32 which is driven at rotation rate R. As shown, in Figs. 12, 13 the crankshaft 32 is directly connected to the hub 250a of intermediate drive pulley 250 driving pulley at rate R. Drive pulley 250 in turn drives a second intermediate drive pulley or wheel 252 via belt 251 at a higher rotational rate of YR by way of an intermediate hub 252h that has a smaller radius than the radius of both of pulleys 250, 252. Intermediate drive pulley 252 in turn drives fan wheel 200 via belt 253 at an even higher rotational rate of XR by way of another intermediate hub 200hh to wheel 200 that has a smaller radius than radius of both pulleys 252 and 250. Typically, the ratio of XR to R is between about 10:1 and 20:1, most typically between about 13:1 and 15:1.

[0084] Rotation of the resistance wheel 200 as described herein whether the wheel 200 rotates in unison with the shaft 32 or at a higher rotational rate creates a resistance to the force F exerted by the user such that the degree of force resistance RES created by the wheel 200 varies exponentially or geometrically with the rate of rotation R or the amount of force exerted by the user on account the interaction of the surface 210a of the fan blades 210 that are mounted to the axle 220 of the wheel 200 with air. The faster that wheel 200 rotates the amount of air resistance against surfaces 210a of blades 210 increases exponentially or geometrically. Similarly, the rate of rotation generally varies non-linearly (exponentially or geometrically), with the degree of speed, velocity, force, work or power exerted by the user on the foot supports 24a, 24b or resistance assembly 200 et al.. Typically the degree of resistance to rotation R of a fan wheel 200 increases or varies by a cube or cubed factor of or with the degree of speed of rotation of the wheel.

[0085] Top bearings 36a and 36b receiving the axle or crankshaft 32 are secured to a pivotable mounting bracket or arm 38 such that as mounting bracket or arm 38 is pivoted forwardly and rearwardly, shaft 32 and its associated wheel 200 is pivoted forwardly and backwardly together with mounting bracket or arm 38.

[0086] As shown in Figs. 2-8 in order to drive the foot pedals through any selected arc segment, the user must exert a force F on foot pedals 24a, 24b that has a horizontal (or forward-rearward) component FH, FH1, FH2 and a vertical (or upward-downward) component FV, FV1, FV2. The degree of incline of the arc segment that the foot supports must travel through is determined by and will vary with the precise degree of the forward to rearward pivot position of mounting bracket or arm 38.

As shown in FIGs 3-8 the mounting bracket or arm 38 pivots around the axis AA of bottom bearings 46a and 46b so as to be rotatable forwardly and rearwardly FB.

[0087] FIG. 4 is a side view of an exercise apparatus 10. In this view, the foot supports 24a and 24b, forward linkages or legs 26a, 26b and rear linkages or legs 26c, 26d are presented from a perspective that allows ready visualization of the path that foot supports 24a and 24b, and thus a user's feet, will traverse as the foot supports move fore and aft while suspended from the forward and rear linkages. It will be noted that as foot supports 24a and 24b move fore and aft, the forward and aft limit of motion is not unbounded. Rather, the range of motion is defined by the length of the crank arms 40a and 40b (shown in FIG. 4), which provide an appropriate stride length. Further, because the foot supports 24a and 24b are pivotally connected to, and swing with, the forward linkages 26a, 26b and rear linkages 26c, 26d, the foot supports travel a curved or arcuate path, and not an elliptical path, to provide more favorable biomechanics.

[0088] The motion path for the foot supports 24a and 24b can be selectively adjusted by adjusting the pivot position of mounting bracket or arm 38. As described above, the mounting bracket or arm 38 is pivotally mounted to the frame member 48 and pivots fore and aft upon selective manual actuation of a mechanical adjustment mechanism. As is evident by reference to the Figures, pivoting the mounting bracket or arm 38 forward moves the components such as wheel 200 secured directly or indirectly thereto forwardly. Likewise, pivoting the mounting bracket or arm 38 rearward causes the components secured directly or indirectly thereto to move rearward. This selective positioning FB of mounting bracket or arm 38 causes the arcuate segment or motion path of the foot supports 24a and 24b to move to a different location along an arcuate path around a point of rotation "p", shown between pivot assemblies 31b and 31c, at a distance established by the length of the forward and rear linkages or legs 26a, 26b, 26c and 26d. Thus, the specific location on the master arc or arc segment ("the motion path") is user selectable to increase or decrease stride angle and location from a number of user selectable points, or arc segments, defined around the point of rotation.

[0089] In operation, a user approaches the device from the rear region 14, grasps the hand grips 22a and 22b, and places a foot on each of the foot supports 24a and 24b. The user's feet and legs begin to move fore and aft in a comfortable stride. The user selects an exercise program or manually adjusts the device by imputing commands via the display/control panel 20. Also, in response to command input, the mounting bracket or arm 38 is moved fore or aft. As shown, when the mounting bracket or arm 38 moves forward, the motion path of the foot supports is on a more inclined or vertical defined arc segment. To discontinue use of the device, a user simply stops striding, thereby causing the movement of the device to stop, and dismounts from the foot supports.

[0090] Fig. 4 illustrates one of the four bar linkage support mechanisms in a forwardmost, 26a', 26d' and a rearward 26a, 26d position along the pivot stroke of the four bar linkage. The four bar linkage has opposing pivot widths (or opposing pivot link, 18c/24b, 18d/24a widths), W' and W", and opposing pivot lengths (or opposing pivot link, 26a/26d, 26b/26c lengths), L' and L" that form the functional four

bar linkage for purposes of pivotably mounting/supporting the foot pedal 24a from an upper portion 18d (or foot pedal 24b from upper portion 18c) of the overhead support arm or leg, 16b, 16c, of the frame. The foot pedals 24a, 24b themselves comprise a structural portion or the whole of the lower pivot link of the four bar linkages in the apparatuses shown in Figs. 1-10. The distances between the width pivot points 31a and 31d, W' and between the width pivot points 31e and 31f, W" are preferably equal or substantially equal. And, the distances between the length pivot points 31d and 31e, L' and between the length pivot points 31a and 31f, L" are also preferably equal or substantially equal such that the difference between angles A1 and A2, i.e. the degree of rotation or pivot of the foot pedal 24a from back to front and front to back along the arcuate path of translation of the foot pedal from front to back and vice versa is less than about 3 degrees, typically less than about 2.5 degrees. The foot pedals have a foot sole receiving upper surface that defines a generally planar orientation or plane in which the sole of the foot of the user is maintained when standing on a foot pedal. Angle A1 is the angle between the foot sole orientation plane PP1 in which the foot sole surface resides at the backwardmost end of the front to back path of translation and a fixed selected reference plane RP. Angle A2 is the angle between the sole orientation plane PP2 in which the foot sole surface resides at the forwardmost end of the front to back path of translation and the fixed selected reference plane RP. In this arrangement, the difference between angles A1 and A2, at any point/position along the back to front/front to back path of translation of the food pedal 26a is preferably less than about 3 degrees (typically less than about 2.5 degrees), i.e. the plane in which the foot sole surface of the pedal 24a resides does not rotate or pivot more than about 3 degrees at any time during movement through the arcuate path of translation.

[0091] As can be readily seen from Figs. 1-10, the foot pedals always travel in the same overall or master arcuate or other configuration of path of travel from front to rear and from rear to front. The master arcuate path of travel J, Fig. 5, that the pedals 24 a, b may travel in remains the same regardless of what degree of pivot the bracket or arm 38 is positioned in. Pivoting the support bracket or arm 38 to different pivot positions only changes the arc "segment" (e.g. segment AP, Fig. 5, or segment AP', Fig. 6, or segment AP", Fig. 8) through which the pedals may travel from rearwardmost to forwardmost positions but does not change the overall or master path of arcuate travel J. The master arcuate path of travel J is defined by the machine or apparatus itself, i.e. by the

mounting, positioning, lengths and widths of the links 18c, d, 24a, b and 26a-d. The user may select a segment of the overall machine defined arcuate path of foot pedal travel J depending on the degree of pivoting of mounting bracket or arm 38 that the user selects for any given exercise session. As described below each segment selected will have a different degree of incline, e.g. H1 for segment AP and H2 for segment AP'.

[0092] In the embodiment as shown in Figs. 5-8 mounting bracket or arm 38 can be manually pivoted FB via extension or contraction of a mechanical arm or piston 230 that acts as a tilt actuator to pivot the mounting bracket or arm 38 forwardly or backwardly as desired by the user. In the Figs. 5-8 embodiment, the arc segment selection device comprises a fluid driven piston 230 mounted in a fluid sealed cylinder having a drive axis PA, the piston 230 being manually drivable by application of the manual force applied by the user to drive fluid contained within the cylinder via push or turn mechanism 230a to translationally drive the piston a selectable distance PT from its retracted position along the drive axis PA of the cylinder to a selectable one of a plurality of translation positions that correspond to one of the plurality of different arc segments AP, AP'. As can be readily imagined, arm or piston 230 is manually actuatable by the user such as by the user's exerting a selectable degree of manual force by manually actuating a mechanical pumping or screwing mechanism 230a that mechanically causes the arm or piston 230 to extend or contract to a desired degree of translation distance PT that varies with the degree of mechanical force or energy exerted by the user on mechanism 230a and in turn mechanically pivots FB the mounting bracket or arm 38 to a desired degree. Alternatively in a reference example the piston 230 could be screwably engaged within the cylinder with the manual mechanism 230 and be movable translationally in the same or similar manner to the screw 225 reference example where the user manually exerts force to turn the mechanism 230a that through worm gear or nut screwably cause the piston to translate. As shown, the resistance mechanism 200 pivots forwardly and backwardly FB about the pivot axis A of mounting bracket or arm 38 which is orthogonal to the longitudinal axis of the frame 10. Both of the pedals 24a and 24b are synchronized together by the motion of crankshaft 32.

[0093] Figs. 5 and 6 more clearly illustrate the previously described selectability of an arc segment when the mounting bracket or arm 38 and its associated wheel 200 or other resistance device is/are pivoted or tilted from one orientation to another. As shown in Fig. 5, the mounting bracket or arm 38 is positioned with its longitudinal axis X arranged in about a vertical orientation. In this orientation, the maximum difference in height or incline H1 between the rearwardmost position 24b' of the foot pedal 24b and forwardmost position 24b" of the foot pedal 24b is less than the maximum difference in height or incline H2 of Fig. 8 where the axis of the mounting bracket or arm 38 and its associated components 30 have been tilted or pivoted forwardly by an angle A from the position of Fig. 5. As shown, the arcuate path AP of the pedals 24b in Fig. 5, going from position 24b' to 24b", is less steep or upwardly inclined than the arcuate path AP' of the pedals going from position 24b"' to 24b"" in Fig. 6. Thus, as shown, the user can select the degree of arc of travel of the pedals by selecting the position of tilt of assembly 30 to which the linkage bars 28b are attached.

[0094] As also shown in Figs. 5 and 6 the pedals travel along the same selected arcuate segment path AP or AP' from front to rear and from rear to front one the pivot position of mounting bracket or arm 38 is selected.

[0095] Figs. 7 and 8 show an embodiment where a pair of pivoting upper body input arms 100a, 100b are provided that the user can manually grasp by hand at an upper region such as handles 106a, 106b, the handles 106a, b being a rigidly connected extension of arms 100a, 100b respectively and moving/pivoting together with the arms forward or backward. The handles 106a, 106b and arms 100a, 100b are pivotably interconnected to both the frame and to the pedals. As shown the handles 106a, 106b and arms 100a, 100b are pivotably interconnected to the frame via a cross bar member 500, the bottom ends of the arms being freely pivotably mounted via pin/aperture joints 104a, 104b at their bottom ends, the joints being attached to bar support member 500 at appropriate distances from each other along the length of bar support 500. Arm linkage members 102a, 102b, are pivotably attached at one end to the arms at joints 108a, 108b which allow the linkage members to rotate/pivot on and with respect to the arms. Linkage members 102a, 102b are also pivotably attached at another end to some component of the arcuate path traveling assembly of foot pedal, and four bar linkage supports 26. As shown in Figs. 9, 10 an end of the linkages 102a, 102b distal from the arm connection point are pivotably attached to the forward longitudinal four bar linkage members 26d, 26a respectively via joints 110a, 110b that allow the linkage members to rotate around the axes of the joints, the joints interconnecting the linkage members 102a, b and the longitudinal four bar linkage members 26d, a.

[0096] As shown in Figs. 7, 8 as the foot pedal assemblies 24, 26 travel along the arcuate path AP" from either front to back or from back to front, the handles 106 and arms 100 follow the front to back movement of the pedals with a pivoting front to back or back to front movement. That is, when the right pedal 24a moves forwardly the right handle 106a and arm 100a pivot or move forwardly; when the right pedal 24a moves backwardly the right handle 106a and arm 100a pivot or move rearwardly; when the left pedal 24b moves forwardly the handle 106b and arm 100b pivot or move forwardly; when the left pedal 24b moves rearwardly the handle 106b and arm 100b pivot or move rearwardly. Such following motion is shown for example with reference to four bar linkage arm 26d in three sequential front to back positions 26d1, d2 and d3 which correspond respectively to arm 100a positions, 100a1, a2, a3. The degree of front to back pivoting of the

arms 100a, b can be predetermined at least by selective positioning of the pivot joints 108a, 108b, 110a, 110b, selective positioning of cross bar 500 and selection of the lengths of linkage arms 102a, 102b.

[0097] In the Figs. 7, 8 embodiments, the user can reduce or transfer the amount of energy or power required by the user's legs and/or feet to cause the foot pedals to travel along the arcuate path AP" from back to front by pushing forwardly on the upper end of the arms 102a, 102b during the back to front pedal movement. And, the user can increase the speed of forward movement by such pushing; or reduce the speed and increase the power or energy required by the legs to effect forward movement by pulling. Conversely the user can reduce or transfer the amount of power or energy required to cause the pedals to move from front to back by pulling backwardly on the upper end of the arms. And, the user can increase the speed of rearward movement by such pulling or reduce the speed by pushing; or reduce the speed and increase the power or energy required by the legs to effect rearward movement by pushing.

[0098] The four bar linkage foot assemblies, 24a, 26a, d, 18d and 24b, 26c, b, 18c that are pivotably linked via the linkages 102a, 102b to the pivotably mounted arms 100a, 100b can be configured to enable the foot pedal and the plane in which the sole of the foot is mounted to either not rotate or to rotate/pivot to any desired degree during front to back movement by selecting the lengths L' and L" and widths W' and W", Fig. 4 appropriately to cause the desired degree of rotation/pivoting. These four bar linkage assemblies also, via the above described linkages to the arms 100a, b, cause the arms to travel along the same path of pivot from front to back and back to front.

[0099] In the apparatus shown in Figs. 4-8, the linkages 28a, 28a', 28a", 28a"' and 28b, 28b', 28b", 28b"' are interconnected to the wheel 200 via the four bar linkage and the linkages 28a, 28b at opposing 180 degree circle positions 40c and 40d from the center of rotation of the crank arms 40a, b and/or shaft 32, i.e. the linkages are connected at maximum forward and maximum rearward drive positions respectively. This 180 degree opposing interconnection causes the right 24b, 24b', 24b", 24b"' and left 24a, 24a', 24a" and 34a"' foot pedals to always travel in opposite back and forth translational directions, i.e. when the right pedal is traveling forward the left pedal is traveling backwards and vice versa. Similarly, the pivotably mounted arms 100a and 100b are interconnected to the bracket or arm 38 and wheel 200 via the four bar linkage, the links 28a, 28b and the links 102a, 102b such that when the right arm is moving forward the left arm is moving backward and vice versa. As shown in Figs. 7, 8 the arms 100a, 100b travel forwardly or backwardly together with their associated foot pedals 28a and 28b respectively.

[0100] In any event, the left and right side pedals 24a, b and input arms 100a, b are linked to the resistance 200 or drive assembly 28a, 28b, 40a, 40b, 32 such that when the left side components (i.e. left pedal and associated input arm) are traveling forward the right side components (i.e. right pedal associated input arm) are traveling backward for at least the majority of the travel path and vice versa.

[0101] The upper body input arms 100a, b are interconnected or interlinked to the same pivotable mounting member 38 as described above via the links 102a, b, four bar linkage members 26a, b and links 28a, b as shown in Figs. 7, 8. In the same manner as forward or backward pivoting of the mounting bracket or arm 38 changes the degree of incline and/or path of travel of foot pedals 24a, b as described above with reference to Figs. 5, 6, a forward or backward pivoting of the mounting bracket or arm 38 also changes the degree of back to front pivoting and/or the degree of path of travel of arms 100a, b. Thus, in the same manner as the user is able to select the degree of incline of the path of travel of the foot pedals, e.g. arc path segment AP versus arc path segment AP' as shown in Figs. 5, 6 and also described above with regard to mounting bracket or arm 38 enabling the user to select the degree of arc segment stride
length and angle/incline, the user is able to select the degree of back to front/front to back pivot stroke or travel path of input arms, 100a, b, by adjusting the front to back pivot position FB of the center of rotation of rotation connection/interconnection points 40c and 40d.

[0102] The input arms 100a, b are linked to the foot pedals 24a, b in a manner that causes an input arm (e.g. 100a) to move forwardly as its associated foot pedal (24a) moves forwardly and upwardly, or conversely that causes an input arm to move backwardly as its associated foot pedal moves backwardly and downwardly along the user selected arc segment.

[0103] Figs. 9-10 illustrate an alternative manually actuatable mechanism for mechanically adjusting FB the position of bracket or arm 38 and thus the selection of a particular arc segment. In the Figs. 9-10 reference example, the manually adjustable element comprises a U-shaped handle assembly 300 that is attached to pivoting bracket or arm 38. The handle assembly includes a locking arm 307 that is spring load biased in a downward DN direction such that the distal end tooth 308 is biased into being received within a selected one of forward to back FB fixed position slots 306a, 306b, 306c, etc that are provided within fixedly mounted arm 306. Pivotable movement of the handle assembly 300 in the FB direction pivots the bracket or arm 38 and any associated resistance mechanism such as fan 200 in unison around pivot point AA thus changing the arc segment depending on the degree of movement of the handle assembly 300 in the FB direction. As shown the handle assembly 300 can be pivoted around axis AA between a plurality of preselected fixed back and forth positions, 306a, 306b, 306c, etc depending on the number and precise location of slots 306a, 306b, 306c, etc that are provided within the upper surface of positioning bar 306 that is fixedly attached or interconnected to the frame 16a-16d, 18a-18d. Back forth positioning FB of the handle assembly 300 and its fixedly

interconnected mounting bracket or arm 38 between preselected fixed positions 306a, 306b, 306c can be achieved by the user's manually grabbing the upper handle element 304 and pivoting FB the handle assembly 300 around pivot axis AA by any selectable degree. The handle assembly 300 in combination with its fixedly interconnected mounting bracket or arm 38 effectively comprise pivotable lever that is pivotably mounted to the frame around pivot axis AA and is interconnected to the foot support, the lever having a proximal handle 304 that is readily manually accessible by a user standing on a foot support such that the user can selectively pivot the lever 38, 300 a selected arcuate degree FB. Manual pivoting of the lever 38, 300 the selected arcuate degree thus limits travel of the foot support through a corresponding selected one of the plurality of different arc segments. In operation, when the user manually engages the handle 304, the user can simultaneously squeeze upwardly UP, Fig. 10 on the underside surface 302a of spring loaded trigger 302 to cause the trigger 302 and its interconnected arm 307 that is slidably mounted within an arm housing 300h to move upwardly UP, Fig. 10 toward the handle 304 such that the distal end of the arm 307 which comprises a tooth 308 complementary in shape to the slots 306a, 306b, 306c, etc becomes disengaged and is withdrawn out of whichever slot 306a, 306b, 306c, etc that the tooth is locked into by the downward DN spring load that is exerted on trigger 302 and arm 307 by the spring mechanism (not shown). As in the Figs. 2-3, 5-8 apparatus, in such a Fig. 9-10 apparatus therefore, depending on the degree or amount of manual force exerted by the user in the FB' direction on handle assembly 300, an arc segment AP, AP' having a selected and different degree of incline and requiring a selected and different degree of force F to move horizontally FH1, FH2 and vertically FV1, FV2 can be manually selected by the user by the exertion of a selected amount of manual force on the arc segment selection device 300.

[0104] Figs. 11-12 illustrate another alternative manually actuatable mechanism for mechanically adjusting the position FB of mounting bracket or arm 38 and thus the selection of a particular arc segment. In the Figs. 11-12 reference example, the manually adjustable element comprises an elongated cylindrical handle assembly 400 comprising a tube or tubular handle 404 pivotably mounted to the frame 16a-16b, 18a-18b, for back and forth FB' movement, a rod or trigger 406 slidably mounted within the handle 404 rod that is spring load biased in an upward UP direction by a spring (not shown), a bracket 402 with upwardly extending slots 402a, 402b, 402c and a lever assembly 404 that is pivotably interconnected between the handle 404 and the mounting bracket or arm 38. The tube or tubular handle 400 effectively comprises a pivotable lever that is pivotably mounted to the frame 10 and interconnected to the foot support. The lever 400 is pivotably mounted to the frame 16b, 18d, 10 and pivots around axis AAA. The lever 400 has a proximal handle portion 404 that is readily manually accessible by a user while standing on a foot support 24a, 24b such that the user can selectively pivot FB the lever 400 a selected arcuate degree FB, the pivoting of the lever the selected arcuate degree limiting travel of the foot support through a corresponding selected one of the plurality of different arc segments. The handle or lever 400 is manually pivotable back and forth FB' between selectable fixed positions corresponding to slots 402a, 402b, 402c. As shown the lever 400 is interconnected to mounting bracket or arm 38 via lever linkages 408. A user can adjust the back and forth FB' position of the lever 400 and its pivotally interconnected mounting bracket or arm 38 between preselected back and forth fixed positions that correspond to slots 402a, 402b, 402c by the user's manually grabbing the handle 404 and simultaneously pushing downwardly DN, Fig. 12 on the top surface 406a of spring loaded trigger 406 to cause the trigger 406 slidably mounted within handle 404 to move downwardly DN such that a pin 406b that projects laterally from the sliding rod or trigger 406 is disengaged from within whichever of slots 402a, 402b, 402c that the pin 406b is received within. Once the trigger 406 is manually actuated downwardly DN a distance sufficient to release pin 406a from a slot 402a, 402b, 402c, the user can manually exert a selected amount of back and forth FB' directed force that in turn pivots the mounting bracket or arm 38 and its associated resistance assembly to a selected back and forth FB position. Once a desired back and forth FB' position is reached, the user releases downward force on the trigger surface 406a, the trigger 406 is urged upward UP and the locking pin 406b is allowed to be received into a selected one of the slots 402a, 402b, 402c thus locking the handle assembly 400 and mounting arm into a selected forward to back FB position. As in the Figs. 2-3, 5-8 apparatuses, in such a Fig. 11-12 apparatus, therefore, depending on the degree or amount of manual force exerted by the user in the FB' direction on handle assembly 400, an arc segment AP, AP' having a selected and different degree of incline and requiring a selected and different degree of force F to move horizontally FH1, FH2 and vertically FV1, FV2 can be manually selected by the user by the exertion of a selected amount of manual force on the arc segment selection device 400.

[0105] Although the wheel 200 with fan blades 210 is one preferred resistance assembly, other resistance devices that create resistance that varies either linearly or non-linearly with the degree of speed, velocity, force F, work or energy exerted by the user on the foot supports or resistance assembly are known to those skilled in the art and can be interconnected to the foot pedals 24a, 24b.

[0106] FIG. 14 is a detailed view of the interface console region 20 of the present disclosure, consisting of an LCD type visual display 21a and user operated panel of manually actuatable or engageable push-buttons 21b. By its nature, the LCD type visual display is capable of executing multiple different interfaces or information-carrying images, described in detail below. The panel of push-buttons remains fixed, with each button achieving

a specified function.

[0107] Button 128, labeled "CIRCUIT | INTERVAL" permits the user to quickly and easily select the desired mode of operation - accordingly, he or she simply depresses the top portion 128a to enter Circuit Training Mode, and depresses the lower portion 128b to enter Interval Training Mode. Up and down arrow keys, 130a and 130b respectively, allow the user to toggle between consecutive numerical values when setting inputs such as desired time or desired number of intervals. Button 124, labeled "GO ENTER", functions as a confirmation tool, allowing the user to begin the workout routine as well as approve input values or any other user-system dialogues and interactions. Button 126, labeled "STOP REVIEW", serves the opposite purpose, allowing the user to terminate the workout routine and/or enter review mode.

[0108] As shown in FIG. 14, a user interface 20 is comprised of an LCD visual display 21a that displays the default interface for a Circuit Training Mode, characterized by a menu label 122d reading "CIRCUIT TRAINING", such that the user may easily ascertain the selected mode of operation at any given moment in time. All output values read "0", as the user has not yet begun the workout routine. In this interface, the primary visual display area 120 displays the user's instantaneous output power, measured in units of Watts. The secondary visual display area 122 displays more detailed information in the form of meters traveled (122a), SPM or Strides Per Minute (122b), and time elapsed (122c).

[0109] After mounting the exercise device, the user simply presses the "Go" button 124 and begins the workout routine. Time counter 122c begins tracking elapsed time, updating every second. The SPM display 122b measures the rate at which the user actuates the movable foot supports back and forth, with periodic updates on the order of one second. The meters traveled visual display 122c tracks cumulative distance over the course of the entire workout routine, updating only when a new integer value of distance is achieved. Of course, this figure refers not to a literal distance traveled by the user's body, but rather, the cumulative distance of the path(s) executed by the user's feet.

[0110] The user is not required to press the "Go" button 124 to begin a workout routine providing an additional degree of flexibility and ease of use to the hurried or novice user. By simply actuating the movable foot supports into their back and forth motion, the interface console is activated, the only difference being that a more limited set of information is subsequently presented to the user. Primary display area 120 will provide a reading of instantaneous power output in Watts exactly as described above, and SPM 122b will likewise function in an unchanged manner, because these instantaneous values are not time dependent in their measurement. However, display areas 122a and 122c, meters and elapsed time, respectively, will have no output. They are accumulated, time-dependent values, and as such, cannot be accurately displayed in the absence of a discrete, user-defined starting point.

[0111] FIG. 15 illustrates an example in which a user has begun a workout routine. The display interface itself is identical to that of FIG. 1, the only change being in the values presented. Accordingly, display area 122c indicates that the workout routine has been performed for 5 seconds, in which time the user has traveled a distance of 26 meters. Note that the presence of values in display areas 122a and 122c indicates that the "Go" button 124 was used to initiate this workout routine. Display areas 120 and 122b display the user's instantaneous output in terms of Power and SPM, respectively. As this workout is ongoing, input commands from buttons in panel 21b would have no effect, with the one exception being "Stop" button 126, which is employed to terminate the workout routine and all timing mechanisms.

[0112] After completing the workout routine and pressing "Stop" button 126, the interface of display 21a is replaced with a review interface, seen in FIG. 16. Label 131 in the top left corner indicates at all times to the user that the mode of operation is and was set to Circuit Training Mode, and furthermore, that the interface console is in the review interface. This review interface is only accessible after those workouts which were initiated by pressing the "Go" button 124. For those cases in which the button was not pressed, the display will return to the default interface depicted in FIG. 1 after the user ceases operation of the exercise device.

[0113] The review interface is designed to be simple and easy to understand, introducing no new measurements or other factors. It presents the user with just four values, tabulated into either averaged or accumulated form. Display areas 132a and 132b, average SPM and average Power, respectively, are averages that are measured over the complete duration of the workout routine, and provide a convenient form for the user to characterize his or her overall physical performance or output. Display areas 132c and 132d are the accumulated values for meters traveled and time elapsed, respectively.

[0114] FIGS. 17-21 illustrate the interfaces and operation of an Interval (as opposed to Circuit) Training Mode. FIG. 17 depicts the first of three input interfaces, which are presented to the user prior to the beginning of the workout routine. Menu label 122d has changed to read "INTERVAL TRAINING", such that the user may easily ascertain the selected mode of operation at any given moment in time. Command prompt 134 reads "SET WORK TIME", informing the user that he or she is choosing the amount of exercise time that each interval should consist of. Primary display area 120 provides a display of the currently selected amount of work time, in seconds. Arrow keys 130a and 130b are used to increment or decrement the work time as desired. Once the work time is suitably adjusted, the user presses "Enter" button 124 and is taken to the second input interface screen, seen in FIG. 5.

[0115] Two changes distinguish FIGS. 17 and 18. FIG.

18 uses an inverted color scheme as compared to FIG. 17, and the command prompt 134 has updated to "SET REST TIME", in order to inform the user that he or she is choosing the amount of resting, non-exercise time that each interval should consist of. By utilizing an inverted color scheme, it becomes far easier for the user to distinguish between the two discrete input steps, as he or she would be more likely to fail to recognize the change if only command prompt 134 updated between the two input steps. The amount of time that the rest period shall consist of is set in a manner identical to the one described above. The amount of work time and rest time need not be equal. Once the rest time is suitably adjusted, the user presses "Enter" button 124 and is taken to the final input interface screen, seen in FIG. 19.

[0116] As between FIGS. 18 and 19, the color scheme inverts once again, continuing the process of aiding the user in recognizing requests for new information or inputs. Command prompt 134 has updated to "SET TOTAL INTERVALS", informing the user that he or she is choosing the number of intervals that the workout routine shall consist of. Note that one interval consists of a single work period followed immediately by a single rest period. As in the previous two input interfaces, primary display area 120 displays the adjustable, currently selected input value. As before, this value is incremented or decremented by arrow keys 130a and 130b. A smaller display area, 120b, is introduced in this interface, and provides the user with a convenient readout of how long the total workout routine will last, based on the prior inputs of work time and rest time and the current input of total intervals. This readout is re-calculated and adjusted concurrent with any adjustments that the user may make to the total number of intervals. After pressing "Go" button 124, the user now begins the interval workout routine.

[0117] FIG. 20 illustrates the interface presented while the interval training workout is ongoing. Note the similarity between said interface and the circuit training interface of FIG. 1 and 2. While these two interface screens would never be seen one after another, the difference between the two screens is nevertheless emphasized by the use of contrasting color schemes. The bottom three display areas 122a-c are highly similar between the two different interface modes. 122a and 122c are identical to as described above, and 122b is identical to the Power measurement display described above, but relocated to a different zone of the display.

[0118] In Interval Training Mode, display label 122d has changed to read "INTERVAL SETS 5", such that the user may easily ascertain that he or she is currently in Interval Training Mode, and such that the user may furthermore keep track of the number of intervals, or sets, remaining. While the number five is seen in FIG. 20, note that this is solely for purposes of example, as in reality, the number seen on the display updates in real-time to indicate the number of intervals remaining in the workout routine. D

[0119] Immediately after the workout routine is initiated by the user, the first interval begins, starting with the work/exercise portion. The user's current state, or position in the cycle of the interval, is indicated in the top left corner of primary display area 120, by a label reading either "WORK" or "REST". In both the work and rest steps, a large counter fills primary display area 120, beginning at the predetermined amount of time selected by the user via the process described above. The counter then decrements second by second, until it expires at zero.

[0120] When the counter expires at zero, the next step of work or rest commences, and this cycle of intervals continues until the user presses "Stop" button 126 or the input number of total intervals is completed in full. Once the workout routine is either terminated or expires on its own, the user is presented with the review interface of FIG. 21. Label 131 in the top left corner indicates at all times to the user that the mode of operation is and was set to Interval Training Mode, and furthermore, that the interface console is in the review interface. The review interface is designed to be simple and easy to understand, introducing no new measurements or other factors. It presents the user with just four values, all tabulated into accumulated form. Display area 132a presents the user with the total number of full sets performed over the duration of the workout routine, and 132b similarly presents the user with the total distance, in meters, executed by his or her foot path(s). Display area 132c is shown depicting the average power output of the user, in watts, while display area 132d presents the total amount of elapsed time spent performing the interval training routine.

Claims

1. An exercise apparatus comprising:

a foot support (24a, 24b) suspended from above by a suspension assembly on a frame (10), the foot support (24a, 24b) being adapted to support a user in an upright position with the user's foot disposed on the foot support (24a, 24b),

the foot support (24a, 24b) being movable by the user on the frame (10) back and forth between a rearwardmost downward position (24a') and a forwardmost upward position (24a) through any one of a plurality of complete, reproducible and different arc segments (AP, AP') of a master arcuate path (J) that has the same path of travel from the rearwardmost downward position (24a') to the forwardmost upward position (24a) and back to the rearwardmost downward position (24a'), each different arc segment (AP, AP') being individually selectable by the user,

each said different arc segment (AP, AP') being defined by movement of the foot support (24a,

24b) between a corresponding different forwardmost upward position (24b", 24b"") and different rearwardmost downward position (24b', 24b"') each of said different arc segments having a different degree of incline (H1, H2) corresponding to each different forwardmost upward (24b", 24b"") and rearwardmost downward position (24b', 24b"') of the foot support,
wherein movement of the foot support between the rearwardmost downward position (24a') and the forwardmost upward position (24a) and back to the rearwardmost downward position (24a') defines a complete exercise cycle,
a resistance assembly (200) interconnected to the foot support, the resistance assembly being adapted to exert a resistance to movement of the foot support by the user,
characterized in that the apparatus includes:

a mounting bracket or arm (38) that can be manually pivoted (FB) via extension or contraction of a fluid driven piston (230) that acts as a tilt actuator to pivot the mounting bracket or arm (38) forwardly or backwardly, and
an arc segment selection device comprising the fluid driven piston (230), wherein the fluid driven piston (230) is mounted in a fluid sealed cylinder having a drive axis (PA), the piston (230) being manually drivable by application of manual force by the user to drive fluid contained within the cylinder via a push or turn mechanism (230a) to translationally drive the piston (230) a selectable distance (PT) along the drive axis (PA) of the cylinder to a selectable one of a plurality of different translational positions that correspond to one of the plurality of different arc segments (AP, AP'), the selectable distance (PT) varying with the degree of mechanical force or energy exerted by the user on the push or turn mechanism (230a).

2. The exercise apparatus according to claim 1, wherein the resistance assembly (200) is interconnected to the foot support (24a, 24b) and the fluid driven piston (230) in an arrangement such that the resistance assembly (200) is manually movable (FB) to one of a plurality of different fixed resistance assembly positions that correspond to the selected amount or degree of manual force exerted by the user on the mechanism (230a) and a corresponding one of the plurality of translational positions.

3. The apparatus of claim 2, wherein the resistance assembly (200) pivots forwardly and backwardly (FB) about a pivot axis (A) of the mounting bracket or arm (38) which is orthogonal to a longitudinal axis of the frame (10).

4. A method of performing a simulated walking or running exercise using an apparatus according to any preceding claim, comprising:

selecting one of the different arc segments (AP, AP') and,
manually actuating the arc segment selection device (230) to move the arc segment selection device (230) to one of the plurality of different fixed mechanical positions that fix or limit travel of the foot support (24a, 24b) to the selected one of the plurality of different arc segments (AP, AP').

5. A method of performing multiple different exercises in time sequential manner by an exerciser, the method comprising:

the exerciser's selecting at least first and second different exercise regimes that require exercise of different muscle groups,
the exerciser's performing and completing a selected one of the first or second exercise regimes,
substantially immediately after the step of performing and completing the selected one of the first or second exercise regimes, the exerciser's performing and completing the other of the first or second exercise regimes,
wherein the first exercise regime comprises performing walking or running according to claim 4.

Patentansprüche

1. Übungsgerät, umfassend:

eine Fußstütze (24a, 24b), die von oben durch eine Aufhängungsanordnung an einem Gestell (10) aufgehängt ist, wobei die Fußstütze (24a, 24b) dazu eingerichtet ist, einen Benutzer in einer aufrechten Stellung zu stützen, wobei der Fuß des Benutzers auf der Fußstütze (24a, 24b) angeordnet ist,
wobei die Fußstütze (24a, 24b) durch den Benutzer an dem Gestell (10) zwischen einer hintersten Abwärtsstellung (24a') und einer vordersten Aufwärtsstellung (24a) durch ein beliebiges von einer Vielzahl von vollständigen, reproduzierbaren und unterschiedlichen Bogensegmente (AP, AP') eines bogenförmigen Hauptwegs (J), der denselben Bewegungsweg von der hintersten Abwärtsstellung (24a') zu der vordersten Aufwärtsstellung (24a) und zurück zu der hintersten Abwärtsstellung (24a') aufweist, vor und zurückbewegbar ist, wobei jedes

unterschiedliche Bogensegment (AP, AP') durch den Benutzer einzeln auswählbar ist,
wobei jedes unterschiedliche Bogensegment (AP, AP') durch eine Bewegung der Fußstütze (24a, 24b) zwischen einer entsprechenden unterschiedlichen vordersten Aufwärtsstellung (24b", 24b"") und einer entsprechenden hintersten Abwärtsstellung (24b', 24b"') definiert ist,
wobei jedes der unterschiedlichen Bogensegmente einen unterschiedlichen Neigungsgrad (H1, H2) aufweist, der jeder unterschiedlichen vordersten Aufwärtsstellung (24b", 24b"") und jeder unterschiedlichen hintersten Abwärtsstellung (24b', 24b"') der Fußstütze entspricht,
wobei eine Bewegung der Fußstütze zwischen der hintersten Abwärtsstellung (24a') und der vordersten Aufwärtsstellung (24a) und zurück zu der hintersten Abwärtsstellung (24a') einen vollständigen Übungszyklus definiert,
eine Widerstandsanordnung (200), die mit der Fußstütze gekoppelt ist, wobei die Widerstandsanordnung dazu eingerichtet ist, einen Widerstand auf eine Bewegung der Fußstütze durch den Benutzer auszuüben,
dadurch gekennzeichnet, dass das Gerät Folgendes beinhaltet:

eine Montagehalterung oder einen Montagearm (38), die bzw. der von Hand mittels Ausfahrens oder Einfahrens eines fluidangetriebenen Kolbens (230), der als ein Kippbetätiger zum Schwenken der Montagehalterung oder des Montagearms (38) nach vorne oder nach hinten fungiert, geschwenkt (FB) werden kann, und
eine Bogensegmentauswahlvorrichtung, die den fluidangetriebenen Kolben (230) umfasst, wobei der fluidangetriebene Kolben (230) in einem fluiddichten Zylinder mit einer Antriebsachse (PA) montiert ist, wobei der Kolben (230) von Hand durch Anwendung einer Handkraft durch den Benutzer zum Antreiben von Fluid, das im Inneren des Zylinders enthalten ist, mittels eines Druck- oder Drehmechanismus (230a) antreibbar ist, um den Kolben (230) um eine auswählbare Strecke (PT) entlang der Antriebsachse (PA) des Zylinders zu einer auswählbaren von einer Vielzahl von unterschiedlichen Translationsstellungen, die einem von der Vielzahl von unterschiedlichen Bogensegmenten (AP, AP') entsprechen, translatorisch anzutreiben, wobei die auswählbare Strecke (PT) mit dem Grad einer mechanischen Kraft oder Energie, die durch den Benutzer auf den Druck- oder Drehmechanismus (230a) ausgeübt wird, variiert.

2. Übungsgerät nach Anspruch 1, wobei die Widerstandsanordnung (200) mit der Fußstütze (24a, 24b) gekoppelt ist und der fluidangetriebene Kolben (230) in einer derartigen Einrichtung ist, dass die Widerstandsanordnung (200) von Hand in eine von einer Vielzahl von unterschiedlichen festgelegten Widerstandsanordnungsstellungen, die dem ausgewählten Umfang oder Grad einer Handkraft, die durch den Benutzer auf den Mechanismus (230a) ausgeübt wird, und einer entsprechenden von der Vielzahl von Translationsstellungen entsprechen, bewegbar (FB) ist.

3. Gerät nach Anspruch 2, wobei die Widerstandsanordnung (200) um eine Schwenkachse (A) der Montagehalterung oder des Montagearms (38), die orthogonal zu einer Längsachse des Gestells (10) ist, nach vorne und nach hinten (FB) schwenkt.

4. Verfahren zur Durchführung einer simulierten Geh- oder Laufübung unter Verwendung eines Geräts nach einem vorhergehenden Anspruch, umfassend:

Auswählen von einem der unterschiedlichen Bogensegmente (AP, AP') und
Betätigen der Bogensegmentauswahlvorrichtung (230) von Hand, um die Bogensegmentauswahlvorrichtung (230) in eine von der Vielzahl von unterschiedlichen festgelegten mechanischen Stellungen zu bewegen, die eine Bewegung der Fußstütze (24a, 24b) auf die ausgewählte von der Vielzahl von unterschiedlichen Bogensegmenten (AP, AP') festlegen oder begrenzen.

5. Verfahren zur Durchführung mehrerer unterschiedlicher Übungen auf zeitsequentielle Weise durch eine übende Person, wobei das Verfahren Folgendes umfasst:

Auswählen von mindestens einem ersten und einem zweiten Übungsplan, die unterschiedlich sind und die eine Betätigung unterschiedlicher Muskelgruppen erfordern, durch die übende Person,
Durchführen und Abschließen eines ausgewählten von dem ersten und dem zweiten Übungsplan durch die übende Person,
im Wesentlichen unmittelbar nach dem Schritt des Durchführens und Abschließens des ausgewählten von dem ersten und dem zweiten Übungsplan Durchführen und Abschließen des anderen von dem ersten und dem zweiten Übungsplan durch die übende Person,
wobei der erste Übungsplan ein Durchführen eines Gehens oder Laufens nach Anspruch 4 umfasst.

Revendications

1. Appareil d'exercice comprenant :

un support de pied (24a, 24b) soutenu par un dispositif de suspension sur un cadre (10), le support de pied (24a, 24b) étant adapté pour supporter un utilisateur dans une position debout, le pied de l'utilisateur étant posé sur le support de pied (24a, 24b),
le support de pied (24a, 24b) pouvant être déplacé par l'utilisateur sur le cadre (10) en va-et-vient entre une position descendante la plus en arrière (24a') et une position ascendante la plus en avant (24a), via un quelconque segment en arc d'une pluralité de différents segments en arc complets et reproductibles (AP, AP') d'une trajectoire courbe maîtresse (J) qui a la même trajectoire de déplacement de la position descendante la plus en arrière (24a') à la position ascendante la plus en avant (24a) que de retour vers la position descendante la plus en arrière (24a'), chaque différent segment en arc (AP, AP') étant individuellement sélectionnable par l'utilisateur,
chaque dit différent segment à arc (AP, AP') étant défini par le mouvement du support de pied (24a, 24b) entre une différente position ascendante la plus en avant (24b", 24b"") et une différente position descendante la plus en arrière (24b', 24b"') correspondantes, chacun desdits différents segments en arc ayant un déclivité différente (H1, H2) correspondant à chaque différente position ascendante la plus en avant (24b", 24b"") et à chaque position descendante la plus en arrière (24b', 24b"') du support du pied,
dans lequel le mouvement du support de pied, entre la position descendante la plus en arrière (24a') et la position ascendante la plus en avant (24a) et de retour vers la position descendante la plus en arrière (24a'), définit un cycle d'exercice complet,
un mécanisme de résistance (200) relié au support de pied, le mécanisme de résistance étant adapté pour exercer une résistance au mouvement du support de pied qu'effectue l'utilisateur,
caractérisé en ce que l'appareil inclut :

une équerre ou un bras de fixation (38) qui peut pivoter manuellement (FB) sous l'action du déploiement ou de la rentrée d'un piston actionné par fluide (230), qui agit en tant qu'actionneur d'inclinaison pour faire pivoter l'équerre ou le bras de fixation (38) vers l'avant ou vers l'arrière, et
un dispositif de sélection de segments en arc comportant le piston actionné par fluide (230), dans lequel le piston actionné par fluide (230) est monté sur un cylindre étanche au fluide doté d'un axe d'entraînement (PA), le piston (230) pouvant être entraîné manuellement par une force manuelle qu'applique l'utilisateur pour entraîner le fluide que contient le cylindre moyennant un dispositif de poussée ou de rotation (230a) pour entraîner, par translation, le piston (230) sur une distance sélectionnable (PT) le long de l'axe d'entraînement (PA) du cylindre sur une position sélectionnable d'une pluralité de différentes positions translationnelles qui correspondent à un segment en arc de la pluralité de différents segments en arc (AP, AP'), la distance sélectionnable (PT) variant en fonction du degré de la force mécanique ou de l'énergie exercée par l'utilisateur sur le mécanisme de poussée ou de rotation (230a).

2. Appareil d'exercice selon la revendication 1, dans lequel le mécanisme de résistance (200) est relié au support de pied (24a, 24b) et au piston entraîné par fluide (230) selon un agencement tel que le mécanisme de résistance (200) peut être manuellement déplacé (FB) sur une position d'une pluralité de différentes positions fixes du mécanisme de résistance qui correspond au montant ou degré sélectionné de force manuelle exercée par l'utilisateur sur le mécanisme (230a) et sur une position correspondant à une position de la pluralité de positions translationnelles.

3. Appareil selon la revendication 2, dans lequel le mécanisme de résistance (200) pivote vers l'avant et vers l'arrière (FB) de part et d'autre de l'axe de rotation (A) de l'équerre ou du bras de fixation (38) qui est orthogonal par rapport à un axe longitudinal du cadre (10).

4. Procédé pour effectuer une simulation d'exercice de marche ou de course avec un appareil selon l'une quelconque des revendications précédentes, consistant à :

sélectionner un segment des différents segments en arc (AP, AP') et,
manuellement actionner le dispositif de sélection de segments en arc (230) pour déplacer le dispositif de sélection des segments en arc (230) sur une position de la pluralité de différentes positions mécaniques fixes qui fixe ou limite le déplacement du support de pied (24a, 24b) sur le segment en arc sélectionné de la pluralité de différents segments en arc (AP, AP').

5. Procédé pour effectuer de multiples différents exer-

cices de manière séquentielle dans le temps par un exerciseur, le procédé comprenant :

la sélection par l'exerciseur d'au moins un premier et d'un deuxième différents programmes d'exercice qui impliquent le travail de différents groupes de muscles,
la réalisation et l'achèvement par l'exerciseur d'un programme sélectionné du premier ou du deuxième programme d'exercice,
essentiellement immédiatement à la suite de la réalisation et de l'achèvement du programme sélectionné du premier ou du deuxième programme d'exercice, la réalisation et l'achèvement par l'exerciseur de l'autre programme du premier ou du deuxième programme d'exercice,
dans lequel la premier programme d'exercice comporte la réalisation d'un exercice de marche ou d'un exercice de course selon la revendication 4.

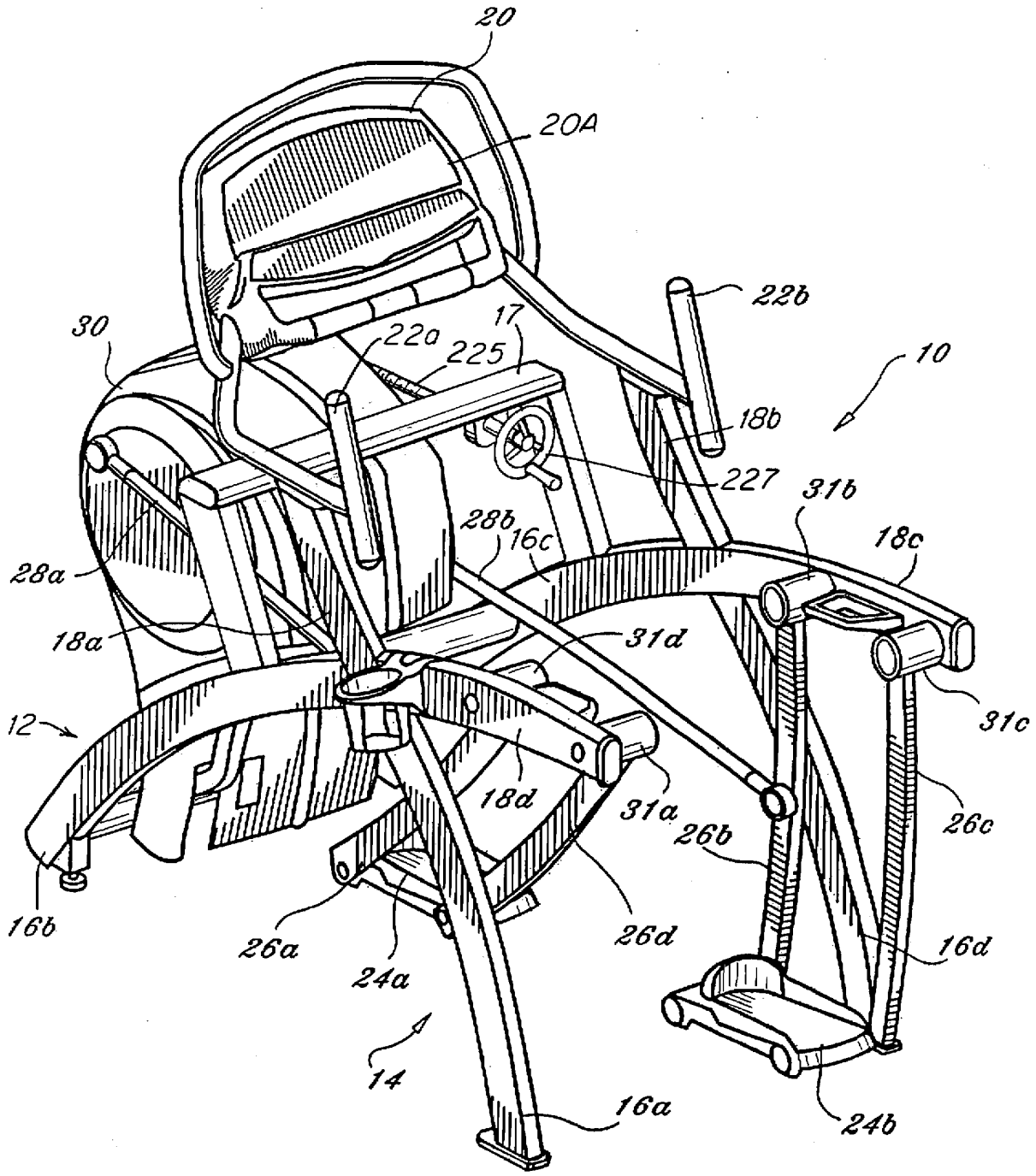
20
20A
22b
17
30
220
225
10
18b
227
31b
28b
16c
18c
28a
18a
31d
12
31c
18d
31a
26b
26c
16b
26a
26d
16d
24a
14
16a
24b

Fig. 1

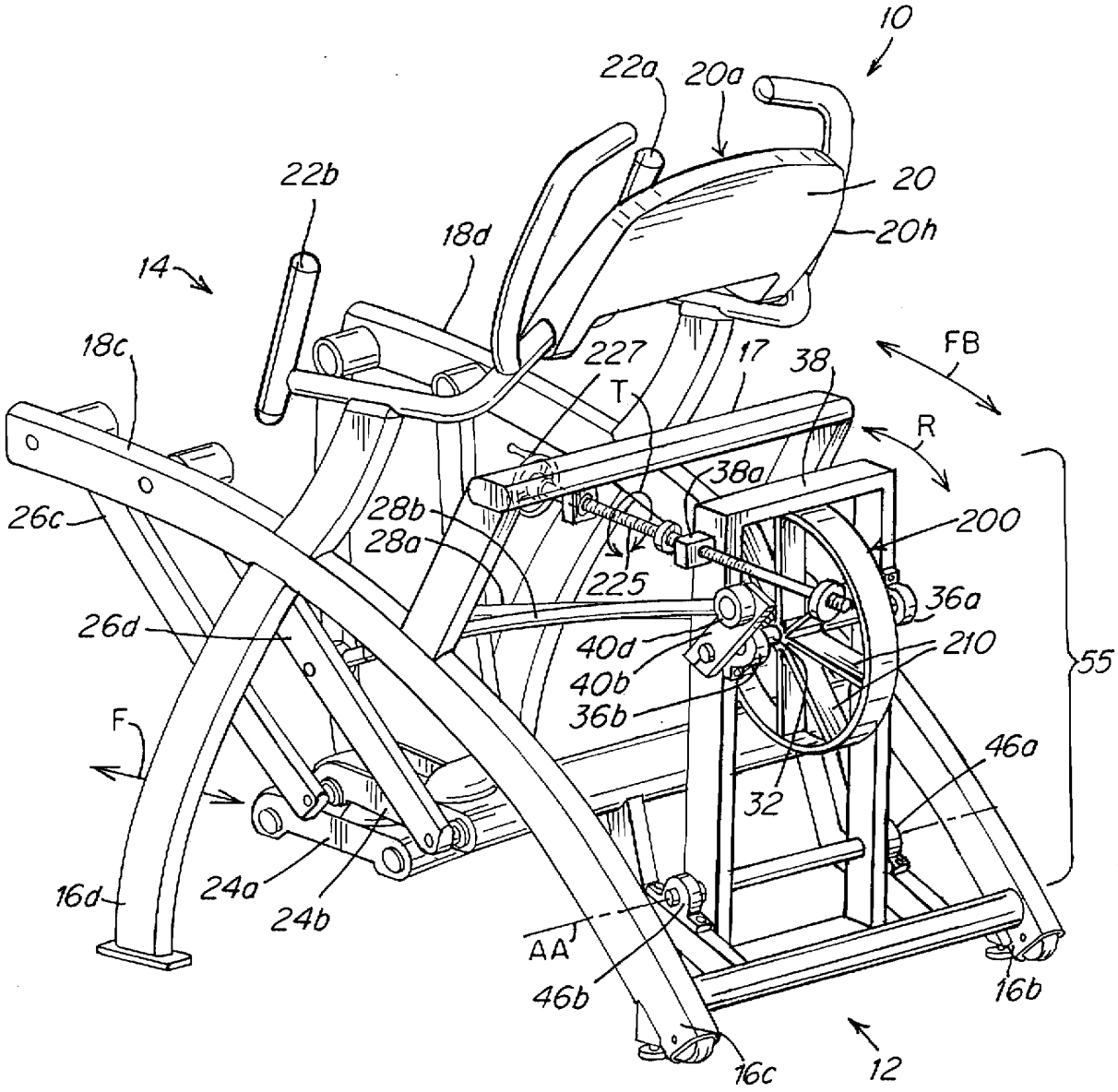
10
22a
20a
22b
20
18d
20h
14
18c
227
17
38
FB
T
R
38a
28b
200
26c
28a
225
36a
26d
40d
210
40b
55
36b
F
46a
32
16d
24a
24b
AA
46b
16b
16c
12

Fig. 2

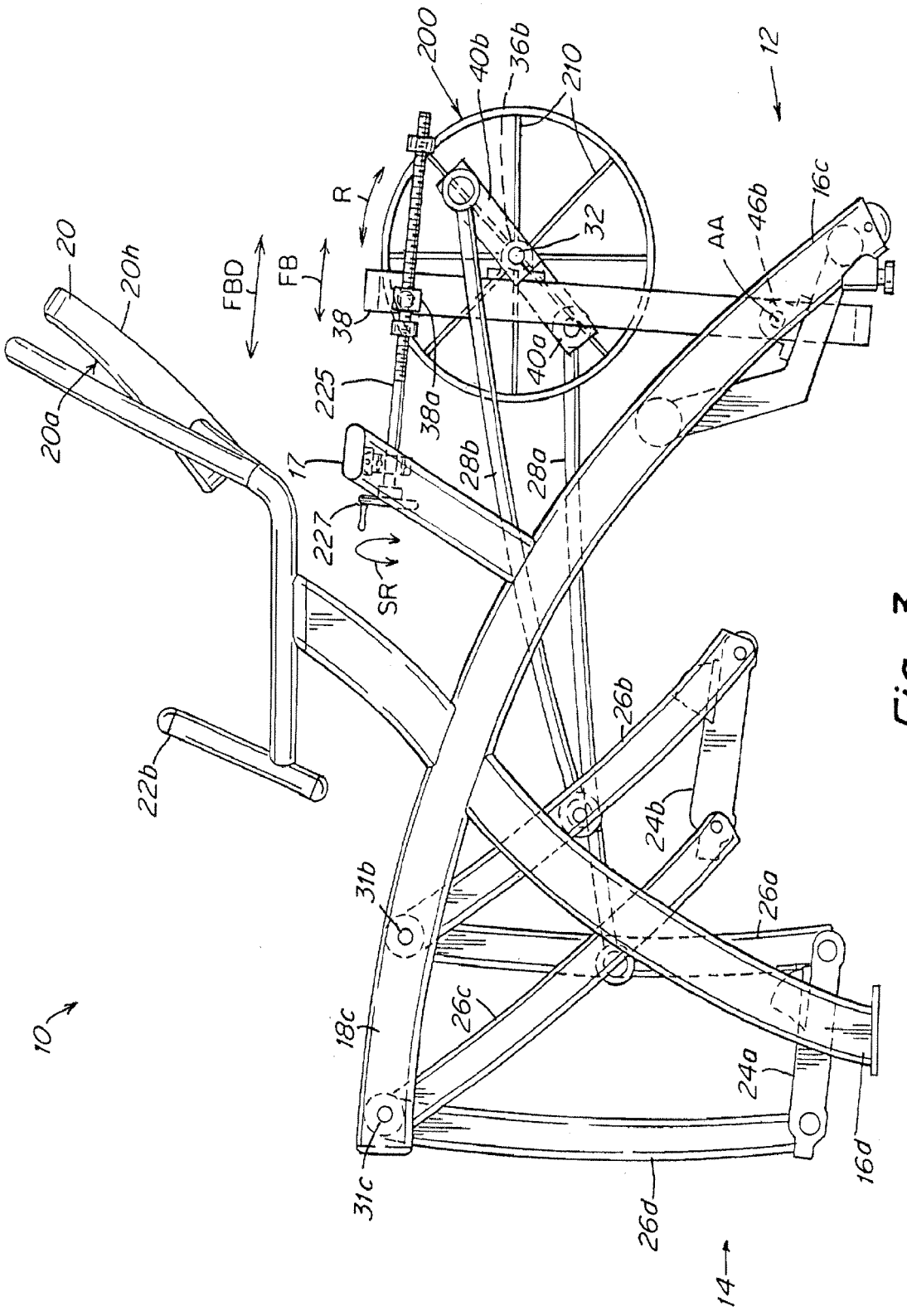
200
40b
36b
210
12
R
32
AA
46b
16c
20
20h
FBD
FB
38
40a
225
38a
20a
17
28b
28a
227
SR
22b
26b
24b
31b
26a
10
18c
26c
24a
16d
31c
26d
14

Fig. 3

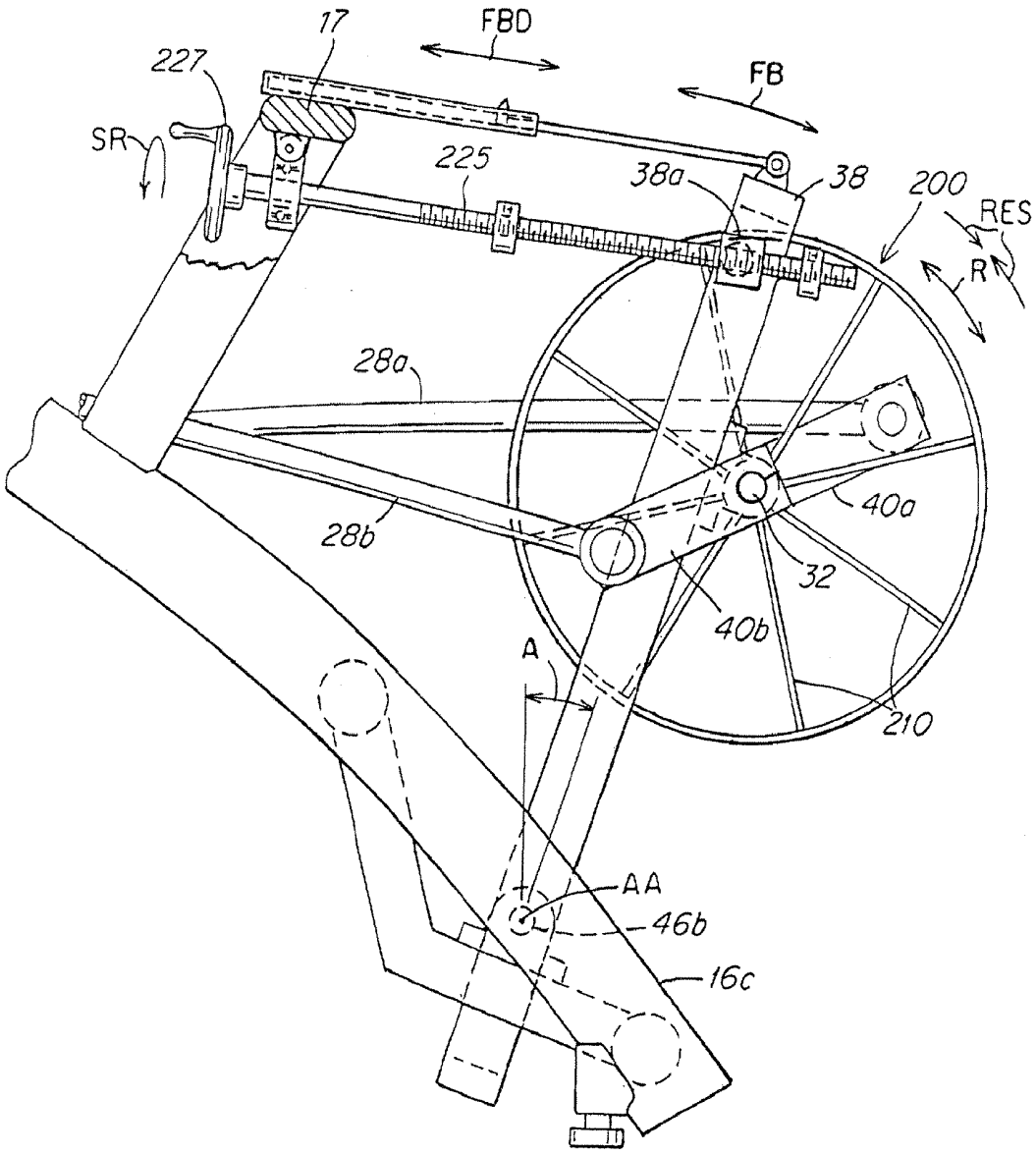
17
FBD
227
FB
SR
225
38a
38
200
RES
R
28a
28b
40a
32
40b
A
210
AA
46b
16c

Fig. 3A

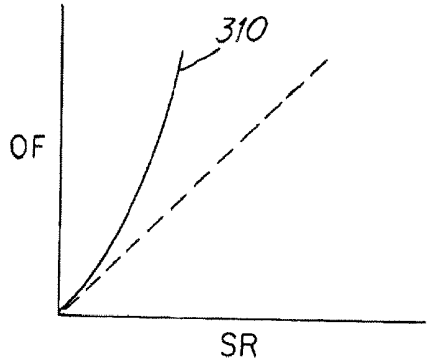
310
OF
SR

Fig. 3B

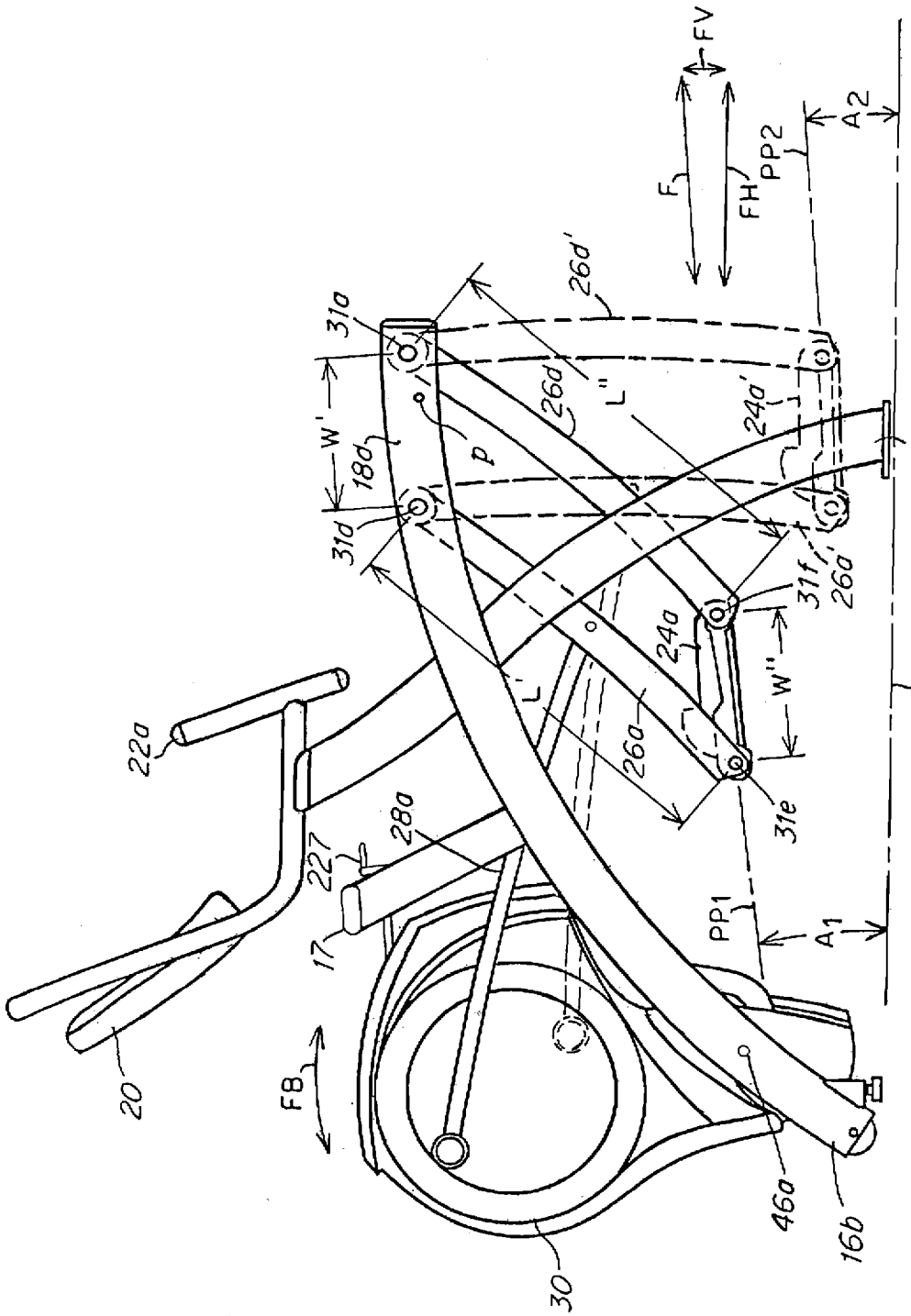
FV
F
FH
PP2
A2
26d'
31a
W'
18d
26d
L"
24a'
16a
P
31d
31f
26d'
24a
W''
RP
L'
26a
31e
22a
28a
227
17
PP1
A1
20
F8
46a
16b
30

Fig. 4

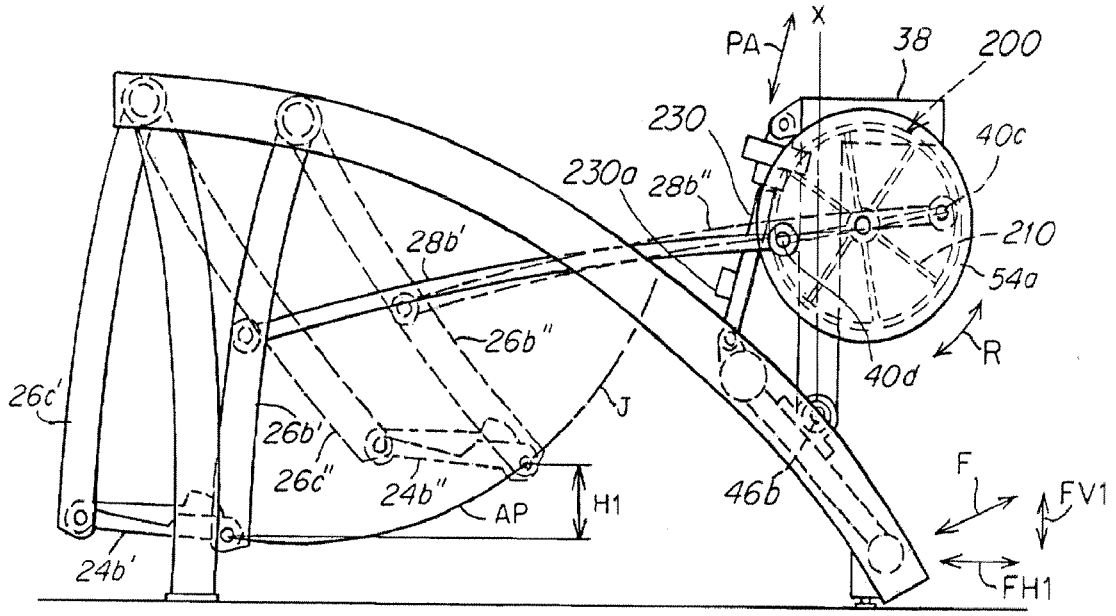
PA
X
38
200
230
230a
28b''
40c
210
54a
28b'
26b''
R
40d
26c'
26b'
J
26c''
24b''
AP
H1
46b
F
FV1
FH1
24b'

Fig. 5

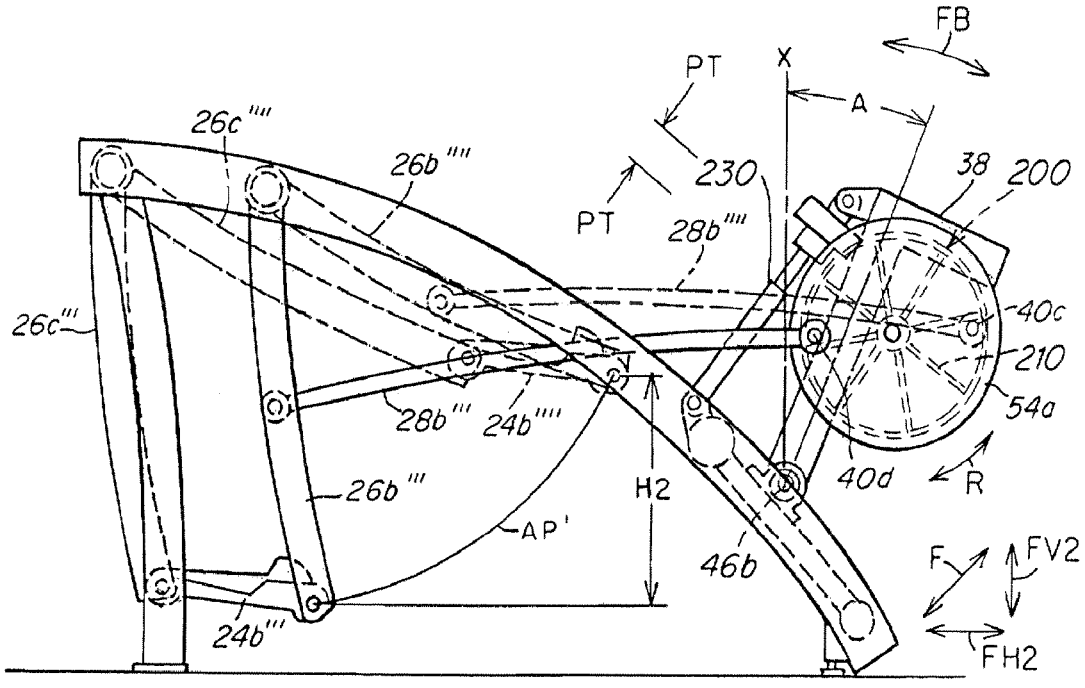
FB
PT
X
A
26c''''
26b''''
230
38
200
PT
28b''''
40c
26c'''
210
28b'''
24b''''
54a
40d
R
26b'''
H2
AP'
46b
F
FV2
24b'''
FH2

Fig. 6

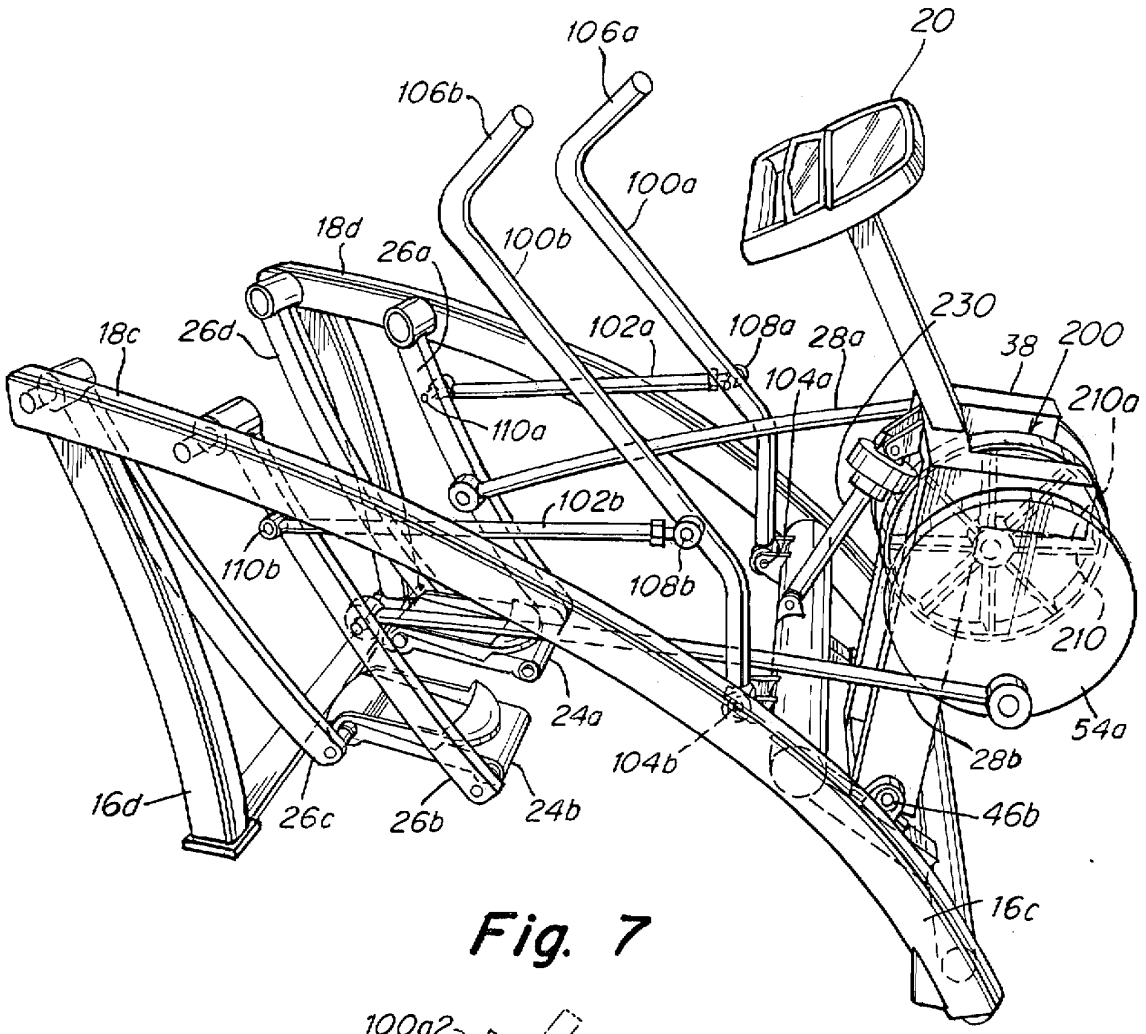
106a
20
106b
100a
18d
26a
100b
230
18c
26d
102a
108a
28a
38
200
104a
210a
110a
102b
110b
108b
210
24a
54a
104b
28b
16d
26c
26b
24b
46b
16c

Fig. 7

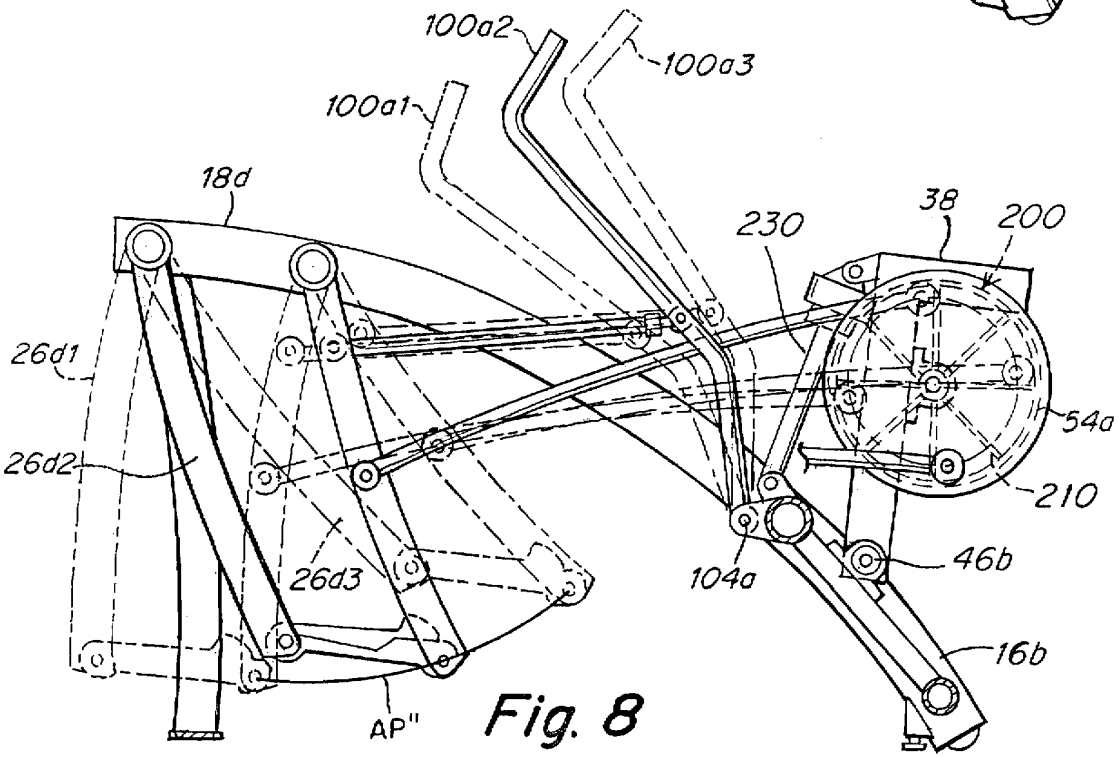
100a2
100a3
100a1
18d
38
200
230
26d1
54a
26d2
210
46b
26d3
104a
16b
AP"

Fig. 8

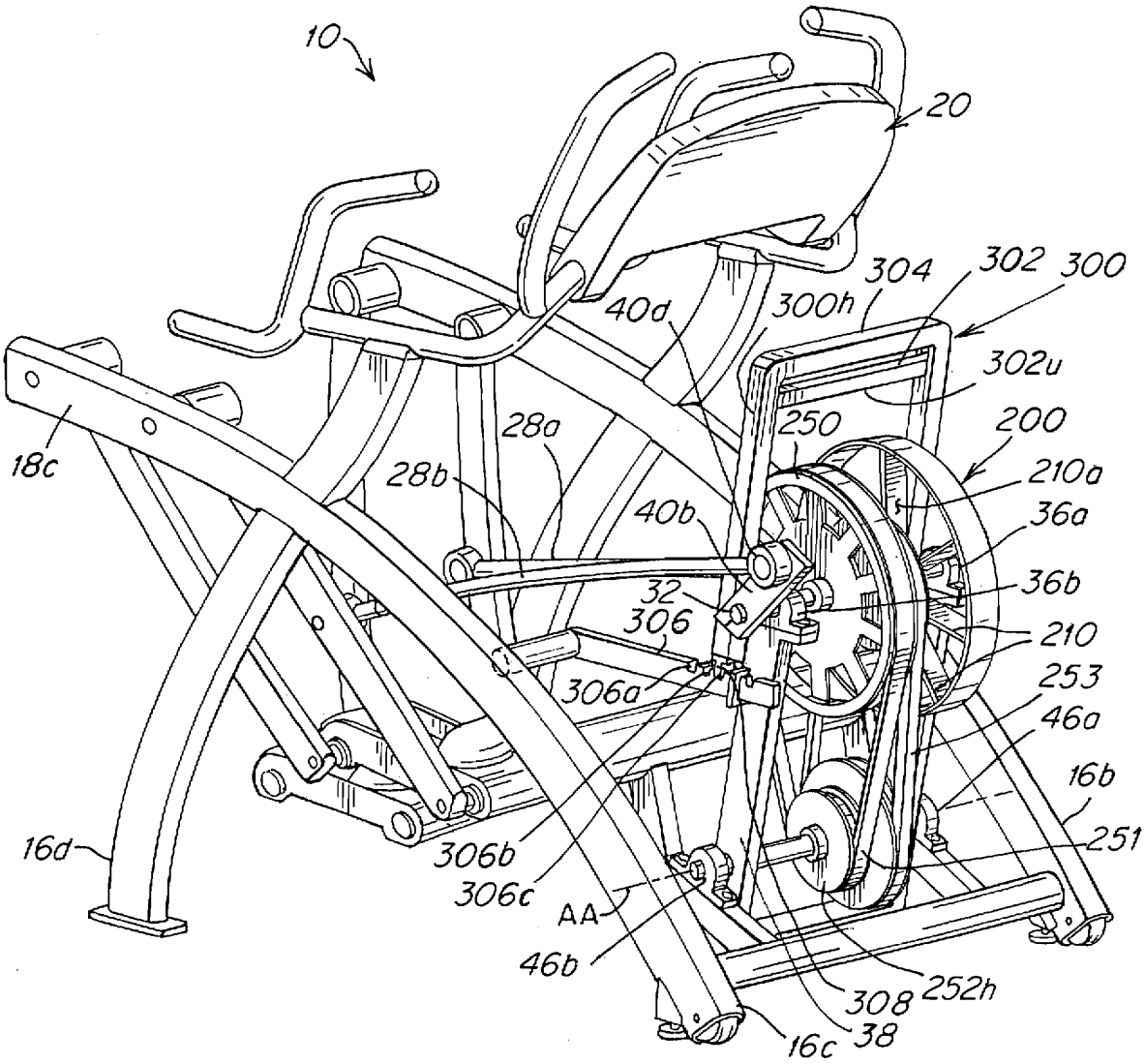
10
20
304
302
300
40d
300h
302u
250
200
28a
28b
210a
40b
36a
32
36b
306
210
306a
253
46a
16b
18c
16d
306b
306c
AA
251
46b
308
252h
38
16c

Fig. 9

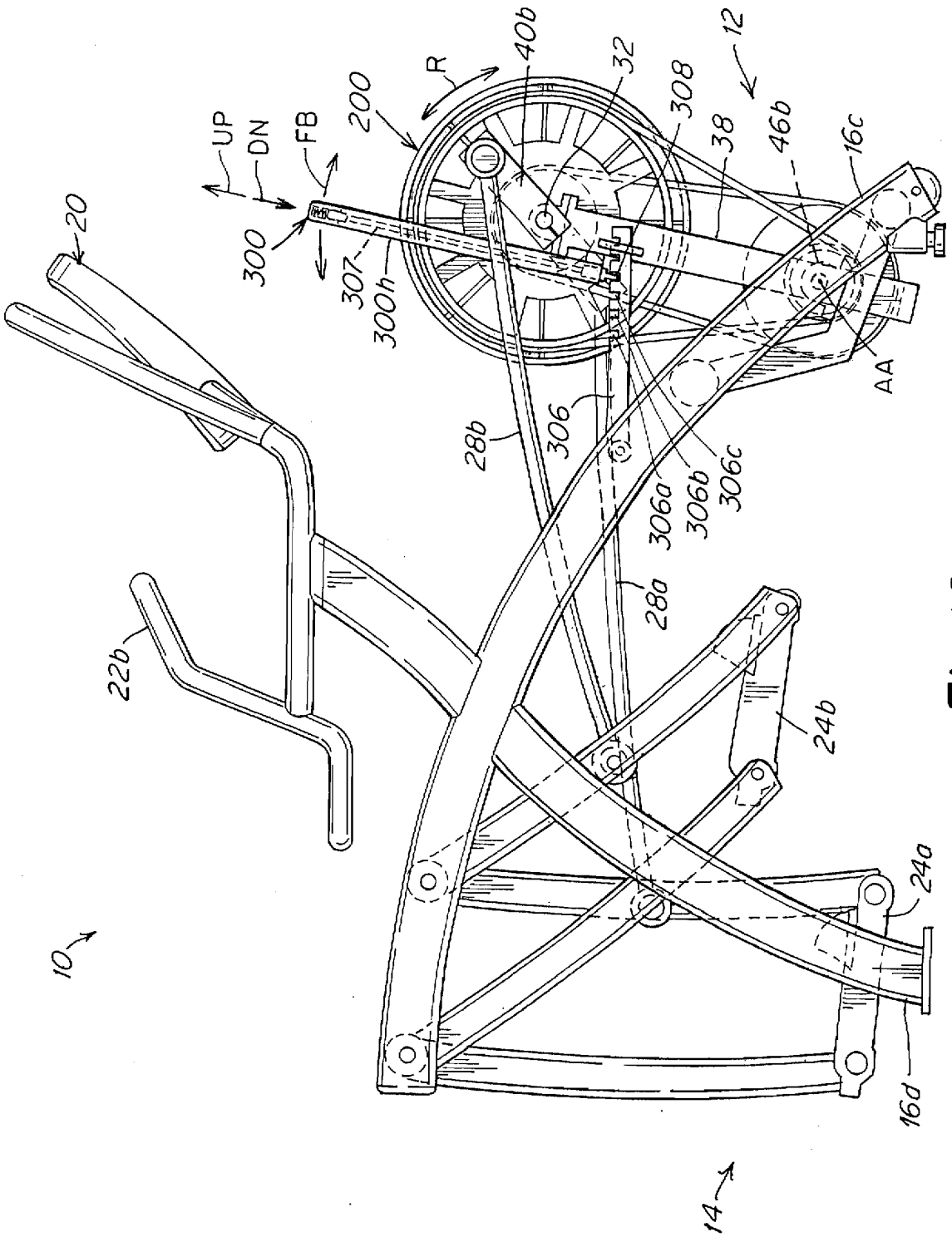
UP
DN
FB
R
200
40b
32
308
12
38
46b
16c
20
300
307
300h
AA
306
28b
306a
306b
306c
28a
22b
24b
24a
16d
10
14

Fig. 10

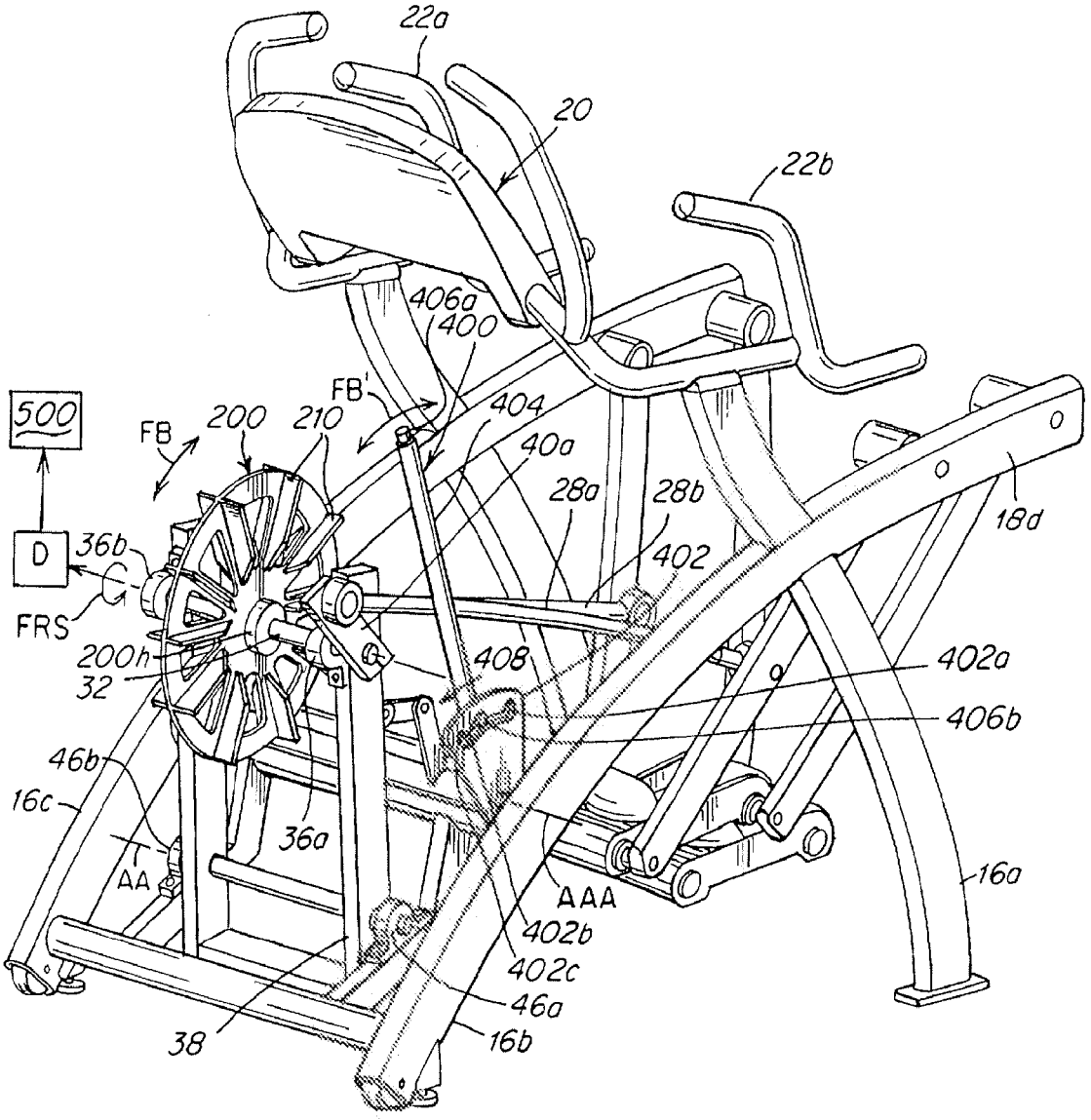
22a
20
22b
406a
400
FB'
404
40a
500
FB
200
210
28a
28b
18d
D
36b
402
FRS
200h
408
402a
32
406b
46b
16c
36a
AA
AAA
16a
402b
402c
46a
38
16b

Fig. 11

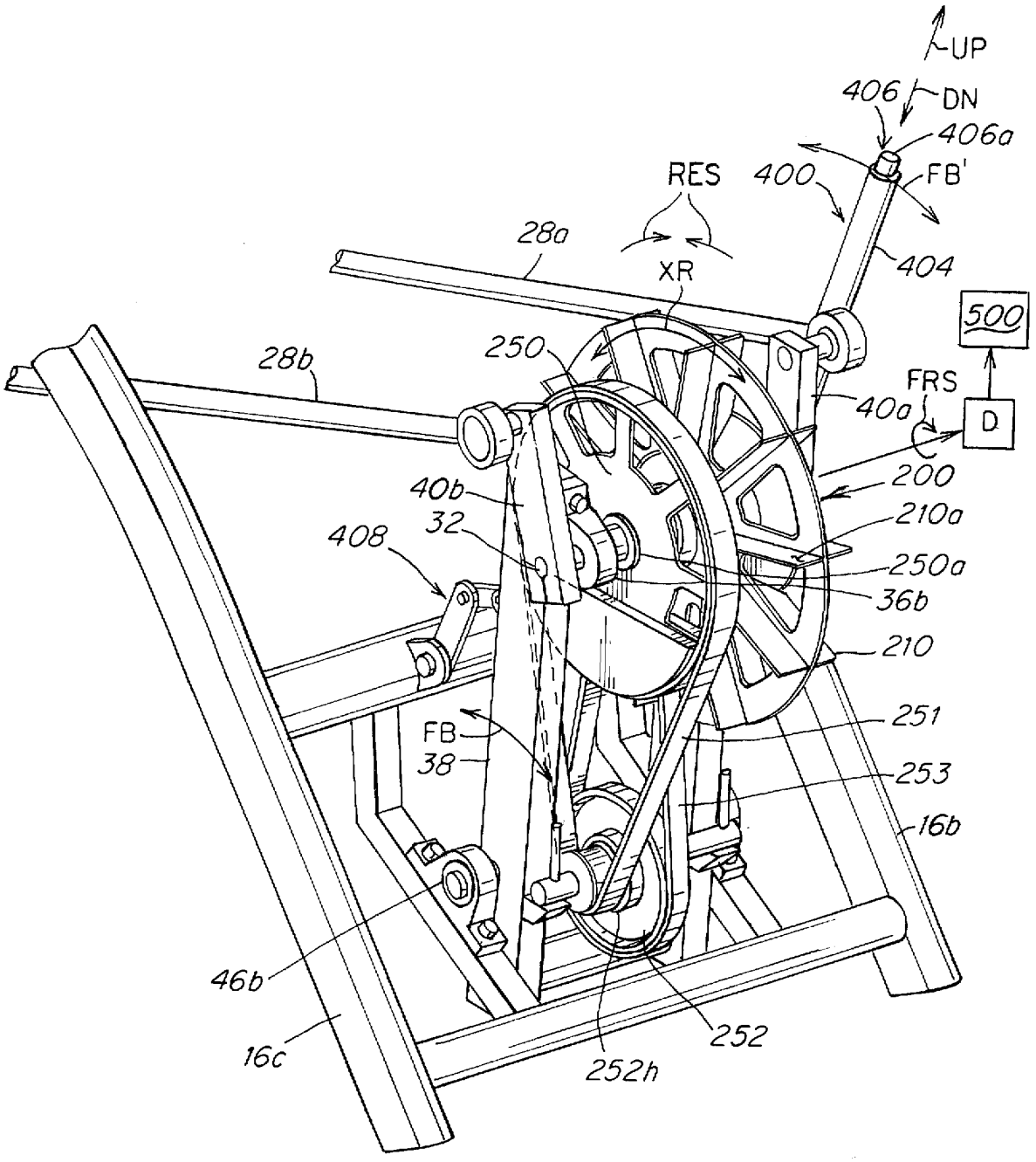
UP
406
DN
406a
RES
400
FB'
28a
XR
404
500
250
28b
FRS
40a
D
200
40b
32
210a
408
250a
36b
210
FB
251
38
253
16b
46b
16c
252
252h

Fig. 12

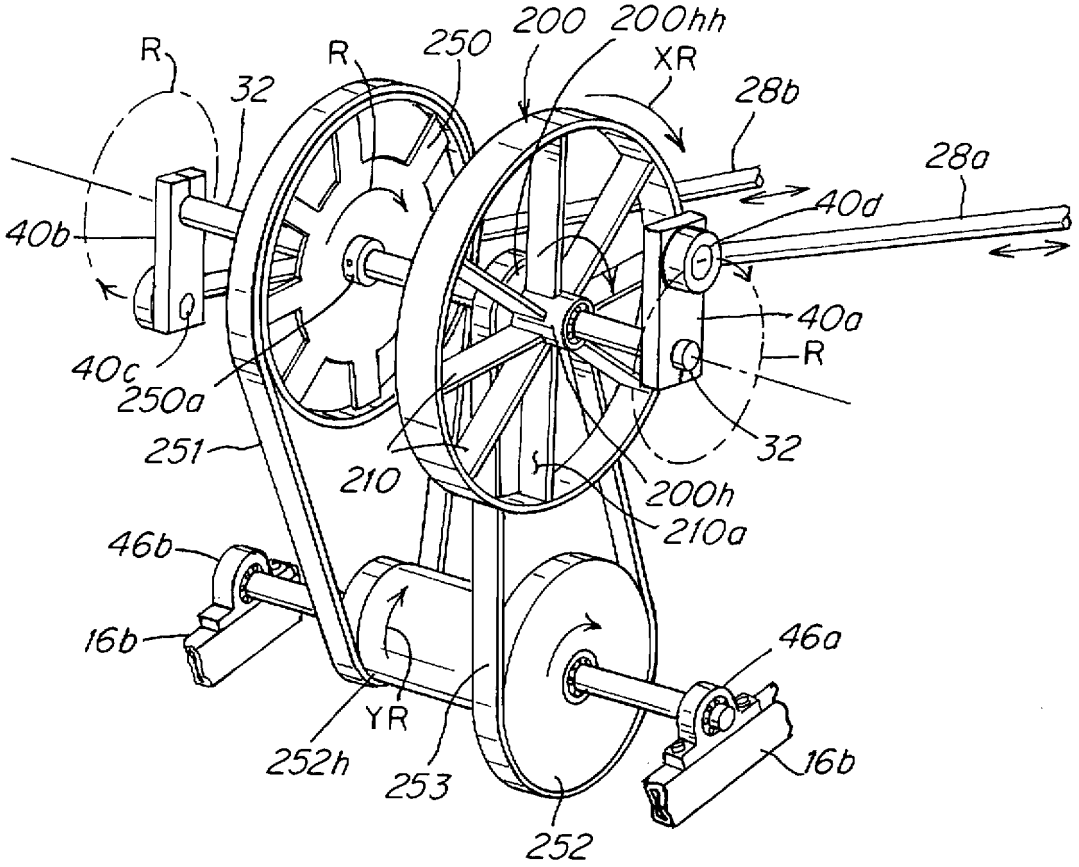
R
R
250
200
200hh
XR
28b
28a
32
40d
40b
40a
R
40c
250a
251
210
32
200h
210a
46b
16b
46a
YR
252h
253
16b
252

Fig. 13

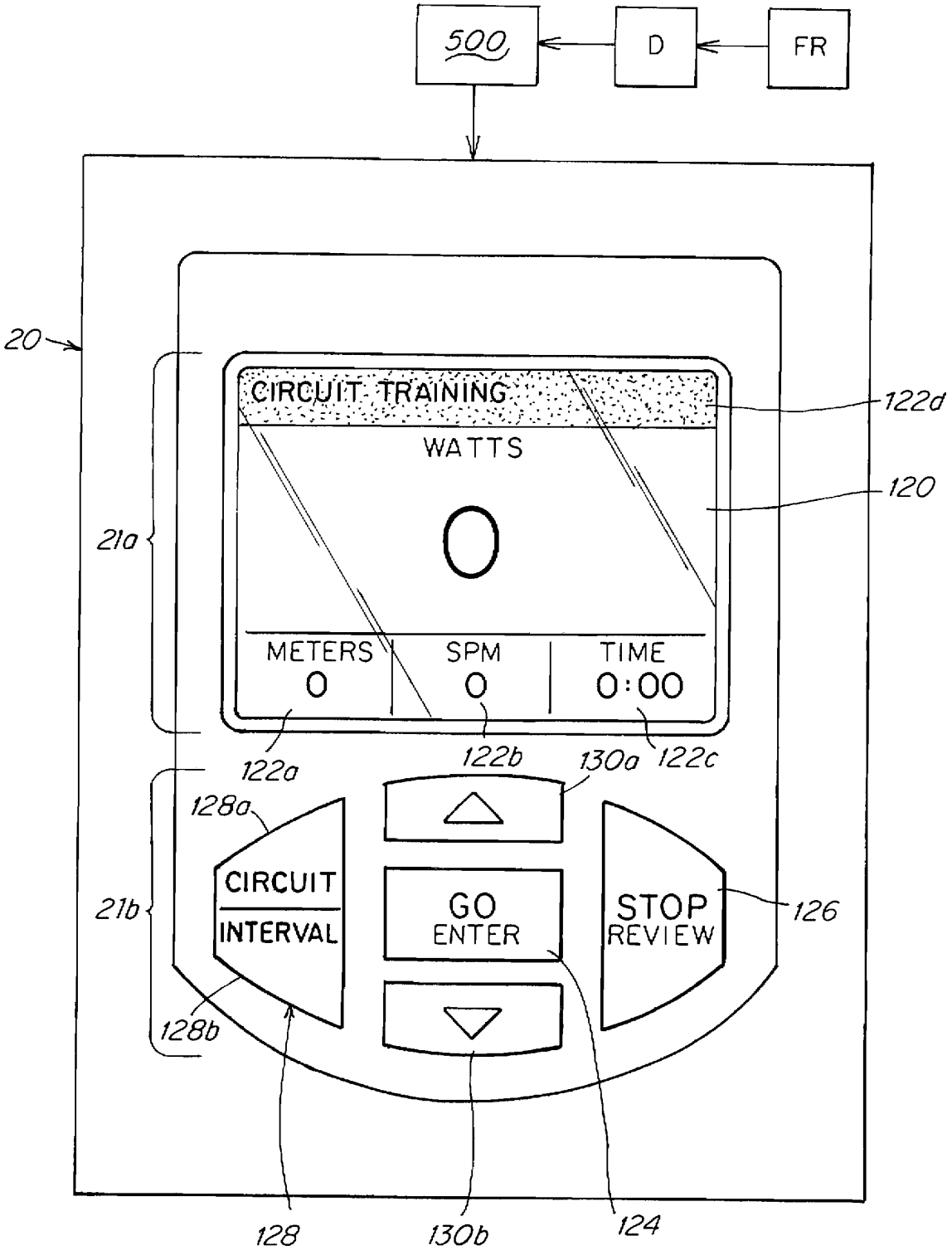
500
D
FR
20
CIRCUIT TRAINING
WATTS
0
METERS
0
SPM
0
TIME
0:00
122d
120
21a
122a
122b
130a
122c
128a
CIRCUIT
INTERVAL
GO
ENTER
STOP
REVIEW
126
21b
128b
128
130b
124

Fig. 14

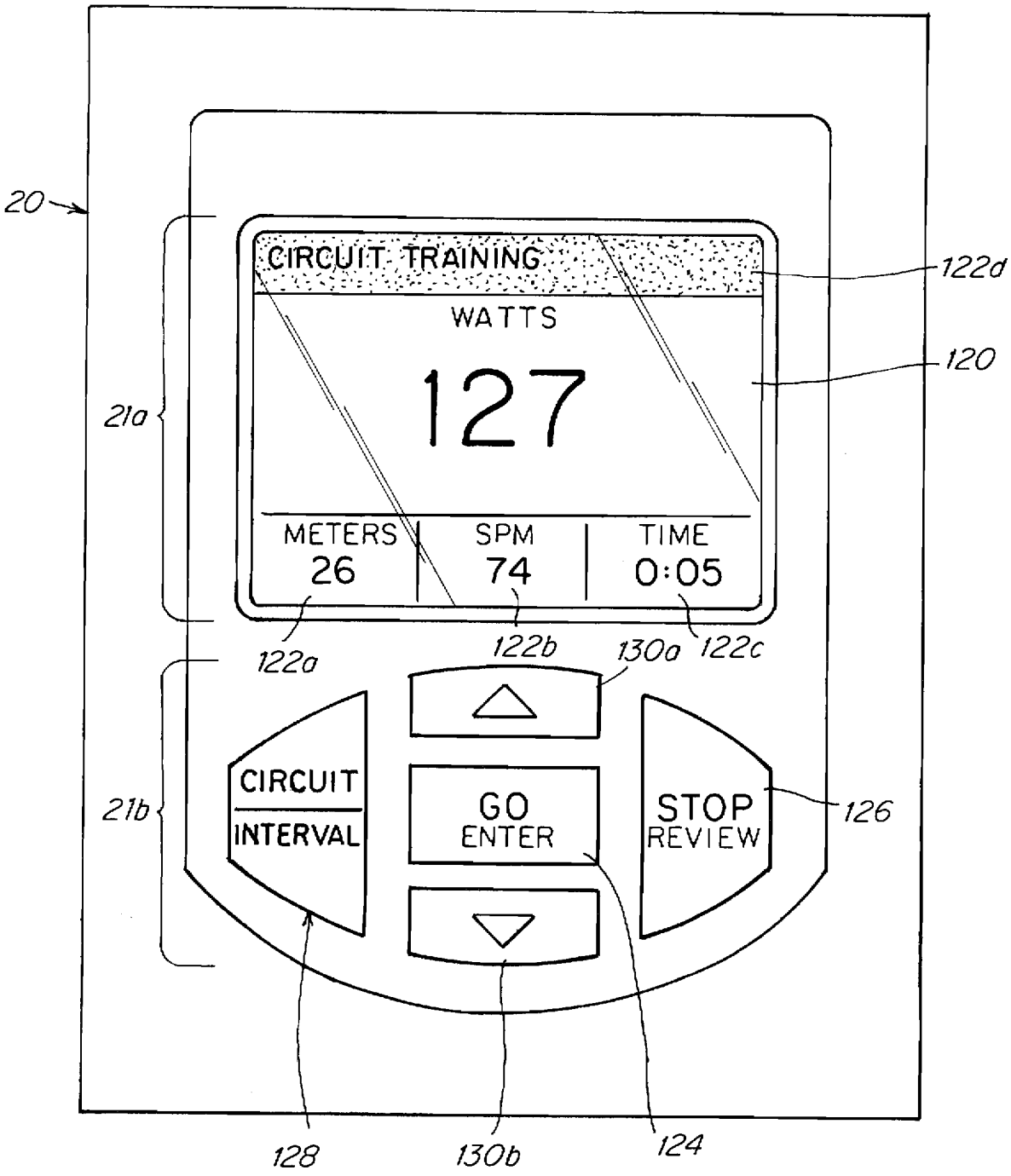
20
CIRCUIT TRAINING
WATTS
127
METERS
26
SPM
74
TIME
0:05
122d
120
21a
122a
122b
130a
122c
21b
CIRCUIT
INTERVAL
GO
ENTER
STOP
REVIEW
126
128
130b
124

Fig. 15

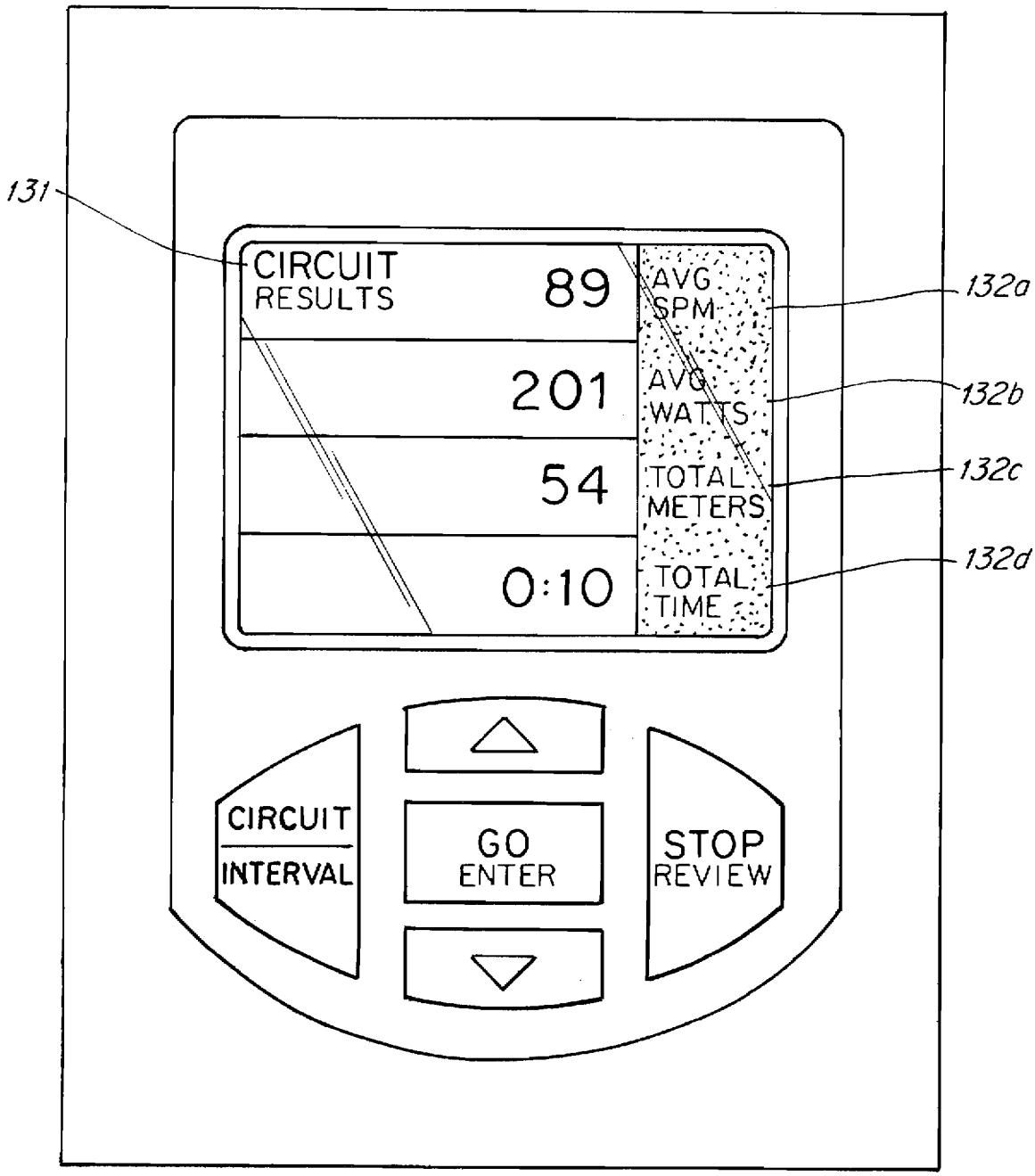
131
CIRCUIT
RESULTS
89
201
54
0:10
AVG
SPM
AVG
WATTS
TOTAL
METERS
TOTAL
TIME
132a
132b
132c
132d
CIRCUIT
INTERVAL
GO
ENTER
STOP
REVIEW

Fig. 16

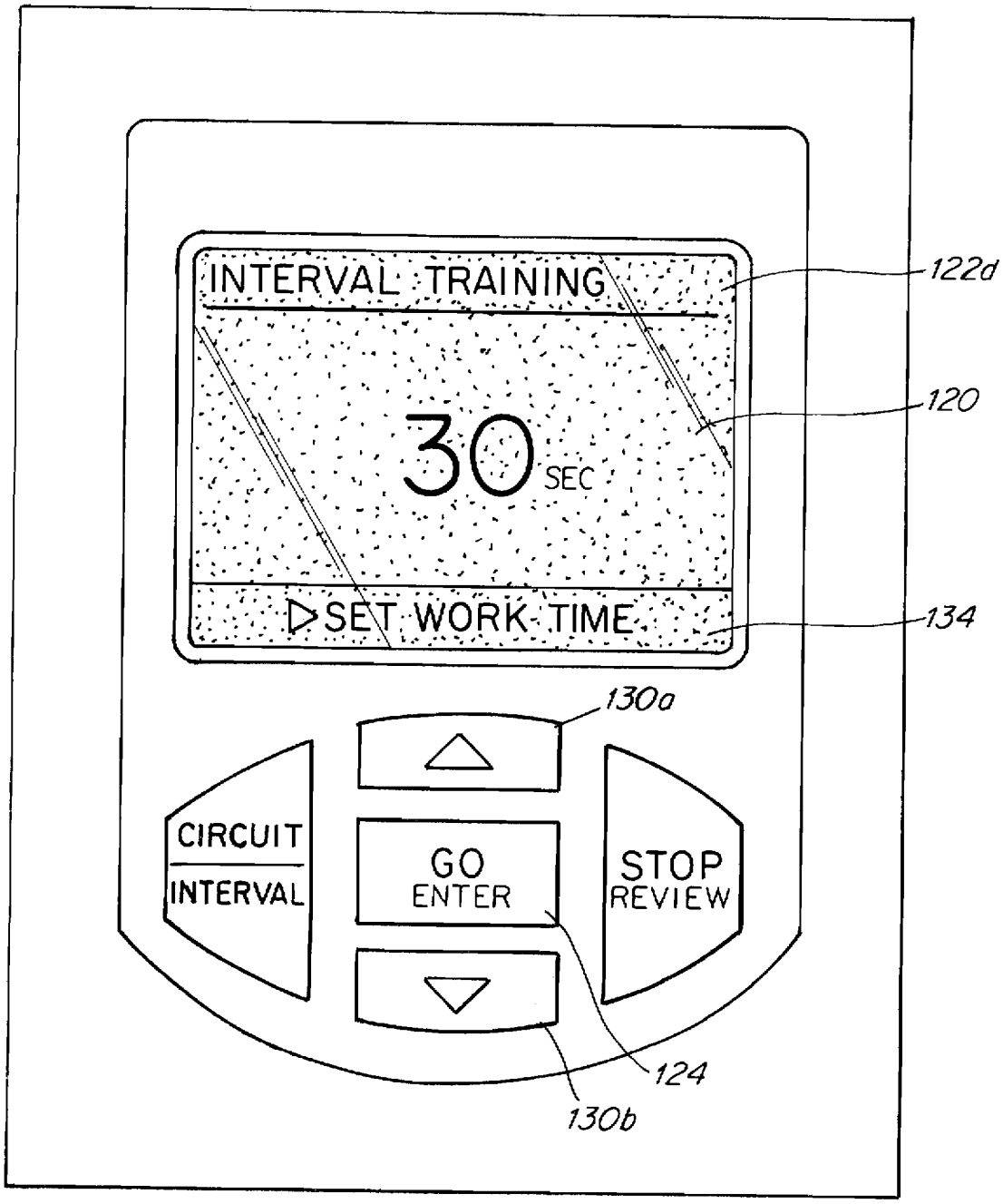
INTERVAL TRAINING
30 SEC
SET WORK TIME
122d
120
134
130a
CIRCUIT
INTERVAL
GO
ENTER
STOP
REVIEW
124
130b

Fig. 17

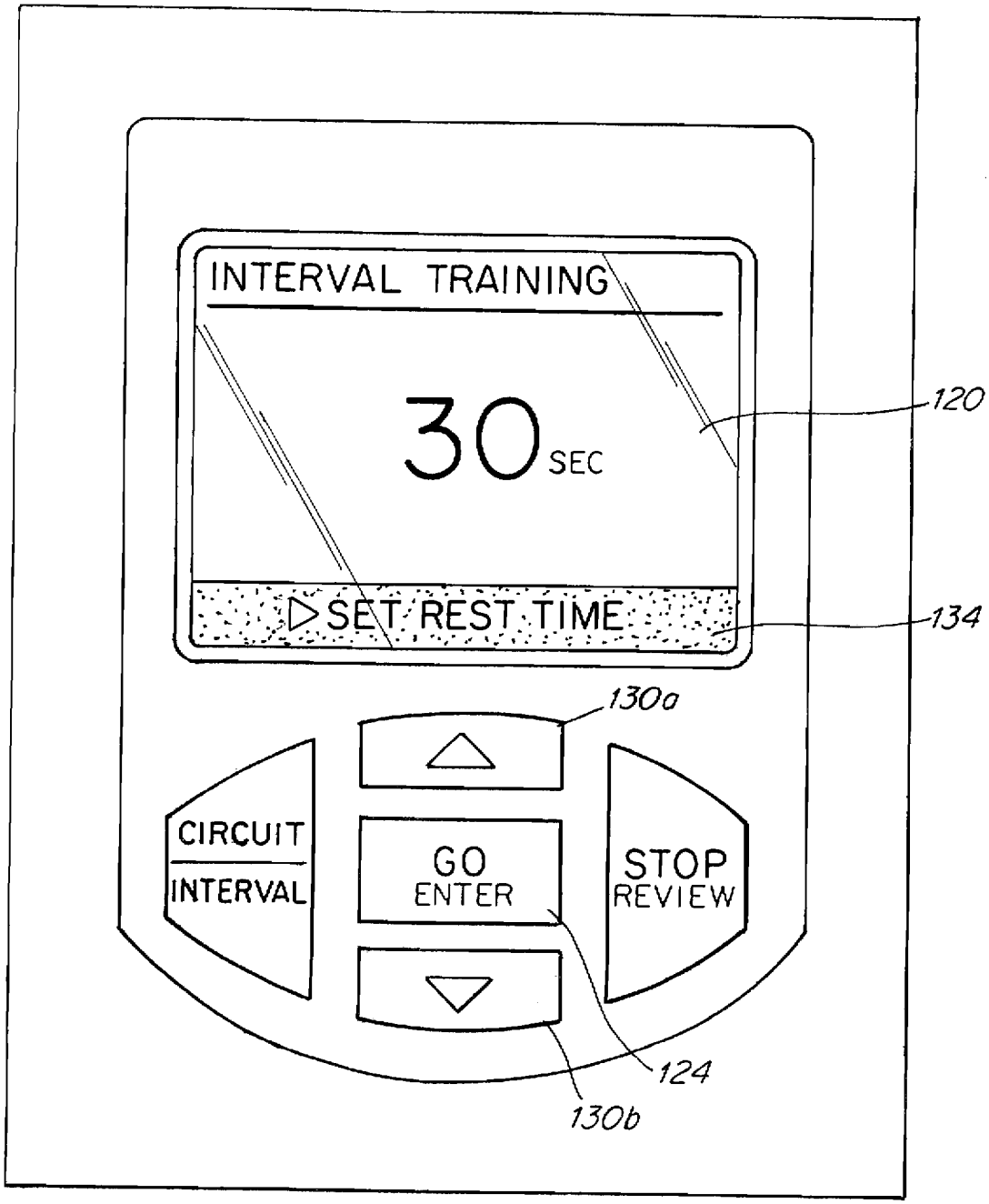
INTERVAL TRAINING
30 SEC
SET REST TIME
120
134
130a
CIRCUIT
INTERVAL
GO
ENTER
STOP
REVIEW
124
130b

Fig. 18

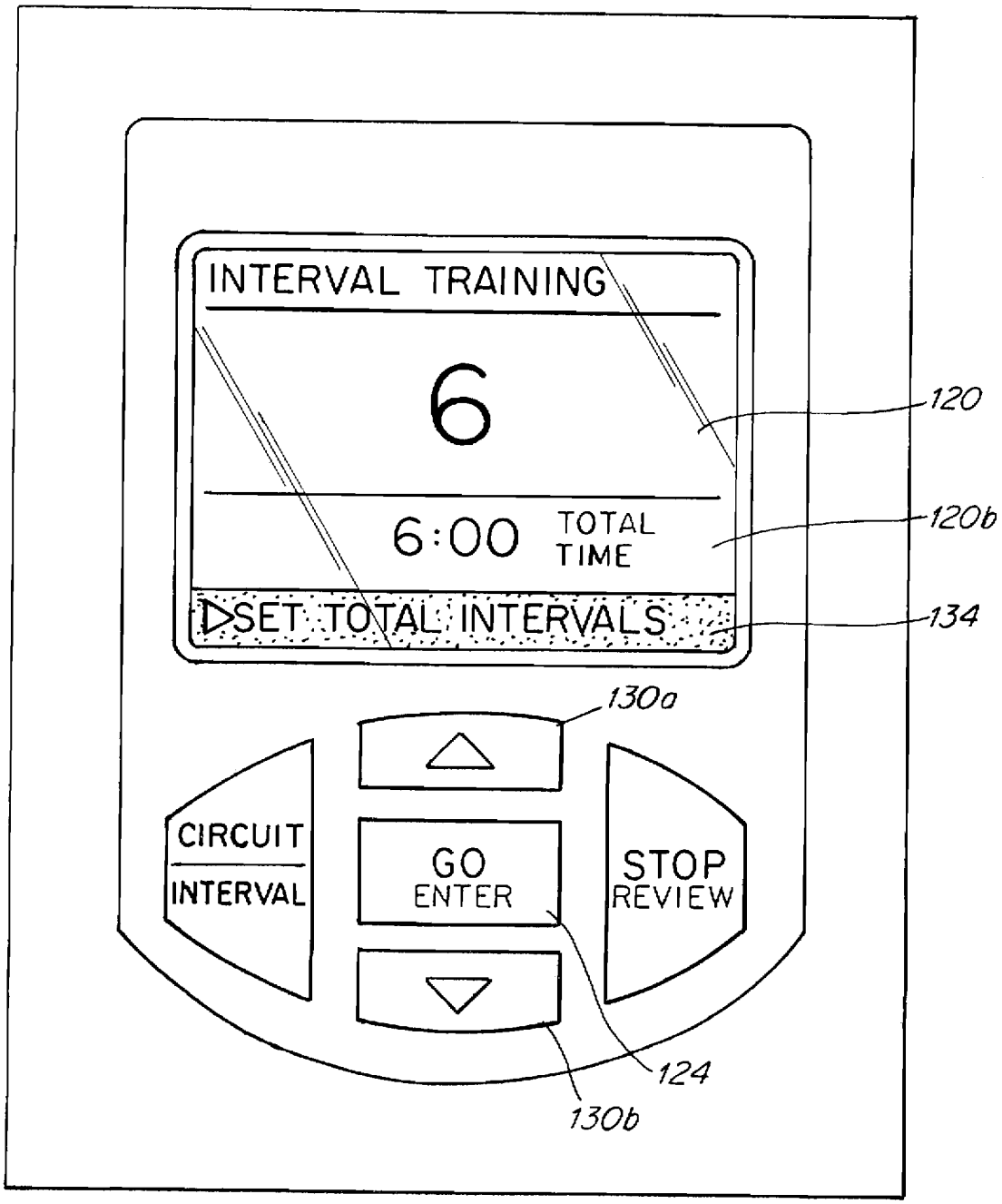
INTERVAL TRAINING
6
6:00
TOTAL
TIME
SET TOTAL INTERVALS
120
120b
134
130a
CIRCUIT
INTERVAL
GO
ENTER
STOP
REVIEW
124
130b

Fig. 19

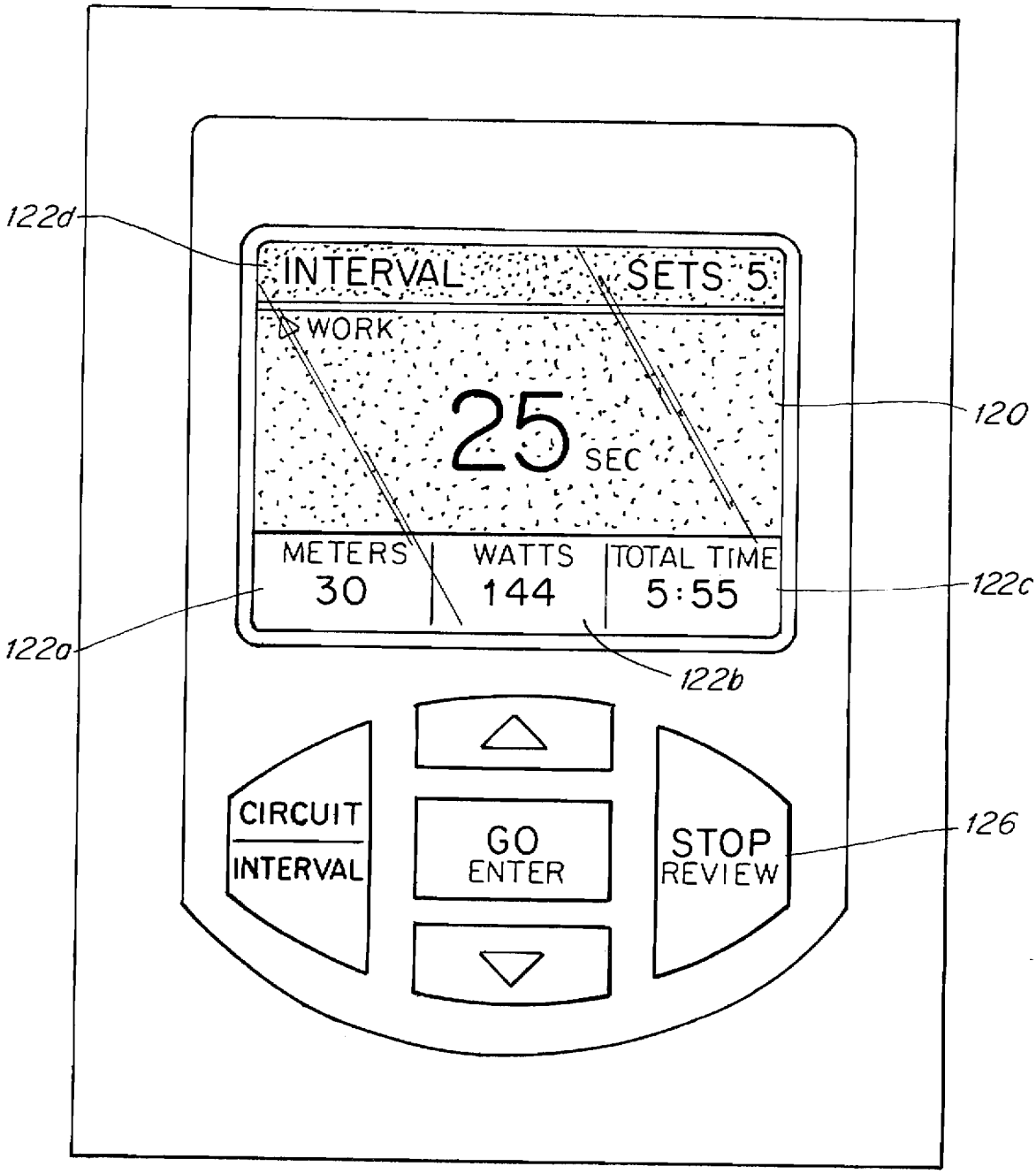
122d
INTERVAL
SETS 5
WORK
25
SEC
120
METERS
30
WATTS
144
TOTAL TIME
5:55
122c
122a
122b
CIRCUIT
INTERVAL
GO
ENTER
STOP
REVIEW
126

Fig. 20

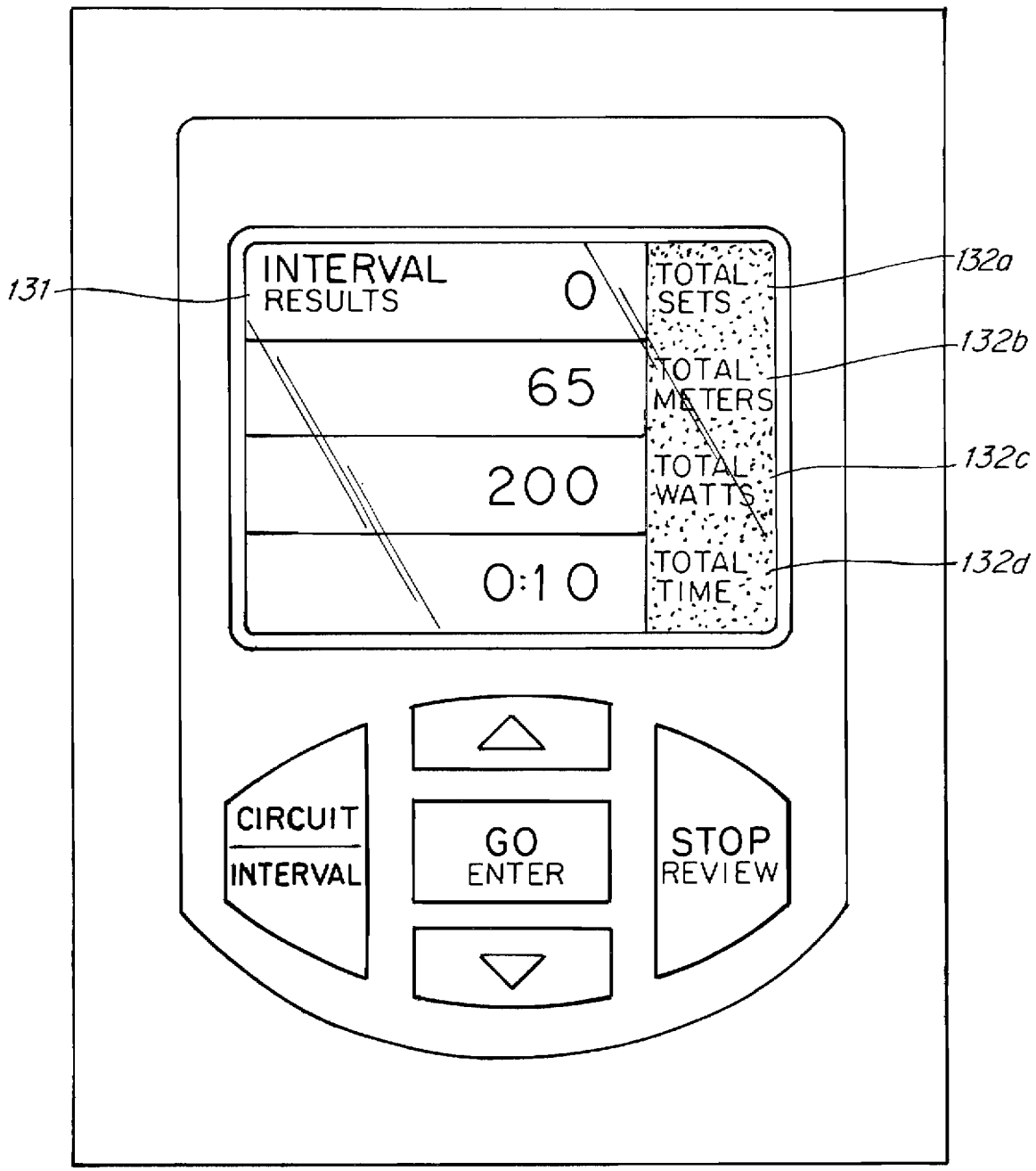
131
INTERVAL
RESULTS
0
65
200
0:10
TOTAL
SETS
TOTAL
METERS
TOTAL
WATTS
TOTAL
TIME
132a
132b
132c
132d
CIRCUIT
INTERVAL
GO
ENTER
STOP
REVIEW

Fig. 21

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 2004224825 A **[0003]**