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[54] EXERCISER WITH WORK-INDICATING MECHANISM

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[52] **U.S. Cl.**.....**272/69**, 272/72, 272/73, 73/379, 272/DIG. 1, 272/DIG. 4, 272/DIG. 5

[51] **Int. Cl.**.....**A63b 23/06**, A63b 69/06, A63b 69/16

[58] **Field of Search**.....272/73, 72, 69; 73/379

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[57] **ABSTRACT**

Exercise apparatus such as a treadmill, rowing machine, pedaling device or the like which includes an indicator arranged to be driven at a rate in proportion to the degree of difficulty of the exercise expended for recording work done. The apparatus in its embodiment employs an operating member on which the person exercises and adjustable controls for varying the difficulty of the exercise. The indicator is driven by the operating member through a drive connection, and the apparatus includes adjustment means incorporated in the drive connection which is connected directly to the adjustable controls so that the rate of operation of the indicator is in proportion to the degree of difficulty of the exercise.

12 Claims, 13 Drawing Figures

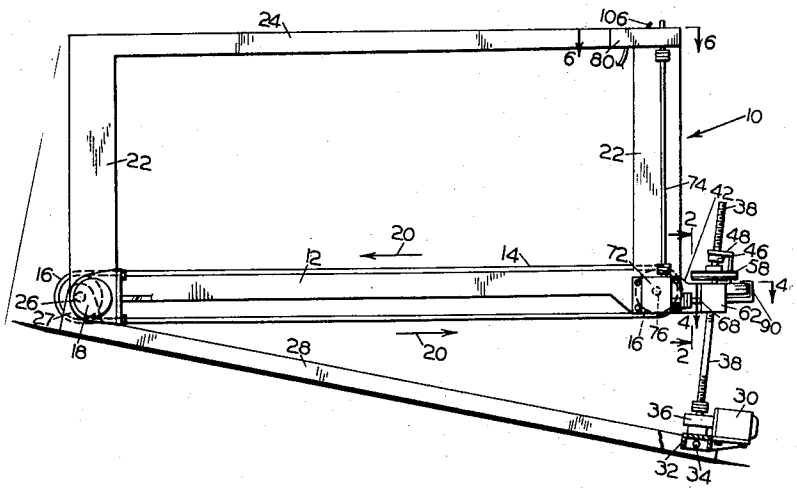


FIG. 1

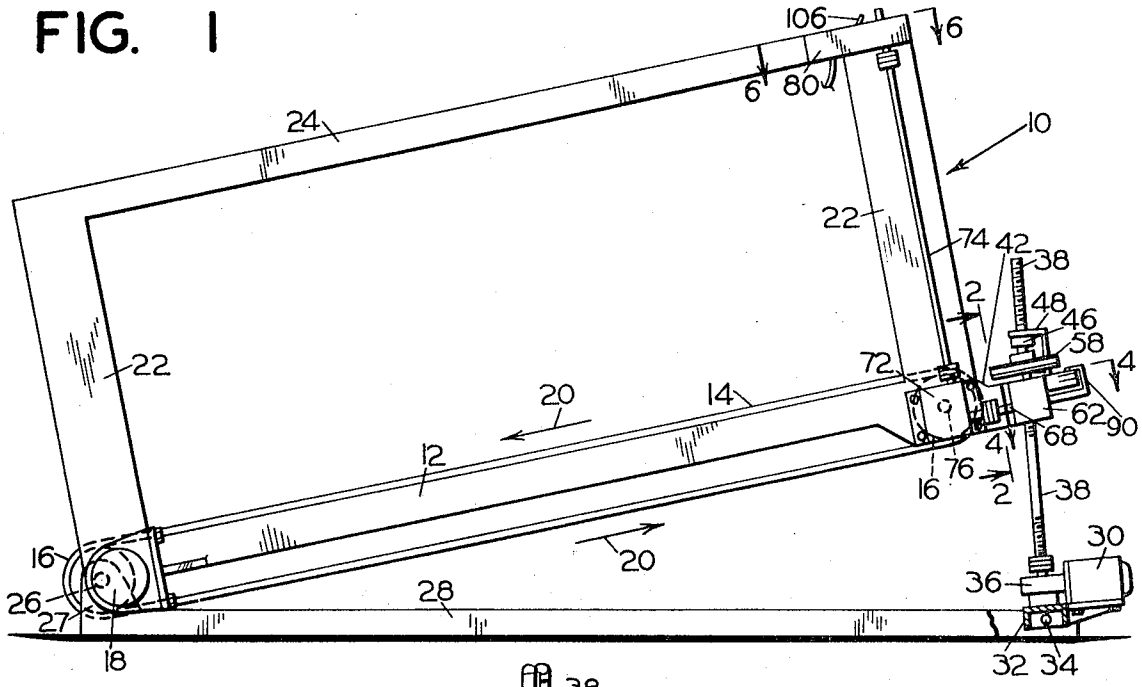
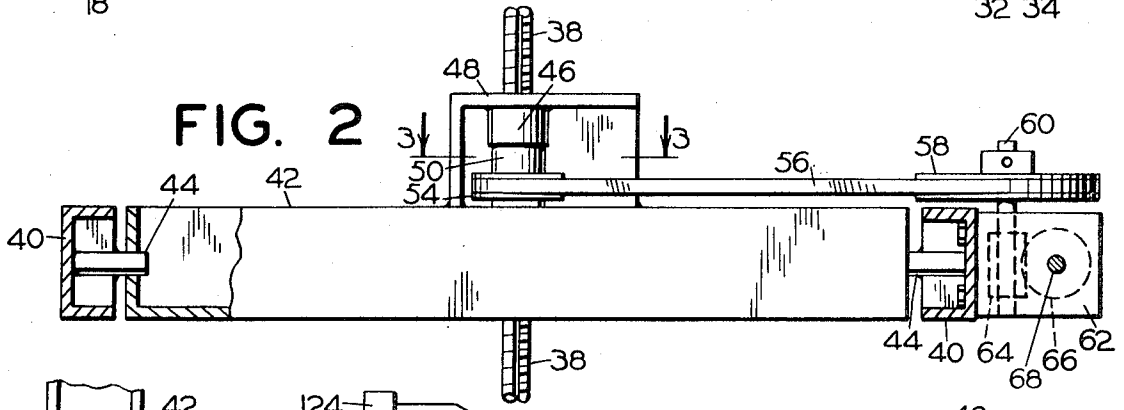


FIG. 2



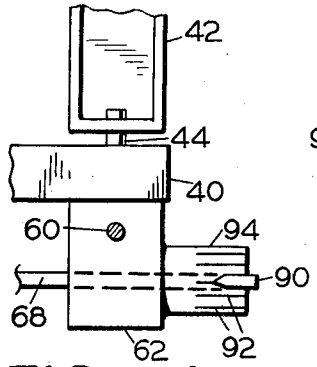


FIG. 4

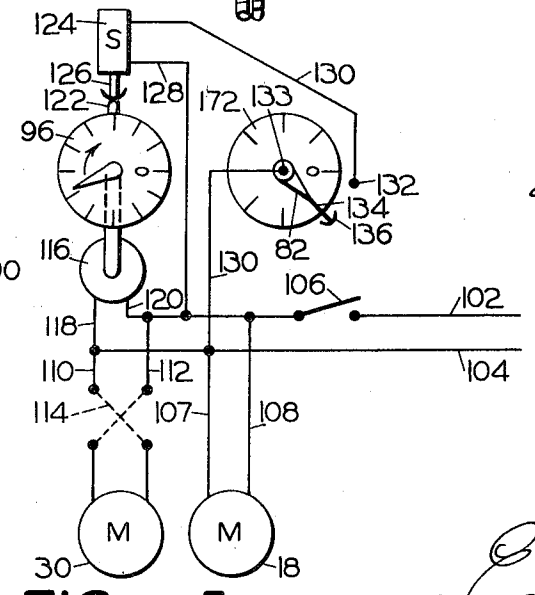


FIG. 5

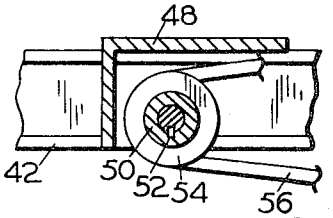


FIG. 3

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FIG. 7

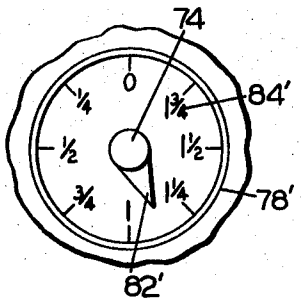
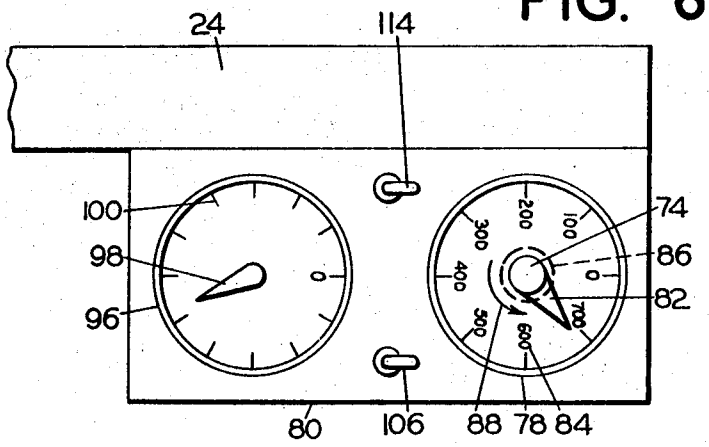


FIG. 6



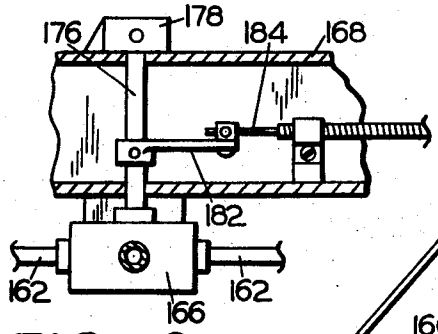


FIG. 9

FIG. 8

FIG. 10

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FIG. 12

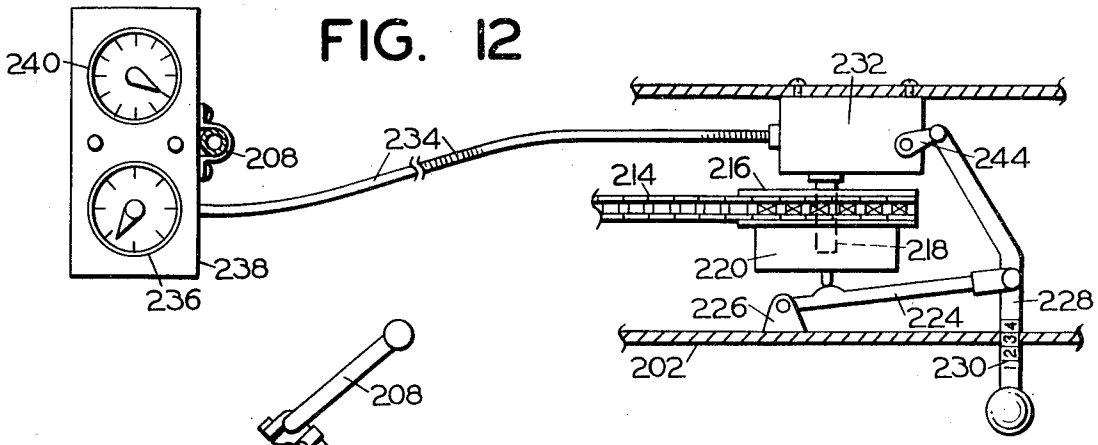


FIG. 11

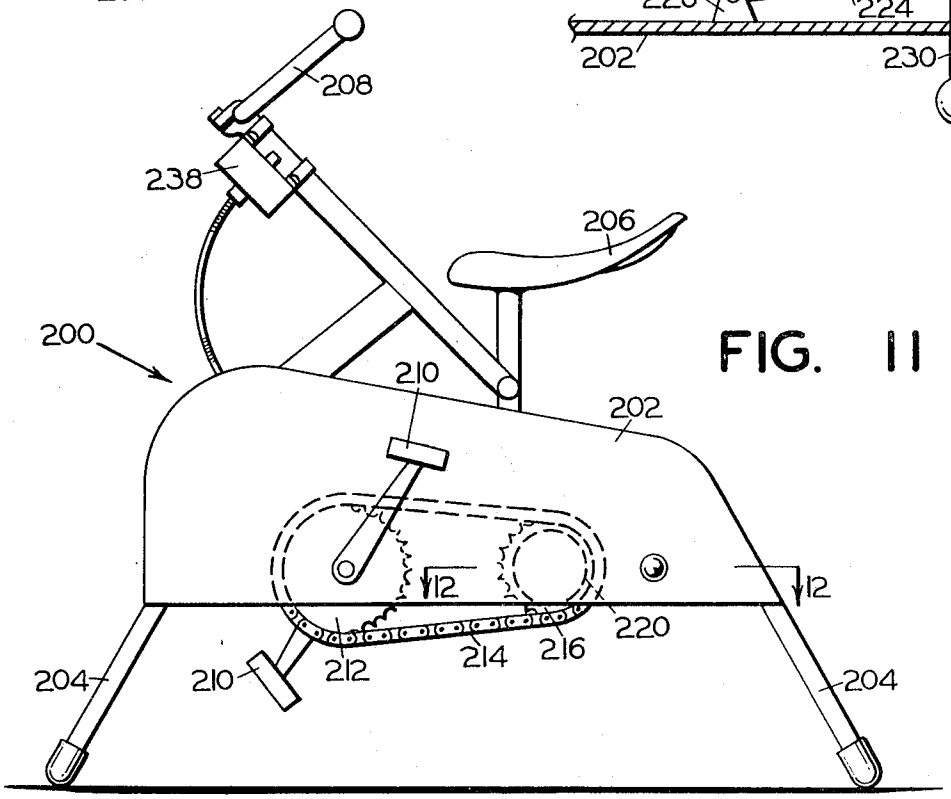
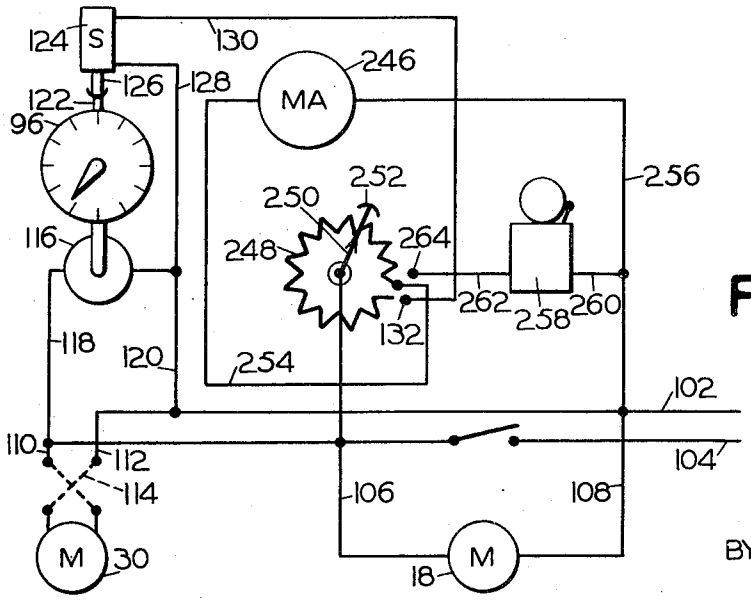


FIG. 13



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EXERCISER WITH WORK-INDICATING MECHANISM

BACKGROUND OF THE INVENTION

Exercising apparatus has heretofore been employed with means for varying the degree of difficulty of the exercise. For example, treadmills have been provided which can be elevated at one end so that the difficulty of running thereon is dependent upon the inclination of the treadmill. Exercise apparatus has also been provided with indicating mechanism for showing the amount of work done. For example, treadmills have odometers driven by the treadmill to show how far the runner has progressed. It may be the desire, however, of the person exercising to lessen the time required to expend a certain amount of energy, and the energy indicating means of the prior devices fail to show true work expended even though there is a change in the degree of difficulty of the exercise. For example, the odometer on a treadmill of existing devices will register the same distance regardless of the angle of tilt thereof. Thus, the true work expended is not accurately measured.

SUMMARY OF THE INVENTION

Accordingly, it is a primary objective of the present invention to provide workout indicating mechanism for exercising apparatus which is arranged to measure the amount of exercise expended in proportion to the degree of difficulty of such exercise.

Another object of the invention is to provide indicating mechanism of the type described which is applicable to different types of exercising apparatus and which in connection with any one of the different types of structure not only measures the energy expended such as calories, but also has a speed of movement in proportion to the degree of difficulty of the exercise, exemplary exercising apparatus on which the indicating mechanism may be used comprising treadmills, rowing machines, pedaling machines, and others.

Another object of the invention is to provide indicating mechanism of the type described utilizing an indicator for illustrating the energy expended, such indicator being adjustable to operate from a set position and return to a start position and having a structural combination of a timer arranged such that upon setting of the exercise indicating means the timer is returned to a start position.

The invention will be better understood and additional objects and advantages will become apparent from the following description taken in connection with the accompanying drawings which illustrate preferred forms of the device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a treadmill in combination with which features of the present invention are embodied;

FIG. 2 is an enlarged fragmentary sectional view taken on the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary sectional view taken on the line 3—3 of FIG. 2;

FIG. 4 is an enlarged sectional view taken on the line 4—4 of FIG. 1;

FIG. 5 is a wiring diagram of electrically operated apparatus which may be used for driving a treadmill and for operating indicating mechanism of the present invention;

FIG. 6 is an enlarged fragmentary top plan view of an instrument panel having indicating mechanism of the present invention incorporated therein, said view being taken on the line 6—6 of FIG. 1;

FIG. 7 is a fragmentary plan view of a modified form of exercise indicating means for indicating the amount of energy expended;

FIG. 8 is a top plan view, partly diagrammatic, of a rowing machine in combination with which features of the present invention are embodied;

FIG. 9 is an enlarged fragmentary sectional view taken on the line 9—9 of FIG. 8;

FIG. 10 is a fragmentary diagrammatic view showing a valve structure utilized in the embodiment of FIG. 8;

FIG. 11 is a side elevational view of another form of exercising apparatus in the form of a pedaling machine and showing features of the present invention embodied therein;

FIG. 12 is a fragmentary sectional view taken on the line 12—12 of FIG. 11; and

FIG. 13 is a wiring diagram of a second form of control means for the present exercising apparatus.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

FIGS. 1 through 6 show the invention as associated with a treadmill 10 having a base frame 12 on which an endless belt 14 operates over end rollers 16. One of the rollers is driven by an electric motor 18 to operate the belt 14 in the direction of arrows 20, FIG. 1. The base frame 12 has an integral upright frame 22 including longitudinal hand rails 24 secured thereto. Frame 12 is pivotally connected at 26 to upright lugs 27 on one end of a floor engaging base 28. An electric motor 30 is secured on a crosspiece 32 secured pivotally to the other end of the base 28 by end stub shafts 34. The motor 30 has a gearbox 36 mounted thereon the mechanism of which is driven by the output shaft of the motor. This gear mechanism drives an upright screw 38 comprising an end support for the treadmill capable of changing the angle of the treadmill.

The frame 12 of the treadmill has a pair of forwardly projecting side frame portions 40, best seen in FIG. 2, between which a frame member 42 is pivotally supported, as by means of stub shafts 44 integrated with the frame portions 40. The elevating screw 38 projects freely through the frame member 42 and has threaded engagement with a sleeve 46 integral with a frame extension 48 in turn integral with the frame member 42. A hub 50 has a key connection 52 on the shaft, FIG. 3, thus providing rotation of the hub with the shaft but permitting relative axial movement between the hub and shaft. The hub 50 has an integral pulley which drives a laterally extending belt 56 engageable with a pulley 58 keyed or otherwise secured on a shaft 60 journaled in a housing 62 secured to one forward frame portion 40. A worm gear 64 is secured on the shaft 60 within the housing 62 and is in mesh with a pinion gear 66 on a shaft 68 also journaled in the housing 62 and projecting both forwardly and rearwardly from the housing 62. FIG. 1, secured to the side of the bottom frame 12 of the treadmill. An upright output shaft 74 extends from the gear box 72 and is driven from a shaft 76 which comprises the shaft of the front roller 16. Gearbox 72 is of a well-known construction having arrangement of gearing and change speed construction such that upon selective rotative positioning of shaft 68 the gear ratio drive between the shaft 76 and the shaft 74 is varied. That is, the gearing and change speed mechanism of gearbox 72 and the operation of shaft 68 thereon is such that the rotative speed of shaft 74 in relation to the rotative speed of shaft 68 is increased proportionately as the treadmill is raised by screw 38. Mechanism 72 may comprise any type of ratio change mechanism or transmission and need not be a gearing arrangement as described. The upper end of shaft 74 comprises the drive shaft of an instrument 78 which shows work done. Such instrument is shown in FIG. 6 and is mounted in an instrument panel 80, also seen in FIG. 1, secured to the upright frame 22 of the treadmill. Instrument, 78 has a pointer 82 driven by the shaft 74 but capable of being set manually. This instrument has designations or calibrations 84, such as calory designations, which show the extent of exercise to be expended. In order to provide hand setting of the pointer 82 and yet provide a driving connection with the shaft 74, such pointer is connected to the said shaft by a friction clutch 86.

It is preferred that the designations 84 include a start position, namely a zero position, FIG. 6, and various other increments of work done. For example, FIG. 6 illustrates the instrument 78 divided into increments of 100 calories. The person exercising can set the pointer to the amount of calories which

he wishes to expend, and when the pointer has returned to zero, he knows that the amount of work desired has been done. Preferably, the pointer is manually set in a counterclockwise direction, as designated by the arrow **88** in FIG. **6**, and returns with the shaft **74** in a clockwise direction. The designations **84** may be in other types of units of work expended. For example, in FIG. **7** the instrument comprises an odometer, having distance designations **84'** such as miles or fractions thereof. Pointer **82'** of the instrument **78'** is operated by the shaft **74** similar to the pointer **82** in the embodiment of FIG. **6**.

In the operation of the device, the operator sets the pointer **82** or **82'** to the desired position as determined by the extent of energy he wishes to expend. That is, the operator sets the pointer **82** to the amount of calories he wishes to expend. The speed of movement of the return pointer **82** is determined by the inclined position of the treadmill since as explained hereinbefore, the change speed gearbox **72** is arranged such that the shaft **68** controls the output speed of shaft **74** as determined by the tilt of the treadmill. The parts are arranged such that the more steeply that the treadmill is inclined the faster the speed of output shaft **74**. In other words, the harder the operator works, the faster the return of pointer **82** will be and the quicker he will get done, the relationship of work done and return speed of the pointer **82** being empirically determined to provide substantially accurate results.

The forward end of shaft **68** which projects from housing **62**, FIGS. **1** and **4**, has a reversely turned pointer **90** integral therewith. Graduations **92** are provided on a block **94** secured to the housing **62** and the pointer **90** operates thereover. By means of pointer **90** and the graduations **92**, the runner can determine the tilted position of the treadmill and thus can set the angle of tilt as desired.

The instrument panel **80** also includes a timer **96** having a pointer **98** associated with time designations **100** which may comprise minutes as an example.

The structure and operation of the electrical system is shown in the wiring diagram of FIG. **5**. Referring in detail to such FIG., a pair of line wires **102** and **104** feed the system. One of the line wires has a master switch **106** for the system therein, such switch being located on the instrument panel **80**, FIGS. **1** and **6**. The treadmill operating motor **18** is connected into the line wires by suitable wires **107** and **108** and the treadmill elevating motor **30** is similarly connected into the line wires **102** and **104** by wires **110** and **112**, the motor **30** being a reversible-type motor and having a reversing switch **114** in its circuit mounted on the instrument panel **80** for raising or lowering the treadmill.

The timer **96** is driven by an electric motor **116** connected to the line wires **102** and **104** by wires **118** and **120**. It is preferred that the timer be of a construction such that it can be reset to its start position by the actuation of a button **122** thereon, as in common timer structure, and a solenoid **124** is included in the circuit having an operating plunger **126** arranged to engage the button and reset the timer upon closing of the circuit to the solenoid. The solenoid is connected in the circuit by wires **128** and **130**, the latter wire being associated with control means for the solenoid **124**. Such control means comprises a contact **132** at one terminal end of the wire **130** and a rotatable electrical connection **133** connected to the base of a switch arm **134** having a contact end **136** arranged for engagement with the contact **132**. Contact arm **134** is secured to and rotates with the pointer **82**. The circuit to the solenoid is thus closed upon engagement of the switch arm **134** with the contact **132** but as seen in FIG. **5** contact **132** is placed such that the circuit to the solenoid is not closed when the pointer **82** has returned to start or zero, assuming of course that the arm **134** is driven in return movement in a clockwise direction. Thus, the timer will not be reset unless the pointer **82** travels a small distance past the zero position or else the said pointer is rotated counterclockwise almost a full revolution to engage the contact **132**. Although the system herein shown comprises an electric resetting of the timer, it is to be understood that such may be accomplished by mechanical connection between the pointer **82** and the timer.

In the use of the treadmill, the operator first closes the master switch **106**. Such closes the circuit to the treadmill motor **18** and to the timer motor **116** and thus each of these motors is in continuous operation until the switch **106** is again opened. Switch **114** is operated to energize the motor **30** in the desired direction for raising or lowering the treadmill. The operator sets the pointer **82** on the instrument **72** to a position indicating the amount of exercise he wishes to expend. This is accomplished first by rotating the pointer counterclockwise to a point to cause engagement of contact **136** with contact **132** for resetting the timer **96** and then returning the pointer to the position desired. The operator can then step on the treadmill and commence his exercise. The rate at which the pointer **82** returns is dependent upon the degree of difficulty of the exercise, i.e., such rate of return of said pointer depends upon the angle of tilt of the treadmill. As explained hereinbefore, such return of the pointer is controlled by the speed of output shaft **74** and the speed of shaft **74** is controlled by the speed setting of gearbox **72** as determined by the elevation of the one end of the treadmill. The gear ratio is such that when the treadmill is in a down or level position, the instrument **78** shows true lineal travel of the belt **14**.

FIGS. **8**, **9** and **10** show a second embodiment of the invention, wherein the principles thereof are applied to a rowing machine **140**. Only the primary elements of such rowing machine are illustrated since such machines are of conventional construction. For the purpose of illustration, such rowing machines have a base frame **142**, a seat **144** slidable longitudinally on the frame, outrigger frames **146** on the frame **142**, and oars or arms **148** pivotally connected to the outriggers by pivot means **150**. It is desired that the work required to pivot the arms **148** be varied, and for this purpose fluid cylinders **152** have plunger **154** operative therein which are integrated with rods **156**. Cylinders **152** are secured to the outriggers **146** by suitable brackets **158**, and the rods **156** have a pivot connection **160** with respective arms **148**. Conduits **162** lead from one end of the cylinders **152** and conduits **164** lead from the opposite ends of said cylinders, the two conduits **162** and **164** leading through a valve **166** which as is apparent in FIG. **10** controls the flow between conduits **162** and **164**. FIG. **10** shows the valve in fully open position wherein fluid can flow freely through the valve with a minimum of resistance; however, if the valve is rotated it is apparent that the inlet of fluid from conduits **162** is restricted an amount depending upon the position of the valve core, the two inlets for conduits **162** having symmetrical association with the core for equal control of the oars.

According to the present invention means are associated with the valve **166** which upon setting of the valve changes the return speed of exercise indicating means. More particularly, an instrument panel **168** is secured to the frame **142** and has a timer **170**, exercise indicating means **172** such as an odometer or calorie measuring instrument, and adjustable control means **174** for varying the degree of difficulty of the exercise. The adjustable control means **174** comprises a shaft **176**, FIG. **9**, which leads upwardly from the core of valve **166** and which is rotatable therewith. The shaft projects through the instrument panel **168** and has an operating knob **178** at its upper end associated with graduation marks **180** on the instrument panel. Secured to the shaft **176** and rotatable therewith is an arm **182** connected at its outer end to one end of a flexible shaft **184** extending at its other end into a gearbox **186**. Gearbox **186** has an input shaft **188** having a pinion gear **190** secured thereto and engaged by a rack **192** having a pivot connection **194** at one end with one of the arms **148** and having slidable movement through a guide **195**. Rack **192** is adapted to drive the shaft **188** in one direction only, namely in the strike direction of the oars. The output of gearbox **186** comprises a flexible shaft **196** which extends to and drives the odometer **172**.

The gearbox **186** is thus driven by the rack **192** upon reciprocating movement of the one arm **148** and the output from such gearbox drives the odometer. The flexible shaft **184** connected to the adjustable control means **174** is arranged to change the gear ratio of the gearbox such that upon selected positioning of the knob **178** with the valve **166** the output of the gearbox **186** is varied. The parts are connected and arranged such that as the valve is adjusted to make the oars harder to pull, the ratio of the gearbox is changed to increase the output of speed of the shaft **196**. Thus, even though the oars are operated at the same rate of speed the odometer returns proportionately faster as the degree of difficulty of exercise increases. The graduations **180** show set positions of the knob **178** for controlled operation. The timer **170** of the FIG. **8** embodiment may be mechanically or electrically driven and may be resettable by means similar to that shown in FIG. **5**. The odometer has a slip clutch connection **186** with its shaft.

FIGS. **11** and **12** show still another application of the present invention wherein it may be associated with an exercise machine in the form of a pedaling apparatus **200**. Such machine comprises a frame **202** supported on legs **204**, a seat **206** and a handlebar assembly **208**. Such machines have bicycle pedals **210** which operate a sprocket wheel **212** engaged by a sprocket chain **214** driving a rearwardly disposed sprocket wheel **216**. Sprocket wheel **216** drives a shaft **218** which operates a brake **220** for controlling the degree of difficulty of the sprocket rotation. Such brake is well known in the art and is operated by a lever **224** pivotally connected at one of its ends to the frame at **226** and pivotally connected at its other end to an adjusting handle **228** movable through the frame **202** to different positions for adjusting the braking effect on the sprocket wheel **216**. Adjusting handle **228** has setting indicia **230** thereon for positioning the handle to a selected position of braking.

Sprocket shaft **218** is connected into a gear box **232** having an output shaft **234** which drives an odometer or other exercise indicating means **236** on an instrument panel **238** secured to the handlebar assembly **208**. Instrument panel **238** also has a timer **240**, and the structure of such timer and odometer as well as the drive means for the latter are of similar operation and structure to that illustrated in the previous embodiments. Handle **228** is pivotally connected at its inner end to a lever **244** which comprises a shaft lever for the gearbox and the parts are arranged such that as the adjusting handle **228** is moved inwardly to increase the resistance of rotation to the sprocket wheel **216** the gear ratio is stepped up to increase the speed of shaft **234** and thus the return speed of odometer **236**. Thus, the more difficult the exercise the faster the return of the exercise indicating means **236** as in other embodiments.

FIG. **13** illustrates an embodiment wherein the exercise indicating means may be totally electrical in that the instrument which shows the amount of exercise to be expended comprises a milliammeter **246** and the operating structure therefor comprises a potentiometer **248**. The circuit is similar to the circuit shown in FIG. **5** to the extent that it has line wires **102** and **104**, circuit wires **107** and **108** for the motor **18**, circuit wires **110** and **112** for the motor **30**, a reversing switch **114** in the circuit to motor **30**, a motor **116** for driving the timer **96**, circuit wires **118** and **120** for the timer motor, a timer reset button **122**, a solenoid **124** which operates the timer reset button by means of its plunger **126**, circuit wires **128** and **130** for the solenoid, and the solenoid operating contact **132**.

The circuit of FIG. **13**, similar to FIG. **5**, also has a switch arm **250** having a contact end **252** which is engageable with the contact **132** for resetting the timer. The milliammeter and potentiometer are in series circuit with the lines **102** and **104** comprising wires **254** and **256**. The shaft on which arm **250** is mounted comprises the driven shaft from the exercise machine, such as the shaft **74** of FIG. **1**, or the shafts **196** and **234** of FIGS. **8** and **12**, respectively, and it is apparent that with a setting of the arm **250** on the potentiometer **248** a reading of resistance will appear on the milliammeter **246**. Thus, such electrical components have been adapted to the present purpose wherein the milliammeter which will show the amount of work to be completed will have a reading depending upon the position of arm **250**. As the arm **250** returns, the milliammeter will designate exercise accomplished the same as a mechanical connection. Contact **132** is provided on the far side of the start or set position of the potentiometer whereby when the system is set up for exercise the arm **250** must be turned counterclockwise an amount sufficient to engage the contact **132** to energize the solenoid and thus reset the timer. After the timer has been reset, the potentiometer is positioned to the amount of exercise desired. The milliammeter readings may comprise distance or calories, or any other appropriate exercise indicating means.

The circuit of FIG. **13** includes a signal **258** which may be in the form of a bell arranged to ring when the exercise has been completed. For this purpose, the bell is in a circuit having a wire **260** connected to wire **256** and a wire **262** terminating in a contact **264** adjacent to the start position and arranged such that when the arm **250** has returned to a start position, the contact end **252** completes a circuit to the bell and the bell will sound until the master switch **106** is opened.

According to the present invention there is provided in combination with means for indicating an amount of exercise accomplished means to vary the speed of such indicating means in proportion to the degree of difficulty of exercise. By such means, the operator can perform a given amount of exercise in a lesser time by increasing the difficulty of the exercise, the indicating means showing the extent of exercise accomplished as the latter progresses.

It is to be understood that the forms of our invention herein shown and described are to be taken as preferred examples of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of our invention.

Having thus described our invention, we claim:

1. Exercise apparatus comprising
- a. an operating member arranged to be worked by a person performing exercise functions,
- b. adjustable control means arranged to vary the difficulty of the exercise functions,
- c. movable indicating means arranged to indicate the amount of exercise expended,
- d. a drive connection between said operating member and said movable indicating means,
- e. and adjustment means incorporated in said drive connection and connected directly to said adjustable control means,
- f. said adjustment means being movably set by selected positioning of said adjustable control means and being arranged such that upon being selectively set it varies the speed of movement of said movable indicating means in proportion to the degree of difficulty of exercise.

2. The exercise apparatus of claim **1** including
- a. an electric circuit,
- b. said movable indicating means including manually operated reset means for repositioning said indicating means to a start position,
- c. a timer for correlating the time and work done,
- d. electrically operated reset means in said circuit arranged to reset said timer,
- e. and contact means in said circuit arranged for engagement by said movable indicating means when the latter is disposed adjacent to its start position to energize said reset means for resetting said movable indicating means.

3. The exercise apparatus of claim **1** wherein said adjustment means comprises a gear ratio mechanism.

4. The exercise apparatus of claim **1** wherein said movable indicating means is calibrated to show an equivalent of distance traveled.

5. The exercise apparatus of claim **1** wherein said movable indicating means is calibrated to show an equivalent of calories expended.

6. The exercise apparatus of claim **1** including

a. an electric circuit,
b. said movable indicating means comprising an electrically operated meter in said circuit and said adjustment means comprising electricity flow control means to said meter,
c. said meter being calibrated to show amount of work done.

7. The exercise apparatus of claim 1 wherein
a. said operating member comprises a treadmill,
b. said adjustable control means comprising elevating mechanism arranged to tilt the treadmill longitudinally to vary the difficulty of exercise functions,
c. said adjustment means comprising a change ratio mechanism operated by said elevating mechanism.

8. The exercise apparatus of claim 7 wherein
a. said elevating mechanism comprises a driven screw having threaded connection to an end portion of said treadmill whereby to vary the tilt of said treadmill,
b. and including a shaft connection between said driven screw and said change ratio mechanism.

9. The exercise apparatus of claim 7 wherein
a. said elevating mechanism comprises a driven screw having threaded connection to an end portion of said treadmill whereby to vary the tilt of said treadmill,
b. a shaft connection between said driven screw and said change ratio mechanism,
c. and means carried on said shaft indicating rotated positioning thereof for designating the angle of tilt of said treadmill.

10. The exercise apparatus of claim 1 wherein
a. said operating member comprises a rowing machine having pivoted oarlike arms,
b. said adjustable control means comprising resistance mechanism connected to said arms,
c. said adjustment means comprising a change ratio mechanism operated by said resistance mechanism.

11. The exercise apparatus of claim 1 wherein
a. said operating member comprises a rowing machine having pivoted oarlike arms,
b. said adjustable control means comprising a plunger connected to one of said oarlike arms and operating in a cylinder having fluid line connections,
c. said adjustment means comprising a change ratio mechanism operated by said resistance mechanism.

12. The exercise ratio of claim 1 wherein
a. said operating member comprises a bicycle-type pedaling apparatus,
b. said adjustable control means comprising brake structure connected to said pedaling apparatus,
c. said adjustment means comprising a change ratio mechanism operated by said brake structure.

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