July 25, 1933. A. S. FITZ GERALD 1,919,627

EXERCISING APPARATUS

Filed Aug. 15, 1931 2 Sheets-Sheet 1

Fig.1.

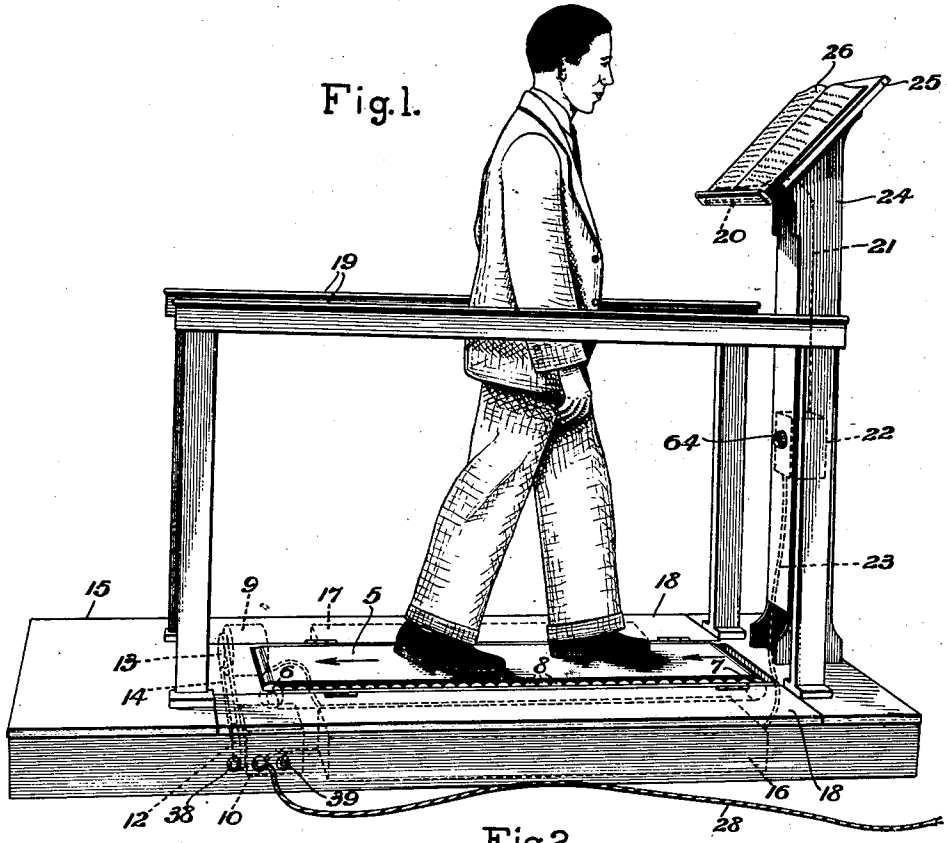
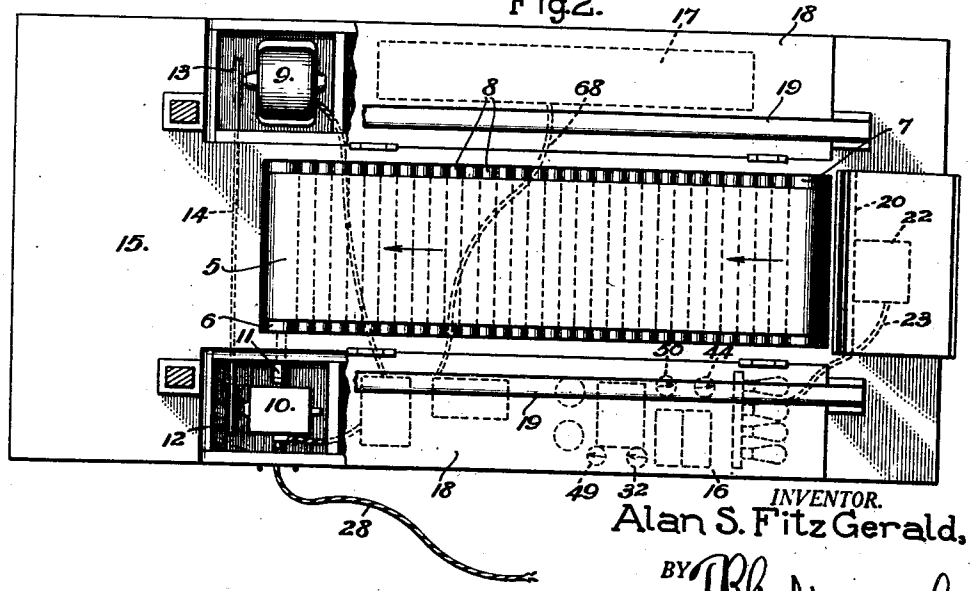


Fig.2.



INVENTOR.
Alan S. Fitz Gerald,
BY T. R. Goldsborough
HIS ATTORNEY.

July 25, 1933. A. S. FITZ GERALD 1,919,627

EXERCISING APPARATUS

Filed Aug. 15, 1931 2 Sheets-Sheet 2

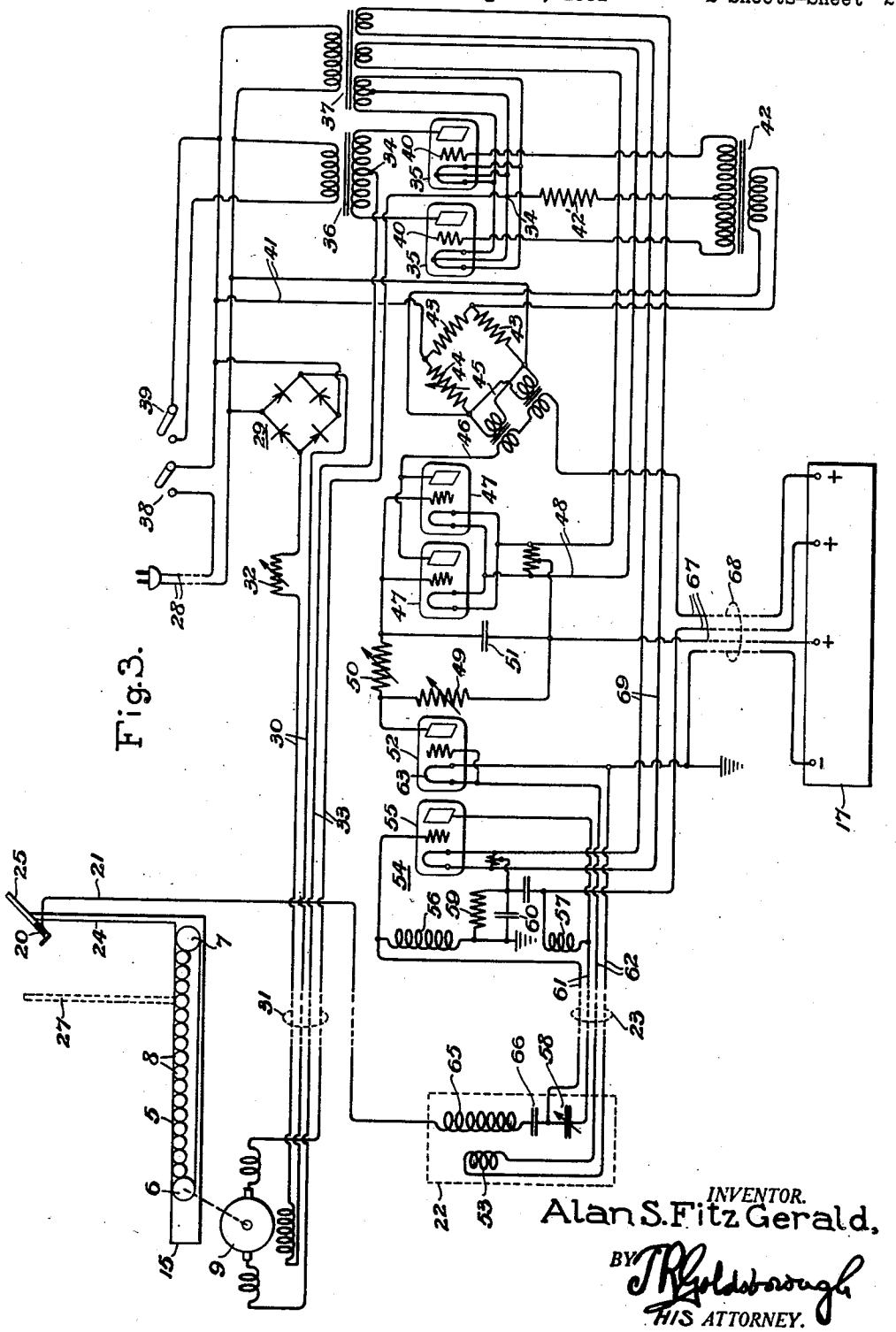


Fig. 3.

INVENTOR.
Alan S. Fitz Gerald,
BY J. R. Goldsborough
HIS ATTORNEY.

Patented July 25, 1933 1,919,627

UNITED STATES PATENT OFFICE

ALAN S. FITZ GERALD, OF WYNNEWOOD, PENNSYLVANIA, ASSIGNOR TO RADIO CORPORATION OF AMERICA, A CORPORATION OF DELAWARE

EXERCISING APPARATUS

Application filed August 15, 1931. Serial No. 557,351.

The present invention relates to exercising apparatus for the human body and, more particularly, it relates to apparatus of the above character having a moving track or treadmill upon which exercise may be taken by walking or running.

It is well known that brisk walking is one of the most beneficial forms of exercise, for the reason that it brings into use substantially all of the muscles of the body, and is of the recreative type requiring very little mental concentration upon the act of exercising. It is also well known that, under modern living conditions, an increasing number of practical obstacles stand in the way of obtaining proper exercise by walking. Few people are, therefore, permitted or inclined, to obtain the benefit of such exercise.

Exercising devices and apparatus, heretofore known and used in lieu of natural means for obtaining exercise, have certain disadvantages some of which may briefly be considered. These disadvantages have limited their use, and the benefits which would accrue to the many who are in need of but ordinarily are deprived of the same, such as those persons engaged in sedentary occupations in large centers of population.

Exercising devices and apparatus of the usual treadmill type, as an aid in obtaining exercise by walking, may be considered to be subject to the disadvantage that the exercise provided is not natural walking exercise, but involves exercise which is strenuous to various degrees.

Certain apparatus of the above type, known heretofore, includes an inclined track which is set in motion by the efforts of the user, the track being provided with a certain amount of loading which enables strenuous muscular exercise to be taken. Machines or apparatus of that character provide for taking exercise of a type which differs notably from normal easy walking action upon the level and compares more nearly with climbing stairs or walking uphill.

Exercising apparatus of the type adapted to move the body by the application of power, known and used heretofore, is characterized by the disadvantage that the user does not exercise voluntarily at a rate determined by his will but, after adjusting the speed or rate of movement of the machine to some particular fixed value, he is then required to adjust his muscular action so that it coincides with the then fixed speed of operation. An exercising apparatus of this type is the well known "electric horse". In addition, apparatus of this character involves a manipulation of certain controls for its proper operation, and at best is entirely mechanical in its application of motion to the body for the purpose of exercise.

Furthermore, in taking a form of exercise involving strenuous muscular exertion such as exercise of the type known as the "daily dozen", a mental concentration upon the physical acts is necessary, thereby taking from this form of exercise many of the aspects of recreation which should be present for greatest benefit.

Accordingly, it is an object of the present invention to provide an exercising apparatus that shall furnish the possibility of walking exercise under conditions closely resembling that of unrestricted walking upon a level surface; thereby permitting the various muscles of the body of a user to be afforded exercise without excessive effort and without mental concentration upon the physical act of exercising.

It should here be pointed out that an outstanding characteristic of walking as an exercise which distinguishes it from organized physical exercise, is that it is an activity which, given a good road surface, requires no appreciable mental operation. The motive nerves which control the muscles used in walking appear to function automatically by nature. Thus one may walk for hours without mental concentration upon the actual method of ambulation. This is not true of other organized exercises, which may be characterized generally as being entirely a labor to be carried out for the purpose of health.

Accordingly, it is a further object of the present invention to take advantage of the freedom from concentration necessary to the act of walking for exercise, and therefore

to provide an exercising apparatus which permits the body to receive exercise under control of the will of the exerciser while at the same time the mind may be utilized to advantage, as by reading or studying, thereby to prevent what may be regarded as a daily expenditure of a large amount of valuable time in exercising.

It is a further object of the present invention to provide an apparatus of the character described which shall respond automatically to the presence of a user or pedestrian upon it to set up the exercising operation, and which shall automatically respond to the demand made upon it by the user or pedestrian for exercising action.

It is a further object of the present invention to provide an exercising apparatus of the type employing a treadmill or moving track surface, the rate of movement of which is automatically controlled by the movement of the body of the user along the track surface while exercising.

It is a further object of the present invention to provide an exercising apparatus, the operation of which is controlled by the capacity effect of the body of the user with respect to an element of an electrical control circuit for said apparatus.

In carrying out the invention, a movable track is provided, of suitable material having a surface adapted to simulate the surface of an out-of-door dirt track. The track is set in motion and is automatically controlled in such a manner that the user, exerciser or pedestrian thereon may take walking, or running exercise as upon an outdoor track, at any speed he may choose, within his capabilities and suited to his desires.

The motor means is controlled entirely automatically by changing the position along the track of the body of the person taking exercise by moving the body in a forward direction to increase the speed, and in the opposite direction to reduce the speed. Since the track moves in said opposite direction it tends to carry the body backward to establish a reduced speed.

Control means responsive to the position of the body of the person taking exercise may take the form of a suitable arrangement of photo-electric cells and associated light sources, whereby beams of light are projected across the track to the cells and are successively intercepted to successively de-energize the cells in the light path, thereby to control circuits connected with the motor.

Likewise, electrostatic or capacity plates and electrodes may be arranged to be similarly influenced by changes of position along the track, of the body of the person taking exercise. Thus, for example, in a preferred embodiment of the invention, an electrode or plate is located adjacent the forward end of the track and controls by the body capacity effect of the pedestrian with respect to it, an electrical control apparatus for the motor means.

The electrode is approached by the user while walking on the track, thus increasing the body-electrode capacity which so controls the motor means as to cause an increase in the track speed. The speed of the track is thus determined by the position of the body of the user with respect to the electrode, whereby the user may, by his own efforts, determine his walking or running rate and hold it at any desired speed.

The invention will, however, be better understood from the following description when taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

In the drawings, Fig. 1 is a view in perspective of one side of an apparatus embodying the invention and illustrates the exercising position of a user of the apparatus; Fig. 2 is a plan view of the apparatus shown in Fig. 1, on the same scale, with certain portions broken away to show details of the interior thereof; and Fig. 3 is a wiring diagram showing the circuits of the apparatus of Figs. 1 and 2.

Referring to Figs. 1 and 2 of the drawings, 5 is a movable track carried by two spaced parallel drums 6 and 7 and is supported between said drums by a plurality of additional parallel rollers 8 to provide a flat surface adapted to serve as a track upon which a user of the apparatus, or pedestrian, as indicated in Fig. 1, may walk to receive exercise. The track may be of any suitable width and length to provide the desired surface area for permitting the user or pedestrian full freedom of stride in both walking and running exercise, and may be provided by any suitable means which preferably simulates an out-of-door natural dirt track.

In the present example, the track 5 is of relatively thick rubberized material such as canvas, providing a resilient surface and is of the endless belt type whereby it is arranged to pass continuously around the spaced drums 6 and 7. It is obvious that the resiliency of the track may further be increased by cushion mounting the supporting means in any suitable manner whereby the track tends more perfectly to simulate a natural outdoor running track.

As the pedestrian walks forward along the track surface, the latter is arranged to be driven in the opposite direction, as indicated by arrows, to maintain the position of the body of the pedestrian substantially fixed in space. The driving means may be any suitable motor device adapted to be controlled in speed. In the present example, it is provided by an electric motor 9 connected with one of the drums 6 through the medium of a reduction gearing 10 having a drive shaft 11

connected with drum 6, and a driven pulley 12 connected with a pulley 13 on the motor, by a suitable belt 14.

The track and its supporting means, together with the motor means for driving the track, are mounted in a suitable base member or platform 15 which provides a housing therefor and for an electrical control means or apparatus 16 for the motor means and an electric potential supply means 17 for the apparatus.

Access is had to the apparatus located in the base or platform through suitable hinged doors or covers 18 forming part of the base or platform surface surrounding the moving track. Suitable hand rails 19 are also provided in connection with the base or platform and are adjusted to a height to readily be grasped by the pedestrian as a steadying means while exercising.

In exercising by walking upon a track or surface of limited area, such as that necessarily provided in an apparatus of this character, the position of the body of the exerciser or pedestrian along the track should substantially be fixed. In order to provide for this, the track surface is arranged to be moved at a rate depending upon the demands of the pedestrian, whereby the track will move in a backward direction, as indicated by the arrows, at the same rate of speed as the pedestrian desires to move forward and at which he would move forward upon a fixed track.

In accordance with the invention, the rate of speed at which the track surface moves is arranged to be controlled automatically without the attention of the exerciser or pedestrian, by causing the motor means which drives the track to be controlled by movement of the body of the exerciser in either a forward or backward direction along the track.

The arrangement is such that a slight change of position of the body of the exerciser along the track in a forward direction sets up a correspondingly increased speed of the track tending to restore the body to the former position. Thus, as the body of the exerciser is moved forward, a constantly increasing restoring force is applied thereto by the increased speed of the track thereby permitting the exerciser to walk or run at an increased speed in the new position. A corresponding change of position in the opposite direction likewise sets up a corresponding decrease in speed and a lower walking or exercising rate for the pedestrian.

A control arrangement of this character is provided preferably, by means responsive to changes of position and electrical capacity of the body of the pedestrian along the track with respect to an electrical control circuit element whereby without involving any conscious controlling effort upon the part of the exerciser or mechanical or electrical connections therewith, a full control action may be obtained.

To this end, as a preferred embodiment of the invention, there is provided and positioned adjacent the forward end of the track toward which the exerciser walks, a control electrode or capacity plate 20 which is connected through a lead 21, a control box 22 and a cable 23, with the motor control apparatus 16 in the base of the machine. The control electrode is positioned at a height such that it is electrically influenced by the position of the body of the exerciser or pedestrian with respect to it and, in the present example, is carried, together with the control box 22 and connected lead and cable, by a suitable stand or pedestal 24 mounted upon the base of the apparatus at the forward end of the track directly in continuation of the latter.

Any other suitable control element which may be influenced by changes in the position of the body of the exerciser, may however be provided, as hereinbefore mentioned. In the case wherein the exercising apparatus is employed for permitting running exercise, the control element or elements such as capacity plates, photo-electric cells, associated light sources and the like, may be located in suitable positions, for example along the track on opposite sides thereof, to be controlled by changes in the position of the body of the exerciser on the track without interfering with a full running action of the body.

As a present preferred arrangement, however, the control element is a simple electrode as shown and is located in a pedestal which is also arranged to carry a suitable supporting means 25 for an object of interest to the exerciser at a height and in such a position substantially as indicated in Fig. 1, whereby the object may be viewed by the exerciser during the exercising operation, for example, a book or magazine 26 may be read while exercising.

Referring now to Fig. 3 in which, for like parts representing those shown in Figs. 1 and 2, the same reference numerals are used, the track 5, its driving motor 9, and control element 20 are shown in connection with the circuits of the electrical means for controlling the speed of the track in response to changes in the position of a body or distributed capacity 27, representing that of a pedestrian or exerciser upon the track.

In the present example, the motor 9 is of the direct current type whereby its speed may be controlled from zero to that necessary to drive the track at any desired maximum speed, for example, three and one-half miles per hour for ordinary full walking speed. The motor is controlled by supplying it with separate field excitation from the alternating current input leads 28 of the apparatus,

through a suitable rectifying means such as a contact type of rectifier, indicated at 29. The rectifier or direct current output from the rectifier 29 is supplied to the motor through suitable field leads 30 carried in a cable 31 connecting the motor with the apparatus. Inserted in circuit with the motor field is a suitable means such as a variable resistor 32, for controlling the field excitation whereby the speed of the motor may be adjusted.

The armature leads from the motor, indicated at 33, are also carried by the cable 31 and are connected with the direct current output terminals 34—34 of a full wave rectifier system employing a pair of grid controlled electric discharge devices 35 in connection with an alternating current supply transformer 36, and a filament supply transformer 37 for the filaments of the devices 35.

Both of the transformers are supplied from the alternating current supply leads 28 of the apparatus through a power switch 38. An auxiliary power switch 39 is provided in circuit with the transformer 36 for separately controlling the power supply to the rectifier system and devices 35 and to the motor armature. The rectifier system thus provided is arranged to control the supply of rectified or direct current to the motor armature from the alternating current source 28.

The rectifier devices or tubes 35 are provided with grids or control electrodes 40 and are a well known mercury-vapor current-conduction type, for example, they are preferably of the type known commercially as Thyratrons. As is well known, such electric discharge devices conduct current when their anodes are of a sufficiently positive potential with respect to their cathodes, and have the added characteristic that the current may be prevented from starting to flow by applying to the control grids a certain negative potential while the anodes are at zero or a negative potential. As the negative grid potential is reduced the devices suddenly become conducting at a certain negative grid potential substantially near a zero value and thereafter as the grids are made increasingly more positive, they have no further control upon the rectifying or conducting action of the device.

With a rectifier of this character, as is well known, the rectified current output may be controlled by varying the phase relation between an alternating current applied to the anodes and an alternating potential applied to the control grids. In the present example, this well known control feature of the thyratron or current-conduction grid-control power type of rectifier is taken advantage of by supplying an alternating potential to the grids 40 of the rectifier device 35 from the same alternating supply leads 28 which supply current to the anodes. This potential is taken through leads 41 which are connected with the grids through a push-pull input transformer 42. As indicated at 42′ a stabilizing resistor is included in the grid circuit return lead, for more stable operation of the rectifier devices.

Interposed between the source of alternating potential and the grids, and in the present example between said source of potential and the primary of the input transformer 42, is connected a phase-changing network or bridge including two fixed arms 43—43 of equal resistance value, an adjustable resistance arm 44, and a variable impedance arm, provided in the present example by a saturating reactor 45 connected in the output or anode circuit 46 of an electric discharge amplifier provided by a pair of parallel connected electric discharge amplifier devices 47.

The amplifiers of the present example receive cathode or filament heating current from transformers 37 through leads 48 and are supplied with a grid biasing or control potential from a variable impedance or resistor 49 through a time delay network including a second variable resistor 50 and a shunt capacity 51.

Connected in circuit with the source of bias potential or variable resistor 49 is a hot cathode rectifier device or valve 52, the cathode of which is supplied with alternating current through a pickup coil 53 from a high frequency oscillator 54. The oscillator 54 may be of any suitable type adapted to be controlled by a tuned circuit and in the present example is provided by a three-element electric discharge device 55 having its anode and grid circuits coupled by suitable coils 56 and 57 which are tuned to a resonant frequency by a variable condenser 58.

Bias potential for the oscillator is obtained by a suitable grid resistance 59 and a shunt capacity 60. Suitable leads 61 connecting the variable condenser 58 with the oscillator circuit and leads 62 connecting the pickup coil 53 with the filament 63 of the bias control tube or rectifier 52 are carried in a cable 23 connecting the control box 22 with the remainder of the apparatus. A knob for controlling condenser 58 is indicated at 64 in Fig. 1.

Located in the box 22 and closely associated with the pickup coil 53 for the transfer of high frequency energy thereto from the oscillator 54, is a coil or high inductance 65 which is connected to the grid side of the oscillator circuit through a series condenser 66. The circuit represented by coil 65 and condenser 66 is tuned by the distributed capacity of its coil and resonates at a frequency slightly below that to which the oscillator is tuned by the condenser 58.

The oscillator frequency may thus be adjusted so that both circuits are resonant substantially to the same frequency, but for the purpose of stable operation, the oscillator

frequency is slightly greater than the frequency of the circuit represented by coil 65 and condenser 66. This last named circuit may be called the control or antenna circuit and is connected by the lead 21 to the control electrode or antenna plate 20, whereby the condition of resonance of said circuit may be varied by the distributed capacity of a body 27 moving along the track 5.

In the control or antenna circuit, the ratio of inductance to capacity is very high. Thus a small increase of capacity caused by a body brought toward the control electrode causes the circuit to change its natural frequency considerably. Being connected to the control grid of the oscillator, the frequency of which is but slightly greater, the transfer of the energy from the oscillator which takes place through the control circuits 65 to the pickup coil 53 is controlled thereby. By adjusting the size of coil 53, the energy delivered to the cathode of the rectifier 52 is such that it is fully excited and hence provides full rectifier action when the control or antenna circuit is uninfluenced by the presence of any body near the antenna plate or control electrode 20.

By moving a body toward the electrode 20, the capacity of the control circuit is increased and this serves to reduce its frequency. The amount of decrease depends upon the relation between the frequencies of the two circuits. A greater decrease in the frequency of the oscillator circuit, and hence greater control, is obtained when the control circuit is close to the oscillator circuit in frequency than when it is at a greater frequency difference. This difference may be adjusted by the variable condenser 58 and it will be seen that this serves to vary the effect of a body, moving with respect to the electrode 20, upon the frequency of the tuned control circuit and the control of the rectifier or control tube 52.

It will be seen that the valve or rectifier device 52 operates to control the amplifier 47 through the medium of the grid circuit of the latter and the bias resistor 49. The valve 52 is in turn controlled by the transfer of energy from the oscillator 54, which transfer of energy is controlled by the condition of resonance of the control or antenna circuit controlled by a body 27 moving with respect to the antenna plate or electrode 20.

The operating result of this arrangement is to place the amplifier 47 under control of the potential set up across the resistor 49 by the current flow therethrough from the source 17 under control of the tube 52. This potential is applied to the control electrodes of the amplifier 47.

It will be appreciated that if means other than the capacity plate or control electrode 20 are associated with the track for automatic control, in accordance with the position of the body of the person taking exercise, a corresponding change in the connection between the control means and the resistor 49 may be made whereby the same mode of operation is carried out, namely that as the body 27 moves along the track the potential existing across resistor 49 and the bias potential for amplifier 47 is correspondingly varied.

Suitable operating potentials for the anodes of the various electric discharge devices provided in the control apparatus, above described, are obtained from the source 17 through leads 67 carried in a suitable cable 68. Filament or heating current for the oscillator device 55 is obtained from transformer 37 through leads 69.

From the foregoing description it will be seen that a control circuit arrangement is provided between a circuit element located adjacent the track, a control circuit responsive to movement of a body on the track with respect to said control element, and a circuit of the motor by which its speed is controlled.

As a preferred modification, and as shown in the present example, a grid controlled rectifier is provided for supplying current to the motor and the rectifier is in turn controlled by supplying alternating current to its grid circuit through a phase changing network including a saturating reactor located in the anode circuit of an electric discharge amplifier.

The amplifier is connected with a control device through a time delay network for changing its grid bias and the control device is excited by energy from a high frequency oscillator taken through a tuned high frequency circuit controlled by the electrode or control element located adjacent the track.

The motor which drives the track is thus supplied by the rectifier, the output of which is controlled by the grid voltage phase-shift actuated by the body capacity applied to the control circuit by a pedestrian while exercising upon the track. The speed of the track is controlled by the position of the pedestrian or person taking exercise with respect to the electrode. When he is at the extreme end of the track remote from the electrode, the motor does not turn.

As the person taking exercise moves up the track toward the electrode, the capacity between his body and the electrode increases and the grid voltage of the rectifier through the phase changing network shifts in phase and allows a current of increasing value to be supplied to the motor, causing the latter to operate at an increasing speed. Thus there is included in this arrangement the elements of an automatic speed regulating system.

If the pedestrian walks faster, the motor speed and that of the track increases. If he

walks less rapidly, the motor and the track slow down. At whatever speed the pedestrian moves on the track, the latter automatically carries him away from the electrode just far enough so that motor speed is reduced to operate the track at his speed of walking. At that point, a condition of equilibrium is maintained.

The combination of reading and taking exercise simultaneously has many advantages. The exercise is entirely automatic, as indicated hereinbefore, and requires no mental application. One is able to apply one's mind to the reading just as well as if one were at rest. The exercise is obtained without the feeling of monotony and being bored, which usually results from aimless walking.

It is pointed out that the operation of the machine as described above involves no manipulation of any controls as is the case with other exercising machines, such as, for instance, the well-known electric horse. But with the present walking machine the control is entirely automatic. The user behaves exactly as if he were walking along a highway. He walks as he feels inclined. He stops whenever he wishes. The moving track automatically accommodates itself to his action.

It will be noted that because of the fact that the device is controlled by the capacity effect of a body upon an electrode or antenna plate adjacent the track, motion of the hands and arms may often effect sudden variations in the control potentials and in the speed of the track. By employing the time delay means in the circuit, the variations in speed of the track is made responsive to the position of the body of the pedestrian and is not responsive to the variations which would tend to be set up by rapid motion of the arms or legs.

In the present example, the time delay means is inserted in circuit with the amplifiers 47 in the grid circuit thereof, the arrangement being such that sudden changes in the bias potential are applied to the grid circuit through the variable resistor 50 which may be adjusted for proper response and the voltages are then applied to the grid circuit across a condenser 51 which operates as a storage device thereby further preventing sudden changes in the bias potential applied to the grid circuit. It has been found that in certain applications a variable resistance 50 of 3 megohms maximum and a capacity 51 of .5 m. f. d. is suitable at a time delay means, permitting a delay of from 0 to several seconds if desired.

It is suggested here that a time lag of approximately two seconds be used as it is found that less than this may cause too fast an acceleration and more than this will necessitate the pedestrian to pause for a moment while the track attains the desired speed.

The distance between the pedestrian and the electrode or bookrest by which it is carried, may be adjusted by the knob 64 which controls the frequency of the oscillator circuit. As will be seen from a consideration of the circuit, with the body of the pedestrian located in a certain position with respect to the electrode, the control circuit is tuned to a certain frequency with respect to which the oscillator circuit may be tuned, to increase or reduce the transfer of energy from the oscillator to the control device or tube 52, thereby permitting the pedestrian to take up a position as close as he desires to the object which he is viewing upon the stand while at the same time exercising at the desired speed.

The operation is as follows: The filaments of the various electric discharge devices are heated by closing switch 38 with switch 39 open. As soon as the rectifier devices 35 are warm enough to start conducting current, the switch 39 is closed to apply high voltage to the anode circuits for transformer 36 and to permit the rectified output to be supplied to the motor 9.

In the rest or stop position of the track, the rectifier is normally adjusted to deliver current to the motor sufficient to nearly overcome the friction losses of the driving system. This may be adjusted by an adjustment of the alternating current network in a grid circuit of the rectifier with respect to the impedance of the saturating reactor 45 in the adjacent arm of the network or bridge.

It will be noted that in the present example, the saturating reactor is provided by a transformer comprising two separate units, the primaries of which are connected in series and the secondaries of which are connected in parallel. This is for the reason that the existing audio frequency transformers were employed and the circuit arrangement shown provided a proper matching of impedance values although it is obvious that a single reactor may be employed.

As soon as the pedestrian steps upon the end of the track opposite to the antenna plate or control electrode 20, the slight increase in capacity will be enough to start the track moving at a low speed. The pedestrian then proceeds slowly to walk along the track facing the antenna plate or electrode. As he approaches the latter the motor gradually attains speed until the pedestrian is walking at a maximum desired rate which is determined by the gearing ratio between the motor and the track and the power of the motor. This speed is approximately three and one-half miles per hour for normal maximum walking rate. The pedestrian then adjusts the knob 64 to regulate his distance from the

pedestal in order to insure comfortable reading of whatever material he may have thereon.

Should the pedestrian desire to walk slower, he has but to slacken his pace. Due to the inertia of the driving system, he will be moved away from the antenna plate, thereby decreasing the capacity between his body and the plate; consequently the driving motor will receive less current from the rectifier. He can either proceed at this retarded gait or he can stop walking entirely in which event he will be carried still farther from the antenna plate, the driving system then coming to rest. The pedestrian may walk at any speed he desires; can accelerate up to the maximum, or stop as many times as he likes, without fear of being thrown from the track.

I claim as my invention:

1. An exercising apparatus including in combination, a movable track means, a motor means connected with said track means to move it, and a control means for said last named means for varying the rate of movement of the track means in response to changes in position of a body along the track means.

2. An exercising apparatus including in combination, means providing a movable track, and motor means for moving said track in one direction, said last named means having a control element responsive to changes in the position of a body on the track for changing the rate of movement of the track.

3. An exercising apparatus including in combination, means providing a movable track, motor means connected with said track for moving it, and control means for said last named means having a control element associated with the track, said control element being responsive to the presence of a body upon said track to cause the motor means to operate, and being responsive to changes in the position of a body along the track for changing the rate of movement of said track.

4. An exercising apparatus including in combination, means providing a movable track, motor means for moving said track, means for providing an electrical field in association with said track, and means connected with said motor means and responsive to changes in a condition of said field for controlling the rate of movement of said track in response to the presence and position of a body thereon.

5. In an exercising apparatus, the combination with means providing a movable track surface whereon exercise may be taken by walking, of electrical means responsive to movement of a body along said track in one direction for causing said track to move in the opposite direction at a rate dependent upon the position of said body along said track.

6. An exercising apparatus including in combination, means providing a movable track, motor means for moving the track to permit exercising thereon by walking or running, and control means for the motor means having an element arranged to be influenced capacitatively by the position of a body while exercising upon the track automatically to control the rate of movement of the track.

7. In an exercising apparatus, a movable track, electric motor means for moving the track, an alternating current rectifier connected with said motor means to supply operating current thereto, a control circuit for the apparatus having a control element arranged to be associated electrically with a body when on the track to change a condition of operation of said circuit, a control circuit for said rectifier including an alternating current phase changing network, and electrical means connected with said network and with said first named control circuit for applying a controlling current to said network in response to changes in the condition of operation of said control circuit.

8. In an exercising apparatus, the combination with a movable track means, an electric motor driving means therefor and a control circuit for the motor, of an alternating current rectifier connected with said motor driving means to supply operating current thereto, said rectifier having a pair of full-wave-connected grid-controlled electric discharge rectifier devices, means for supplying an alternating control voltage to said devices including a phase changing impedance network, said network including a phase changing reactor, an electric discharge amplifier having an anode circuit connected with said reactor, and means for supplying a variable biasing potential to said amplifier automatically in response to changes in position of a body on and along the track means.

9. In an exercising apparatus, the combination of means providing a movable track, electric motor means for moving said track in one direction whereby exercise may be taken by walking upon the track in the opposite direction, and control means for the motor responsive to a change of position in said opposite direction of a body located on said track, to increase the speed of said track.

10. In an exercising apparatus, the combination of a movable track, electric motor means for moving said track, an alternating current network including a saturating reactor arranged to control the supply of operating current to said motor, an electric discharge amplifier connected with said saturating reactor, means arranged to supply a bias potential to said amplifier, a time delay network interposed between said amplifier and said last named means, and an electrical control circuit including a control element associated with the track, and means connected

with said bias potential supply means for controlling the latter automatically in response to changes in position of a body on and along said track.

11. An exercising apparatus including in combination, movable track means, motor means connected with said last named means to move it, means for providing an electrical field in association with said track means, and control means for said motor means responsive to changes in a condition of said field for varying the rate of movement of the track means in response to changes in position of a body along said track means with respect to said field.

ALAN S. FITZ GERALD.