ABSTRACT: An upwardly and rearwardly sloping treadmill, having steps thereon, mounted in a supporting structure for adjustment of the slope of the treadmill. Fluid pressure means includes a control valve and a pump operatively connected to the treadmill and operated thereby to generate resistance of the treadmill against working force applied thereto by the user.
REVOLVING STEP EXERCISER WITH ADJUSTABLE SLOPE

BACKGROUND OF THE INVENTION

Exercisers, such as those operating in the manner of bicycles, rowing machines, and the like, are well known, many of these having means for varying resistance to the muscular efforts applied thereagainst by the user, for the purpose of improving physical fitness, athletic training and the like. It is recognized that walking and full climbing are not only highly beneficial in strengthening leg muscles but are also valuable in improving the physical tone of a person's body generally. Treadmills are also well known, as being means for operating mechanical devices of various types.

SUMMARY OF THE INVENTION

An important object of this invention is the provision of an exerciser which operates in the manner of a treadmill, and which is quickly and easily adapted for use by persons of various weights.

Another object of this invention is the provision of an exerciser which is highly effective in strengthening of a user's leg muscles and improving general physical fitness.

Still another object of this invention is the provision of an exerciser which requires no outside power, other than that of the user, for its operation.

To the above ends, I provide a revolving step exerciser comprising a supporting structure, a step-equipped treadmill sloping upwardly and rearwardly relative to said supporting structure, means for adjusting the slope of the treadmill, a fluid pump operated by the treadmill, and valve means for controlling the flow of fluid discharged by the pump to vary the resistance of the treadmill to user-imparted movement thereof.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in side elevation of a revolving step exerciser produced in accordance with this invention, some parts being broken away.

FIG. 2 is a view in front elevation, as seen from the left to the right with respect to FIG. 1.

FIG. 3 is a longitudinal section taken substantially on the line 3-3 of FIG. 1.

FIG. 4 is a transverse section taken on the line 4-4 of FIG. 2.

FIG. 5 is an enlarged fragmentary view in top plan of an instrument forming portion of the exerciser.

FIG. 6 is an enlarged fragmentary view in perspective of one of the steps of this invention.

FIG. 7 is an enlarged fragmentary section taken substantially on the line 7-7 of FIG. 2, and FIG. 8 is a view, partly in diagram and partly in section of a fluid pressure system of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A supporting structure comprises a pair of laterally spaced triangular support frames 1 and 2, preferably made from rigid metallic tubing, and each including a horizontal base portion 3, upwardly converging front and rear leg portions 4 and 5 respectively, connected at their lower ends to the front and rear ends of their respective base portion 3, and a side strut 6 extending angularly forwardly and upwardly from the rear end of its respective base portion 3 and welded or otherwise rigidly secured to its respective front leg portion 4. A rear cross brace member 7 is rigidly secured at its opposite ends to the rear end of each base portion 3.

An upwardly and rearwardly sloping treadmill, indicated generally at 8, comprises a pair of elongated rearwardly and upwardly sloping plate-like side members 9 and 10 disposed in a parallel relationship and each disposed laterally outwardly of a respective one of the support frames 1 and 2. The treadmill further includes a lower front transverse shaft 11 extending transversely through the lower front end portions of the side members 9 and 10 and an upper rear transverse shaft 12 journalled in bearings 13 in the upper rear end portions of the side members 9 and 10. A pair of laterally spaced drive sprocket wheels 14 keyed or otherwise rigidly mounted on the shaft 12, a pair of laterally spaced idler sprockets 15 journalled on the shaft 11, and an endless flexible conveyor 16 carried by the sprocket wheels 14 and 15. The conveyor 16 comprises a pair of endless link chains 17 each entrained over a different aligned pair of sprocket wheels 14 and 15, and a plurality of steps 18, each step 18 being in the nature of an angular transverse member formed to provide a normally generally horizontal tread portion 19 and a normally generally vertical riser portion 20. The opposite ends of each tread portion 19 are provided with pairs of rigid mounting arms 21 pivotally secured at their outer projected ends 22 to the link chains 17, as indicated at 23, see FIG. 7. In like manner, each riser portion 20 is provided at its opposite ends with a pair of rigid mounting arms 24 having their extended portions 25 pivotally connected to the link chains 17 at the pivotal connections 23 of an adjacent pair of mounting arms 21. Each step 18 is reinforced by one or more gussets 26, see FIGS. 4 and 7. The link chains 17, being entrained over the sprocket wheels 14 and 15, define upper operating flights 27 and lower return flights 28, the steps 18 on the return flights 28 being inverted relative to those on the operating flights 27.

The treadmill 8 further includes a pair of laterally spaced handrails 29 disposed adjacent opposite ends of the steps 18 and formed to provide legs 30 that are suitably anchored at their lower ends to return flanges 31 on the side members 9 and 10. The handrails 29 are further supported by brace members 32 also rigidly secured to the return flanges 31, and to the handrails 29. A cushion or padded hood 33 is mounted on the upper rear end of the treadmill 8 by means of mounting brackets or the like 34 bolted or otherwise rigidly secured to end wall portions 35 of the hood 33 and to adjacent ones of the treadmill side members 9 and 10.

Means for mounting the treadmill 8 in the frame structure including the support frames 1 and 2 comprises the lower front shaft 11, a cross shaft 36 connected at its opposite ends to the connected upper ends of the leg portions 4 and 5 of each support frame 1 and 2, a transverse rockshaft 37 having opposite end portions journaled in the side members 9 and 10 and disposed in spaced parallel relationship to the cross shaft 36, and a pair of laterally spaced rock arms 38 each rigidly secured at its inner end to the rockshaft 37 and having a slot 39 at its outer end through which the cross shaft 36 extends, see particularly FIG. 4. Means for imparting rocking movements to the rockshaft 37, to vary the angular or sloping disposition of the treadmill 8 comprises a lever 40 rigidly secured at its inner end to the rockshaft 37 adjacent the laterally outer surface of the side member 9 and a toothed quadrant 41 rigidly secured to said outer surface of the side member 9 for engagement with a conventional releasable locking mechanism 42 on the lever 40. With this arrangement, the slope of the treadmill may be varied to suit the operator's needs. It will be noted, with reference to FIG. 3, that the lower front end portions of the side members 9 and 10 are provided with bearings 43 which journal the treadmill 8 at its lower front end on the lower front shaft 11.

For the purpose of imparting a load to the conveyor 16, fluid-pressure-operated means is provided, comprising a fluid pump 44, a fluid reservoir 45, and low-pressure inlet and high-pressure outlet conduits 46 and 47 respectively connecting the pump 44 to the reservoir 45, the pump and reservoir 45 being rigidly secured to the treadmill side member 9. For the purpose of the present example, the pump 44 is shown in FIG. 8 as being of the rotary vane type comprising a housing 48 defining a pump chamber 49, a rotor 50 journalled in the housing 48 eccentrically within the chamber 49, and a plurality of circumferentially spaced radial vanes 51 radially shadily...
mounted in the rotor 50. The rotor 50 is mounted on a pump drive shaft 52 disposed in spaced parallel relationship to the upper rear treadmill shaft 12, and is connected thereto by sprocket wheels 53 and 54 mounted on the shafts 52 and 12 respectively, and an endless link chain 55 entrained over the sprocket wheels 53 and 54. Preferably, a relatively heavy flywheel 56 is mounted on the pump drive shaft 52 to aid in smooth running of the apparatus.

The reservoir 45 is formed to provide a valve body portion 57 having a fluid passageway 58 therein that extends from the outlet conduit 47 to the interior of the reservoir 45. The passageway 58 is normally closed by a valve element 59 slidably mounted in an opening 60 in the valve body 57 and yieldingly urged toward a valve-closed position by a coil compression spring 61 interposed between the valve element 59 and the collar 62 of an adjustment screw 63 that is screw threaded through a retaining or packing nut 64 screw threadedly received in the valve body portion 57; see FIG. 8. The passageway 58 is provided with a tapered portion 65 through which fluid flows from the conduit 47 to the interior of the reservoir 45 at a gradually increasing volume as the valve element 59 is moved against bias of the spring 61 away from its valve-closed position shown in FIG. 8.

The inturnd flange 31 of the side member 9 overlies the pump 44, reservoir 45 and valve body portion 57, and provides an instrument panel on which is mounted a spring-wound clock or timer, the dial of which is indicated at 66, see particularly FIG. 5. A fluid pressure indicator 67 is interposed in the conduit 47, and includes an indicator dial 68 disposed adjacent the timer dial 66. The adjustment screw 63 projects upwardly and outwardly through an opening in the panel-forming flange 31 and is provided with a control knob 69. Also mounted on the panel-forming portion of the flange 31 associated with the side member 9 is a conventional counter mechanism 70 having an actuator 71 that is adapted to be engaged by suitable means, such as the steps 18, to indicate the number of steps traversed by a person using the exerciser.

In use, as the operator mounts the steps 18 associated with the operative flight 27, the weight of the user will cause the conveyer 16 to move, imparting rotation to the shaft 12 and consequent operation of the fluid pump 44 in a direction to force fluid through the conduit 47 toward the reservoir 45. Pressure of fluid in the conduit 47 will be indicated on the dial 68, and will tend to move the valve element 59 toward an open position against bias of the coil spring 61. Should the operator's weight be insufficient to impart downward movement to the operating flights 27 at a speed equivalent to the operator's walking pace, the control knob 69 is rotated in a direction to decrease bias of the spring 61 against the valve element 59, whereby the valve element 59 will be opened further under pressure of the fluid in the conduit 47 to permit faster rotation of the pump rotor 50 and consequent forward and downward movement of the operating flights 27. On the other hand, should the user's weight cause the operating flights 27 to move forwardly and downwardly at a speed greater than the operator's desired walking speed, the control knob 69 is turned to effect greater bias of the spring 61 against the valve element 59, to increase the load on the pump 44. Thus, the exerciser is capable of use by persons of various weights and walking speeds. By manipulation of the lever 40, the slope or pitch of the treadmill 8 may be varied to a limited degree, to provide for different climbing angles. Operation of the exerciser is completely dependent on the weight and effort of the user, and requires no outside source of power except that used by the timer 66.

What I claim is:

1. A revolving step exerciser comprising:
   a. a supporting structure including a pair of laterally spaced generally vertical support frames, a cross brace member connecting said support frames, and a cross shaft connected at its opposite ends to said support frame;
   b. a longitudinally sloping treadmill including,
      1. a pair of laterally spaced parallel side members each disposed adjacent a different one of said support frames,
      2. a pair of lower front and upper rear parallel transverse shafts connecting the side members, said lower front shaft being secured to said support frames, said side members being journaled on said lower front shaft,
      3. wheel means on said transverse shafts,
      4. an endless conveyer entrained over said wheel means between said side members and including a plurality of longitudinally spaced steps,
   c. a rock shaft having opposite end portions journaled in said side members in spaced parallel relation to said cross shaft;
   d. a rock arm secured at one end to said rock shaft and projecting radially therefrom, said rock arm having a slot therein through which said cross shaft extends, said slot being elongated in a direction transversely of said cross shaft;
   e. adjustment means for imparting rocking movement to said rock shaft to move said side members relative to said cross shaft and about the axis of said lower front transverse shaft, whereby to vary the slope angle of the treadmill relative to the supporting structure;
   f. and means for applying a load on the treadmill against movement of said conveyer relative to said supporting structure.

2. The revolving step exerciser according to claim 1 in which said adjustment means comprises a lever arm having one end fixed to said rock shaft adjacent one of said side members, and a quadrant and a releasable quadrant engaging member, one on said adjacent side member and one on said lever arm, for releasably locking said lever arm in desired set angular positions of the treadmill.