

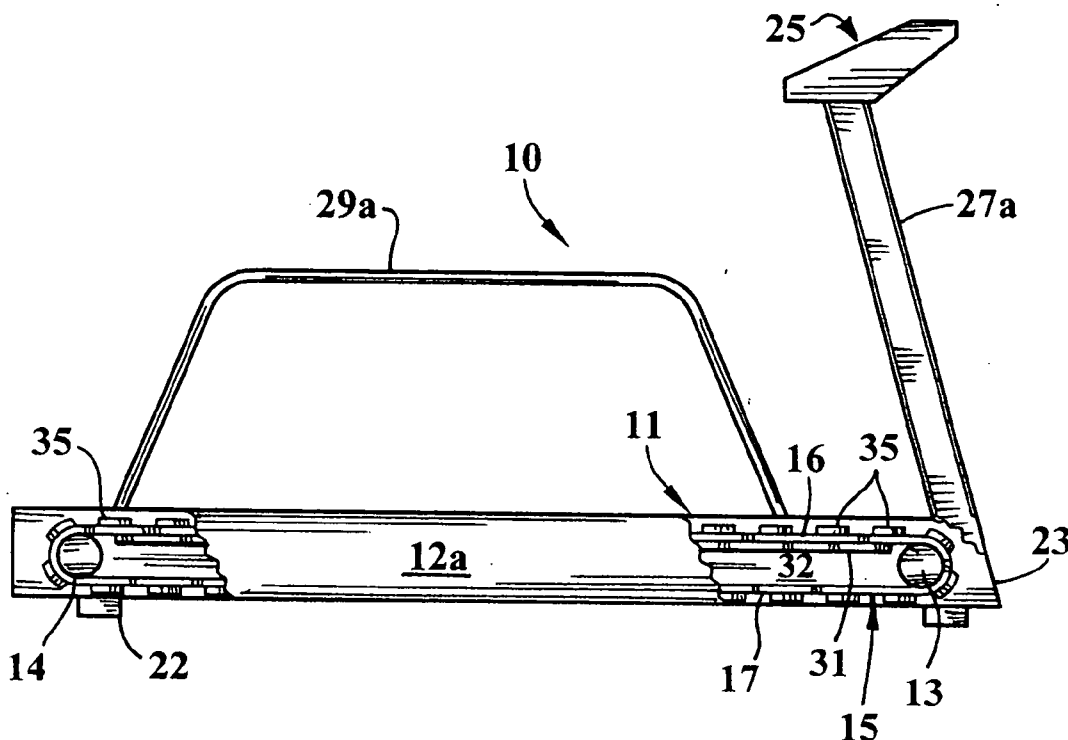
(43) **Pub. Date:** **Dec. 27, 2007**

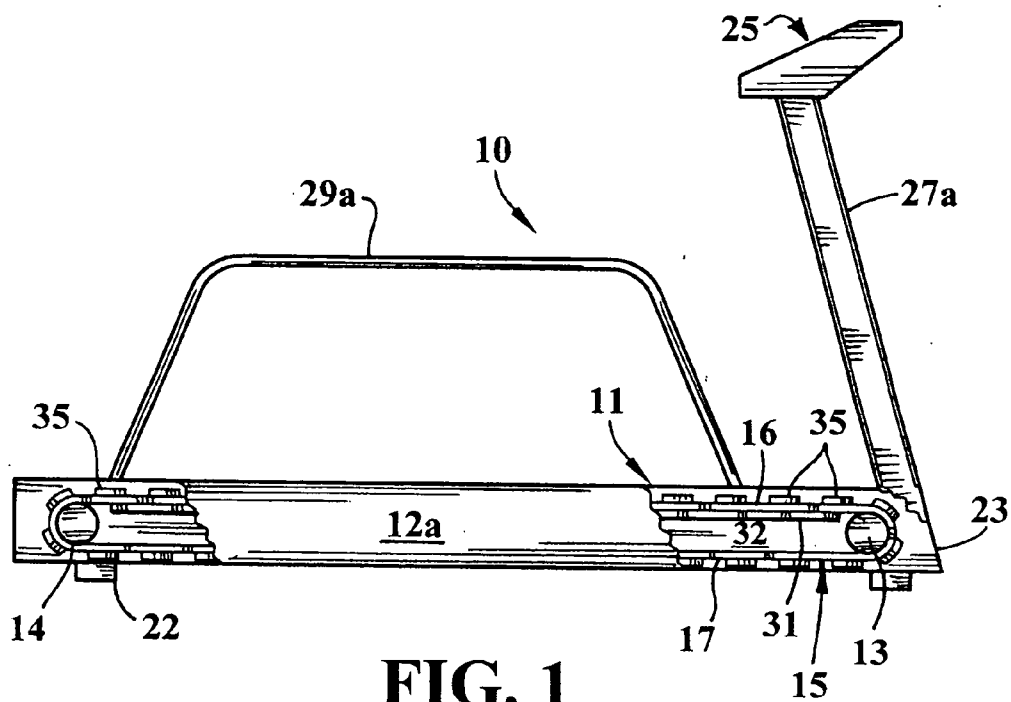
(52) **U.S. Cl.** ..... **482/54**

(57) **ABSTRACT**

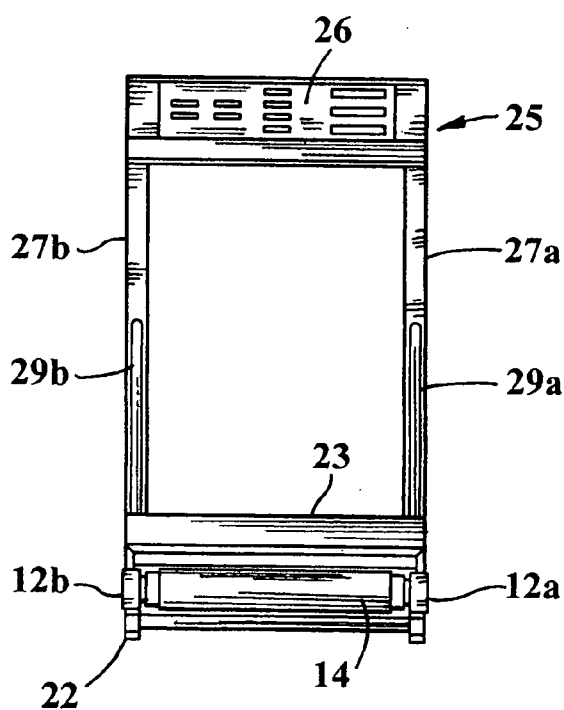
An exercise belt for a treadmill is provided having a modified surface that simulates natural ground terrain for the purpose of strengthening the muscles of the exerciser's ankles. The modified surface is produced by regions of variable effective thickness which may be protrusions or attached pads of varied shape, thickness, hardness and spacing. In another aspect, a kit is provided having a large number of pads of varied shape, thickness and hardness adhesively attachable to the belt.

### Publication Classification





**FIG. 1**



**FIG. 2**

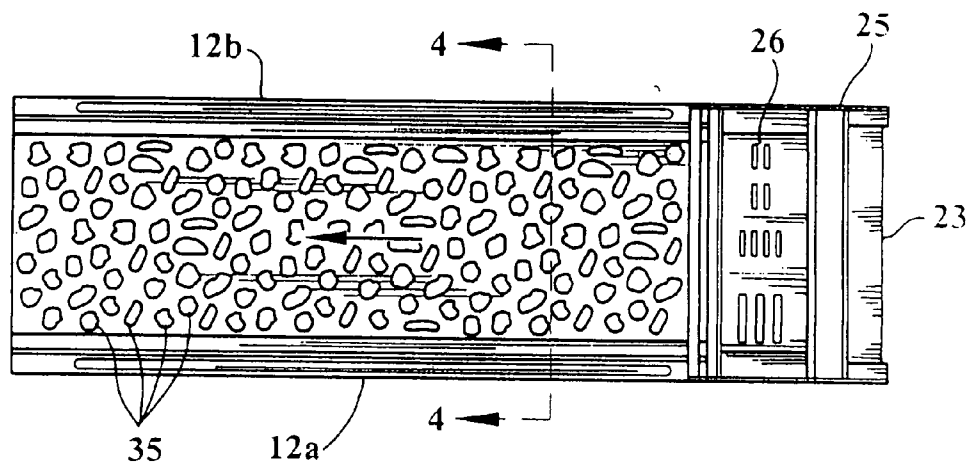


FIG. 3

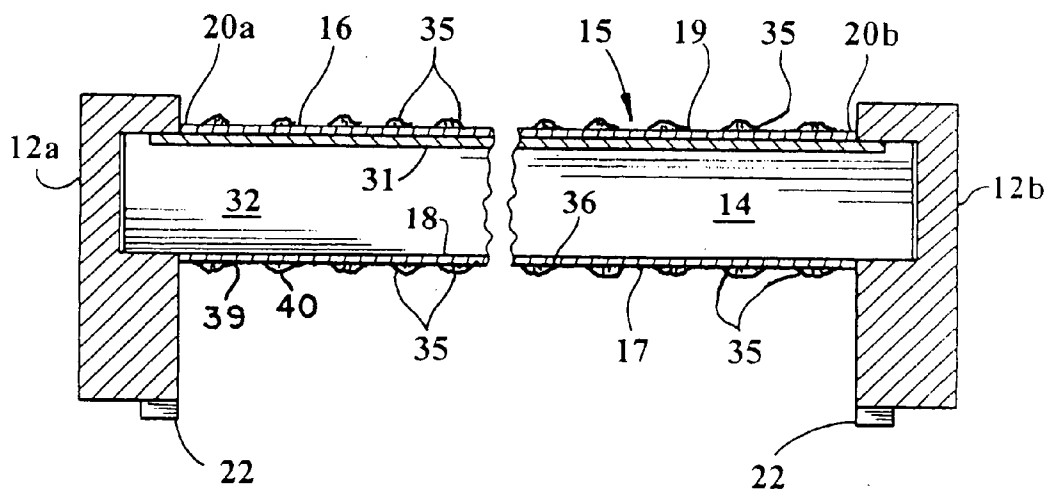
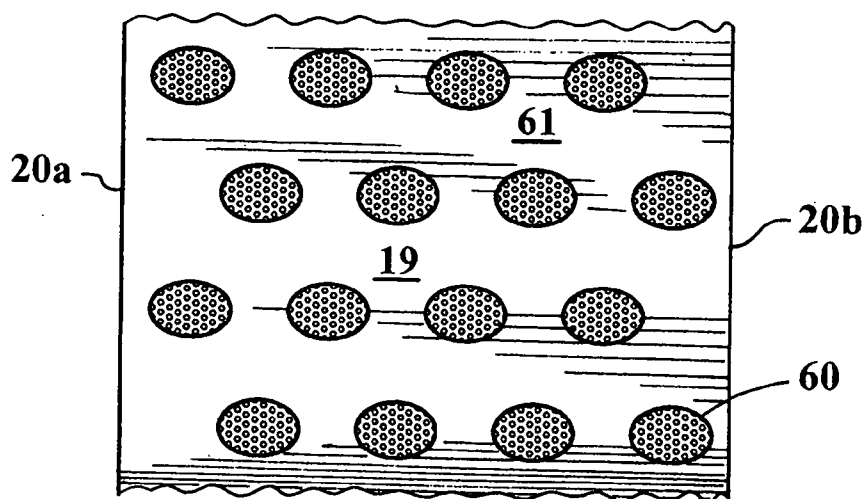


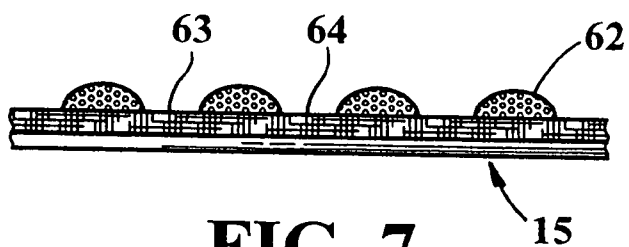
FIG. 4



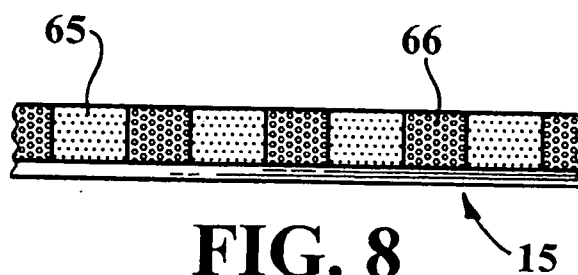
**FIG. 5**



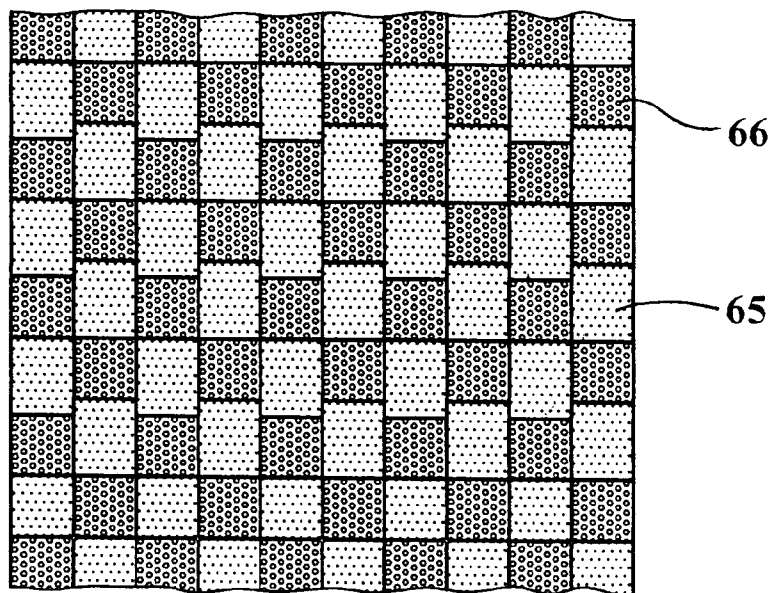
**FIG. 6**



**FIG. 7**



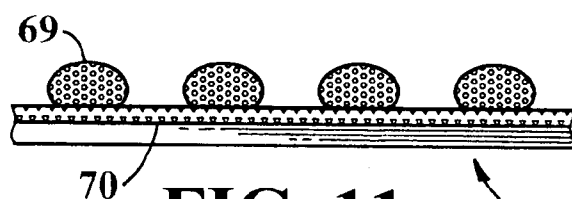
**FIG. 8**



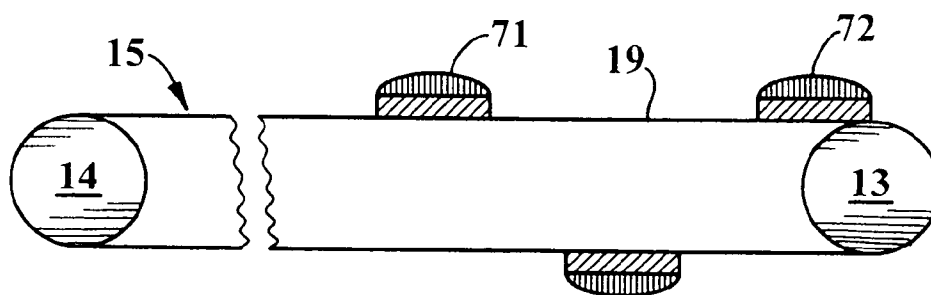
**FIG. 9**



**FIG. 10**



**FIG. 11**



**FIG. 12**

## **SURFACE-MODIFIED EXERCISE BELT FOR A TREADMILL**

### **BACKGROUND OF THE INVENTION**

**[0001]** 1. Field of the Invention

**[0002]** This invention relates to exercise machines, and more particularly concerns treadmill machines having a modified exercise surface that simulates natural ground terrain.

**[0003]** 2. Description of the Prior Art

**[0004]** Exercise treadmills in widespread use enable exercise-conscious persons to simulate a controlled walking, running, or jogging exercise program indoors with a minimum amount of space. The speed of exercise, the duration of the exercise period, and the work expended may be readily controlled by regulating the speed and inclination of the treadmill belt, and the length of the exercise period.

**[0005]** Typically, an exercise treadmill includes an endless belt entrained around a pair of spaced-apart rollers, with one of the rollers being driven at a predetermined speed such that the upper reach of the belt moves from a front to rear direction. In order for the user to remain stationary relative to a handlebar or the frame of the treadmill, the user must walk or run on the upper reach of the belt. By increasing or decreasing the surface speed of the belt, and by changing the inclination of the belt, the degree of physical energy expended by the user to keep pace with the belt may be selectively varied.

**[0006]** The upper reach of the belt must be supported by support means interposed between the upper and lower reaches of the belt. The support means may typically be a stationary flat slider plate having a very low friction surface or polymeric sheet that is in contact with the belt. Alternatively, the support means may be a series of parallel rollers positioned orthogonally to the direction of movement of the belt, said rollers minimizing frictional interaction with the belt. Both the interior and exterior surfaces of the belt are typically flat. As a consequence, the exerciser is provided with a constantly smooth exercise surface, quite unlike the experience of walking or running outdoors on moist or loose soil, grass or woodland trails or on a gravel shoulder surface adjacent a suburban road. In such outdoor running or walking sessions, irregularities in the terrain impart varied stresses to the exerciser's feet and ankles. The stresses cause flexion of the ankles in lateral, forward and rearward directions, and serve to strengthen the associated muscles.

**[0007]** It is accordingly an object of the present invention to provide a treadmill apparatus which provides a modified exercise surface that simulates natural terrain.

**[0008]** It is another object of this invention to provide a treadmill of the aforesaid nature wherein said modified surface is incorporated into the belt component of the treadmill apparatus.

**[0009]** It is a further object of the present invention to provide treadmill apparatus of the aforesaid nature wherein the nature of said modified surface is adjustable.

**[0010]** These objects and other objects and advantages of the invention will be apparent from the following description.

### **SUMMARY OF THE INVENTION**

**[0011]** The above and other beneficial objects and advantages are accomplished in accordance with the present

invention by an endless belt of flexible construction bounded by interior and exterior surfaces and parallel side edges, and adapted to tightly embrace front and rear rollers of a treadmill machine whereby said belt is caused to have horizontally elongated upper and lower reaches in vertically spaced apart juxtaposition with intervening support means acting upon said upper reach, said upper reach constituting a foot path that moves rearwardly at a controlled speed, said belt incorporating regions of variable effective thickness associated with said exterior surface in a manner to simulate natural ground terrain.

**[0012]** In one embodiment, the regions of variable effective thickness are provided by a series of protrusions disposed along the length and width of the belt. The size, shape and distribution of the protrusions can be variable and disposed in a random or uniform pattern. The elevation of such protrusions and their inclination with respect to the surface of the belt should be adequate to induce reasonable but not excessive inclination of the exerciser's ankle, so as to safely strengthen the associated leg muscles.

**[0013]** In addition to said height and inclination of the elevated regions, the deformability of the elevated regions under the load imparted on them by the foot of the person using the treadmill is low, causing tilting of the ankle. It is preferred that the protrusions have some deformability under load in order to avoid hard impact upon the bottom of the foot of the exercising person. Consequently, it is desired to have some flatness or curvature to the tip, that is highest point, of the elevated regions in order to prevent any sharp pointed object like experience to the foot of the person walking or running on the treadmill. The person may be wearing shoes or may be bare foot while using the treadmill.

**[0014]** The spacing between the elevated areas is preferably large enough as compared to the size of the heel of most adults, so that the heel gets tilted as it lands on the inclined part of the elevated region, causing tilting of the ankle either laterally, forwardly or rearwardly. The non-elevated or valley region of the belt can be flat or can have many small size raised areas to impart a massage like action to the bottom sole if the person walking on the belt is bare footed. The elevated regions can also be made up of many small size raised areas as well.

**[0015]** Said elevated regions can be integral with the belt, having been produced during the manufacture thereof as by a molding operation. Alternatively, pads of varied thickness, compressibility and shape can be bonded in varied spacings to said exterior surface. The belt can be of uniform thickness, having a flat surface wherein the valley areas are filled with material having lower hardness than the hardness of the elevated regions. Such construction simulates the effect of traversing upon uneven ground, and strengthens the involved ankle muscles.

**[0016]** In a still further embodiment, the sought variability in the effective thickness of the belt can be achieved by a separate sheet-like structure removably attachable to the belt. In order to reduce the extension of the material closer to the outer surface as the belt goes around the rollers, the belt can be slitted across the width every short distance along the length of the belt. The slits may be as deep as the thickness of the belt or may be shorter.

**[0017]** In yet another embodiment of the present invention, the aforesaid regions of variable effective thickness of

the belt may be formed on-demand by the inflation of a pillow-like structure underneath or above the upper reach of the belt.

#### BRIEF DESCRIPTION OF THE DRAWING

[0018] For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing forming a part of this specification and in which similar numerals of reference indicate corresponding parts in all the figures of the drawing:

[0019] FIG. 1 is a side view of an embodiment of the treadmill of the present invention with portions broken away to reveal interior details.

[0020] FIG. 2 is a left end view of FIG. 1 with portions broken away.

[0021] FIG. 3 is a top plan view of FIG. 1.

[0022] FIG. 4 is an enlarged sectional view taken in the direction of the arrows upon the line 4-4 of FIG. 3.

[0023] FIG. 5 is an enlarged fragmentary side view of an embodiment of the treadmill belt of the present invention having identical rounded pads.

[0024] FIG. 6 is a fragmentary top view of the belt of FIG. 5.

[0025] FIG. 7 is a fragmentary side view of a belt embodiment having pads of high hardness and a valley area having small raised elements.

[0026] FIG. 8 is a fragmentary side view of a belt embodiment having a checkerboard pattern of alternating soft and hard rectangular pads.

[0027] FIG. 9 is a fragmentary top view of the belt of FIG. 8.

[0028] FIG. 10 is a fragmentary sectional side view of a belt having pads of high hardness embedded in a valley of lesser hardness.

[0029] FIG. 11 is a fragmentary sectional side view of a belt having inflatable pads.

[0030] FIG. 12 is a schematic side view of a belt embodiment with pads having vertical slits.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

[0031] Referring now to FIGS. 1-12, an embodiment of the exercise treadmill 10 of the present invention is shown having a frame 11 including a pair of laterally spaced apart parallel side channels 12a and 12b extending lengthwise of the frame. A front roller 13 and a rear roller 14 are journaled between said side channels adjacent the front and rear ends thereof, respectively. An endless flexible belt 15 is entrained around the front and rear rollers, with the belt having horizontally elongated upper and lower reaches 16 and 17, respectively. Belt 15 is bounded by interior and exterior surfaces 18 and 19, respectively, and parallel side edges 20a and 20b. The distance between said rollers, and consequently the length of said upper and lower reaches is typically between about 4 and 8 feet. The width of the belt, namely the distance of separation of said side edges is typically between about 18 and 30 inches. As commonly constructed, the belt contains at least one layer of a reinforcing fabric embedded in a synthetic elastomer such as neoprene by way of a compression molding operation similar to the production of automobile tires. The belt is fabricated from a single length of belt material having a thickness

of about 0.125 inch, the end edges of which are joined by metal fasteners. The material of construction of the belt must be durable, resilient to repeated impact load, abrasion resistance, may be composite, multi-layered, open cell foam, closed cell foam, hybrid of open and closed cell foam, impregnated with binders, woven, made up of discrete or continuous fibers using various manufacturing process commonly used in manufacturing belt like articles in various combinations therein, can contain additives like antimicrobial, antifungal, deodorizing compounds, moisture absorbing, hydrophobic, and hydrophilic compounds.

[0032] As shown in FIG. 3, the upper reach 16 of the belt moves from front to rear so that a user standing on the upper reach has to walk or run at a predetermined speed in the forward direction (to the right as shown in FIGS. 1 and 3) to remain stationary relative to frame 11. Front roller 13 is generally rotatably driven by a variable speed DC electric motor housed within the frame, with the motor connected to the roller by means of a belt and pulley drive. A plurality of shock absorbing support feet 22 comprised of rubber pads, springs or the like are provided on the bottom faces of said side channels at the forward and rear ends thereof for the purpose of minimizing vibration of the treadmill. A front frame member 23 is secured to and extends between the forward ends of the side channels.

[0033] As generally indicated at 25, a control panel is provided at the front end of the treadmill in position so that the panel's display may be readily viewed by a user of the treadmill when walking or running on upper reach 16. Control panel 25 includes a plurality of switches for controlling the operation of the drive motor. Also, certain display readouts 26 may be provided for showing the speed of the belt and hence the velocity at which the user is walking or running. Control panel 25 is supported by a pair of support arms 27a and 27b secured to respective side channels 12a and 12b and extending upwardly and rearwardly from the front ends thereof. Paired handlebars 29a and 29b extend upwardly from side channels 12a and 12b, respectively, and provide a grip for the user while walking or running on upper reach 16 of the belt. A slider panel 31 fabricated of heat-conductive metal is secured by said side channels in the intervening space 32 between said upper and lower reaches, and slidingly supports said upper reach along its entire length.

[0034] In a first embodiment of the treadmill of this invention, as best shown in FIGS. 3 and 4, the elevated regions or protrusions are in the form of a series of resilient pads 35 of varied thickness, size, shape and compressive modulus adhered in varied spacing and patterns to exterior surface 19 of the belt. The laterally extending shape of the pad is defined by a perimeter 39 of preferably irregular configuration. The pads are typically fabricated of resilient polymers, and have a flat bottom surface 36. The upper surfaces of the pads may be flat, rounded or otherwise contoured. In preferred embodiments, the upper surface has a central region of maximum elevation or apogee 40 which is downwardly tapered toward said perimeter, causing the pad to have a hill-shaped profile with a maximum height or thickness corresponding to said region of maximum elevation. Such construction provides lessened impact, and provides comfort to the soles of the exerciser's feet.

[0035] The pads may have a height or thickness, measured between said bottom surface and region of maximum elevation in the range of 0.1 to 1.50 inch, and may be of foam

structure, having closed and/or open cells. The pads may be adhered to the belt by conventional adhesives, and may be emplaced either in a factory operation or by the treadmill user. In fact, one aspect of the present invention is a kit comprised of pads and/or pad material along with a supply of a suitable adhesive. Alternatively, the bottom surfaces 36 of the pads of the kit may contain a layer of contact adhesive covered by a protective release paper. Such kits will contain between about 25 and 100 pads.

[0036] The nature of the selection and arrangement of pads on the belt provides a texture which can simulate the effects of walking or running upon different types of natural terrain. Such effect serves to strengthen the ankle muscles of the exerciser.

[0037] FIGS. 5 and 6 illustrate a belt embodiment having identical rounded pads 60 upon flat exterior surface 19. The spaces between the pads are considered as valleys 61.

[0038] FIG. 7 illustrates a belt embodiment having pads 62 of high hardness surrounded by a valley area 63 having small raised elements 64.

[0039] FIGS. 8 and 9 illustrate a belt embodiment having a checkerboard pattern of alternating soft pads 65 and hard pads 66.

[0040] FIG. 10 shows a belt embodiment having pads 67 of high hardness embedded in a valley layer 68 of lesser hardness.

[0041] FIG. 11 illustrates a belt embodiment having inflatable pads 69 connected to underlying air supply means 70.

[0042] FIG. 12 shows a belt embodiment with pads 71 having vertical slits 72 oriented transversely to the direction of belt travel.

[0043] While particular examples of the present invention have been shown and described, it is apparent that changes and modifications may be made therein without departing from the invention in its broadest aspects. The aim of the appended claims, therefore, is to cover all such changes and modifications as fall within the true spirit and scope of the invention.

Having thus described our invention, what is claimed is:

1) A continuous resilient exercise belt for a treadmill machine, said belt having an exterior surface and opposed flat interior surface, said belt incorporating regions of variable effective thickness associated with said exterior surface in a manner to simulate natural ground terrain.

2) The belt of claim 1 wherein said regions of variable effective thickness are comprised of a series of protrusions disposed upon said exterior surface.

3) The belt of claim 2 wherein the size and spacing of said protrusions are such as to cause flexion of the ankles of the exerciser in a manner to simulate running or walking upon natural outdoor terrain.

4) The belt of claim 2 wherein said protrusions are of varied hardness within said series.

5) The belt of claim 2 wherein said protrusions are bounded by a perimeter which defines the specific lateral shape of the protrusion.

6) The belt of claim 2 wherein said exterior surface has attached thereto a continuous layer of a substrate softer than said belt, and said protrusions are outwardly directed from said layer.

7) The belt of claim 5 wherein the upper surface of each protrusion has a region of maximum elevation which is downwardly tapered toward said perimeter, causing said protrusion to have a hill-shaped profile that minimizes impact upon the soles of the exerciser's feet.

8) The belt of claim 2 wherein said protrusions are pads separately adhered to said exterior surface.

9) The belt of claim 2 wherein the height and firmness of said protrusions are adjustable by virtue of applied pneumatic pressure.

10) The belt of claim 2 wherein said protrusions are continuous integral extensions of said belt.

11) A kit comprised of resilient pads, each pad having a flat bottom surface and thickness in the range of 0.1 to 1.50 inch, and adhesive means for securing said pads by way of said flat surfaces to the exterior surface of a belt of an exercise treadmill.

12) The kit of claim 11 wherein said adhesive means comprises a layer of contact adhesive disposed upon said bottom surfaces, and a sheet of protective release paper disposed upon said layer of contact adhesive.

13) The kit of claim 12 comprised of 25 to 100 pads of varied size, shape and hardness.

14) The belt of claim 2 wherein said protrusions are randomly distributed and have varied lateral shapes.

15) The belt of claim 2 wherein said protrusions are uniformly distributed.

16) The belt of claim 2 wherein said protrusions have varied height.

17) The belt of claim 2 wherein said protrusions are of uniform height.

18) The belt of claim 8 wherein said pads are of foam construction.

19) The kit of claim 11 further comprised of instructions for the placement of said pads in a manner causing said exterior surface to simulate natural ground terrain.

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