United States Patent

Hesen

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[54] **DIAGNOSTIC AND THERAPEUTIC EXERCISE TREADMILL**

[72] Inventor: **Joseph A. Hesen,** Burbank, Calif.

[73] Assignee: **Del Mar Engineering Laboratories,** Los Angeles, Calif.

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[52] **U.S. Cl.** .....**272/69,** 198/184, 128/2 R

[51] **Int. Cl.** **A63b 23/06**

[58] **Field of Search** ...272/69; 119/29; 198/184, 193, 198/204

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Primary Examiner—Anton O. Oechsle
Assistant Examiner—R. T. Stouffer
Attorney—Jessup & Beecher

[57] **ABSTRACT**

An improved exercise treadmill is provided for diagnostic and therapeutic purposes, and which includes a heavy multi-ply nylon belt which is driven along and around a metal plate to define the walking area. The metal plate is composed, for example, of material of high heat conductivity, and it is coated with Teflon. This results in low friction and insures low drag, regardless of the weight of the patient. An advantage of the Teflon coating is that it does not require waxing. The aforesaid plate may be coated on both sides so that it may be reversed for extended use after the Teflon coating on one surface has become worn.

Additionally, the metal plate is supported by a layer of resilient sheet material mounted on a platform to give the desired resilience to the plate.

6 Claims, 3 Drawing Figures

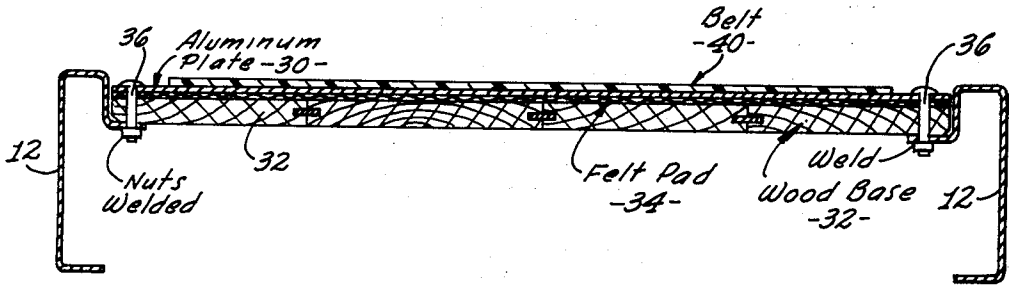


Fig. 1

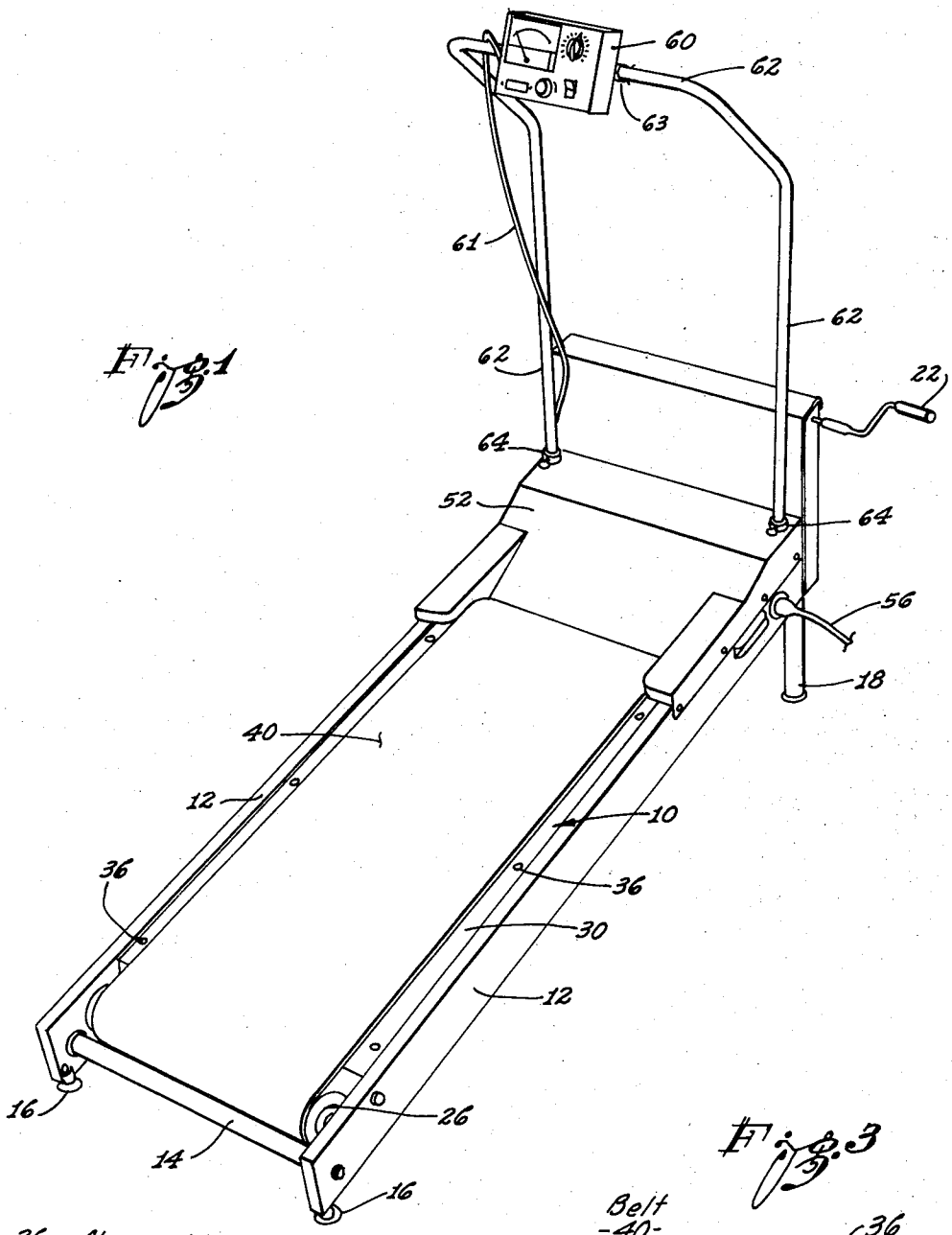
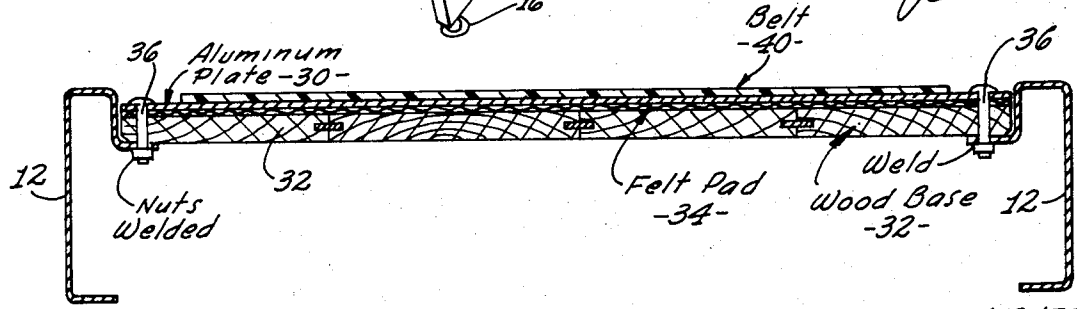


Fig. 3



INVENTOR:
Joseph A. Hegen
Jenner and Boucher
By Keith D. Boucher
ATTORNEYS

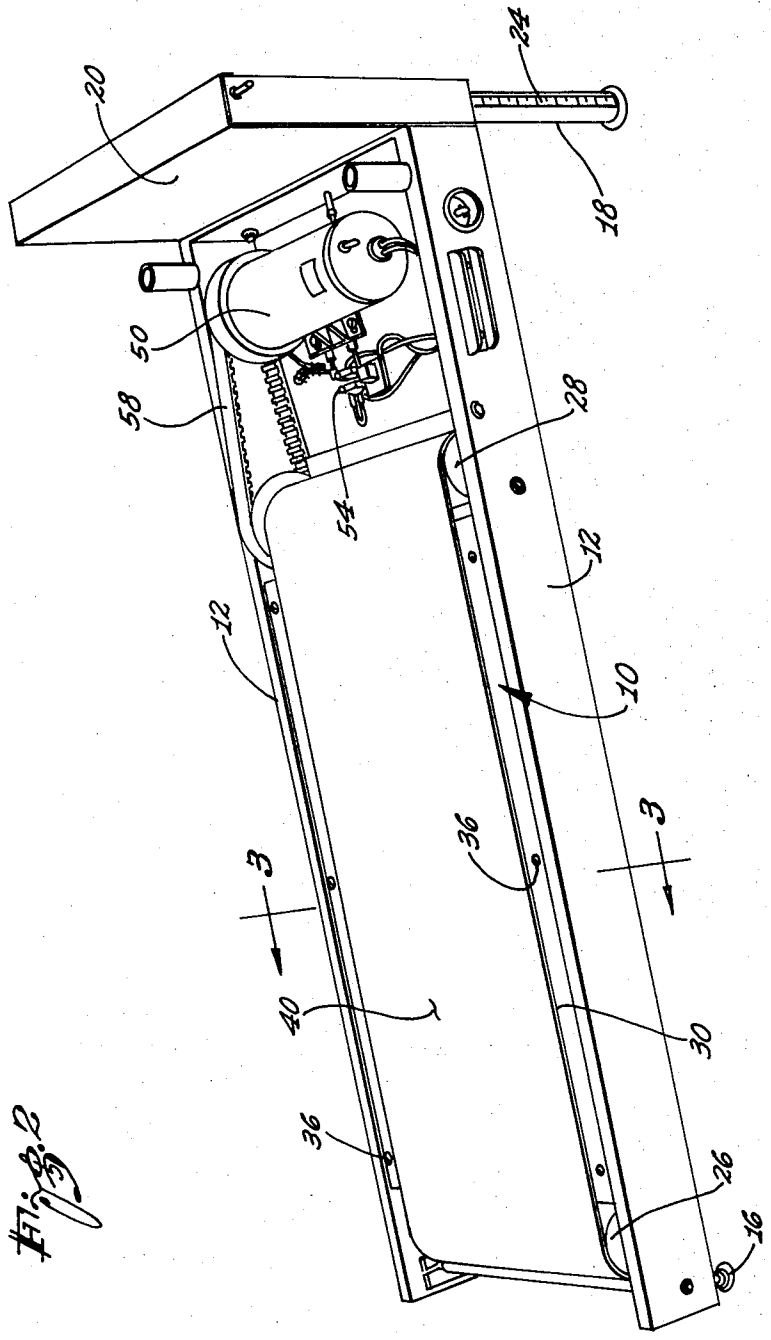


Fig. 2

INVENTOR:
Joseph A. Hesen
Jenny and Beecher
By Keith D. Beecher
ATTORNEYS

DIAGNOSTIC AND THERAPEUTIC EXERCISE TREADMILL

BACKGROUND OF THE INVENTION

It has been usual in the prior art for electrocardiograms to be taken of patients in a resting position on a table or bed. However, it has been found that a resting patient may often produce a normal electrocardiogram, even though there is clinical or other evidence of occlusion. In order to overcome the limitations of the aforesaid resting electrocardiograms, clinicians have devised a simple two-step exercise test, so that the patient may be evaluated under mild stress. More recently it has been found that more conclusive electrocardiograms may be obtained if the patient is subjected to a continuous exercise representing a constant workload which may be graded at various time intervals.

The treadmill has proven to be the ideal instrument for the latter purpose, and treadmill stress testing has become widespread in the art as a basis for a constant and accurate monitoring system, and for the evaluation of various physiological responses to steady state exercise. The treadmill also has the feature of reproducibility, simplicity and safety, when used for stress testing.

Treadmill stress testing has many applications in the overall evaluation of heart disease, both as a diagnostic and as a therapeutic aid. The treadmill of the present invention is advantageous in that it is absolutely safe, easy to operate, and capable of a long trouble-free, smooth-running and quiet operational life. The particular embodiment of the invention to be described, for example, exhibits smooth accelerations even from **0** miles per hour, and a smooth and non-jerking variable speed from 0 to 10 miles per hour. The embodiment to be described may be operated at a fixed or variable elevation. It exhibits a relatively large walking area. It has adjustable gliders to provide a firm footing, and it is designed to have a space-saving configuration. The embodiment to be described also has a remote speed and elevation control for the convenience of the physician.

Specifically, the design of the treadmill unit of the present invention is such that the patient normally steps on and off the walking area while the aforesaid belt is stationary so as to preclude any possibility of the patient stumbling. The unit exhibits a low profile further to facilitate the ease with which the patient may step on or off the belt of the walking area. In addition, the unit to be described includes a sturdy handrail which is comfortable to hold and which is positioned at a convenient height. The construction of the unit is sturdy and durable.

The elevation of the unit, as mentioned above, may be fixed or variable. For example, the elevation may be fixed at a **10%** grade, or it may be adjustable manually or electrically from horizontal to a 20 percent grade. An appropriate scale is provided on the instrument to indicate the elevation. The remote speed control may be positioned, for example, up to **12** feet from the treadmill in a constructed embodiment, so that the physician may keep a close watch of the patient, the physician being aided by various instruments. The control may also be mounted on the aforesaid handrail for operation by the patient in a therapeutic and rehabilitative exercise program.

A particular feature of the invention is in the walking area in which, as mentioned above, a heavy multi-ply nylon belt is provided which rides on a metal plate of high heat conductivity and coated with Teflon or equivalent material. This results in low friction, and it insures minimum drag even for the heavier patients, as mentioned above. As also pointed out previously herein, the Teflon surface does not require waxing, and the plate may be coated on both sides so that it may be reversed if required after extensive use. The metal plate also serves as a heat sink, due to its mass, high specific heat, and high heat conductivity, so that localized frictional heat build-up is held to a low level. That is, the metal plate is made of material, such as aluminum, having a high value of specific heat, and also a high value of thermal conductivity, so as to serve as an efficient means of dissipating heat, so that the local surface temperature rise due to frictional heating is minimized.

In a constructed embodiment of the invention, for example, the speed is adjustable from 0–10 miles an hour, the elevation is adjustable from level to 20percent grade, the walking area is of the order of 47 inches ×16 inches, the dimensions are of the order of 66 inches ×21 inches, the weight is of the order of 185 pounds. A **1** horsepower variable speed motor is provided with a direct current speed control, and which may be energized from the usual household alternating-current mains. The foregoing specifications are listed herein merely by way of example, and are not intended to limit the concept of the invention in any way.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective representation of apparatus which may be constructed to incorporate the concepts of the present invention;

FIG. **2** is a second view of the apparatus of FIG. **1** with certain components removed so as to reveal the internal operating elements of the apparatus; and

FIG. **3** is a cross-sectional view of the apparatus, taken substantially along the line3—3 of FIG. **2**.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

As illustrated in the drawings, the apparatus of the invention includes, for example, a frame **10** of elongated rectangular configuration. The frame **10** comprises a pair of side rails **12** which are held in spaced and parallel relationship by transverse rods, such as the rod **14**. A pair of support pedestals **16** are mounted at one end of the frame **10**, and a further pair of support pedestals, such as the illustrated pedestal **18**, are supported from the other end of the rectangular frame. The pedestals **18** are adjustable by an appropriate jack mechanism contained, for example, in a rectangular housing **20**, and the adjustment may be made, for example by means of a hand crank **22**, or an appropriate electrical drive may be provided. A scale **24** is provided on the side of the pedestal **18**, so that a predetermined desired inclination may be obtained for the frame **10**.

A pair of rollers **26** and **28** are mounted at spaced positions on the frame **10**, as shown, and a metal plate **30** is mounted on the frame between the rollers. As best shown in the representation of FIG. **3**, the plate **30** is supported on a platform **32**, and a layer of appropriate resilient material, such as a felt pad **34**, is interposed between the platform and the plate. The resulting assembly is supported on the side rails **12** by means of appropriate bolts, such as the bolts **36**.

The plate **30**, for example, may be composed of aluminum alloy, or any other appropriate material of high heat conductivity. The platform **32** may be composed of a selected appropriate grade of plywood, such as 0.75 AD grade. The metal plate **30** is coated on its upper side with appropriate low friction material, such as Teflon; Du Pont No. 958 – 203 black Teflon being appropriate for the purpose. It is preferable to coat both sides of the plate **30** with the Teflon, so that the plate may be reversed in the event of wear of the upper surface of the plate after extensive use.

An endless belt **40** is looped around the rollers and extends along the plate **30**. The belt **40** is preferably a three-ply endless fabric belt composed, for example, of nylon. The top side of the belt is treated with rubber to provide a friction surface, whereas the underside is bare duct nylon ply, in the particular example, to minimize the friction between the plate **30** and the belt.

An electric drive motor **50** is mounted at one end of the frame, as best shown in FIG. **2**, adjacent the roller **28**, and between the roller and the end of the frame **10**. The motor **50** is normally enclosed by a housing **52** shown, for example, in FIG. **1**, the housing also enclosing an appropriate control unit **54** for the motor. The motor and the control unit may be energized from the usual AC main through an electric cable **56**, which is plugged into the side of the frame **10**, as shown in FIG. **1**. The motor **50** is coupled, for example, to the roller **28** through a drive belt assembly **58**, which turns so the belt **40** is driven in the direction shown by arrows **3** in FIG. **2**.

The motor control unit **54** is under the control of a remote control unit shown as **60** in FIG. **1**, and which is connected with the circuitry of the control unit **54** through an appropriate electric cable **61**. The remote control unit **60** may conveniently be clipped by means of clips, such as the clip **63**, onto a handrail **62** which, in turn, is mounted in appropriate sockets **64** on the housing **52**. The control unit **60** may be unclipped from the handrail, and mounted in some remote place, so as to be controlled by the physician, rather than by the patient himself.

The remote control unit **60** includes an on-off switch, and a speed control knob, as well as appropriate indicating instruments. A feature of the remote control unit is that the control of the motor **50** is such that the switch may be turned on, and yet the speed control may be turned down to a zero speed so as to permit the patient to step on and off the belt **40** while it is stationary. When the patient has stepped onto the stationary belt **40**, the speed control knob may then be turned until the belt starts to move, and this is achieved without any jerking motion which would tend to cause the patient to stumble.

As described above, the treadmill of the invention may be adjusted to any desired inclination, merely by turning the hand crank **22** until the desired inclination is reached, as indicated, by the scale **24**.

When the patient is on the belt **40**, it moves smoothly across the plate **30**, by reason of the Teflon coating on the plate. Any heat generated during the frictional engagement of the belt with the plate is rapidly carried away by the high heat conductive material of the plate. After periods of extensive use, should the Teflon coating become worn, it is a simple matter to reverse the plate, so that the Teflon coating on the opposite side may be used. The platform **32** provides a firm support for the plate, and the felt layer **34** provides a desired resilience between the plate and the platform. Bolt and nut assemblies **36** as shown in FIGS. **2** and **3** hold the plate **30** firmly in place on the frames **12** together with platform **32** and felt layer **34**. For safety and ease of assembly, the nuts on nut and bolt assemblies **36** may be welded to frames **12**, or caged nuts may be used.

The invention provides, therefore, an improved therapeutic treadmill construction, which is fabricated to exhibit a low profile to facilitate the ease with which the patient may step on or off the belt, and which includes a sturdy handrail which is comfortable to hold and which is positioned at a convenient height. The invention additionally provides an improved construction, whereby the belt is supported on a firm support platform, the platform being constructed as an assembly so as to provide minimum friction between the belt and the platform, and at the same time to provide high heat conductivity so as to conduct away any heat which may be generated by the engagement of the belt with the platform. The drive motor of the apparatus is controlled, so that there is a smooth speed control of the belt from zero to maximum speed, and so that the patient need not step on or off a moving belt, nor need he attempt to stand on a belt subject to jerking motion.

The improved treadmill of the invention is safe and easy to operate, and it is capable of long trouble-free, smooth-running and quiet operational life.

While a particular embodiment of the invention has been shown and described, modifications may be made, and it is intended to cover all such modifications as fall within the spirit and scope of the invention in the following claims.

What is claimed is:

1. Therapeutic exercise apparatus including: a frame having an elongated rectangular configuration; a pair of rollers mounted at spaced positions on said frame; a metal plate of high heat conductivity supported on said frame between said rollers and extending essentially from one of said rollers to the other of said rollers; a coating of low frictional material disposed on at least one surface of said plate; a flat platform mounted on said frame under said plate and serving as a support for said plate; a layer of resilient sheet material interposed between said platform and said plate; and an endless belt looped around said rollers and extending along the coated surface of said plate.

2. The apparatus defined in claim **1**, in which said layer of resilient sheet material is composed of felt, and said platform is composed of wood.

3. The apparatus defined in claim **2**, in which said plate is composed of aluminum alloy.

4. The apparatus defined in claim **1**, in which said coating of low frictional material is composed of Teflon.

5. The apparatus defined in claim **1**, in which said endless belt is composed of a multi-ply nylon fabric and which includes a rubber friction coating on the outer surface thereof.

6. Therapeutic exercise apparatus including: a frame having an elongated rectangular configuration; a pair of rollers mounted in spaced positions on said frame; a plate of high heat conductivity supported on said frame between said rollers; a coating of low frictional material

disposed on both surfaces of said plate; and an endless belt looped around said rollers and extending along the coated surface of said plate, in which said plate is removable from said frame to permit reversal of said plate on said frame, and in which said coating is on both surfaces of said plate to double the wear life of said coating.

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