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(54) **STATIONARY EXERCISE APPARATUS
HAVING A PREFERRED FOOT PLATFORM
PATH**

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(*) Notice: This patent is subject to a terminal dis-
claimer.

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(22) Filed: **Nov. 12, 1999**

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(64) Patent No.: **5,766,113**
Issued: **Jun. 16, 1998**
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Filed: **Jun. 18, 1996**

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U.S. Applications:

(63) Continuation of application No. 08/497,612, filed on Jun.
30, 1995, now Pat. No. 5,593,372, which is a continuation-
in-part of application No. 08/377,846, filed on Jan. 25, 1995,
now Pat. No. 5,573,480.

(51) **Int. Cl.**⁷ **A63B 69/16; A63B 22/04**

(52) **U.S. Cl.** **482/52; 482/70**

(58) **Field of Search** 482/51, 52, 53,
482/57, 70, 79, 80

(57) **ABSTRACT**

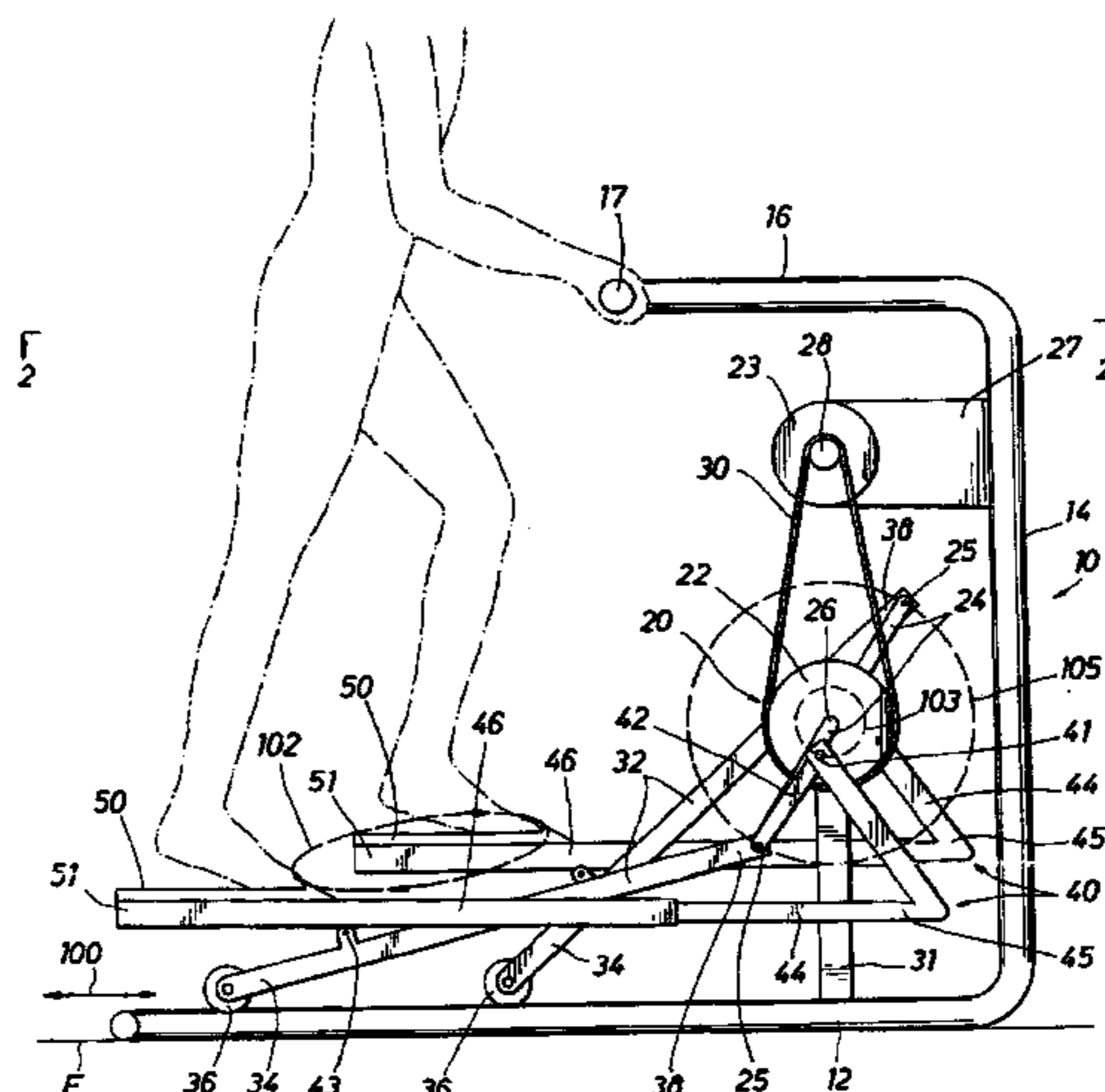
A stationary exercising apparatus which promotes cardio-vascular exercise yet minimizes impact on critical joints through the generation of a predetermined elliptical path movement while maintaining foot platforms substantially parallel with the floor. A base structure supports a pair of reciprocating members which are displaced in a horizontal direction parallel with the floor at one end yet reciprocate in circular motion at the other end through a coupling system attached to the frame. A linkage assembly is included which operates in conjunction with the reciprocation of one end of the reciprocating members to maintain the foot platforms substantially parallel with a reference plane while revolving the foot platforms in a substantially elliptical path. The apparatus may include additional linkage to facilitate a corresponding upper body exercise involving movement of the arms along a predetermined arc.

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34 Claims, 4 Drawing Sheets



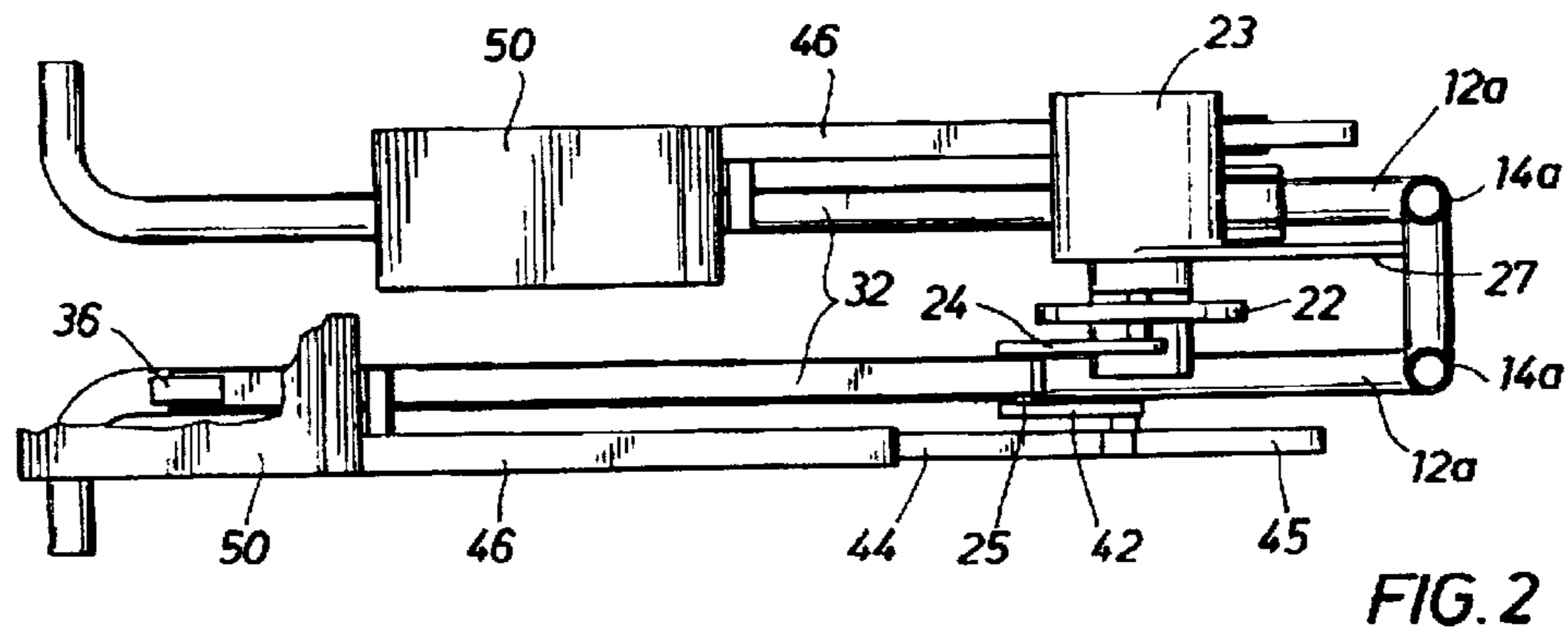
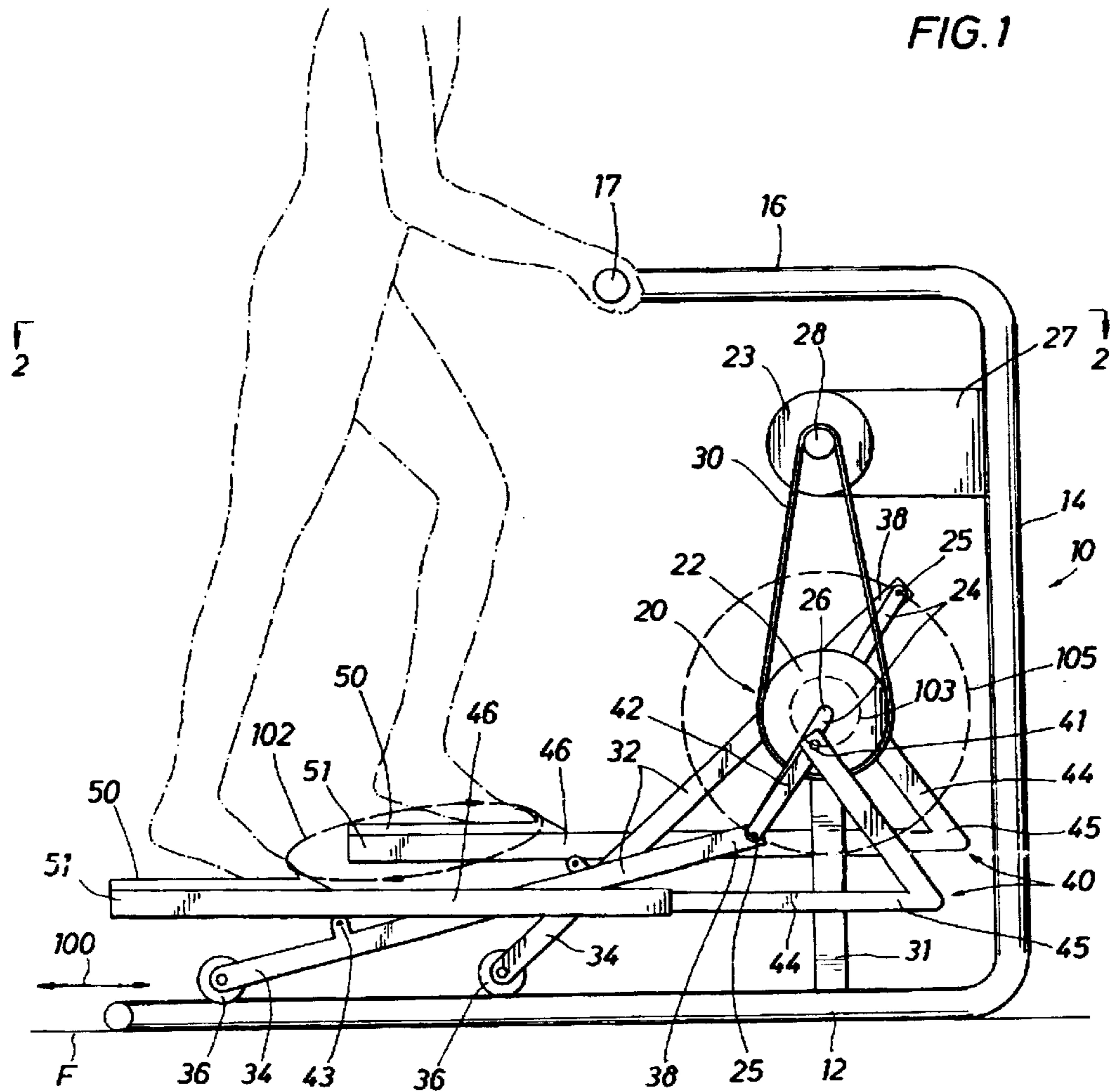
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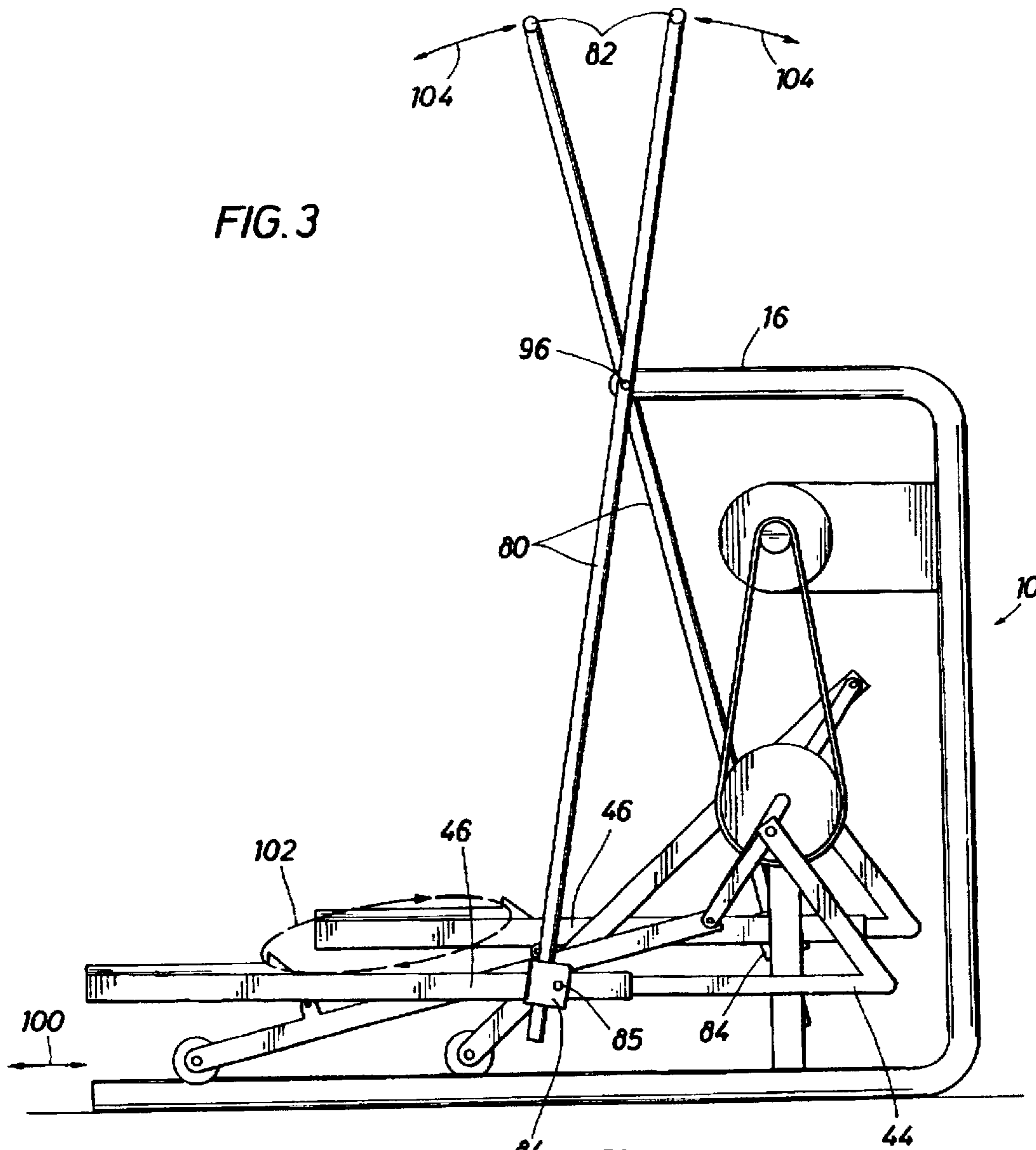


FIG. 3

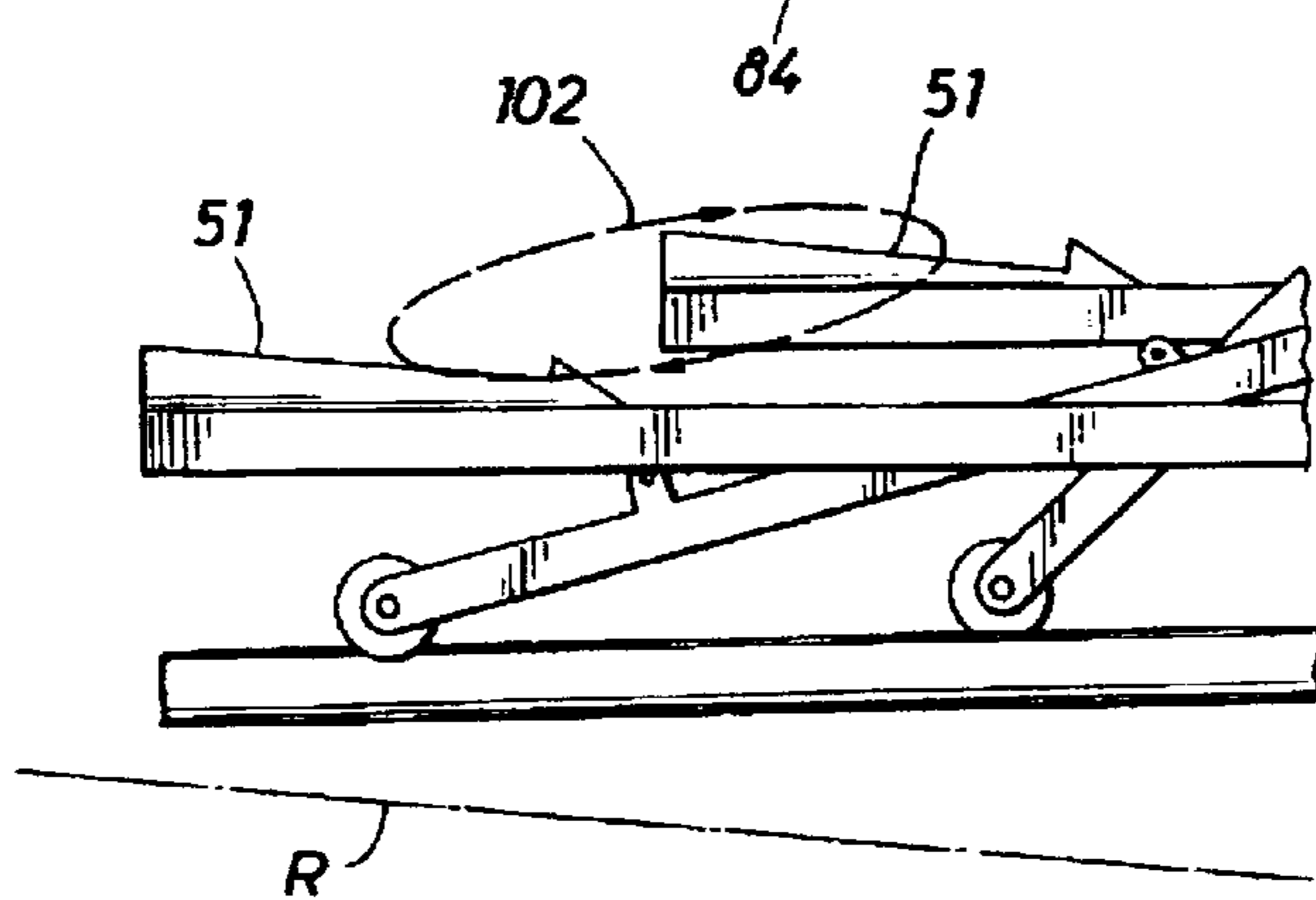


FIG. 4

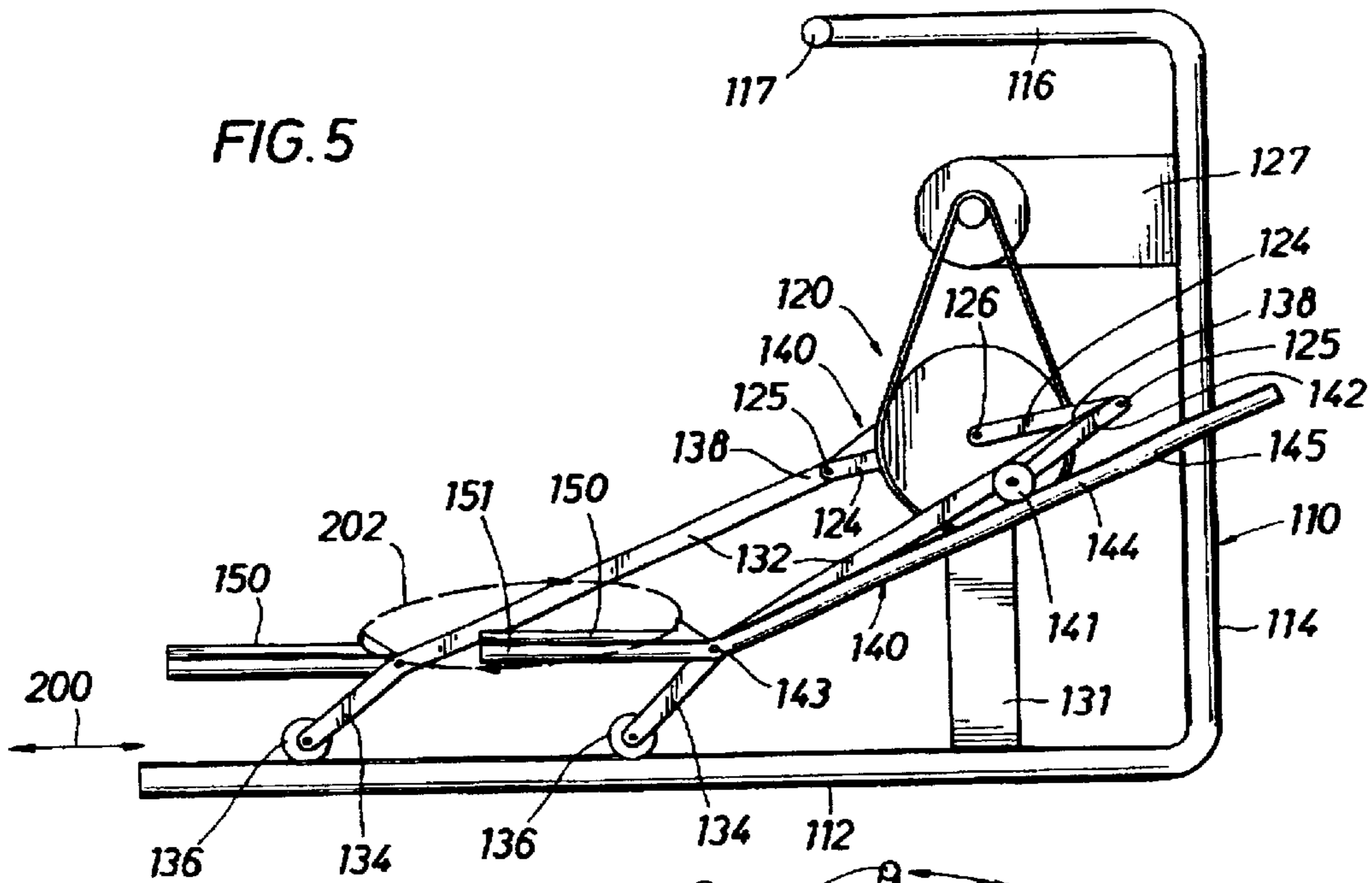
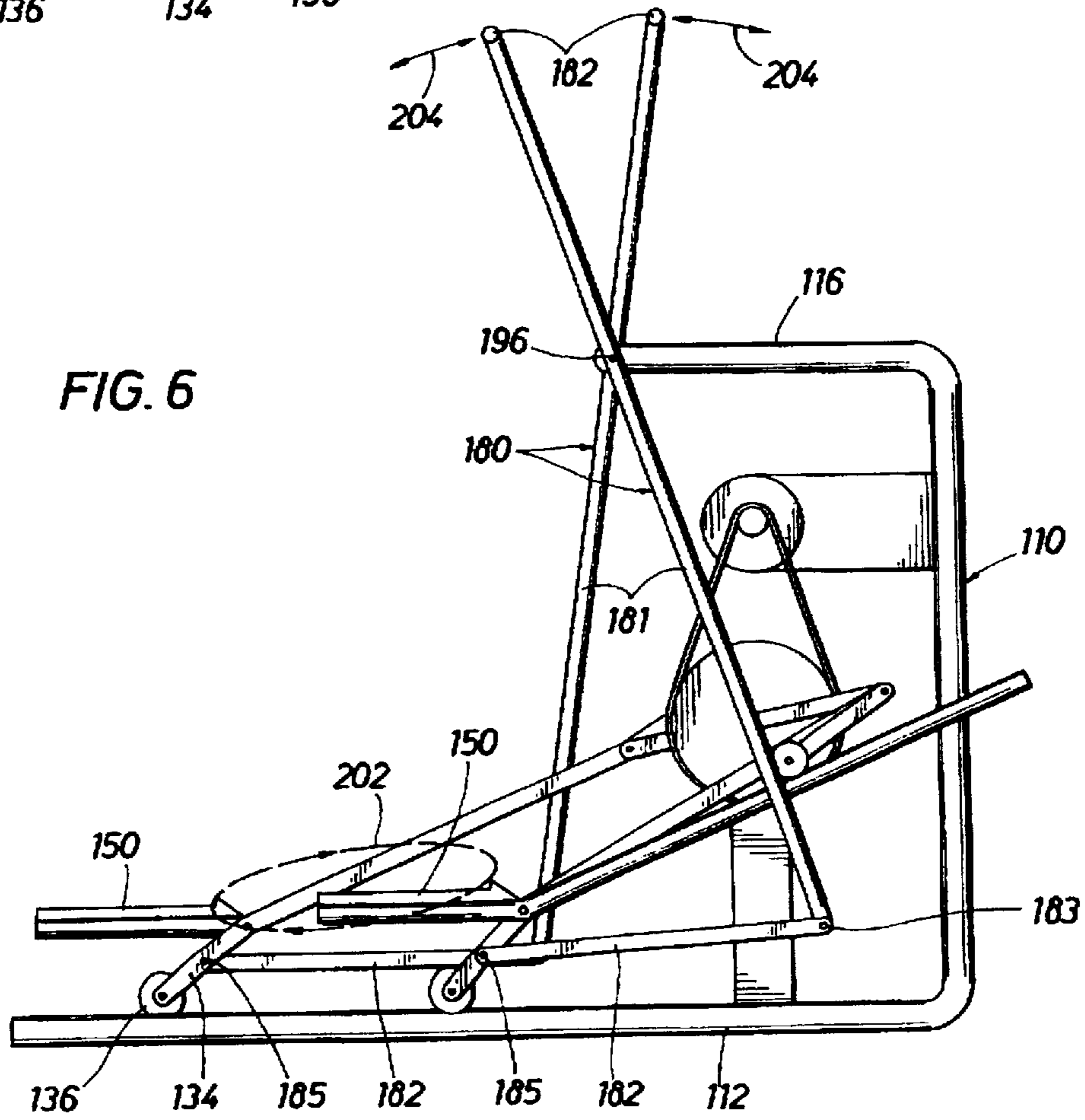


FIG. 6



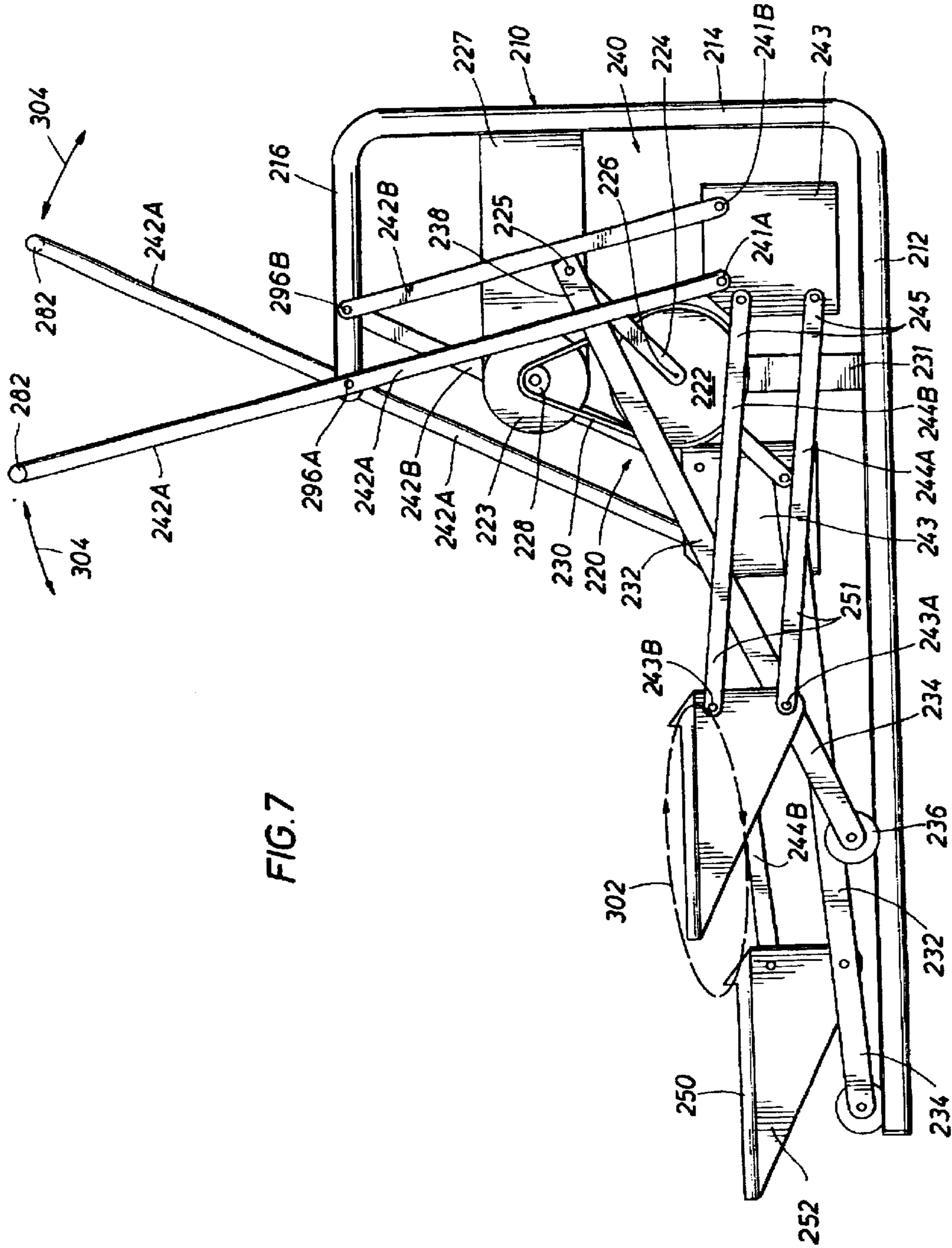


FIG. 7

**STATIONARY EXERCISE APPARATUS
HAVING A PREFERRED FOOT PLATFORM
PATH**

Matter enclosed in heavy brackets [] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

RELATED APPLICATION

This application is a continuation of application Ser. No. 08/497,612 filed Jun. 30, 1995 now U.S. Pat. No. 5,593,372 for Stationary Exercise apparatus Having A Preferred Foot Platform Path, which was a continuation-in-part of U.S. application Ser. No. 08/377,846 filed Jan. 25, 1995 now U.S. Pat. No. 5,573,480 entitled Stationary Exercise Apparatus.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an improved stationary exercising apparatus. More particular, the invention relates to an improved exercising apparatus which enables the user to move his feet in an elliptical path while foot platforms remain substantially parallel with a reference plane.

2. Description of the Prior Art

Stair climbing is a popular form of exercise for the cardiovascular system. However, it can over prolonged use overstress the knees. Walking is also a popular form of exercise but it does not load the cardiovascular system to the extent stair climbing does. Therefore, the need exists for an improved stationary exercising device which will load the cardiovascular system as stair climbing does but does not overload or unduly stress the knees and other joints. Prior art stair climbing devices have two common draw backs. First, they require excessive lifting of the knees or an exaggerated vertical movement of the lower legs. See, for example, U.S. Pat. Nos. 3,316,898; 4,949,993; 4,989,857; and 5,135,477. Alternatively, the devices which do tend to promote a more natural movement of the knees and ankles are difficult to ascend and descend because of the configuration of the devices. See, for example, U.S. Pat. No. 5,242,343. Additionally, while certain prior art devices have attempted to imitate a more natural movement of the knees or ankles, they have failed to provide an accurate simulation. See, for example, U.S. Pat. Nos. 5,242,343 and 5,383,829.

In addition, the need exists for a more rhythmic movement of the hand motions in combination with a stair climbing exercise to accelerate the cardiovascular workout and exercise of the upper body muscle groups without unduly overstressing the elbows and shoulders. Hence, the need exists for an improved stationary exercise device which can combine the movements of the feet and hands in a more natural and rhythmic motion.

SUMMARY OF THE INVENTION

Briefly, the invention relates to an improved stationary exercising device. A frame is provided which includes a base portion adapted to be supported by the floor, a mid portion and a top portion. A coupling member is attached to the frame which includes a pulley defining a pivot axis. Two reciprocating members are positioned in spaced relationship to the base portion of the frame. One end of each reciprocating member is adapted for linear movement substantially parallel with the floor. That end of each of the reciprocating member being linearly displaced may contact the base

portion or it may slide directly on the floor. The other end of each reciprocating member is attached, directly or indirectly, to the pulley of the coupling member. In this manner, rotation of the pulley causes one end of each reciprocating member to orbit, such as in a circular motion, while the other end of each reciprocating member moves in a linear manner. Means are also included for orienting the bottom of the foot of the user through two foot platforms or foot pads so that each foot platform follows a predetermined substantially elliptical path while the foot platforms remain substantially parallel to a reference plane, such as the floor, through their revolution about the ellipse.

Such means for orienting the bottom of the foot may include a duplicate pair of linkage assemblies, one for each foot of the user. Each such linkage assembly may comprise two links. One end of one link pivotally attached proximate the first end of a corresponding reciprocating member. The other end of the first link is in contact with one end of the second link of the linkage assembly. The other end of the second link of that same linkage assembly is pivotally connected to the end of the corresponding reciprocating member to which the first link is proximately attached.

In this manner, during the operation of the present invention, the coupling member in a preferred embodiment serves to rotate one end of the reciprocating member in a circular path while the other end of the reciprocating member moves substantially parallel with the floor, and the coupling member also serves to rotate the end of the second link of each linkage assembly in pivotal connection with the corresponding reciprocating member. This action moves each foot platform in a predetermined substantially elliptical path yet permits the foot platform to remain substantially parallel with a reference plane, such as the floor, during such elliptical movement.

In the preferred embodiment, the first link of each linkage assembly includes a bent portion supported within a telescoping portion. One end of the bent portion is pivotally connected attached to the second end of the second link. This configuration enables the corresponding foot platform or foot pad to remain substantially parallel to a reference plane during the elliptical revolution. The preferred embodiment may include corresponding arm linkage members which are pivotally attached to the telescoping portion of the first link and to the frame assembly permitting the user to exercise the upper body muscles by moving the hands arms through an arcuate path while the foot platforms revolve in a substantially predetermined elliptical path.

In an alternate embodiment of the present invention the first link of each linkage assembly includes a foot portion and an elongated second portion which is in slidable engagement with a roller, or equivalent, mounted on the second end of the second link. This configuration also permits a substantially elliptical path movement of the foot platforms yet permits the foot platforms to remain substantially parallel with a reference plane during their revolution through the elliptical path. Once again, this alternate embodiment may include arm linkage members pivotally attached back to corresponding reciprocating members.

In another alternate embodiment of the present invention, each linkage assembly may comprise two pairs of parallel links. The first pair of parallel links act in a similar fashion to the first link of the preferred embodiment while the second set of parallel links act in a similar fashion to the second link in the preferred embodiment. However, since two parallelograms are established through the use of parallel links connected by a pivot plate between the two pairs

of links, the foot platform remains parallel with a reference plane, such as the floor, while moving through a predetermined substantially elliptical path. In addition, one link of the second pair of links of each linkage assembly may be longer and used as an arm member to promote exercise of the upper body muscle group at the same time.

The more important features of this invention have been summarized rather broadly in order that the detailed description may be better understood. There are, of course, additional features of the invention which will be described hereinafter which will also form the subject of the claims appended hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to more fully describe the drawings used in the detailed description of the present invention, a brief description of each drawing is provided.

FIG. 1 is an elevation view of the preferred embodiment of the present invention.

FIG. 2 is a plan view of the preferred embodiment of the present invention.

FIG. 3 is an elevation view of the preferred embodiment of the present invention having arm members.

FIG. 4 is a detail view of a portion of the present invention.

FIG. 5 is an elevation view of an alternate embodiment of the present invention.

FIG. 6 is an elevation view of the alternate embodiment of the present invention shown in FIG. 4 having arm members.

FIG. 7 is an elevation view of yet another alternate embodiment of the present invention.

DETAILED DESCRIPTION OF PRESENT INVENTION

Referring to FIGS. 1 and 2, a frame 10 is shown comprising a base portion 12, a mid portion 14, and a top portion 16. Referring briefly to FIG. 2, the frame 10 comprises two bottom portions 12a and 12b, two mid portions 14a and 14b, and two top portions (not shown). In essence, the frame is comprised of two separate bents "a" and "b". Obviously, variations can be made to frame 10 as disclosed without departing from the spirit of the invention.

A coupling system 20 is fixed relative to the frame and comprises a pulley 22, crank members 24, resistant brake 23, sheave 28 and belt 30. A plurality of operative members are coupled with the coupling system 20 to control the elliptical path of movement of the foot platforms 50. The plurality of operative members include a pair of reciprocating members 32 and a pair of primary links 44. Two reciprocating members 32 are positioned in the lower proximity of frame 10. Each reciprocating member 32 has one end 34 which is adapted to move laterally in a linear direction as shown in FIG. 1 by arrow 100. A roller 36 is mounted at each end 34 of reciprocating member 32 and is adapted, as shown in FIG. 1, to ride on base portion 12 of frame 10. Alternatively, roller 36 may directly engage the floor, if desirable. The other end 38 of each reciprocating member 32 is pivotally connected to one end of a crank 24. The pivotal connection at end 38 may be through a journal member 25 (see FIG. 2) which extends from the end of crank 24 through an aperture in end 38 of each reciprocating member 32 and attaches to one end of a link 42 [of linkage assembly 40 as discussed below]. The crank members 24 and the links 42 may be referred to in combination as a crank assembly with the distal end of the

crank assembly being at the outer end of crank 24. The other end of crank 24 is attached to pulley 22 at pivot axis 26 of coupling system 20. Pulley 22 revolves about axis 26. The preferred embodiment may include a handle portion 17 which is an integral part of top portion 16 of frame 10.

In the preferred embodiment, the present invention includes duplicate linkage assemblies 40. Each linkage assembly 40 comprises [two] a primary [links 42 and] link 44. Link 42 is fixed at one end to journal member 25 and is pivotally connected at its other end 41 to primary link 44. [Link] The end 41 might also be referred to as an intermediate location of the crank assembly. Primary link 44 comprises two portions—a bent portion 45 and a telescoping portion 46. One end of bent portion 45 reciprocates within telescoping portion 46. A foot platform or foot pad 50 is attached to telescoping portion 46 of primary link 44 proximate end 51 of primary link 44.

Referring to FIG. 3, the preferred embodiment shown in FIG. 1 is reproduced but includes arm members 80. Each arm member includes a handle portion 82 which is gripped by the user during the operation of the apparatus. The other end of each arm member 80 reciprocates within a sleeve 84. Sleeve 84 is pivotally attached to telescoping portion 46 through pivot point 85. Each arm member 80 is pivotally connected at pivot point 96 to the top portion 16 of frame 10. During operation of the apparatus, arm member 80 pivots about point 96 and thereby slides vertically relative to sleeve 84 as link 44 revolves in accordance with the present invention as described below.

In the operation of the preferred embodiment as shown in FIGS. 1-3, the user "U" ascends the present invention from the back or the sides which facilitate its use. In some prior art disclosures, ascending and descending is difficult and cumbersome due to the location of the pulleys and of the structure. However, in the case of the present invention it is easy to ascend and descend as there is a minimal amount of interference in the structure during exercise activity.

During operation, a climbing motion by the user results in the displacement of first ends 34 of each reciprocating member 32 in the direction of arrow 100. Similarly, an orbiting motion which is preferably a circular motion occurs at the second end 38 of each reciprocating member 32 as shown in phantom by circle 105. At points between the ends 34 and 38 of each reciprocating member 32, the motion gradually changes from a circular motion (at ends 38) to a linear motion at ends 34. This geometric transition occurs in the form of an approximate ellipse. It is not a perfect elliptical shape; it tends to be slightly more egg-shaped. However, it provides a more natural and rhythmic body movement.

Additionally, the circular movement of journal member 25 results in a similar circular motion of the outer end of links 42 since each crank 24 and link 42 are fixed relative to one another through journal member 25. This causes pivot connection 41 to rotate in a circle about axis 26 as shown in phantom as circle 103. Thus, two concurrently circular motions occur as shown by circles 103 and 105. Such dual circular motion translates to a substantially elliptical shape as shown by ellipse 102 at foot platforms 50 yet permits each foot platform 50 to remain substantially parallel with a reference plane, which in the case of FIG. 1 is shown as the floor "F", or base portion 12, during such elliptical movement of foot platform 50. Obviously, foot platform 50 may be initially oriented at an angle relative to a reference plane other than the floor by bending the end of portion 46 or including a wedge under each platform 50. In either event,

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the present invention still provides that the foot platforms **51** remains substantially parallel to a reference plane "R" as shown in FIG. 4.

Referring to FIG. 3, while the user displaces the foot platforms in a substantially elliptical shape, the arms are used to oscillate handle portions **82** in an arcuate path as shown by arrow **104**. The arc of arrow **104** is defined by the radius of a circle extending from pivot point **96** to handle portions **82**.

Referring still to FIGS. 1-3, resistant brake **23** of coupling system **20** operates in a manner well-known to those skilled in the art. Resistant brake **23** serves to increase or decrease the load on the pulley through the sheave point **28**/belt **30** arrangement. Coupling system **20** is secured to base portion **12** of frame **10** through plate **31**. Similarly, resistant brake **23** is secured to mid portion **14** of frame **10** through bracket **27**.

Referring to FIGS. 5 and 6, an alternate embodiment of the present invention is shown. When possible, identical two-digit reference numerals will be used to designate similar structure found in the preferred embodiment but with a 100 series prefix. Frame **110** comprises a base portion **112**, a mid portion **114**, and a top portion **116**. A coupling system **120** is included having identical components of the coupling system **20** described above for the preferred embodiment. Furthermore, coupling system **120** performs in an identical manner to coupling system **20** described above for the preferred embodiment.

A pair of reciprocating members **132** are also included, each having a first end **134** on which rollers **136** are mounted. The second end **138** of each reciprocating member **132** is pivotally connected via a journal member **125** to one end of each crank **124**. Again, two linkage assemblies **140** are included, each having a [first link **142** and a second link] *primary link* **144**. Each *primary link* **144** supports a foot platform **150** over end **151**. Additionally, each *primary link* **144** is pivotally connected, preferably in front of foot platform **150** to a reciprocating member **132** proximal end **134** at connection **143**. *Again, the cranks 124 and the primary links 142 might be referred to as crank assemblies.*

Link **142** is fixed at one end to journal member **125** at the distal end of the crank assembly. Thus, each link **142** is fixed relative to corresponding crank member **124**. The other end of each link **142** includes a roller **141** which translationally engages portion **145** of *primary link* **144**. As in the case of the preferred embodiment, a handle portion **117** is available to be gripped by the user.

Referring to FIG. 6, the alternate embodiment previously shown in FIG. 5 is depicted with arm members **180**. Each arm member **180** includes two links **181** and **182**. Link **181** is pivotally connected at pivot connection **196** to top portion **116** of frame **110**. The other end of each link **181** is pivotally connected at connection **183** to one end of link **182**. The other end of link **182** is pivotally connected at pivot point **185** to end **134** of a reciprocating member **132**. Each link **181** includes a handle portion **182** which the operator grips during operation of the apparatus.

In the operation of the alternate embodiment as shown in FIGS. 5 and 6, the user ascends the device from the side or the rear with ease, places both feet of foot platforms **150**, grabs handle portion **117** and begins a climbing motion. At that point, first end **134** of each reciprocating member **132** is displaced in a linear manner in the direction of arrow **200**. Similarly, as in the case of the preferred embodiment, end **138** of each reciprocating member **132** moves in a circular motion about axis **126** as shown in phantom by circle **105** (see FIG. 1). Again, the change from a linear movement at

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ends **134** of reciprocating members **132** to a circular movement at ends **138** of reciprocating member **132** is an approximate ellipse of varying shape depending on its location along the length of reciprocating member **132**. As in the case of the preferred embodiment, as journal member **125** revolves in a circular path as shown by circle **105** (FIG. 1) about axis **126**, roller **141** revolves in a circular path about axis **126** as shown in phantom line by circle **103** (see FIG. 1). This serves to provide for a substantially elliptical path for foot platform **150** yet provides that platform **150** will remain substantially parallel with the floor "F" or other reference plane as described above with respect to FIGS. 1 and 4.

Referring now to the operation of the alternate embodiment including arm members as shown in FIG. 6, the operation of the hands through arcuate path **204** is facilitated by the reciprocating motion of rollers **136** along base portion **112**. Such lateral movement in the direction of arrow **200** (see FIG. 4) serves to laterally displace pivot connection **185** which, through links **181** and **182**, oscillates handle portion **182** in an arcuate path **204**. The radius of arcuate path **204** is determined by the distance from the handles to pivot connection **196** which defines the radius of the circle of the arcuate path **204**.

Referring to FIG. 7, another alternate embodiment is shown. As in the case of the previous embodiments, similar structure will be referred to with the same two-digit reference numeral when possible but with a 200 series prefix.

Frame **210** comprises a base portion **212**, a mid portion **214** and a top portion **216**. A coupler system **220** is shown which includes the same components and functions identical with the coupling system **20** of the preferred embodiment. Two reciprocating members **232** are included, each having a first end **234** to which a roller **236** is attached. The other end **238** of each reciprocating member **232** is pivotally connected to one end of a crank **224** of coupling system **220**. As in the case of the previous embodiments, this alternate embodiment includes two identical link assemblies **240**. Each link assembly **240** includes two pairs of links **242A/B** and **244A/B**. As shown, link **242A** is pivotally mounted parallel with link **242B**, and link **244A** is pivotally mounted parallel to link **244B**. A foot platform pedal structure **252** is pivotally attached to ends **251** of links **244A/B** at pivot connections **243A/B**. Foot platform pedal **242** is also pivotally attached to end **234** of reciprocating member **232** through pivoted connection **243A**. Links **244A/B** are pivotally connected at ends **245** to a pivot plate **243**. Links **244A/B** are pivotally connected at one end through pivot connections **241A/B** to pivot plate **243**. The other end of link **242B** is pivotally connected at pivot point **296B** to top portion **216** of frame **210**. Link **242A** is pivotally connected through pivot connection **296A** to the top portion **216** of frame **210** as well. However, the connection at **296A** is not the upper end of link **296A**. Rather, as shown, link **242A** extends upwardly therefrom and includes a handle portion **282** at its opposite end which is used by the operator. Each foot platform pedal **252** includes a foot platform **250** on which the user places his foot during operation of the apparatus.

As in the case of the previous embodiments, this alternate embodiment includes a resistant brake **223** which serves to increase or decrease the load on the pulley **222** of coupling system **220** through the sheave **228**/belt **230** arrangement. Resistant brake **223** in combination with the sheave **228**/belt **230** arrangement operates in the identical manner to resistant brake **23** and sheave **28**/belt **30** of the preferred embodiment as discussed above. As shown, coupling system **220** is

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mounted to base portion 212 by a plate 231. Similarly, resistant brake 223 is mounted to mid portion 214 of frame 220 by a plate 227.

In the operation of this alternate embodiment, the user ascends the device from the side or the rear and begins the climbing motion using foot platforms 250. The user also grabs handle portions 282 and begins an oscillating motion. Since each link 242A is pivotally connected at connection 296A, the handle portions define an arcuate path as shown by arrow 304. During the climbing motion, foot platforms 250 define a substantially elliptical path as shown by path 302. In the operation of this embodiment, the movement of linkage assemblies 240 maintains foot platform 250 substantially parallel with the floor or other reference plane at all times while the foot platform revolves through elliptical path 302. As in the case of the preferred embodiment and as shown in FIGS. 1 and 4 and discussed above, the shape of each pedal 252 may be selected to orient each platform 250 and an acute angle relative to the floor but parallel to one another and a reference plane "R". Thus, in the operation of this embodiment, as each platform revolves in a substantially elliptical path but each such platform 250 remains substantially parallel to a reference plane as it revolves through path 302.

Each linkage assembly 240 comprises two parallelograms, the first defined by parallel links 242A/B, top portion 216 between connections 296A/B, and the pivot plate 243 between pivot connections 241A/B. The second parallelogram is defined by links 244A/B, foot platform pedal 252 and pivot plate 243. As in the case of the previous embodiments, the climbing motion which the operator imposes on platforms 250 serves to revolve point 225 in a circular path about axis 226. Linkage assemblies 240 serve to ensure that foot platforms 250 remain substantially parallel with the floor or a reference plane as it revolves in the predetermined substantially elliptical path 302.

An improved stationary exercising device is disclosed in the foregoing preferred and alternate embodiments which maximizes cardiovascular exercise yet minimizes stress on critical joints through the use of linkages which define a predetermined substantially elliptical path that more accurately simulates natural and rhythmic body movement coupled with movement of a foot platform which remains substantially parallel with the floor. Keeping the foot platform substantially parallel with a reference plane, such as the floor, is beneficial since users would anticipate that the step or platform surface will remain at the same angular orientation during its revolution through the substantially elliptical path.

Obviously, modifications and alterations of the embodiments disclosed herein will be apparent to those skilled in the art in view of this disclosure. It is intended that all such variations and modifications fall within the spirit and scope of this invention as claimed.

What is claimed is:

1. An apparatus for exercising comprising:

a frame having a base portion adapted to be supported by a floor;

first and second reciprocating members, each reciprocating member having a first end and a second end, a portion of said first and second reciprocating members adapted for substantially linear motion;

a coupling member having (i) a pulley supported by said frame defining a pivot axis, and (ii) means for attaching said second ends of said first and second reciprocating members to said pulley so that rotation of said pulley

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results in orbital movement of said second ends of said first and second reciprocating members about said pivot axis; and

means operatively associated with said reciprocating members for orienting the bottom of the foot of the user of the apparatus, said orienting means including first and second foot platforms so that during operation of the apparatus each said foot platform remains substantially parallel with a predetermined reference plane while revolving in a predetermined substantially elliptical path.

2. The exercising apparatus according to claim 1 wherein said frame further comprises a top portion adapted to provide hand support for the user of the apparatus.

3. The exercising apparatus according to claim 1 wherein said coupler member attaching means comprises:

a first element attached at one end to said pulley proximate said pivot axis and at its other end to said second end of said first reciprocating member; and

a second element attached at one end to said pulley proximate said pivot axis and at its other end to said second end of said second reciprocating member.

4. The exercising apparatus according to claim 1 wherein each reciprocating member includes means for enabling said first ends of said reciprocating members to contact said base portion.

5. The exercising apparatus according to claim 1 wherein each said reciprocating member includes means for enabling said first ends of said reciprocating members to contact the floor.

6. The exercising apparatus according to claim 1 wherein said reference plane is the floor supporting said frame.

7. The exercising apparatus according to claim 1 wherein said apparatus further comprises means operatively associated with said foot platforms for linking arcuate motion of the hands of the user with the revolution of said foot platforms in said predetermined substantially elliptical path.

8. The exercising apparatus according to claim 1 wherein said orienting means comprises:

a first linkage assembly having a first pair of links, a second pair of links, and a pivot plate, said first pair of links having first and second ends, said first end of at least one of said first pair of links pivotally attached between said first and second ends of said first reciprocating member proximate said first end of said first reciprocating member and said first ends of said first pair of links pivotally attached to said first foot platform and said second ends of said first pair of links pivotally attached to said pivot plate, said second pair of links having first and second ends, said first ends of said second pair of links pivotally attached to said pivot plate and at least one of said second pair of links pivotally attached to said frame; and

a second linkage assembly having a first pair of links, a second pair of links, and a pivot plate, said first pair of links of said second linkage assembly having first and second ends, said first end of at least one of said first pair of links of said second linkage assembly pivotally attached between said first and second ends of said second reciprocating member proximate said first end of said second reciprocating member, said first ends of said first pair of links of said second linkage assembly pivotally attached to said second foot platform, and said second ends of said first pair of links of said second linkage assembly pivotally attached to said pivot plate of said second linkage assembly, said second pair of

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links of said second linkage assembly having first and second ends, said first ends of said second pair of links of said second linkage assembly pivotally attached to said pivot plate of said second linkage assembly and at least one of said second pair of links of said second linkage assembly pivotally attached to said frame, said second end of one of said second pair of links of said first linkage assembly and said second end of one of said second pair of links of said second linkage assembly having a handle portion so that the user of said apparatus may grip said handle portions during use of the apparatus enabling a substantially arcuate movement of said handle portions.

9. An apparatus for exercising comprising:

a frame having a base portion adapted to be supported by a floor;

first and second reciprocating members, each reciprocating member having a first end and a second end, a portion of said first and second reciprocating members adapted for substantially linear motion;

a coupling member having (i) a pulley supported by said frame defining a pivot axis, and (ii) means for pivotally attaching said second ends of said first and second reciprocating members to said pulley so that rotation of said pulley results in orbital movement of said second ends of said first and second reciprocating members about said axis; and

first and second linkage assemblies, said first linkage assembly pivotally connected proximate a first end between the first and second ends of said first reciprocating member proximate said first end of said first reciprocating member and said first linkage assembly having a second end attached to said coupling member attaching means at said first reciprocating member, said second linkage assembly pivotally connected proximate a first end between the first and second ends of said second reciprocating member proximate said first end of said second reciprocating member and said second linkage assembly having a second end attached to said coupling member attaching means at said second reciprocating member,

said first linkage assembly having a foot platform proximate said first end of said first linkage assembly and said second linkage assembly having a foot platform proximate said first end of said second linkage assembly,

wherein during use of the apparatus said foot platforms remain substantially parallel with a predetermined reference plane while revolving in a predetermined substantially elliptical path.

10. The exercise apparatus according to claim 9 wherein said apparatus further comprises means for linking arcuate motion of the hands of the user with the revolution of said foot platforms in said predetermined substantially elliptical path.

11. The exercise apparatus according to claim 9 wherein said reference plane is the floor supporting said frame.

12. An exercising apparatus comprising:

a frame having a base portion adapted to be supported by a floor;

a first linkage assembly having:

(i) a reciprocating member,

(ii) a foot member assembly, and

(iii) an arm member assembly, said reciprocating member having a first end and a second end, a portion of said reciprocating member being adapted for substantially linear movement;

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a second linkage assembly having:

(i) a reciprocating member,

(ii) a foot member assembly, and

(iii) an arm member assembly, said reciprocating member of said second linkage assembly having a first end and a second end, a portion of said second linkage assembly reciprocating member being adapted for substantially linear movement; and

a coupling member having:

(i) a pulley supported by said frame defining a pivot axis; and

(ii) means for pivotally attaching said second ends of said reciprocating members to said pulley so that rotation of said pulley results in orbital movement of said second ends of said reciprocating members about said axis,

said first linkage assembly foot member assembly comprising a first foot link and a second foot link, said first foot link having first and second ends and said first foot link pivotally connected to said first linkage assembly reciprocating member proximate said first end of said first linkage assembly reciprocating member and proximate said first end of said first foot link, said second foot link having first and second ends, said first end of said second foot link attached to said coupler member attaching means at said second end of said first linkage assembly reciprocating member and said second end of said second foot link engaging said first foot link proximate said second end of said first foot link, said first foot link of said first linkage assembly foot member assembly includes a foot platform proximate said first end of said first foot link,

said second linkage assembly foot member assembly comprising a first foot link and a second foot link, said first foot link of said second foot member assembly having first and second ends, said first foot link of said second foot member assembly being pivotally connected to said second linkage assembly reciprocating member proximate said first end of said second linkage assembly reciprocating member and proximate said first end of said first foot link of said second linkage assembly foot member assembly, said second foot link of said second linkage assembly foot member assembly having first and second ends, said first end of said second foot link of said second linkage assembly foot member assembly attached to said coupling member attaching means at second end of said second linkage assembly reciprocating member and said second end of said second foot link of said second linkage assembly foot member assembly engaging said first foot link of said second linkage assembly foot member assembly, said first foot link of said second linkage assembly foot member assembly includes a foot platform proximate said first end of said first foot link of said second linkage assembly foot member assembly,

wherein upon operation of the apparatus, said foot platform of said first linkage assembly foot member assembly and said foot platform of said second linkage assembly foot member assembly remain substantially parallel with a predetermined reference plane while revolving in a predetermined substantially elliptical path.

13. The exercising apparatus according to claim 12 wherein said second foot link of said first and second linkage assemblies foot member assembly include a roller mounted

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at the second end of said second foot links to slidably engage said first foot links of said first and second linkage assemblies foot member assembly proximate said second end of said first foot links.

14. The exercising apparatus according to claim 12 wherein each said arm member assembly of said first and second linkage assemblies comprise first and second arm members pivotally interconnected and pivotally attached at one end to a reciprocating member proximate the first end of said reciprocating member and pivotally attached at the other end of said pivotally interconnected first and second arm members to said frame.

15. The exercising apparatus according to claim 12 wherein said coupler member attaching means comprises:

a first element attached at one end to said pulley proximate said pivot axis and at its other end to said second end of said first linkage assembly reciprocating member; and

a second element attached at one end to said pulley proximate said pivot axis and at its other end to said second end of said second linkage assembly reciprocating member.

16. The exercising apparatus according to claim 12 wherein each reciprocating member includes means for enabling said first ends of said reciprocating members to contact said base portion.

17. The exercising apparatus according to claim 12 wherein each said reciprocating member includes means for enabling said first ends of said reciprocating members to contact the floor.

18. The exercising apparatus according to claim 12 wherein said reference plane is the floor supporting said frame.

19. An exercising apparatus comprising:

a frame having a base portion adapted to be supported by a floor;

a first linkage assembly having a reciprocating member and a foot link, said reciprocating member having first and second ends, a portion of said reciprocating member adapted for substantially linear movement, said foot link having first and second ends, said foot link pivotally attached proximate said *first* end of said foot link between said first and second ends of said reciprocating member proximate said first end of said reciprocating member;

a second linkage assembly having a reciprocating member and a foot link, said reciprocating member of said second linkage assembly having first and second ends, a portion of said second linkage assembly reciprocating member adapted for substantially linear movement, said foot link of said second linkage assembly having first and second ends, said foot link of said second linkage assembly pivotally attached *proximate said first end of said foot link* between said first and second ends of said reciprocating member of said second linkage assembly proximate said first end of said reciprocating member of said second linkage assembly; and

a coupling member having (i) a pulley supported by said frame defining a pivot axis, and (ii) means for attaching said second ends of said reciprocating members to said pulley and said second ends of said foot links so that rotation of said pulley results in orbital movement of said second ends of said reciprocating members about said axis and in orbital movement of said second ends of said foot links about said axis while said foot platforms remain substantially parallel with a predeter-

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mined reference plane and revolves in a predetermined substantially elliptical path.

20. The exercising apparatus according to claim 19 wherein said coupler member attaching means comprises:

a first element attached to one end to said pulley proximate said pivot axis and at its other end to said second end of said reciprocating member of said first linkage assembly; and

a second element attached at one end to said pulley proximate said pivot axis and at its other end to said second end of said reciprocating member of said second linkage assembly.

21. The exercising apparatus according to claim 19 wherein said frame further comprises a top portion adapted to provide hand support for the user of the apparatus.

22. The exercising apparatus according to claim 19 wherein each reciprocating member includes means for enabling said first ends of said reciprocating members to contact said base portion.

23. The exercising apparatus according to claim 19 wherein said reference plane is the floor supporting said frame.

24. The exercising apparatus according to claim 19 wherein said second foot links of said first and second linkage assemblies include a roller mounted at said second end of said second foot links of said first and second linkage assemblies to slidably engage said second end of said first foot link of said first and second linkage assemblies.

25. An apparatus for exercising comprising:

a frame having a base portion adapted to be supported by a floor;

first and second reciprocating members, each reciprocating member having first and second ends, a portion of said first and second reciprocating members adapted for substantially linear motion;

a coupling member having (i) a pulley supported by said frame defining a pivot axis, and (ii) means for pivotally attaching said second ends of said first and second reciprocating members to said pulley so that rotation of said pulley results in orbital movement of said second ends of said first and second reciprocating members about said pivot axis;

a first linkage assembly having a first link and a second link, said first link having first and second ends, said first link pivotally attached between said first and second ends of said first reciprocating member proximate said first end of said first reciprocating member and proximate said first end of said first link, said first link including a foot platform proximate said first end of said first link and said first link including a bent portion distally from said foot platform, said second link having first and second ends, said first end of said second link attached to said coupler member attaching means at said second end of said first reciprocating member and said second end of said second link pivotally attached to said second end of said first link;

a second linkage assembly having a first link and a second link, said first link of said second linkage assembly having first and second ends, said first link of said second linkage assembly pivotally attached between said first and second ends of said second reciprocating member proximate said first end of said second reciprocating member and proximate said first end of said first link of said second linkage assembly, said first link of said second linkage assembly including a foot platform proximate said first end of said first link of said

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second linkage assembly and said first link of said second linkage assembly including a bent portion distally from its foot platform, said second link of said second linkage assembly having first and second ends, said first end of said second link of said second linkage assembly attached to said coupler member attaching means at said second end of said second reciprocating member and said second end of said second link of said second linkage assembly pivotally attached to said second end of said first link of said second linkage assembly,

wherein during operation of the apparatus each said foot platform remains substantially parallel with a predetermined reference plane while revolving in a predetermined substantially elliptical path.

26. The exercising apparatus according to claim 25 wherein said first links of said first and second linkage assemblies include a telescoping portion.

27. The exercising apparatus according to claim 25 wherein said coupler member attaching means comprises:

a first element attached at one end to said pulley proximate said pivot axis and at its other end to said second end of said first reciprocating member; and

a second element attached at one end to said pulley proximate said pivot axis and at its one end to said second end of said second reciprocating member.

28. The exercising apparatus according to claim 25 wherein said apparatus further comprises means for linking arcuate motion of the hands of the user with the revolution of said foot platforms in said predetermined substantially elliptical path.

29. The exercising apparatus according to claim 25 wherein said reference plane is the floor supporting said frame.

30. An apparatus for exercising comprising:

a frame having a base portion adapted to be supported by a floor;

first and second reciprocating members, each reciprocating member having a first end and a second end, a portion of said first and second reciprocating members adapted for substantially linear motion;

a coupling member having (i) a pulley supported by said frame defining a pivot axis, and (ii) means for attaching said second ends of said first and second reciprocating members to said pulley so that rotation of said pulley results in orbital movement of said second ends of said first and second reciprocating members about said pivot axis; and

first and second linkage assemblies for orienting the bottom of the foot of the user of the apparatus,

said first linkage assembly pivotally connected to said first reciprocating member and said frame and including a foot platform and said second linkage assembly pivotally connected to said second reciprocating member and said frame and including a foot platform so that during operation of the apparatus each said foot platforms remain substantially parallel with a predetermined reference plane while revolving in a predetermined substantially elliptical path.

31. An apparatus for exercising, comprising:

a coupling member having (i) a pulley defining a pivot axis and (ii) crank assemblies having distal ends and intermediate locations moving in first and second orbital paths respectively about said pivot axis,

first and second pairs of operative members comprised of at least a first operative member and a second opera-

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tive member, a portion of each pair of operative members adapted for reciprocating movement,

a pair of foot platforms, each foot platform being attached to a pair of operative members,

said first operative members being operatively connected adjacent to a first end to said distal ends of said crank assemblies for orbital movement in said first orbital path, said second operative members being operatively connected to said intermediate locations of said crank assemblies such that crank assembly rotation about said pivot axis causes said foot platforms to move in a substantially elliptical path.

32. An apparatus for exercising, comprising:

a coupling member having (i) a pulley defining a pivot axis and (ii) crank assemblies having distal ends and intermediate locations moving in first and second orbital paths respectively about said pivot axis,

first and second pairs of operative members comprised of at least a first operative member and a second operative member, a portion of each pair of operative members adapted for reciprocating movement,

a pair of foot platforms, each foot platform being attached to a pair of operative members,

said first operative members being operatively connected adjacent to a first end to said distal ends of said crank assemblies for orbital movement in said first orbital path, said second operative members being operatively connected to said intermediate locations of said crank assemblies such that crank assembly rotation about said pivot axis causes said foot platforms to move in a substantially elliptical path and remain substantially parallel to a predetermined reference plane during at least a portion of the ellipse.

33. An apparatus for exercising, comprising:

a coupling member having (i) a pulley defining a pivot axis and (ii) crank assemblies having distal ends and intermediate locations moving in first and second orbital paths respectively about said pivot axis,

first and second pairs of operative members comprised of at least a first operative member and a second operative member, a portion of each pair of operative members adapted for reciprocating movement,

a pair of foot platforms, each foot platform being attached to a pair of operative members,

said first operative members being pivotally connected to said distal ends of said crank assemblies, said second operative members being pivotally connected to said intermediate locations of said crank assemblies such that crank assembly rotation about said pivot axis causes said foot platforms to move in a substantially elliptical path.

34. An apparatus for exercising, comprising:

a coupling member having (i) a pulley defining a pivot axis and (ii) crank assemblies having distal ends and intermediate locations moving in first and second orbital paths respectively about said pivot axis,

first and second pairs of operative members comprised of at least a first operative member and a second operative member, a portion of each pair of operative members adapted for reciprocating movement,

a pair of foot platforms, each foot platform being attached to a pair of operative members,

said first operative members being pivotally connected to said distal ends of said crank assemblies, said second operative members being pivotally connected to said

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intermediate locations of said crank assemblies such that crank assembly rotation about said pivot axis causes said foot platforms to move in a substantially elliptical path and remain substantially parallel to a

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predetermined reference plane during at least a portion of the ellipse.

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