US010974118B2

(12) **United States Patent**
Bass et al.

(10) **Patent No.: US 10,974,118 B2**
(45) **Date of Patent: Apr. 13, 2021**

(54) **MOVABLE SUPPORT FOR EXERCISE EQUIPMENT**

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(73) Assignee: **Saris Cycling Group, Inc.**, Madison, WI (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 23 days.

(21) Appl. No.: **15/999,259**

(22) Filed: **Aug. 16, 2018**

(65) **Prior Publication Data**

US 2019/0070476 A1 Mar. 7, 2019

Related U.S. Application Data

(60) Provisional application No. 62/546,748, filed on Aug. 17, 2017, provisional application No. 62/637,003, filed on Mar. 1, 2018.

(51) **Int. Cl.**
A63B 69/16 (2006.01)
A63B 22/06 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***A63B 69/16*** (2013.01); ***A63B 21/005*** (2013.01); ***A63B 21/0058*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC . A63B 21/005; A63B 21/0058; A63B 21/225; A63B 22/0023; A63B 22/0605;
(Continued)

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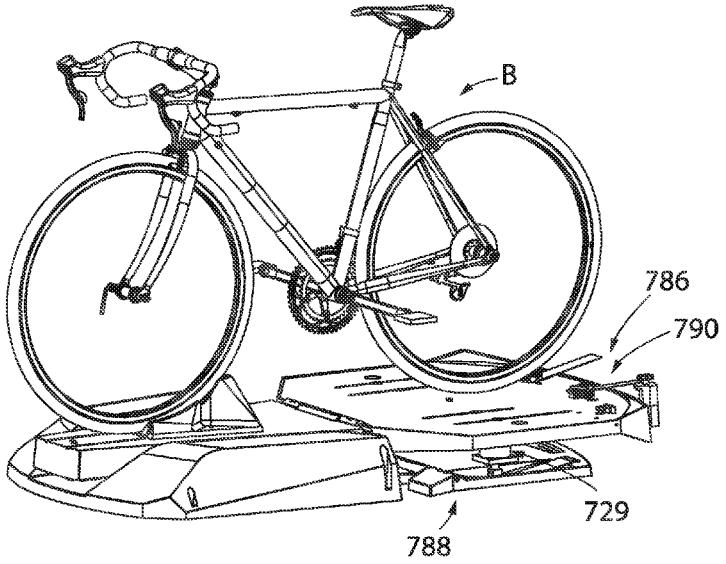
(74) *Attorney, Agent, or Firm* — Boyle Fredrickson, S.C.

(57) **ABSTRACT**

An exercise arrangement includes a movable support that is movable in a fore-aft direction and simultaneously movable laterally, e.g. about a tilt axis. The support may be a platform movably mounted to a base. A roller and track arrangement may be provided between the platform and the base, to provide movement of the platform in the axial direction relative to the base as well as an axially neutral position of the platform relative to the base. The roller and track arrangement may be in the form of one or more curved roller and track engagement surfaces that extend in the axial direction and that provide a gravity bias of the platform toward the neutral position. The roller and track arrangement may provide tilting movement of the movable platform about the tilt axis. A tilt biasing arrangement biases the platform toward a neutral tilt position relative to the base.

43 Claims, 40 Drawing Sheets



(51) **Int. Cl.**

A63B 22/00	(2006.01)
A63B 22/16	(2006.01)
A63B 26/00	(2006.01)
A63B 21/005	(2006.01)
A63B 21/22	(2006.01)
A63B 24/00	(2006.01)

(52) **U.S. Cl.**

CPC ***A63B 21/225*** (2013.01); ***A63B 22/0023*** (2013.01); ***A63B 22/0605*** (2013.01); ***A63B 22/16*** (2013.01); ***A63B 26/003*** (2013.01); *A63B 2022/0641* (2013.01); *A63B 2024/0093* (2013.01); *A63B 2069/163* (2013.01); *A63B 2069/164* (2013.01); *A63B 2069/165* (2013.01); *A63B 2210/50* (2013.01); *A63B 2225/09* (2013.01); *A63B 2225/50* (2013.01)

(58) **Field of Classification Search**

CPC A63B 22/16; A63B 26/003; A63B 69/16; A63B 71/023; A63B 2022/0641; A63B 2024/0093; A63B 2069/161–168; A63B 2071/025; A63B 2071/026; A63B 2209/00; A63B 2210/50; A63B 2210/51; A63B 2210/80; A63B 2225/09; A63B 2225/50

See application file for complete search history.

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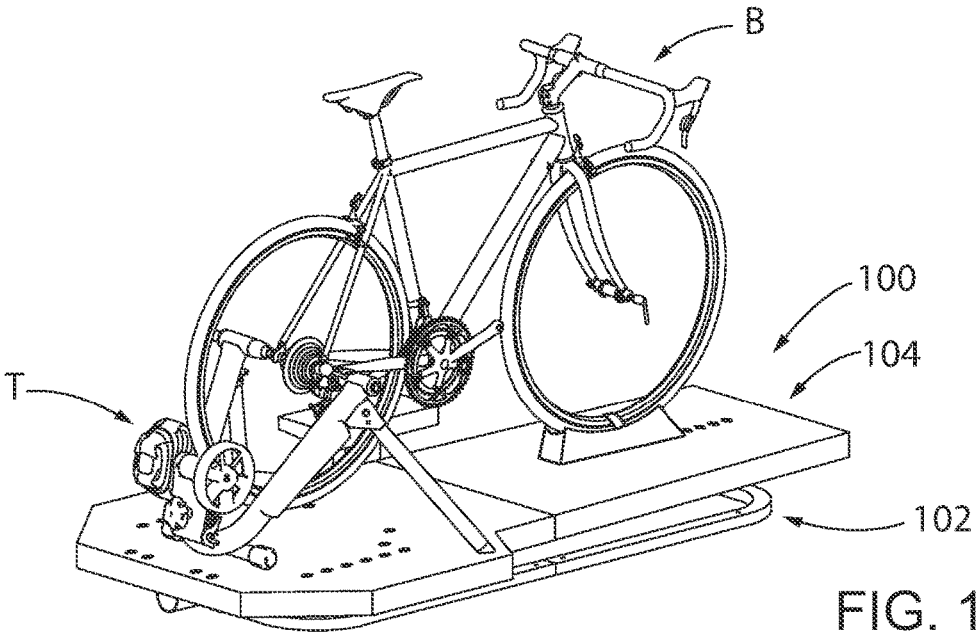


FIG. 1

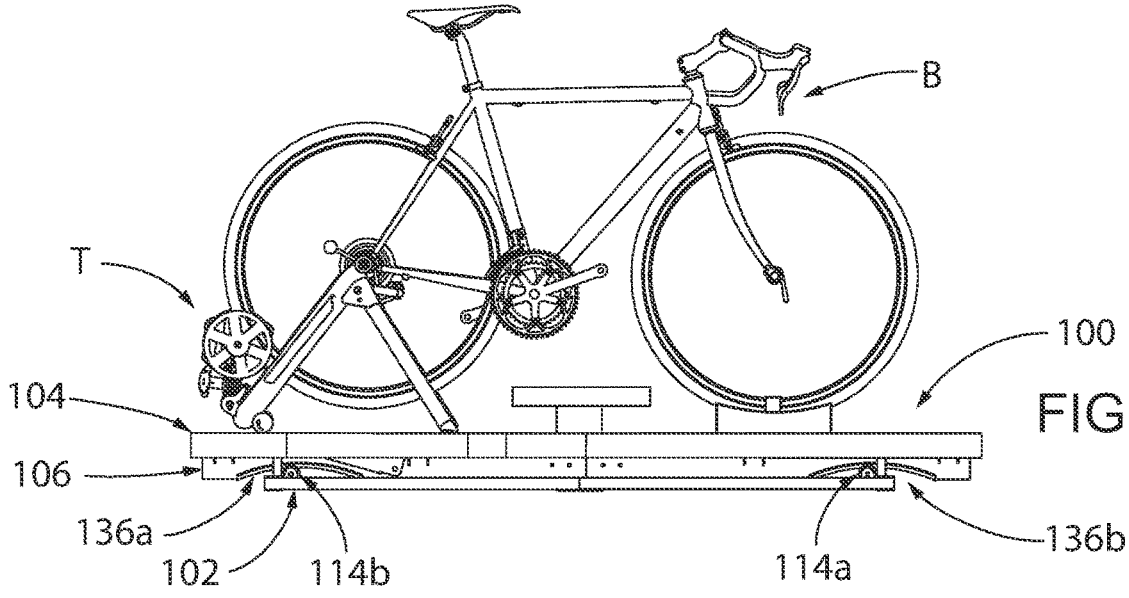
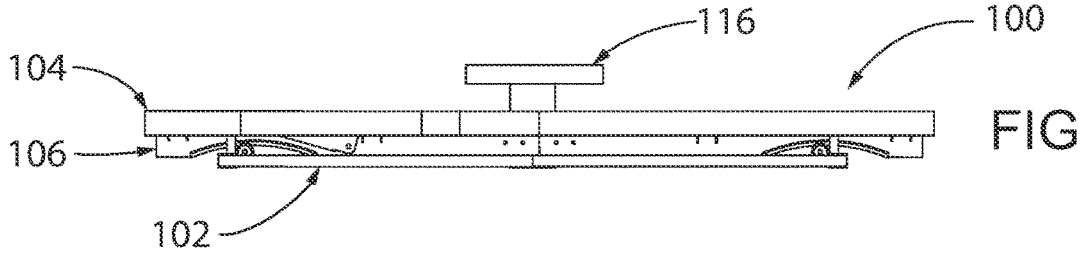


FIG. 2



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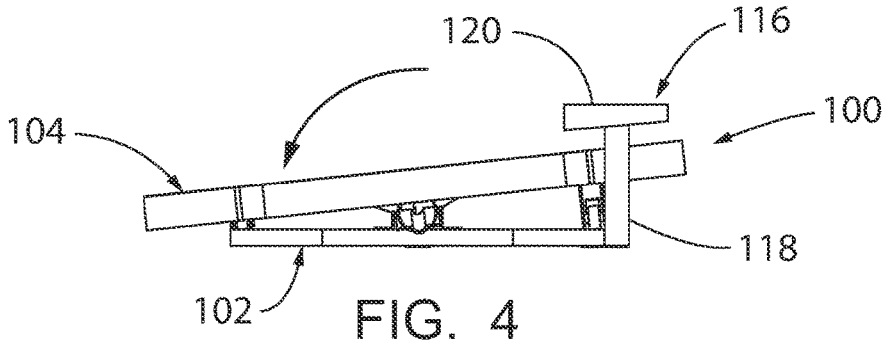


FIG. 4

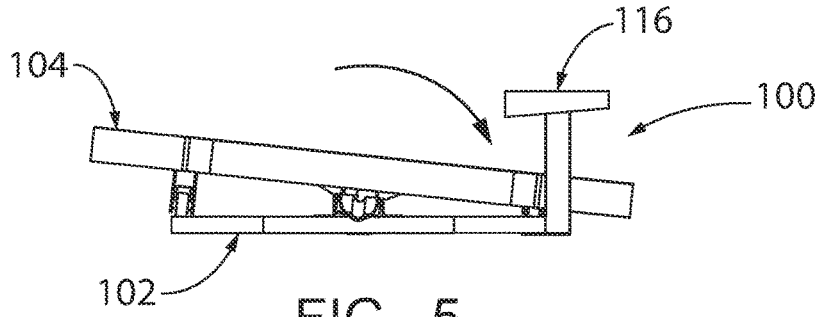


FIG. 5

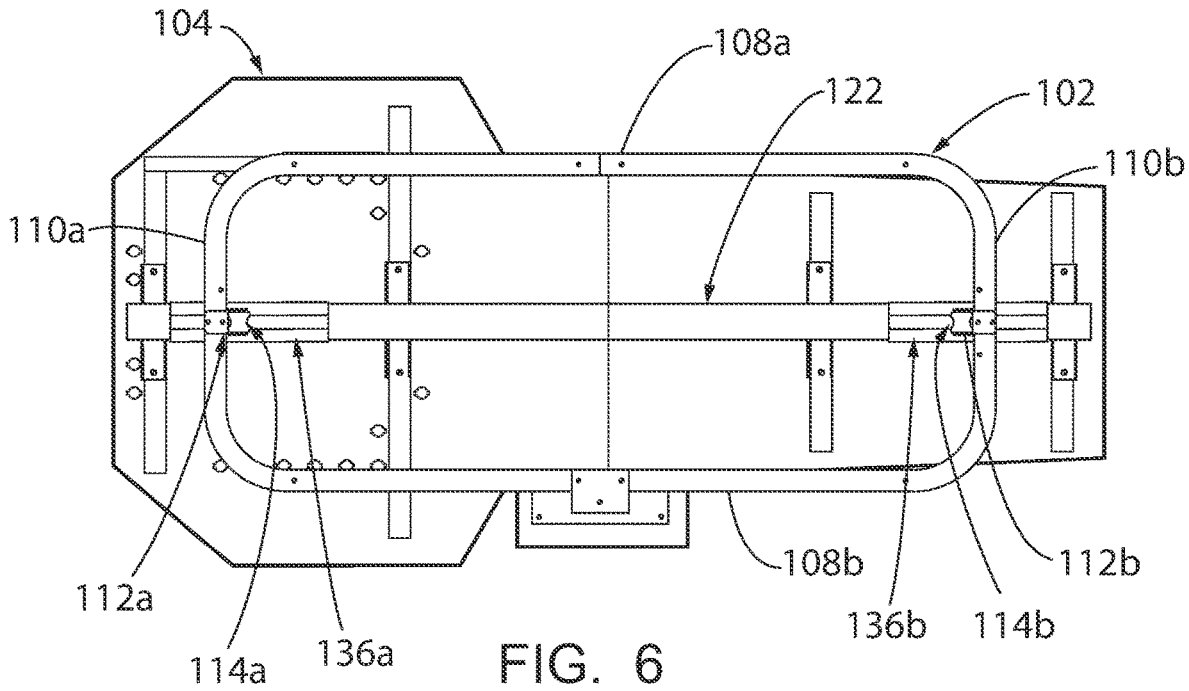
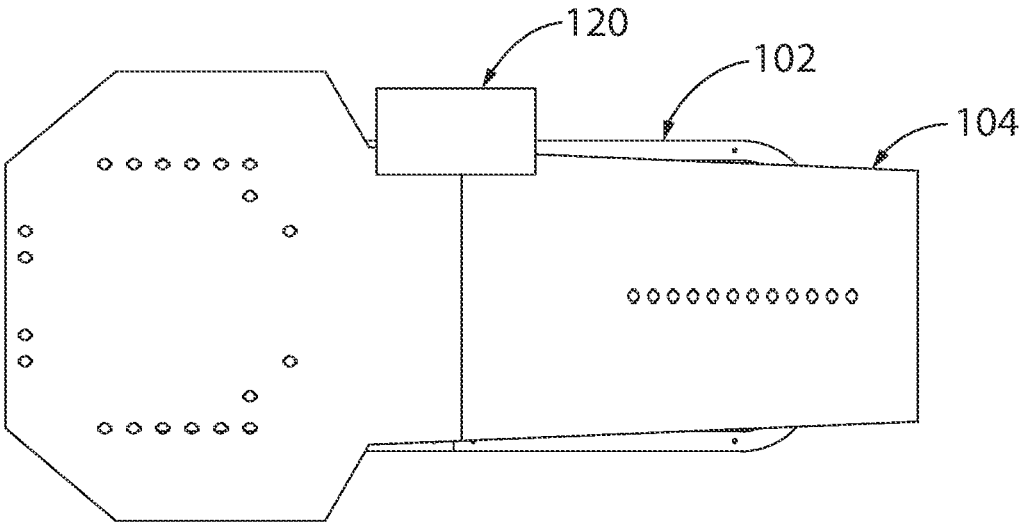


FIG. 6



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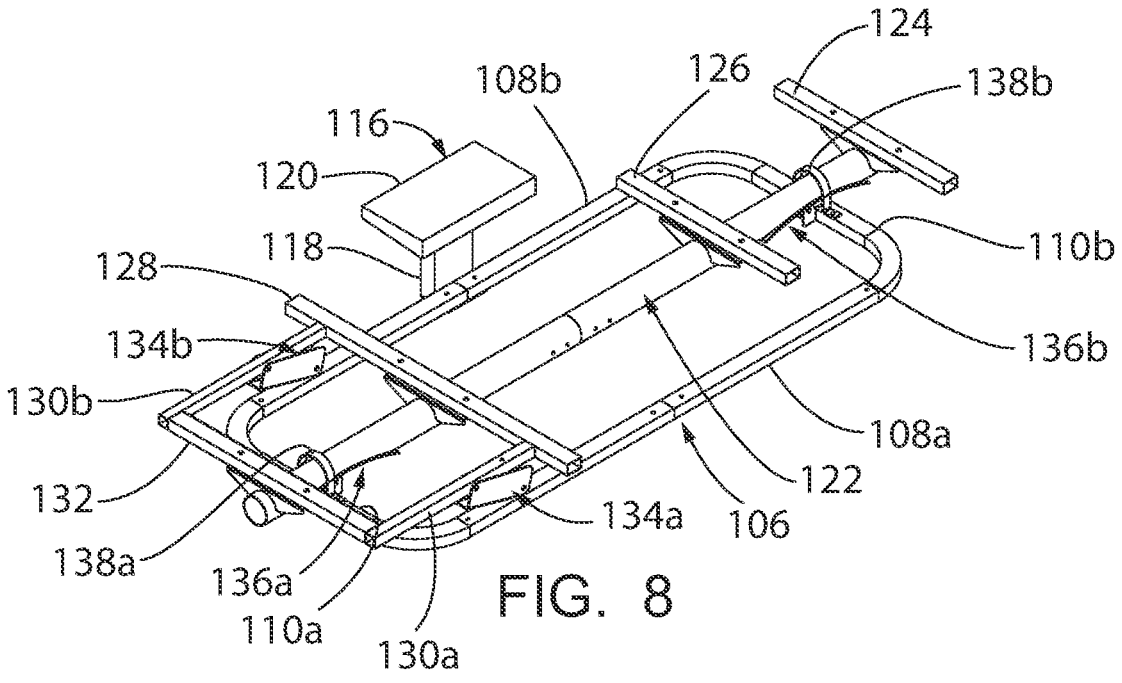

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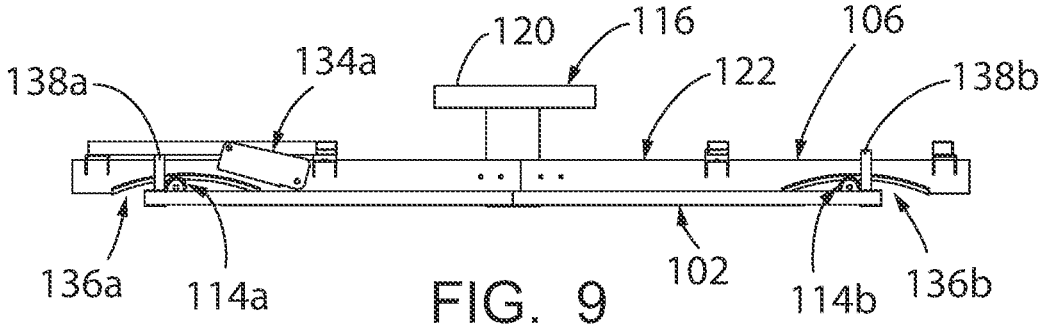

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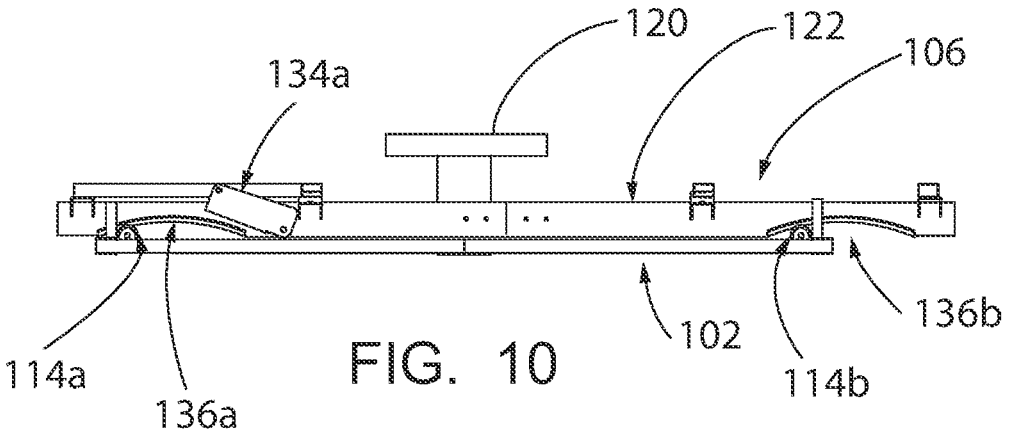
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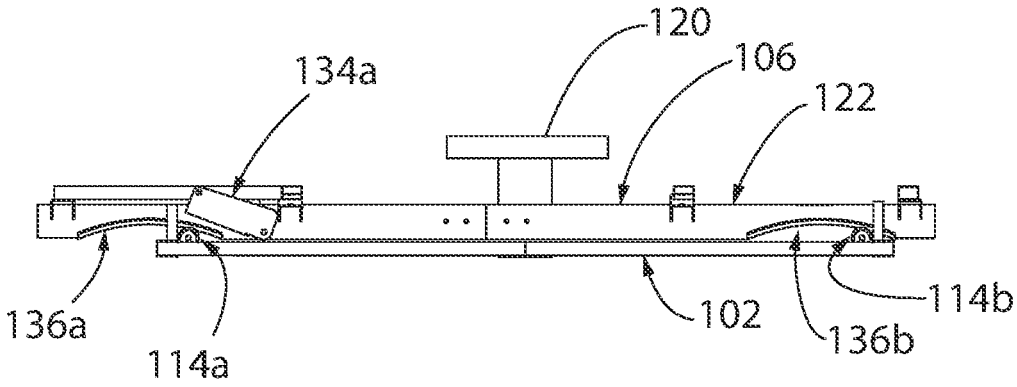
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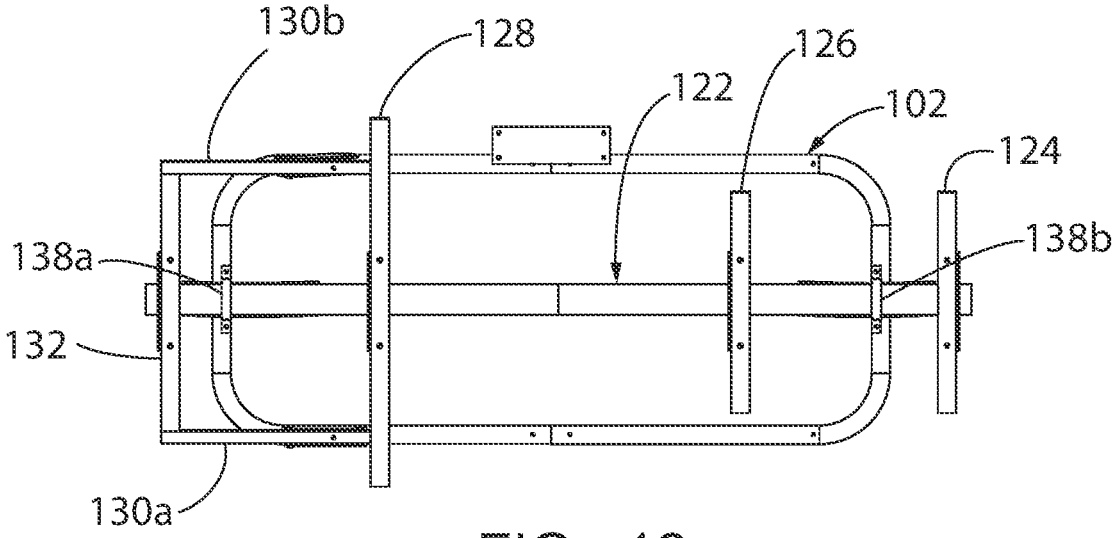
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FIG. 12

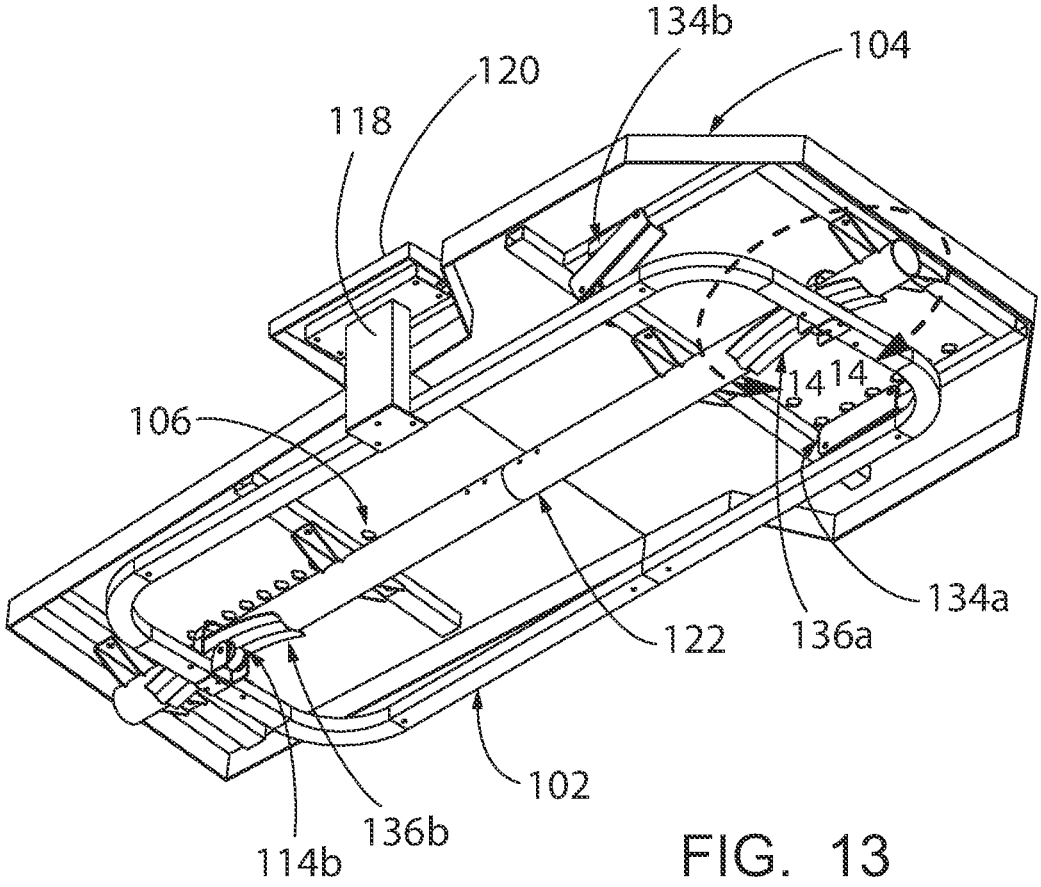
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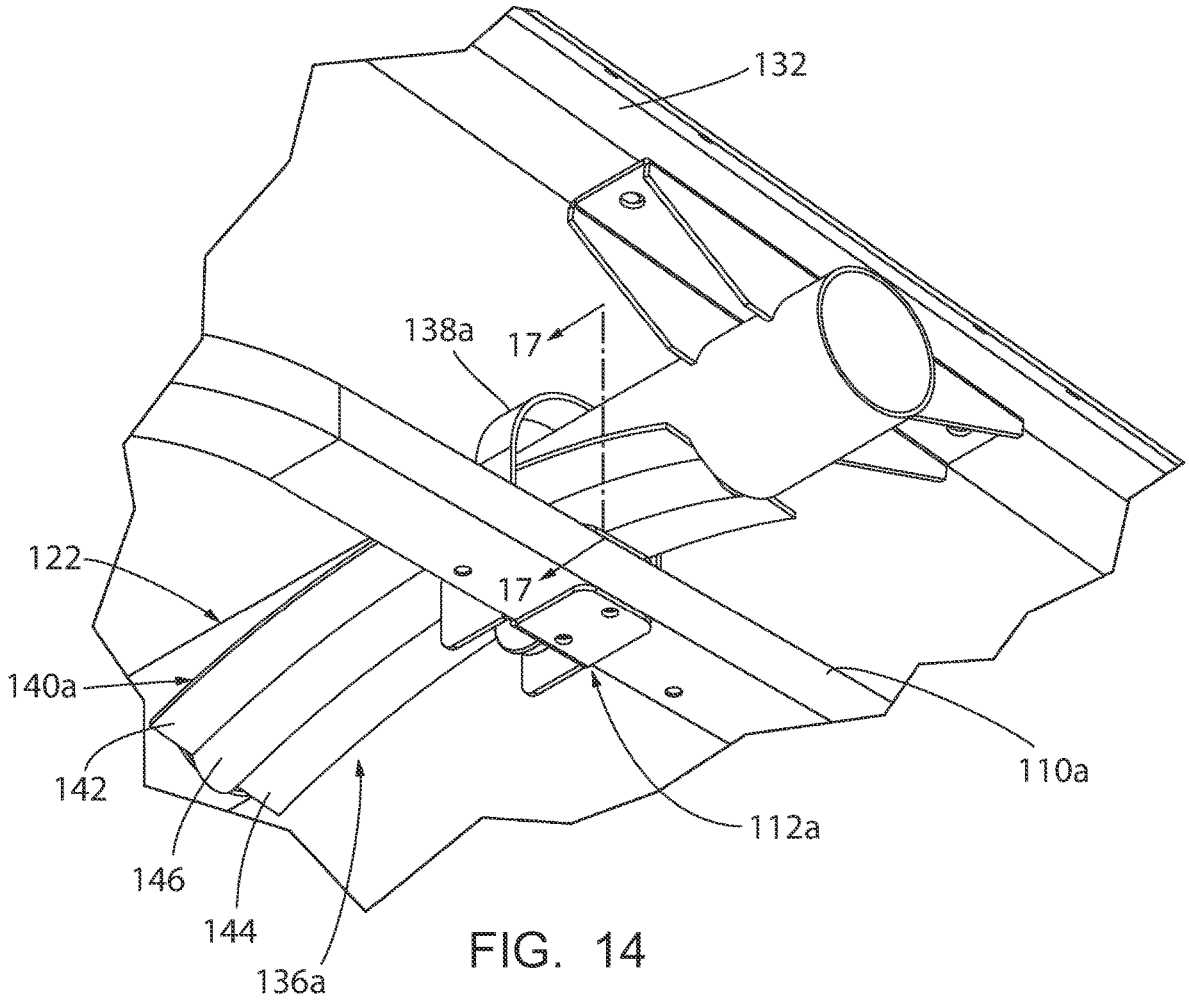
FIG. 13



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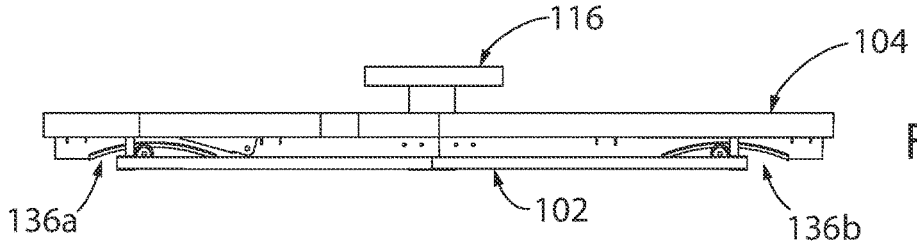

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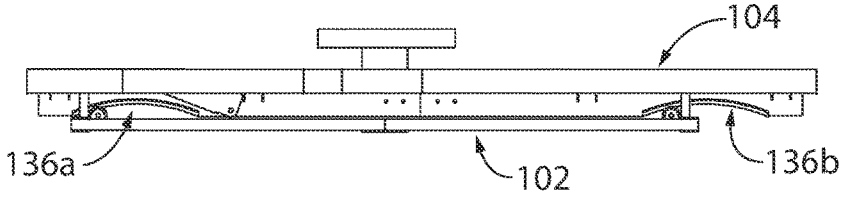

FIG. 16

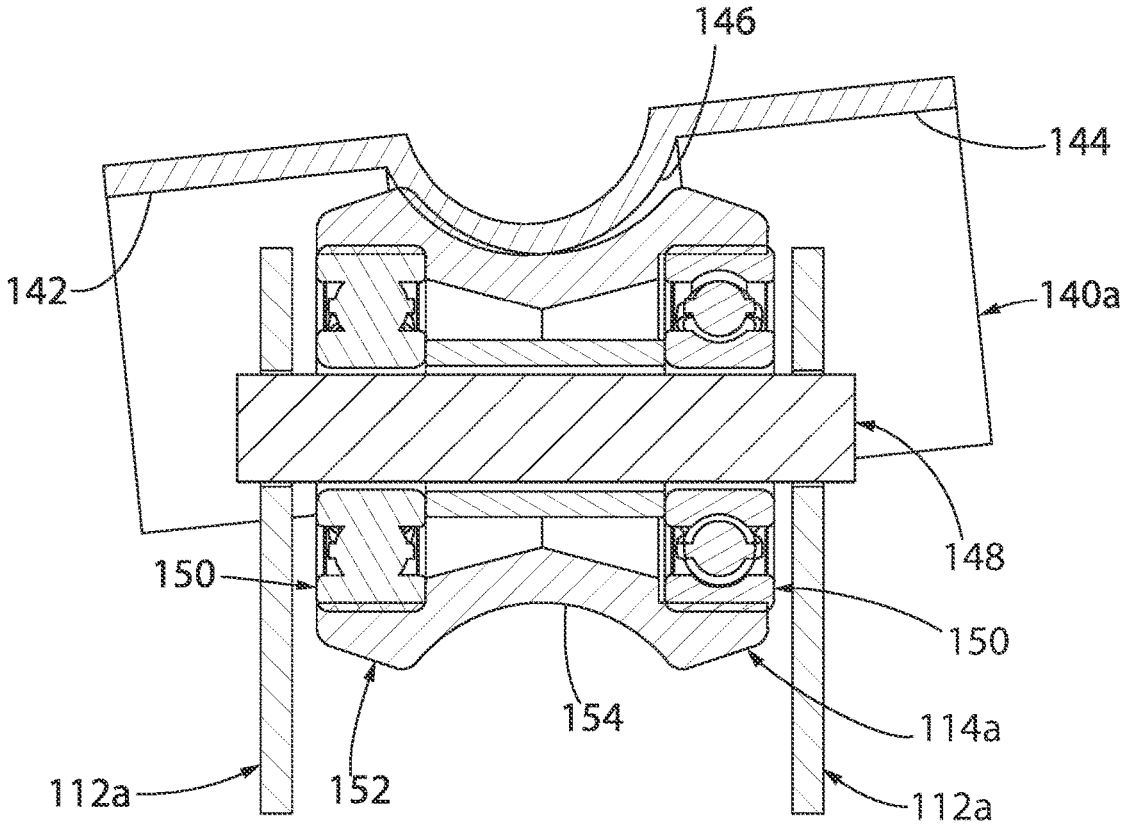
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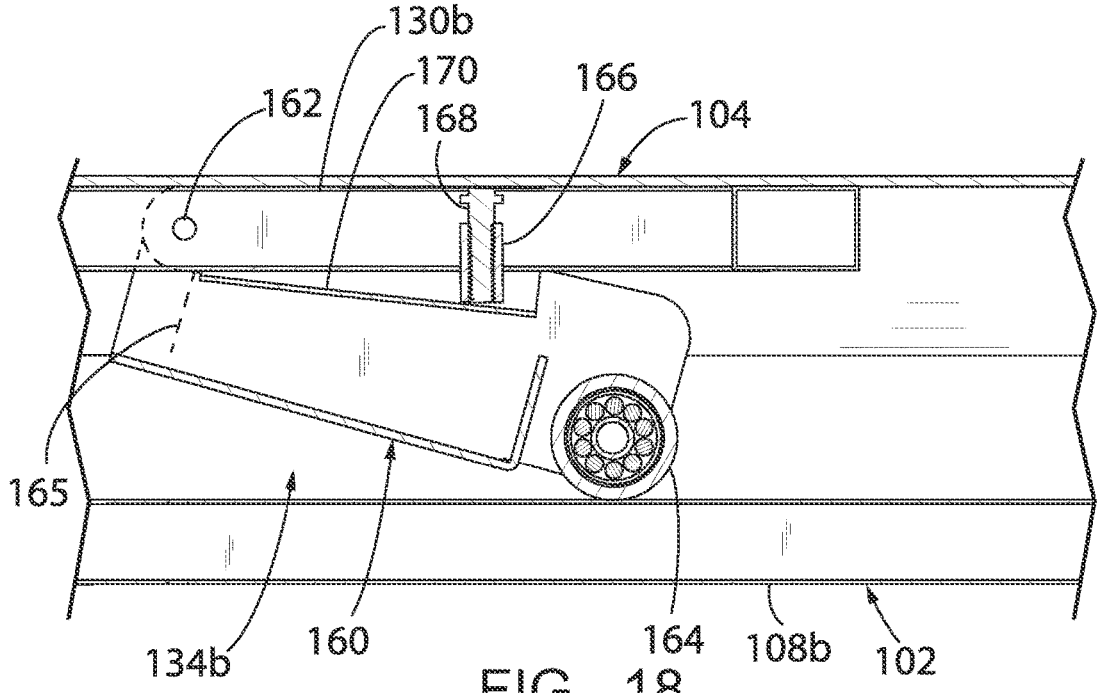
FIG. 17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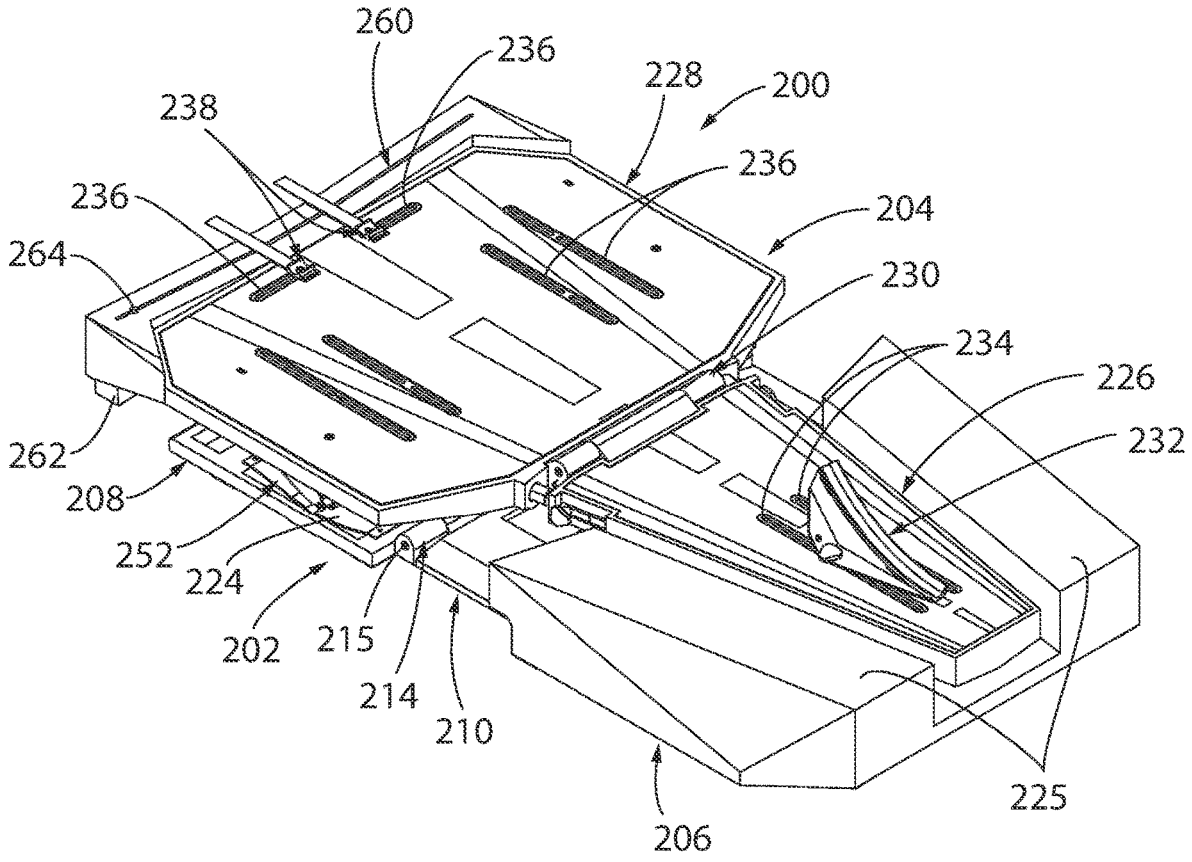
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FIG. 19

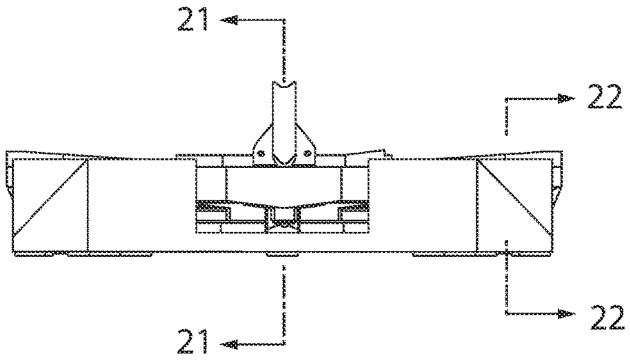


FIG. 20

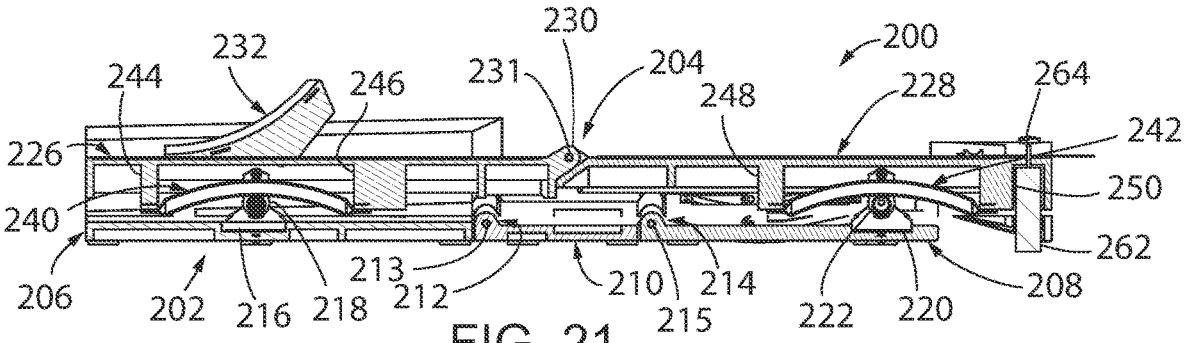


FIG. 21

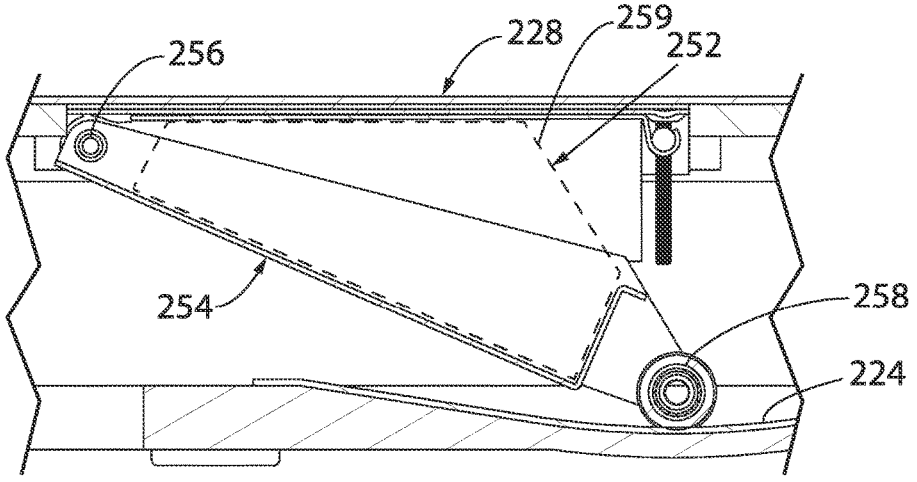


FIG. 22

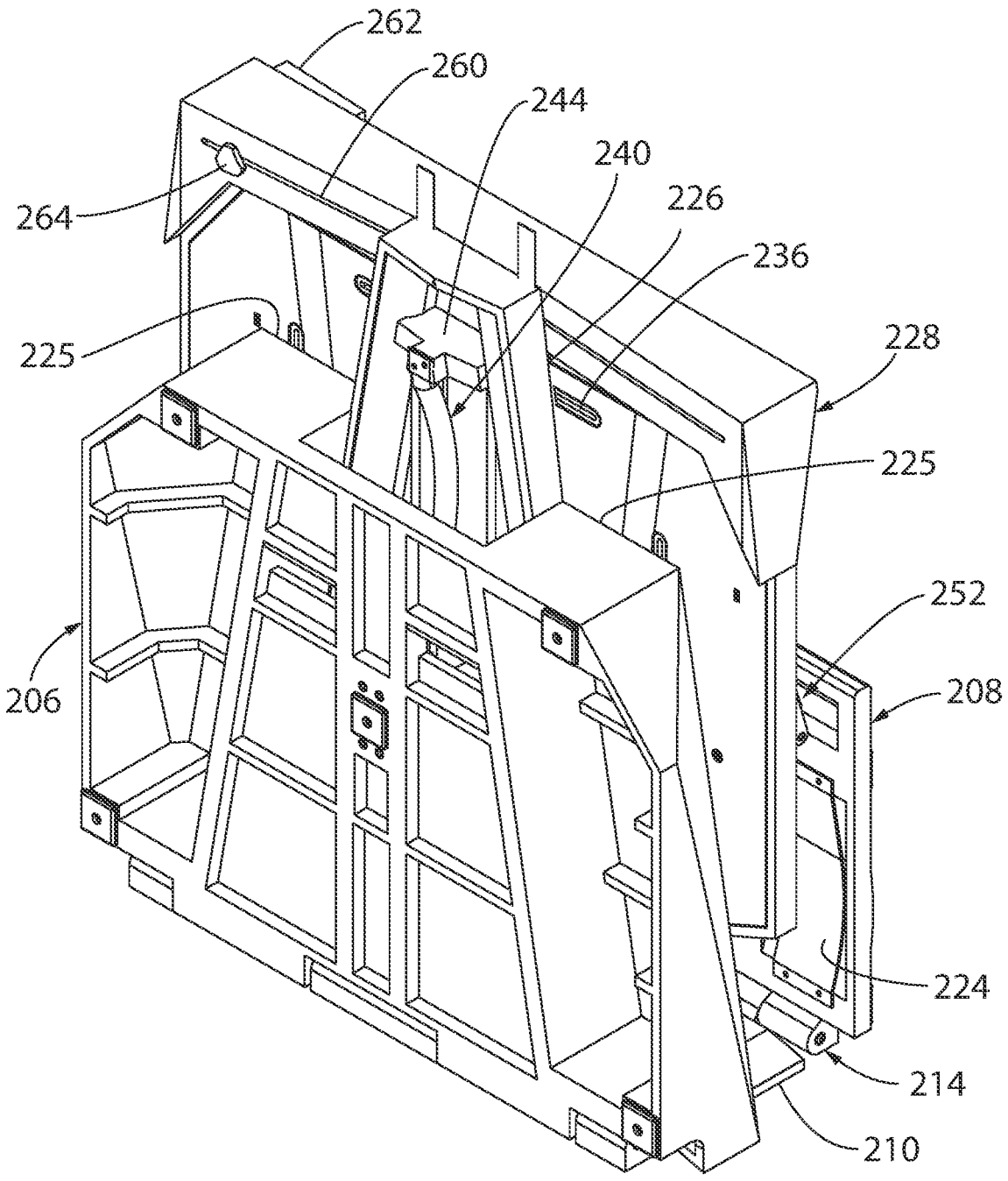


FIG. 23

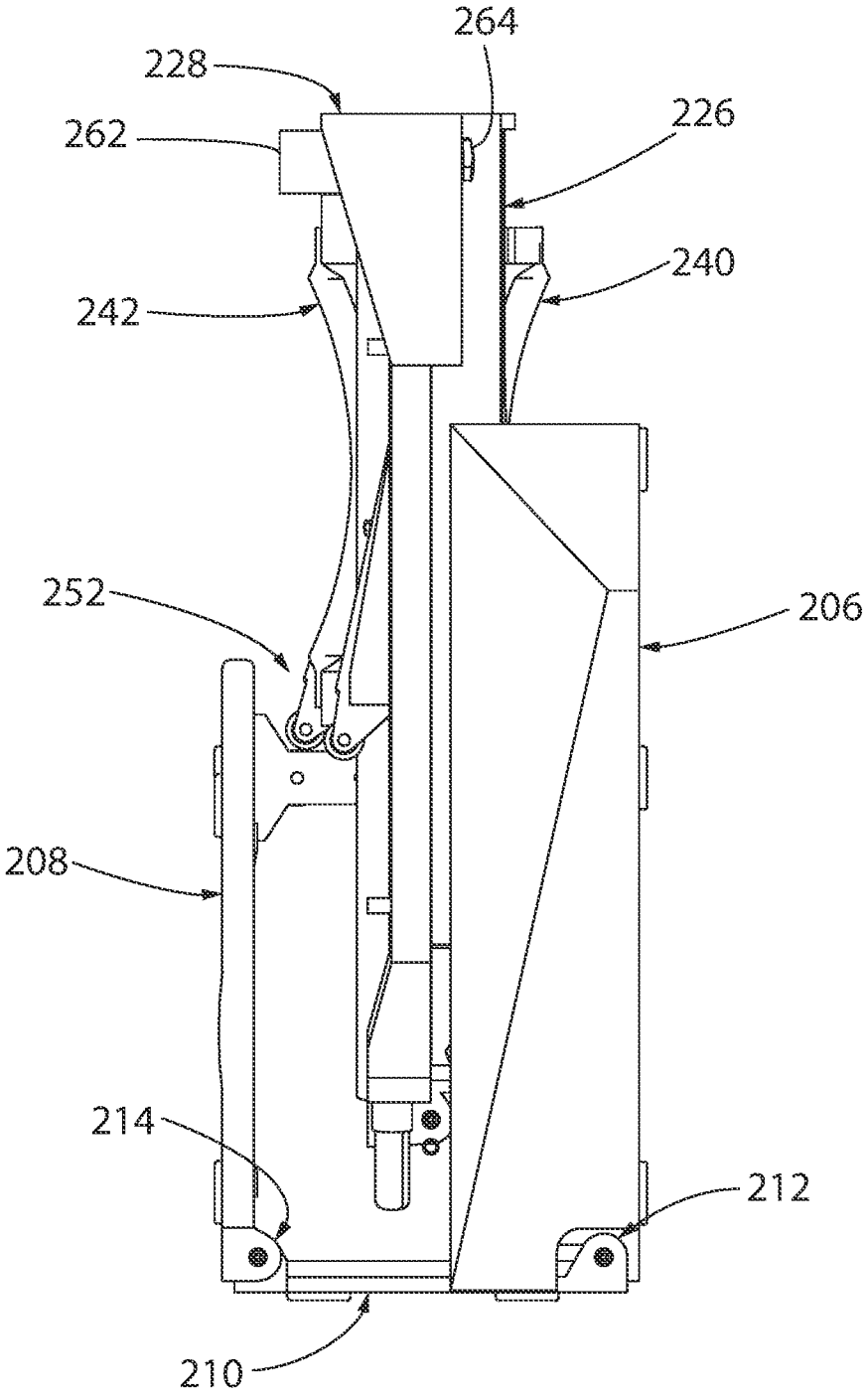


FIG. 24

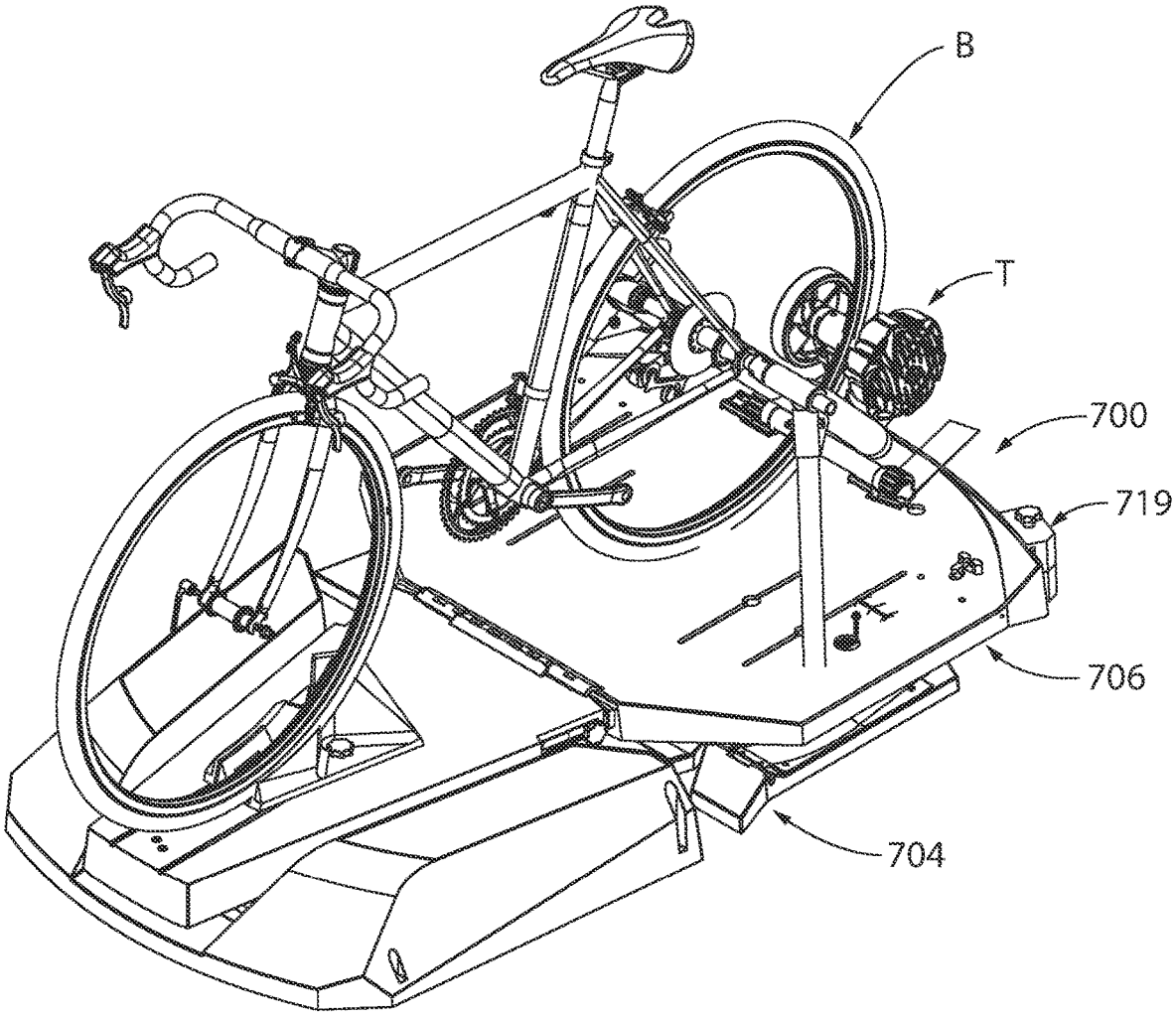


FIG. 24a

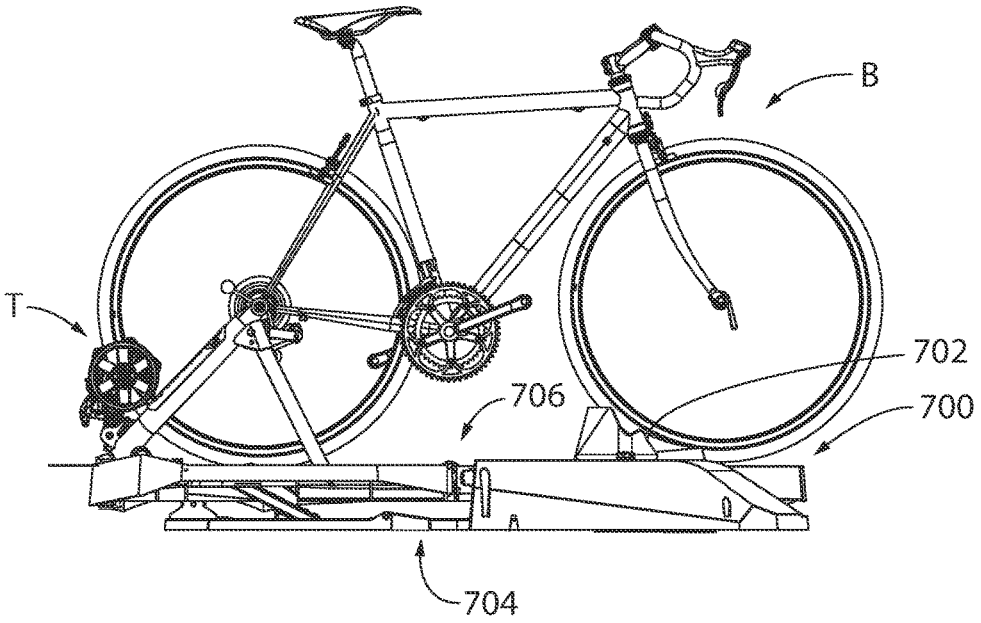


FIG. 24b

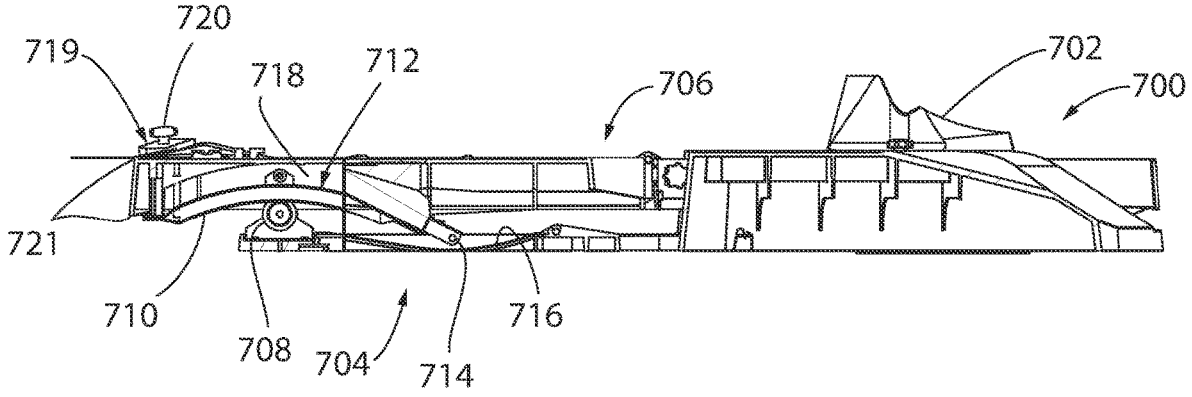


FIG. 24c

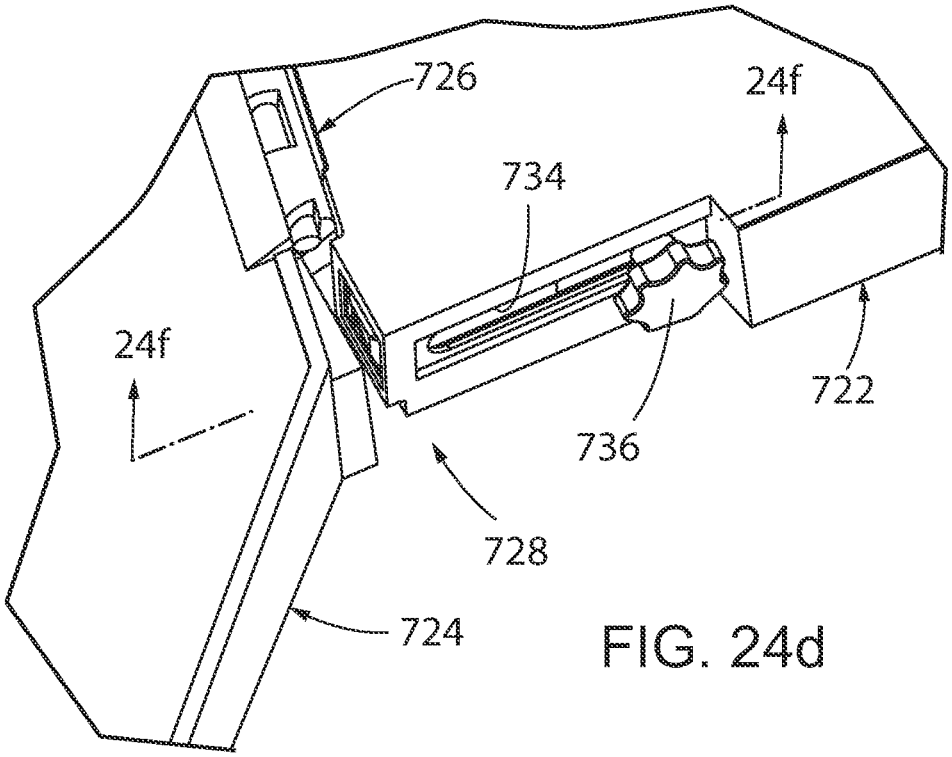
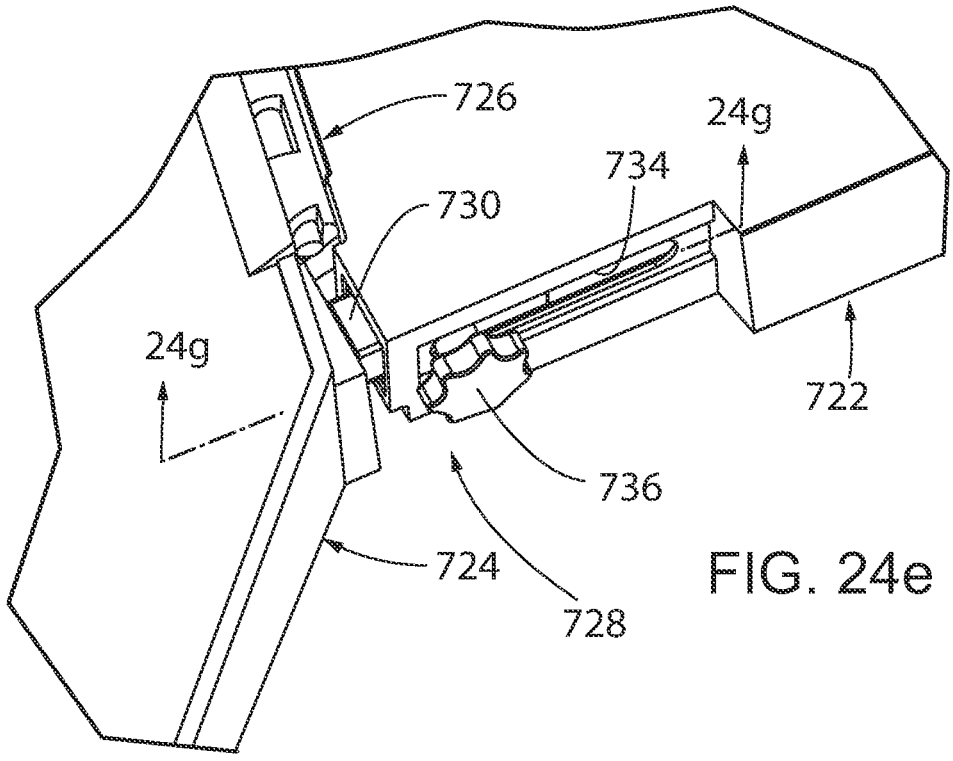


FIG. 24d



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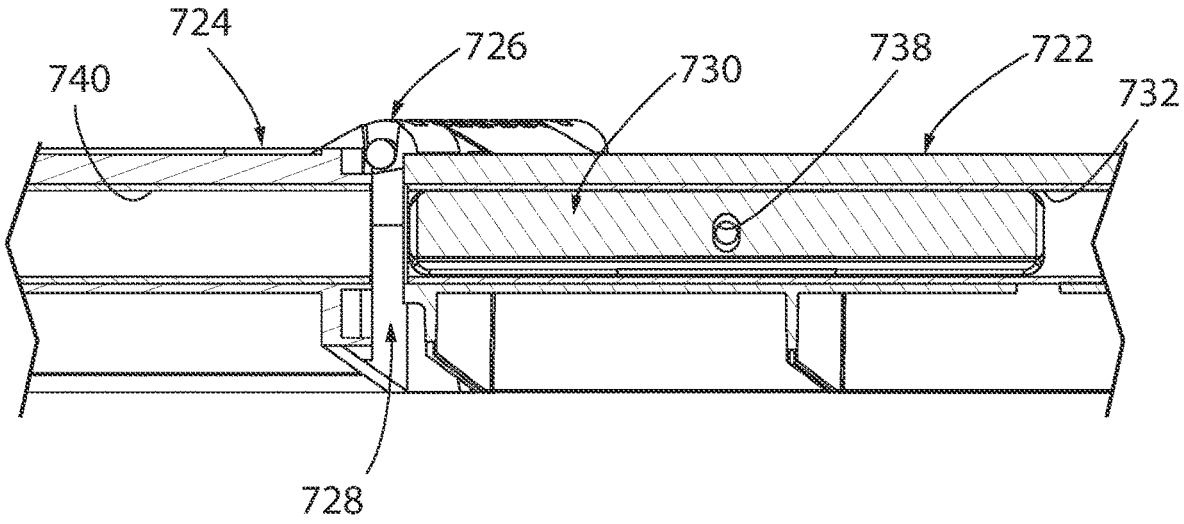


FIG. 24f

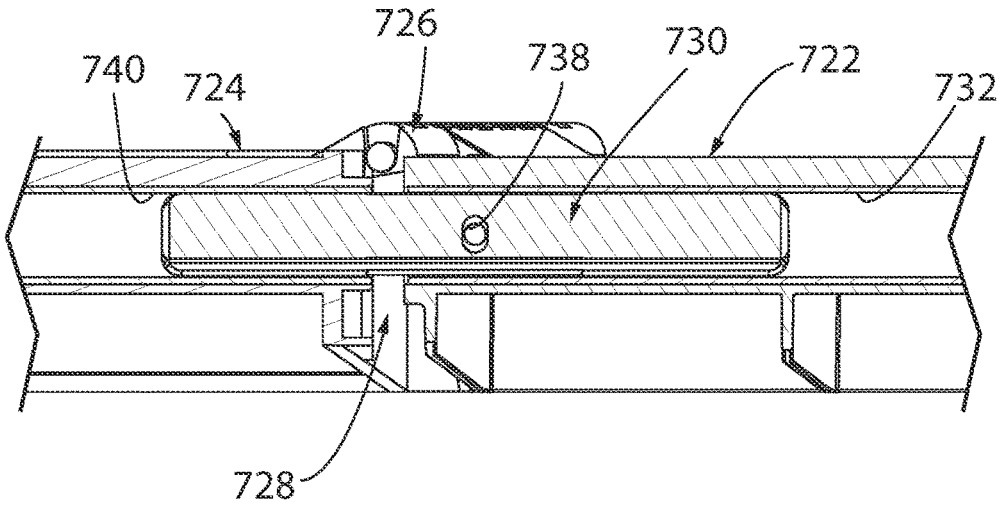


FIG. 24g

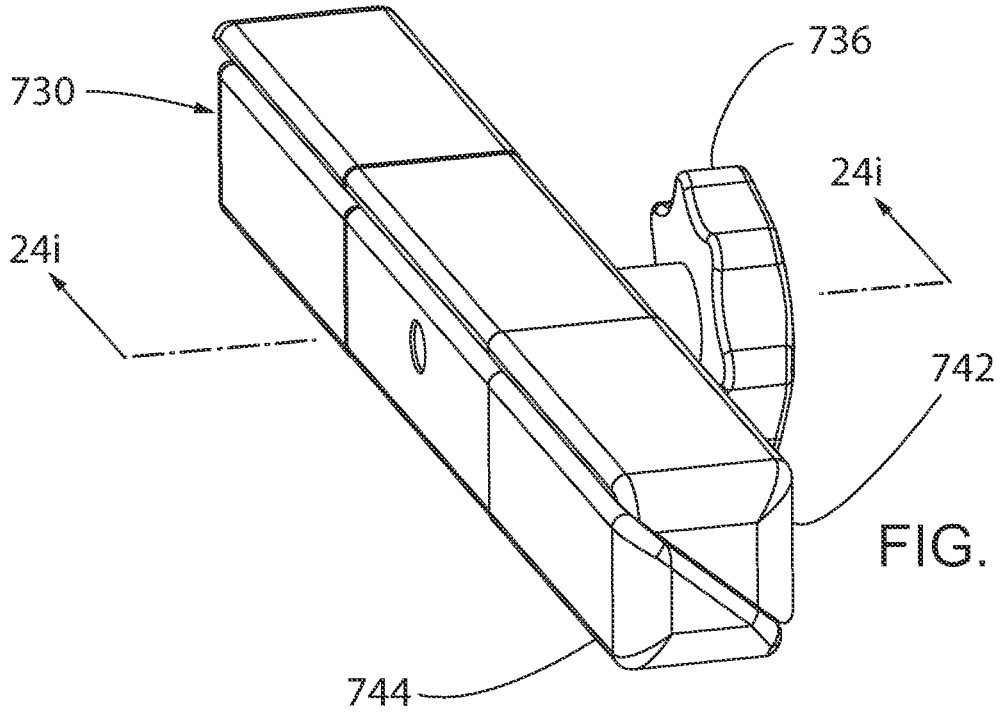


FIG. 24h

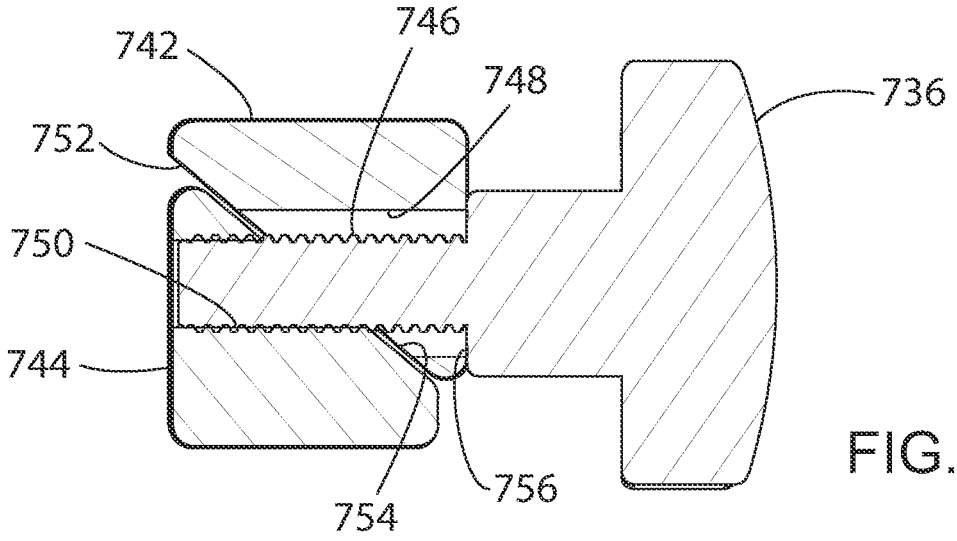
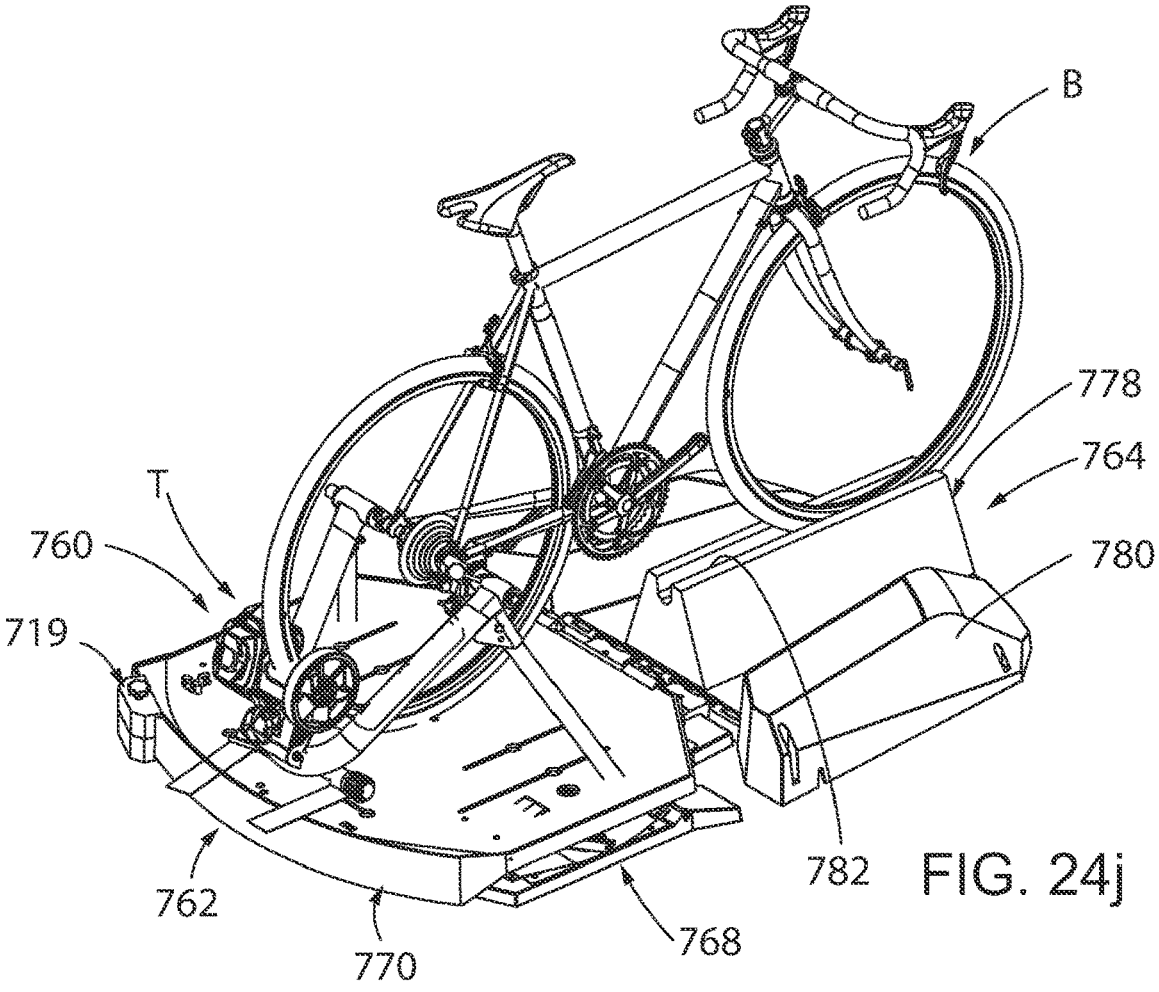


FIG. 24i



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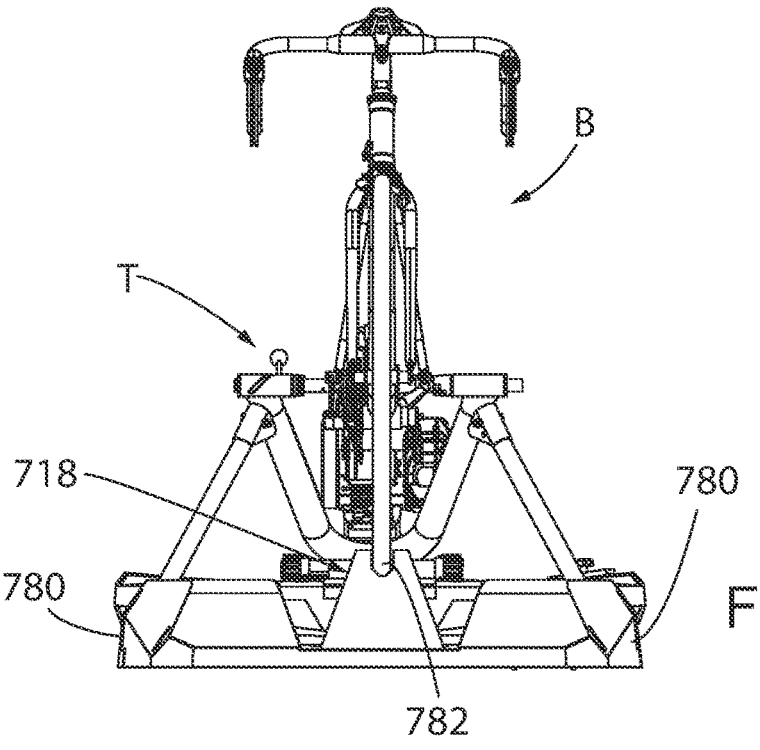

FIG. 24k

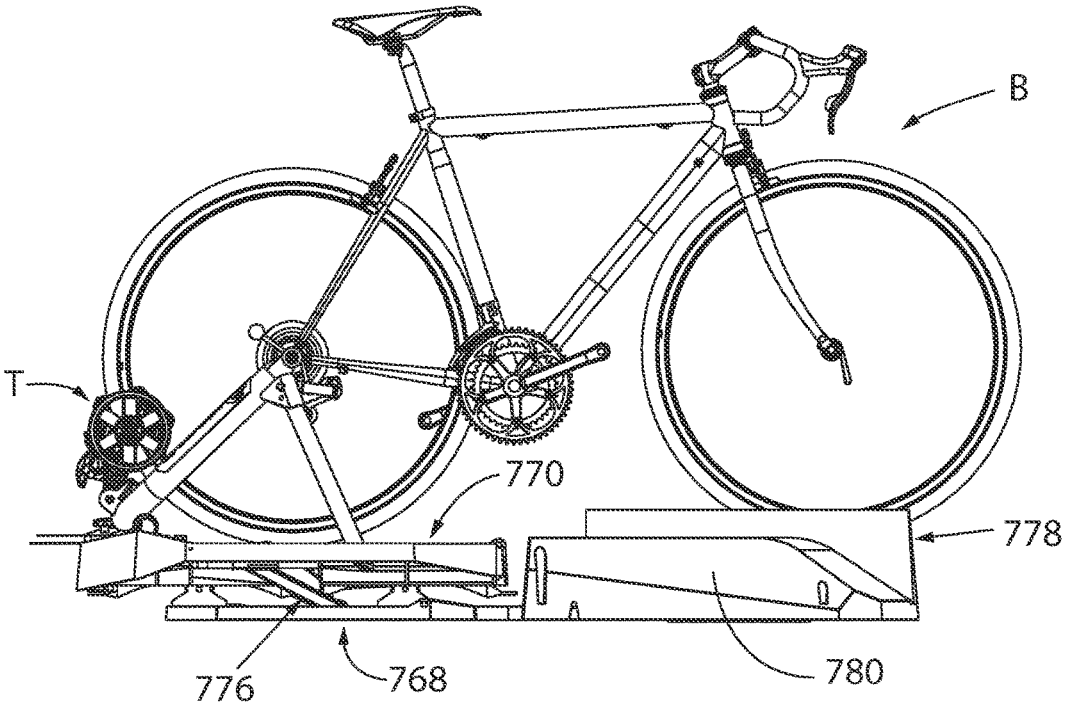

FIG. 24L

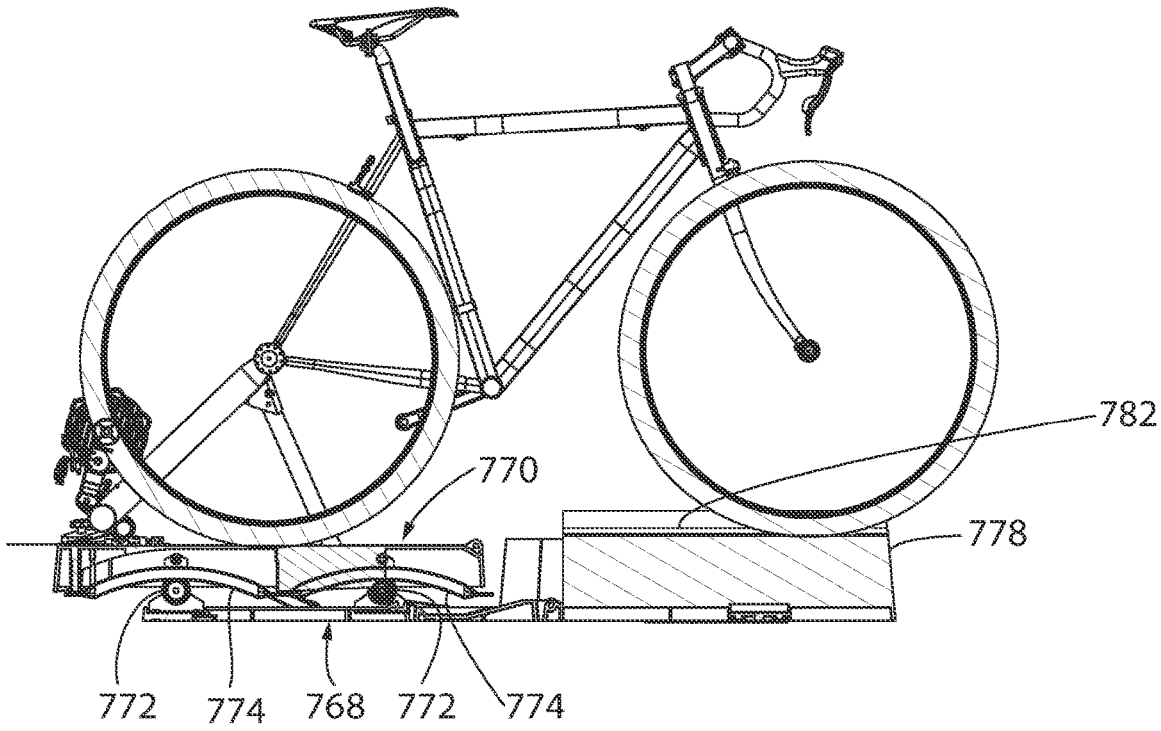

FIG. 24m

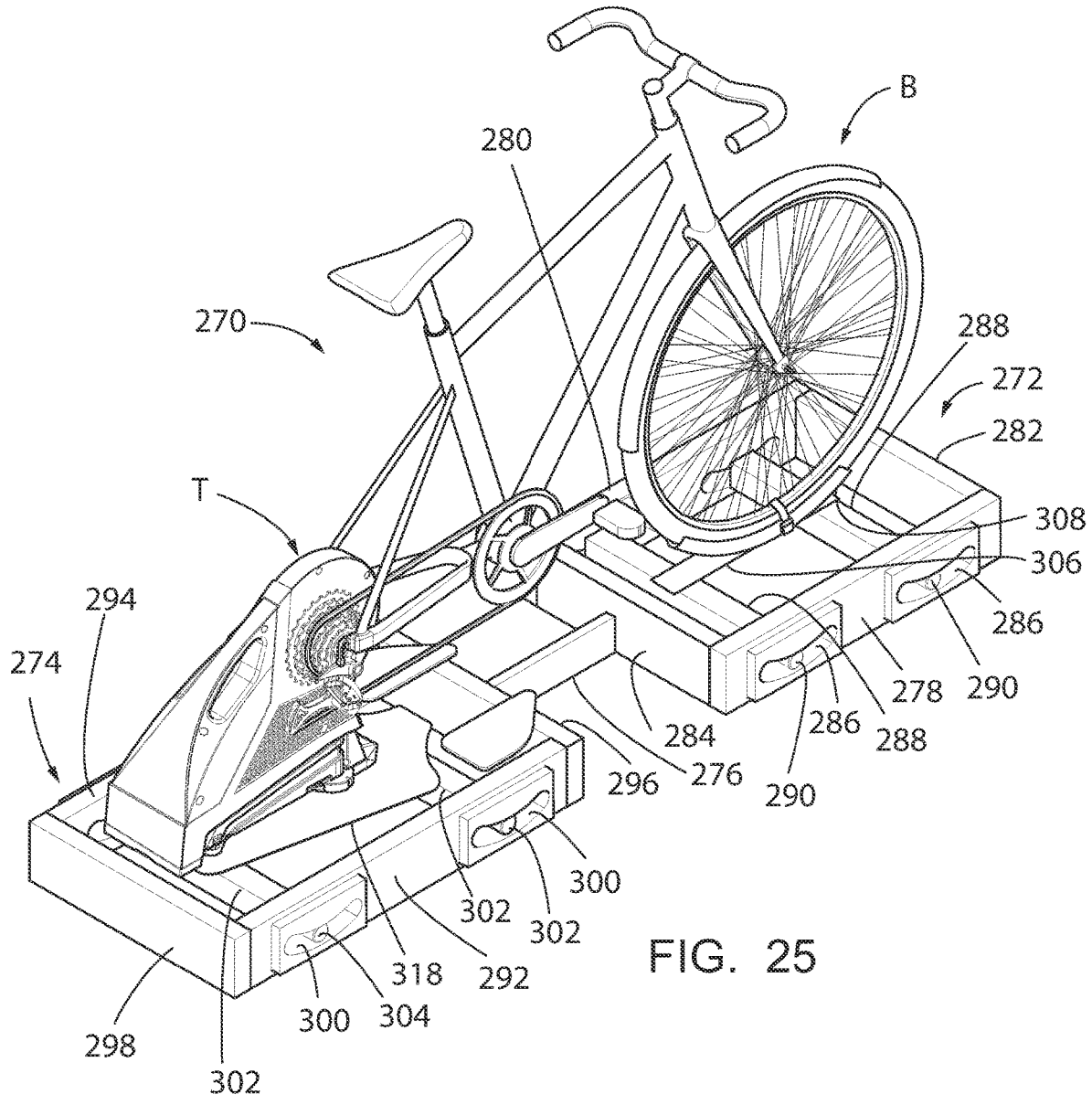
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FIG. 25

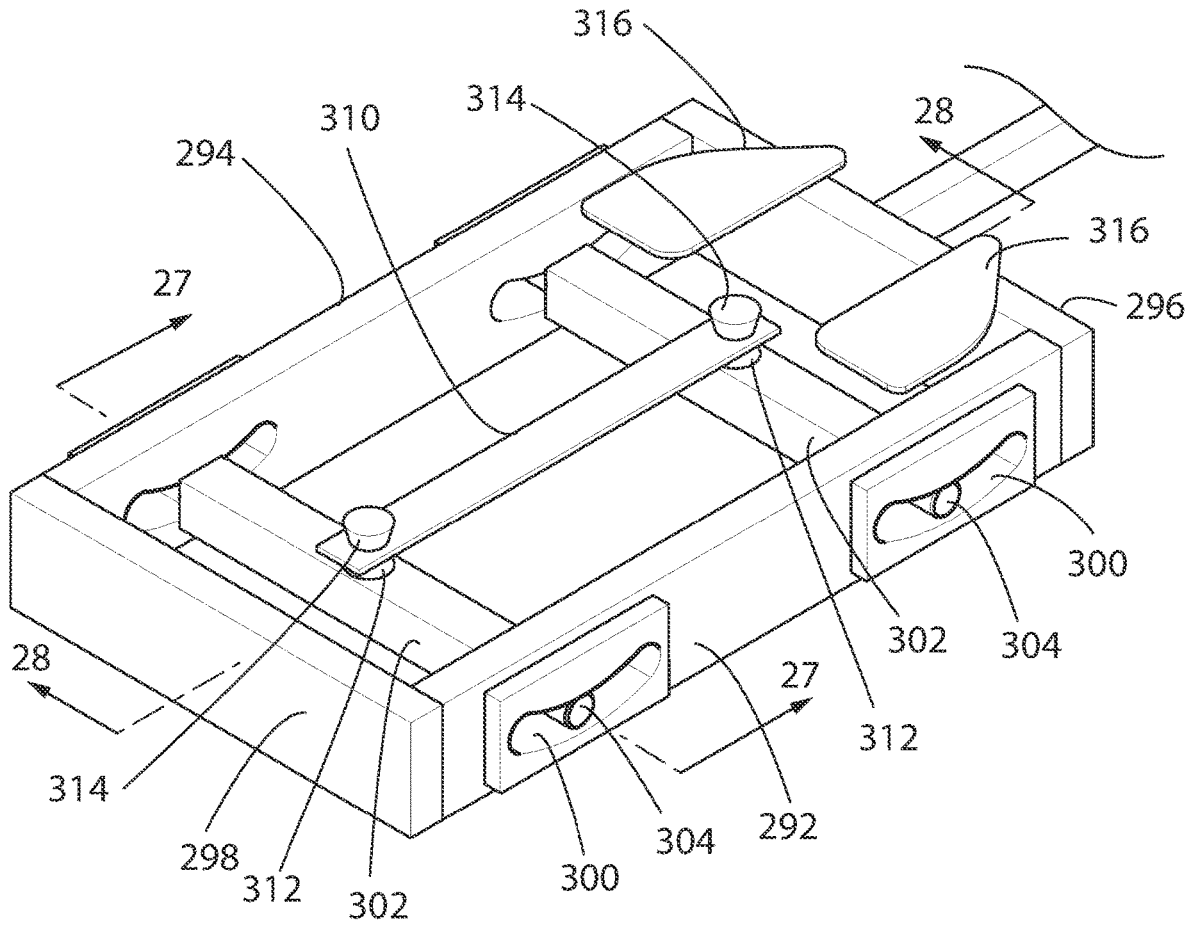
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FIG. 26

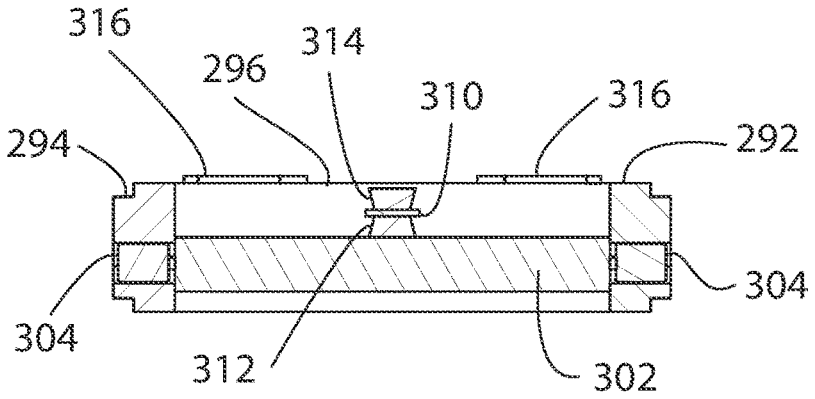
316
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FIG. 27

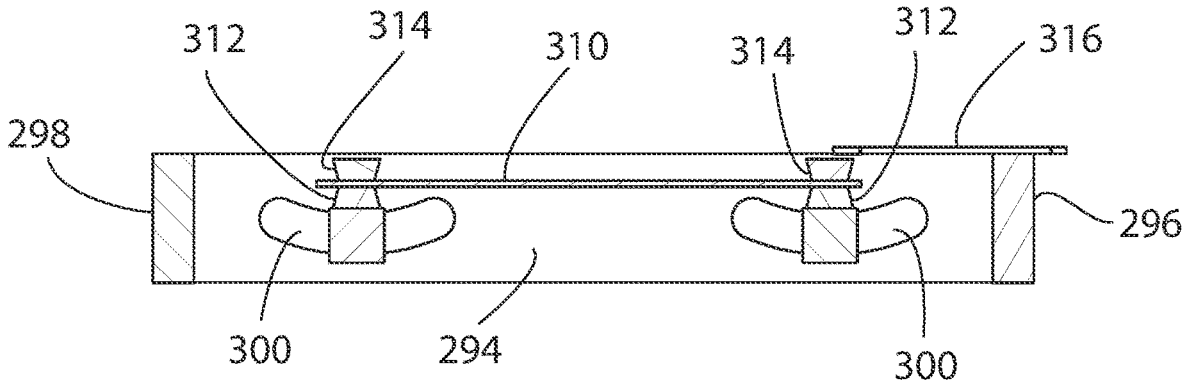
312
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FIG. 28

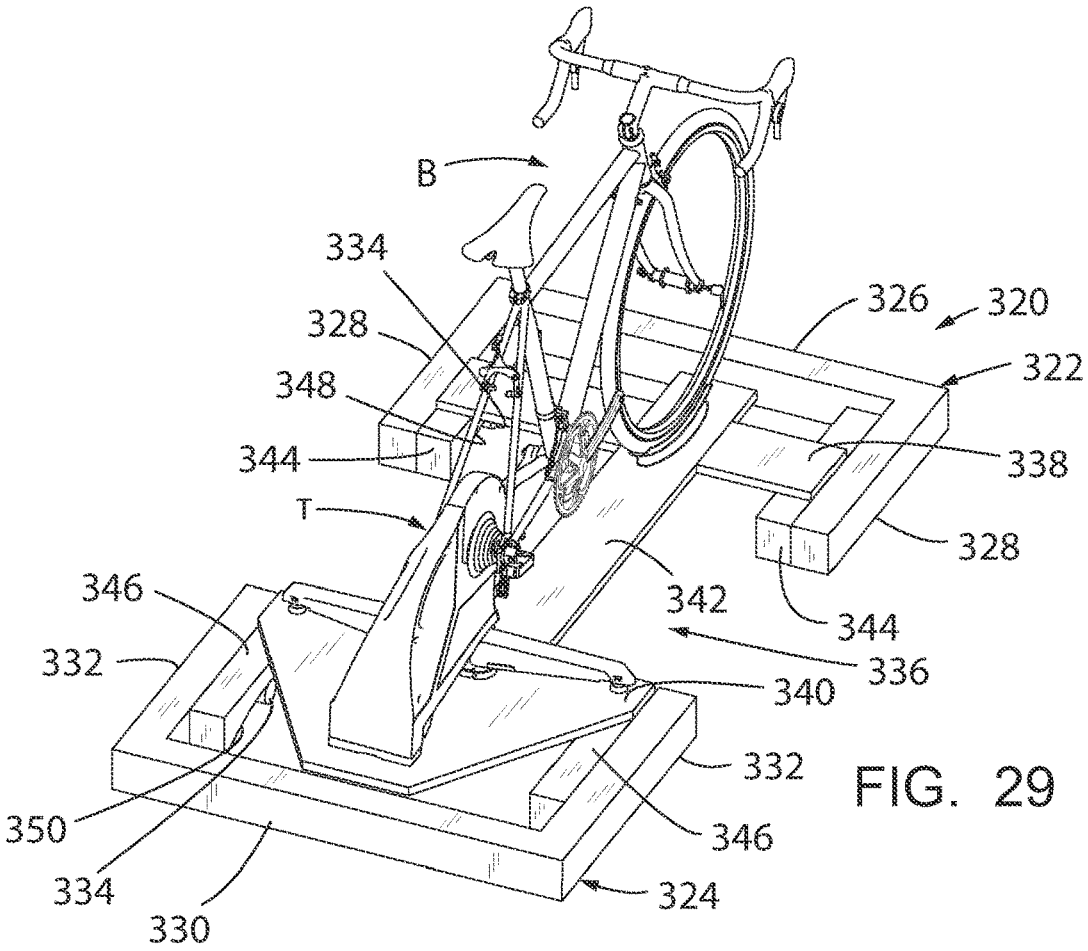
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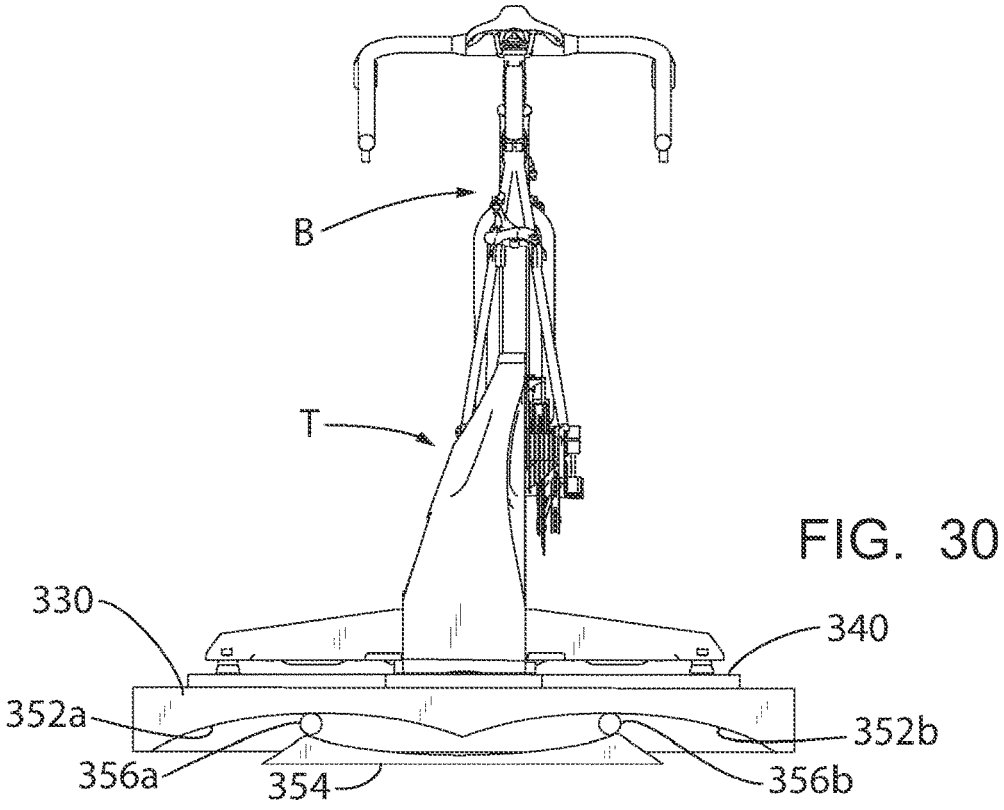
FIG. 29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330
352a
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340
352b
356b

FIG. 30

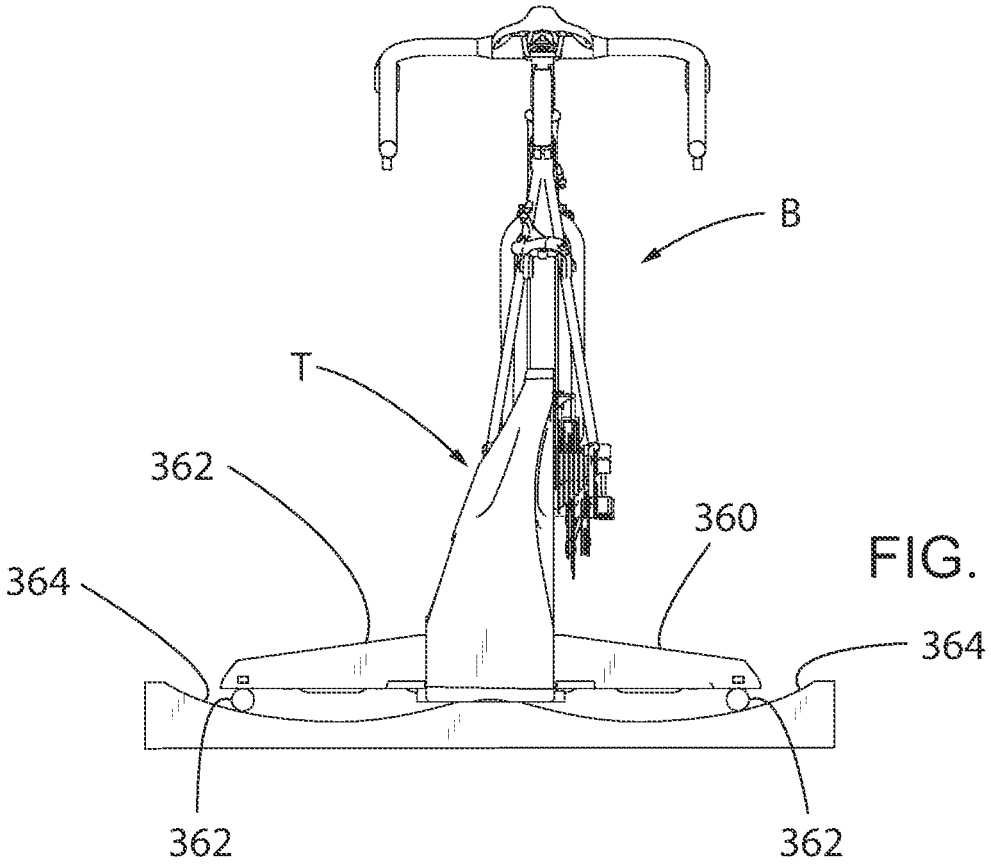

FIG. 31

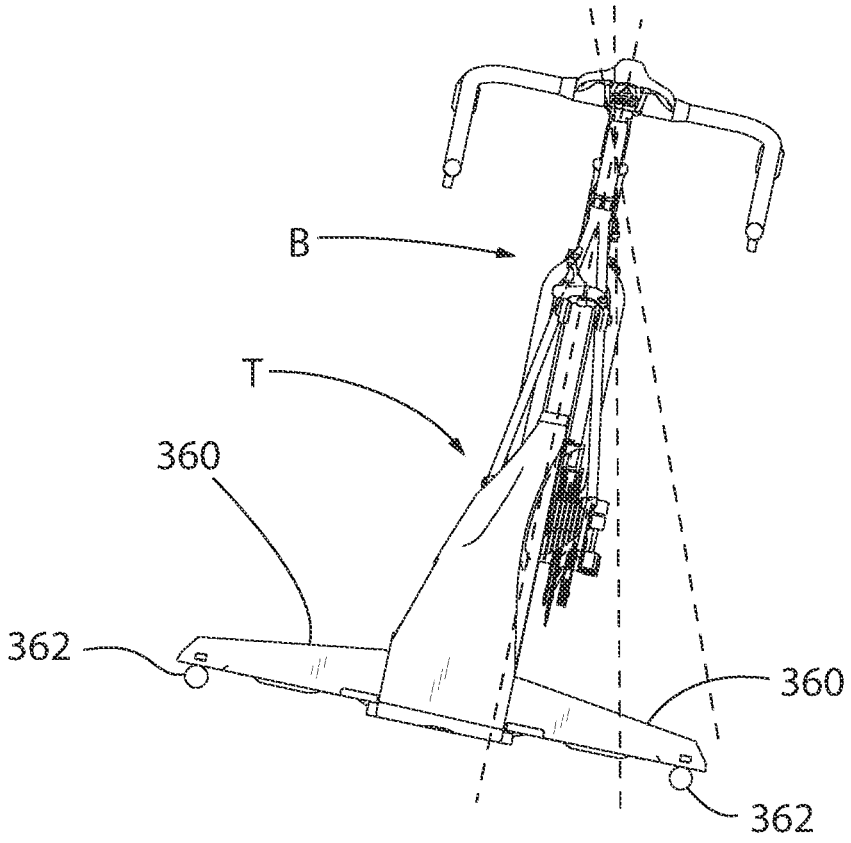

FIG. 32

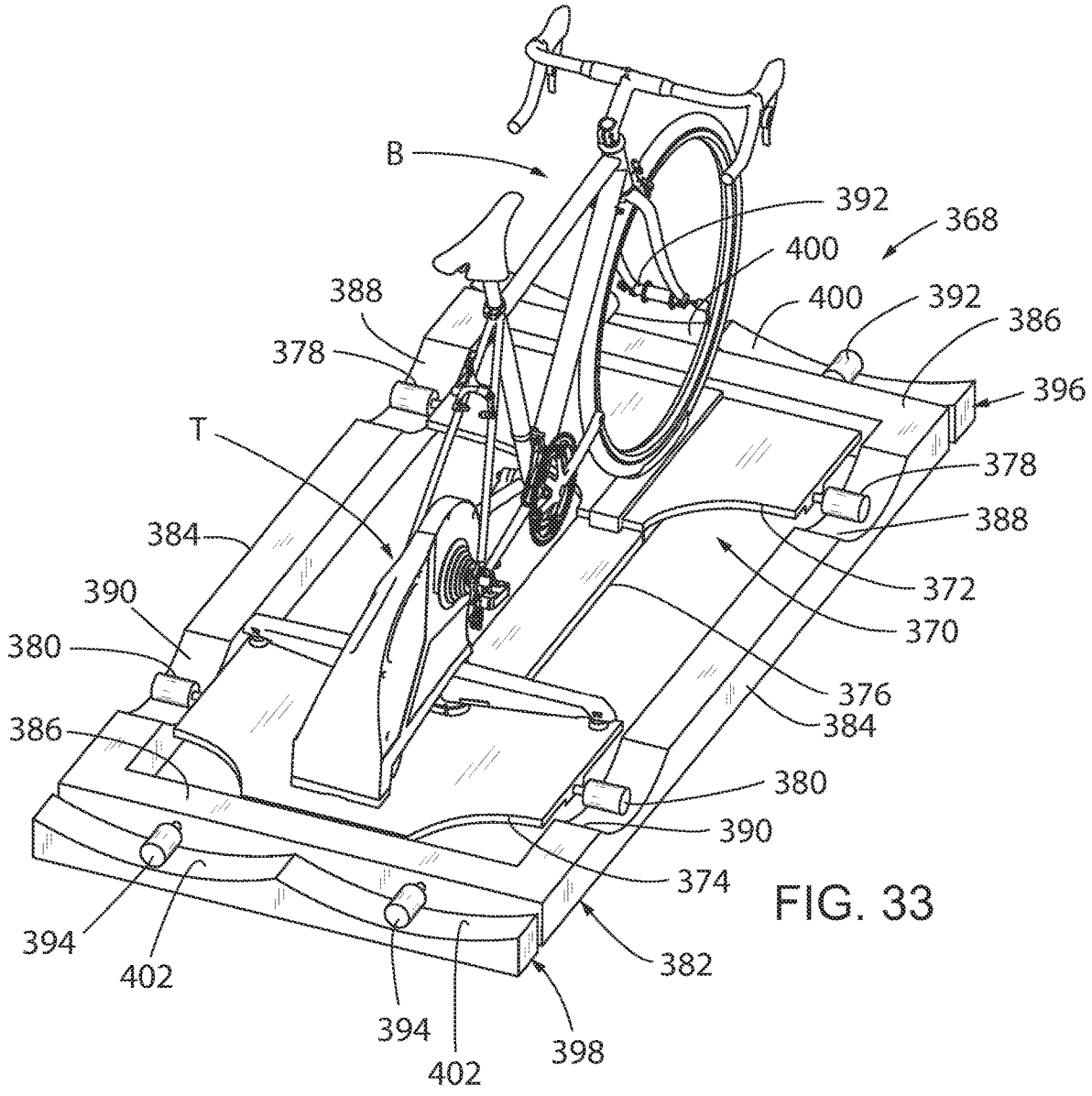
B
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FIG. 33

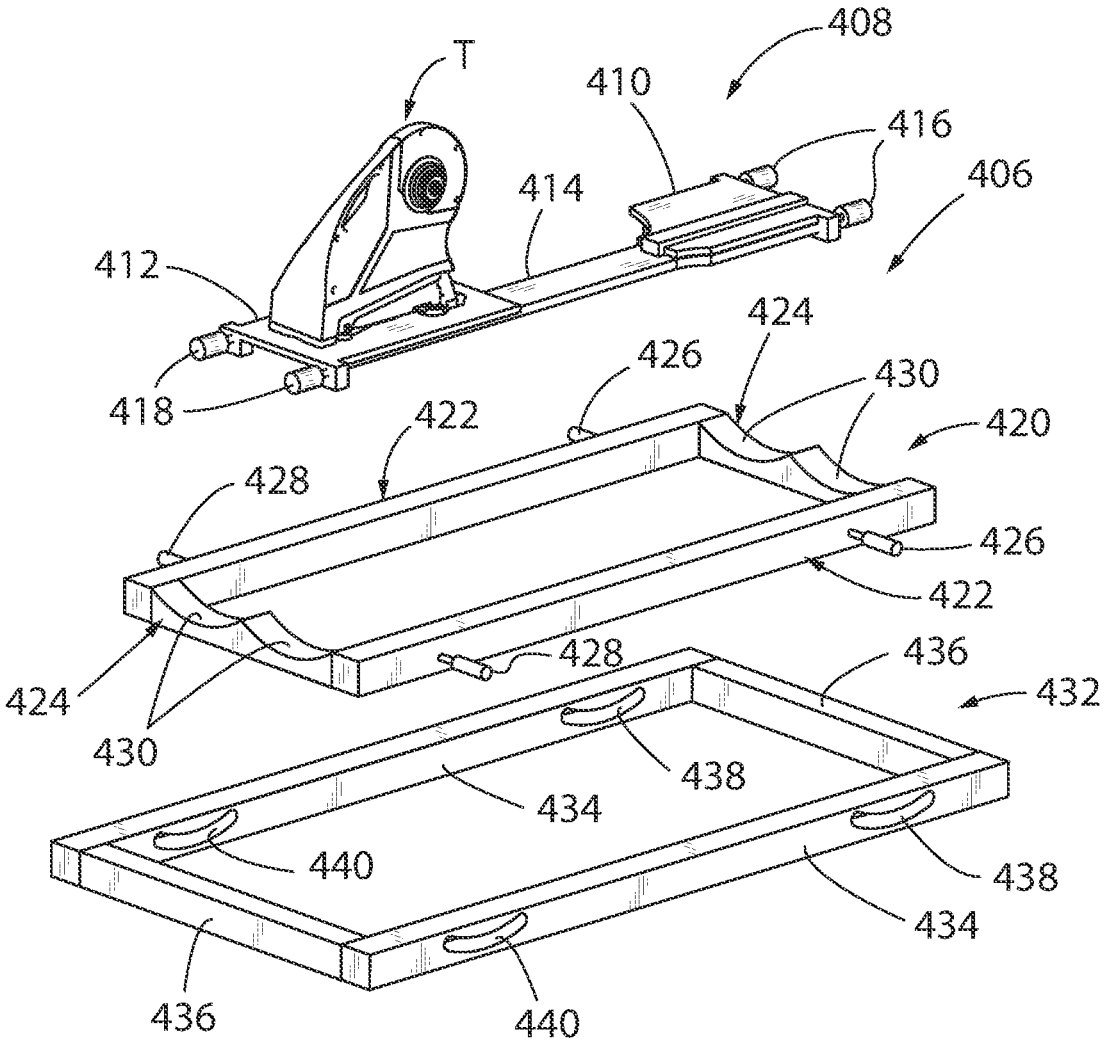
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FIG. 34

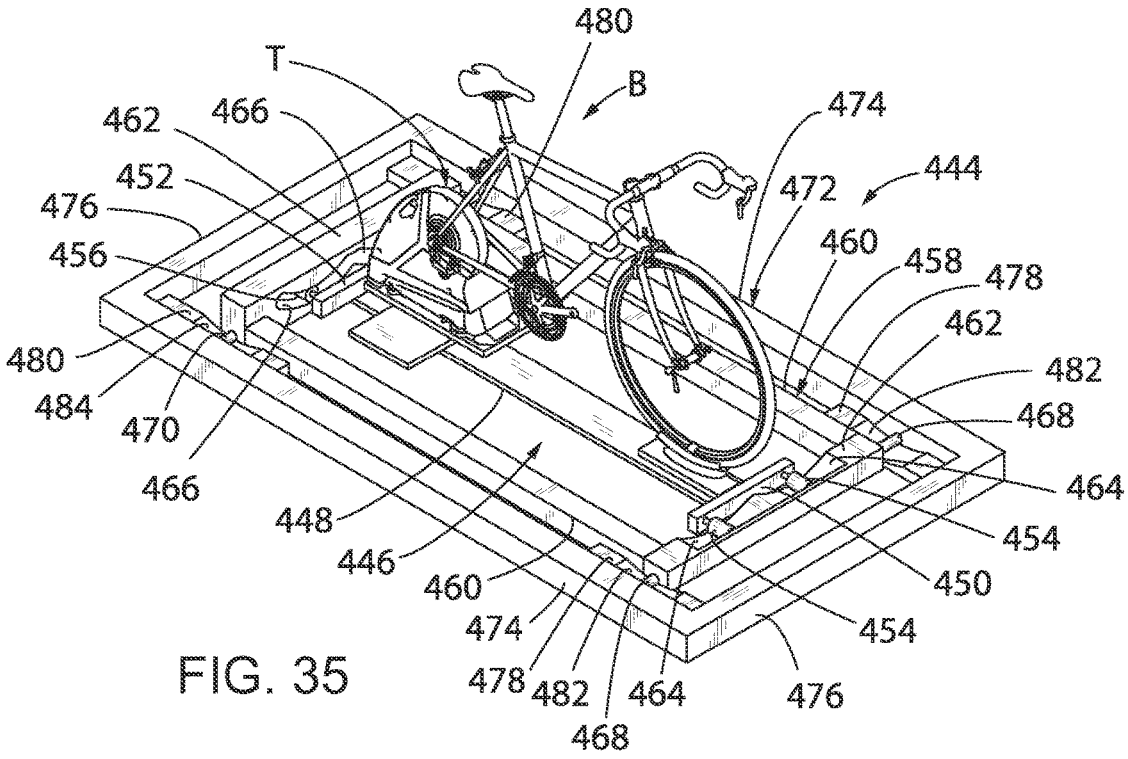
480
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FIG. 35

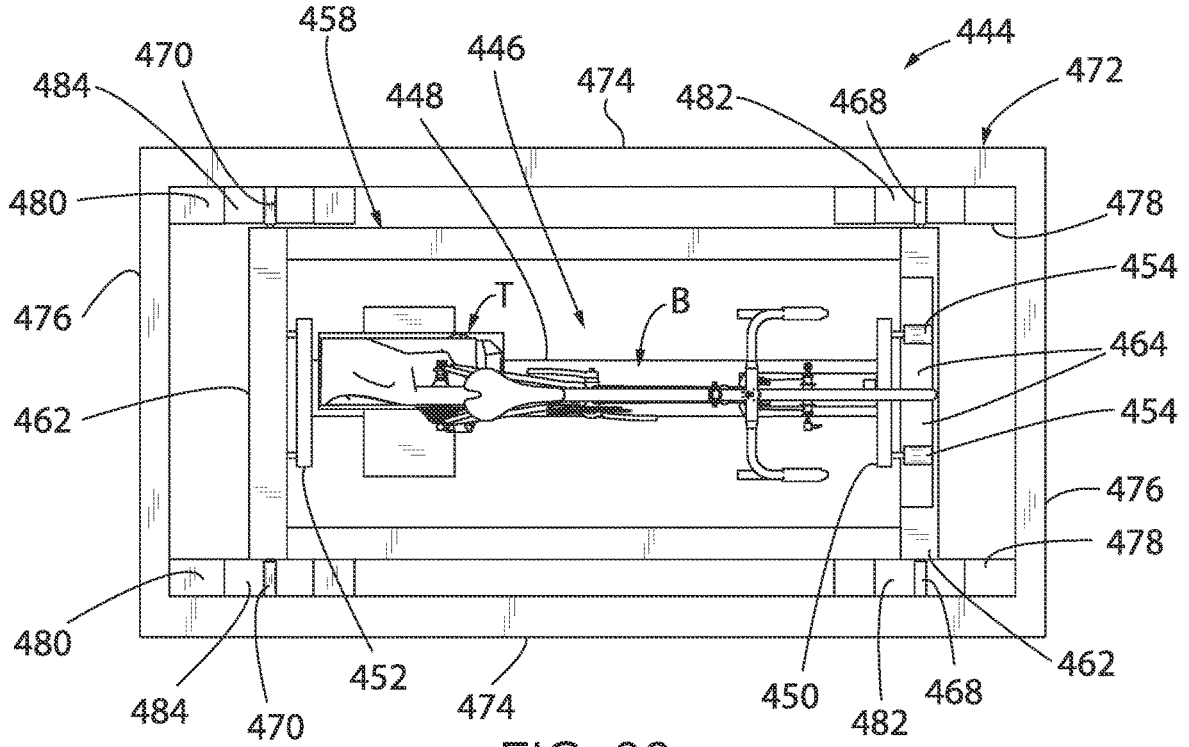
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FIG. 36

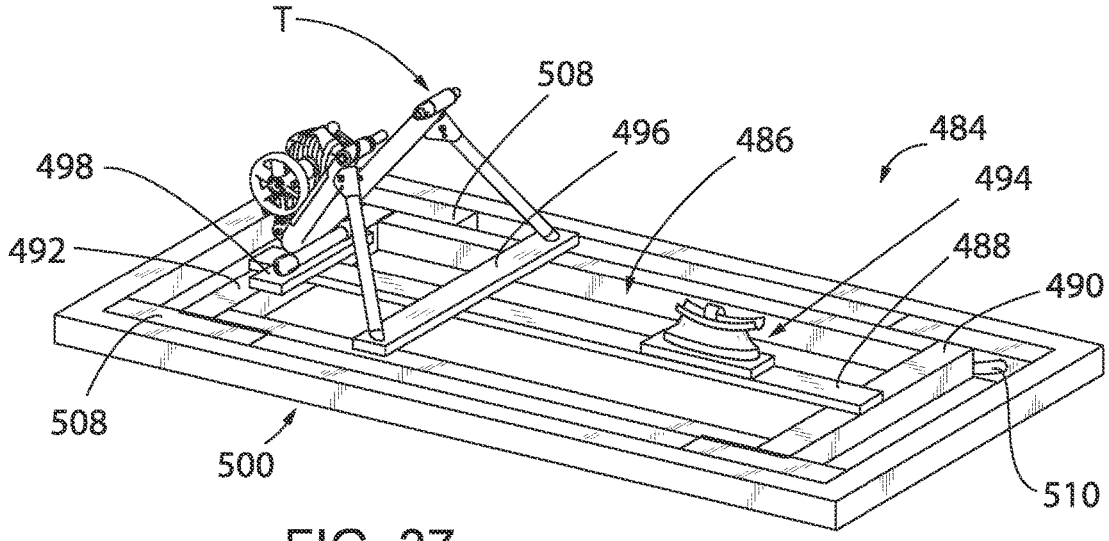
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FIG. 37

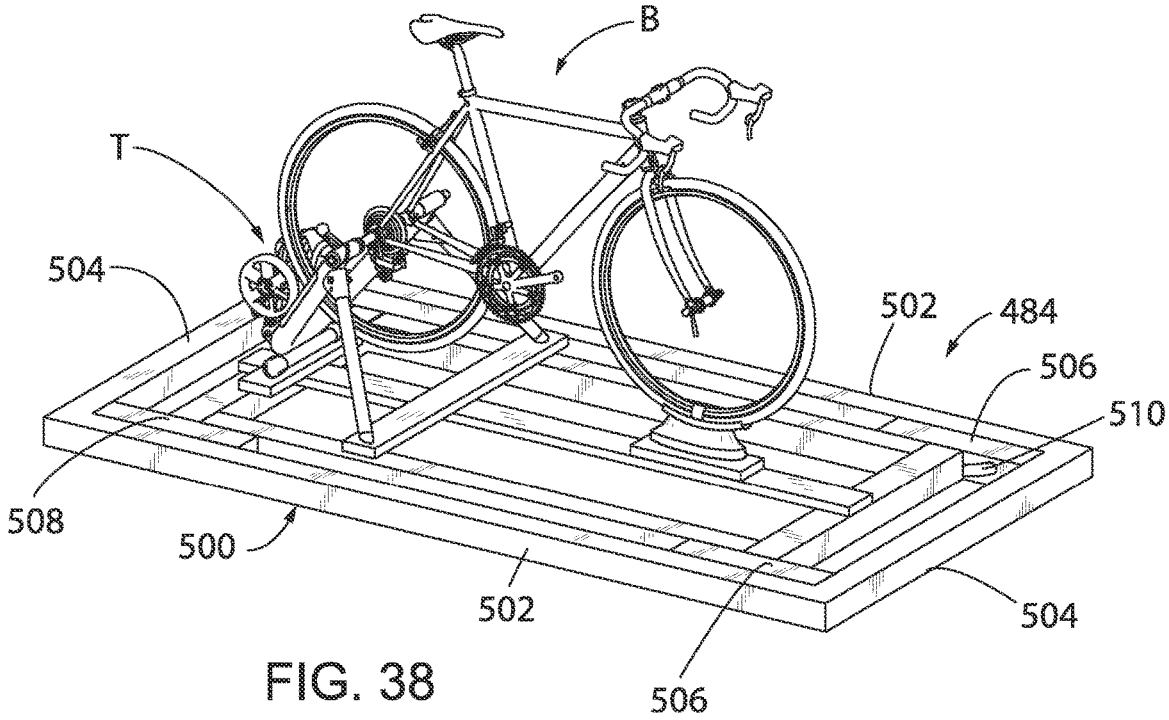
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FIG. 38

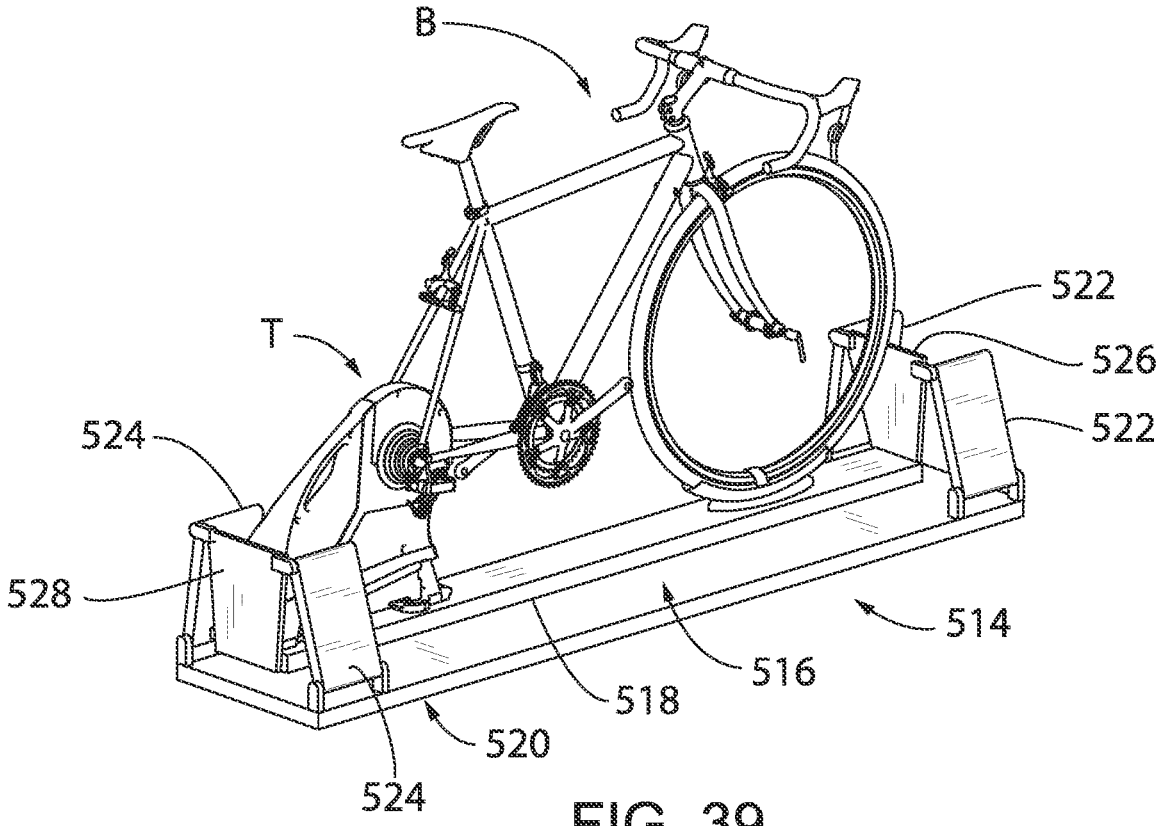

FIG. 39

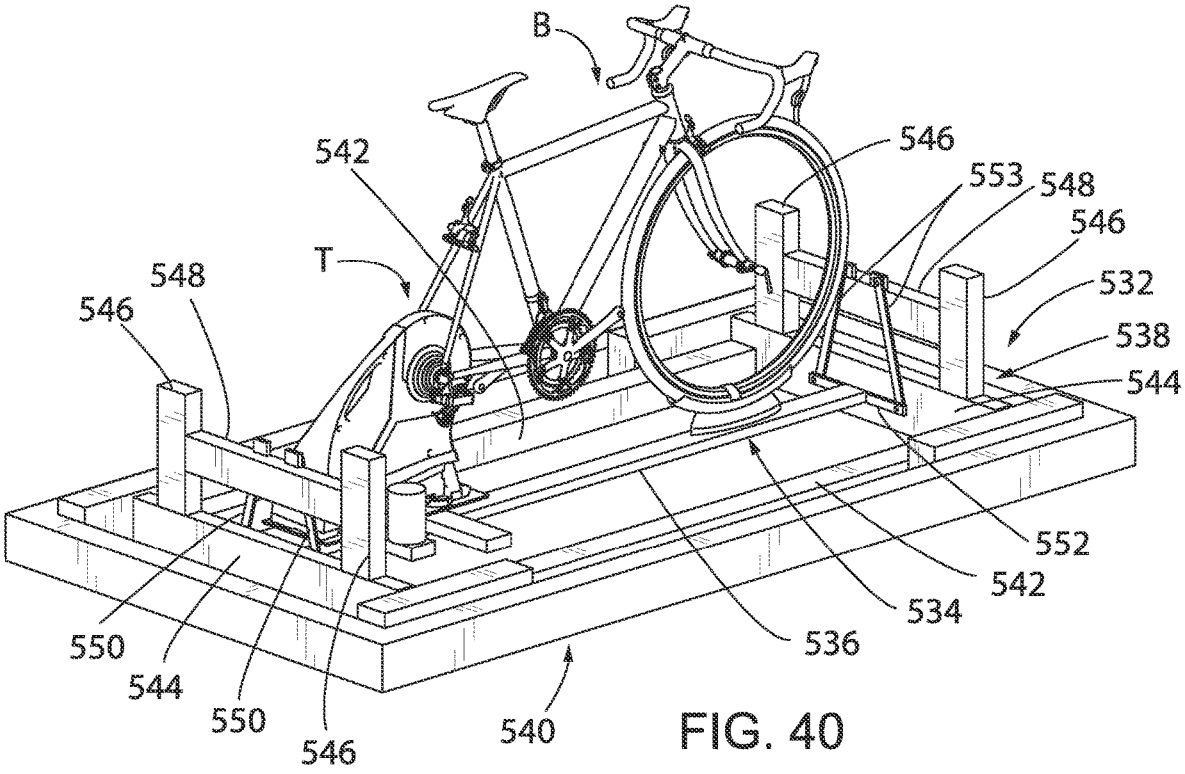
B
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FIG. 40

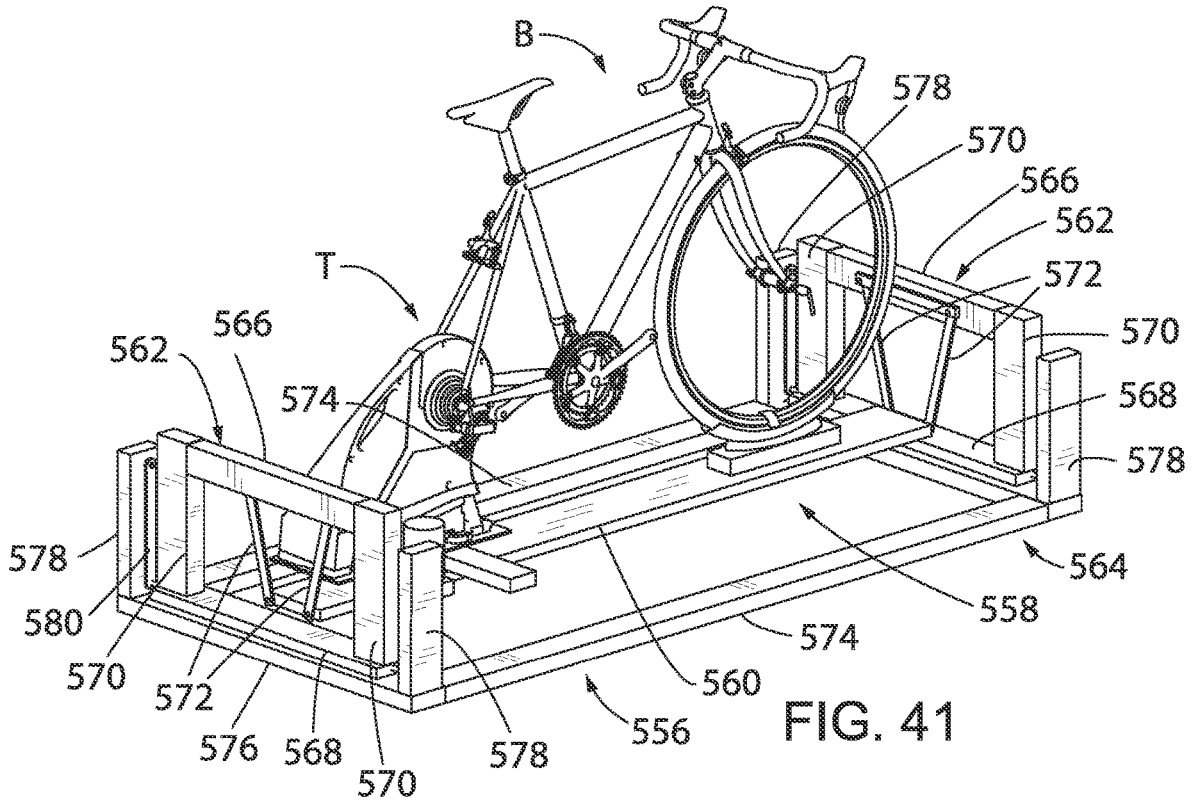
B
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FIG. 41

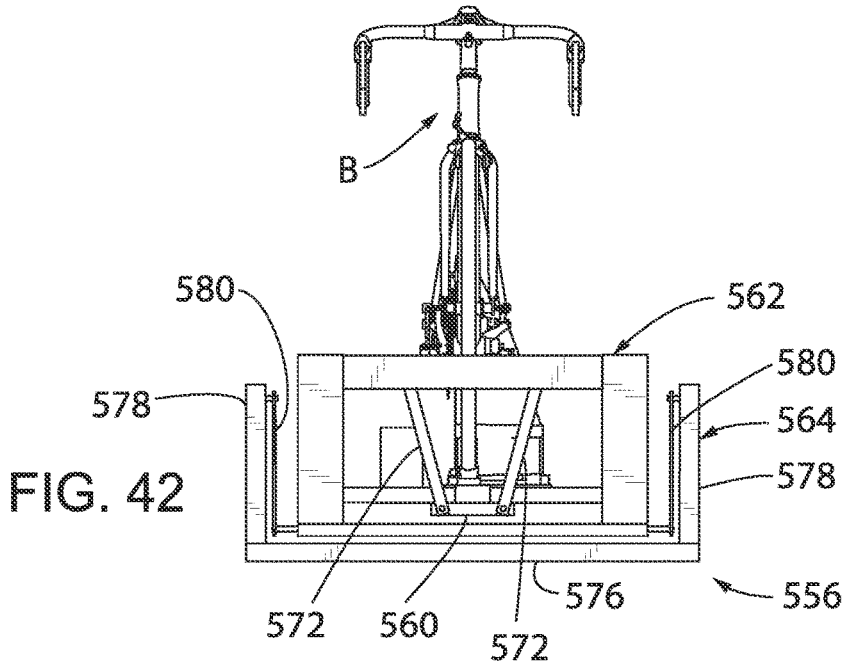
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FIG. 42

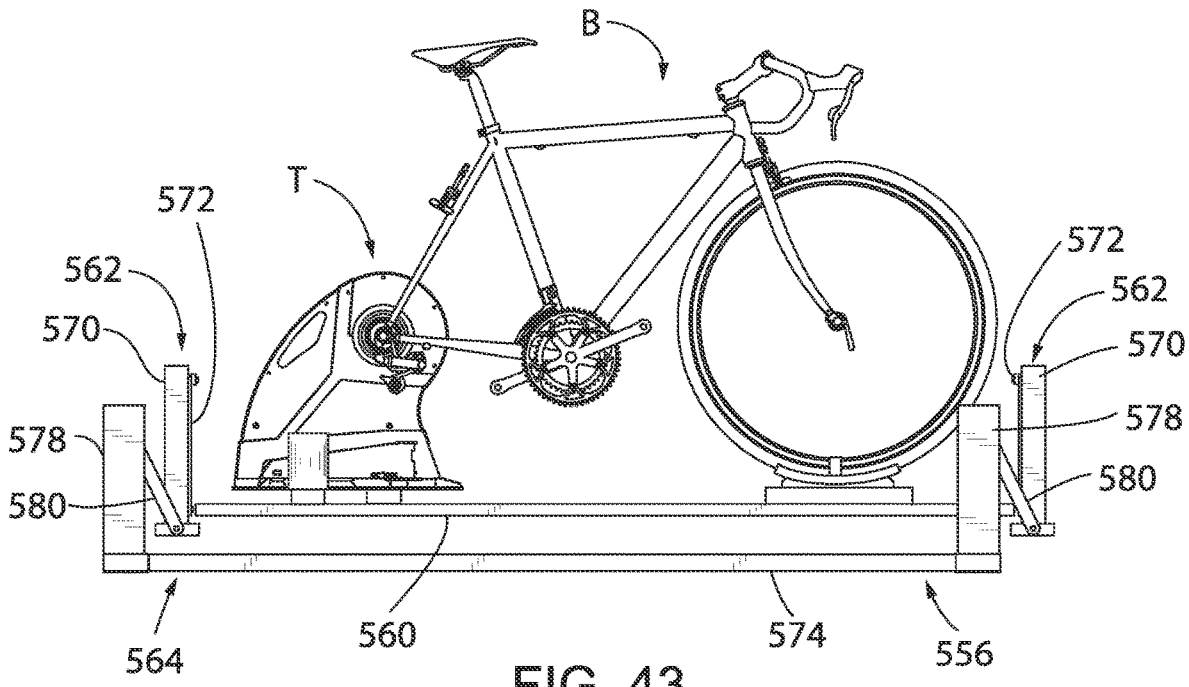

FIG. 43

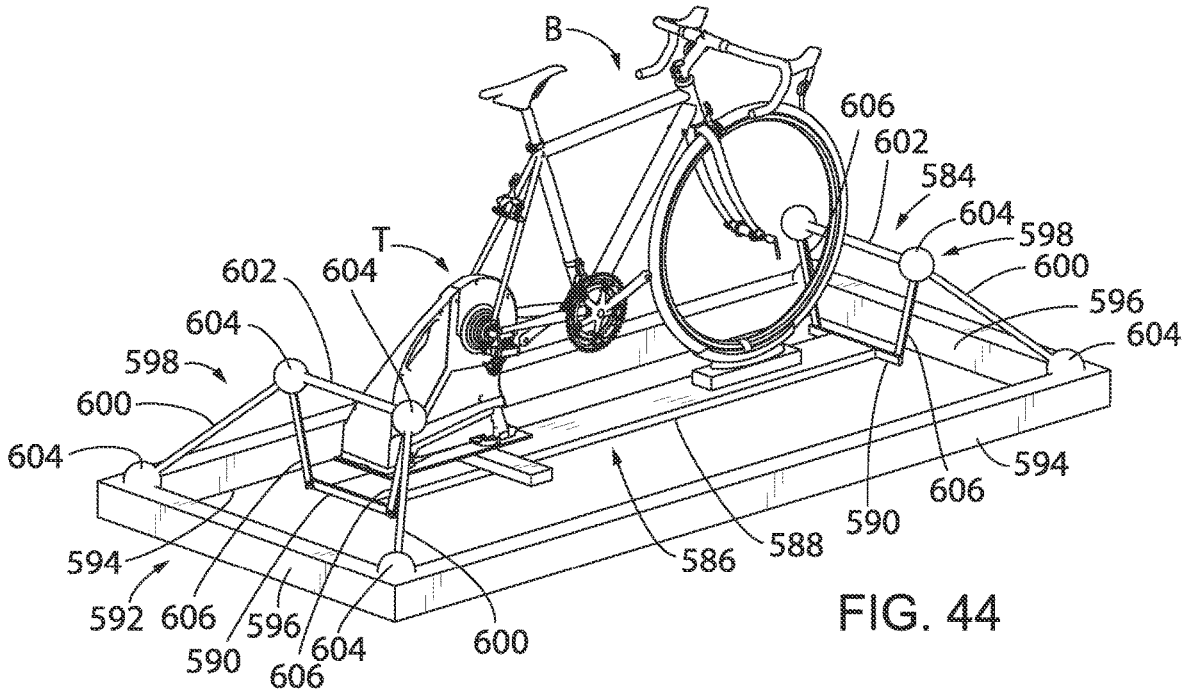
B
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FIG. 44

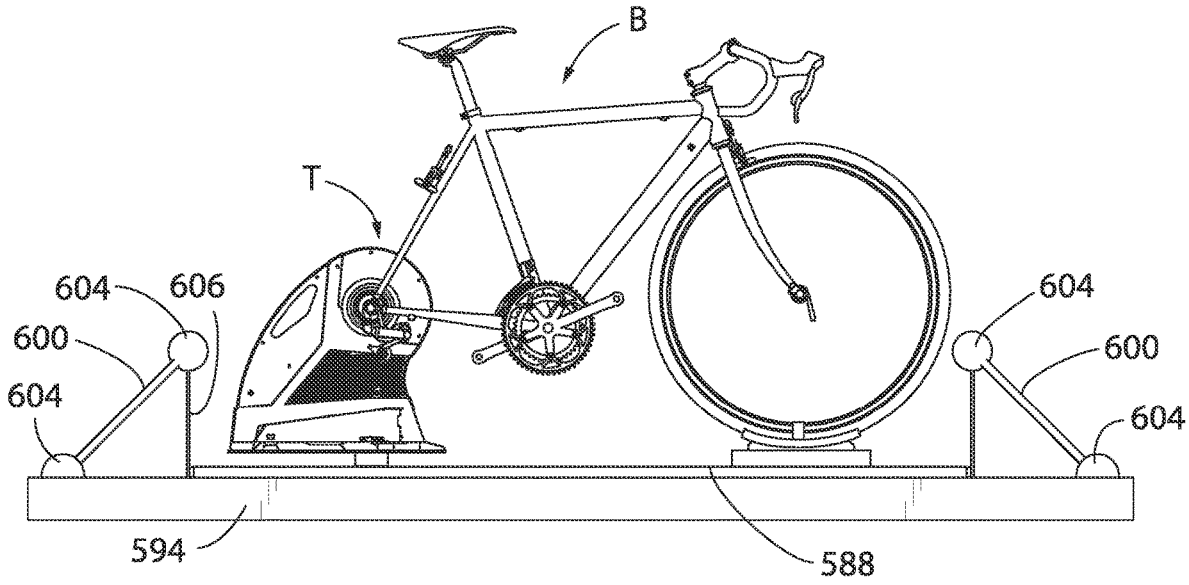
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FIG. 45

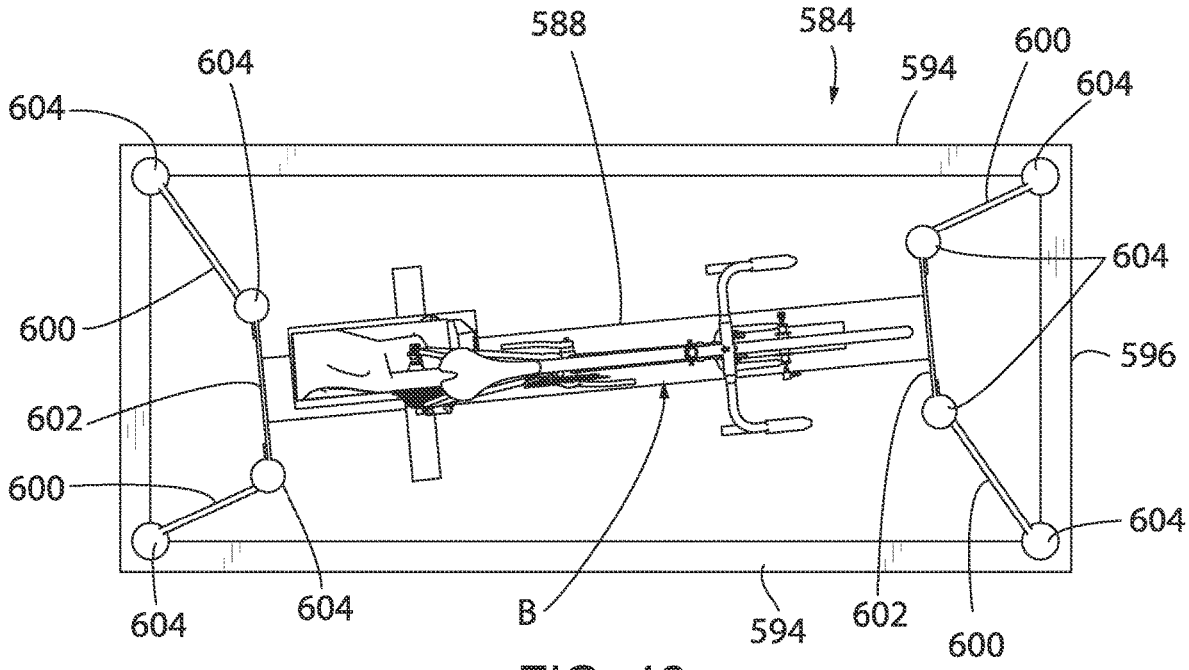
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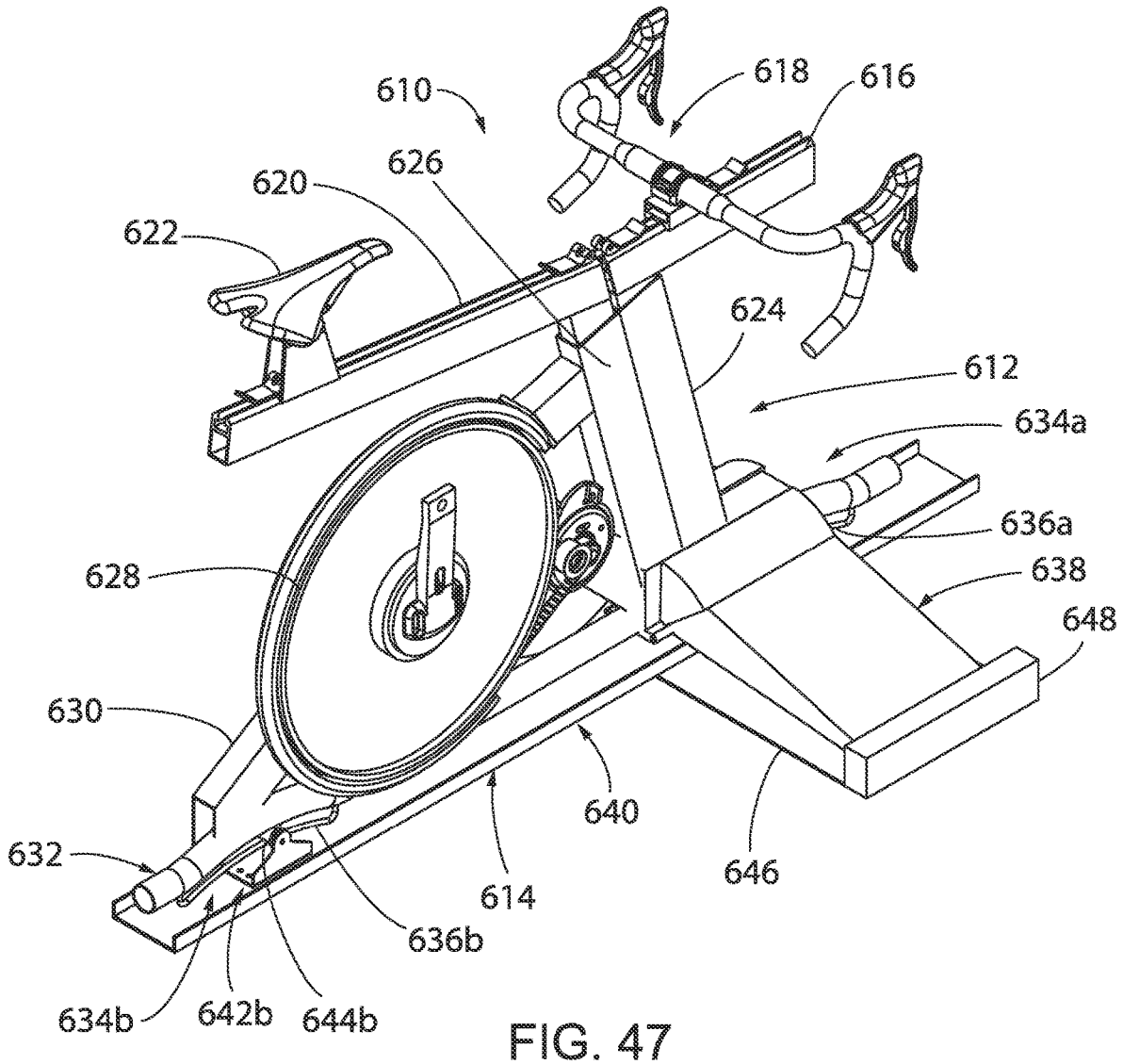
FIG. 46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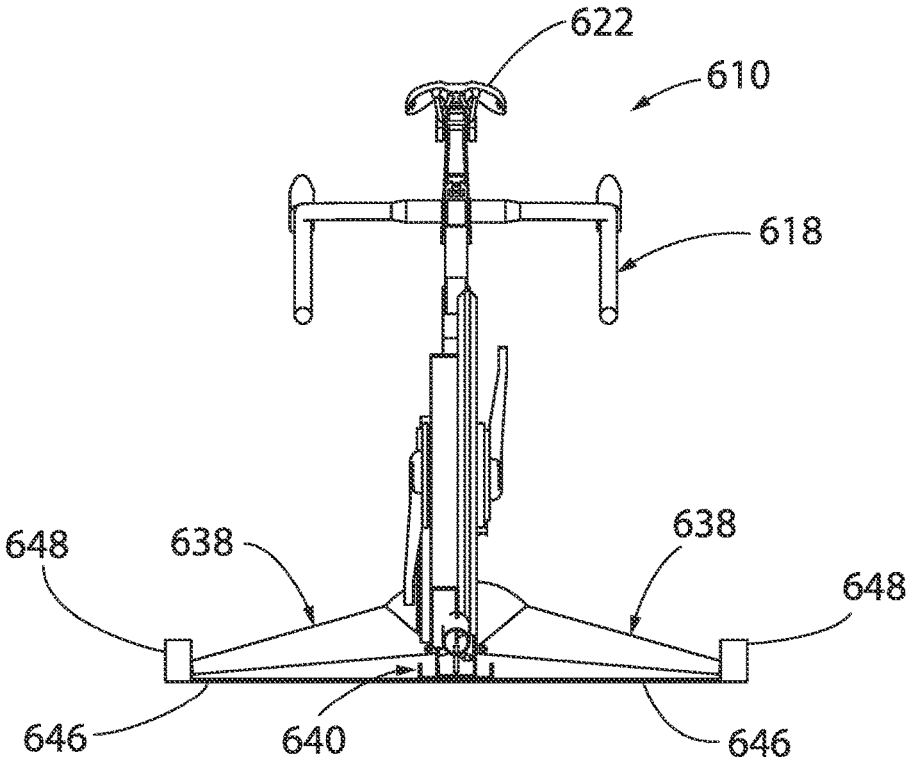
636b
634b
642b
644b

FIG. 47


622
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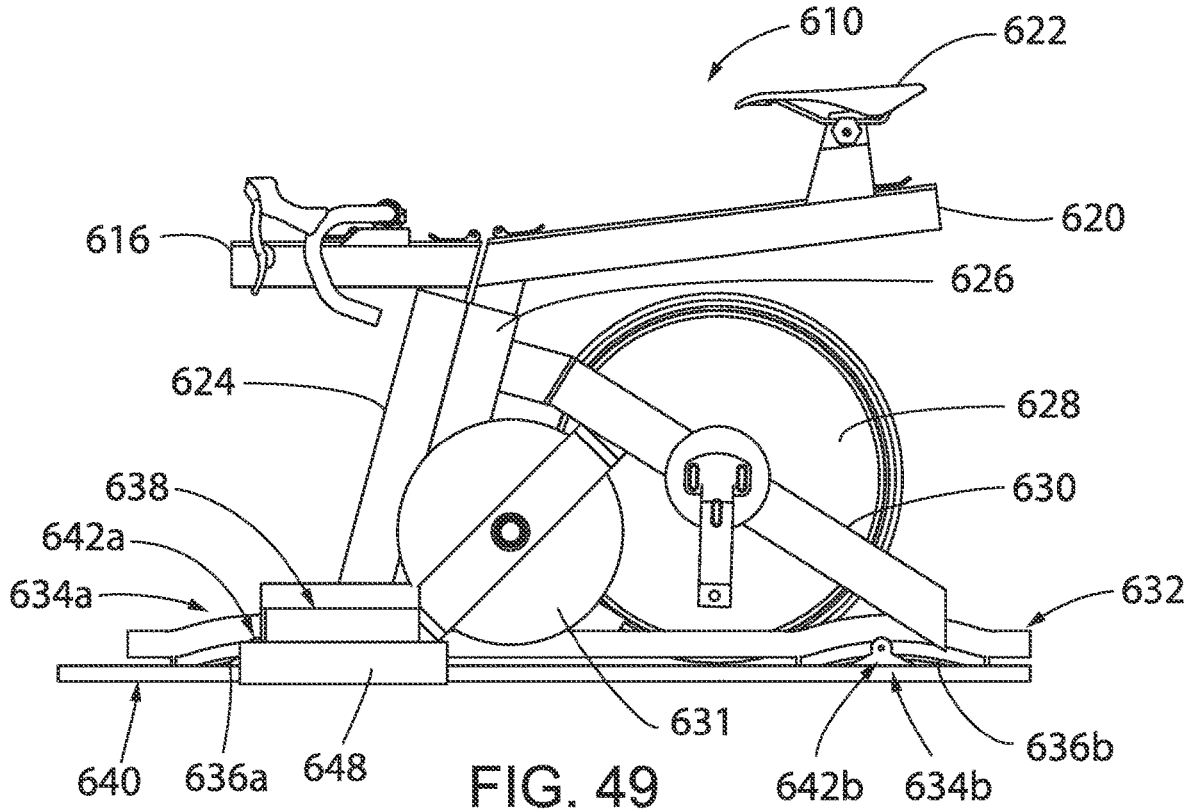
646

FIG. 48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636b

FIG. 49

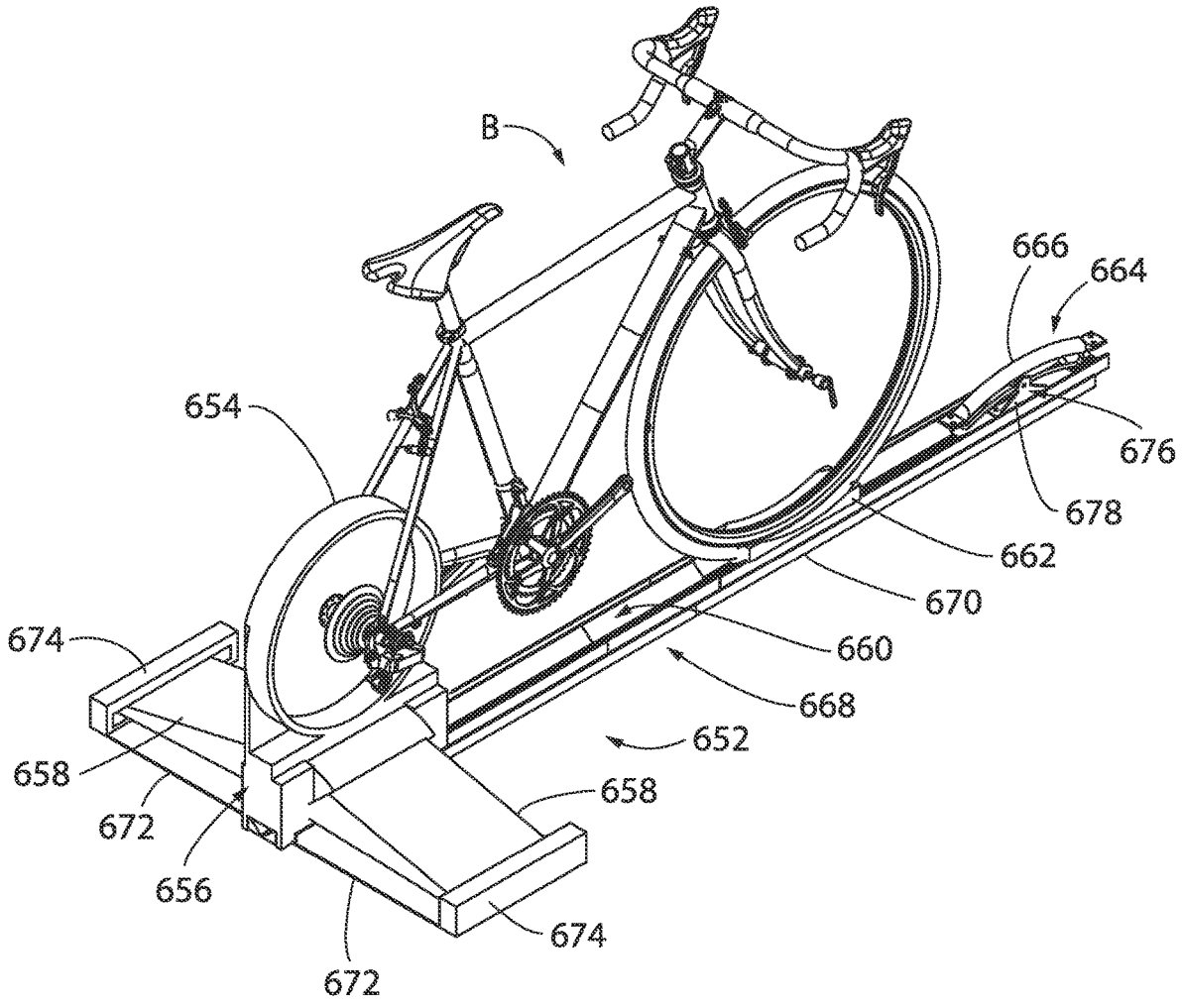
B
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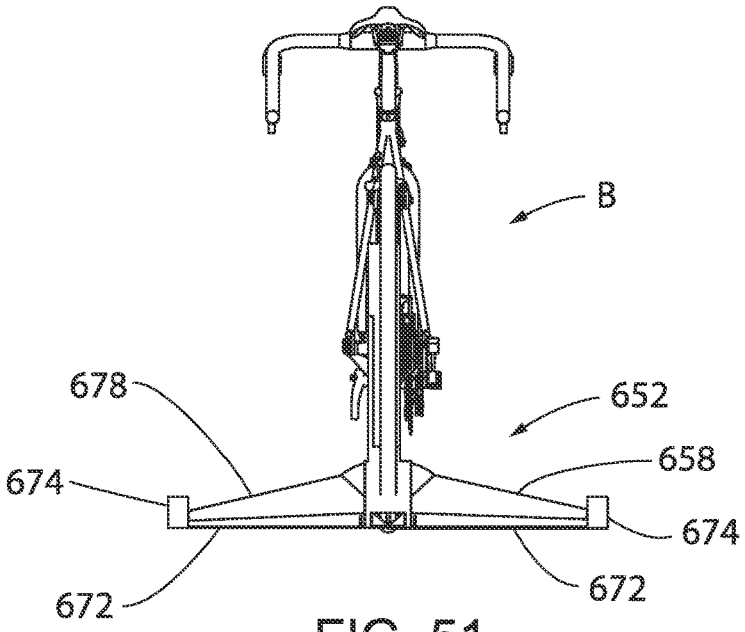
FIG. 50


B
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674
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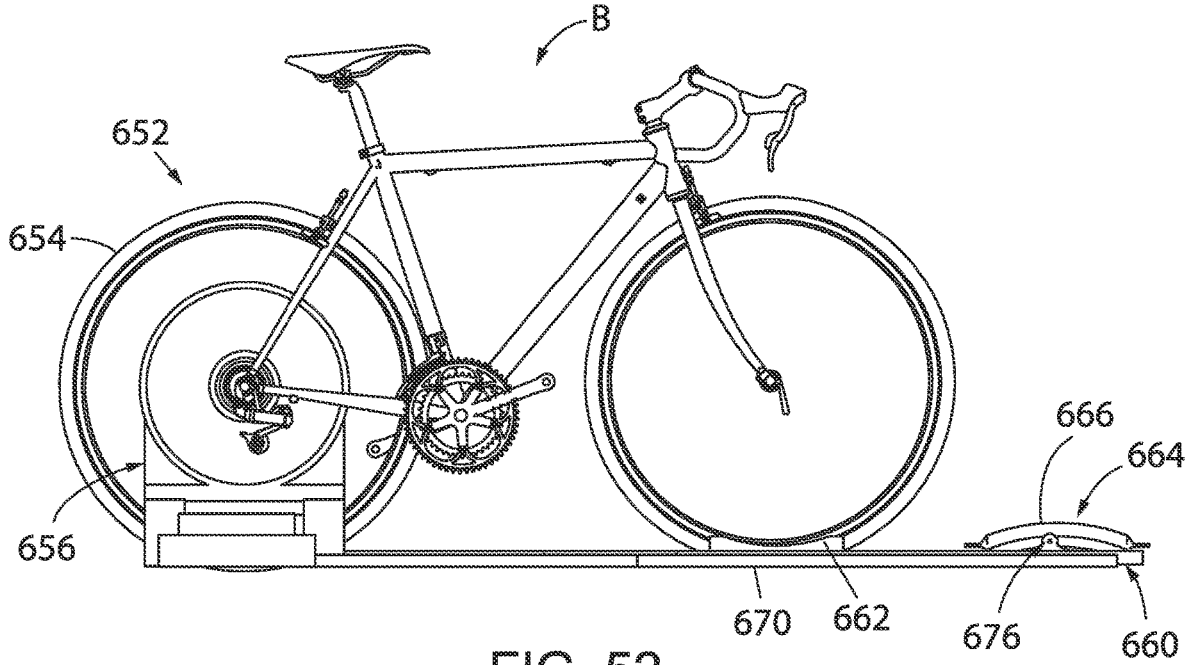
FIG. 51


B
652
654
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664
656
670
662
676
660

FIG. 52

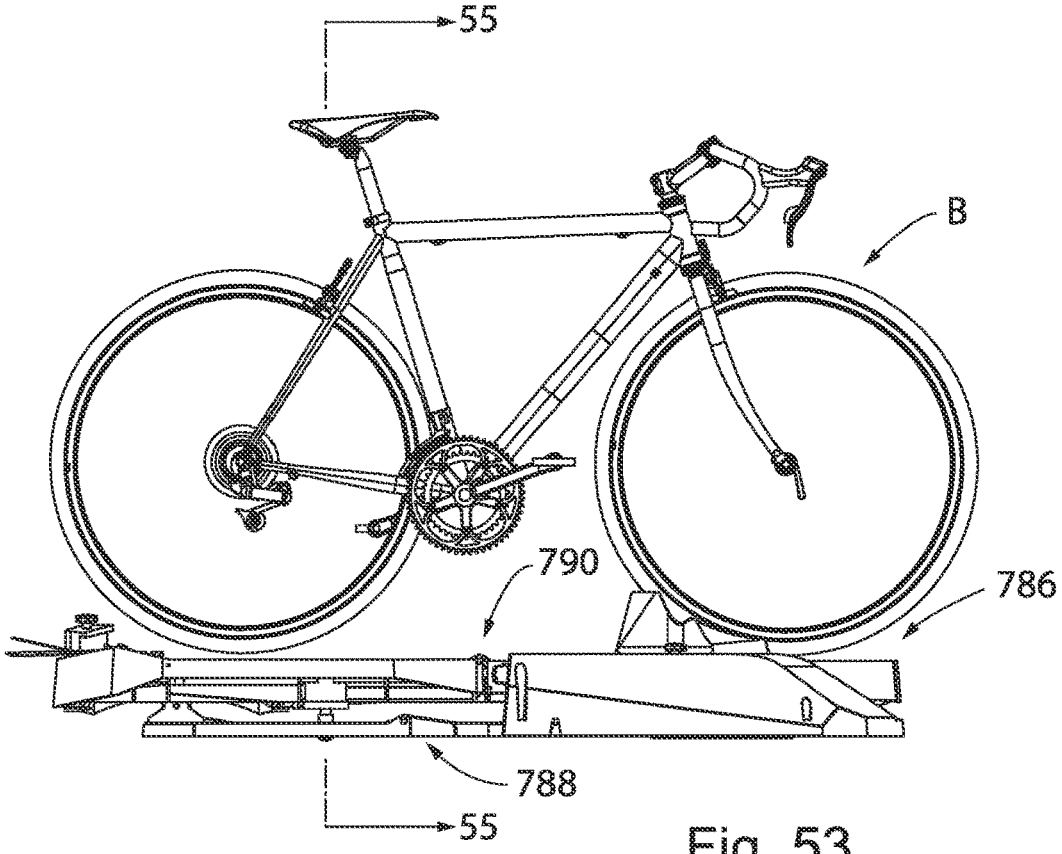


Fig. 53

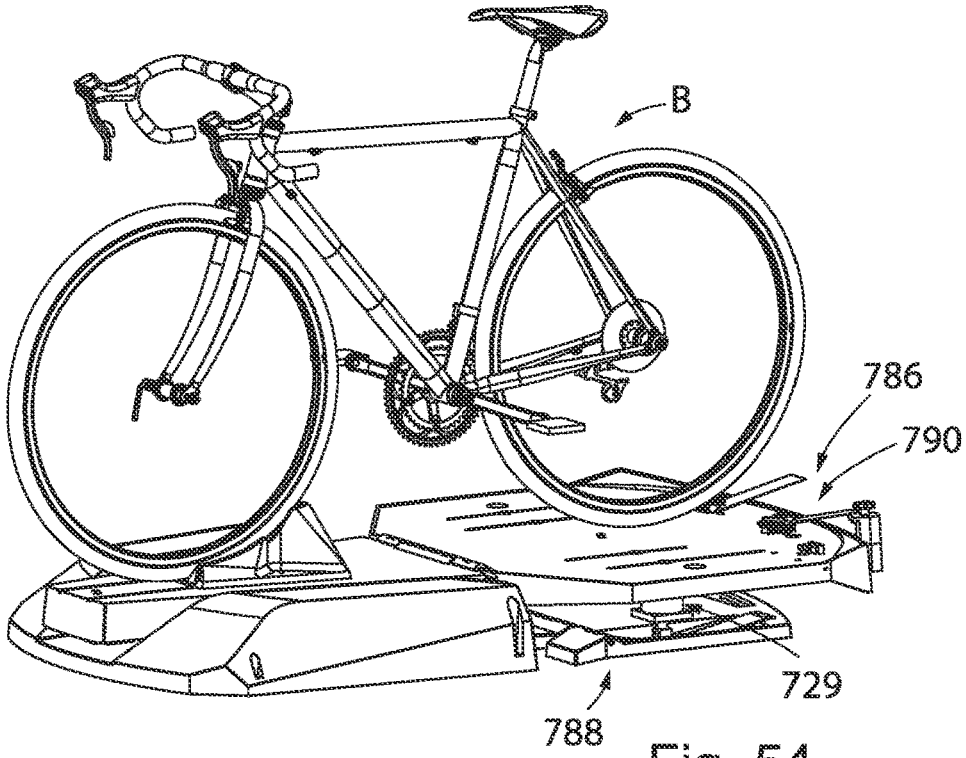
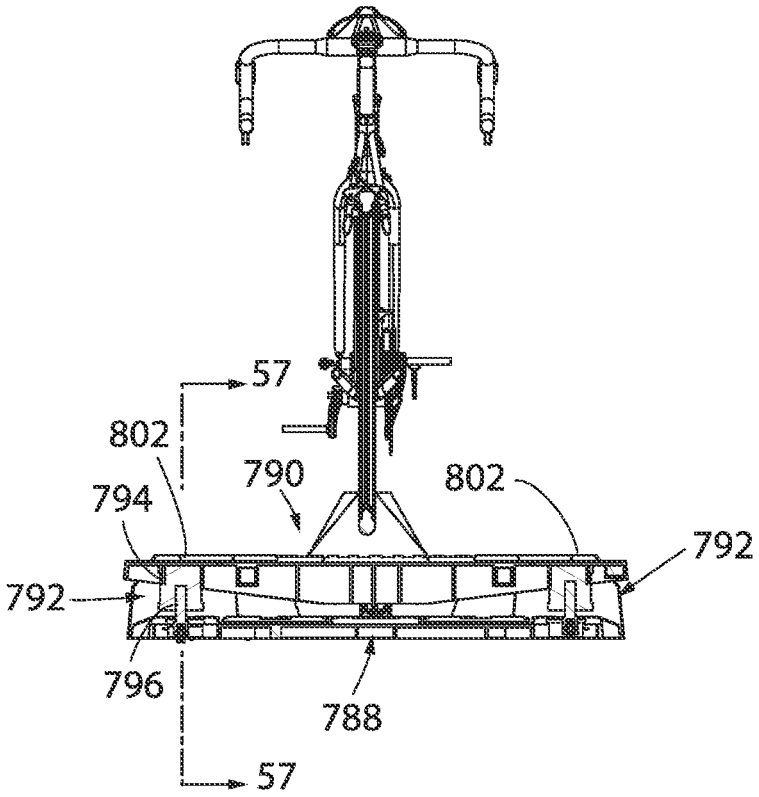


Fig. 54


57
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790
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794
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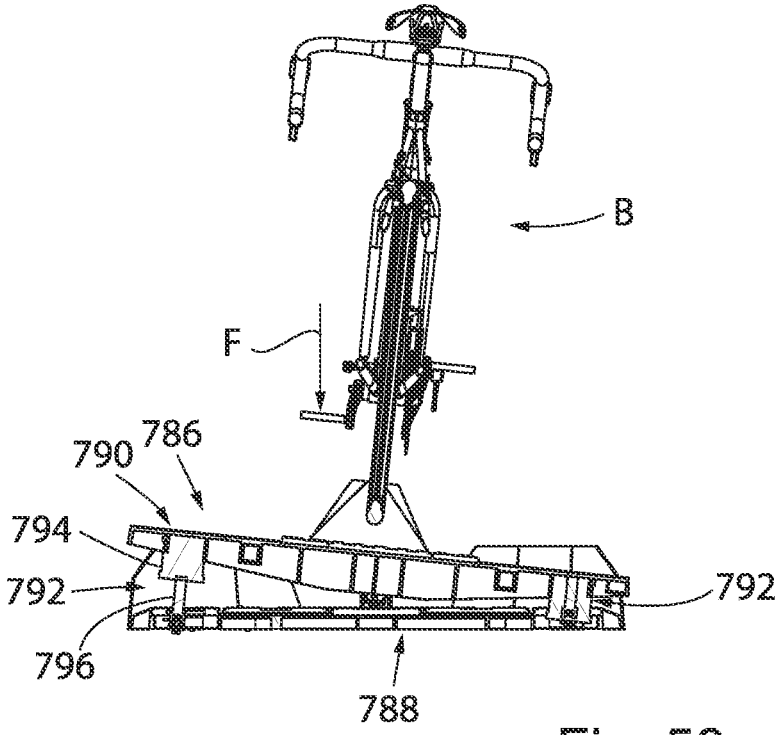
57

Fig. 55


B
F
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786
794
792
792
796
788

Fig. 56

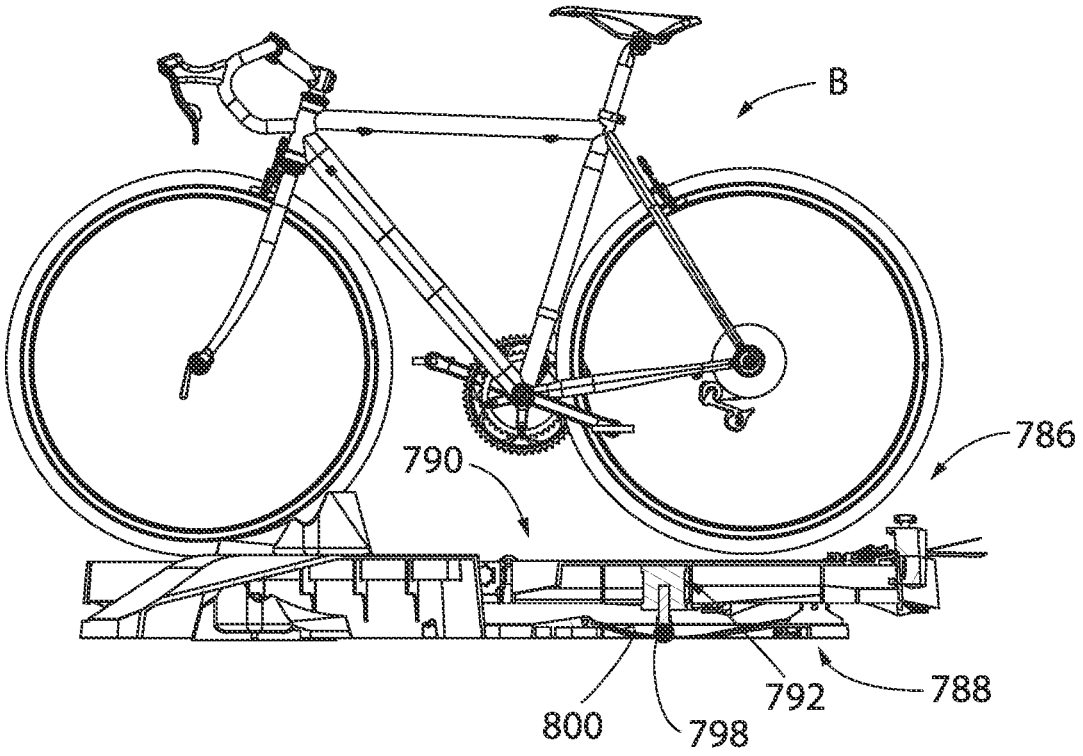

FIG. 57

MOVABLE SUPPORT FOR EXERCISE EQUIPMENT

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. provisional patent application Ser. No. 62/546,748 filed Aug. 17, 2017, and U.S. provisional patent application Ser. No. 62/637,003 filed Mar. 1, 2018, the entire disclosures of which are hereby incorporated by reference.

BACKGROUND AND SUMMARY

Various types of indoor exercise equipment are designed to mimic or simulate exercise activities that are typically done in an outdoor environment. For example, a stationary treadmill allows a user to walk or run indoors as opposed to outdoors. Similarly, a stationary cycle allows the user to experience cycling-type exercise indoors as opposed to outdoors. As an example of the latter, a conventional bicycle can be mounted to an indoor bicycle trainer, which allows the user to adapt a bicycle, which is typically used outdoors, for use in an indoor environment.

While actual outdoor conditions cannot be exactly replicated when exercising on exercise equipment in an indoor environment, exercise equipment can be configured or controlled to simulate outdoor conditions. For example, in the case of the treadmill, the incline of the treadmill belt can be adjusted to simulate running or walking uphill or downhill. Stationary cycles and bicycle trainers, which most commonly are positioned upright and horizontal, have been designed to include features that allow the stationary cycle or bicycle and trainer combination to tilt side-to-side and to adjust an angle of inclination either upwardly or downwardly.

It is an object of the present invention to enable a user to more realistically experience movement that occurs in an outdoor environment when using an item of exercise equipment in an indoor environment. It is another object of the invention to provide movement of an item of exercise equipment in different directions or planes to enhance the user's experience when using the item of exercise equipment. It is a still further object of the invention to provide a support system for an item of exercise equipment that allows movement of the item of exercise equipment in different directions to enhance the user's experience, and that can be either incorporated in the item of exercise equipment during original manufacture or that can be used with existing items of exercise equipment.

In accordance with a first aspect of the invention, an exercise arrangement for use on a support surface includes a user support and input arrangement that is configured to support a user and that includes a user force input arrangement, and a movable support arrangement interposed between the support surface and the user support and input arrangement. The movable support arrangement is movable in a first fore-aft direction that includes a component that is generally parallel to the support surface, and simultaneously movable in a second direction that is non-parallel to the first direction in response to forces applied by the user to the user force input arrangement. Representatively, movement of the movable support arrangement in the first direction may be movement of the movable support arrangement in an axial or fore-aft direction, and movement of the movable support arrangement in the second direction may be tilting movement of the movable support arrangement about a tilt axis that extends in the axial direction.

In one embodiment, the movable support arrangement may be in the form of a platform that is movably mounted to a base, and the user support and input arrangement may be supported on the platform. The user support and input arrangement may be in the form of a bicycle and a bicycle trainer with which the bicycle is engaged. Alternatively, the user support and input arrangement may be in the form of an item of exercise equipment supported on the platform.

The movable support arrangement may be in the form of a roller and track arrangement interposed between the platform and the base, with the roller and track arrangement providing movement of the platform in the axial direction relative to the base in response to forces applied by the user to the user force input arrangement. The roller and track arrangement may be configured to define an axially neutral position of the platform relative to the base, and also configured to bias the platform toward the axially neutral position. Representatively, the roller and track arrangement may be in the form of one or more curved roller and track engagement surfaces that extend in the axial direction and that provide a gravity bias of the platform toward the neutral position.

The roller and track arrangement may be further configured to provide tilting movement of the movable platform about the tilt axis relative to the base. The movable support arrangement may further include a tilt biasing arrangement for biasing the platform toward a neutral tilt position relative to the base. Representatively, the tilt biasing arrangement may be in the form of a pair of springs between the base and the platform, with the pair of springs being located one on either side of the tilt axis.

In one embodiment, the platform may include a front platform section and a rear platform section that are secured together via a pivot connection, which enables the front and rear platform sections to be positioned in an operative use position and folded together about a transverse pivot axis to a folded storage position.

In accordance with another aspect of the invention, a cycle-type exercise system includes a cycle device, which may include pedals for enabling a user to apply input forces, such as pedaling forces, and a movable support arrangement that supports the cycle device above a supporting surface, with the movable support arrangement providing movement of the cycle device in a fore-aft direction along a longitudinal axis and simultaneous tilting movement of the cycle device about a tilt axis that is generally parallel to the longitudinal axis, in response to input forces applied by the user to the pedals of the cycle device. In one form, the cycle device is in the form of a bicycle engaged with a bicycle trainer. In this embodiment, the movable support arrangement is in the form of a platform on which the bicycle and trainer are supported, and a base interposed between the platform and the supporting surface. The platform is mounted to the base for fore-aft movement along the longitudinal axis and for tilting movement about the tilt axis. In another form, the cycle device is in the form of a stationary exercise cycle, and the movable support arrangement is incorporated into a frame of the stationary exercise cycle. In another form, the cycle device is in the form of a bicycle and the movable support is incorporated into the structure of a bicycle trainer with which the bicycle is engaged

In an embodiment in which the cycle device is in the form of a bicycle engaged with a bicycle trainer, the movable support arrangement may include a front support and a rear support, with the front support being configured to support

a front wheel of the bicycle and the rear support being configured to support the bicycle trainer. Each of the front and rear supports includes a roller arrangement that provides movement of the bicycle and the bicycle trainer in the fore-aft direction along the longitudinal axis. The bicycle trainer is mounted to the rear support via an axially extending central support arrangement that provides tilting movement of the bicycle trainer about the tilt axis, and the front wheel of the bicycle is mounted to the front support via a central front wheel support that accommodates movement of the bicycle and the bicycle trainer about the tilt axis. In an embodiment in which the cycle device is in the form of a bicycle engaged with a bicycle trainer, the movable support arrangement includes a front support and a rear support, with the front support being configured to support a front wheel of the bicycle and the rear support being configured to support the bicycle trainer. Each of the front and rear supports may include an axial roller arrangement that provides movement of the bicycle and the bicycle trainer in the fore-aft direction along the longitudinal axis, and at least the rear support includes a transverse roller arrangement that provides movement of the bicycle trainer about the tilt axis.

In another embodiment, the movable support arrangement may be in the form of a first support, a second support and a third support, with the bicycle and the bicycle trainer being supported on the first support, the first support being supported on the second support via a first roller arrangement that provides movement of the first support in the fore-aft direction, and the second support being supported on the third support via a second roller arrangement that provides movement of the first second support and the first support about the tilt axis.

In yet another embodiment, the movable support arrangement may be in the form of a first support, a second support and a third support, with the bicycle and the bicycle trainer being supported on the first support, the first support being supported on the second support via a first roller arrangement that provides movement of the first support about the tilt axis, and the second support being supported on the third support via a second roller arrangement that provides movement of the second support and the first support in the fore-aft direction.

In a further embodiment, the movable support arrangement may be in the form of a first support on which the bicycle and the bicycle trainer are supported, a base configured to be positioned on a support surface, and a suspension-type engagement arrangement between the base and the first support, with the suspension-type engagement arrangement providing movement of the first support in both the fore-aft direction and about the tilt axis.

In a still further embodiment, the movable support arrangement may be in the form of a first support, a second support and a base, with the bicycle and the bicycle trainer being positioned on the first support, a suspension-type engagement arrangement being interposed between the first support and the second support for providing movement of the first support about the tilt axis, and a roller arrangement being provided between the second support and the base for providing movement of the second support relative to the base in the fore-aft direction.

In a still further embodiment, the movable support arrangement may be in the form of a first support, a second support and a base, with the bicycle and the bicycle trainer being positioned on the first support, a first suspension-type engagement arrangement being interposed between the first support and the second support for providing movement of the first support about the tilt axis, and a second suspension-type engagement arrangement being interposed between the second support and the base for providing movement of the second support in the fore-aft direction.

In a still further embodiment in which the cycle device is in the form of a bicycle engaged with a resistance device, the movable support arrangement may include a base positioned on a support surface, a support on which the bicycle and the bicycle trainer are positioned, a pair of front support arms extending from the base, a pair of rear support arms extending from the base, a suspension-type engagement arrangement interposed between the support and the front and rear support arms for providing movement of the support about the tilt axis, and a pivot connection associated with the front and rear support arms for providing movement of the support in the fore-aft direction.

In a still further embodiment in which the cycle device includes a frame, the movable support arrangement may include a base adapted to be supported on a support surface and a roller and track arrangement interposed between the frame and the base. The roller and track arrangement provides movement of the frame in the fore-aft direction relative to the base in response to forces applied by the user to the user force input arrangement, and further provides tilting movement of the frame about the tilt axis relative to the base. The movable support arrangement includes a fore-aft biasing arrangement for biasing the frame toward a neutral fore-aft position and a tilt biasing arrangement for biasing the frame toward a neutral tilt position. The roller and track arrangement includes one or more curved roller and track engagement surfaces between the frame and the base that extend in the fore-aft direction and that provide a gravity bias of the frame toward the neutral fore-aft position. The frame may include a pair of stabilizers or outriggers, and the tilt biasing arrangement acts on the pair of stabilizers or outriggers for biasing the frame toward the neutral tilt position.

In a still further embodiment in which the cycle device is in the form of a bicycle engaged with a resistance device, the movable support arrangement includes a base positioned on a support surface, a support with which the bicycle and the resistance device are engaged, and a roller and track arrangement interposed between the support and the base. The roller and track arrangement provides movement of the support in the fore-aft direction relative to the base in response to forces applied by the user to the user force input arrangement, and further provides tilting movement of the support about the tilt axis relative to the base. The movable support arrangement includes a fore-aft biasing arrangement for biasing the support toward a neutral fore-aft position and a tilt biasing arrangement for biasing the support toward a neutral tilt position. The roller and track arrangement may include one or more curved roller and track engagement surfaces between the support and the base that extend in the fore-aft direction and that provide a gravity bias of the support toward the neutral fore-aft position. The support may include a pair of stabilizers or outriggers, and the tilt biasing arrangement acts on the pair of stabilizers or outriggers for biasing the support toward the neutral tilt position.

In accordance with yet another aspect of the invention, a support for an exercise arrangement that includes a cycle device with pedals for enabling a user to apply input pedaling forces includes a base adapted to be positioned on a support surface and a movable support engaged with the base and that is configured to support the cycle device above the base. The movable support is movably mounted to the base for movement in a fore-aft direction along a longitu-

dinal axis in response to input pedaling forces applied by the user to the pedals of the cycle device. The movable support is further movably mounted to the base for simultaneous tilting movement of the cycle device about a tilt axis that is coincident with the longitudinal axis. The cycle device may be in the form of a bicycle and trainer combination or a cycle-type exercise device. In one form, the movable support may be in the form of a platform mounted to the base for movement in the fore-aft direction and for movement about the tilt axis. The platform may include a front platform section and a rear platform section that are secured together via a pivot connection that enables the front and rear platform sections to be positioned in an operative use position and folded together about a transverse pivot axis to a folded storage position.

In accordance with a still further aspect of the invention, a cycle-type exercise device includes a frame configured to support a user, a pedal arrangement movably mounted to the frame for enabling a user to apply input pedaling forces, and a support structure to which the frame is secured and that supports the frame above a support surface. The support structure provides movement of the frame in a fore-aft direction along a longitudinal axis in response to input pedaling forces applied by the user to the pedal arrangement. The support structure may further provide tilting movement of the frame about a tilt axis that is coincident with the longitudinal axis in response to input pedaling forces applied by the user to the pedal arrangement. Representatively, the support structure may include a base positioned on the support surface, and the frame includes a movable mounting arrangement by which the frame is mounted to the base, with the movable mounting arrangement providing movement of the frame in both the fore-aft direction along the longitudinal axis and tilting movement of the frame about the tilt axis. The movable mounting arrangement may include a roller and track arrangement interposed between the frame and the base, and the roller and track arrangement may provide movement of the frame in the fore-aft direction relative to the base and tilting movement of the frame about the tilt axis relative to the base in response to forces applied by the user to the pedal arrangement. The roller and track arrangement is configured to define an axially neutral position of the frame relative to the base in the fore-aft direction, and is further configured to bias the frame toward the axially neutral position. The roller and track arrangement may further include one or more curved roller and track engagement surfaces that extend in the fore-aft direction and that provide a gravity bias of the base toward the neutral position.

Other aspects, features and advantages of the invention will become apparent to those skilled in the art from the following detailed description and accompanying drawings. It should be understood, however, that the detailed description and specific examples, while indicating certain embodiments of the present invention, are given by way of illustration and not of limitation. Many changes and modifications may be made within the scope of the present invention without departing from the spirit thereof, and the invention includes all such modifications.

BRIEF DESCRIPTION OF THE DRAWINGS

A clear conception of the advantages and features constituting the present invention, and the construction and operation of typical mechanisms provided with the present invention, will become more readily apparent by referring to the exemplary, and therefore non-limiting, embodiments illustrated in the drawings accompanying and forming a part of this specification, wherein like reference numerals designate the same elements can be several views, and in which:

FIG. **1** is an isometric view of an embodiment of a movable support for an item of exercise equipment in accordance with the present invention, in which the item of exercise equipment is in the form of a bicycle mounted to a bicycle trainer;

FIG. **2** is a side elevation view of the movable exercise equipment support and bicycle and trainer combination of FIG. **1**;

FIG. **3** is a view similar to FIG. **2**, showing the movable exercise equipment support without the bicycle and trainer combination;

FIG. **4** is an end elevation view of the movable exercise equipment support of FIGS. **1-3**, showing tilting movement of the support in a first direction;

FIG. **5** is an end elevation view of the movable exercise equipment support of FIGS. **1-4**, showing tilting movement of the support in a second direction opposite the first direction;

FIG. **6** is a bottom plan view of the movable exercise equipment support of FIGS. **1-5**;

FIG. **7** is a top plan view of the movable exercise equipment support of FIGS. **1-6**;

FIG. **8** is an isometric view of a base and frame forming a part of the movable exercise equipment support of FIGS. **1-7**;

FIG. **9** is a side elevation view of the movable exercise equipment support base and frame of FIG. **8**;

FIG. **10** is a view similar to FIG. **9**, showing axial or fore-aft movement of the frame relative to the base in a first direction;

FIG. **11** is a view similar to FIGS. **9** and **10**, showing axial or fore-aft movement of the frame relative to the base in a second direction opposite the first direction

FIG. **12** is a top plan view of the movable exercise equipment support base and frame of FIG. **8**;

FIG. **13** is isometric view of the underside of the movable exercise equipment support of FIGS. **1-7**;

FIG. **14** is an enlarged partial isometric view of the portion of FIG. **13** designated by the line **14-14**;

FIGS. **15** and **16** are views similar to FIGS. **9** and **10**, respectively, showing the base and frame portions of the movable exercise equipment support with a platform portion of the movable exercise equipment support removed;

FIG. **17** is a partial section view taken along line **17-17** of FIG. **14**;

FIG. **18** is a side elevation view, partially in section, showing an embodiment of a biasing arrangement incorporated into the movable exercise equipment support of FIGS. **1-8**, with reference to line **18-18** of FIG. **8**;

FIG. **19** is an isometric view of another embodiment of a movable exercise equipment support in accordance with the present invention, showing the movable exercise equipment support in an operative, use configuration;

FIG. **20** is an end elevation view of the movable exercise equipment support of FIG. **19**;

FIG. **21** is a longitudinal section view taken along line **21-21** of FIG. **20**;

FIG. **22** is a partial section view similar to FIG. **18**, showing a tilt biasing arrangement incorporated into the movable exercise equipment support of FIG. **19**;

FIG. **23** is an isometric view of the movable exercise equipment support of FIGS. **19-22**, showing the movable exercise equipment support in an inoperative, folded configuration;

FIG. **24** is a side elevation view of the folded movable exercise equipment support of FIGS. **19-23**;

FIG. **24***a* is an isometric view of an embodiment of a movable exercise equipment support similar to that shown in FIGS. **19-25**, showing a bicycle and trainer positioned on the exercise equipment support;

FIG. **24***b* is a side elevation view of the movable exercise equipment support of FIG. **24***a;*

FIG. **24***c* is a longitudinal section view of the movable exercise equipment support of FIG. **24***a;*

FIG. **24***d* is a partial isometric view showing a portion of the movable exercise equipment support of FIG. **24***a* and a coupling mechanism incorporated therein, in which the coupling mechanism is shown in a retracted or inoperative position;

FIG. **24***e* is a view similar to FIG. **24***d*, showing the coupling mechanism in an extended or operative position;

FIG. **24***f* is a partial section view taken along line **24***f*-**24***f* of FIG. **24***d;*

FIG. **24***g* is a partial section view taken along line **24***g*-**24***g* of FIG. **24***e;*

FIG. **24***h* is an isometric view of a movable coupling member incorporated into the coupling mechanism of FIGS. **24***d*-**24***g;*

FIG. **24***i* is a section view taken along line **24***i*-**24***i* of FIG. **24***h;*

FIG. **24***j* is an isometric view of another embodiment of a movable exercise equipment support in accordance with the present invention;

FIG. **24***k* is a front elevation view of the movable exercise equipment support of FIG. **24***j;*

FIG. **24***l* is a side elevation view of the movable exercise equipment support of FIG. **24***j;*

FIG. **24***m* is a longitudinal section view of the movable exercise equipment support of FIG. **24***j;*

FIG. **25** is an isometric view of another embodiment of a movable exercise equipment support in accordance with the present invention;

FIG. **26** is a partial isometric view showing a rear portion of the movable exercise equipment support of FIG. **25**;

FIG. **27** is a section view taken along line **27-27** of FIG. **26**;

FIG. **28** is a partial section view taken along line **28-28** of FIG. **26**;

FIG. **29** is an isometric view of another embodiment of a movable exercise equipment support in accordance with the present invention;

FIG. **30** is a rear elevation view of the movable exercise equipment support of FIG. **29**;

FIG. **31** is a view similar to FIG. **30**, showing in alternative embodiment for providing movement of the exercise equipment about the tilt axis;

FIG. **32** is view similar to FIGS. **30** and **31**, illustrating tilting movement of the exercise equipment in the embodiments of FIGS. **29-31**;

FIG. **33** is an isometric view of another embodiment of a movable exercise equipment support in accordance with the present invention;

FIG. **34** is an exploded isometric view illustrating components of another embodiment of a movable exercise equipment support in accordance with the present invention;

FIG. **35** is an isometric view of another embodiment of a movable exercise equipment support in accordance with the present invention;

FIG. **36** is top plan view of the movable exercise equipment support of FIG. **35**;

FIG. **37** is an isometric view of another embodiment of a movable exercise equipment support in accordance with the present invention;

FIG. **38** is a view similar to FIG. **37**, showing a bicycle and trainer secured to the movable exercise equipment support;

FIG. **39** is an isometric view of another embodiment of a movable exercise equipment support in accordance with the present invention;

FIG. **40** is an isometric view of another embodiment of a movable exercise equipment support in accordance with the present invention;

FIG. **41** is an isometric view of another embodiment of a movable exercise equipment support in accordance with the present invention;

FIG. **42** is a front elevation view of the movable exercise equipment support of FIG. **41**;

FIG. **43** is a side elevation view of the movable exercise equipment support of FIGS. **41** and **42**;

FIG. **44** is an isometric view of another embodiment of a movable exercise equipment support in accordance with the present invention

FIG. **45** is side elevation view of the movable exercise equipment support of FIG. **44**;

FIG. **46** is a top plan view of the movable exercise equipment support of FIGS. **44** and **45**;

FIG. **47** is an isometric view of an item of exercise equipment, in the form of a stationary cycle, which incorporates a movable support in accordance with the present invention;

FIG. **48** is a rear elevation view of the item of exercise equipment of FIG. **47**;

FIG. **49** is side elevation view of the item of exercise equipment of FIGS. **47** and **48**;

FIG. **50** is an isometric view of a bicycle trainer incorporating a movable support in accordance with the present invention;

FIG. **51** is a rear elevation view of the bicycle trainer of FIG. **50**;

FIG. **52** is a side elevation view of the bicycle trainer of FIGS. **50** and **51**;

FIG. **53** is a side elevation view of another embodiment of a movable exercise equipment support in accordance with the present invention;

FIG. **54** is an isometric view of the movable exercise equipment support of FIG. **53**;

FIG. **55** is a section view taken along line **55-55** of FIG. **53**;

FIG. **56** is a view similar to FIG. **55**, showing tilting movement of the movable exercise equipment support; and

FIG. **57** is a section view taken along line **57-57** of FIG. **55**.

In describing the embodiments of the invention which are illustrated in the drawings, specific terminology will be resorted to for the sake of clarity. However, it is not intended that the invention be limited to the specific terms so selected and it is to be understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose. For example, the words "connected," "attached," or terms similar thereto are often used. They are not limited to direct connection or attachment, but include connection or attachment to other elements where such connection or attachment is recognized as being equivalent by those skilled in the art.

DETAILED DESCRIPTION

The various features and advantageous details of the subject matter disclosed herein are explained more fully

with reference to the non-limiting embodiments described in detail in the following description.

Referring to the following description in which like reference numerals represent like parts throughout the disclosure, a first embodiment of a movable exercise equipment support in accordance with the present invention is shown generally at **100** in FIGS. **1-18**. In this embodiment, the movable exercise equipment support **100** is separate from, but adapted to support, an item of exercise equipment. In the illustrated embodiment, the item of exercise equipment is in the form of a bicycle B engaged with a bicycle trainer T. The bicycle trainer T is illustrated as a relatively conventional trainer that engages the rear wheel of the bicycle B and provides resistance when the user applies input forces to the pedals of bicycle B, in a manner as is known. Trainers of this type are commonly available, such as under the brand CycleOps manufactured by Saris Cycling Group, Inc. of Madison Wis. It is understood, however, that any other type of bicycle trainer, such as a director drive trainer, may be employed. It is further understood that the item of exercise equipment supported by the movable exercise equipment support **100** need not be limited to equipment such as a bicycle and trainer combination, and that any type of stationary exercise equipment to which repetitive or cyclic forces are applied by a user during operation may be employed.

The movable exercise equipment support **100** generally includes a base **102** that is adapted to be positioned on a supporting surface such as a floor, a platform **104**, and a frame **106**. The bicycle B and trainer T are positioned on an upwardly facing surface defined by the platform **104**. The platform **104** is secured to the frame **106**, and the frame **106** is movably mounted to the base **102**, in a manner to be explained. The frame **106** is movable relative to the base **102** in response to input forces applied by the user to the pedals of bicycle B during use, as will also be explained. In a first direction of movement, as shown in FIGS. **4** and **5**, the platform **104** and frame **106** are movable in clockwise and counterclockwise directions about a longitudinal tilt axis, which enables the bicycle B, trainer T and the user to move from side-to-side in response to input forces applied by the user to the pedals of bicycle B.

As shown in FIGS. **6** and **8**, the base **102** may be formed of tubular metal members that are secured together in a generally rectangular configuration, although other satisfactory materials and configurations may be employed. In the illustrated embodiment, the base **102** includes a pair of side members **108***a*, **108***b* and a pair of end members **110***a*, **110***b*. A bracket **112***a* is mounted to the end member **110***a*, and a bracket **112***b* is mounted to the end member **110***b*. The bracket **112***a* rotatably supports a grooved roller **114***a*, and the bracket **112***b* rotatably supports a grooved roller **114***b*.

A step **116** is secured to one of the base side members **108***a*, **108***b*. In the illustrated embodiment, the step **116** includes an upright post **118** that is secured at its lower end to the base side member **108***b*, and a generally horizontal step member **120** secured to the upper end of the post **118**. The step **116** is stationarily secured to the base **102**, and is adapted to support the weight of the user above the platform **104** as the user mounts and dismounts the bicycle B.

In the illustrated embodiment, the frame **106** includes a longitudinal frame member **122** that overlies the base **102** and that extends beyond the ends of base **102**. A series of platform mounting members are located above and secured to the longitudinal frame member **122**. Representatively, the platform mounting members may include a front transverse platform mounting member **124**, an intermediate transverse platform mounting member **126**, and a rear transverse platform mounting member **128**. A rear subframe, which includes a pair of side subframe members **130***a*, **130***b* and an end subframe member **132**, is secured to the rear transverse platform mounting member **128**, extending rearwardly therefrom. A pair of tilt biasing bracket assemblies **134***a*, **134***b*, the construction and operation of which will later be explained, are pivotably mounted to side subframe members **130***a*, **130***b*.

The platform **104** overlies and is secured to the platform mounting members **124**, **126**, **128**, **130***a*, **130***b* and **132** of frame **106**. The platform **104** may be have a generally flat, planar configuration, defining an upwardly facing top surface on which the bicycle B and trainer T can be positioned. If desired, the platform **104** may include a series of holes or apertures, which may receive fasteners, straps, etc. that can be used to secure the bicycle B and trainer T in position. Suitable fasteners are adapted to extend through openings in the platform mounting members **124**, **126**, **128**, **130***a*, **130***b* and **132** and into engagement with the platform **104** for securing the platform **104** to the frame **106**. The platform **104** may have any configuration as desired, and in the illustrated embodiment has a somewhat wider rear area for accommodating the trainer T and a narrower forward area on which the front wheel of the bicycle B is positioned.

The longitudinal frame member **122** is provided with rear and front engagement areas **136***a*, **136***b*, respectively. The rear and front engagement areas **136***a*, **136***b* rest on and are supported by the rear and front grooved rollers **114***a*, **114***b*, respectively, to allow frame **106**, and thereby platform **104** and bicycle B and trainer T supported thereabove, to move in an axial or fore-aft direction relative to the base **102** in response to input forces applied by the user to the pedals of bicycle B. The rear and front engagement areas **136***a*, **136***b* are identically constructed, and have an arcuate configuration that provides movement of the frame **106** upwardly and downwardly as the frame **106** is moved in the axial or fore-aft direction relative to the base **102**. In this regard, the frame **106** is gravity biased toward an axially neutral position, as shown in FIG. **9**, due to the arcuate configuration of the engagement areas **136***a*, **136***b*. The frame **106** can be moved rearwardly and upwardly relative to the base **102** as shown in FIG. **10**, as well as forwardly and upwardly relative to the base **102** as shown in FIG. **11**, in reaction to forces that are experienced by the platform **104** and frame **106** in response to application of input forces by the user to the pedals of the bicycle B. Semicircular retainer brackets **138***a*, **138***b* are secured to rear and front end members **110***a*, **110***b*, respectively, and extend over the rear and front end areas, respectively, of longitudinal frame member **122**. The retainer brackets **138***a*, **138***b* function to limit the upward movement of longitudinal frame member **122** relative to base **102**, to ensure that rear and front engagement areas **136***a*, **136***b* remain in engagement with rear and front grooved rollers **114***a*, **114***b*, respectively.

As noted previously, the rear and front engagement areas **136***a*, **136***b* are identically configured. The details of rear engagement area **136***a* will be described with reference to FIG. **14**, with the understanding that such description applies equally to the details of front engagement area **136***b*. In the illustrated embodiment, as detailed in FIG. **14**, rear engagement area **136***a* includes a downwardly facing track member **140***a* that is secured to longitudinal frame member **122**. In the illustrated embodiment, the track member **140***a* has an arcuate configuration, and is engaged within a correspondingly shaped cut-out area of longitudinal frame member **122**. Representatively, the longitudinal frame member **122** may

be formed of a tubular member having a generally circular cross-section, and the walls of the tubular member may be cut to form a recess within which the arcuate track member **140***a* is received. Both the longitudinal frame member **122** and the track member **140***a* may be formed of a metal material, and the track member **140***a* may be secured within the recess of longitudinal frame member **122** by welding. It is understood, however, that the longitudinal frame member **122** and track member **140***a* may be formed of any material as desired and the track member **140***a* may be secured to the longitudinal frame member **122** in any desired manner.

The track member **140***a* includes a pair of side areas **142**, **144** and a central bead area **146** between the side areas **142**, **144**. Representatively, the side areas **142**, **144** may be relatively flat in cross-section, and the central bead area **146** may have a convex or outwardly arcuate configuration. This configuration is illustrated in FIG. **17**, which shows that the central bead area **146** may have a configuration that is generally semicircular.

FIG. **17** also illustrates the grooved roller **114***a* and its engagement with the semicircular central bead area **146** of track member **140***a*. As shown in FIG. **17**, the grooved roller **114***a* is located between a pair of upstanding members defined by the bracket **112***a* and is rotatable about an axle or shaft that extends between and is secured to the upstanding members of bracket **112***a*. The grooved roller **114***a* includes a pair of roller bearing assemblies **150** through which the shaft **148** extends, and which are engaged with an outer shell portion **152** of grooved roller **114***a* that defines a groove **154**. The groove **154** has a radius that is slightly larger than that of central bead area **146** of track member **140***a*, so that central bead area **146** nests within the groove **154**. Engagement of the central bead area **146** within the groove **154** provides the dual function of allowing axial movement of track member **140***a* upon rotation of grooved roller **114***a* to thereby allow longitudinal frame member **122** to move axially relative to base **102**, while at the same time allowing longitudinal frame member **122** to pivot relative to grooved roller **114***a*. As can be appreciated, the axial movement of track member **140***a* on grooved roller **114***a* provides axial or fore-aft movement of platform **104** relative to base **102**, and pivoting movement of central bead area **146** of track member **140***a* within groove **154** of grooved roller **114***a* provides tilting movement of frame member **122** and thereby platform **104** relative to base **102**. Engagement of central bead area **146** within groove **154** further functions to limit transverse or lateral movement of track **140***a* relative to roller **114***a*, which secures the transverse or lateral position of longitudinal frame member **122**, and thereby frame **106** and platform **104**, relative to base **102**.

FIG. **18** illustrates tilt biasing bracket assembly **134***b*, which along with tilt biasing bracket assembly **134***a* functions to bias frame **106**, and thereby platform **104**, to a neutral tilt position. The following description of tilt biasing bracket assembly **134***b* applies equally to tilt biasing bracket assembly **134***a*.

As shown in FIG. **18**, tilt biasing bracket assembly **134***b* includes a bracket member **160**, which is pivotably secured at its upper end to side subframe member **130***b* via a pin **162**. A wheel or roller **164** is rotatably mounted to the lower end of bracket member **160**, and rests on the upwardly facing surface of frame side member **108***b*. A biasing component engages bracket member **160** to bias bracket member **160** downwardly toward frame side member **108***b*. The biasing component may be in the form of a torsion spring, a compression spring, or any other satisfactory mechanism or device for exerting a downward biasing force on bracket member **108***b*. In the illustrated embodiment, the spring is in the form of a foam block **165**, which is illustrated in a compressed condition applying an upward biasing force on side frame member **130***b* and a downward biasing force that urges roller **164** against base side member **108***b*. In this manner, roller **164** is biased against the upwardly facing surface of frame side member **108***b*.

A threaded sleeve **166** is secured to side subframe member **130***b*, and an adjustment screw **168** is threadedly engaged with sleeve **166**. The adjustment screw **168** has a head at its upper end that can be accessed through an opening in platform **104**, and the lower end of adjustment screw **168** bears against a preload bracket shown at **170**. Rotation of adjustment screw **168** functions to adjust the rotational position of frame **106** and platform **104** relative to base **102**. In this manner, the adjustment screws **168** of tilt biasing bracket assemblies **134***a*, **134***b* can be selectively rotated to place platform **104** in a level orientation.

In use, movable exercise platform **104** and frame **106** of equipment support **100** move in an axial, fore-aft direction and tilt side-to-side during use of the bicycle B by a user, to provide an experience for the user that more closely resembles real-world conditions. In this regard, when the application of forces to the pedals of bicycle B are unbalanced, i.e. when there is a net downward force on one side of bicycle B at any point in time that is experienced by platform **104**, the platform **104** will tilt in the direction of the downward force by pivoting movement of the central bead areas, such as **146**, of the track members, such as **140**, within the grooves, such as **154**, of the rollers **114***a*, **114***b*. Simultaneously, when the application of forces to the pedals of bicycle B results in horizontal, axial forces being transferred to platform **104**, the platform **104** will move forwardly or rearwardly in an axial or fore-aft direction by axial movement of the track members, such as **140***a*, on the grooved rollers, such as **114***a*. The arcuate configuration of the track members, such as **140***a*, of the engagement areas **136***a*, **136***b* provides a gravity bias of platform **104** toward an axially neutral position in which the rollers **114***a*, **114***b* are positioned in the uppermost central portion of the engagement areas **136***a*, **136***b*, respectively. During such axial or fore-aft movement of the platform **104** and frame **106**, the rollers such as **164** of the tilt biasing bracket assemblies **134***a*, **134***b* are moved in an axial or fore-aft direction along the upwardly facing surfaces of the base side members **108***a*, **108***b*. The spring biasing component(s) of the tilt biasing bracket assemblies **134***a*, **134***b* function to maintain the rollers such as **164** of the tilt biasing bracket assemblies **134***a*, **134***b* in contact with the upwardly facing surfaces of the base side members **108***a*, **108***b*, respectively. In this manner, the tilt biasing bracket assemblies **134***a*, **134***b* function to exert upward biasing forces on the underside of platform **104** on either side of longitudinal frame member **122** to bias platform **104** to the neutral tilt position as frame member **122** moves axially relative to base **102**, while at the same time the arcuate engagement areas **136***a*, **136***b* bias platform **104** to an axially neutral position during side-to-side tilting movement of platform **104**.

FIGS. **19-24** illustrate another embodiment of a movable exercise equipment support in accordance with the present invention, shown at **200**. In this embodiment, the movable exercise equipment support **200** includes a foldable base section **202** and a foldable platform section **204**.

The foldable base section **202** includes a front base portion **206**, a rear base portion **208**, and an intermediate base portion **210** located between the front base portion **206** and the rear base portion **208**. A front hinge **212** pivotably

connects the front base portion **206** to the front of the intermediate base portion **210** via a front hinge pin **213**, and a rear hinge **214** pivotably connects the rear base portion **208** to the rear of the intermediate base portion **210** via a rear hinge pin **215**. The front and rear hinges **212**, **214**, respectively, may have any conventional hinge configuration as desired, and enable the front base portion **206** and the intermediate base portion **210** to pivot relative to each other about front hinge pin **213** and the rear base portion **208** and the intermediate base portion **210** to pivot relative to each other about rear hinge pin **215**.

The front base portion **206** of base section **202** includes a centrally located front bracket **216** to which a front grooved roller **218** is rotatably mounted. Similarly, the rear base portion **208** of base section **202** includes a centrally located rear bracket **220** to which a rear grooved roller **222** is rotatably mounted. In addition, the rear base portion **208** includes a pair of upwardly facing tracks **224** located one adjacent each side edge of the rear base portion **208**. The front base portion **206** also includes a pair of steps **225**, which are configured to support the weight of the user when mounting or dismounting the item of exercise equipment, such as bicycle B.

The platform section **204** includes a front platform portion **226** and a rear platform portion **228**. The front platform portion **226** is configured to fit between the steps **225** of the front base portion **206**. A hinge **230** including a hinge pin **231** pivotably connects the rear of the front platform portion **226** and the front of the rear platform portion **228**, to enable the front platform portion **226** and the rear platform portion **228** to pivot relative to each other. The front platform portion **226** may include an optional wheel support **232**, which is configured to underlie the front wheel of a bicycle, such as bicycle B, when positioned on movable exercise equipment support **200**. The wheel support **232** may be movable within guide tracks or slots **234** formed in front platform portion **226** to accommodate different types and sizes of bicycles and to allow adjustment in the position of the bicycle on the platform section **204**. A series of guide tracks or slots **236** may be formed in rear platform portion **228**. Retainer straps, such as shown at **238**, may be movably mounted in the slots **236**. The retainer straps **238** may be employed for securing a bicycle trainer, such as trainer T, in position on the upwardly facing surface of rear platform portion **228**.

On its underside, platform section **204** includes front and rear centrally located arcuate tracks **240**, **242** secured to front and rear platform portions **226**, **228**, respectively. The tracks **240**, **242** have a construction like that of track member **140** described previously, with a central bead area the extends in a front-rear direction along the length of the track. As also described previously, the central bead areas of the tracks **240**, **242** are engaged within the grooves of rollers **218**, **222**, respectively.

In this embodiment, the front platform portion **226** is formed with a pair of track mounting bosses **244**, **246**, and the front track **240** extends between and is mounted to the front track mounting bosses **244**, **246**. Similarly, the rear platform portion **228** is formed with a pair of track mounting bosses **248**, **250**, and the rear track **242** extends between and is mounted to the rear track mounting bosses **248**, **250**. Representatively, the bosses **244** and **246** may be formed integrally with the material of front platform portion **226**, such as in molding operation. Similarly, the bosses **248** and **250** may be formed integrally with the material of rear platform portion **228**, such as in molding operation. It is understood, however, that the bosses may be formed separately and may be secured in any satisfactory manner to the platform section **204**.

In addition, a pair of tilt biasing bracket assemblies, such as shown at **252**, are mounted one to each side of the rear platform portion **228**. As shown in FIG. **22**, each tilt biasing bracket assembly **252** includes a bracket member **254** that is pivotably mounted to the underside of rear platform portion **228** via a pin **256**. A roller **258** is rotatably mounted to the end of bracket member **254** and is engaged with track **224** on rear base section **208**. As described previously with respect to tilt biasing bracket assembly **134***a*, a biasing component engages bracket member **254** to bias bracket member **254** downwardly toward frame side member rear base portion **208**. The biasing component may be in the form of a torsion spring, a compression spring, or any other satisfactory mechanism or device for exerting a downward biasing force on bracket member **254**. In the illustrated embodiment, the spring is in the form of a foam block **259**, which is illustrated in a compressed condition applying an upward biasing force on the underside of rear platform portion **228** and a downward biasing force that urges roller **258** against track **224**. In this manner, roller **258** is biased against the upwardly facing surface of track **224**.

At its rearward end, rear platform portion **228** includes a laterally movable counterweight arrangement. The counterweight arrangement includes a guide track **260** that extends across the rearward end of rear platform portion **228**, in combination with a counterweight member **262** located below the guide track **260**. The counterweight member **262** is movable within a laterally extending channel formed in the rear end of rear platform portion **228** below guide track **260**. A counterweight positioning member, which may be in the form of a button **264**, is secured to counterweight member **262**. The button **264** has a connector portion that extends through the guide track **260**. With this arrangement, the button **264** can be moved along the guide track **260** to place counterweight member **262** in any desired lateral position relative to platform section **204**. The position of counterweight member **262** can thus be varied to accommodate any unevenness in the distribution of weight by the item of exercise equipment supported on platform section **204** relative to the longitudinal or fore-aft axis of the platform section **204**. Such unevenness may be caused, for example, by engagement of the bicycle B with a trainer T that has a relatively heavy flywheel that is off-center relative to the longitudinal axis of the platform section **204**.

Operation of movable exercise equipment support **200** is generally the same as described previously with respect to the movable exercise equipment support **100** of FIGS. **1-18**. That is, exercise equipment support **200** moves in an axial, fore-aft direction and tilts side-to-side during use of the bicycle B by a user, to provide an experience for the user that more closely resembles real-world conditions. The platform section **204** will tilt in the direction of the downward force by pivoting movement of the central bead areas of the track members, **240**, **242**, within the grooves of the rollers **218**, **222**, respectively. Simultaneously, when axial horizontal forces are transferred to platform section **204**, the platform section **204** will move forwardly or rearwardly in an axial or fore-aft direction by axial movement of the track members **240**, **242** on the grooved rollers **218**, **222**, respectively. The arcuate configuration of the track members **240**, **242** provides a gravity bias of platform section **204** toward an axially neutral position in which the rollers **218**, **222** are positioned in the uppermost central portion of the track members **240**, **242**, respectively. During such axial or fore-

aft movement of the platform section **204**, the rollers such as **258** of the tilt biasing bracket assemblies **252** are moved in an axial or fore-aft direction along the upwardly facing surfaces of the tracks such as **224**. The spring biasing component(s) of the tilt biasing bracket assemblies **252** function to maintain the rollers such as **258** of the tilt biasing bracket assemblies **252** in contact with the upwardly facing surfaces of the tracks **224**. In this manner, the tilt biasing bracket assemblies **252** function to exert upward biasing forces on the underside of platform section **204** on either side of longitudinal axis of platform section **204** to bias platform section **204** to the neutral tilt position while platform section **204** moves axially relative to base section **202**, while at the same time the arcuate configuration of tracks **240**, **242** biases platform section **204** to an axially neutral position during side-to-side tilting movement of platform section **204**. The arcuate shape of track **224** isolates the tilt bias from the effects of fore-aft movement of the platform section **204**, to provides a consistent tilt biasing force throughout the range of movement of platform section **204**.

The construction and configuration of movable exercise equipment support **200** provides an added feature as shown in FIGS. **23** and **24**. In this regard, when movable exercise equipment support **200** is not in use, such as during shipment or storage, it can be folded to a relatively compact inoperative configuration. To accomplish this, front and rear platform portions **226**, **228**, respectively, are pivoted together at hinge **230**. Intermediate base portion **210** has a width slightly greater than the folded-together width of front and rear platform portions **226**, **228**, respectively, so that front base portion **206** can be folded upwardly to a position adjacent front platform portion **226** and rear base portion **208** can be folded upwardly to a position adjacent rear platform portion **228**. Suitable latch mechanisms may be employed for selectively maintaining the movable exercise equipment support **200** in the folded position.

The embodiments illustrated in FIGS. **1-24** show the front wheel of the bicycle B being engaged with and supported on a trough or riser structure secured to the front area of the platform. It is understood, however, that the front of the bicycle B may be supported in any other manner as desired such as, but not limited to, a fork mount in a manner as is known.

FIG. **24***a*-**24***c* illustrates an embodiment of a movable exercise equipment support in accordance with the present invention, shown generally at **700**, which is generally similar to the embodiment of FIGS. **19-24**. The bicycle B and trainer T are shown as being supported on the movable exercise equipment support **700**. While the drawings illustrate the trainer T in the form of a wheel-on trainer, it is understood that any other type of trainer, such as a direct drive trainer, may be employed. A front wheel support **702** is positioned on the front platform portion of movable exercise equipment support **700** for supporting the front wheel of bicycle B.

The base section and platform section of movable exercise equipment support **700** are similar in construction and operation to the base and platform sections **202**, **204** of movable exercise equipment support **200** as shown and described with respect to FIGS. **19-24**. The illustrations of movable exercise equipment support **700** illustrate additional features that may be incorporated into the movable exercise equipment supports **200**, **700**.

As shown in FIG. **24***c*, the movable exercise equipment support **700** has a base section **704** and a platform section **706**. Grooved rollers, such as **708**, are rotatably mounted to the base section **704**, and arcuate beaded tracks, such as shown at **710**, are secured to the platform section **706** and engaged with the grooved rollers **708** for providing axial fore-aft movement of the platform section **706** relative to the base section **704**. Tilt biasing bracket assemblies, such as **712**, which have rollers such as **714**, are provided on platform section **706** for biasing the platform section **706** toward a neutral tilt position. The tilt bracket rollers **714** are engaged with and movable along tracks, such as **716**, on the base section **704**.

The tracks **716** of base section **704** have a curvature and configuration that matches that of tracks **710** of platform section **706**, but face upwardly rather than downwardly. That is to say, the engagement surface of each track **710** faces downwardly whereas the engagement surface of each track **716** faces upwardly. In addition, each track **716** is axially offset relative its associated track **710** by a distance corresponding to the center-to-center spacing between roller **708** and roller **714**. With this arrangement, the tilt biasing force exerted on the tilt biasing bracket assembly **712** by the spring, shown at **718**, is not affected by the axial position of the platform section **706** relative to the base section **704**. As can be appreciated, if the roller **714** of the tilt bracket assembly **712** were to move along differently configured surface on the base section **704**, such as a flat surface, the biasing force exerted by the spring **718** would change constantly during axial movement of the platform section **706** relative to the base section **704**. The configuration of the track **710** and the track **716** as shown in FIG. **24***c* avoids this problem.

This embodiment illustrates an alternative version of a counterweight arrangement for offsetting any axial imbalance of the exercise equipment relative to the platform. In this version, a counterweight **719** is made up of upper and lower counterweight sections that are secured together via an extendible and retractable screw, which can be operated using a knob **720**. Each counter weight section is provided with a transverse channel, within which upper and lower lips **721** defined at the rear surface of rear platform section **706** are received. The lips **721** extend across the width of the platform section **706**. By loosening the counterweight screw using the knob **720**, the counterweight **719** can be moved to any desired position along the width of the platform section **706**. When the counterweight **719** is in the desired position, the screw is tightened using the knob **720** to move the counterweight sections together, which clamps the counterweight sections onto the lips **721** and maintain it in the desired position.

FIGS. **24***d*-**24***g* illustrate another feature, in the form of a latch or coupling arrangement, that may be incorporated into the movable exercise equipment supports such as **200**, **700**. As described previously, the movable exercise equipment support may include a front platform portion **722** and a rear platform portion **724**, which are foldably connected via a hinge **726**. A coupling mechanism, shown generally at **728**, is provided for selectively securing the front and rear platform portions **722**, **724**, respectively, together to maintain the platform portions in an unfolded, operative configuration. A coupling mechanism such as **728** may be provided on either or both sides of the movable exercise equipment support.

The coupling mechanism **728** includes a coupler shaft **730** that is slidably disposed within a passage **732** that extends inwardly from the end surface of front platform portion **722**. A slot **734** is formed in a portion of the length of the wall of front platform portion **722** that forms passage **732**. A handle or knob **736** is located exteriorly relative to the wall of front platform portion **722**, and a threaded shank extends inwardly

from the knob **736** and into engagement with a transverse threaded passage **738** formed in a side area of coupler shaft **730**. The knob **736** may be employed to axially move the coupler shaft **730** within slot **734**, with the range of movement of coupler shaft **730** being governed by engagement of the shank with the ends of slot **734**.

A receiver passage **740** extends inwardly from the end surface of rear platform portion **724**, and is generally in alignment with passage **732** when the front platform portion **722** and the rear platform portion **724** are unfolded. The receiver passage **740** has a cross-section similar to, but slightly larger than, that of coupler shaft **730**.

With this arrangement, when the platform portions **722**, **724** are initially unfolded, the coupler shaft passage **732** and the receiver passage **740** are generally aligned with each other, as shown in FIG. **24***f*. The user then grasps knob **736** and advances coupler shaft **730** rearwardly so as to move coupler shaft **730** into receiver passage **740**. Coupler shaft **730** thus functions to prevent front platform portion **722** and rear platform portion **724** from being moved away from the unfolded operative position. Simultaneously, movement of coupler shaft **730** into receiver passage **740** provides an automatic leveling of front and rear platform portions **722**, **724**, respectively, on the base of the movable exercise equipment support due to the gravity bias of the connected platform portions **722**, **724** toward a horizontal position.

FIGS. **24***h* and **24***i* illustrate a representative construction of coupler shaft **730**. In this embodiment, coupler shaft **730** includes a pair of coupler shaft sections **742**, **744** that are engaged with each other via the threaded shaft, shown at **746**, that is connected to and extends from knob **736**. The shaft **746** extends through a slotted passage **748** in coupler shaft section **742**, and the threaded end portion of shaft **746** is secured within a threaded passage **750** in coupler shaft section **744**. The coupler shaft sections **742**, **744** are provided with complementary angled engagement surfaces **752**, **754**, respectively. Knob **736** defines a shoulder **756** so that, when knob **736** is turned to advance threaded shaft **746**, engagement of shoulder **756** with the surface of coupler shaft section **742** at the entrance of slotted passage **748** causes engagement surface **752** of coupler shaft section **742** to slide laterally and upwardly on engagement surface **754** of coupler shaft section **744**. Since the passages **732**, **740** are only slightly larger than the cross-section of coupler shaft **730**, such movement of coupler shaft section functions to securely engage the surfaces of coupler shaft sections **742**, **744** with the walls of the passages **732**, **740**, to securely engage the coupler shaft **730** with the front and rear platform portions **722**, **724**, respectively, and to prevent movement of coupler shaft **730** due to vibration or relative movement of the platform portions **722**, **724**.

FIGS. **24***j*-**24***m* illustrate another embodiment of a movable exercise equipment support, shown at **760**, in accordance with the present invention. The bicycle B and trainer T are shown as being supported on the movable exercise equipment support **760**. While the drawings illustrate the trainer T in the form of a wheel-on trainer, it is understood that any other type of trainer, such as a direct drive trainer, may be employed.

In this embodiment, the movable exercise equipment support **760** includes a rear portion **762** and a front portion **764**. The rear portion **762** includes a base **768** and a platform **770**. The base **768** includes a pair of axially aligned rollers **772**, and the platform **770** includes a pair of downwardly facing beaded tracks **774** that are engaged with the rollers **772**. The rollers **772** and the tracks **774** have generally the same construction and function as described previously, providing both axial fore-aft movement and tilting movement of platform **770** relative to base **768**. Tilt biasing bracket assemblies, such as shown at **776**, are provided on platform **770** and engage base **768** to bias platform **770** toward a neutral tilt position, as described previously.

In this embodiment, the front portion **764** of movable exercise equipment support **760** is stationary. A front wheel support **778** underlies the front wheel of the bicycle B, and a pair of steps **780** are provided one on either side of wheel support **778**. The front wheel support **778** includes an upwardly facing slot or channel **782**. The channel **782** is configured to receive the front wheel of bicycle B, so that the front wheel of bicycle can move axially in a fore-aft direction in response to axial forces applied to the bicycle B during operation. When transverse or lateral forces are experienced by the bicycle B during operation, the bottom of the front wheel of bicycle B rotates within the channel **782** to enable the bicycle B to tip or tilt. With this arrangement, the movable exercise equipment support **760** has somewhat of a hybrid movement system due to axial and tilting movement of the platform **770** at the rear of bicycle B and conventional, although tracked, rolling and tilting of the front wheel of the bicycle B within the channel **782** of the wheel support **778**.

FIGS. **25-28** illustrate another embodiment of a movable exercise equipment support in accordance with the present invention, shown at **270**. In this embodiment, movable exercise equipment support **270** is illustrated as supporting a bicycle B and trainer T (in this case a direct drive trainer), although it is understood that any other type of exercise equipment may be employed.

The movable exercise equipment support **270** generally includes a front section **272** and a rear section **274**, which are joined together by a connector member **276**. The front section **272** has a generally rectangular configuration, including a pair of sidewalls **278**, **280** and a pair of end walls **282**, **284**. The sidewalls **278**, **280** are provided with arcuate slots **286**. Front cross-members **288** extend between the sidewalls **278**, **280**. Each front cross-member **288** includes a roller **290** at each end, which is positioned within one of the slots **286**. In a similar manner, rear section **274** has a generally rectangular configuration, including a pair of sidewalls **292**, **294** and a pair of end walls **296**, **298**. The sidewalls **292**, **294** are provided with arcuate slots **300**. Rear cross-members **302** extend between the sidewalls **292**, **294**. Each rear cross-member **302** includes a roller **304** at each end, which is positioned within one of the **300**.

A front wheel support **306** extends between and is secured to front cross-members **288**. The front wheel support **306** may have a wheel-engaging trough **308** secured thereto, which is adapted to receive the front wheel of bicycle B to retain it in position relative to front section **272**. Similarly, with reference to FIG. **26**, a rear support member **310** extends between and is secured to rear cross-members **302**. A lower resilient pad or cushion member **312** is secured between rear support member **310** and the facing surface of rear cross-member **302**. An upper resilient pad or cushion member **314** is secured to the upper surface of rear support member **310**. A pair of steps **316** may be provided on rear section **274** to assist a user and mounting and dismounting the bicycle B.

The trainer T may be provided with or secured to a mounting plate **318**, and the mounting plate **318** in turn is secured to the upper surface of rear support member **310**. The rear support member **310** and the front and rear sets of cushion members **312**, **314** extend along a longitudinal axis defined by movable exercise equipment support **270**, and

cushion members **312**, **314** enable the trainer T and bicycle B to tilt or tip about an axis parallel to the longitudinal axis of movable exercise equipment support **270**. The cushion members **312**, **314** are formed of a stiff yet resilient material, which tends to bias mounting plate **318** toward a horizontal position. In this manner, trainer T and bicycle B are biased toward an upright, vertical position. As described previously, the tipping or tilting of trainer T and bicycle B can occur when, during use of bicycle B, one side of the movable exercise equipment support **270** experiences a net downward or upward force relative to the other. Simultaneously, when horizontal forces are applied to bicycle B and trainer T, such forces are transferred via front and rear support members **306**, **310**, respectively, to front and rear sections **272**, **274**, respectively, of movable exercise equipment support **270**. Such forces cause movement of front rollers **290** within slots **286** and rollers **304** within slots **300**, to allow bicycle B and trainer T to move in a fore-aft direction. The arcuate and upwardly facing convex configuration of slots **286**, **300** provide a gravity bias of rollers **290**, **304**, respectively, toward their lowermost positions within slots **286**, **300**, to bias bicycle B and trainer T toward an axially neutral position.

Another embodiment of a movable exercise equipment support in accordance with the present invention is shown at **320** in FIGS. **29** and **30**. In this embodiment, the movable exercise equipment support **320** has a two-part base consisting of a front base section **322** and a rear base section **324**. The base sections **322**, **324** are generally C-shaped and face each other. It can be appreciated, however, that the base section **322**, **324** may be joined together to form a single-piece base. Front base section **322** includes a front cross-member **326** and a pair of rearwardly extending side members **328** that extend one from each end of front cross-member **326**. Similarly, rear base section **324** includes a rear cross-member **330** and a pair of forwardly extending side members **332** that extend one from each end of rear cross-member **330**. An inwardly extending roller, such as shown at **334**, is provided on each of side members **328**, **332**.

In this embodiment, bicycle B and trainer T are secured to a frame assembly, shown generally at **336**, which includes a front frame member **338**, a rear frame member **340**, and a central axial member **342**. The front wheel of bicycle B is secured to central axial member **342** at front frame member **338**, and trainer T is supported on rear frame member **340**, which is in the form of a platform that underlies trainer T and to which trainer T is secured. The front frame member **338** is secured at its ends to a pair of front side support members **344**, and the rear frame member **340** is secured at its ends to a pair of rear side support members **346**. A downwardly facing arcuate engagement surface, shown at **348**, is formed in the underside of each front side support member **344**, and a similarly configured downwardly facing arcuate engagement surface **350** is formed in the underside of each rear side support member **346**. The arcuate engagement surfaces **348**, **350** rest on the rollers, such as **334**, that are secured to base side members **328**, **333**. By gravity, the rollers **334** tend to remain in the uppermost central areas of the arcuate engagement surfaces **348**, **350**, to position the frame assembly **336** and thereby bicycle B and trainer T in a lowered, axially neutral position.

As shown in FIG. **30**, the underside of rear cross-member **330** is provided with a pair of downwardly facing, transversely extending arcuate engagement surfaces **352***a*, **352***b*. A roller support **354** is positioned on a supporting surface such as a floor, and a pair of laterally spaced rollers **356***a*, **356***b* are rotatably mounted to roller support **354** in any suitable manner. The arcuate engagement surfaces **352***a*, **352***b* are positioned on the rollers **356***a*, **356***b*, respectively. By gravity, the rollers **356***a*, **356***b* tend to remain in the uppermost central areas of the arcuate engagement surfaces **352***a*, **352***b*, respectively, to position the frame assembly **336** and thereby bicycle B and trainer T in a centered, laterally neutral and upright position. A similar pair of downwardly facing, transversely extending arcuate engagement surfaces are provided on the underside of front cross-member **326**, and a roller support similar to roller support **354**, carrying laterally spaced rollers, is positioned on a supporting surface such as a floor, below the front pair of arcuate engagement surfaces.

In this version, exercise equipment support **320** moves in an axial, fore-aft direction and side-to-side during use of the bicycle B by a user, to provide an experience for the user that more closely resembles real-world conditions. The frame assembly **336** and the front and rear base section **322**, **324** will move laterally on the rollers such as **356***a*, **356***b* when horizontal lateral or transverse forces are applied to frame assembly **336** during use of bicycle B and trainer T. Simultaneously, when horizontal axial forces are transferred to frame assembly **336**, the frame assembly **336** will move forwardly or rearwardly in an axial or fore-aft direction by axial movement of the engagement surfaces **348**, **350** on the rollers **334**. The arcuate configuration of the engagement surfaces provides a gravity bias of frame assembly **336** toward both an axially neutral position and a laterally neutral position.

FIGS. **31** and **32** illustrate a tip or tilt function that can be incorporated into a movable exercise equipment support in accordance with the present invention. Representatively, the tip or tilt function illustrated in FIGS. **31** and **32** can be utilized in combination with a base and frame that incorporates an axial or fore-aft movement function such as shown and described previously, e.g. in connection with the embodiment illustrated in FIGS. **29** and **30**. As shown in FIGS. **31** and **32**, the bicycle B may be engaged with a trainer T having laterally extending brace members or outriggers **360**, with rollers **362** being secured toward the outer ends of brace members **360**. A base or frame includes a pair of upwardly facing arcuate engagement surfaces **364**, and the rollers **362** are supported by the engagement surfaces **364**. In this version, the rollers **364** at an at-rest position as shown in FIG. **31** are positioned outwardly of the center area of the engagement surfaces **364**. In this manner, while engagement surfaces provide a gravity bias of trainer T and bicycle B toward a lowered position, it is not the lowermost position that would be attained if the rollers **362** were normally to rest in the lowermost center areas of the engagement surfaces **364**. A tip or tilt function is thus attained when a net downward force is applied to the bicycle B and trainer T on one side of the other of the axial centerline of the bicycle B and trainer T, as shown in FIG. **32**. Here, it can be seen that the radii of engagement surfaces **364** can be such that the center of the axis of tipping or tilting movement of the bicycle B and trainer T can be placed at a relatively elevated position relative to the position of the user on bicycle B, e.g. above the user's center of gravity. In contrast to other trainers with side-to-side or tilting movement, this provides the user with a relatively stable and safe feel during side-to-side movement.

FIG. **33** illustrates another embodiment of a movable exercise equipment support in accordance with the present invention, shown at **368**. In this embodiment, the bicycle B and trainer T are secured to a platform assembly **370** that includes a front platform section **372**, a rear platform section

374, and a central axial member 376 that extends between and is secured to the front platform section 372 and the rear platform section 374. A pair of front rollers 378 are mounted one to each side of front platform section 372, and a pair of rear rollers 380 are mounted one to each side of rear platform section 374.

The platform assembly 370 is supported on a generally rectangular frame 382 that includes a pair of side frame members 384 and a pair of end frame members 386. The side frame members 384 are each provided with a front, upwardly facing arcuate engagement surface 388 and a rear, upwardly facing arcuate engagement surface 390. The front rollers 378 of platform assembly 370 are positioned within and rest on the front, upwardly facing arcuate engagement surfaces 388, and the rear rollers 380 of platform assembly 370 are positioned within and rest on the rear, upwardly facing arcuate engagement surfaces 390.

The front end frame member 386 includes a pair of forwardly extending rollers 392, and the rear end frame member 386 includes a pair of rearwardly extending rollers 394. A front support member 396 is positioned adjacent to and forwardly of front end frame member 386, and similarly a rear support member 398 is positioned adjacent to and rearwardly of rear frame member 386. Front support member 396 includes a pair of arcuate, upwardly facing engagement surfaces 400, and rear support member 398 includes a pair of arcuate, upwardly facing engagement surfaces 402. The front rollers 392 are positioned within and rest on the front, upwardly facing arcuate engagement surfaces 400, and the rear rollers 394 are positioned within and rest on the rear, upwardly facing engagement surfaces 402.

As can be appreciated, the front engagement surfaces 388 and rear engagement surfaces 390 of side frame members 384 extend in an axial or front-rear direction, and front and rear rollers 392, 394, respectively, are rotatable about an axis of rotation primarily, but not necessarily, parallel thereto. The front engagement surfaces 400, 402 of front and rear support members 396, 398, respectively, extend in a transverse direction that may be perpendicular to the axial or front-rear direction, or alternatively may be radiused, and front and rear rollers 378, 380, respectively, are rotatable about an axis of rotation primarily, but not necessarily, parallel thereto. With this arrangement, movement of front and rear rollers 378, 380, respectively, within and along front and rear engagement surfaces 388, 390, respectively, allows bicycle B and trainer T to move in a fore-aft axial or longitudinal direction in response to axial forces experienced by platform assembly 370 during use of bicycle B. Simultaneously movement of front and rear rollers 392, 394, respectively, within and along front and rear engagement surfaces 400, 402, respectively, provides lateral or transverse movement of bicycle B and trainer T in response to transverse forces experienced by platform assembly 370 during use of bicycle B. The curvature of engagement surfaces 388 and 390 provides a gravity bias toward an axially neutral position, while likewise the curvature of engagement surfaces 400, 402 provides a gravity bias toward a laterally neutral position.

FIG. 34 illustrates another embodiment of a movable exercise equipment support in accordance with the present invention, shown at 406. In this embodiment, the bicycle B (not shown) and trainer T are carried by a platform assembly 408 that includes a front platform section 410, a rear platform section 412 and an axial connector member 414 that extends between and is secured to front and rear platform sections 410, 412, respectively. A pair of front rollers 416 extend forwardly from front platform section 410, and a pair of rear rollers 418 extend rearwardly from rear platform section 412. The front and rear rollers 416, 418, respectively, are rotatable about axes of rotation that are parallel to a longitudinal axis of platform assembly 408.

Platform assembly 408 is positioned on a frame assembly 420, which includes a pair of side members 422 and a pair of end members 424. The frame side members 422 are provided with a pair of front rollers 426 and a pair of rear rollers 428. Each end frame member 424 includes a pair of upwardly facing arcuate engagement surfaces 430. The engagement surfaces 430 extend in a transverse direction relative to the axial or longitudinal axis of platform assembly 408. The rollers 426, 428 are rotatable about respective axes of rotation that also extend in a transverse direction relative to the axial or longitudinal axis of platform assembly 408.

The frame assembly 420 is engaged with and supported by a base assembly 432, which includes a pair of side members 434 and a pair of end members 436. The base side members 434 have arcuate front engagement slots 438 and arcuate rear engagement slots 440. The front and rear engagement slots 438, 440 extend in a direction that is parallel to the longitudinal axis of platform assembly 408.

The frame assembly 420 and base assembly 432 are generally rectangular in configuration, with frame assembly 420 having a footprint smaller than that of base assembly 432. In this manner, frame assembly 420 can be nested within the open interior of base assembly 432. When so positioned, the front rollers 426 of frame assembly 420 are positioned within and movable along the front slots 438 of base assembly 432, and likewise the rear rollers 428 of frame assembly 420 are positioned within and movable along the rear slots 440.

With this configuration, movement of front and rear rollers 416, 418, respectively, within and along front and rear engagement surfaces 430, respectively, allows bicycle B and trainer T to move in a transverse or lateral direction in response to transverse or lateral forces experienced by platform assembly 408 during use of bicycle B. Simultaneously, movement of front and rear rollers 426, 428, respectively, within and along front and rear slots 438, 440, respectively, provides fore-aft axial or longitudinal movement of bicycle B and trainer T in response to axial forces experienced by platform assembly 408 during use of bicycle B. The curvature of the engagement surfaces of slots 438, 440 provides a gravity bias toward an axially neutral position, while likewise the curvature of engagement surfaces 430 provides a gravity bias toward a laterally neutral position.

FIGS. 35 and 36 illustrate another embodiment of a movable exercise equipment support in accordance with the present invention, shown at 444. In this embodiment, the bicycle B and trainer T are secured to and supported on a platform assembly 446, which includes an axially extending central support or platform member 448. The front end of platform member 448 is secured to a front platform member 450, and the rear end of platform member 448 is secured to a rear platform member 452. A pair of front rollers 454 are secured to and extend forwardly from front platform member 450, and a pair of rear rollers 456 are secured to and extend rearwardly from rear platform member 452.

Platform assembly 446 is positioned on a frame assembly 458, which includes a pair of side members 460 and a pair of end members 462. The frame end members 462 are provided with laterally or transversely extending arcuate engagement surfaces, which in the case of the front end member 462 are in the form of arcuate upwardly facing

engagement surfaces **464** and in the case of the rear end member **462** are in the form of arcuate slots **466**. The front and rear rollers **454**, **456** of platform assembly **446** are positioned in and supported by the front engagement surfaces **464**, and the rear rollers **456** of platform assembly **446** are positioned in and supported by the slots **466**. As in previously described embodiments, the engagement surfaces **464** and the slots **466** extend in a lateral or transverse direction relative to the longitudinal axis of bicycle B, and the rollers **454**, **456** are rotatable about axes of rotation that are perpendicular thereto, i.e. parallel to the axial or longitudinal axis of bicycle B. The frame assembly **458** also includes a pair of outwardly extending front rollers **468**, which may be secured one to each end of frame front end member **462**, and a pair of outwardly extending rear rollers **470** which may be secured one to each end of frame rear end member **462**.

The frame assembly **458** is positioned on and supported by a base assembly **472**. Both the frame assembly **458** and the base assembly **472** have a generally rectangular configuration, with frame assembly **458** having a footprint slightly smaller than that of base assembly **472** so that it can be received within the interior of base assembly **472**. Base assembly **468** includes a pair of side members **474** and a pair of end members **476**, as well as a pair of front support members **478** and a pair of rear support members **480**. Each front support member **478** includes an upwardly facing arcuate engagement surface **482**, and each rear support member **480** includes an upwardly facing arcuate engagement surface **484**. When frame assembly **458** is positioned within the interior of base assembly **472**, the front rollers **468** are positioned within and supported by the upwardly facing arcuate front engagement surfaces **482**, and likewise the rear rollers **470** are positioned within and supported by the upwardly facing arcuate rear engagement surfaces **484**. As in the previously described embodiments, the engagement surfaces **482**, **484** extend in an axial or longitudinal direction that is parallel to the longitudinal axis of bicycle B, and likewise the rollers **468**, **470** are rotatable about axes of rotation perpendicular thereto, i.e. transverse to the longitudinal axis of bicycle B.

With this configuration, movement of front and rear rollers **454** within and along the front engagement surfaces **464** and movement of the rear rollers **456** within and along the rear slots **466** allows bicycle B and trainer T to move in a transverse or lateral direction in response to transverse or lateral forces experienced by platform assembly **446** during use of bicycle B. Simultaneously movement of front and rear rollers **468**, **470** respectively, within and along front and rear engagement surfaces **482**, **484** respectively, provides fore-aft axial or longitudinal movement of bicycle B and trainer T in response to axial forces experienced by platform assembly **446** during use of bicycle B. The curvature of engagement surfaces **482**, **484** provides a gravity bias toward an axially neutral position, while likewise the curvature of engagement surfaces **464** and slots **466** provides a gravity bias toward a laterally neutral position.

FIGS. **37** and **38** illustrate another embodiment of a movable exercise equipment support in accordance with the present invention, shown at **484**. In this embodiment, the bicycle B and trainer T are secured to and supported on a carrier assembly **486**, which includes an axially extending central support or carrier member **488**. The front end of carrier member **488** is secured to a front cross member **490**, and the rear end of carrier member **488** is secured to a rear cross member **492**. The front wheel of the bicycle B may be secured to central carrier member **488** via a wheel support **494**. Trainer T may be secured to the rear area of central carrier member **488** via a pair of transversely extending trainer mounting members **496**, **498**. Each end of front cross member **490** and rear cross member **492** has a roller (similar to rollers **468**, **470** in the previously-described embodiment), extending outwardly therefrom.

The carrier assembly **486** is mounted to a base assembly **500**, which may include a pair of side members **502** and a pair of end members **504**. Base assembly **500** further includes a pair of front support members **506** and a pair of rear support members **508**. Each of the front and rear support members is provided with an arcuate engagement slot, such as shown at **510**, within which the outwardly extending rollers that are secured to the ends of front cross member **490** and rear cross member **492** are received. The slots **510** extend in a direction parallel to the longitudinal axis of the bicycle B, and the rollers at the ends of front and rear cross members **490**, **492** are rotatable about axes of rotation that are perpendicular thereto.

With this configuration, movement of the rollers within and along the slots **510** provides fore-aft axial or longitudinal movement of bicycle B and trainer T in response to axial forces experienced by carrier assembly **486** during use of bicycle B. The curvature of the slots **510** provides a gravity bias toward an axially neutral position. In this embodiment, a tilting or tipping arrangement is interposed between the ends of central carrier member **488** and the front and rear cross members **490**, **492**, respectively. Representatively, the tilting or tipping arrangement may have a form similar to that described previously with respect to FIGS. **25-28**, although it is understood that any other satisfactory arrangement may be employed.

FIG. **39** illustrates another embodiment of a movable exercise equipment support in accordance with the present invention, shown at **514**. In this embodiment, the bicycle B and trainer T are secured to and supported on a carrier assembly **516**, which includes an axially extending central support or carrier member **518**. A compound linkage system is employed to movably mount carrier assembly **516** to a base, shown at **520**. The linkage system includes a pair of front link members **522** and a pair of rear link members **524**. The front and rear link members **522**, **524**, respectively, extend upwardly from the upper surface of base **520**, and are pivotably mounted to base **520**. The pivot connection between the lower ends of link members **522**, **524** to base **520** enables link members **522**, **524** to move in a transverse or lateral direction about pivot axes that are parallel to the longitudinal axis of the bicycle B. A front suspension link member **526** is secured to and extends upwardly from the front end of central carrier member **518**, and similarly a rear suspension link member **528** is secured to and extends upwardly from the rear end of central carrier member **518**. The upper end of front suspension link member **526** is pivotably mounted to and extends between front link members **522**. Likewise, the upper end of rear suspension link member **528** is pivotably mounted to and extends between rear link members **524**. The pivot connections of the upper ends of suspension link members **526**, **528** provide pivoting movement of front and rear suspension link members **526**, **528** in a front-rear or axial direction, about pivot axes that are perpendicular to the longitudinal axis of bicycle B. With this configuration, axial forces experienced by carrier assembly **516** during use of bicycle B and trainer T cause carrier assembly **516** to swing forwardly and rearwardly in a fore-aft direction. Simultaneously, transverse or lateral forces experienced by carrier assembly **516** during use of bicycle B and trainer T cause carrier assembly **516** to move

laterally or transversely due to lateral or transverse pivoting movement of link members **522**, **524** relative to base **520**.

FIG. **40** illustrates another embodiment of a movable exercise equipment support in accordance with the present invention, shown at **532**. In this embodiment, the bicycle B and trainer T are secured to and supported on a carrier assembly **534**, which includes an axially extending central support or carrier member **536**. The carrier assembly **534** is supported by a frame assembly **538**, which in turn is engaged with a base assembly **540**.

The frame assembly **538** may have a generally rectangular configuration, including a pair of side frame members **542** and a pair of end frame members **544**. A pair of spaced apart upright members **546** are secured to and extend upwardly from each end frame member **544**. A cross member **548** extends between and is secured to each pair of upright members **546**.

A pair of suspension links **550** are pivotably mounted at their upper ends to each cross member **548**. At their lower ends, each suspension link **550** is pivotably connected to a transverse link mounting bar, such as **552**, secured to each end of central carrier member **536**. The pivot connections of suspension links **550** allow links **552** move laterally or transversely about pivot axes that are parallel to the longitudinal axis of bicycle B.

A movable mounting arrangement is interposed between the frame assembly **538** and the base assembly **540**. The movable mounting arrangement between frame assembly **538** and base assembly **548** may have any configuration as desired, such as those described previously with respect to FIGS. **34-39**, to allow frame assembly **538** to move in a fore-aft or axial direction parallel to the longitudinal axis of bicycle B.

With this configuration, the lateral or transverse forces experienced by carrier assembly **534** during use of bicycle B cause carrier assembly **534** to swing transversely or laterally via the pivot connections of suspension links **550**. Simultaneously, the axially movable mounting arrangement between frame assembly **538** and base assembly **540** allows carrier assembly **534** and thereby bicycle B and trainer T to move in a fore-aft or axial direction when carrier assembly **534** experiences axial or longitudinal forces during operation of bicycle B.

FIGS. **41-43** illustrate another embodiment of a movable exercise equipment support in accordance with the present invention, shown at **556**. In this embodiment, the bicycle B and trainer T are secured to and supported on a carrier assembly **558**, which includes an axially extending central support or carrier member **560**. The carrier assembly **558** is supported by a pair of end frame assemblies **562**, which in turn are engaged with a base assembly **564**.

Each frame assembly **562** has a generally rectangular configuration, including a top member **566**, a bottom number **568**, and a pair of side members **570**. A pair of suspension links **572** are pivotably mounted at their upper ends to each top frame member **566**. At their lower ends, each suspension link **572** is pivotably connected to one of the ends of central carrier member **560**. The pivot connections of suspension links **572** allow links **572** to move laterally or transversely about pivot axes that are parallel to the longitudinal axis of bicycle B.

The base **564** also has a generally rectangular configuration, including a pair of base side members **574** and a pair of base end members **576**. An upright member **578** extends from each corner of base **564**. A series of suspension links **580** are pivotably mounted between frame assemblies **562** and upright members **578**. Each suspension link **580** is pivotably mounted at its upper and to one of upright members **578** and is pivotably mounted at its lower end it to one of the ends of frame assembly bottom member **568**. The pivot connections of suspension links **580** allow links **580** to move about pivot axes that are transverse to the longitudinal axis of bicycle B.

With this configuration, the lateral or transverse forces experienced by carrier assembly **558** during use of bicycle B cause carrier assembly **558** to swing transversely or laterally via the pivot connections of suspension links **572**. Simultaneously, the axial or longitudinal forces experienced by carrier assembly **558** during use of bicycle B cause carrier assembly **558** to swing in a fore-aft or axial direction via the pivot connections of suspension links **580**.

FIGS. **44-46** illustrate another embodiment of a movable exercise equipment support in accordance with the present invention, shown at **584**. In this embodiment, the bicycle B and trainer T are secured to and supported on a carrier assembly **586**, which includes an axially extending central support or carrier member **588**. Transverse link mounting members **590** are secured one to each end of central carrier member **588**.

Movable exercise equipment support **584** also includes a base assembly **592**, which in the illustrated embodiment is generally rectangular in configuration and includes a pair of base side members **594** and a pair of base and members **596**. In this embodiment, the carrier assembly **586** is positioned above base assembly **592** and is suspended therefrom via a linkage arrangement, which includes front and rear linkages, shown at **598**. Each linkage **598** includes a pair of side link members **600** and a transverse central link member **602**. The side link members **600** are pivotably mounted by universal pivot joints **604** to base assembly **592**, e.g. at the corners of base assembly **592** defined by base side members **594** and base end members **596**. Similarly, a universal pivot joint **604** is connected between the upper end of each side link member **600** and the adjacent end of each central link member **602**. The carrier assembly **586** is suspended below the central link members **602** via suspension links **606**, each of which is connected at its upper end to one of universal pivot joints **604** and at its lower and to one of transverse link mounting members **590**.

With this configuration, the lateral or transverse forces experienced by carrier assembly **586** during use of bicycle B cause carrier assembly **586** to swing transversely or laterally via the pivot connections of suspension links **606** to universal pivot joints **604**. Simultaneously, the axial or longitudinal forces experienced by carrier assembly **586** during use of bicycle B cause carrier assembly **586** to swing in a fore-aft or axial direction by the pivot connections of universal pivot joints **604** to base assembly **592**. In addition, as shown in FIG. **46**, any differential in the lateral forces experienced by the carrier assembly **586** can enable carrier member **588** to twist about an upright or vertical axis.

FIGS. **47-49** illustrate an embodiment of the present invention in which a movable support can be incorporated directly into the frame or support structure of an item of exercise equipment. In this embodiment, the item of exercise equipment is in the form of an exercise cycle, shown generally at **610**, although it is understood that the item of exercise equipment may be any other type of exercise equipment as desired. The exercise cycle **610** generally includes a frame assembly **612** and a base assembly **614**. The frame assembly **612** may include a front upper frame member **616** to which a handlebar assembly **618** is adjustably mounted, and a rear upper frame member **622** which a saddle or seat **622** is adjustably mounted. The front upper

frame member **616** may be vertically movable via a post that is telescopingly positioned within a front support tube **624**, and likewise the rear upper frame member **620** may be vertically movable via a post that is telescopingly positioned within a rear support tube **626**. The exercise cycle may also include a drive gear **628**, which is rotatably supported on a rear support member **630**. The drive gear **628** is rotatable in response to user input forces applied to a set of pedals, in a manner as is known. The exercise cycle **610** may also include a rotatable flywheel **631** that is driven by the drive gear **628**, in a manner as is known.

The lower ends of front support tube **624**, rear support tube **626** and rear support member **630** are mounted to and extend upwardly from an axially extending bottom frame member **632**, which forms a part of frame assembly **612**. The bottom frame member **632** extends along the longitudinal axis of exercise cycle **610** and supports the frame assembly **612** above base assembly **614**. In the illustrated embodiment, the bottom frame member **632** is in the form of an axially extending tubular member, although it is understood that any other satisfactory structural member may be employed. The bottom frame member **632** has a length that exceeds the components of frame assembly **612** thereabove, and includes front and rear engagement areas, shown at **634***a*, **634***b*, respectively, at which bottom frame member **632** is engaged with and supported above base assembly **614**. In the illustrated embodiment, the front engagement area **634***a* is located forwardly of the forwardmost position at which the handlebar assembly **618** can be positioned, and the rear engagement area **634***b* is located rearwardly of the rearwardmost location at which the saddle **622** can be positioned.

An arcuate beaded track member **636***a* is secured to the underside of bottom frame member **632** at front engagement area **634***a*. Similarly, an arcuate beaded track member **636***b* is secured to the underside of bottom frame member **632** at the rear engagement area **634***b*. The arcuate beaded track members **636***a*, **636***b* are constructed and configured similarly to the tracks **240**, **242** described previously with respect to the embodiment of the present invention illustrated in FIGS. **19-24**. Representatively, the portions of bottom frame member **632** to which the arcuate beaded track members **636***a*, **636***b* are mounted may be provided with an arcuate curvature having a radius that matches that of tracks **636***a*, **636***b*, although bottom frame member **632** may be formed without such curved portions or other such structure.

A pair of outriggers or stabilizers **638** are secured to frame assembly **612**. The stabilizers **638** extend outwardly in opposite directions from frame assembly **612** and may be secured to frame assembly **612** in any satisfactory manner.

Base assembly **614** includes an axially extending central base member **640**, which is adapted to be placed on a supporting surface such as a floor. The central base member **640** underlies bottom frame member **632** of frame assembly **612**. A front bracket **642***a* is mounted to the forward end of central base member **640** and a rear bracket **642***b* is mounted to the rearward end of central base member **640**. A grooved roller is rotatably mounted to each of front and rear brackets **642***a*, **642***b*, respectively. The grooved roller mounted to rear bracket **642***b* is shown in FIG. **47** at **644***b*, and a similarly configured grooved roller is rotatably mounted to front bracket **642***a*. The grooved rollers such as **644***b* are configured similarly to the grooved rollers shown and described previously with respect to the embodiments of the present invention as shown in FIGS. **1-24** and are configured to receive the central bead areas of the track members **636***a*, **636***b* that are secured to the underside of bottom frame member **632**.

With this configuration, as described previously, the track members **636***a*, **636***b* and the grooved rollers such as **644***b* allow both axial or fore-aft movement of bottom frame member **632** relative to base member **640** and pivoting movement of bottom frame member **632** on the central beaded areas of the track members **634***a*, **634***b* within the grooves of the rollers such as **644***b*. In this manner, longitudinal or axial forces experienced by bottom frame member **632** during use of the exercise cycle **610** cause forward or rearward translation of bottom frame member **632** relative to base assembly **614** by movement of track members **634***a*, **634***b* within the grooved rollers, such as **644***b* and thereby axial or fore-aft movement of frame assembly **612**. The arcuate configuration of track members **634***a*, **634***b* provides a gravity bias of frame assembly **612** toward an axially neutral position, as also described previously.

Each stabilizer **638** overlies a plate **646**, and plates **646** are secured to and extend outwardly from central base member **640** in opposite directions. The outer end of each stabilizer **638** is positioned within a channel defined by a stabilizer guide **648**, and each stabilizer guide **648** is secured to the outer end of one of plates **646**. The channel defined by the stabilizer guide **648** has a length greater than that of stabilizer **638**, so that stabilizer **638** can move back and forth within the channel of stabilizer guide **648** during fore-aft movement of stabilizers **638**. A tilt biasing arrangement is interposed between each stabilizer **638** and its underlying plate **646**. Representatively, the tilt biasing arrangement may have a configuration as described previously with respect to tilt biasing bracket assemblies **134***a*, **134***b* as shown and described with respect to FIGS. **1-18** or tilt biasing bracket assemblies **252** as shown and described with respect to FIGS. **19-24**. As also described previously, the tilt biasing arrangement acts on the stabilizers **638** to bias the frame assembly **612** of exercise cycle **610** toward a neutral, upright tilt position. While a pair of outriggers or stabilizers **638** are illustrated, it is understood that a single outrigger or stabilizer may be employed, or alternatively that the tilt biasing mechanism may be incorporated into any other structure of the exercise cycle **610** to bias exercise cycle **610** toward an upright position.

FIGS. **50-52** illustrate an embodiment of the present invention in which a bicycle B is engaged with and supported by a trainer **652**, which includes movable features in accordance with the present invention. In this embodiment, the movable support is incorporated directly into the structure of the trainer **652**. The trainer **652** is illustrated as being in the form of a direct drive trainer, although it is understood that a wheel-on trainer may also be employed. The trainer **652** includes a flywheel **654** which, in a manner as is known, is adapted to rotate in response to power input to the trainer **652** by rotation of the pedals of bicycle B. A resistance-providing arrangement, such as an electromagnetically controlled resistance mechanism, may be employed to selectively resist rotation of flywheel **654**. Flywheel **654** may be contained within a suitable housing or other enclosure.

Trainer **654** includes a central mounting section **656** that supports flywheel **654**, and a pair of stabilizers **658** extend outwardly in opposite directions from central mounting section **656**. A central bottom support member **660** extends forwardly from the front end of central mounting section **656**. The central bottom support member **660** may be provided with a wheel mount **662** on which the front wheel of bicycle B is supported. The front end of central bottom

support member **660** includes a front engagement area **664**, which includes an arcuate beaded track member **666** having a construction and configuration as described previously. A similar arcuate beaded track member is interconnected with and underlies central mounting section **656** at the rear end of bottom support member **660**.

Trainer **652** also includes a base assembly **668**, on which bottom support member **660** is positioned. The base assembly **668** includes a central axial base member **670**, which underlies bottom support member **660**. The base assembly **668** also includes a pair of plates **672** that extend outwardly in opposite directions from the rearward end of base member **670**. The plates **672** underlie the stabilizers **658**, as described previously, and a stabilizer guide **674** is secured to the outer end of each plate **672**. As also described previously, the end of each stabilizer **658** is positioned within a guide channel defined by the stabilizer guide **674** and is movable in a fore-aft direction therewithin. The base assembly **668** also includes a pair of brackets at each engagement area of bottom support member **660**. A front one of the brackets is shown at **676**, and a similarly configured rear bracket is secured to the rearward end of base member **670**. A grooved roller, such as shown at **678**, is rotatably mounted to each of the brackets, such as **676**.

In a manner similar to that described previously, any axial or longitudinal forces applied to bicycle B during use and experienced by mounting section **656** and bottom support member **660** cause axial fore-aft movement of bottom support member **660** relative to base assembly **668** by movement of the track members, such as **666**, on the grooved rollers, such as **678**. Again, the curved configuration of the track member such as **666** provides a gravity bias of support member **660**, and thereby bicycle B, to an axially neutral position. Any transverse or lateral forces applied to bicycle B during use cause bottom support member **662** tip or tilt relative to base assembly **668** by rotation of the central beaded area of each track, such as **666**, on the roller, such as **678**, on which the track is supported. Such tipping or tilting movement of the bottom support member **660** is transferred to the bicycle B and experienced by the user. As described previously, a tilt biasing arrangement is interposed between each stabilizer **658** and its underlying plate **672**, to bias bicycle B toward an upright or neutral tilt position. Again, while a pair of outriggers or stabilizers **658** are illustrated, it is understood that a single outrigger or stabilizer may be employed, or alternatively that the tilt biasing mechanism may be incorporated into any other structure of the trainer **652** to bias trainer **652** toward an upright position.

FIGS. **53-57** illustrate another embodiment of a movable exercise equipment support in accordance with the present invention, shown generally at **786**, on which the bicycle B and a trainer (not shown) may be supported. As in previously-described embodiments, the trainer with which bicycle B is engaged may be a wheel-on trainer or a direct drive trainer, in a manner as is known.

The general components and construction of movable exercise equipment support **786** are similar to those previously described with respect to movable exercise equipment support **200** as shown in FIGS. **19-24** and movable exercise equipment support **700** as shown in FIGS. **24***a*-**24***i*. In this regard, the movable exercise equipment support **786** generally includes a base section **788** and a platform section **790**. As described previously, the platform section **790** is movable in an axial, fore-aft direction relative to base section **788** in response to application of longitudinal forces to movable exercise equipment support **76** in response to operation of bicycle B. Platform section **790** also tilts side-to-side in response to application of forces to bicycle B that are off-center relative to the longitudinal axis of movable exercise equip in support **786**. Movable exercise equipment support **786** differs from the previously-described embodiments, however, in that the tilt biasing bracket assemblies incorporate in the movable exercise equipment supports such as **200**, **700** are replaced by a pair of cylinder assemblies **792** located one on either side of movable exercise equipment support **76**. The cylinder assemblies **792** are positioned between the rear portion of platform section **790** and the underlying rear portion of base section **788**, and in the illustrated embodiment are secured to and carried by the rear portion of the platform section **790**. Each cylinder assembly **792** includes a cylinder body **794** and an extendable and retractable rod **796**. A roller **798** is secured to the end of each rod **796**, and is engaged against an engagement surface or track **800** on the rear portion of base section **788**, as described previously. The cylinder assemblies **792** may be in the form of hydraulic cylinders, although it is understood that pneumatic cylinders, stepper motors, or any other linear or rotating actuator may also be employed. The cylinder assemblies **792** are hydraulically linked together, so that the cylinder assemblies **792** move up and down opposite one another at the same rate in response to lateral or longitudinally off-center forces being applied to bicycle B or experienced by movable exercise equipment support **786**. The cylinder assemblies **792** thus control side-to-side tilting movement of platform section **790** relative to base section **788**, and the cylinder rods **796** are biased outwardly, in a manner as is known, to provide a tilt biasing that tends to position the sum of forces vertically closer to or through the tilt axis.

A force sensor **802** is located at the top of each cylinder body **794**, and bears against the underside of platform section **790**. Each force sensor **802** is interconnected with a hydraulic controller that in turn is interconnected with each cylinder assembly **792**. With this arrangement, when a downward force is applied to a first side of the bicycle B that exceeds the upward force on a second side of the bicycle B, represented at F in FIG. **56**, the sensors **802** will determine that a greater amount of forces being applied to the first side of the bicycle B. An algorithm within the hydraulic controller then calculates the desired tilt of the platform section **790** according to the magnitude of the force F, and the controller commands the cylinder actuator to operate the cylinder assembly **792** on the first side of the bicycle B to extend the cylinder rod **796** and provide upward movement of the platform section **790** on the first side of the bicycle B by a desired amount according to the magnitude of the force F. By tilting the bicycle B upwards in this manner against the pedal force F, the center of force is moved back toward the pivot axis to stabilize the system, which mimics conditions experienced during real-world operation of a bicycle in outdoor conditions.

The speed of response in the cylinder assemblies **792** or other actuators could be tied to the virtual speed of the rider. In addition, the system could be controlled by an internal or separate computer through a wired or wireless signal.

It can thus be appreciated that the present invention provides a movable support arrangement for exercise equipment that in the first instance provides axial fore-aft movement of the item of exercise equipment, to provide a realistic feel during operation of the item of exercise equipment. The axial exercise equipment movement can be combined with lateral or tilting movement, to further enhance the realistic feel experienced by the user during operation. The movable support can be separate from an item of exercise equipment,

such that the item of exercise is separate from and positioned on the movable support. Alternatively, the movable support can be incorporated into the structure of the item of exercise equipment itself.

A direct drive trainer used in combination with the movable exercise equipment supports described above offer several benefits over previous systems. In the past, for example, in order to reduce peak saddle pressure, which has a significant impact on user comfort, previous bicycle trainers would either 1) require a large flywheel-based trainer unit to smooth out the rider's pedal stroke or 2) incorporate movement into the trainer, for instance, allowing for side-to-side or font-to-rear tilting movements. To smooth out the rider's pedal stroke, a direct drive trainer unit as shown can rapidly change the resistance based on the position of the pedal stroke, with greater resistance being generated during the high torque part of the user's pedal stroke and less resistance during the dead spot of the user's pedal cycle. The amount of resistance can be adjusted based on sensor readings, for instance, using accelerometer-based cadence sensors, reed switch sensors, position sensors, and other sensors as would be known to one of ordinary skill in the art. Based on the sensor readings, resistance can be increased and decreased rapidly to allow for a full reversal within each pedal stroke. These changes in resistance can be calculated based on any number of factors, including for instance increase or decrease in torque, increase or decrease in speed, redundantly positive or negative acceleration, increase or decrease in instantaneous power, or derivatives of power. Similarly, the resistance could be calculated based on any combination of these factors. The adjustments in resistance can be achieved, for instance, using electromagnetic coils, although a motor controller including a drive and a brake could similarly be used. However, any number of other methods of generating resistance could similarly be employed. For instance, these could include systems that deposit generated power into resistors, systems that dissipate power through eddy current resistance, and friction-based systems.

Previously, the two options stated above were not compatible with one another primarily because the weight associated with a large flywheel-based trainer unit resulted in significant gyroscopic stability, which made it difficult to simulate realistic movement during use of the trainer system. However, by using the embodiments described above, a movable direct drive-type bicycle trainer system generates both the smooth pedal stroke associated with use of a heavy flywheel-based trainer unit, while also allowing for realistic movement of the system in the form of fore and aft and side-to-side movement.

It is understood that the invention disclosed and defined herein extends to all alternative combinations of two or more of the individual features mentioned or evident from the text and/or drawings. All of these different combinations constitute various alternative aspects of the present invention. The embodiments described herein explained the best modes known for practicing the invention and will enable others skilled in the art to utilize the invention.

Various additions, modifications, and rearrangements are contemplated as being within the scope of the following claims, which particularly point out and distinctly claim the subject matter regarding as the invention, and it is intended that the following claims cover all such additions, modifications, and rearrangements.

We claim:

1. An exercise arrangement for use on a support surface, comprising:

a user support and input arrangement that is configured to support a user and that includes a user force input arrangement, wherein application of forces by the user during operation of the user force input arrangement includes application of forces in a first, axial direction that is generally parallel to the support surface and application of forces in a second direction that is non-parallel to the first, axial direction; and

a movable support arrangement interposed between the support surface and the user support and input arrangement, wherein the movable support arrangement is movable in the first, axial direction in response to the application of forces by the user in the first, axial direction during operation of the user force input arrangement, and is simultaneously movable in the second direction in response to the application of forces by the user in the second direction during operation of the user force input arrangement.

2. The exercise arrangement of claim **1**, wherein movement of the movable support arrangement in the second direction comprises tilting movement of the movable support arrangement about a tilt axis that extends in the axial direction.

3. The exercise arrangement of claim **2**, wherein the movable support arrangement comprises a platform that is movably mounted to a base, wherein the user support and input arrangement is supported on the platform.

4. The exercise arrangement of claim **3**, wherein the user support and input arrangement comprises a bicycle and a bicycle trainer with which the bicycle is engaged.

5. The exercise arrangement of claim **3**, wherein the user support and input arrangement comprises an item of exercise equipment supported on the platform.

6. The exercise arrangement of claim **3**, wherein a roller and track arrangement is interposed between the platform and the base, wherein the roller and track arrangement provides movement of the platform in the first, axial direction relative to the base in response to axial forces applied by the user to the user force input arrangement.

7. The exercise arrangement of claim **6**, wherein the roller and track arrangement is configured to define an axially neutral position of the platform relative to the base, and is further configured to bias the platform toward the axially neutral position.

8. The exercise arrangement of claim **7**, wherein the roller and track arrangement comprises one or more curved roller and track engagement surfaces that extend in the first, axial direction and that provide a gravity bias of the platform toward the neutral position.

9. The exercise arrangement of claim **6**, wherein the roller and track arrangement is further configured to provide tilting movement of the movable platform about the tilt axis relative to the base.

10. The exercise arrangement of claim **3**, wherein the platform comprises a front platform section and a rear platform section that are secured together via a pivot connection that enables the front and rear platform sections to be positioned in an operative use position and folded together about a transverse pivot axis to a folded storage position.

11. The exercise arrangement of claim **3**, further comprising a tilt biasing arrangement for biasing the platform toward a neutral tilt position relative to the base.

12. The exercise arrangement of claim **11**, wherein the tilt biasing arrangement comprises a pair of springs between the base and the platform, wherein the pair of springs are located one on either side of the tilt axis.

13. The exercise arrangement of claim 12, wherein each spring is incorporated in a roller arrangement that is interposed between the frame and the platform, wherein the spring maintains engagement of the roller arrangement between the base and the platform during axial movement of the platform relative to the base and simultaneously applies a biasing force on the platform that biases the platform to the neutral tilt position relative to the base.

14. The exercise arrangement of claim 13, wherein the movement of the platform relative to the base in the first, axial direction also includes movement of the platform relative to the base in a vertical direction, and wherein the tilt biasing arrangement is configured to isolate the biasing force of the springs of the tilt biasing arrangement from vertical movement of the platform relative to the base.

15. The exercise arrangement of claim 3, further comprising an adjustable weight arrangement associated with the platform for countering any imbalance of the user support and input arrangement relative to a longitudinal axis defined by the platform.

16. The exercise arrangement of claim 2, wherein the user support and input arrangement includes a frame, and wherein the movable support arrangement is incorporated into the frame of the user support and input arrangement.

17. A cycle-type exercise system, comprising:

a cycle device for enabling a user to apply input forces, wherein application of forces by the user during operation of the cycle device includes application of forces in a first, axial direction that is generally parallel to a support surface and application of forces in a second direction that is non-parallel to the first, axial direction; and

a movable support arrangement that supports the cycle device above the support surface, wherein the movable support arrangement is configured to provide movement of the cycle device along a longitudinal axis in the first, axial direction in response to the application of forces by the user in the first, axial direction during operation of cycle device and is further configured to provide simultaneous tilting movement of the cycle device about a tilt axis that is parallel to the longitudinal axis, in response to input forces applied by the user in the second direction during operation of the cycle device.

18. The cycle-type exercise system of claim 17, wherein the cycle device comprises a bicycle engaged with a bicycle trainer, and wherein the movable support arrangement comprises a platform on which the bicycle and trainer are supported, and a base interposed between the platform and the support surface, wherein the platform is mounted to the base for movement in the axial direction along the longitudinal axis and for tilting movement about the tilt axis.

19. The cycle-type exercise system of claim 17, wherein the cycle device comprises a stationary exercise cycle, and wherein the movable support arrangement is incorporated into a frame of the stationary exercise cycle.

20. The cycle-type exercise system of claim 17, wherein the cycle device comprises a bicycle engaged with a bicycle trainer, and wherein the movable support arrangement comprises a front support and a rear support, wherein the front support is configured to support the front of the bicycle and the rear support is configured to support the bicycle trainer, wherein each of the front and rear supports includes a roller arrangement that provides movement of the bicycle and the bicycle trainer in the axial direction along the longitudinal axis, and wherein the bicycle trainer is mounted to the rear support via an axially extending central support arrangement that provides tilting movement of the bicycle trainer about the tilt axis and wherein the front wheel of the bicycle is mounted to the front support via a central front wheel support that accommodates movement of the bicycle and the bicycle trainer about the tilt axis.

21. The cycle-type exercise system of claim 17, wherein the cycle device comprises a bicycle engaged with a bicycle trainer, and wherein the movable support arrangement comprises a front support and a rear support, wherein the front support is configured to support a front wheel of the bicycle and the rear support is configured to support the bicycle trainer, wherein each of the front and rear supports includes an axial roller arrangement that provides movement of the bicycle and the bicycle trainer in the axial direction along the longitudinal axis, and wherein at least the rear support includes a transverse roller arrangement that provides movement of the bicycle trainer about the tilt axis.

22. The cycle-type exercise system of claim 17, wherein the cycle device comprises a bicycle engaged with a bicycle trainer, and wherein the movable support arrangement comprises a first support, a second support and a third support, wherein the bicycle and the bicycle trainer are supported on the first support, the first support is supported on the second support via a first roller arrangement that provides movement of the first support in the axial direction, and the second support is supported on the third support via a second roller arrangement that provides movement of the first second support and the first support about the tilt axis.

23. The cycle-type exercise system of claim 17, wherein the cycle device comprises a bicycle engaged with a bicycle trainer, and wherein the movable support arrangement comprises a first support, a second support and a third support, wherein the bicycle and the bicycle trainer are supported on the first support, the first support is supported on the second support via a first roller arrangement that provides movement of the first support about the tilt axis, and the second support is supported on the third support via a second roller arrangement that provides movement of the second support and the first support in the axial direction.

24. The cycle-type exercise system of claim 17, wherein the cycle device comprises a bicycle engaged with a bicycle trainer, and wherein the movable support arrangement comprises a first support on which the bicycle and the bicycle trainer are supported, a base configured to be positioned on the support surface, and a suspension-type engagement arrangement between the base and the first support, wherein the suspension-type engagement arrangement provides movement of the first support in both the axial direction and about the tilt axis.

25. The cycle-type exercise system of claim 17, wherein the cycle device comprises a bicycle engaged with a bicycle trainer, and wherein the movable support arrangement comprises a first support, a second support and a base, wherein the bicycle and the bicycle trainer are positioned on the first support, a suspension-type engagement arrangement is interposed between the first support and the second support for providing movement of the first support about the tilt axis, and a roller arrangement is provided between the second support and the base for providing movement of the second support relative to the base in the axial direction.

26. The cycle-type exercise system of claim 17, wherein the cycle device comprises a bicycle engaged with a bicycle trainer, and wherein the movable support arrangement comprises a first support, a second support and a base, wherein the bicycle and the bicycle trainer are positioned on the first support, a first suspension-type engagement arrangement is interposed between the first support and the second support

for providing movement of the first support about the tilt axis, and a second suspension-type engagement arrangement is interposed between the second support and the base for providing movement of the second support in the axial direction.

27. The cycle-type exercise system of claim **17**, wherein the cycle device comprises a bicycle engaged with a resistance device, and wherein the movable support arrangement comprises a base positioned on the support surface, a support on which the bicycle and the bicycle trainer are positioned, a pair of front support arms extending from the base, a pair of rear support aims extending from the base, a suspension-type engagement arrangement interposed between the support and the front and rear support arms for providing movement of the support about the tilt axis, and a pivot connection associated with the front and rear support arms for providing movement of the support in the axial direction.

28. The cycle-type exercise system of claim **27**, wherein the front and rear support arms are further configured to provide movement of the support about a generally vertical twist axis relative to the base.

29. The cycle-type exercise system of claim **17**, wherein the cycle device includes a frame, and wherein the movable support arrangement comprises a base adapted to be supported on the support surface, and a roller and track arrangement interposed between the frame and the base, wherein the roller and track arrangement provides movement of the frame in the axial direction relative to the base in response to forces applied by the user to the cycle device in the first, axial direction, and further provides tilting movement of the frame about the tilt axis relative to the base in response to forces applied by the user to the cycle device in the second direction.

30. The cycle-type exercise system of claim **29**, wherein the movable support arrangement includes tan axial biasing arrangement for biasing the frame toward a neutral position in the axial direction and a tilt biasing arrangement for biasing the frame toward a neutral tilt position about the tilt axis.

31. The cycle-type exercise system of claim **30**, wherein the roller and track arrangement comprises one or more curved roller and track engagement surfaces between the frame and the base that extend in the axial direction and that provide a gravity bias of the frame toward the neutral position in the axial direction.

32. The cycle-type exercise system of claim **31**, wherein the frame includes one or more stabilizers and wherein the tilt biasing arrangement acts on the one or more stabilizers for biasing the frame toward the neutral tilt position.

33. The cycle-type exercise system of claim **17**, wherein the cycle device comprises a bicycle engaged with a resistance device, and wherein the movable support arrangement comprises a base positioned on the support surface, a support with which the bicycle and the resistance device are engaged, and a roller and track arrangement interposed between the support and the base, wherein the roller and track arrangement provides movement of the support in the axial direction relative to the base in response to axial forces applied by the user to the cycle device in the axial direction, and further provides tilting movement of the support about the tilt axis relative to the base in response to forces applied by the user to the cycle device in the second direction.

34. The cycle-type exercise system of claim **33**, wherein the movable support arrangement includes tan axial biasing arrangement for biasing the support toward a neutral axial position and a tilt biasing arrangement for biasing the support toward a neutral tilt position.

35. The cycle-type exercise system of claim **34**, wherein the roller and track arrangement comprises one or more curved roller and track engagement surfaces between the support and the base that extend in the axial direction and that provide a gravity bias of the support toward the neutral axial position.

36. The cycle-type exercise system of claim **35**, wherein the support includes a pair of outriggers and wherein the tilt biasing arrangement acts on the pair of outriggers for biasing the support toward the neutral tilt position.

37. A support for an exercise arrangement that includes a cycle device for enabling a user to apply input forces, wherein application of forces by the user during operation of the cycle device includes application of forces in a first, axial direction that is generally parallel to a support surface and application of forces in a second direction that is non-parallel to the first, axial direction, comprising:

a base adapted to be positioned on a support surface; and

a movable support engaged with the base and that is configured to support the cycle device above the base, wherein the movable support is movably mounted to the base for movement along a longitudinal axis in the first, axial direction in response to input forces applied by the user to the cycle device in the first, axial direction during operation of cycle device, and is further configured to provide simultaneous tilting movement of the cycle device about a tilt axis that is parallel to the longitudinal axis, in response to input forces applied by the user in the second direction during operation of the cycle device.

38. The support of claim **37**, wherein the cycle device comprises a bicycle and trainer combination.

39. The support of claim **37**, wherein the cycle device comprises a cycle-type exercise device.

40. The support of claim **37**, wherein the movable support comprises a platform mounted to the base for movement in the axial direction and for movement about the tilt axis.

41. The support of claim **40**, wherein the platform comprises a first platform section and a second platform section that are secured together via a pivot connection that enables the first and second platform sections to be positioned in an operative use position and folded together about a pivot axis to a folded storage position.

42. A bicycle trainer, comprising:

a base adapted to be positioned on a support surface; and

a movable support engaged with the base, wherein the movable support includes a resistance arrangement and wherein a bicycle is adapted to be engaged with the movable support and to act on the resistance arrangement, wherein application of forces by the user during operation of the bicycle includes application of forces in a first, axial direction that is generally parallel to the support surface and application of forces in a second direction that is non-parallel to the first, axial direction, wherein the resistance arrangement provides resistance to operation of the bicycle, wherein the movable support is movably mounted to the base and is configured to provide axial movement of the resistance arrangement and the bicycle along a longitudinal axis in response to the application of input forces applied by the user to the bicycle in the first, axial direction during operation of the bicycle, and is further configured to provide simultaneous tilting movement of the resistance arrangement and the bicycle about a tilt axis that is parallel to the longitudinal axis, in response to input

forces applied by the user in the second direction during operation of the bicycle.

43. The bicycle trainer of claim **42**, wherein the movable support includes a platform mounted to the base for movement in the axial direction and for movement about the tilt axis.

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