US010532244B2

(12) **United States Patent**
Hockridge

(10) **Patent No.: US 10,532,244 B2**
(45) **Date of Patent: Jan. 14, 2020**

(54) **FLIP AND DIP HANDLE SYSTEM FOR PERFORMING DIP EXERCISES ON AN EXERCISE MACHINE**

(71) Applicant: **HOIST FITNESS SYSTEMS, INC.**, Poway, CA (US)

(72) Inventor: **Bruce Hockridge**, San Diego, CA (US)

(73) Assignee: **HOIST FITNESS SYSTEMS, INC.**, Poway, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 150 days.

(21) Appl. No.: **15/913,685**

(22) Filed: **Mar. 6, 2018**

(65) **Prior Publication Data**

US 2018/0193688 A1 Jul. 12, 2018

Related U.S. Application Data

(63) Continuation of application No. 14/992,978, filed on Jan. 11, 2016, now Pat. No. 9,943,721.
(Continued)

(51) **Int. Cl.**
A63B 21/00 (2006.01)
A63B 23/12 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***A63B 21/4027*** (2015.10); ***A63B 21/068*** (2013.01); ***A63B 21/0628*** (2015.10);
(Continued)

(58) **Field of Classification Search**
CPC A63B 21/00; A63B 21/00047; A63B 21/00069; A63B 21/00072; A63B 21/00181; A63B 21/00185; A63B 21/005; A63B 21/008; A63B 21/0085; A63B 21/012; A63B 21/023; A63B 21/026; A63B 21/0552; A63B 21/0557; A63B 21/0628; A63B 21/068; A63B 21/154; A63B 21/156; A63B 21/4027; A63B 21/4029;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,011,139 A 4/1991 Towley, III
5,277,684 A * 1/1994 Harris A63B 21/4047 482/121
(Continued)

FOREIGN PATENT DOCUMENTS

FR 2892638 A1 5/2007

OTHER PUBLICATIONS

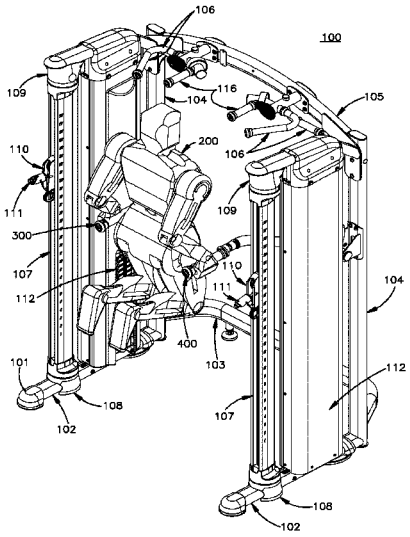
European Patent Office, Partial European Search Report for corresponding European Patent Application No. 16737666.4, dated Aug. 22, 2018, 11 pages.

Primary Examiner — Megan Anderson
(74) *Attorney, Agent, or Firm* — Gordon Rees Scully Mansukhani LLP; David R. Heckadon

(57) **ABSTRACT**

An exercise machine for performing dip exercises, having: a stationary main frame; first and second mounting brackets connected to the stationary main frame; first and second dip handle assemblies connected to the mounting brackets, each dip handle assembly having a first exercise arm, a first stop plate, and a first arm mount hub, wherein the first and second dip handle assemblies are each configured to be converted between an exercise position and a storage position while connected to the exercise machine.

12 Claims, 16 Drawing Sheets



Related U.S. Application Data

(60) Provisional application No. 62/102,192, filed on Jan. 12, 2015.

(51) **Int. Cl.**

A63B 21/062	(2006.01)
A63B 23/035	(2006.01)
A63B 21/068	(2006.01)
A63B 21/005	(2006.01)
A63B 21/008	(2006.01)
A63B 21/012	(2006.01)
A63B 21/02	(2006.01)
A63B 23/04	(2006.01)
A63B 21/055	(2006.01)
A63B 23/00	(2006.01)
A63B 71/00	(2006.01)

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

CPC ***A63B 21/4033*** (2015.10); ***A63B 23/0355*** (2013.01); ***A63B 23/03533*** (2013.01); ***A63B 23/1209*** (2013.01); ***A63B 23/1218*** (2013.01); ***A63B 23/1227*** (2013.01); *A63B 21/005* (2013.01); *A63B 21/008* (2013.01); *A63B 21/00047* (2013.01); *A63B 21/00069* (2013.01); *A63B 21/00072* (2013.01); *A63B 21/0085* (2013.01); *A63B 21/00181* (2013.01); *A63B 21/00185* (2013.01); *A63B 21/012* (2013.01); *A63B 21/023* (2013.01); *A63B 21/026* (2013.01); *A63B 21/0552* (2013.01); *A63B 21/0557* (2013.01); *A63B 21/154* (2013.01); *A63B 21/156* (2013.01); *A63B 21/4029* (2015.10); *A63B 21/4035* (2015.10); *A63B 21/4047* (2015.10); *A63B 23/03525* (2013.01); *A63B 23/03541* (2013.01); *A63B 23/03558* (2013.01); *A63B 23/03575* (2013.01); *A63B 23/1245* (2013.01); *A63B 2023/006* (2013.01); *A63B 2023/0411* (2013.01); *A63B 2071/009* (2013.01); *A63B 2208/0204* (2013.01); *A63B 2208/029* (2013.01); *A63B 2208/0214* (2013.01); *A63B 2208/0228* (2013.01); *A63B 2209/02* (2013.01); *A63B 2210/00* (2013.01); *A63B 2210/50* (2013.01); *A63B 2225/09* (2013.01); *A63B 2225/093* (2013.01)

(58) **Field of Classification Search**

CPC A63B 21/4033; A63B 21/4035; A63B 21/4047; A63B 23/03525; A63B 23/03533; A63B 23/03541; A63B 23/0355; A63B 23/03558; A63B 23/03575; A63B 23/12; A63B 23/1209; A63B 23/1218; A63B 23/1227; A63B 23/1245; A63B 2023/006; A63B 2023/0411; A63B 71/009; A63B 2208/0204; A63B 2208/0214; A63B 2208/0228; A63B 2208/029; A63B 2209/02; A63B 2210/00; A63B 2210/50; A63B 2225/09; A63B 2225/093

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,722,921	A	3/1998	Simonson	
5,810,702	A *	9/1998	Wilkinson	A63B 21/00047 482/130
7,632,221	B1	12/2009	Kolander	
8,057,367	B2	11/2011	Giannelli et al.	
8,070,658	B2	12/2011	Giannelli et al.	
8,708,872	B2	4/2014	Giannelli et al.	
8,992,392	B2	3/2015	Giannelli et al.	
9,089,737	B2	7/2015	Giannelli et al.	
9,199,119	B2	12/2015	Hetrick et al.	
9,211,434	B2	12/2015	Giannelli et al.	
9,320,934	B1	4/2016	Pringle	
9,468,788	B2 *	10/2016	Bissu	A63B 21/00076
2005/0009675	A1	1/2005	Van Den Heever	
2006/0035764	A1	2/2006	Webber	
2007/0161475	A1	7/2007	Kerry	
2009/0048082	A1	2/2009	Abbott	
2009/0253559	A1	10/2009	Maresh	
2010/0279827	A1	11/2010	Farnsworth et al.	
2011/0028280	A1	2/2011	Adams	
2012/0329626	A1	12/2012	Meredith et al.	
2014/0087925	A1	3/2014	Dupuis	
2015/0057137	A1	2/2015	Chen	
2016/0166874	A1	6/2016	Sheeler	
2017/0144008	A1	5/2017	Brown	

* cited by examiner

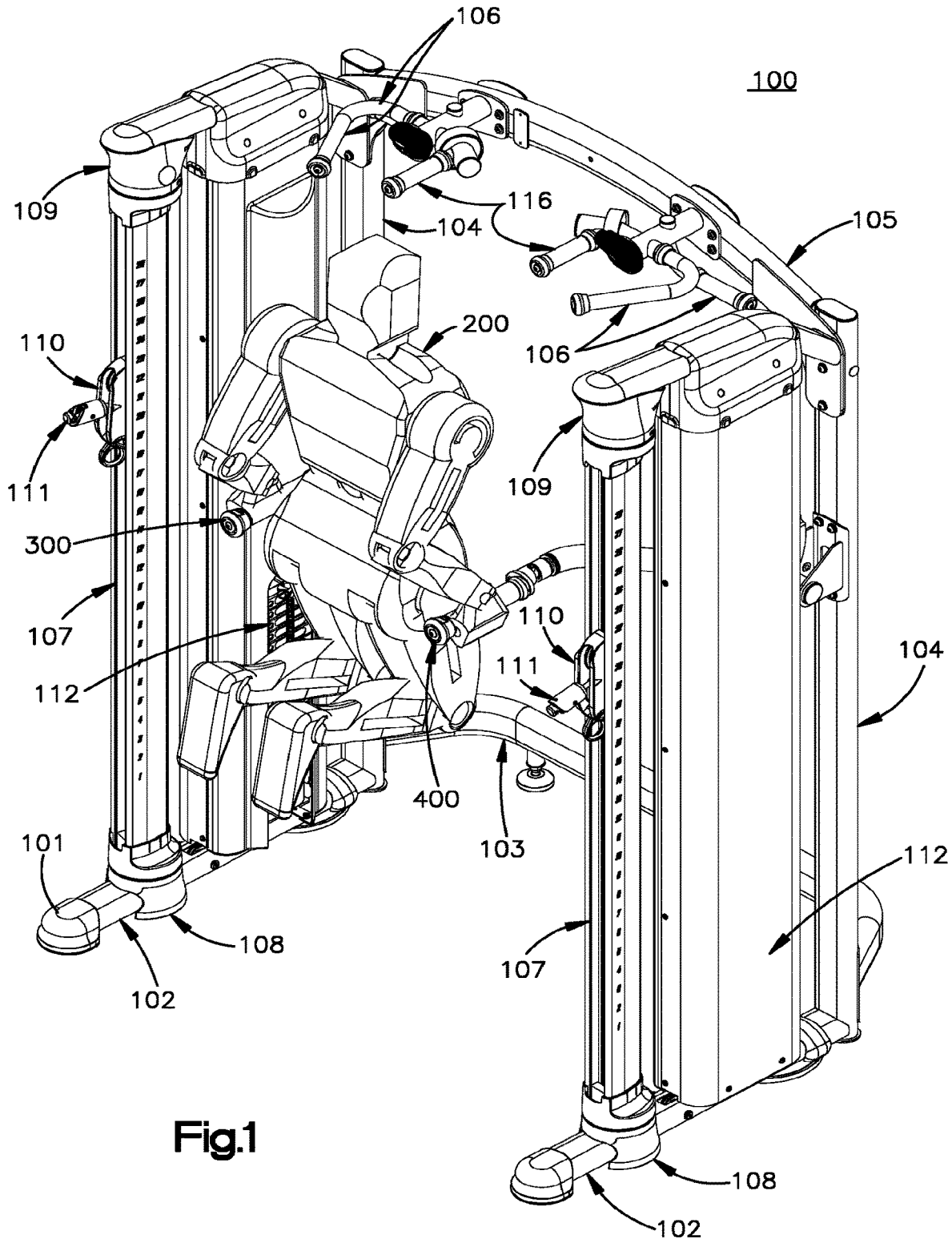

106
100
109
116
104
105
200
110
106
111
109
300
107
110
112
111
104
400
103
101
112
108
107
102
108
102

Fig.1

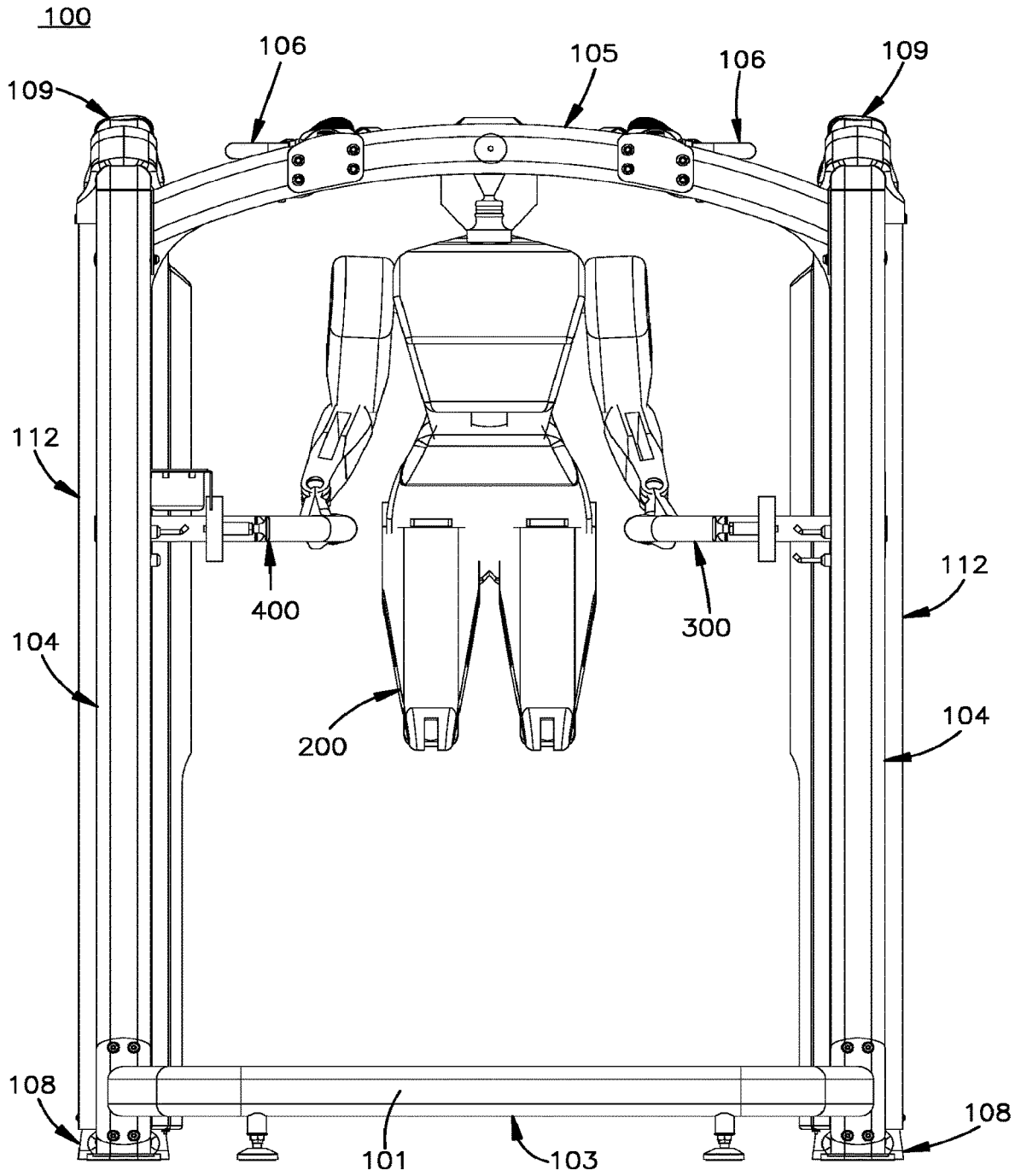

100
106
105
106
109
109
112
112
400
300
104
104
200
108
108
101
103

Fig.2

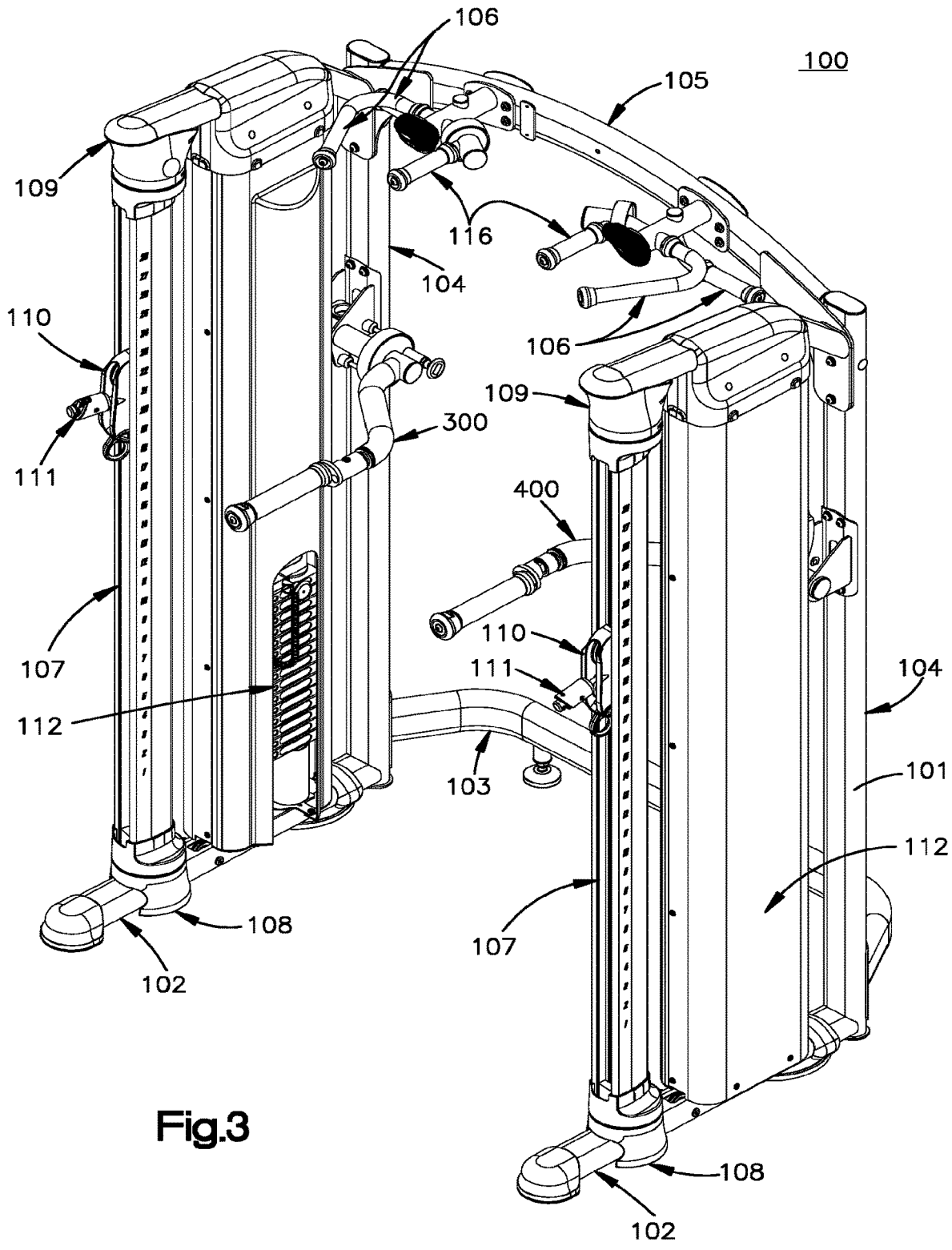

106
100
105
109
116
104
110
106
109
300
111
400
110
111
107
104
112
103
101
112
107
108
102
108
102

Fig.3

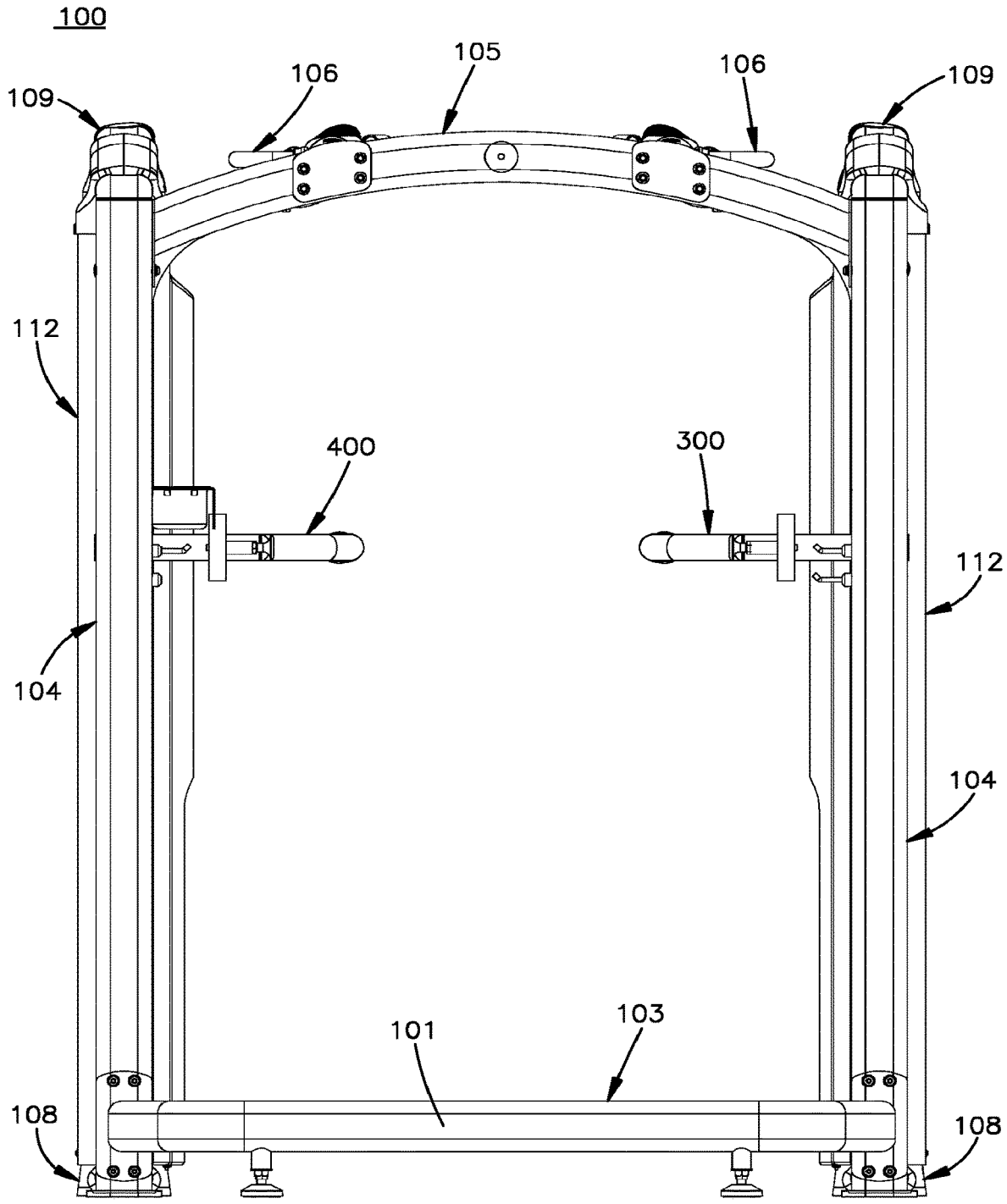


Fig.4

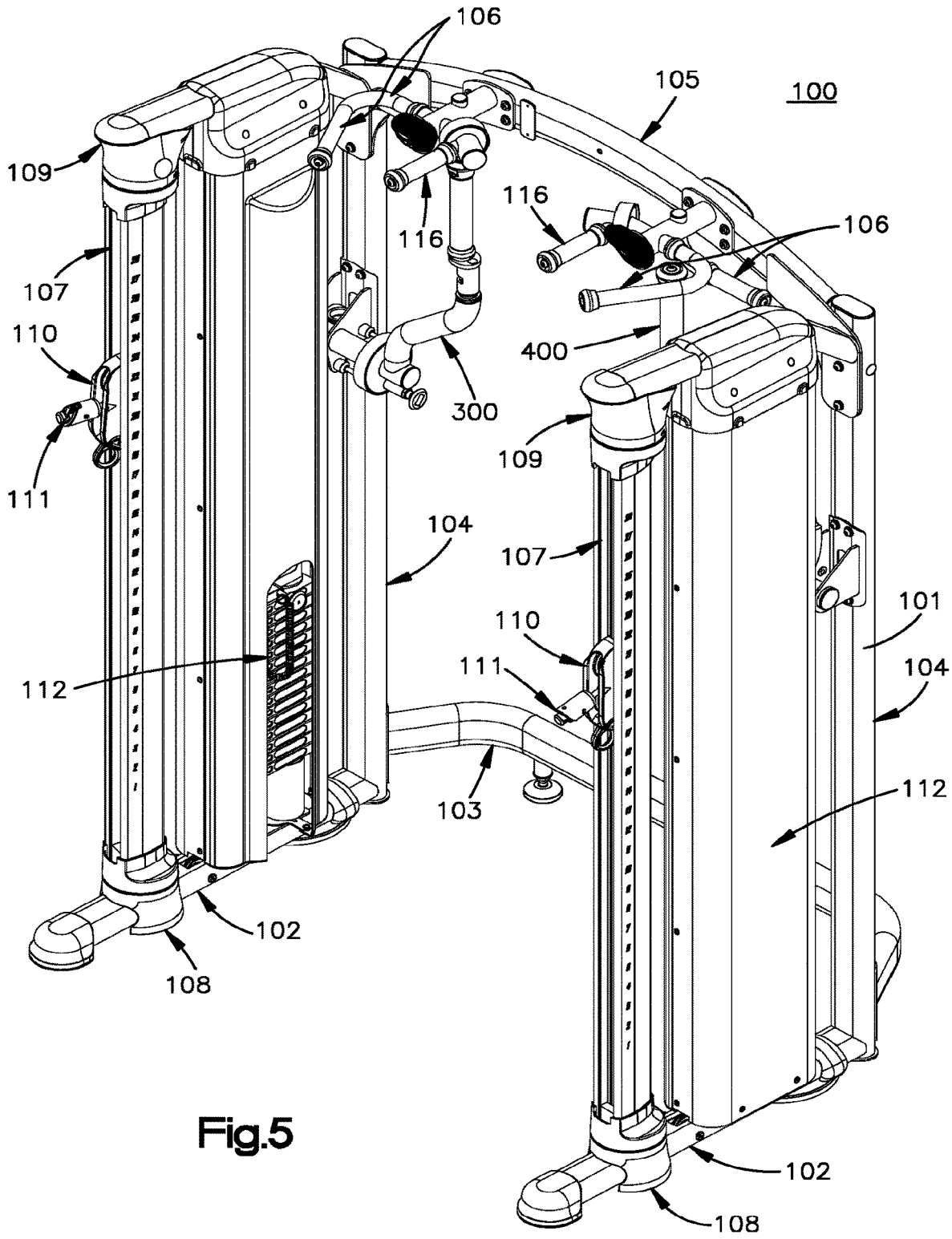

106
105
100
109
116
116
106
107
110
400
300
111
109
104
107
101
110
111
104
112
112
103
102
108
102
108

Fig.5

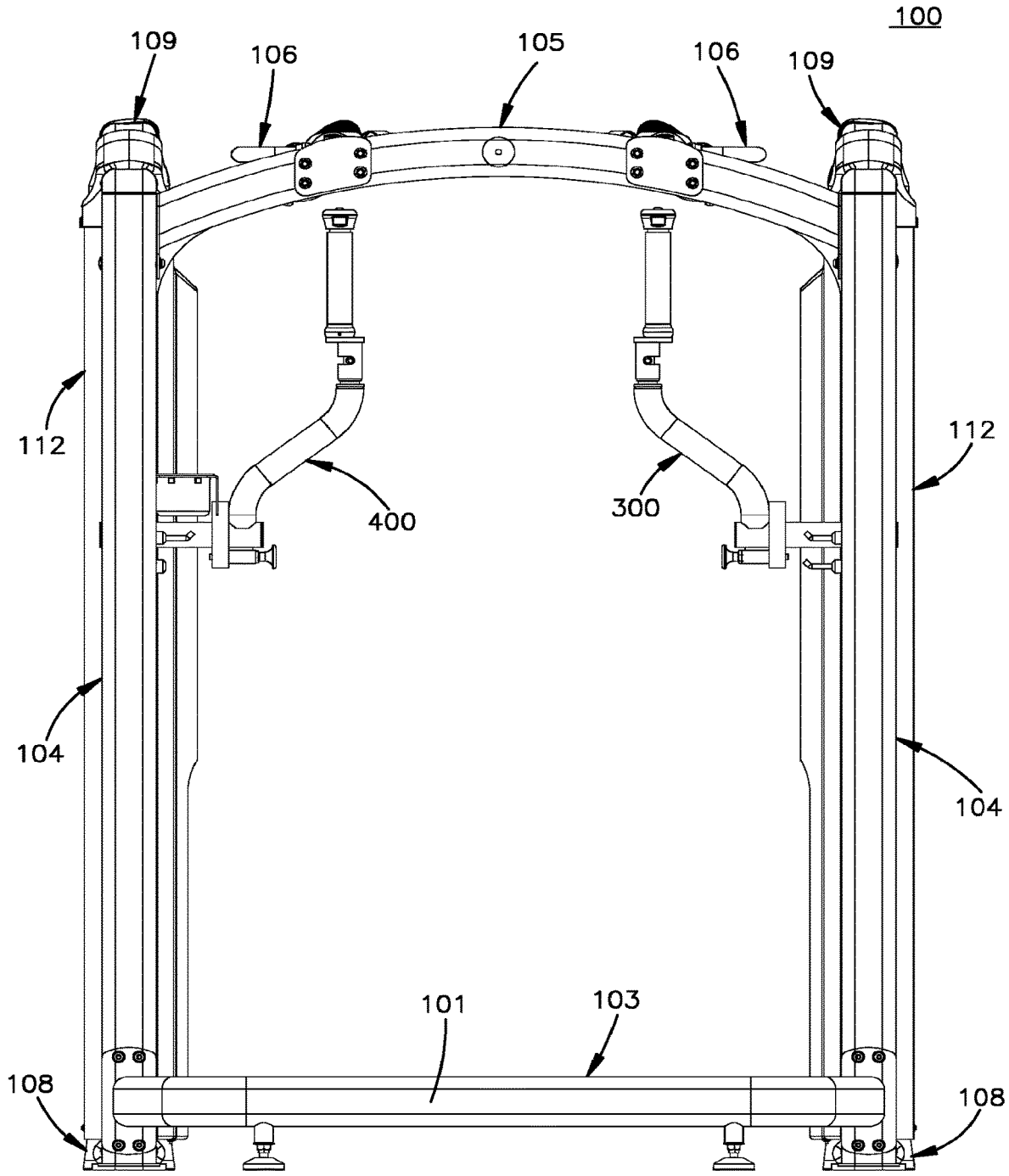


Fig.6

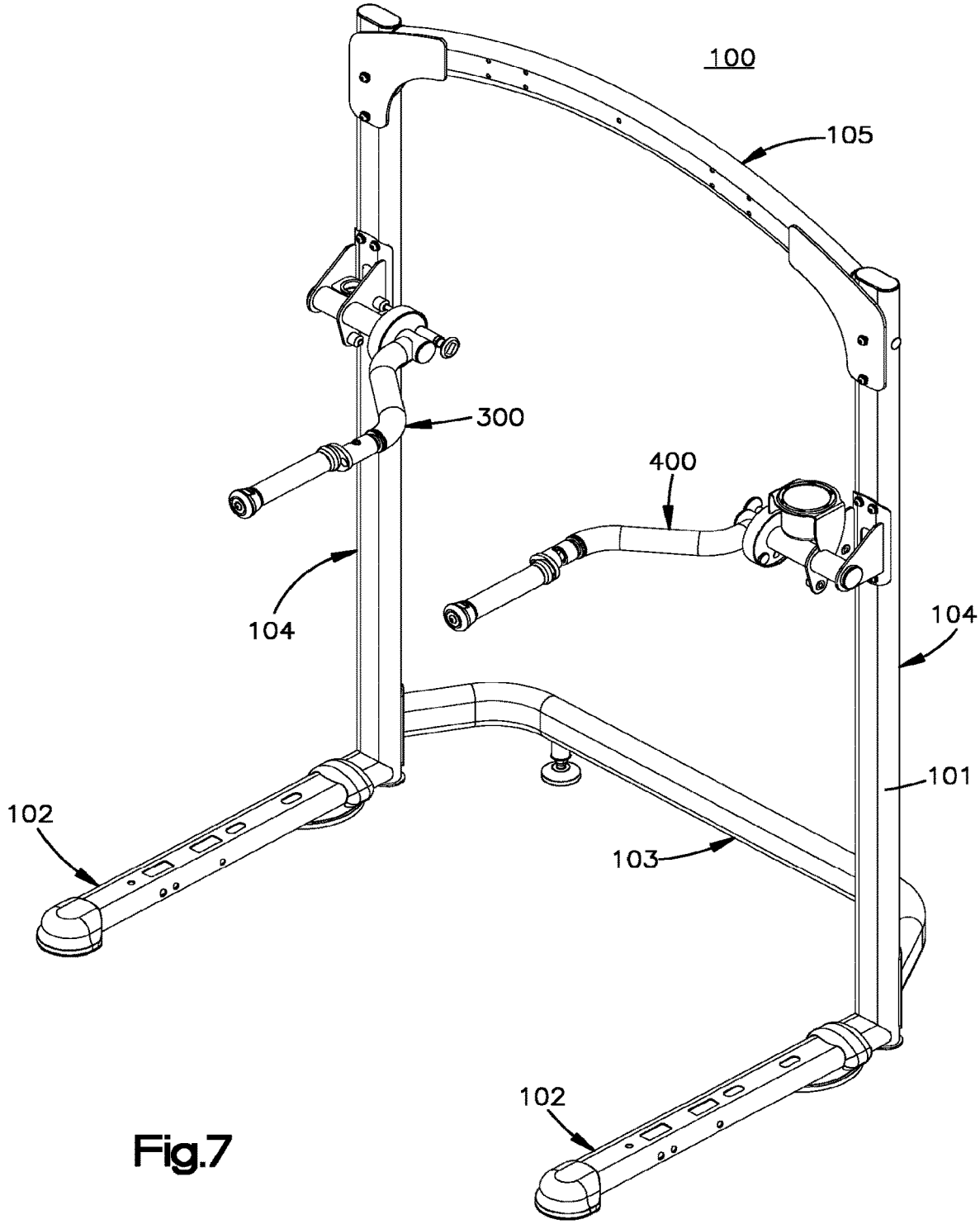


Fig.7

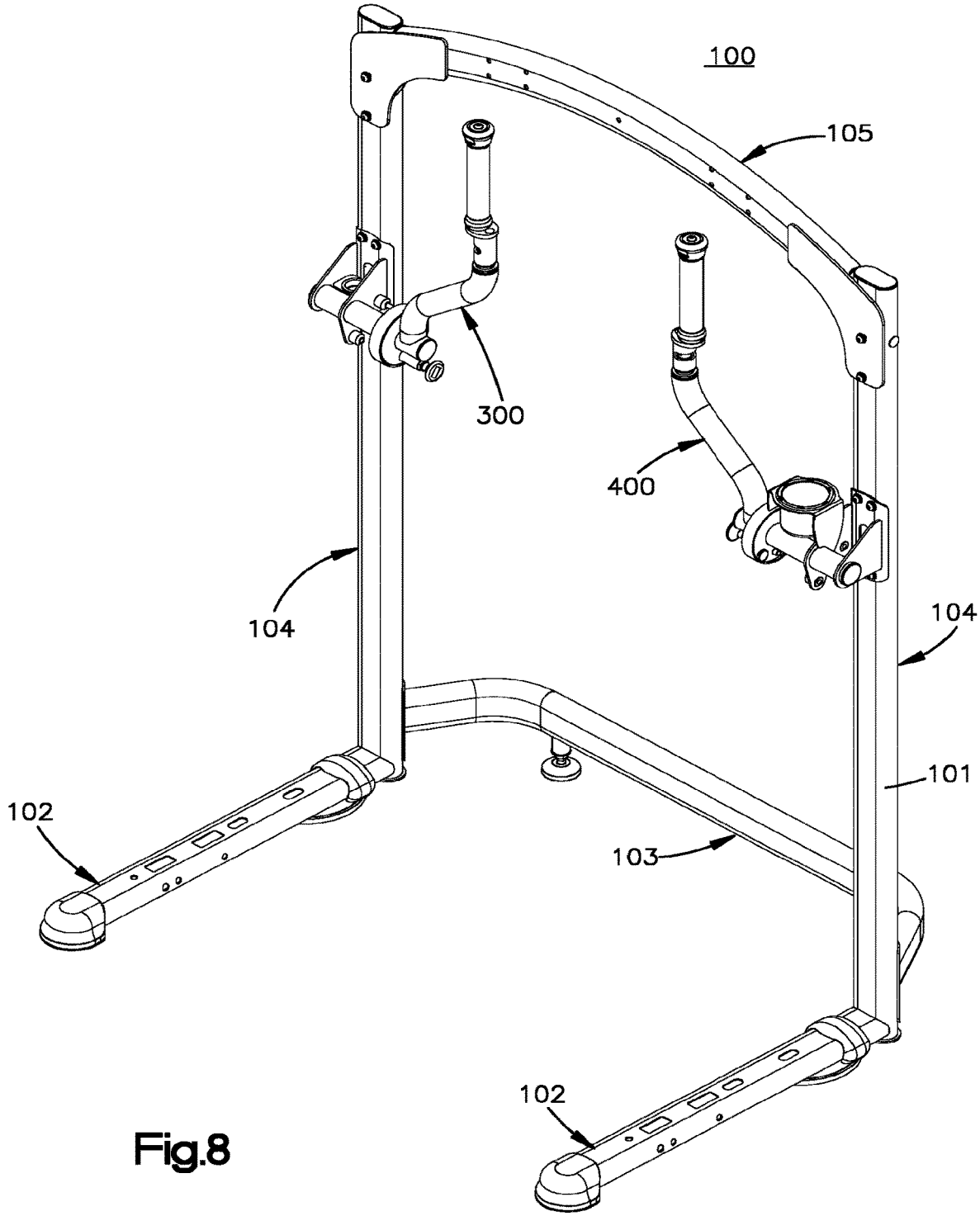


Fig.8

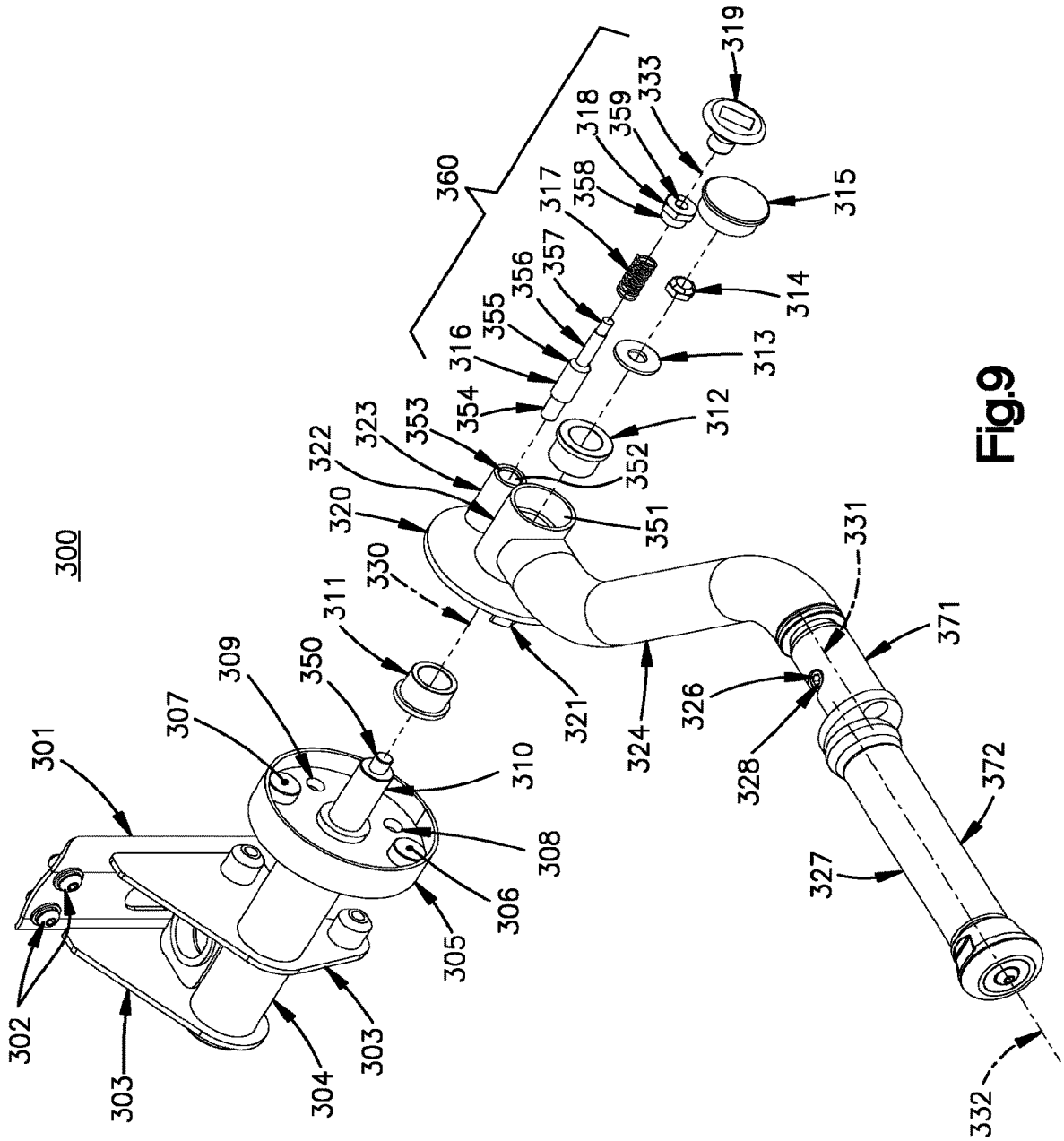

300
301
302
303
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
326
327
328
330
331
332
333
350
351
352
353
354
355
356
357
358
359
360
371
372

Fig.9

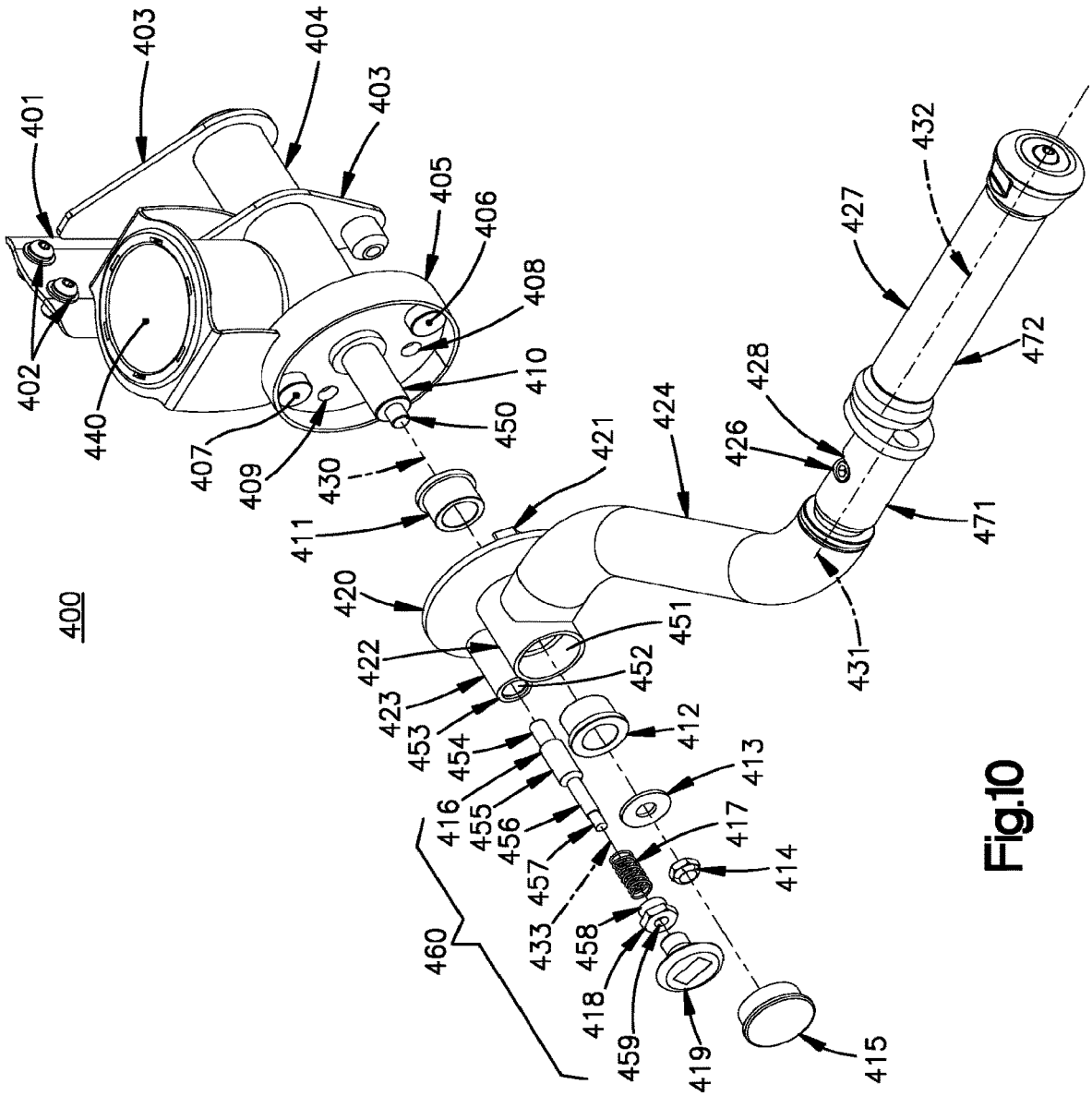

400
401
402
403
404
403
405
406
408
410
450
440
407
409
430
411
421
424
420
422
423
453
454
416
455
456
457
433
458
418
459
419
460
451
452
412
413
417
414
415
426
428
427
432
472
471
431

Fig.10

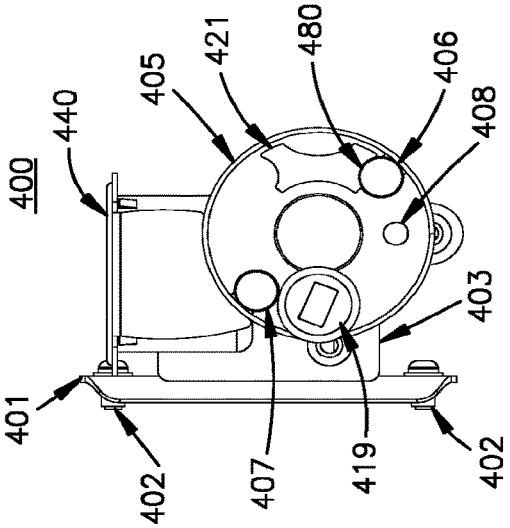


Fig.13

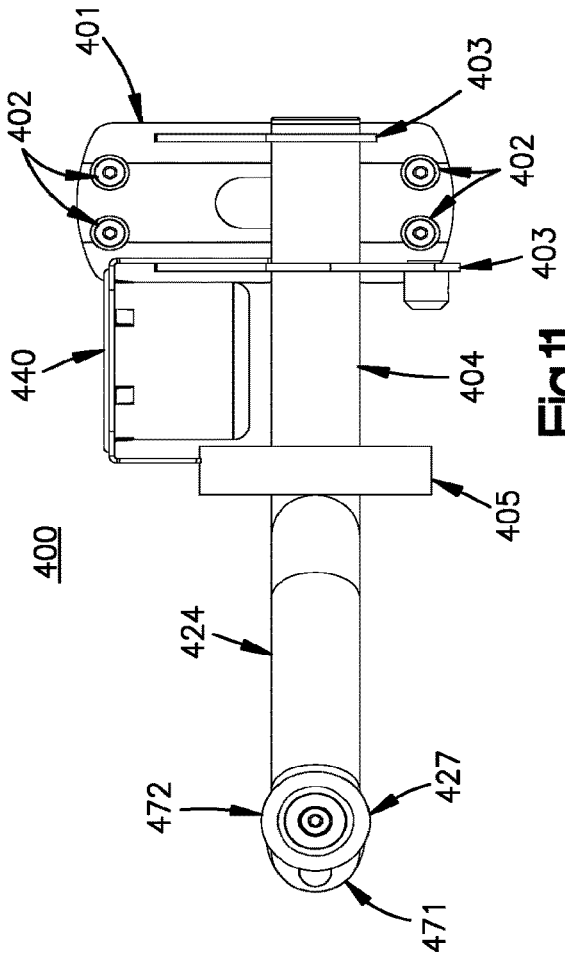


Fig.11

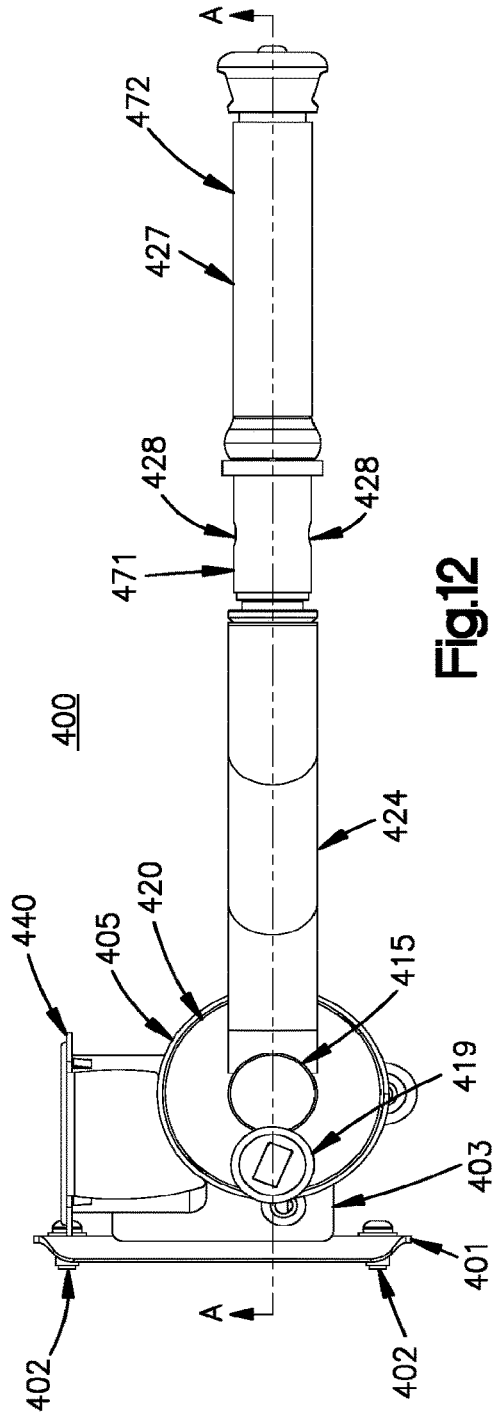


Fig.12

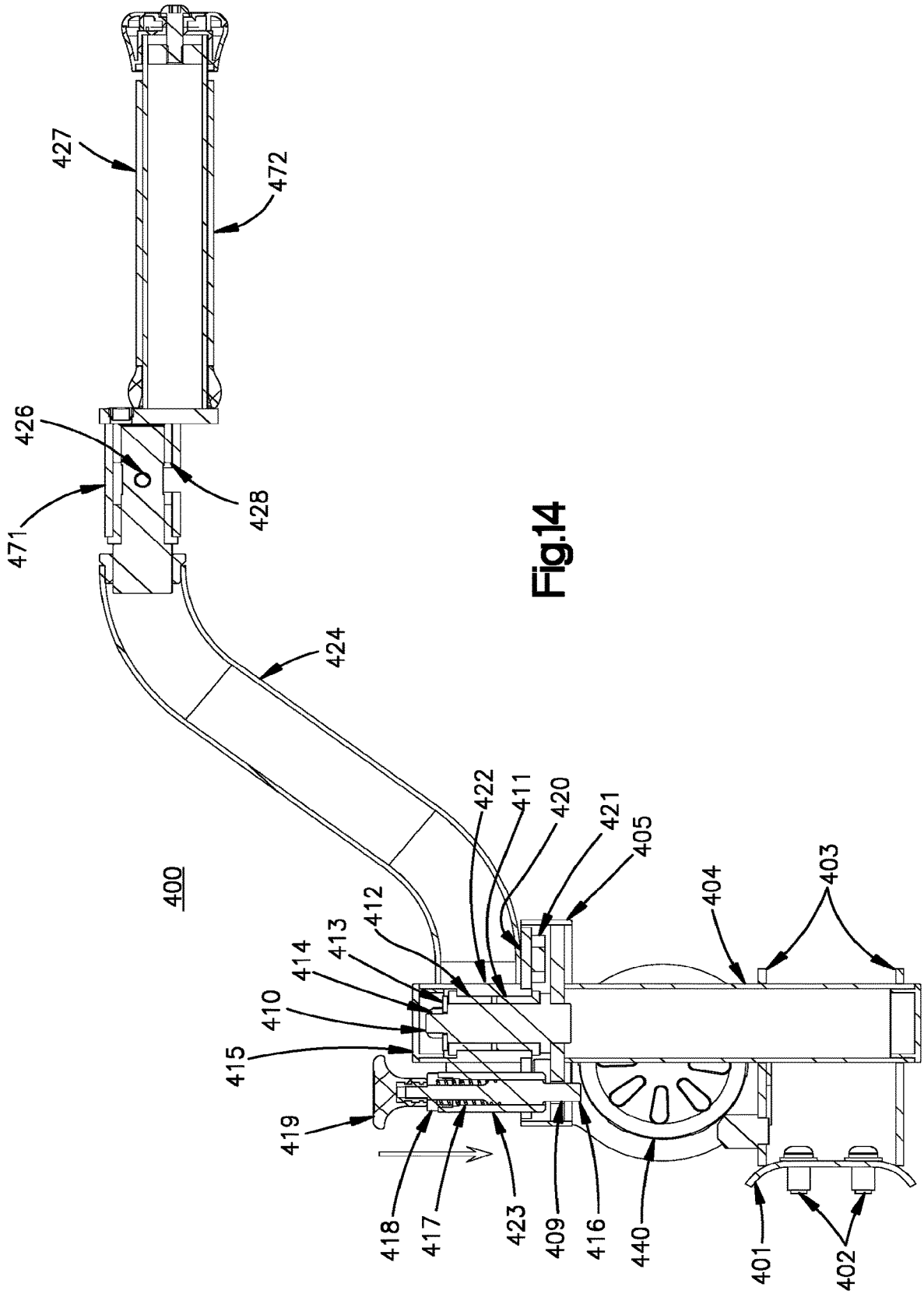

427
472
426
428
471
424
400
422
411
420
421
405
404
403
412
413
414
410
415
419
418
417
423
409
416
440
401
402

Fig.14

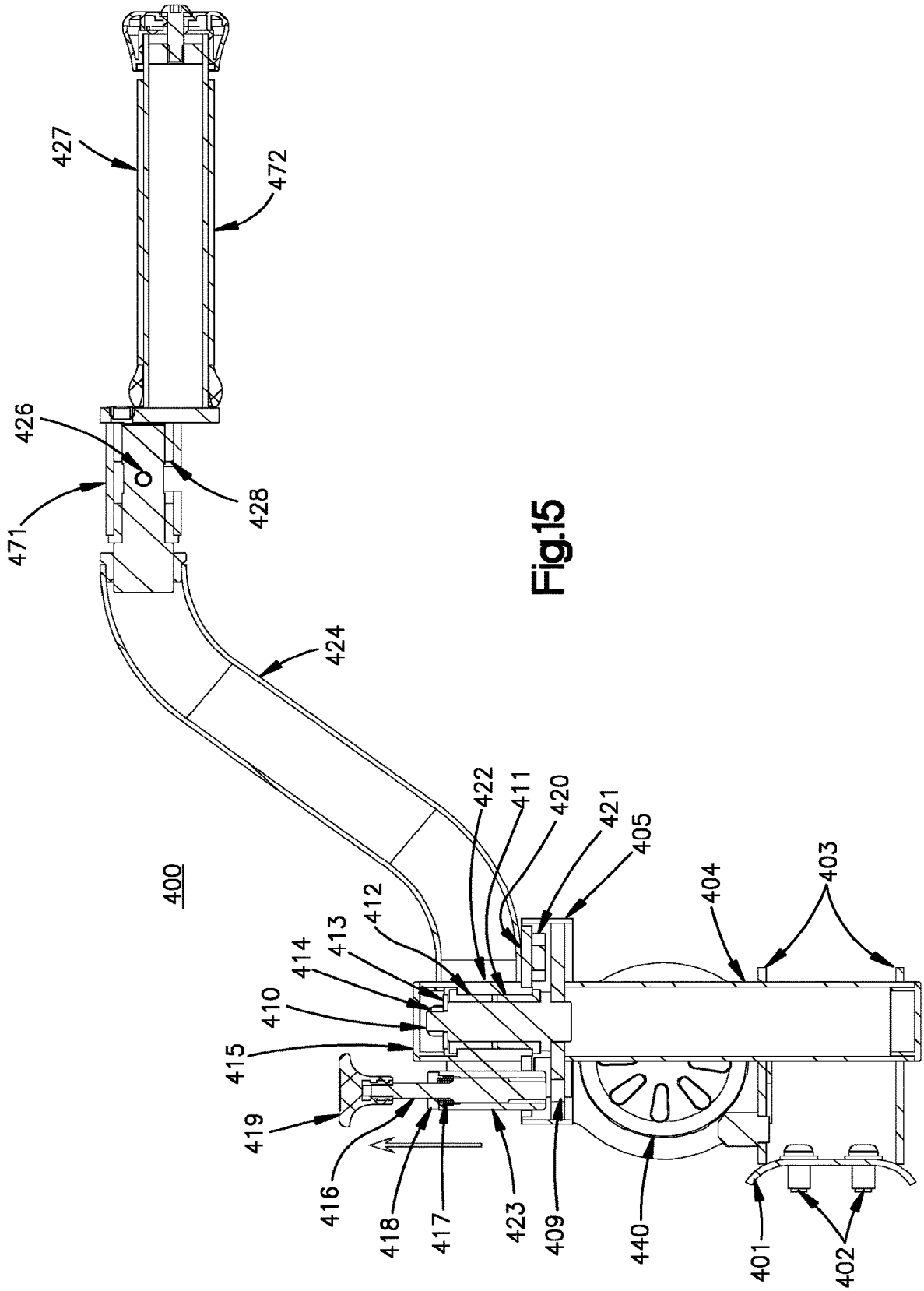

427
472
426
428
471
424
400
422
411
420
421
405
404
403
412
413
414
410
415
419
416
418
417
423
409
440
401
402

Fig.15

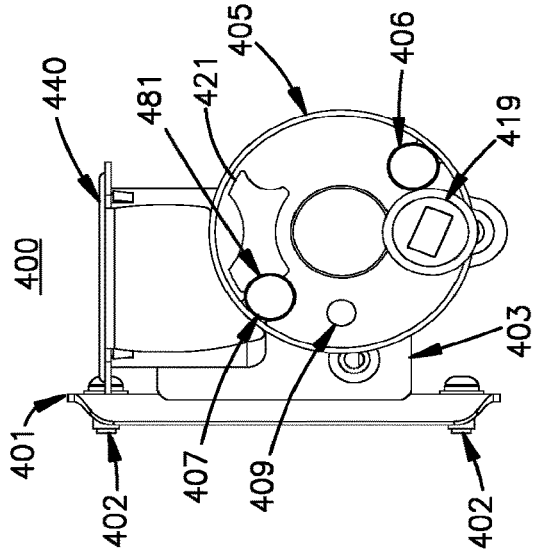


Fig.18

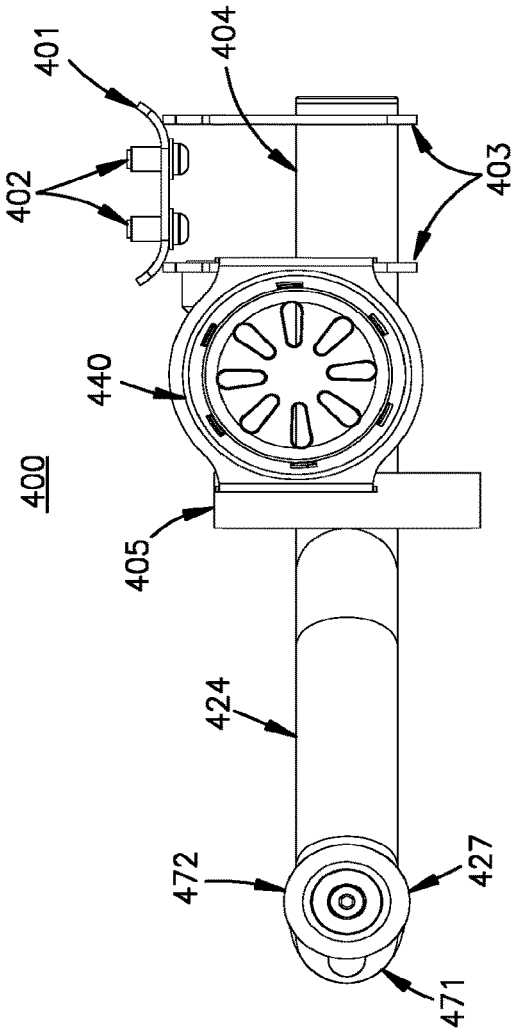


Fig.16

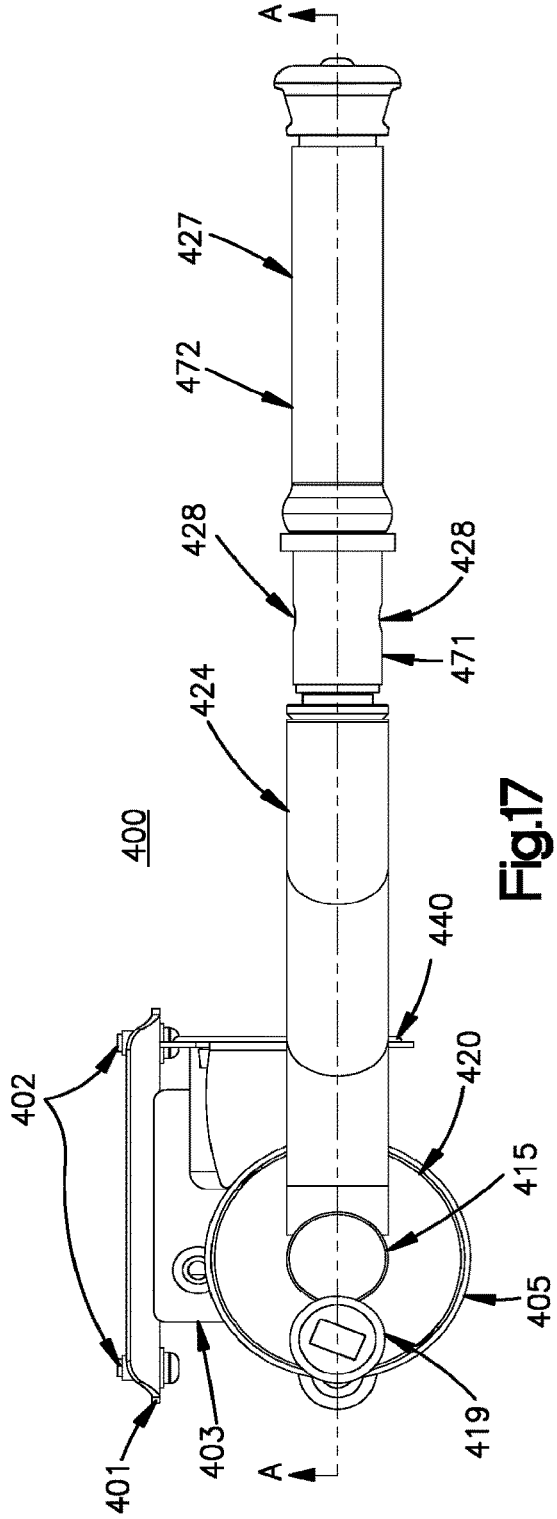


Fig.17

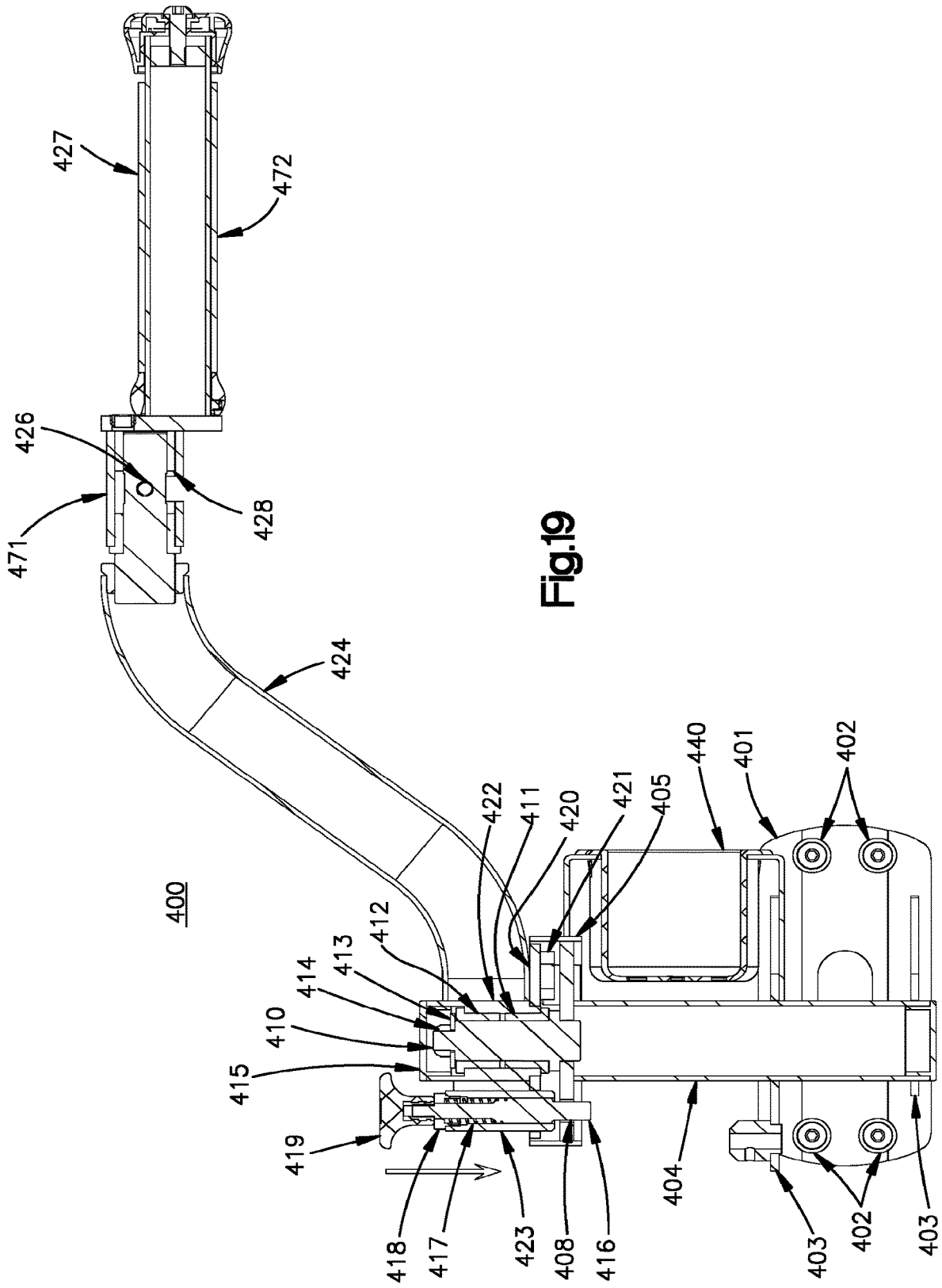
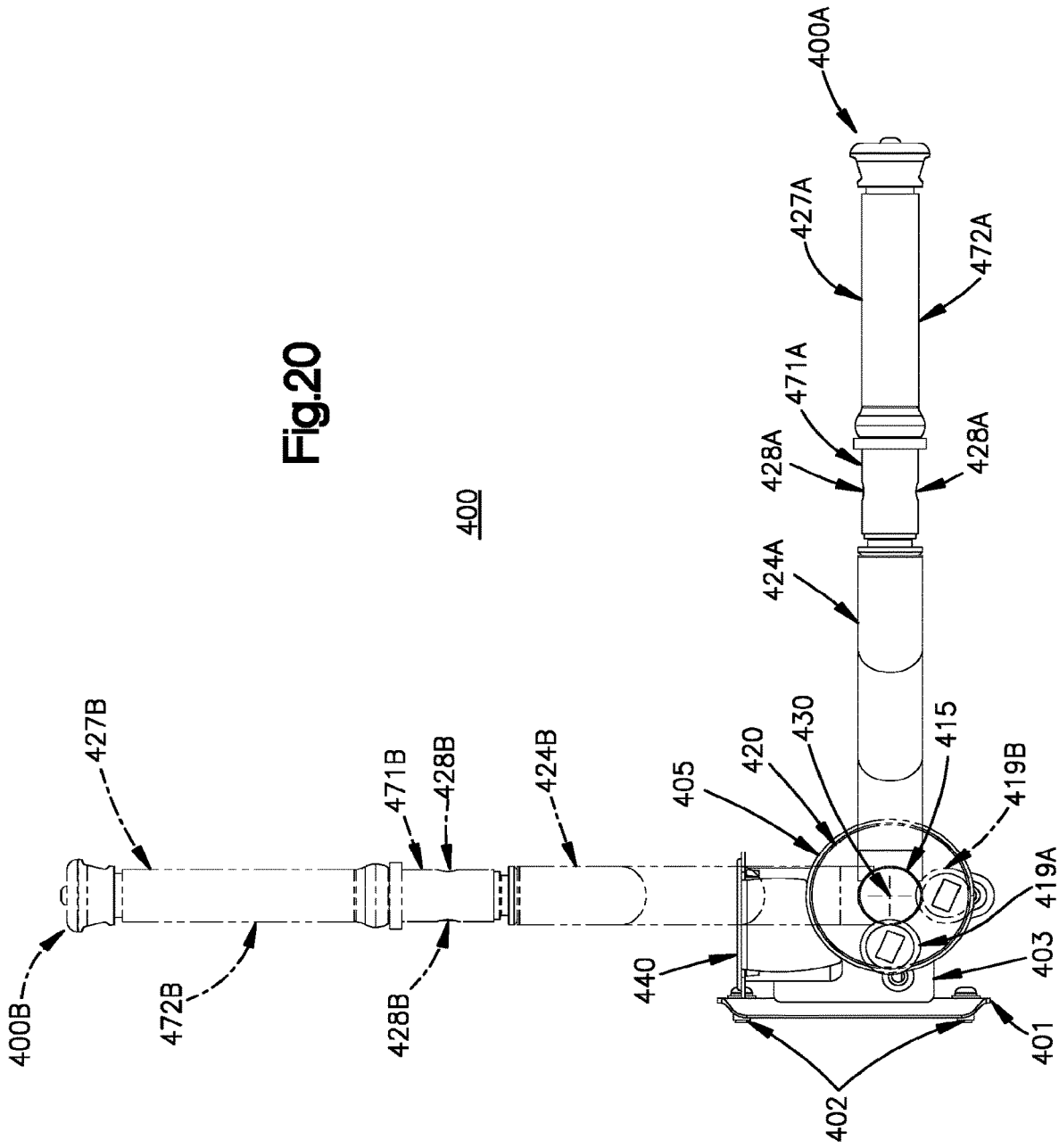

427
472
426
428
471
424
400
422
411
420
421
405
440
401
402
412
413
414
410
415
419
418
417
423
408
416
404
403
402
403

Fig.19

Fig.20


400
400A
427A
472A
471A
428A
428A
424A
427B
471B
428B
424B
405
420
430
415
419B
419A
403
440
400B
472B
428B
401
402

FLIP AND DIP HANDLE SYSTEM FOR PERFORMING DIP EXERCISES ON AN EXERCISE MACHINE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a Continuation of U.S. patent application Ser. No. 14/992,978 filed Jan. 11, 2016, which claims the benefit of U.S. Provisional Application No. 62/102,192 filed Jan. 12, 2015, both of which are incorporated herein by reference in its entirety for all purposes.

FIELD OF THE INVENTION

The present invention generally relates to fitness equipment. Specifically, the embodiments of the present invention are directed to an exercise machine for performing dip exercises, including a flip and dip handle system that allows the dip handle assemblies to be rotated between an exercise position and a storage position.

BACKGROUND OF THE INVENTION

Dip exercises are a popular exercise that typically uses the exerciser's body weight as the exercise resistance. In a dip exercise, the exerciser begins with his arms extending straight down along his sides and uses his arms to support his body on a pair of typically parallel dip handles. The exerciser then bends his arms at the elbow to lower his body, before straightening his arms to push his body up. The exerciser thus returns to the exercise start position.

Traditional dip exercise machines include a fixed pair of dip handles. Dedicated dip exercise machines are not versatile and take up a significant amount of space in an exercise area. Even multi-purpose exercise machines that include fixed dip handles are not particularly versatile because the dip handles extend outwardly, using a significant amount of space and limiting the exerciser's ability to move while performing other exercises.

The dip handles of a multi-purpose exercise machine may be made removable, but this carries additional disadvantages. For instance, when the dip handles are removed from the exercise machine, they must be stored, which requires a certain amount of space that then cannot be used for other purposes. Additionally, removal and reinstallation of the dip handles takes time, which may interfere with and interrupt an exercise routine, particularly where the exerciser wishes to perform an exercise circuit that includes dip exercises in addition to other exercise movements.

Consequently, a need exists for an exercise machine for performing dip exercises that includes dip handles that can be quickly moved between an exercise position and a storage position. The embodiments of the present invention solve this problem by providing an exercise machine for performing dip exercises, including a flip and dip handle system that allows the dip handle assemblies to be rotated between an exercise position and a storage position. Other advantages of the present invention will become apparent to one skilled in the art.

SUMMARY OF THE INVENTION

An embodiment of the present invention is directed to a dip handle system, the dip handle system including a mounting bracket; an arm mount hub connected to the mounting bracket, which includes a pivot shaft, a pair of locking apertures that respectively define an exercise position and a storage position for the dip handle system, and a pair of stop lugs; a bearing housing pivotally mounted to the arm mount hub, which includes a bore into which the pivot shaft is received, a stop plate, and a pull-pin barrel; one or more bearings located between the pivot shaft and the bore of the bearing housing; a stop feature on the stop plate for engaging the stop lugs of the arm mount hub, wherein the stop feature and stop lugs define the travel limits for the dip handle system; a pull pin inserted into the pull-pin barrel for selectively engaging the locking apertures of the arm mount hub to lock the dip handle system into the respective exercise position or storage position; an exercise arm connected to the bearing housing; and a dip handle connected to the exercise arm.

Another embodiment of the present invention is directed to an exercise machine for performing dip exercises, the exercise machine including a main frame and a dip handle system, the dip handle system including a mounting bracket attached to the main frame; an arm mount hub connected to the mounting bracket, which includes a pivot shaft, a pair of locking apertures that respectively define an exercise position and a storage position for the dip handle system, and a pair of stop lugs; a bearing housing pivotally mounted to the arm mount hub, which includes a bore into which the pivot shaft is received, a stop plate, and a pull-pin barrel; one or more bearings located between the pivot shaft and the bore of the bearing housing; a stop feature on the stop plate for engaging the stop lugs of the arm mount hub, wherein the stop feature and stop lugs define the travel limits for the dip handle system; a pull pin inserted into the pull-pin barrel for selectively engaging the locking apertures of the arm mount hub to lock the dip handle system into the respective exercise position or storage position; an exercise arm connected to the bearing housing; and a dip handle connected to the exercise arm.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred features of the embodiments of the present invention are disclosed in the accompanying drawings, wherein similar reference characters denote similar elements throughout the several views, and wherein:

FIG. **1** is a back-right side isometric view of a dual hi-lo pulley functional trainer unit including a flip and dip handle system with the dip handle assemblies in the exercise position and including an exerciser in position to perform a dip exercise.

FIG. **2** is a front side view of the dual hi-lo pulley functional trainer unit as depicted in FIG. **1**.

FIG. **3** is a back-right side isometric view of the dual hi-lo pulley functional trainer unit as depicted in FIG. **1**, but with the exerciser omitted.

FIG. **4** is a front side view of the dual hi-lo pulley functional trainer unit as depicted in FIG. **3**.

FIG. **5** is a back-right side isometric view of the dual hi-lo pulley functional trainer unit as depicted in FIG. **3**, but with the dip handle assemblies in the storage position.

FIG. **6** is a front side view of the dual hi-lo pulley functional trainer unit as depicted in FIG. **5**.

FIG. **7** is a back-right side isometric view of the dual hi-lo pulley functional trainer unit as depicted in FIG. **3**, but with many parts of the exercise machine omitted to more clearly show the flip and dip handle system.

FIG. **8** is a back-right side isometric view of the dual hi-lo pulley functional trainer unit as depicted in FIG. **5**, but with

many parts of the exercise machine omitted to more clearly show the flip and dip handle system.

FIG. **9** is an exploded view of a left dip handle assembly of a flip and dip handle system.

FIG. **10** is an exploded view of a right dip handle assembly of a flip and dip handle system.

FIG. **11** is a back side view of the right dip handle assembly as depicted in FIG. **10**, with the dip handle assembly in the exercise position.

FIG. **12** is a left side view of the right dip handle assembly as depicted in FIG. **11**.

FIG. **13** is a left side view of the right dip handle assembly as depicted in FIG. **12**, but with some parts omitted to more clearly show the engagement of the stop feature with the exercise position stop lug when the dip handle assembly is in the exercise position.

FIG. **14** is a cross-sectional view of the right dip handle assembly according to cross-section A-A depicted in FIG. **12**, with the pull pin engaged to lock the dip handle assembly in the exercise position.

FIG. **15** is a cross-sectional view of the right dip handle assembly according to cross-section A-A depicted in FIG. **12**, with the pull pin disengaged so that the dip handle assembly may be rotated away from the exercise position.

FIG. **16** is a top side view of the right dip handle assembly as depicted in FIG. **10**, with the dip handle assembly in the storage position.

FIG. **17** is a left side view of the right dip handle assembly as depicted in FIG. **16**.

FIG. **18** is a left side view of the right dip handle assembly as depicted in FIG. **17**, but with some parts omitted to more clearly show the engagement of the stop feature with the storage position stop lug when the dip handle assembly is in the storage position.

FIG. **19** is a cross-sectional view of the right dip handle assembly according to cross-section A-A depicted in FIG. **17**, with the pull pin engaged to lock the dip handle assembly in the storage position.

FIG. **20** is a left side, superimposed view of the right dip handle assembly as depicted in FIG. **10**, with the dip handle assembly in the exercise position (shown in solid lines) and the dip handle assembly in the storage position (shown in dashed lines).

DETAILED DESCRIPTION

The embodiments of the present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the illustrated embodiments set forth herein. Rather, these illustrated embodiments are provided so that this disclosure will be thorough and complete and will convey the scope of the invention to those skilled in the art.

In the following description, like reference characters designate like or corresponding parts throughout the figures. It is to be understood that the phraseology and terminology used in the following description are used for the purpose of description and enablement, and should not be regarded as limiting. Additionally, in the following description, it is understood that terms such as "top," "bottom," "side," "front," "back," "inner," "outer," and the like, are words of convenience and are not to be construed as limiting terms.

A flip and dip handle system for performing dip exercises on an exercise machine is described herein. The embodiments of the present invention are designed to provide a handle system for performing dip exercises on an exercise machine that can be quickly moved between a use position and a storage position.

An embodiment of the present invention includes an exercise machine **100** as depicted in FIGS. **1-8**. The exercise machine **100** of FIGS. **1-8** is a dual hi-lo pulley functional trainer unit. However, one of ordinary skill will appreciate that the handle system of the present invention may be adaptable to a number of different exercise machines known in the art. Thus, the present invention is not limited to the dual hi-lo pulley functional trainer unit as depicted in FIGS. **1-8**. FIGS. **1** and **2** depict an exerciser **200** in position to perform a dip exercise.

As best shown in FIGS. **1-6**, the exercise machine **100** of the present embodiment includes a stationary main frame **101**. The main frame **101** is a fixed frame structure and includes horizontal side struts **102**; a horizontal cross strut **103** connecting the horizontal side struts **102** at their front ends; support uprights **104**; and a horizontal connecting strut **105** connecting the support uprights **104** at their top ends. The exercise machine **100** further includes multiple pull-up grips **106**, **116** associated with the horizontal connecting strut **105** for performing pull-up or chin-up exercises. At least one pair of the pull-up grips are adjustable pull-up grips **116** that may be selectively rotated between a fore-aft orientation, wherein each adjustable pull-up grip **116** is substantially horizontal and points toward the back of the exercise machine **100** (FIGS. **1**, **3**, **5**), and a side-to-side orientation, wherein each adjustable pull-up grip **116** is substantially horizontal and points inwardly toward the center of the exercise machine **100**. The adjustable pull-up grips **116** are rotatably adjustable, similar to the adjustable hand grips 40 described in U.S. Patent Application Publication No. 2012-0329626 A1, which is herein incorporated by reference. The fore-aft orientation of the adjustable pull-up grips **116**, is illustrated and described in U.S. Patent Application Publication No. 2012-0329626 A1 as position **40**B. And the side-to-side orientation of the adjustable pull-up grips **116**, is illustrated and described in U.S. Patent Application Publication No. 2012-0329626 A1 as position **40**A.

The exercise machine **100**, as depicted in FIGS. **1-6**, further includes a pair of vertical columns **107**. Each of the vertical columns **107** are rotatably mounted between an upper pivot mount **109** and a lower pivot mount **108** that is connected to the horizontal side strut **102**. Thus, each of the vertical columns **107** is rotatable about its longitudinal axis. A pulley carriage **110** is mounted on each of the vertical columns **107** and may be vertically adjusted up and down, along the length of the respective vertical column **107**.

The exercise machine **100** further includes a source of resistance, which in the case of the embodiment depicted in FIGS. **1-6** is a pair of selectorized weight stacks **112**. One of ordinary skill in the art will appreciate, however, that the source of resistance may include, without limitation, a weight stack, weight plates mounted on pegs, or other types of resistance such as hydraulic, pneumatic, electromagnetic, friction, springs, elastically bending rods, elastic bands, or the like. A cable and pulley system (not shown) includes a cable attached at one end to the selectorized weight stack **112** and an opposite pull end **111**. The pull end **111** of the cable passes through the pulley carriage **110**, such that when the pulley carriage **110** is adjusted up or down, the pull end **111** of the cable also moves up or down. The pull ends **111**, of exercise machine **100**, may be connected to various exercise attachments for performing exercises.

An exerciser may perform an exercise by pulling or pushing one or both pull ends **111** away from the respective pulley carriage **110**. Because the vertical columns **107** are rotatable, and the pulley carriage **110** is vertically adjustable, the path of exercise motion and direction of exercise resistance is highly adjustable. When the exerciser performs an exercise by pulling or pushing a pull end **111** away from its respective pulley carriage **110**, the cable travels through the cable and pulley system and lifts the amount of weight selected within the selectorized weight stack **112**.

As best illustrated in FIGS. **7** and **8**, the exercise machine **100** of the illustrated embodiment further includes a left dip handle assembly **300** and a right dip handle assembly **400**, each mounted on a support upright **104** of the main frame **101**. The left dip handle assembly **300**, including all of its components, is shown with more detail in FIG. **9**. The left dip handle assembly **300** includes a mounting bracket **301** that attaches the left dip handle assembly **300** to the left support upright **104**. According to the depicted embodiment, fasteners **302**, such as bolts, screws, nuts, washers, and/or rivets attach the mounting bracket **301** to the left support upright **104**. However, one of ordinary skill in the art will appreciate that the mounting bracket **301** may be attached through other means known in the art, including without limitation, through welding, adhesives, pins, hooks, or other mechanical interfaces and attaching methods known in the art. The method of attaching may allow the mounting bracket **301** to be adjusted vertically along support upright **104**, or mounted on support upright **104** at a selected height, so that the height of the left dip handle assembly **300** can be selectively adjusted.

Referring still to FIG. **9**, the left dip handle assembly **300** further includes a pair of reinforcing ribs **303** connected to the mounting bracket **301** and a support rod **304** connected to the reinforcing ribs **303**. The support rod **304** is connected to and supports an arm mount hub **305**. The arm mount hub **305**, according to the depicted embodiment, is a round housing that includes an exercise position stop lug **306** and a storage position stop lug **307**. The arm mount hub **305** further includes an exercise position lock hole **309** and a storage position lock hole **308**. A pivot shaft **310** extends from the center of the arm mount hub **305**. The pivot shaft **310** of the depicted embodiment is 1 inch in diameter and includes a threaded end **350** for retaining a bearing housing **322** on the pivot shaft **310**. The threaded end **350** includes ½-13 UNC male threads. However, one of ordinary skill in the art will appreciate that the bearing housing **322** may be retained on the pivot shaft **310** through other means known in the art, including without limitation, cotter pins, e-clips or c-clips, pressed retainers or fittings, male or female threads, and other methods known in the art.

The bearing housing **322** is rotatably mounted on the pivot shaft **310** for rotation about pivot axis **330**. The pivot shaft **310** is inserted through an inner bearing **311**, a bearing bore **351** in the bearing housing **322**, and an outer bearing **312**. Thus, the bearing housing **322** rides on the inner and outer bearings **311**, **312**. The inner and outer bearings **311**, **312** are preferably made from a low-friction material that will not increase the rotating friction between the bearing housing **322** and the pivot shaft **310**, allowing the bearing housing **322** to freely rotate about pivot axis **330**. The inner and outer bearings **311**, **312** are also preferably made from a material that is softer than that of the pivot shaft **310** and the bearing housing **322**, such that any wear resulting from rotation of the bearing housing **322** occurs on the inner and outer bearings **311**, **312**, which are easier and less expensive to replace as wear or maintenance items. As non-limiting examples, the inner and outer bearings **311**, **312** may be made from aluminum, brass or bronze, thermoplastics such as nylon, or they may include a Teflon coating.

According to the embodiment of FIG. **9**, a washer **313** and a locknut **314** threaded onto the threaded end **350** of the pivot shaft **310** retain the bearing housing **322** on the pivot shaft **310**. The washer **313** is a ½" USS flat washer, while the locknut **314** is a ½-13 UNC locknut. As discussed above, however, the bearing housing **322** may be retained on the pivot shaft **310** through other means known in the art. An end cap **315** is inserted into the bearing bore **351** of bearing housing **322**.

As further illustrated in FIG. **9**, the bearing housing **322** is connected to a stop plate **320**, which includes a stop feature **321**. The stop feature **321** engages the respective exercise position stop lug **306** and storage position stop lug **307**, when the bearing housing **322** rotates about pivot axis **330** between the exercise position and the storage position, as described in more detail below.

A pull-pin barrel **323** is connected to stop plate **320** and the bearing housing **322**. The pull-pin barrel **323** includes a pull-pin bore **352** with a female-threaded opening **353**. A spring-loaded pull pin **360** is assembled into the pull-pin bore **352** of the pull-pin barrel **323**. The spring-loaded pull pin **360** includes a pull-pin plunger **316** that has a first end **354** for selectively engaging the respective exercise position lock hole **309** or the storage position lock hole **308**, to lock the left dip handle assembly **300** into either the exercise position or storage position, as described in more detail below. The pull-pin plunger **316** also includes a first intermediate section **355**, which provides a clearance fit with the pull-pin bore **352** of the pull-pin barrel **323** and allows the spring-loaded pull pin **360** to slide along axis **333** within the pull-pin bore **352**. The pull-pin plunger **316** further includes a second intermediate section **356**, smaller in diameter than the first intermediate section **355**, on which a spring **317** is mounted. And the pull-pin plunger **316** includes a threaded end **357** with male threads.

As illustrated in FIG. **9**, the pull-pin plunger **316** of the spring-loaded pull pin **360** is inserted into the pull-pin bore **352** of the pull-pin barrel **323**, with the spring **317** mounted onto the second intermediate section **356**. A barrel cap **318** retains the pull-pin plunger **316** and spring **317** within the pull-pin bore **352** of the pull-pin barrel **323**. The barrel cap **318** includes male threads **358** that engage the female-threaded opening **353** of the pull-pin barrel **323**. Thus, the barrel cap **318** screws into the pull-pin bore **352** of the pull-pin barrel **323**, retaining the pull-pin plunger **316** and spring **317** within the pull-pin bore **352**. The barrel cap **318** includes a hole **359** through which the second intermediate section **356** of the pull-pin plunger **316** is inserted. The second intermediate section **356** of the pull-pin plunger **316** has a clearance fit with the hole **359**, which allows the pull-pin plunger **316** to slide along axis **333**. A threaded knob **319** is threaded onto the threaded end **357** of the pull-pin plunger **316**.

As mentioned above, the spring **317** is mounted on the second intermediate section **356** of the pull-pin plunger **316**. After the barrel cap **318** is screwed into the female-threaded opening **353**, the spring **317** is compressed between the larger diameter first intermediate section **355** and the barrel cap **318**. Because the barrel cap **318** is fixed to the pull-pin barrel **323**, while the pull-pin plunger **316** is slidable along axis **333**, the spring **317** biases the pull-pin plunger **316** toward the arm mount hub **305**. Accordingly, the spring **317** biases the first end **354** of the pull-pin plunger **316** into the exercise position lock hole **309** when the left dip handle

assembly **300** is in the exercise position, or into the storage position lock hole **308** when the left dip handle assembly **300** is in the storage position.

As further shown in FIG. **9**, an exercise arm **324** extends from the bearing housing **322**. The end of the exercise arm **324** opposite the bearing housing **322** has a longitudinal axis **331** and a stop feature **326**. An adjustable dip handle **327** is mounted on the exercise arm **324**. The adjustable dip handle **327** includes a mounting portion **371** and a grip portion **372**. The mounting portion **371** is rotatably mounted on the exercise arm **324** such that it its longitudinal axis is coincident with the longitudinal axis **331** of the end of the exercise arm **324**, and such that the adjustable dip handle **327** may rotate about longitudinal axis **331**. The mounting portion **371** includes a slot **328** that extends at least approximately 180° around the circumference of the mounting portion **371**. The stop feature **326** of the exercise arm **324** is located within the slot **328**, and is configured to limit the adjustable dip handle's **327** rotation about longitudinal axis **331** by engaging the ends of the slot **328** to provide wide (FIGS. **1**, **3**, **7**, **9**) and narrow grip positions for the adjustable dip handle **327**.

The grip portion **372** of the adjustable dip handle **327** has a second longitudinal axis **332** that is not coincident with longitudinal axis **331**. Thus, the adjustable handle **327** can be rotated at least approximately 180° about longitudinal axis **331**, in which case the grip portion **372** rotates in an arcuate path about longitudinal axis **331** between the wide and narrow grip positions. The adjustable dip handle **327** is similar to the dip bar handles 60 described in U.S. Patent Application Publication No. 2012-0329626 A1, which is herein incorporated by reference.

As best illustrated in FIGS. **7** and **8**, the exercise machine **100** of the illustrated embodiment further includes a similar right dip handle assembly **400** mounted on a support upright **104** of the main frame **101**. The right dip handle assembly **400**, including all of its components, is shown with more detail in FIG. **10**. The right dip handle assembly **400** includes a mounting bracket **401** that attaches the right dip handle assembly **400** to the right support upright **104**. According to the depicted embodiment, fasteners **402**, such as bolts, screws, nuts, washers, and/or rivets attach the mounting bracket **401** to the support upright **104**. However, as discussed above with respect to the fasteners **302**, one of ordinary skill in the art will appreciate that the mounting bracket **401** may be attached through other means known in the art. The method of attaching may allow the mounting bracket **401** to be adjusted vertically along support upright **104**, or mounted on support upright **104** at a selected height, so that the height of the right dip handle assembly **400** can be selectively adjusted.

Referring still to FIG. **10**, the right dip handle assembly **400** further includes a pair of reinforcing ribs **403** connected to the mounting bracket **401** and a support rod **404** connected to the reinforcing ribs **403**. The support rod **404** is connected to and supports an arm mount hub **405**. The right dip handle assembly **400** depicted in FIG. **10** further includes a drink holder **440** mounted to one or more of the mounting bracket **401**, reinforcing ribs **403**, support rod **404**, and arm mount hub **405**. One skilled in the art will appreciate that the drink holder **440** may optionally be included on the left dip handle assembly **300**, if preferred.

The arm mount hub **405**, according to the depicted embodiment, is a round housing that includes an exercise position stop lug **406** and a storage position stop lug **407**. The arm mount hub **405** further includes an exercise position lock hole **409** and a storage position lock hole **408**. A pivot shaft **410** extends from the center of the arm mount hub **405**. The pivot shaft **410** of the depicted embodiment is 1 inch in diameter and includes a threaded end **450** for retaining a bearing housing **422** on the pivot shaft **410**. The threaded end **450** includes ½-13 UNC male threads. However, as discussed above with respect to the left dip handle assembly's **300** bearing housing **322**, one of ordinary skill in the art will appreciate that the bearing housing **422** may be retained on the pivot shaft **410** through other means known in the art.

The bearing housing **422** is rotatably mounted on the pivot shaft **410** for rotation about pivot axis **430**. The pivot shaft **410** is inserted through an inner bearing **411**, a bearing bore **451** in the bearing housing **422**, and an outer bearing **412**. Thus, the bearing housing **422** rides on the inner and outer bearings **411**, **412**. The inner and outer bearings **411**, **412** (like inner and outer bearings **311**, **312**) are preferably made from a low-friction material that will not increase the rotating friction between the bearing housing **422** and the pivot shaft **410**, allowing the bearing housing **422** to freely rotate about pivot axis **430**. The inner and outer bearings **411**, **412** are also preferably made from a material that is softer than that of the pivot shaft **410** and the bearing housing **422**, such that any wear resulting from rotation of the bearing housing **422** occurs on the inner and outer bearings **411**, **412**, which are easier and less expensive to replace as wear or maintenance items. As non-limiting examples, the inner and outer bearings **411**, **412** may be made from aluminum, brass or bronze, thermoplastics such as nylon, or they may include a Teflon coating.

According to the embodiment of FIG. **10**, a washer **413** and a locknut **414** threaded onto the threaded end **450** of the pivot shaft **410** retain the bearing housing **422** on the pivot shaft **410**. The washer **413** is a ½" USS flat washer, while the locknut **414** is a ½-13 UNC locknut. As discussed above, however, the bearing housing **422** may be retained on the pivot shaft **410** through other means known in the art. An end cap **415** is inserted into the bearing bore **451** of bearing housing **422**.

As further illustrated in FIG. **10**, the bearing housing **422** is connected to a stop plate **420**, which includes a stop feature **421**. The stop feature **421** engages the respective exercise position stop lug **406** and storage position stop lug **407**, when the bearing housing **422** rotates about pivot axis **430** between the exercise position and the storage position, as described in more detail below.

A pull-pin barrel **423** is connected to stop plate **420** and the bearing housing **422**. The pull-pin barrel **423** includes a pull-pin bore **452** with a female-threaded opening **453**. A spring-loaded pull pin **460** is assembled into the pull-pin bore **452** of the pull-pin barrel **423**. The spring-loaded pull pin **460** includes a pull-pin plunger **416** that has a first end **454** for selectively engaging the respective exercise position lock hole **409** or the storage position lock hole **408**, to lock the right dip handle assembly **400** into either the exercise position or storage position, as described in more detail below. The pull-pin plunger **416** also includes a first intermediate section **455**, which provides a clearance fit with the pull-pin bore **452** of the pull-pin barrel **423** and allows the spring-loaded pull pin **460** to slide along axis **433** within the pull-pin bore **452**. The pull-pin plunger **416** further includes a second intermediate section **456**, smaller in diameter than the first intermediate section **455**, on which a spring **417** is mounted. And the pull-pin plunger **416** includes a threaded end **457** with male threads.

As illustrated in FIG. **10**, the pull-pin plunger **416** of the spring-loaded pull pin **460** is inserted into the pull-pin bore

452 of the pull-pin barrel 423, with the spring 417 mounted onto the second intermediate section 456. A barrel cap 418 retains the pull-pin plunger 416 and spring 417 within the pull-pin bore 452 of the pull-pin barrel 423. The barrel cap 418 includes male threads 458 that engage the female-threaded opening 453 of the pull-pin barrel 423. Thus, the barrel cap 418 screws into the pull-pin bore 452 of the pull-pin barrel 423, retaining the pull-pin plunger 416 and spring 417 within the pull-pin bore 452. The barrel cap 418 includes a hole 459 through which the second intermediate section 456 of the pull-pin plunger 416 is inserted. The second intermediate section 456 of the pull-pin plunger 416 has a clearance fit with the hole 459, which allows the pull-pin plunger 416 to slide along axis 433. A threaded knob 419 is threaded onto the threaded end 457 of the pull-pin plunger 416.

As mentioned above, the spring 417 is mounted on the second intermediate section 456 of the pull-pin plunger 416. After the barrel cap 418 is screwed into the female-threaded opening 453, the spring 417 is compressed between the larger diameter first intermediate section 455 and the barrel cap 418. Because the barrel cap 418 is fixed to the pull-pin barrel 423, while the pull-pin plunger 416 is slidable along axis 433, the spring 417 biases the pull-pin plunger 416 toward the arm mount hub 405. Accordingly, the spring 417 biases the first end 454 of the pull-pin plunger 416 into the exercise position lock hole 409 when the right dip handle assembly 400 is in the exercise position, or into the storage position lock hole 408 when the right dip handle assembly 400 is in the storage position.

As further shown in FIG. 10, an exercise arm 424 extends from the bearing housing 422. The end of the exercise arm 424 opposite the bearing housing 422 has a longitudinal axis 431 and a stop feature 426. An adjustable dip handle 427 is mounted on the exercise arm 424. The adjustable dip handle 427 includes a mounting portion 471 and a grip portion 472. The mounting portion 471 is rotatably mounted on the exercise arm 424 such that it its longitudinal axis is coincident with the longitudinal axis 431 of the end of the exercise arm 424, and such that the adjustable dip handle 427 may rotate about longitudinal axis 431. The mounting portion 471 includes a slot 428 that extends at least approximately 180° around the circumference of the mounting portion 471. The stop feature 426 of the exercise arm 424 is located within the slot 428, and is configured to limit the adjustable dip handle's 427 rotation about longitudinal axis 431 by engaging the ends of the slot 428 to provide wide (FIGS. 1, 3, 7, 10) and narrow grip positions for the adjustable dip handle 427.

The grip portion 472 of the adjustable dip handle 427 has a second longitudinal axis 432 that is not coincident with longitudinal axis 431. Thus, the adjustable handle 427 can be rotated at least approximately 180° about longitudinal axis 431, in which case the grip portion 472 rotates in an arcuate path about longitudinal axis 431 between the wide and narrow grip positions. The adjustable dip handle 427 is similar to the dip bar handles 60 described in U.S. Patent Application Publication No. 2012-0329626 A1, which is herein incorporated by reference.

The operation and use of the right dip handle assembly 400 will now be described with reference to FIGS. 11-20. It is to be understood that the operation and use of the left dip handle assembly 300 is an identical mirror image of that of the right dip handle assembly 400.

FIGS. 11-15 depict the right dip handle assembly 400 in an exercise position. That is, the exercise arm 424 and adjustable dip handle 427 are rotated about pivot axis 430 so that they lie in a substantially horizontal plane. (See also FIGS. 1-4 and 7.) When the exercise arm 424 and adjustable dip handle 427 are rotated toward the exercise position, the bearing housing 422 rotates about pivot axis 430 on the pivot shaft 410. Along with the bearing housing 422, the stop plate 420 rotates about pivot axis 430 with respect to the arm mount hub 405. Accordingly, the stop feature 421 rotates about pivot axis 430 until it contacts the exercise position stop lug 406. FIG. 13 depicts the right dip handle assembly 400 in the exercise position with components omitted to illustrate the contact point 480 between the stop feature 421 and the exercise position stop lug 406.

Similarly, as the bearing housing 422 rotates about pivot axis 430 toward the exercise position, the pull-pin barrel 423 and spring-loaded pull pin 460 rotate about pivot axis 430 with respect to the arm mount hub 405. Thus, the spring-loaded pull pin 460 rotates about pivot axis 430 until the first end 454 of the pull-pin plunger 416 aligns with the exercise position lock hole 409. As discussed above, the spring 417 biases the pull-pin plunger 416 toward the arm mount hub 405, which means that the pull-pin plunger 416 is biased into the exercise position lock hole 409 when the right dip handle assembly 400 is in the exercise position. FIG. 14 depicts the right dip handle assembly 400 in the exercise position with pull-pin plunger 416 inserted into the exercise position lock hole 409. The user may pull on the threaded knob 419 to overcome the biasing force of the spring 417 and withdraw the pull-pin plunger 416 from the exercise position lock hole 409, in order to rotate the right dip handle assembly 400 away from the exercise position. FIG. 15 depicts the right dip handle assembly 400 in the exercise position with the pull-pin plunger 416 withdrawn from the exercise position lock hole 409.

The right dip handle assembly 400 thus utilizes two methods of locating and positioning the right dip handle assembly 400 in the exercise position. First, the stop feature 421 contacts the exercise position stop lug 406 to locate and position the right dip handle assembly 400 in the exercise position. And second, the pull-pin plunger 416 is biased into the exercise position lock hole 409 to further locate and position the right dip handle assembly 400 in the exercise position, and to more affirmatively lock the right dip handle assembly 400 in the exercise position.

In contrast with FIGS. 11-15, FIGS. 16-18 depict the right dip handle assembly 400 in a storage position. That is, the exercise arm 424 and adjustable dip handle 427 are rotated about pivot axis 430 so that they lie in a substantially vertical plane. (See also FIGS. 5-6 and 8.) When the exercise arm 424 and adjustable dip handle 427 are rotated toward the storage position, the bearing housing 422 rotates about pivot axis 430 on the pivot shaft 410. Along with the bearing housing 422, the stop plate 420 rotates about pivot axis 430 with respect to the arm mount hub 405. Accordingly, the stop feature 421 rotates about pivot axis 430 until it contacts the storage position stop lug 407. FIG. 18 depicts the right dip handle assembly 400 in the storage position with components omitted to illustrate the contact point 481 between the stop feature 421 and the storage position stop lug 407.

Similarly, as the bearing housing 422 rotates about pivot axis 430 toward the storage position, the pull-pin barrel 423 and spring-loaded pull pin 460 rotate about pivot axis 430 with respect to the arm mount hub 405. Thus, the spring-loaded pull pin 460 rotates about pivot axis 430 until the first end 454 of the pull-pin plunger 416 aligns with the storage position lock hole 408. As discussed above, the spring 417 biases the pull-pin plunger 416 toward the arm mount hub 405, which means that the pull-pin plunger 416 is biased into

the storage position lock hole **408** when the right dip handle assembly **400** is in the storage position. FIG. **19** depicts the right dip handle assembly **400** in the storage position with pull-pin plunger **416** inserted into the storage position lock hole **408**. As discussed above with respect to the exercise position, the user may pull on the threaded knob **419** to overcome the biasing force of the spring **417** and withdraw the pull-pin plunger **416** from the storage position lock hole **408**, in order to rotate the right dip handle assembly **400** away from the storage position.

The right dip handle assembly **400** thus utilizes two methods of locating and positioning the right dip handle assembly **400** in the storage position. The stop feature **421** contacts the storage position stop lug **407** to locate and position the right dip handle assembly **400** in the storage position. And the pull-pin plunger **416** is biased into the storage position lock hole **408** to further locate and position the right dip handle assembly **400** in the storage position, and to more affirmatively lock the right dip handle assembly **400** in the storage position.

FIG. **20** illustrates the right dip handle assembly **400** in the exercise position (**400**A) superimposed upon the right dip handle assembly **400** in the storage position (**400**B). As shown, in the exercise position **400**A, the exercise arm **424** and adjustable dip handle **427** are substantially horizontal. And in the storage position **400**B, the exercise arm **424** and adjustable dip handle **427** have been rotated approximately 90° to lie in a substantially vertical plane. Furthermore, the spring-loaded pull pin **460** has rotated approximately 90° about pivot axis **430**, as represented in FIG. **20** by the relative positions of the threaded knob **419**A, **419**B. Thus, the spring-loaded pull pin **460** has rotated between positions where it is engaged with the respective exercise position lock hole **409** and storage position lock hole **408** (see FIGS. **13** and **18**).

LIST OF REFERENCE NUMERALS

100—exercise machine
101—main frame
102—horizontal side strut
103—horizontal cross strut
104—support upright
105—horizontal connecting strut
106—pull-up grip
107—vertical column
108—lower pivot mount
109—upper pivot mount
110—pulley carriage
111—pull end
112—selectorized weight stack
116—adjustable pull-up grip
200—exerciser
300—left dip handle assembly
301—mounting bracket
302—fastener
303—reinforcing rib
304—support rod
305—arm mount hub
306—exercise position stop lug
307—storage position stop lug
308—storage position lock hole
309—exercise position lock hole
310—pivot shaft
311—inner bearing
312—outer bearing
313—washer
314—locknut
315—end cap
316—pull-pin plunger
317—spring
318—barrel cap
319—threaded knob
320—stop plate
321—stop feature
322—bearing housing
323—pull-pin barrel
324—exercise arm
326—stop feature
327—adjustable dip handle
328—slot
330—pivot axis
331—longitudinal axis
332—second longitudinal axis
333—axis
350—threaded end
351—bearing bore
352—pull-pin bore
353—female-threaded opening
354—first end
355—first intermediate section
356—second intermediate section
357—threaded end
358—male threads
359—hole
360—spring-loaded pull pin
371—mounting portion
372—grip portion
400—right dip handle assembly
401—mounting bracket
402—fastener
403—reinforcing rib
404—support rod
405—arm mount hub
406—exercise position stop lug
407—storage position stop lug
408—storage position lock hole
409—exercise position lock hole
410—pivot shaft
411—inner bearing
412—outer bearing
413—washer
414—locknut
415—end cap
416—pull-pin plunger
417—spring
418—barrel cap
419—threaded knob
420—stop plate
421—stop feature
422—bearing housing
423—pull-pin barrel
424—exercise arm
426—stop feature
427—adjustable dip handle
428—slot
430—pivot axis
431—longitudinal axis
432—second longitudinal axis
433—axis
440—drink holder
450—threaded end
451—bearing bore
452—pull-pin bore

453—female-threaded opening
454—first end
455—first intermediate section
456—second intermediate section
457—threaded end
458—male threads
459—hole
460—spring-loaded pull pin
471—mounting portion
472—grip portion
480—contact point
481—contact point

The list of reference numerals is provided for convenience and is intended to aid understanding of the illustrated embodiments described above. The embodiments of the present invention may be described in many different forms and should not be construed as limited to the illustrated embodiments. Likewise, the list above setting forth the reference numerals and associated components comprising the illustrated embodiments do not limit the scope of the invention as recited in the claims that follow.

The invention claimed is:

1. An exercise machine for performing dip exercises, comprising:
a frame;
a left dip-handle assembly mounted to a left side of the frame; and
a right dip-handle assembly mounted to a right side of the frame,
wherein each of the left and right dip-handle assemblies comprise:
a mounting bracket,
an arm mount hub,
an exercise position lock hole in the arm mount hub,
a storage position lock hole in the arm mount hub,
an exercise position stop lug in the arm mount hub, and
a storage position stop lug in the arm mount hub;
a bearing housing in rotational alignment with the arm mount hub;
a pull-pin plunger biased to:
insert into the exercise position lock hole when aligned with the exercise position lock hole, and
insert into the storage position lock hole when aligned with the storage position lock hole; and
a dip-exercise arm extending from the bearing housing.

2. The exercise machine of claim **1**, wherein both of the dip-exercise arms comprise:
a mounting portion, and
a grip portion,
wherein the grip portion is moveable with respect to the mounting portion to adjust the distance between the grip portion on a first of the dip-exercise arms and the grip portion on a second of the dip-exercise arms.

3. The exercise machine of claim **2**, wherein both of the grip portions rotate about a longitudinal axis passing through the mounting portion.

4. The exercise machine of claim **3**, wherein both of the grip portions are parallel to the longitudinal axis passing through the mounting portion.

5. The exercise machine of claim **1**, wherein both of the pull-pin plungers rotate about a central axis passing through the arm mount hub.

6. The exercise machine of claim **5**, wherein both of the pull-pin plungers are parallel to the central axis passing through the arm mount hub.

7. The exercise machine of claim **1**, wherein both of the bearing housings comprise:
a first stop that contacts the exercise position stop lug at a first end of a range of travel, and
a second stop that contacts the exercise position stop lug at a second end of the range of travel.

8. The exercise machine of claim **1**, wherein pulling on the pull-pin plunger releases the pull-pin plunger from either of the exercise position lock hole or the storage position lock hole.

9. The exercise machine of claim **1**, wherein both of the bearing housings are rotatable within the arm mount hub.

10. The exercise machine of claim **1**, wherein both of the dip-exercise arms are horizontal in the exercise position and vertical in the storage position.

11. The exercise machine of claim **1**, wherein both of the dip-exercise arms are S-shaped.

12. The exercise machine of claim **1**, wherein both of the bearing housings rotate about a horizontal axis.

* * * * *