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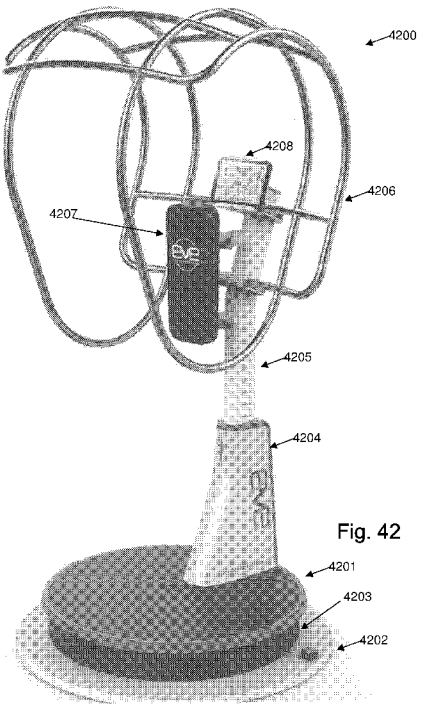

Fig. 42

(57) Abstract: A muscle activation system including: an inclined platform for a user to stand on; a rigid upper body user support frame attached to the inclined platform for supporting the upper body of a user standing on the inclined platform; a base, coupled to the inclined platform, the coupling allowing relative orientation motion between the base and inclined platform. The platform adapted to undergo a precession like motion around a central point so as to circumferentially move a user's upper body, when supported by the rigid upper body user support frame, substantially through an arc around a central point.

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MUSCLE ACTIVATION ASSEMBLY SYSTEM AND METHOD

FIELD OF INVENTION

[0001] The present invention relates to a muscle activation assembly. More particularly the invention relates to an assembly that is adapted to activate muscles of the human body through gravitational forces. There is also provided associated methods of activating and conditioning muscles of the body.

BACKGROUND ART

[0002] Exercise machines and assemblies for activating muscles of the human body are known. Resistance training (also called strength training or weight training) is the one of the most common forms of muscular training which employs the use of resistance to muscular contraction to build the strength, anaerobic endurance and size of skeletal muscles. Resistance training is based on the principle that muscles of the body will work to overcome a resistance force when they are required to do so. Exercise machines and assemblies that employ this form of training are generally provided with weights or resilient bands which provide the requisite resistance to counter movement by a user.

[0003] Passive exercise machines and assemblies are also known which do not involve the use of resistance. Such assemblies generally provide an external means for imparting force or movement to the relevant body part. For example, such assemblies may impart oscillating motion or electrical impulses to the body part.

[0004] The present invention aims to provide an alternative assembly that employs gravity to impart forces on the human body. By imparting forces due to gravity, the invention activates the user's core muscles and key back muscles.

[0005] The potential benefits of core strengthening/endurance training are well known, including but not limited to:

- Balance, Proprioception
- Improved sports performance
- Reduced injury rates
- Increase in spinal stability
- Improved posture
- Reduced Lower back pain

[0006] There are a number of system in the prior art for the physical conditioning of the human body by the means of exercise movement that utilises gravitational effects on the body to advance the muscle state. Examples include US patent 3936047 to Brandt et al. which discloses an axial rotation system having a variable degree of tilt and speed rotation. Other systems include US patent 4509743 to Lie; US

patent 6176817 to Carey et al; US patent 7374522 to Arnold; US patent 7993253 to Fernandez; and US patent 7645221 to Curry.

[0007] Often these machines produce sub-optimal results. The patient is required to stand on a platform and perhaps hold onto a stabilising bar whilst the platform undergoes irregular motion. In this manner the patient receives exercise benefits.

[0008] Any discussion of the background art throughout the specification should in no way be considered as an admission that such art is widely known or forms part of common general knowledge in the field.

SUMMARY OF INVENTION

[0009] As mentioned above, the present invention relates generally to a muscle activation assembly that is adapted to activate muscles of the human body through gravitational forces. Activation of the muscles of a user may be conscious or subconscious.

[0010] In accordance with a first aspect of the present invention, there is provided a muscle activation system including: an inclined platform for a user to stand on; a rigid upper body user support frame attached to the inclined platform for supporting the upper body of a user standing on the inclined platform; a base, coupled to the inclined platform, the coupling allowing relative orientation motion between the base and inclined platform. The platform can be adapted to undergo a precession like motion around a central point so as to circumferentially move a user's upper body, when supported by the rigid upper body user support frame, substantially through an arc around a central point.

[0011] In some embodiments, the base can be coupled to the inclined platform by a universal joint. The inclined platform preferably can include a circumferential rim which engages with the base as the platform undergoes the precession like motion. Preferably, during operation, the platform can be substantially supported by the circumferential rim and the universal joint. The inclined platform can be substantially circular in circumference. In some embodiments, the platform can be generally planar and a normal axis to the platform undergoes rotation around a central point.

[0012] The rigid upper body user support frame can be of a cage like structure having a plurality of hand holds for the user to hold onto during operation. The support frame further preferably can include lower arm holds for structurally supporting the users lower arms. The support frame preferably can include a padded back support.

[0013] In some embodiments, there is provided an automated platform driving means for driving the platform through its motion. The automated platform driving means can comprise an electric motor

interconnected to a rotational plate having a series of circumferential bearings which engage with the platform to drive the motion of the platform.

[0014] In the embodiments, the head and body travel a circumference off their centre of gravity, facing a constant direction, to activate the body's natural gravity reactive systems to potentially strengthen and heal itself. The machine provides the motion to allow this process to take place.

[0015] To make safe the person may be supported or fixed on the motion platform by the feet, (snow boots) legs, (straps) waist (belt) or hands (grip frame) depending on the exercise focus.

[0016] In some embodiments, the existing frames are rigid and fixed to the motion platform. In some alternative embodiments, there will be incarnations where the hands grip the frame that will be able to move in a different programmed fashion in conjunction with the motion platform to give further dimensions to the variables that the machine can offer.

[0017] In accordance with another aspect of the present invention, there is provided a muscle activation system including: a platform for a user to stand on; a support base for supporting the platform; a flexible coupler, coupling the platform to said support base, said coupling allowing relative orientation motion between the base and inclined platform; a first electric drive unit located between the platform and support base, said drive unit including at least one engagement unit for engaging with the bottom surface of the platform and a corresponding surface of the support base to keep them at a predetermined orientation apart from one another, whilst the engagement unit rotates around the flexible coupler.

[0018] In some embodiments, the at least one engagement unit includes a first bearing engaging the bottom surface of the platform and a second bearing engaging the support base, with the first and second bearing being rigidly interconnected. The system can further comprise a flexible coupler elevation unit, for raising and lowering the vertical position of the flexible coupler. In some embodiments, the flexible coupler elevation unit comprises a worm drive. In some embodiments, the flexible coupler comprises a universal joint. In some embodiments, the number of engagement units is at least two, with each engagement unit engaging an outer portion of the bottom platform surface. In some embodiments, the first electric drive unit engages with a bottom surface of the platform so as to elevate or incline a portion of the platform relative to is surrounds. In some embodiments, the at least one engagement unit, engages a lip on the bottom of the platform to push it down.

[0019] According to further aspects of the invention there is provided a muscle activation assembly comprising:

a base adapted to tilt about a substantially central point in 360° of motion;

a support associated with the base and adapted to support a user of the muscle activation assembly;

wherein, in use, a user of the muscle activation assembly is in a substantially static position relative to the base and is tilted about 360° of motion, or part thereof, thereby imparting forces on the body of the user.

[0020] The form of the base is not particularly limited provided this is tiltable about 360° of motion (i.e. in a horizontal plane). In one embodiment, the base comprises a base plate, for example a substantially circular base plate, mounted to tilt about 360° of motion. The user, during operation of the assembly, maintains the same orientation throughout the base plate tilting.

[0021] In certain embodiments, the base plate is tiltable at an angle of from 0° to 25° to the horizontal, for example 2° to 18°, 5° to 15°, 2° to 20°, 5° to 20° to the horizontal. It will be appreciated that the greater the degree of tilt, the more strenuous the muscle activation.

[0022] The base plate may be tiltably mounted on a mount comprising a substantially central universal joint and a plurality of rollers which bear on a running surface of an outer portion of said base plate. Alternatively, an outer underside portion of the base plate may bear on the plurality of rollers. In certain embodiments at least 2 linear actuators mounted to the periphery of the base plate may be provided to facilitate tilting motion. Advantageously, either orbital or linear motion of the base plate can be achieved. An example would be either tilting "fore and aft" or "side to side" to promote muscle activation by the user.

[0023] If desired, the central universal joint and/or said rollers may be associated with a drive. It is envisaged that this may be particularly useful in situation where a user of the muscle activation assembly has limited strength or movement capability. Furthermore, in certain embodiments the assembly may comprise a height adjustment mechanism, for example a threaded jack, adapted to raise and lower the base plate thereby varying the degree of tilt of the base plate, the variation being random or controlled. The internal thread jack may raise and lower the outer roller support rim while the universal joint remains in a fixed position, or may raise and lower the universal joint while the outer roller support rim remains fixed.

[0024] In an alternate embodiment, the base plate comprises a substantially central fixed pivot and, in use, an outer perimeter of the base plate bears a surface on which said muscle activation assembly rests. According to this embodiment, the fixed pivot may be height adjustable to facilitate adjustment of the tilt angle of the base.

[0025] The support may take any suitable form, provided that this is adapted to locate the user in a suitable position relative to the base and support the user in a static position. For example, it is considered that the support may be adapted to maintain the user in a seated or lying static position. However, in a preferred embodiment the support is adapted to maintain the user in an upright static position.

[0026] According to one embodiment, the support comprises a frame extending from the base, the frame comprising a body support and at least one handle. In use, a user positions themself on the body support and grasps the at least one handle. In one embodiment the body support of the frame comprises an upright extending from said base. The upright may comprise padding that receives the back or chest of a user of the muscle activation assembly. It will be appreciated, though, that more than one upright may be provided and a crossbar, optionally with padding, be provided extending between the uprights to support the back or chest of the user. The upright is generally disposed towards and outer edge of the base, but advantageously positions the user such that the user is axially aligned with the central vertical axis of the assembly (i.e. as determined by the pivot point of the base). Preferably the upright is height adjustable. This renders the muscle activation assembly suitable for use by users of varying height.

[0027] It is envisaged that the frame may include a single handle, for example extending horizontally and spaced away from the body support. In this embodiment, the handle may be grasped by both hands of a user. However, in a preferred embodiment, the at least one handle of the frame comprises two handles associated with the body support and adapted to be held by a user of the muscle activation assembly. For example, the handles may comprise substantially elliptical sub-frames associated with the body support and extending outwardly therefrom over the base. In certain embodiments the handles may be adjustable to accommodate users of differing height and arm reach.

[0028] The muscle activation assembly may be suitable for use on athletes to the infirm. As such, a number of different support systems can be employed. One example thought suitable for use by athletes comprises a strap system that safely retains the user at approximately the thigh region to maximise muscle activation in the core and back. One or more hand grip(s) may be provided with sensors in this embodiment. The handgrips may provide a safety support mechanism only, and may not be intended for use while the assembly is operating. The handgrips may provide a "smart" function to a control system that will reduce the intensity when gripped by the user. An algorithm may control the tilting, inclination and speed of change of same during operation so that the assembly may ramp up intensity in a pre-determined way, or randomly. Direction of rotation direction may also be adjusted as desired.

[0029] In that regard, the muscle activation system may further generally comprise a control system provided with software that controls the tilting, inclination and speed of change of same during operation so that the assembly may ramp up intensity in a pre-determined way, or randomly. The system

may generally further comprise one or more sensors adapted to communicate information to the control system.

[0030] The muscle activation assembly may further comprise a seat associated with the body support, the seat preferably being foldable into a non-use position. This may be particularly useful in situations where a user suffers from a disability, is recovering from an injury, or for a sedentary user that requires gradual reactivation of muscle groups. The assembly may be collapsible for easy storage.

[0031] According to another aspect of the invention there is provided a muscle activation method comprising:

locating a user, in a static position, on a support associated with a base adapted to tilt about a substantially central point in 360° of motion, and

tilting the base about 360° of motion, or part thereof, thereby imparting forces on the user while maintaining the static position of the user.

[0032] Consistent with the above discussion of the muscle activation assembly of the invention, tilting is preferably conducted at an angle of up to 25° to the horizontal, for example 2° to 18°, 5° to 15°, 2° to 20°, 5° to 20° to the horizontal. The method may further comprise varying the degree of tilt of the base, the variation being random or controlled.

[0033] It is envisaged that the method may be suitable for conditioning of the multifidus muscle.

[0034] Throughout this specification, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated step or element or integer or group of steps or elements or integers, but not the exclusion of any other step or element or integer or group of steps, elements or integers. Thus, in the context of this specification, the term "comprising" is used in an inclusive sense and thus should be understood as meaning "including principally, but not necessarily solely".

[0035] The present invention consists of features and a combination of parts hereinafter fully described and illustrated in the accompanying drawings, it being understood that various changes in the details may be made without departing from the scope of the invention or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF ACCOMPANYING DRAWINGS

[0036] To further clarify various aspects of some embodiments of the present invention, a more particular description of the invention will be rendered by references to specific embodiments thereof, which are illustrated in the appended drawings. It should be appreciated that these drawings depict only

typical embodiments of the invention and are therefore not to be considered limiting on its scope. The invention will be described and explained with additional specificity and detail through the accompanying drawings in which:

FIG. 1 illustrates a side view of a muscle activation assembly according an embodiment of the invention.

FIG. 2 illustrates a front view of the muscle activation assembly of Figure 1.

FIG. 3 illustrates a sectional view (A-A) of the base of the muscle activation assembly of Figure 1.

FIG. 4 illustrates a side view of a muscle activation assembly of Figure 1 in an alternate orientation.

FIG. 5 illustrates a front view of the muscle activation assembly of Figure 4.

FIG. 6 illustrates a sectional view (B-B) of the base of the muscle activation assembly of Figure 4.

FIG. 7 illustrates a side view of a muscle activation assembly according to an embodiment of the invention, including various tilt pivots.

FIG. 8 illustrates a front view of the muscle activation assembly of Figure 7.

FIG. 9 illustrates a side view of a muscle activation assembly according to an embodiment of the invention, including a universal joint pivot assembly.

FIG. 10 illustrates a sectional view (A-A) of the muscle activation assembly of Figure 9.

FIG. 11 illustrates a side view of the base of the muscle activation assembly of Figure 9.

FIG. 12 illustrates front view of the base of the muscle activation assembly of Figure 9.

FIG. 13 illustrates a sectional view (B-B) of the base of Figure 12.

FIG. 14 illustrates a side view of a muscle activation assembly according to an embodiment of the invention in an extended orientation.

FIG. 15 illustrates a side view of the muscle activation assembly of Figure 14 in a retracted orientation.

FIG. 16 illustrates a perspective view of the muscle activation assembly of Figure 14.

Fig. 17 illustrates a side perspective view of a further muscle activation assembly in a first position;

Fig. 18 illustrates a side perspective view of a further muscle activation assembly in a second position;

Fig. 19 illustrates a side perspective model of the base mat;

Fig. 20 illustrates a side perspective view of base mat and steel frame;

Fig. 21 illustrates a side perspective view of the base moulding;

Fig. 22 illustrates a side perspective view of the base moulding and matt;

Fig. 23 illustrates a close up of a portion of Fig. 23;

Fig. 24 illustrates a side plan view, partly in section, of the stem assembly;

Fig. 25 illustrates a side perspective view of the stem assembly;

Fig. 26 illustrates a side perspective view of the base assembly;

Fig. 27 illustrates an exploded perspective of the top of the base assembly;

Fig. 28 illustrates a side perspective view of the top assembly;

Fig. 29 illustrates an exploded perspective view of the top assembly;

Fig. 30 illustrates a side perspective view of the top of the top assembly;

Fig. 31 illustrates an exploded perspective view of the top of the top assembly;

Fig. 32 illustrates a perspective view of the back pad;

Fig. 33 illustrates a side perspective view of the insertion of the bottom assembly through the platform;

Fig. 34 illustrates a side perspective view of the interconnection of the bottom assembly and platform;

Fig. 35 illustrates a side perspective view of the bottom assembly and platform and base;

Fig. 36 illustrates a close up view of the attachment of the universal joint;

Fig. 37 illustrates a side perspective view in disassembled form of the upper frame assembly;

Fig. 38 illustrates a side perspective view of the insertion of the upper frame assembly into the stem assembly;

Fig. 39 to Fig. 41 illustrate the attachment of the frame assembly to the stem assembly;

Fig. 42 illustrates a further alternative form of the muscle exercise machine;

Fig. 43 illustrates a first sectional view through the base of the alternative muscle exercise machine;

Fig. 44 illustrates a first sectional view through the base of the alternative muscle exercise machine;

Fig. 45 illustrates a CAD side view of the base portion of the alternative muscle exercise machine;

Fig. 46 illustrates a further CAD side view of the base portion of the alternative muscle exercise machine;

Fig. 47 illustrates a further CAD sectional view of the base portion of the alternative muscle exercise machine;

Fig. 48 illustrates a further CAD sectional view of the base portion of the alternative muscle exercise machine;

Fig. 49 illustrates a further CAD sectional view of the base portion of the alternative muscle exercise machine;

Fig. 50 illustrates a further CAD sectional view of the base portion of the alternative muscle exercise machine;

Fig. 51 illustrates a further CAD sectional view of the lower portions of the alternative muscle exercise machine;

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0037] Hereinafter, this specification will describe the present invention according to the embodiments. It is to be understood that limiting the description to the embodiments of the invention is merely to facilitate discussion of the present invention and it is envisioned without departing from the scope of the appended claims.

[0038] Referring to Figures 1 to 3, a muscle activation assembly 100 is illustrated. The assembly 100 includes a base 110 and a frame 120 connected thereto. According to this embodiment; the base 110 includes a base plate 111 having an upper surface 112 on which a user of the assembly 100 stands, generally in an upright position. The base 110 also includes a fixed pivot 113 that is centrally located on an under side of the base plate 111. As illustrated in Figures 1 to 3, the pivot 113 extends to provide a tilt angle of about 6° from the horizontal when the outer perimeter 114 of the base plate 111 bears on the surface on which the assembly 100 rests.

[0039] The frame 120 illustrated in this embodiment includes an upright 121, which in use supports the back or chest of a user, and two spaced generally elliptical handles 122. The elliptical handles 122 are shaped such that a user can grasp them at any location, to some extent depending on the muscles to be activated. Struts 123 are provided to connect the elliptical handles 122 to the upright 121.

[0040] Referring to Figures 4 to 6, the assembly of Figures 1 to 3 is again illustrated, but in this instance the fixed pivot 113 is in an extended orientation. The orientation of the pivot 113 illustrated provides in a tilt angle of about 12° from the horizontal, which results in a more strenuous session for a user of the assembly 100.

[0041] Figures 7 and 8 provide side and front views of a muscle activation assembly 700 that, again, includes a base 710 and a frame 720. In this instance, the pivot 713a-c is adaptable to provide a 6° tilt (713a), 9° tilt (713b) and 12° tilt (713c).

[0042] Figures 9 to 13 illustrate an alternative embodiment of a muscle activation assembly 900 according to the invention. In this embodiment, the assembly 900 includes a base 910 that is mechanised. Specifically, the base 910 includes a base plate 911 having an upper surface 912. The base 911 is mounted on a central universal joint 913 that replaces the fixed pivot of the previous

embodiments. The universal joint 913 is associated with a jack 914, in this embodiment a threaded jack, which is adapted to raise and lower the base plate 911.

[0043] A plurality of rollers 915 is provided. The rollers in this embodiment bear on an outer circumferential portion of the underside of the base plate 911. However, in a preferred embodiment the base plate 911 includes a track (not shown) that depends from the circumferential edge of the base plate 911. The track, which is substantially U-shaped, receives the rollers 915 such that the rollers 915 are always closely associated with the base plate 911. Each of the rollers 915 is associated with a secondary roller 916.

[0044] Referring to Figures 14 to 16, an alternate embodiment of a muscle activation assembly 1400 is illustrated. In this embodiment, the base 1410 is a substantially circular base plate 1411 having an upper surface 1412 and a fixed pivot 1413. It will be appreciated that the base configuration may be interchanged with any previously described configuration.

[0045] In this embodiment, the frame 1420 includes an upright 1421 and two elliptical handles 1422. The upright 1421 is adjustable between an extracted orientation (Figure 14) and a retracted orientation (Figure 15) by virtue of inner and outer telescopic parts 1423, 1424 respectively. A plurality of apertures 1425 are provided to facilitate locking of the upright using, for example, a pin. A back/chest rest 1426 is provided. A user may stand with his or her back or chest against the rest 1426, depending on the muscles to be primarily activated. The rest 1426 is positioned such that when a user of the assembly 1400 bears their chest or back against the rest 1426, their body is substantially axially aligned with the pivot 1413.

[0046] The frame 1420 may be gripped by a user at any location about the substantially elliptical handles 1422. Additional handles 1427 are also provided if desired. Furthermore, crossbars 1428 may also be provided as additional holding points for the user.

[0047] Turning to Fig.17, there is illustrates a further embodiment 1700. The embodiment is mounted on a safety mat 1701, and includes a steel chassis assembly 1702 (not shown) under base moulding assembly 1703. A platform composite assembly for standing on is provided 1704. An upper space frame assembly 1706 is attached to the platform via a stem assembly 1705. The upper space frame includes back support structure 1710 and arm support structures 1712 and 1714. The space frame assembly provides support for a user and is designed to rotate around a central pivot point.

[0048] Fig. 18 reveals the embodiment in a different position revealing the attachment universal joint 1708 around which platform 1704 pivots and upper frame undergoes a precession like motion.

[0049] The construction of the arrangement 1700 will now be discussed. Initially, as illustrated in Fig. 19, a safety matt 1701 is formed as an optional floor base. Turning to Fig. 20, on top of the matt is

places a steel chassis frame 1702. The frame can be levelled by a series of optional spacing discs 1716. On the chassis 1702 is bolted a spacer 1718 and a universal joint 1720. The arrangement can be bolted using joint bolts.

[0050] Turning to Fig. 21, the base moulding 1703 is next mounted over the steel frame. The base moulding includes a base slip ring 1730 by means of a series of M6 screws in holes in the base.

[0051] Fig. 21a shows an insert having the base holes 1732, 1734 for mounting.

[0052] Fig. 22 shows the partially assembled arrangement, with Fig. 23 showing a closeup of the universal joint with a boot covering. The base moulding 1703 being firmly attached to the chassis by means of threaded screws.

[0053] Next, the stem assembly 1705 of Fig. 17 is assembled. Fig. 24, illustrates a side view, partly in section of the stem assembly, with Fig. 25 showing a further side perspective view.

[0054] The stem assembly is formed from two major columns, being the base extrusion assembly 1752 and top extrusion assembly 1754 which mate together in a telescopic structure to provide adjustable height characteristics. The adjustment is provided by control knob and dampener 1758.

[0055] Fig. 27 illustrates the assembly of the control knob. The control knob is designed to lock the top extrusion assembly to the base extrusion assembly.

[0056] Fig. 28 shows the top extrusion assembly in an assembled form. Fig. 29 shows the top extrusion assembly in an exploded perspective form. Turning to Fig. 29 the top extrusion assembly includes extruded stem 1782, support structure 1784, collar 1786, telescopic dampener rod 1789 and fixing bolts 1792, 1790.

[0057] The top 1800 of the extrusion assembly includes a slot for the mounting of the frame or cage 1706 (Fig. 17). The top of the extrusion assembly is shown in more detail in Fig. 30. The mounting bracket includes lateral and inline clamping parts as shown in exploded perspective in Fig. 31. These are used to support and clamp the cage.

[0058] Mounted on the end 1801 (Fig. 30) of the top of the extrusion assembly is the back pad 1710. The backpad is shown in more detail in Fig. 32, including back pad chassis 1711 and mounting screws 1713.

[0059] As illustrated in Fig. 33, the stem assembly 1705 is inserted through a slot 1820 in platform 1704 with the plate portion 1822 being bolted to the underside of base 1704 with the result being as illustrated in Fig. 34. The stem assembly can be inserted by taking the pre-assembled Stem and

removing the Back Pad, and other parts from the top of the stem. The Stem Assembly is fed through the slot in the Platform or base until the Stem Base Plate locates over the threaded studs of the Platform. The stem is adjusted to the desired position. The initial setting should be fully rearwards as shown in the figures. The stem is secured into place by applying and tightening two M10 Nyloc Nuts on the rear studs.

[0060] Next, as illustrated in Fig. 35 and 36, the Platform 1704 and Stem 1705 subassembly is connected to the Universal Joint by pushing the Uni Joint Boot down and aligning the four front studs with the holes in the top of the Universal Joint 1824, threading on the 4 OFF 958 M10 Nyloc Nuts onto studs. 3. The Stem is fixed into place by tightening up four nuts 1826 onto the studs using a ring spanner.

[0061] Next, the upper frame assembly can be formed. An example of the upper frame assembly is shown in Fig. 37 in an exploded perspective view 1706. The upper frame assembly includes caps 1840, handle sleeves 1842, screw e.g. 1844, left and right arm pad assemblies 1712, 1714, guide plats 1848 and large caps 1846.

[0062] As shown in Fig. 38, the assembled upper frame assembly 1706 is then mated with the stem assembly 1705 and bolted thereto. This can be done by lifting the frame and sliding the two guide plates into the top of the stem.

[0063] Fig. 39 shows the process of assembling the Lateral and Inline Clamps joining the Frame to the Stem loosely. Fig. 40 shows the assembly of the Back Pad into place. The bottom two screws are adjusted so they slide snuggly into their keyhole slots. The top two screws are firmly tightened. Next, Fig. 41, the tower stem cap 1802 is tapped into place.

[0064] Other versions are possible. For example, the rotation of the base may be electrically controlled under the control of a computer device. Fig. 42 illustrates one such device which operates in a similar manner to the previous devices

[0065] Electrically controlled embodiment – EVE

[0066] Turning to Fig. 42, the electrical version of the exercise machine is shown 4200. This machine includes a platform 4201 on which the user stands, holding a supporting cage 4206 and using backreset 4207 for either back or stomach support. The platform is connected to base 4202 and interposed is a shroud 4203. A lower stem assembly 4204 interconnects an upper stem assembly 4205, which in turn supports the cage 4206. Electronic control is provded by a touch sensitive computer tablet type device 4208. The tablet 4208 provides a series of exercise type programs for activation by the user.

The arrangement 4200 is designed to be driven automatically and electrically with the platform undergoing a precession like movement and angled at predetermined degree depending on user settings.

[0067] The arrangement 4200 therefore contains to aspect over the manual system. The first is a controlled angle of operation of the platform and the second is the controlled precession of the platform. The implementation of these two additions will now be discussed with reference to the schematic illustrations in Fig. 43 and Fig. 44. In the example embodiment, the angle of inclination of the platform is controlled by a screw drive and the precession motion is controlled by a series of wheel bearings.

[0068] As shown in Fig. 43, the platform 4301 is connected to a universal joint 4302 which in turn is mounted on top of a worm drive 4304 which can raise and lower the platform under electrical control. Fig. 43 shows the platform in a lowered state, with Fig. 44 showing the platform in an inclined state after raising of the worm drive 4304.

[0069] The platform is also supported by bearings e.g. 4308 which are interconnected to bearings 4309 and rotate on support/guide 4307 and is driven by plater 4312. The plater 4312 rotates under the control of an electric motor drive (not shown) and in turn drives the bearings 4308 and 4309 around on platter 4312, thereby causing the platform 4301 to undergo a precession like motion.

[0070] The platform 4301 can include a circumferential lip 4310 and a further perpendicular lip 4303 which engages with the bottom surface of bearing 4308 during operation.

[0071] The net effect experienced by the user is a controlled precession at a predetermined inclination, and predetermined precession rate, with most of the user's weight being supported by the universal joint 4392.

[0072] Turning now to Fig. 45, there is illustrated the first of a series of CAD generated views of the prototype of Fig. 42.The view 4500 is of the prototype in an inclined position, and illustrates the base 4202, platform 4201 and lower assembly 4204. The universal joint 4501 is driven to an elevated position by a worm drive (not shown). The worm drive can in turn be driven by a belt drive.

[0073] A platter 4502 is driven by a second belt drive and includes 4 bearing units 4504, 4506, 4508, and 4510. The bearing units run on track 4512. The two bearing units 4506, 4504, support one end of the platter 4514. The two bearing units 4508 and 4510 include a first bearing for support on track 4512, and a second outer bearing which engages with the lip of the rim 4517 so as to couple the platform 4501 to the platter 4514, in conjunction with the universal joint 4501.

[0074] Turning to Fig. 46, which shows a CAD generated view of the prototype, again in an inclined position, more clearly showing the bearing unit 4514, which includes inner and outer bearings 4516,

4518, with the inner bearing 4514 engaging with the surface of the support track 4512 and the second bearing engages with the rim 4517.

[0075] Turning to Fig. 47, there is illustrated a CAD generated sectional view thorough the base of the prototype, again illustrating teh bearing unit 4514, having inner bearing 4518 and outer bearing 4516, with the inner bearing running along track 4212, and the outer bearing 4516, running along track 4510 of the platform 4201. Fig. 47 also illustrates the inner portions of the worm drive 4702 ultilised in the raising and lowering of the universal joint

[0076] Fig. 48 illustrates a similar sectional view to Fig. 47. However, in this case the worm drive 4702 has been lowered to its base position and the platform 4201 is also lowered. The bearings engage the lip 4510 to maintain the platform in the lowered position.

[0077] Fig. 50 illustrates a different sectional view similar to that of Fig. 48. Fig. 49 illustrates a sectional similar to that of Fig. 47.

[0078] Further Fig. 51 illustrates a further sectional view through the base and lower support member.

[0079] A number of refinements are possible. For example, the upper cage could include a movable or flexible joint in its connection to the upper assembly. The joint could be motorised to be controlled to synconise with the precession like movement of the platform so as to further enhance movement of the user's upper body.

[0080] Unless the context requires otherwise or specifically stated to the contrary, integers, steps or elements of the invention recited herein as singular integers, steps or elements clearly encompass both singular and plural forms of the recited integers, steps or elements.

[0081] It will be appreciated that the foregoing description has been given by way of illustrative example of the invention and that all such modifications and variations thereto as would be apparent to persons of skill in the art are deemed to fall within the broad scope and ambit of the invention as herein set forth.

CLAIMS:

1. A muscle activation system including:

an inclined platform for a user to stand on;

a rigid upper body user support frame attached to the inclined platform for supporting the upper body of a user standing on the inclined platform;

a base, coupled to the inclined platform, said coupling allowing relative orientation motion between the base and inclined platform.

the platform adapted to undergo a precession like motion around a central point so as to circumferentially move a user's upper body, when supported by the rigid upper body user support frame, substantially through an arc around a central point.

2. A system as claimed in claim 1 wherein said base is coupled to the inclined platform by a universal joint.

3. A system as claimed in any previous claim wherein said inclined platform includes a circumferential rim which engages with said base as said platform undergoes the precession like motion.

4. A system as claimed in claim 3 wherein, during operation, the platform is substantially supported by said circumferential rim and said universal joint.

5. A system as claimed in any previous claim wherein said inclined platform is substantially circular in circumference.

6. A system as claimed in any previous claim wherein said platform is generally planar and a normal axis to the platform undergoes rotation around a central point.

7. A system as claimed in any previous claim wherein said rigid upper body user support frame is of a cage like structure having a plurality of hand holds for the user to hold onto during operation.

8. A system as claimed in claim 7 wherein said support frame further includes lower arm holds for structurally supporting the users lower arms.

9. A system as claimed in any previous claim wherein said support frame includes a padded back support.

10. A system as claimed in any previous claim further comprising:

automated platform driving means for driving the platform through its motion.

11. A system as claimed in claim 10 wherein said automated platform driving means comprises an electric motor interconnected to a rotational plate having a series of circumferential bearings which engage with the platform to drive the motion of the platform.

12. A systems as claimed in any preceding claim wherein the platform does not substantially rotate during operation.

13. A muscle activation system including:

a platform for a user to stand on;

a support base for supporting the platform;

a flexible coupler, coupling the platform to said support base, said coupling allowing relative orientation motion between the base and inclined platform;

a first electric drive unit located between the platform and support base, said drive unit including at least one engagement unit for engaging with the bottom surface of the platform and a corresponding surface of the support base to keep them at a predetermined orientation apart from one another, whilst the engagement unit rotates around the flexible coupler.

14. A muscle activation system as claimed in claim 13 wherein the at least one engagement unit includes a first bearing engaging the bottom surface of the platform and a second bearing engaging the support base, with the first and second bearing being rigidly interconnected.

15. A muscle activiation system as claimed in claim 14 further comprising a flexible coupler elevation unit, for raising and lowering the vertical position of the flexible coupler.

16. A muscle activation system as claimed in claim x3 wherein said flexible coupler elevation unit comprises a worm drive.

17. A muscle activation system as claimed in claim 15 wherein said flexible coupler comprises a universal joint.

18. A muscle activation system as claimed in claim 16 wherein the number of engagement units is at least two, with each engagement unit engaging an outer portion of the bottom platform surface.

19. A muscle activation system, as claimed in claim 17 wherein said first electric drive unit engages with a bottom surface of the platform so as to elevate or incline a portion of the platform relative to is surrounds.

20. A muscle activation unit as claimed in claim 18 wherein said at least one engagement unit, engages a lip on the bottom of the platform to push it down.

21. A muscle activation assembly comprising:

a base adapted to tilt about a substantially central point in 360° of motion; and

a support associated with the base and adapted to support a user of the muscle activation assembly;

wherein, in use, a user of said muscle activation assembly is in a substantially static position relative to the base and is tilted about 360° of motion, or part thereof, thereby imparting forces on the body of said user.

22. A muscle activation assembly according to claim 21, wherein said base comprises a base plate, for example a substantially circular base plate, mounted to tilt about 360° of motion.

23. A muscle activation assembly according to claim 22, wherein said base plate is tiltable at an angle of from 0° to 25° to the horizontal, for example 2° to 18°, 5° to 15°, 2° to 20°, 5° to 20° to the horizontal.

24. A muscle activation assembly according to claim 22 or 23, wherein said base plate is tiltably mounted on a mount comprising:

a substantially central universal joint; and

a plurality of rollers on which a running surface of an outer portion of said base plate bears.

25. A muscle activation assembly according to claim 24, wherein said central universal joint and/or said rollers are associated with a drive.

26. A muscle activation assembly according to claim 24 or 25, further comprising a height adjustment mechanism, for example a threaded jack, adapted to raise and lower said base plate thereby varying the degree of tilt of the base plate, said variation being random or controlled.

27. A muscle activation assembly according to any one of claims 24 to 26, wherein said base plate comprises a circumferential track depending from the circumference thereof, said circumferential track receiving said plurality of rollers and defining said running surface.

28. A muscle activation assembly according to claim 22 or 23, wherein said base plate comprises a substantially central fixed pivot and wherein, in use, an outer perimeter of said base plate bears a surface on which said muscle activation assembly rests.

29. A muscle activation assembly according to claim 27, wherein said fixed pivot is height adjustable.

30. A muscle activation assembly according to any one of the preceding claims 21 to 29, wherein said support comprises a frame extending from the base, the frame comprising a body support and at least one handle.

31. A muscle activation assembly according to claim 30, wherein said body support of said frame comprises an upright extending from said base.

32. A muscle activation assembly according to claim 31, wherein said upright is disposed towards and outer edge of said base.

33. A muscle activation assembly according to claim 31 or 32, wherein said upright is height adjustable.

34. A muscle activation assembly according to any one of claims 30 to 33, wherein said at least one handle of said frame comprises two handles associated with said body support and adapted to be held by a user of said muscle activation assembly.

35. A muscle activation assembly according to claim 34, wherein said handles comprise substantially elliptical sub-frames associated with said body support and extending outwardly therefrom over said base.

36. A muscle activation assembly according to claim 34 or 35, wherein said handles are adjustable.

37. A muscle activation system according to any one of claims 21 to 29, wherein said support comprises a strap system that safely retains the user at approximately the thigh region to maximise muscle activation in the core and back.

38. A muscle activation system according to claim 37, further comprising one or more hand grip(s).

39. A muscle activation assembly according to any one of claims 24 to 38, further comprising a control system provided with software that controls the tilting, inclination and speed of change of same during operation so that the assembly may ramp up intensity in a pre-determined way, or randomly.

40. A muscle activation system according to claim 39, further comprising one or more sensors adapted to communicate information to the control system.

41. A muscle activation system according to claim 40, wherein one or more sensor(s) are located on handle(s) of the muscle activation assembly such that intensity experienced by a user may be altered when the handle(s) are gripped by the user.

42. A muscle activation assembly according to any one of the preceding claims 21 to 41, further comprising a seat associated with body support, the seat preferably being foldable into a non-use position.

43. A muscle activation method comprising: locating a user, in a static position, on a base adapted to tilt about a substantially central point in 360° of motion; and tilting said base about 360° of motion, or part thereof, thereby imparting forces on said user.

44. A muscle activation method according to claim 43, wherein said tilting is conducted at an angle of up to 25° to the horizontal.

45. A muscle activation method according to claim 43 or 44, further comprising varying the degree of tilt of the base, said variation being random or controlled.

46. A muscle activation method according to any one of claims 43 to 45, wherein said method comprises conditioning of the multifidus muscle.

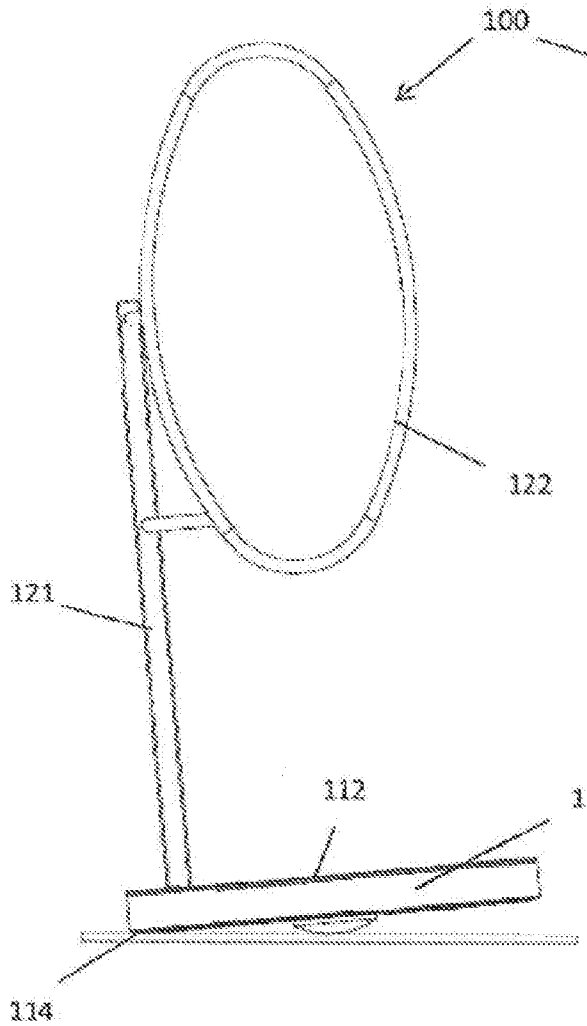


FIGURE 1

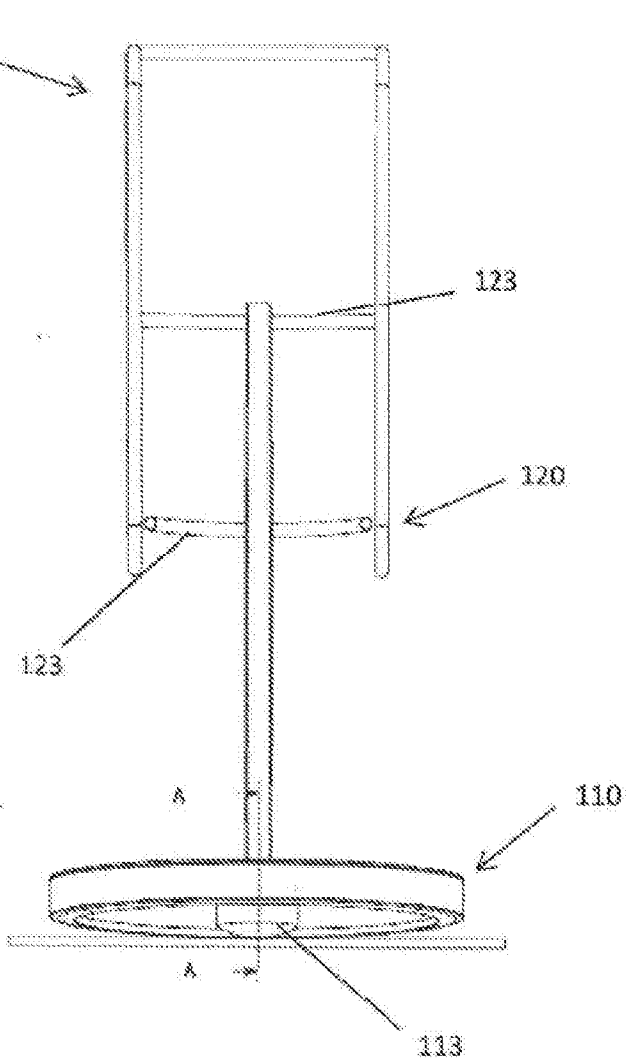


FIGURE 2

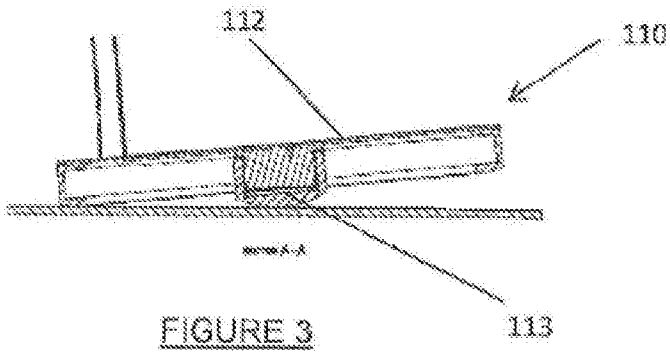


FIGURE 3

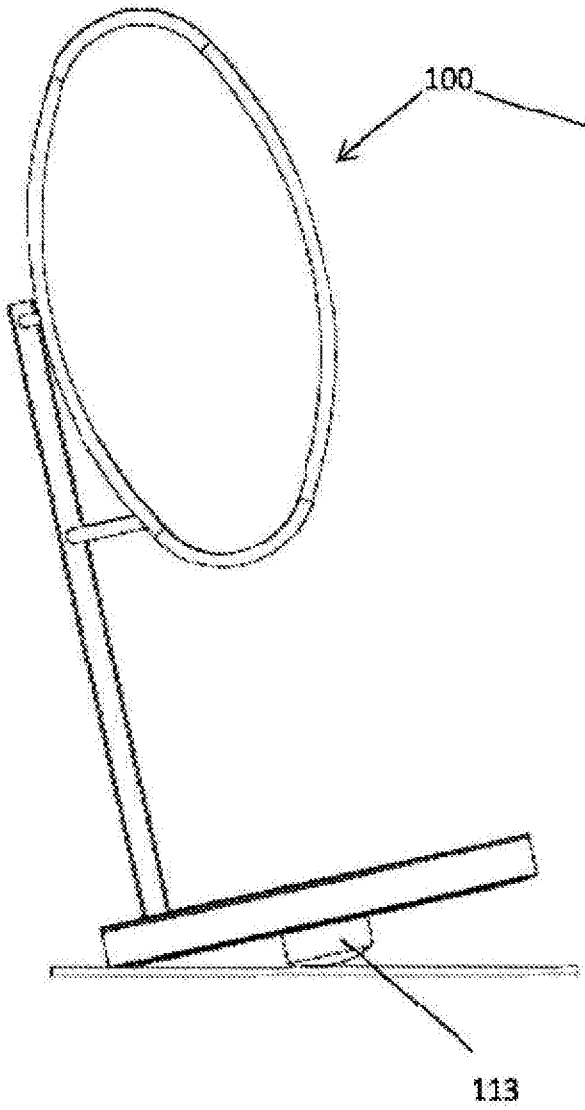


FIGURE 4

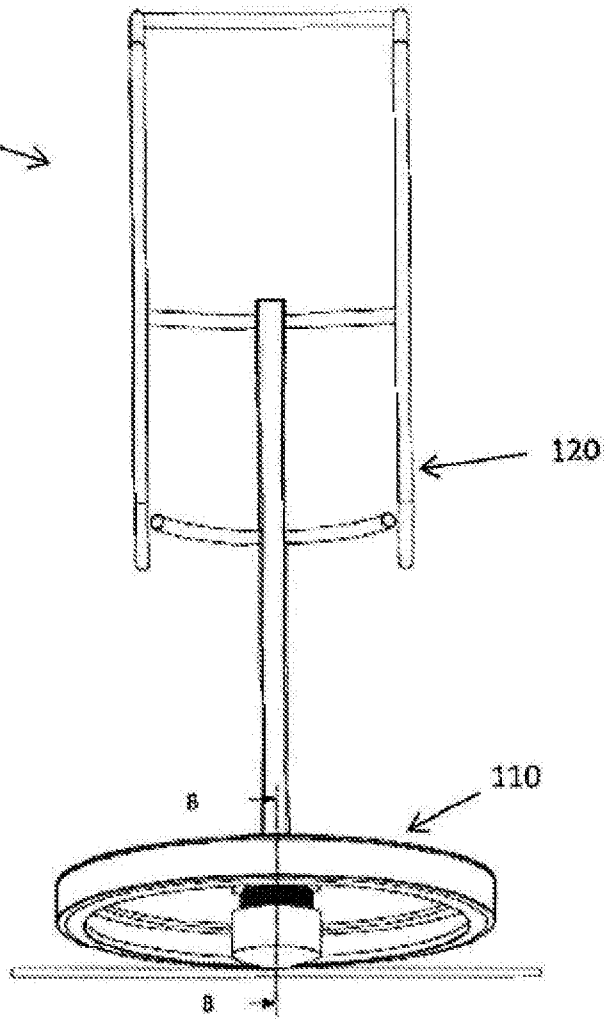


FIGURE 5

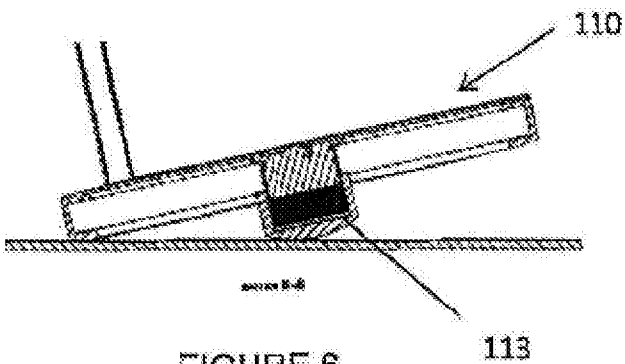


FIGURE 6

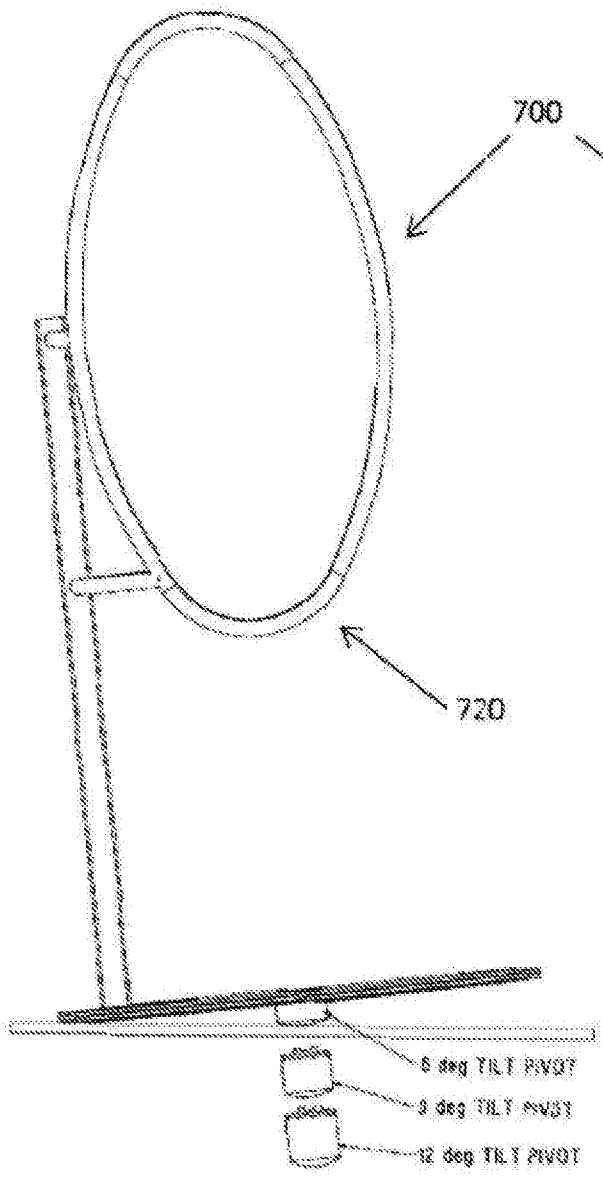


FIGURE 7

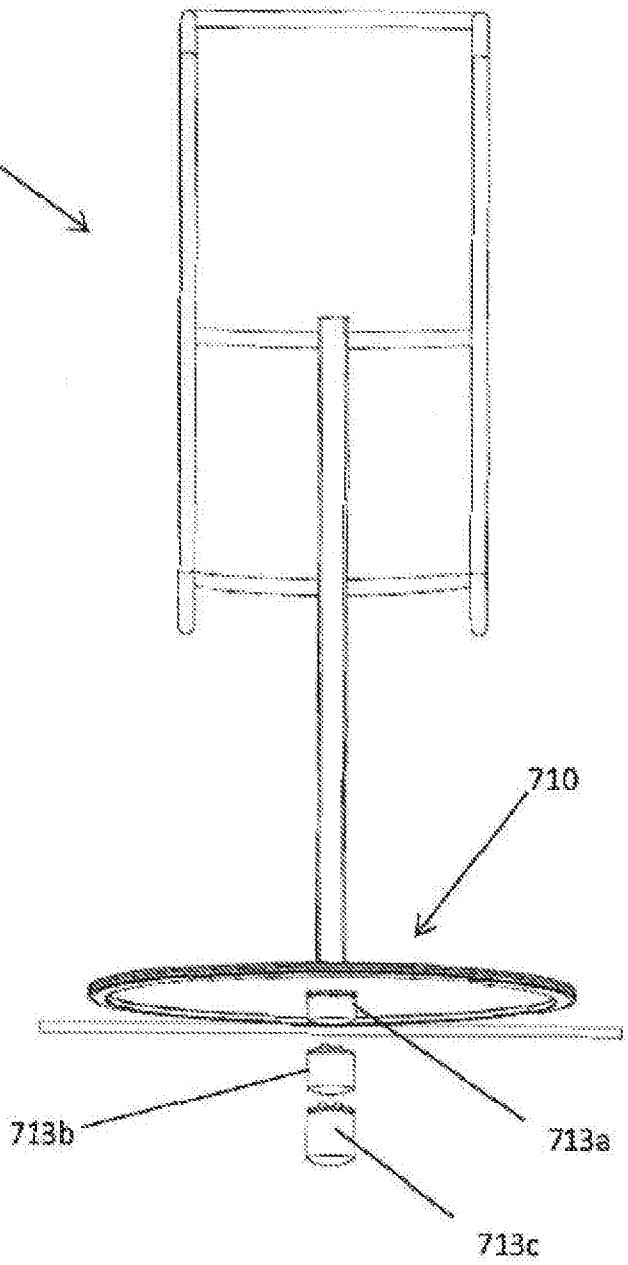


FIGURE 8

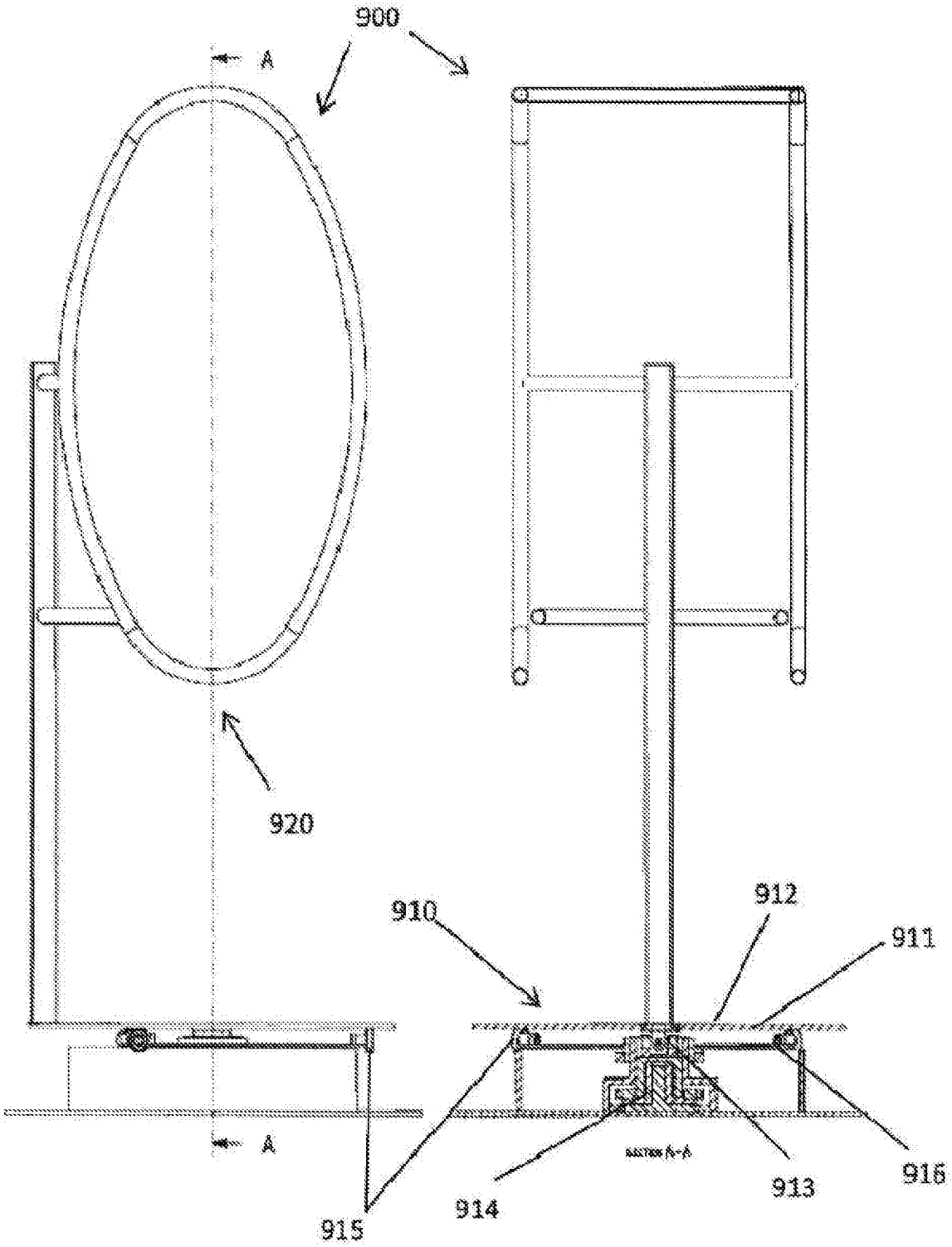


FIGURE 9

FIGURE 10

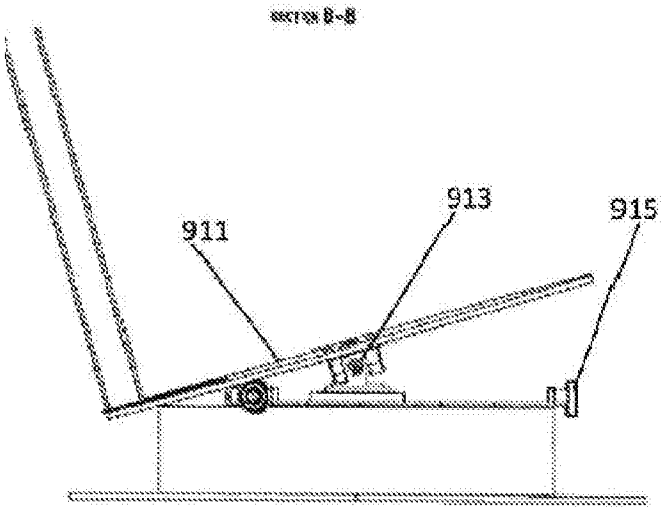


FIGURE 11

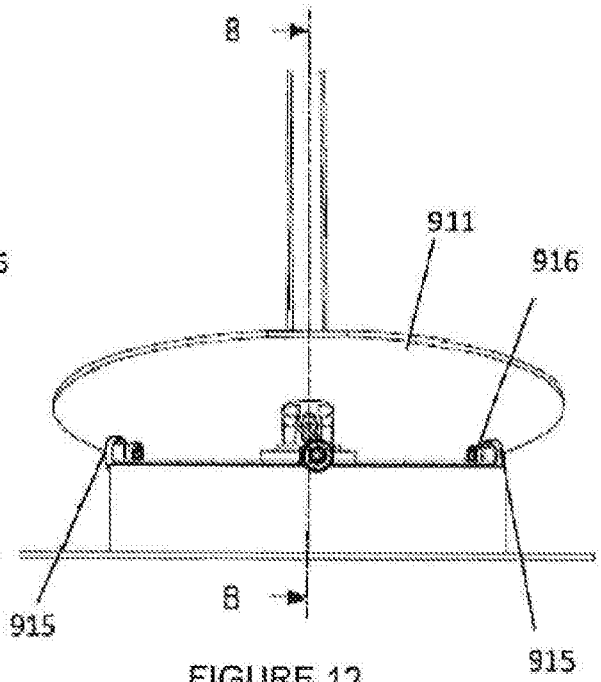


FIGURE 12

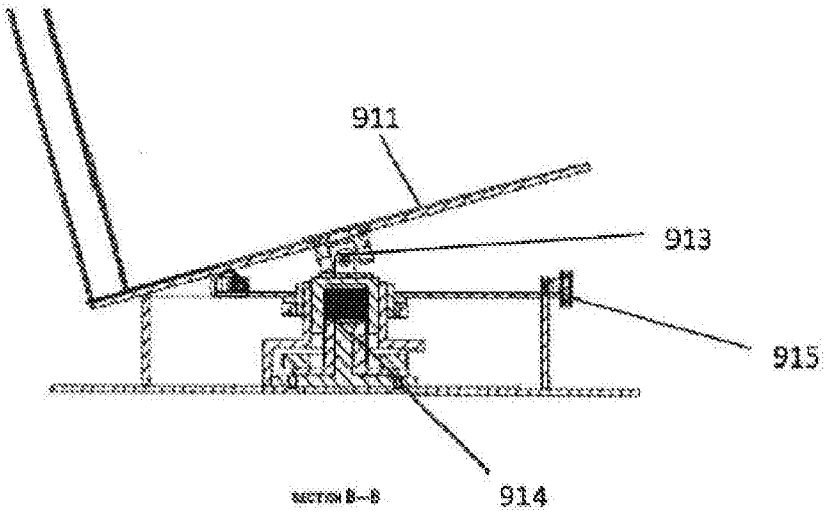


FIGURE 13

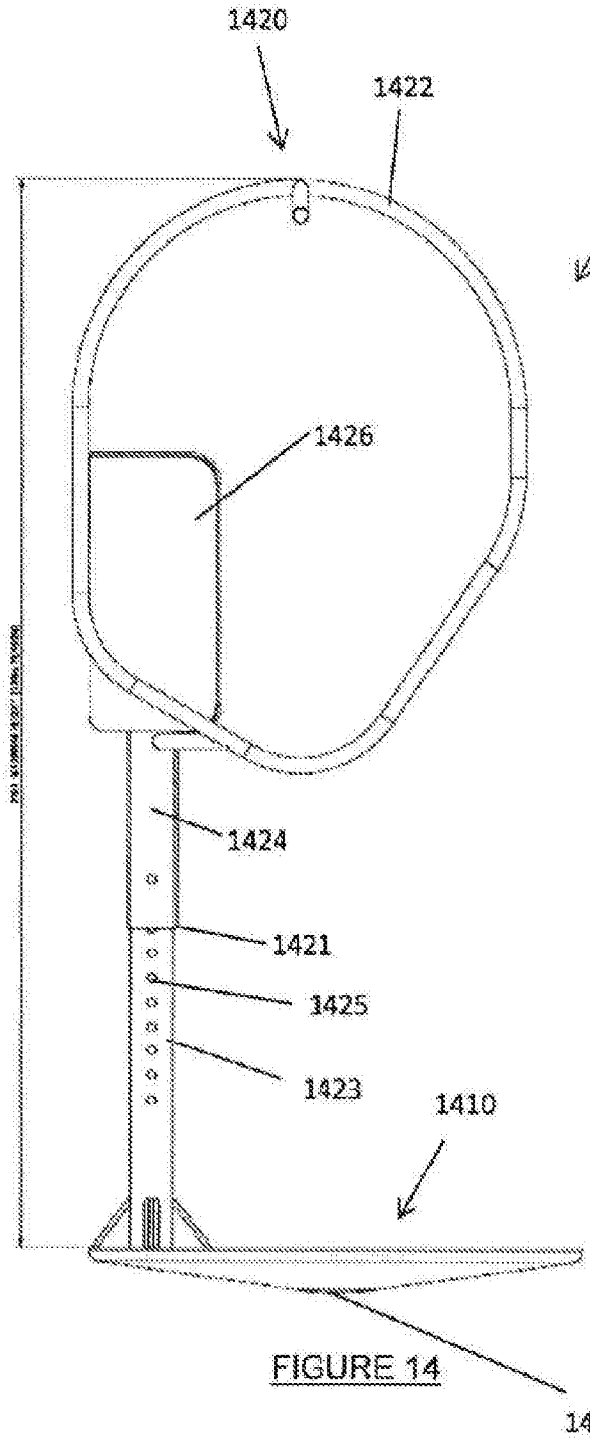


FIGURE 14

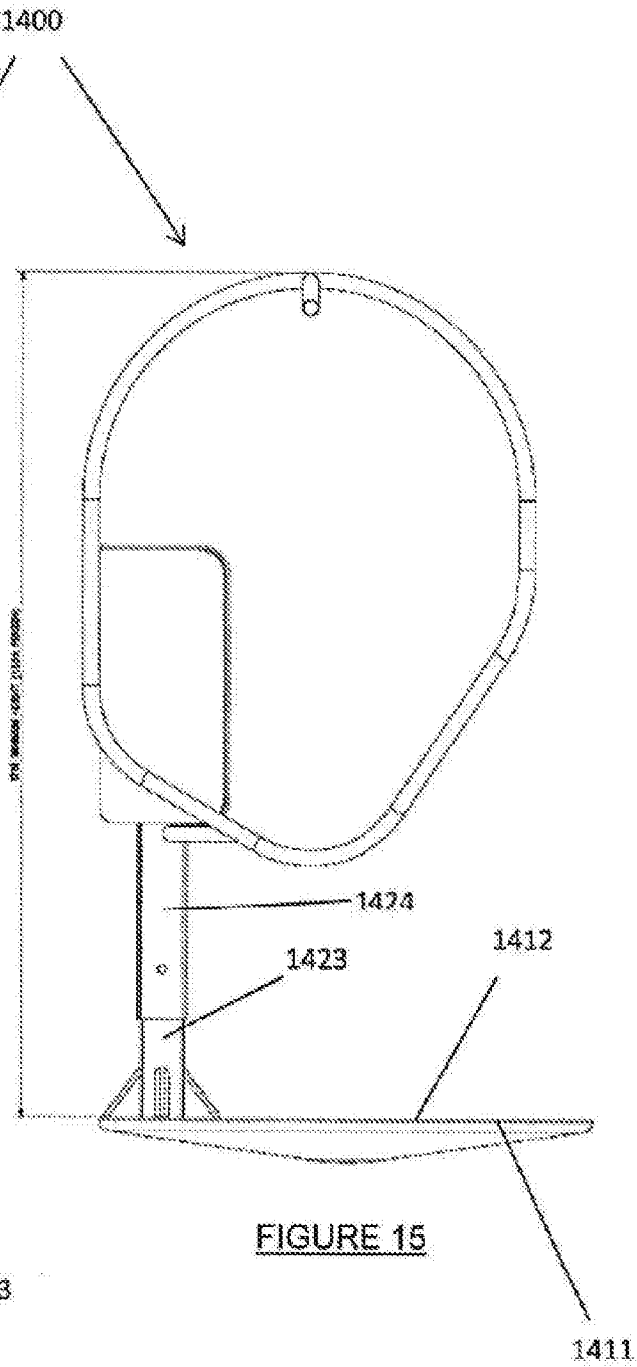


FIGURE 15

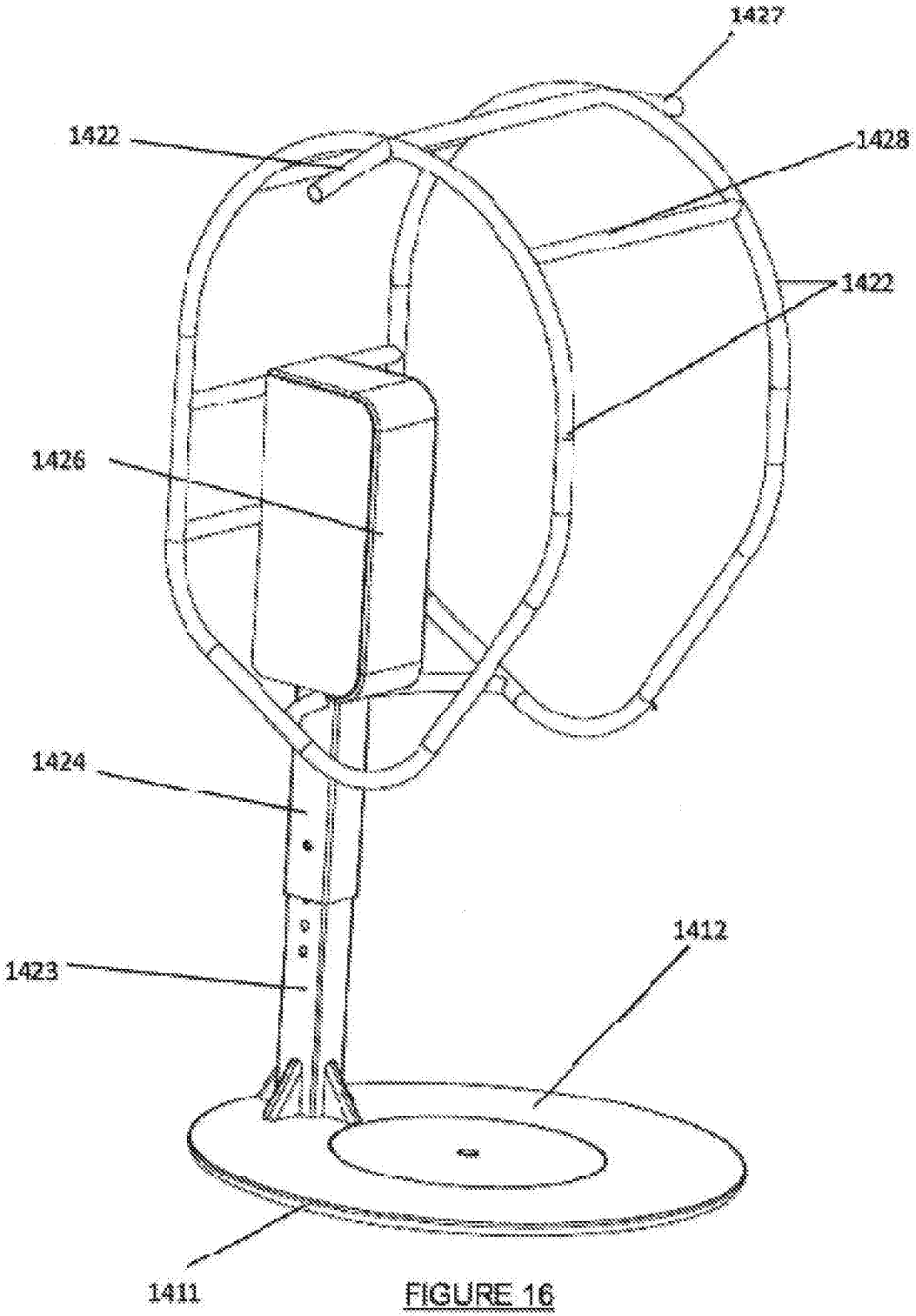


FIGURE 16

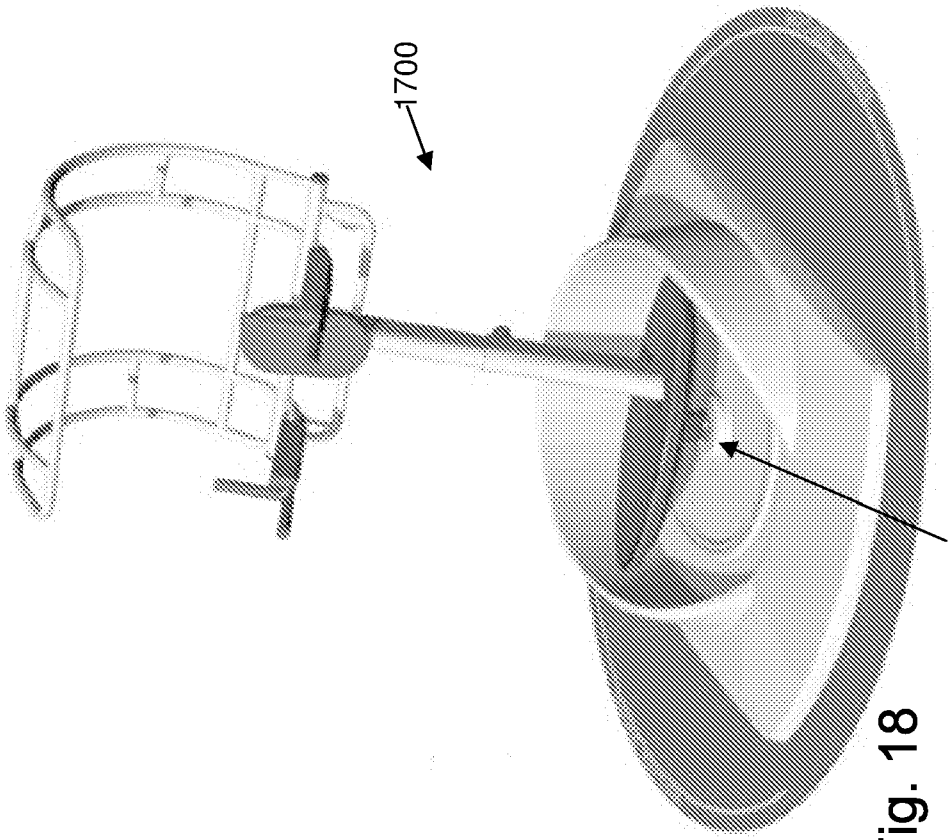


Fig. 18

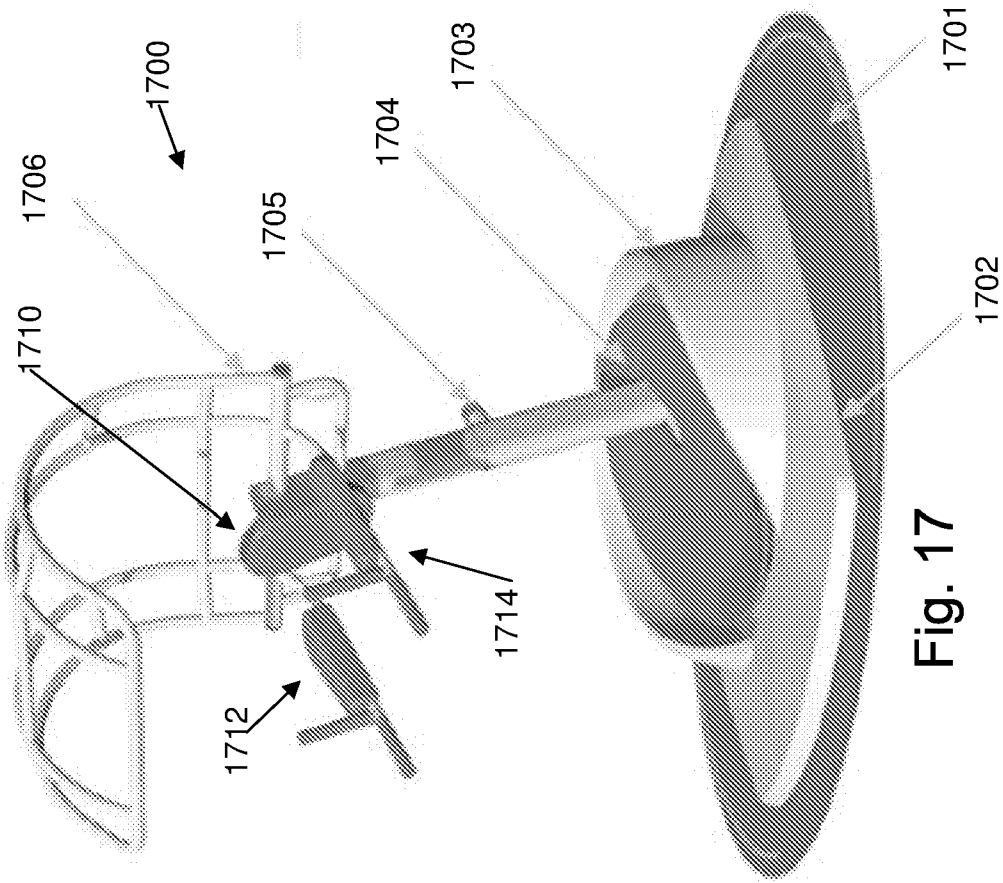


Fig. 17

Fig. 19

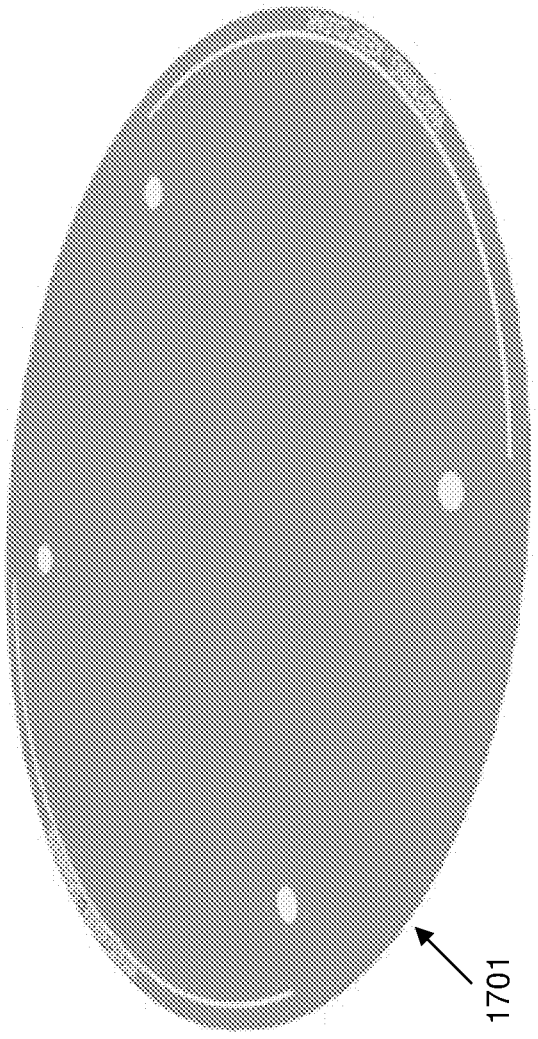
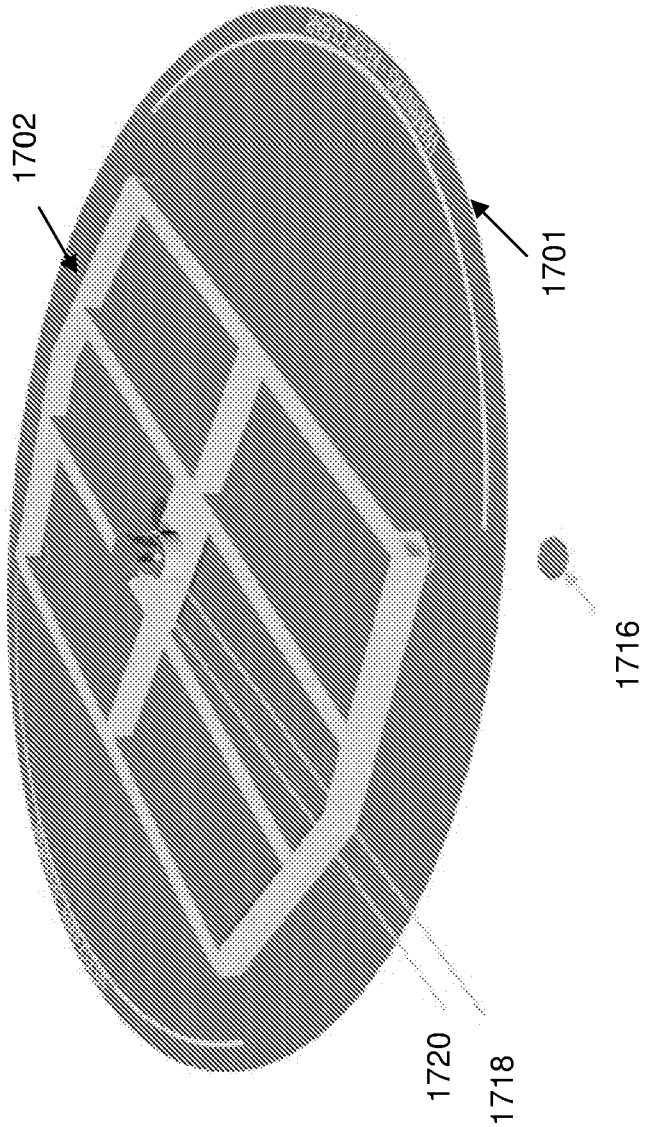


Fig. 20



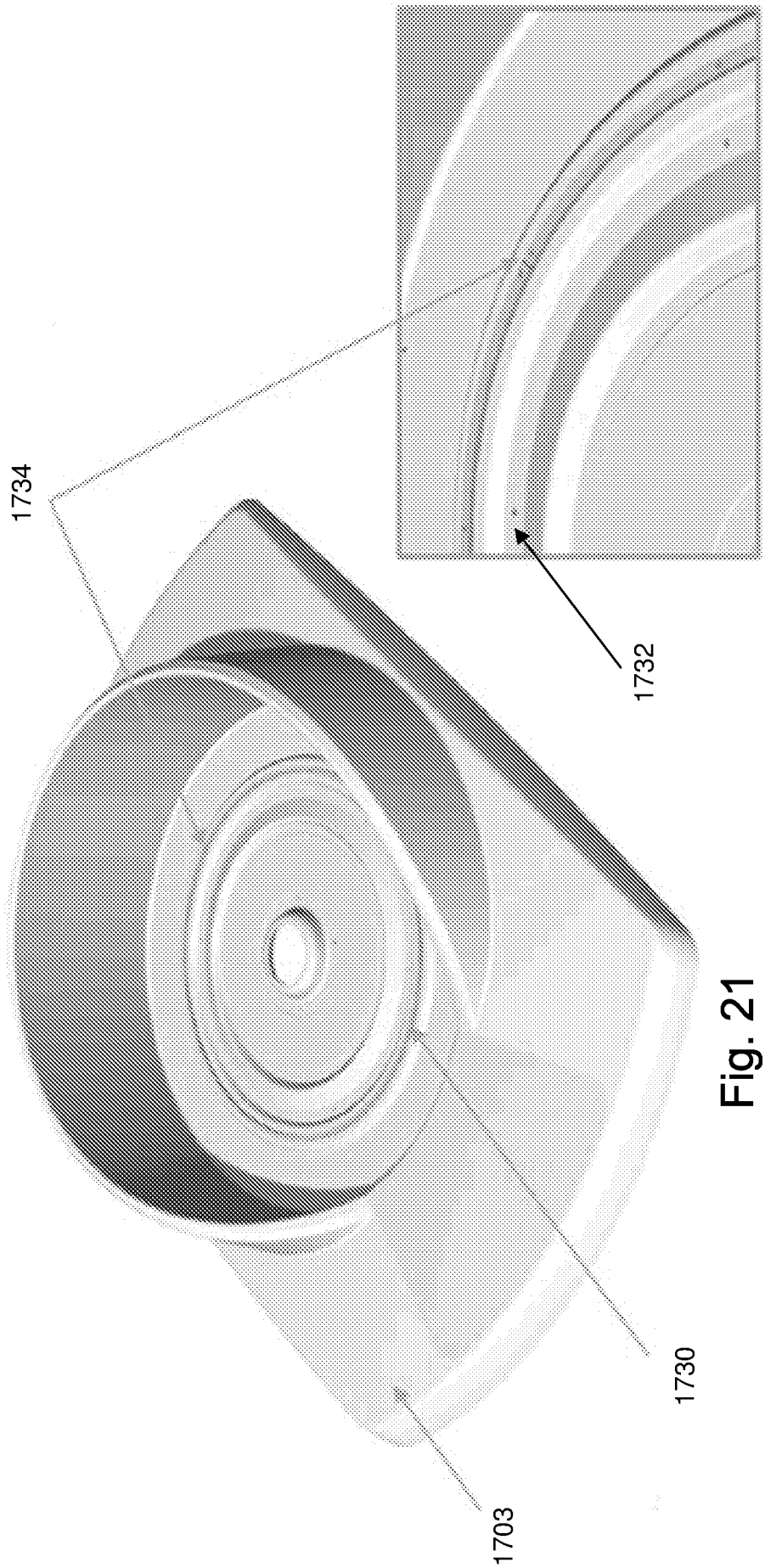


Fig. 21A

Fig. 21

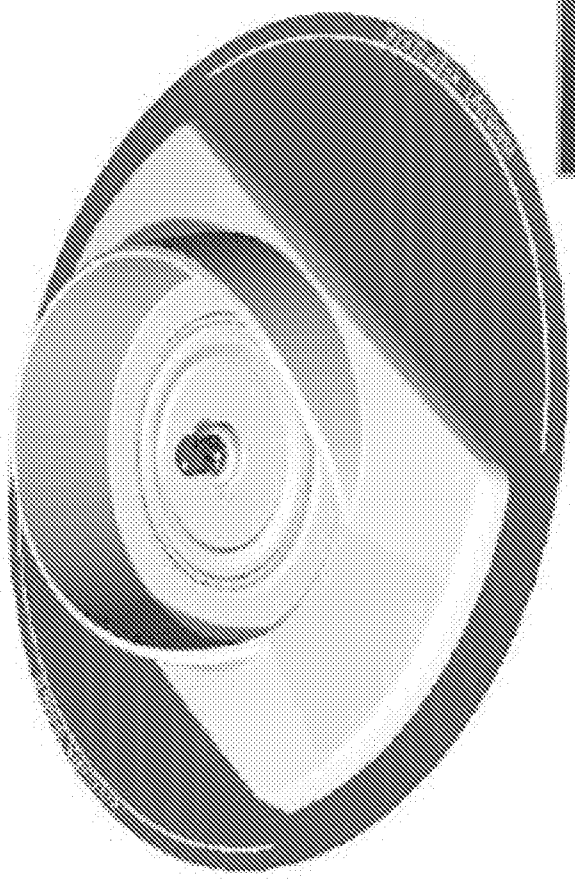


Fig. 22

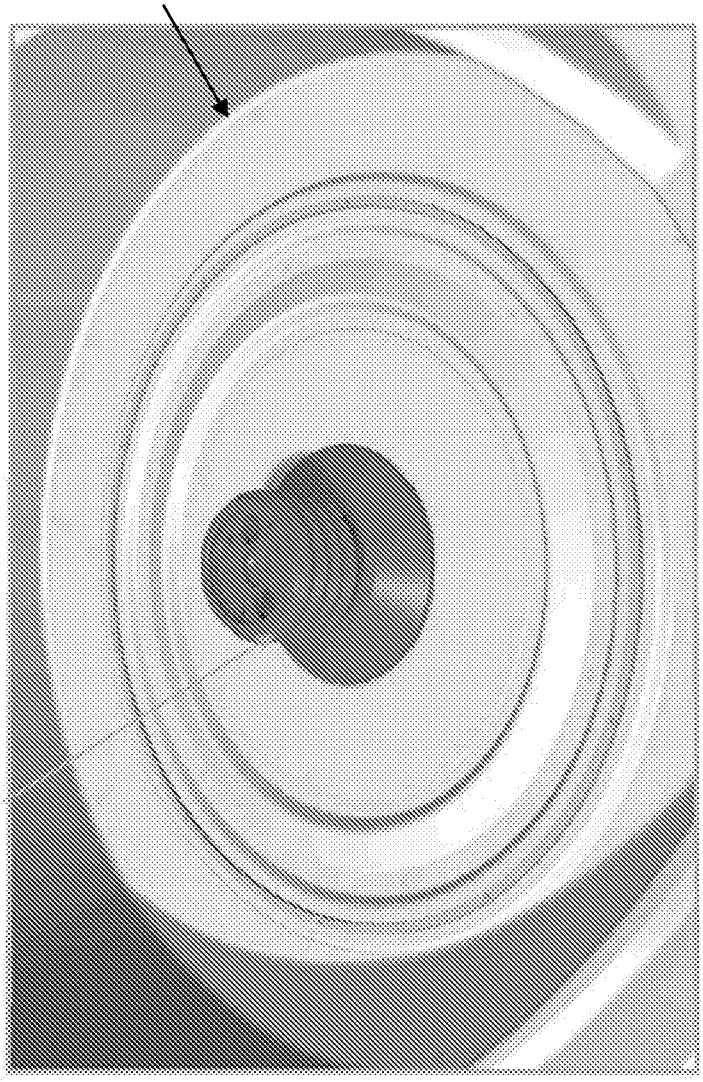


Fig. 23

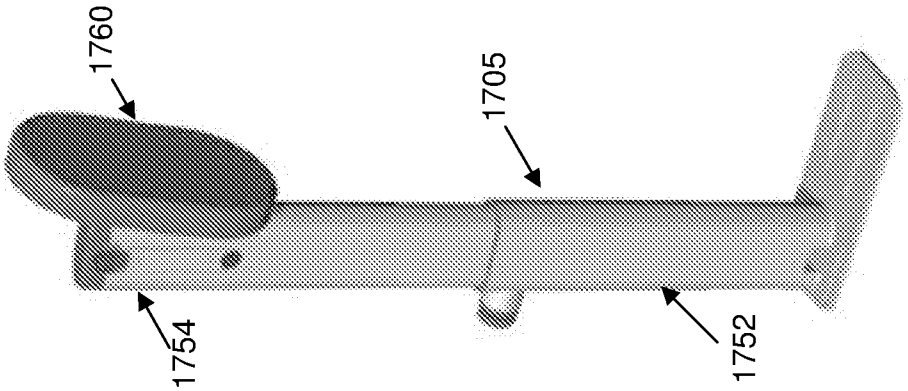


Fig. 25

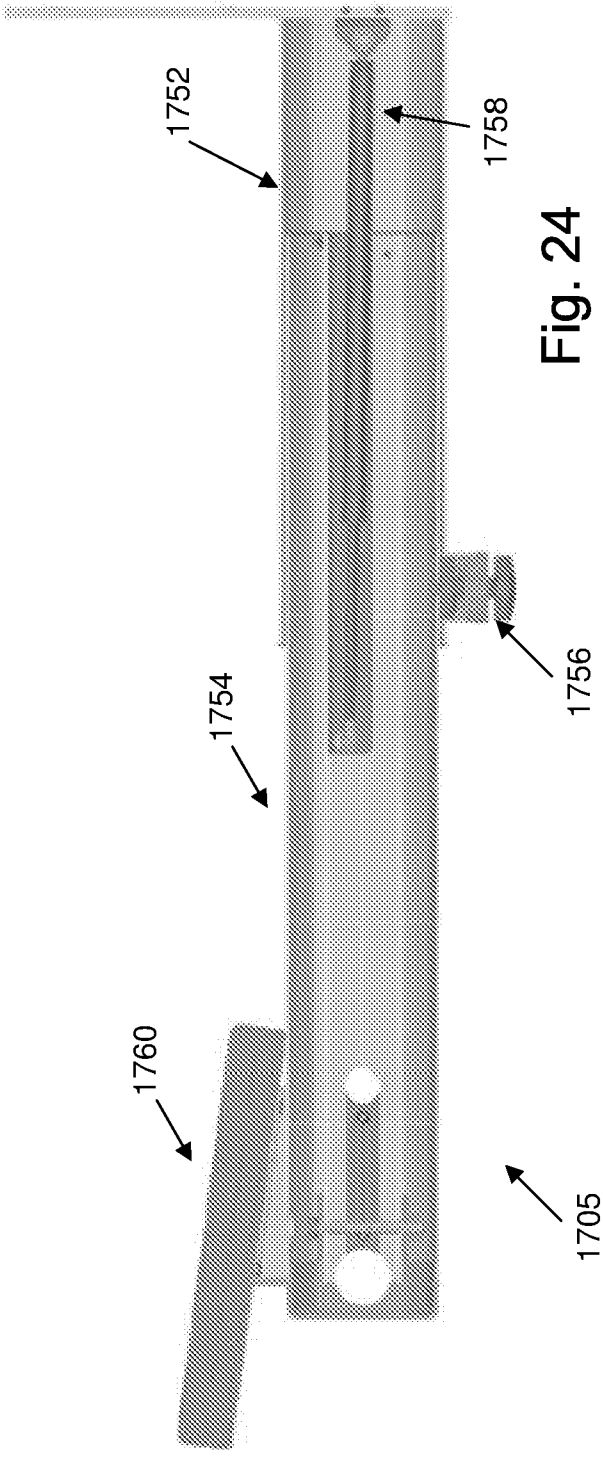


Fig. 24

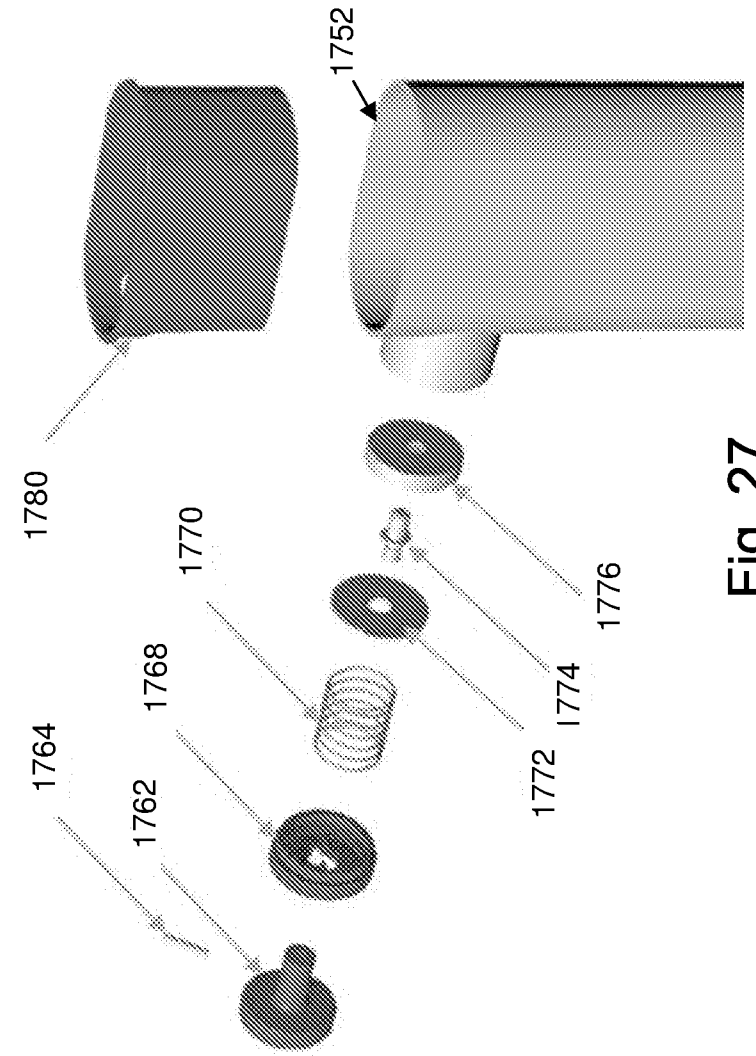


Fig. 27

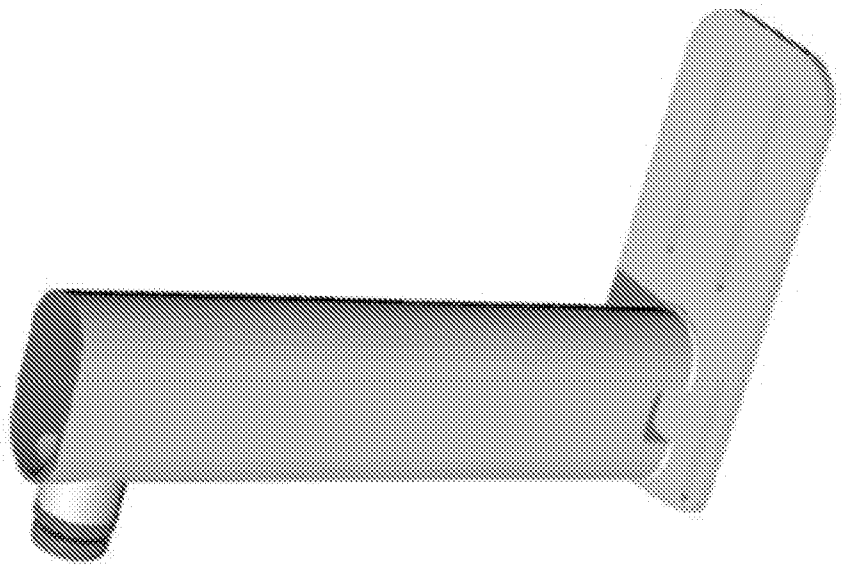


Fig. 26

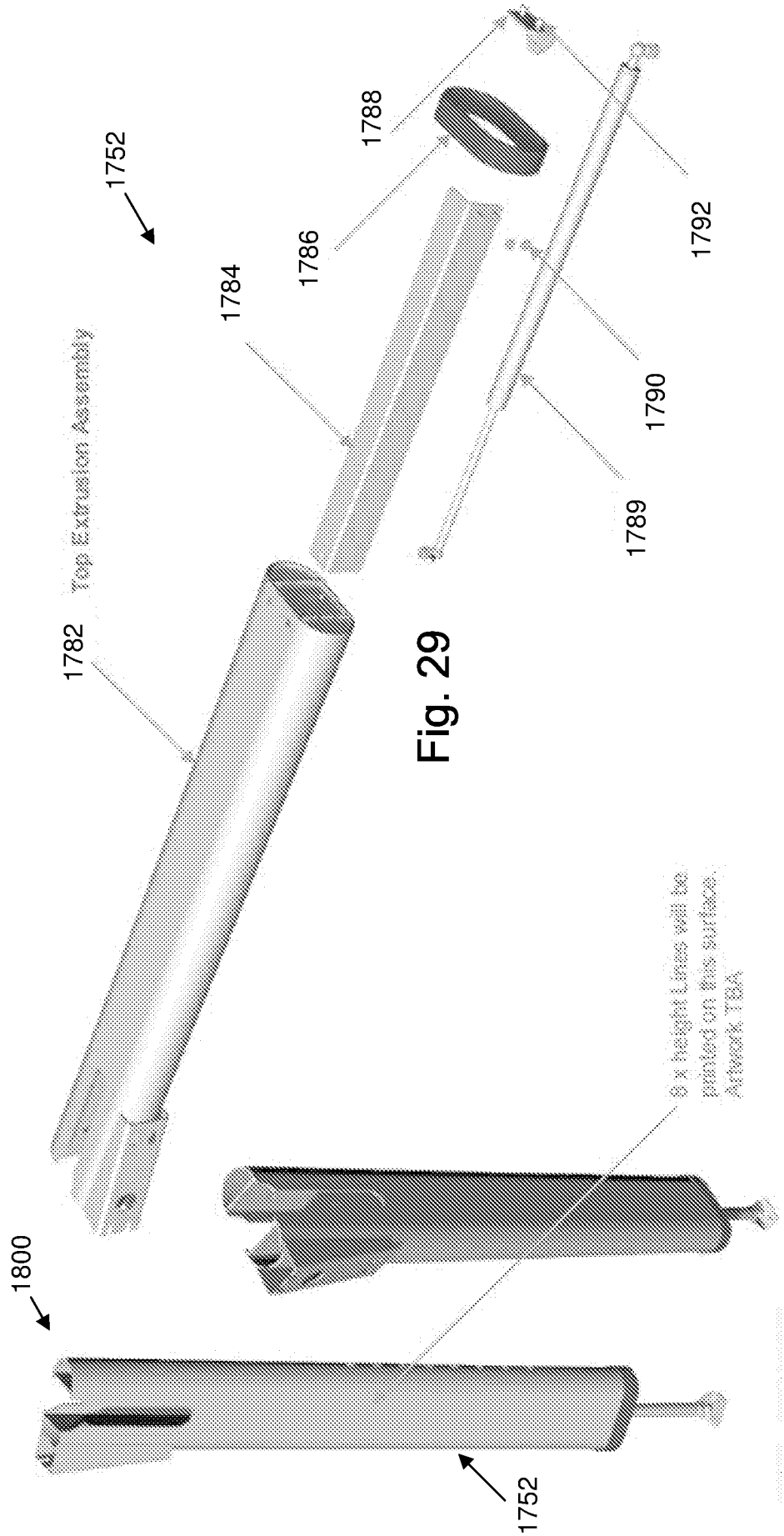

1752
1788
1786
1784
1792
1790
1789
Top Extrusion Assembly
1782
1800
6 x height Lines will be printed on this surface. Artwork TBA
1752

Fig. 29

Fig. 28

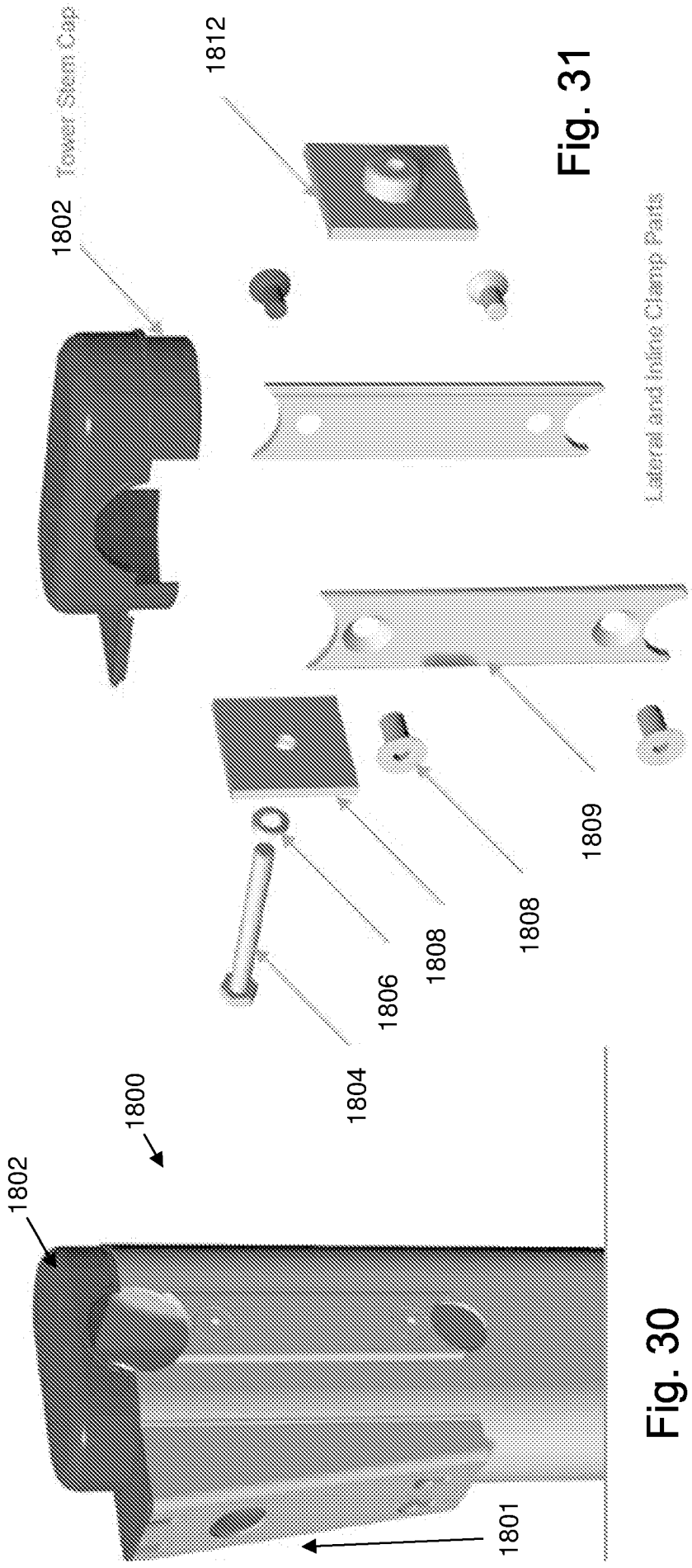

1802
1800
1804
1806
1808
1808
1809
1808
1812
1802
Tower Stem Cap
Lateral and Inline Clamp Parts
1801

Fig. 30

Fig. 31

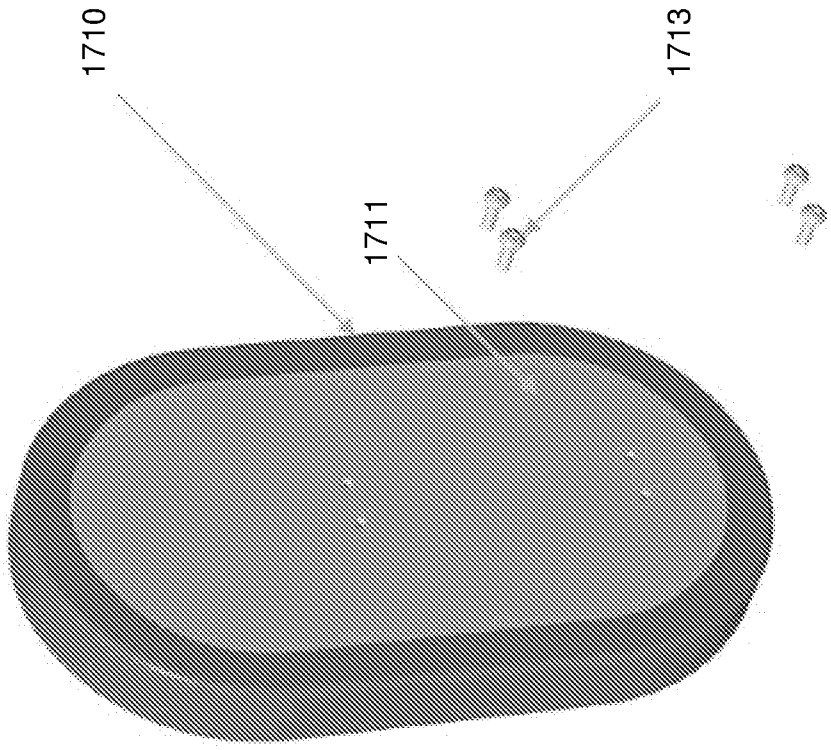


Fig. 32

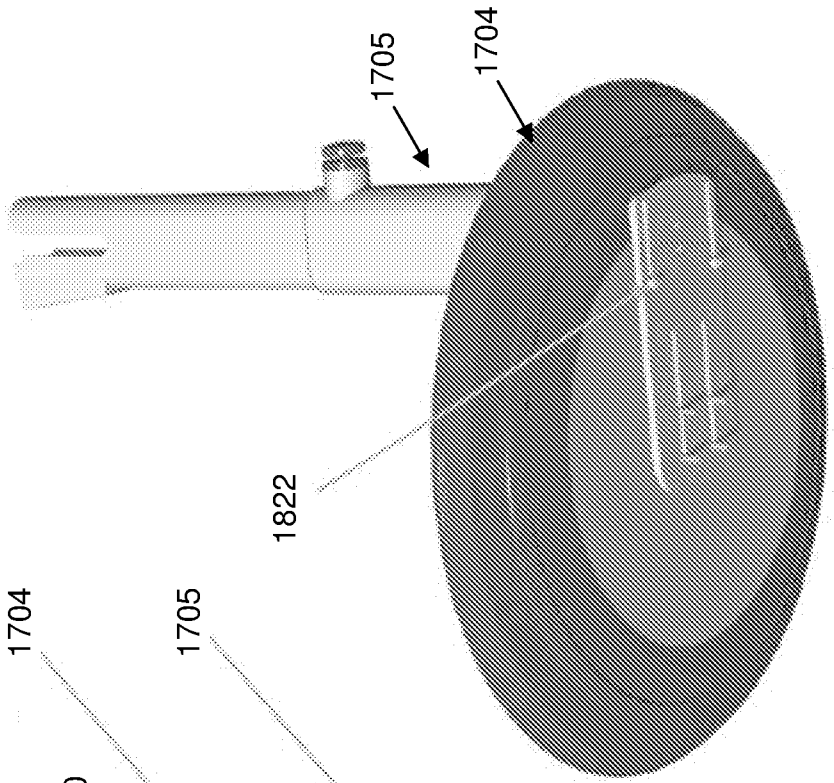


Fig. 34

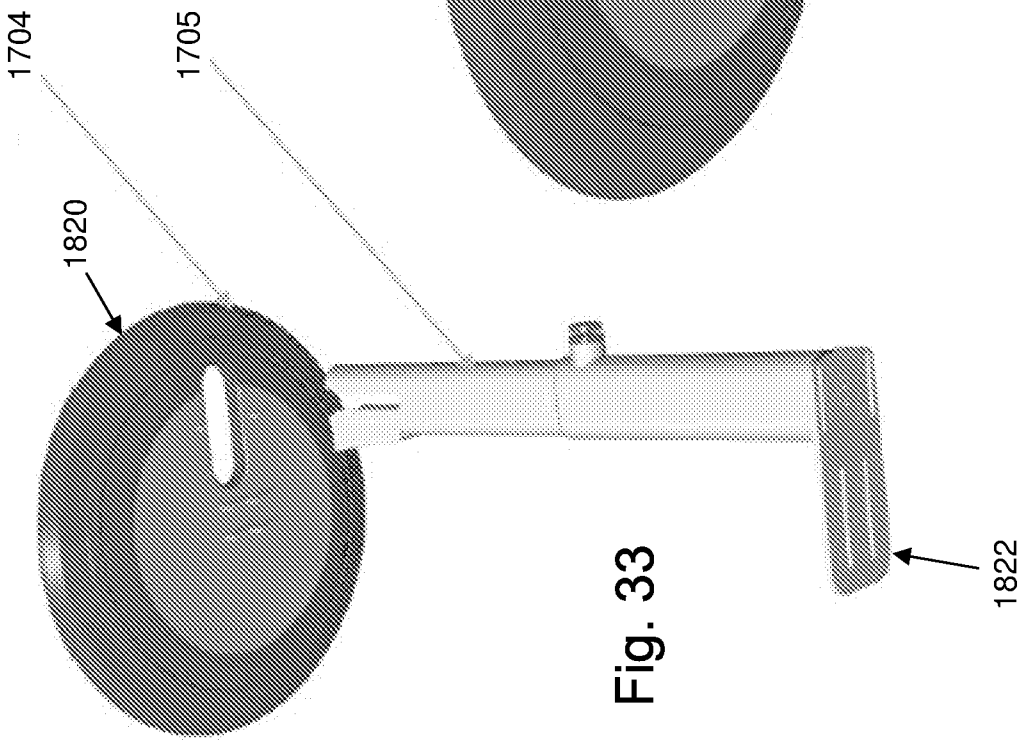


Fig. 33

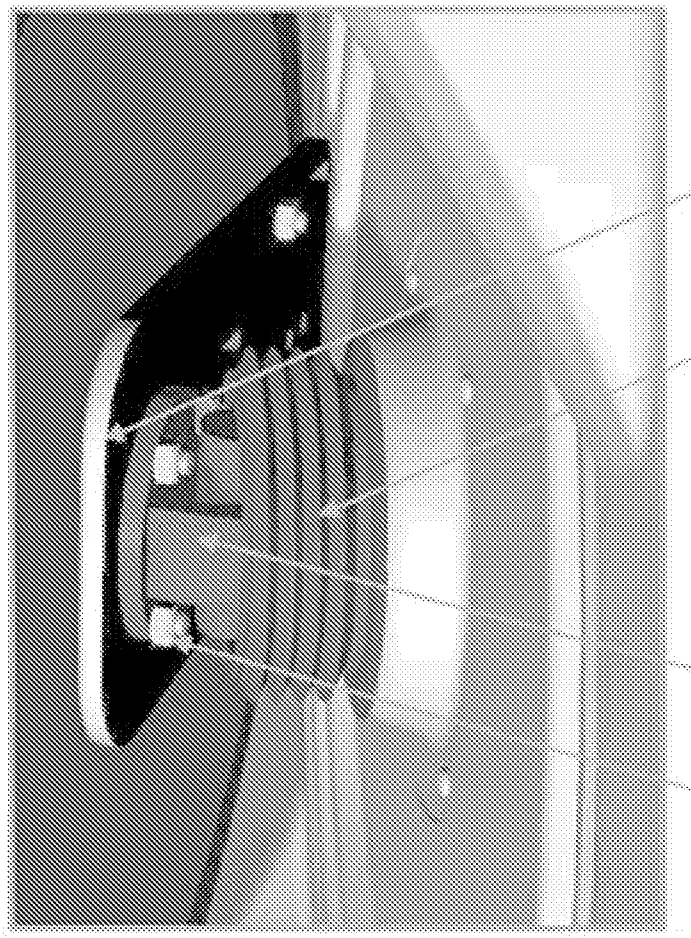


Fig. 36

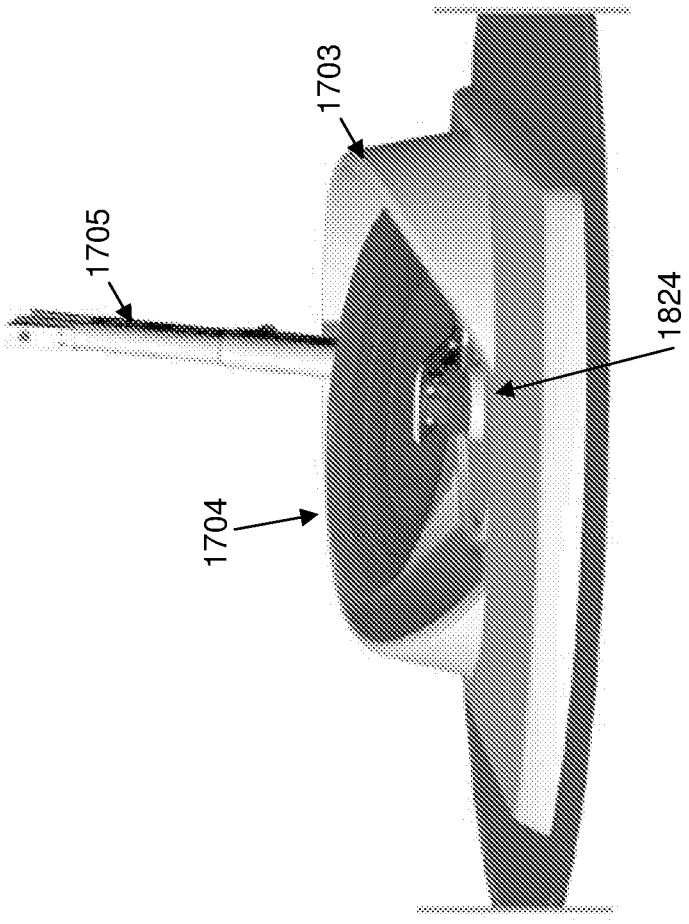


Fig. 35

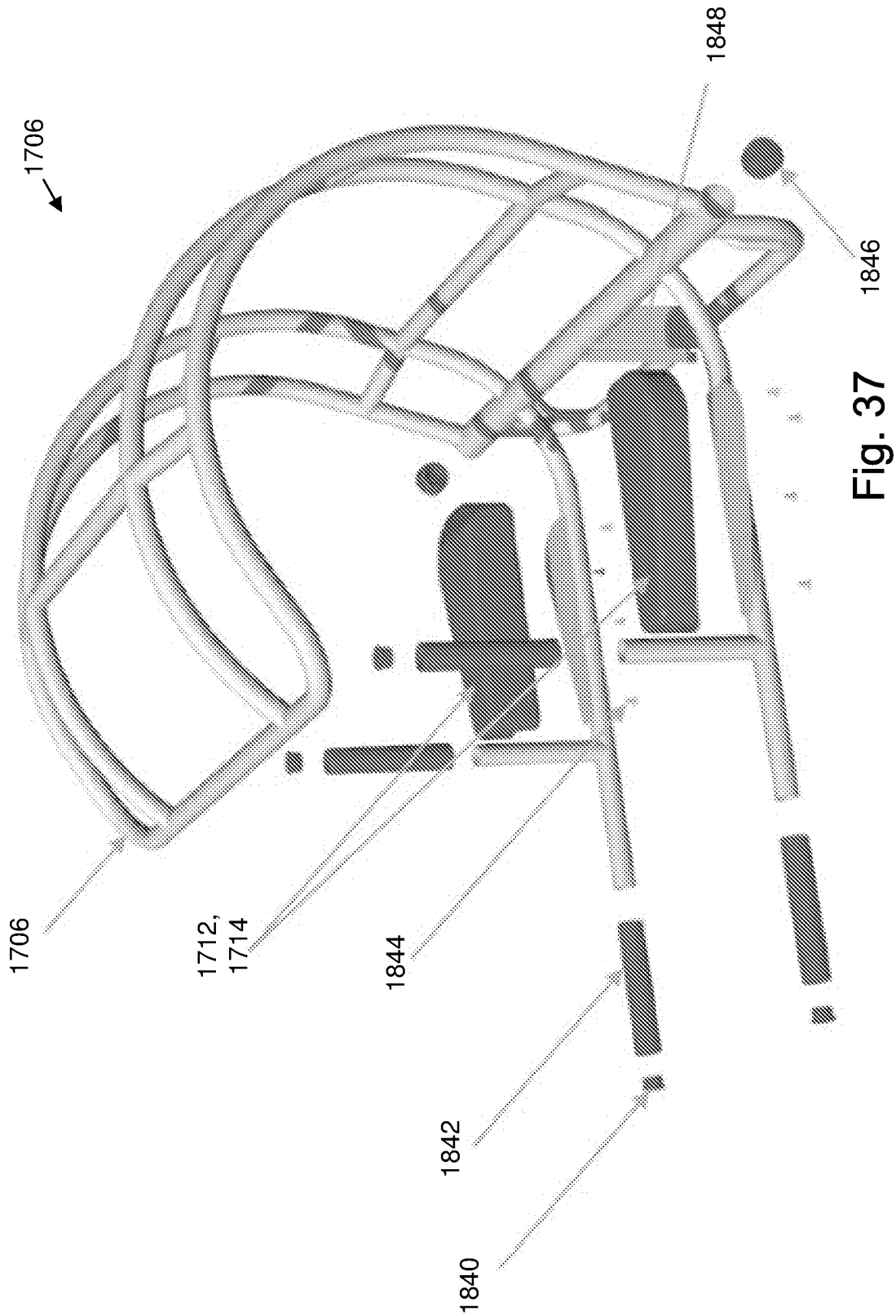


Fig. 37

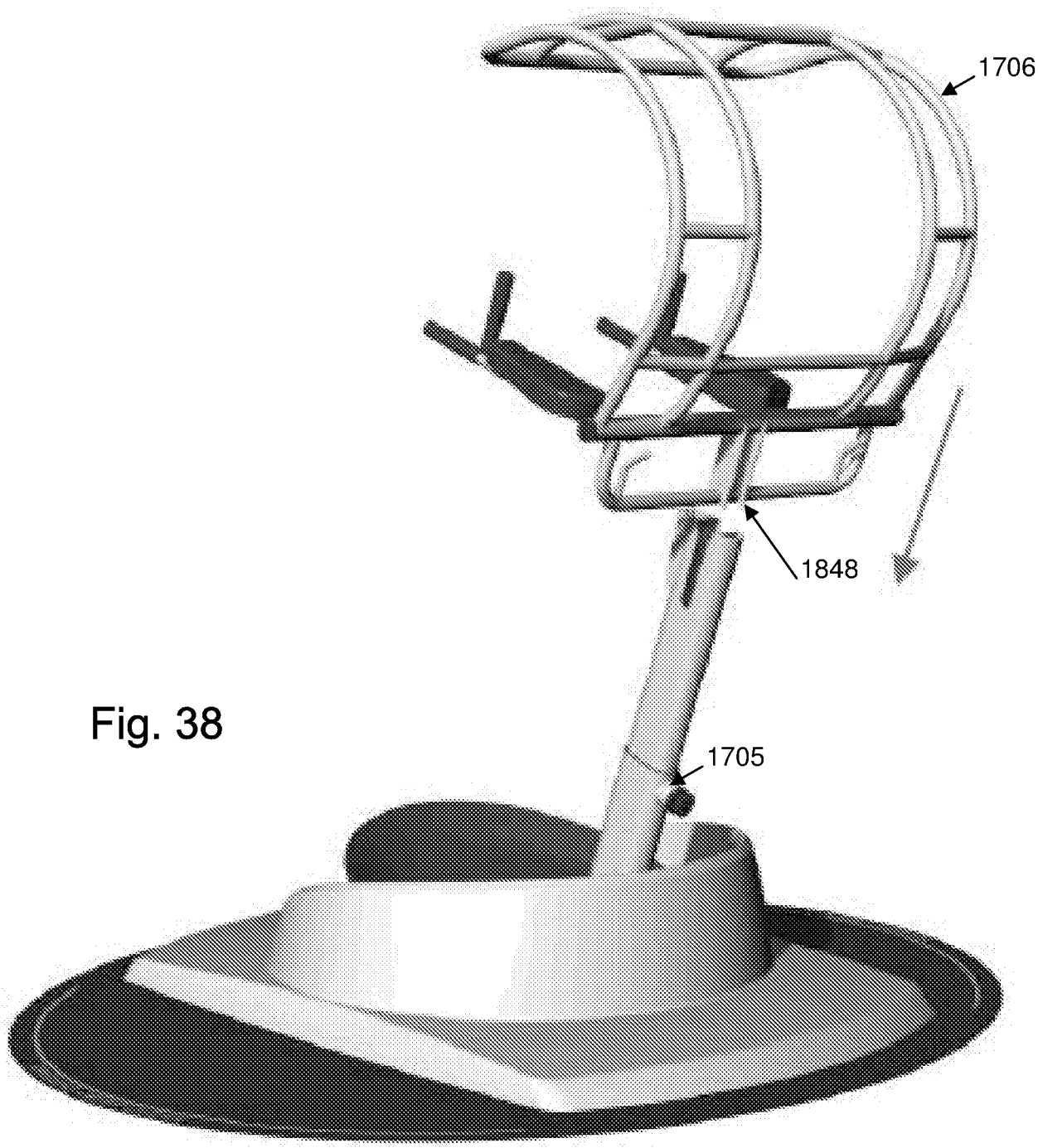


Fig. 38

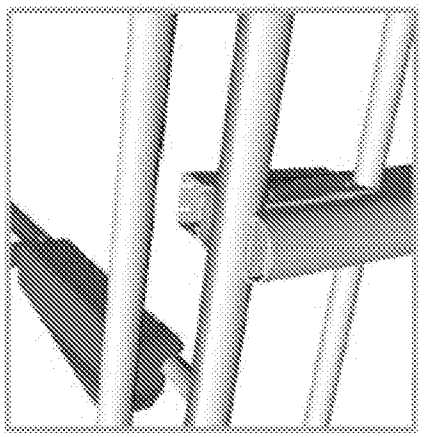


Fig. 39

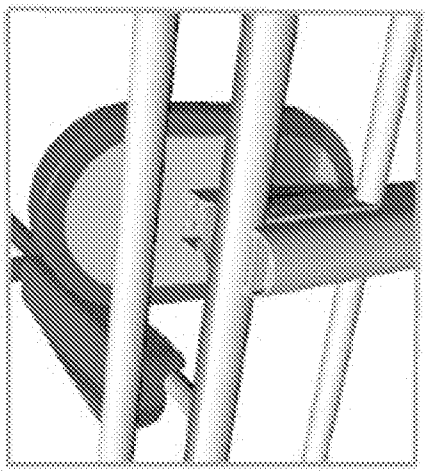


Fig. 40

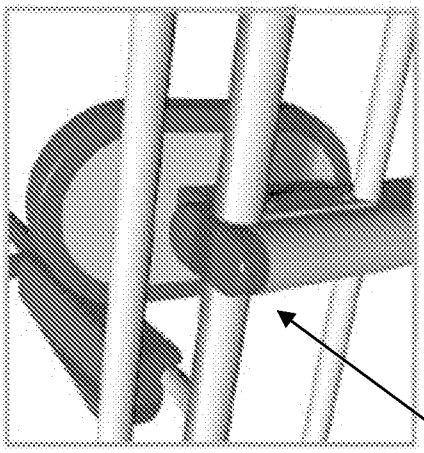


Fig. 41

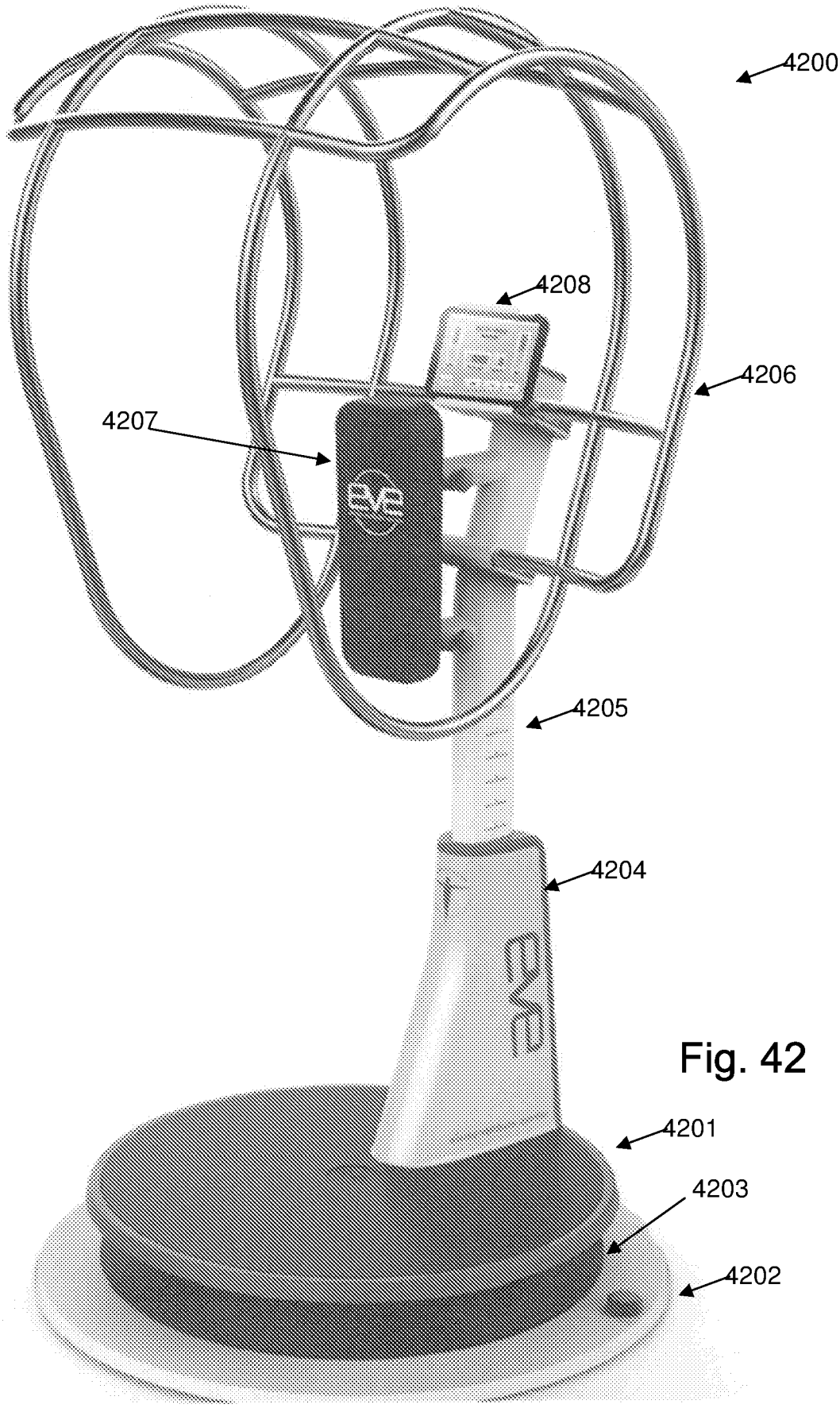


Fig. 42

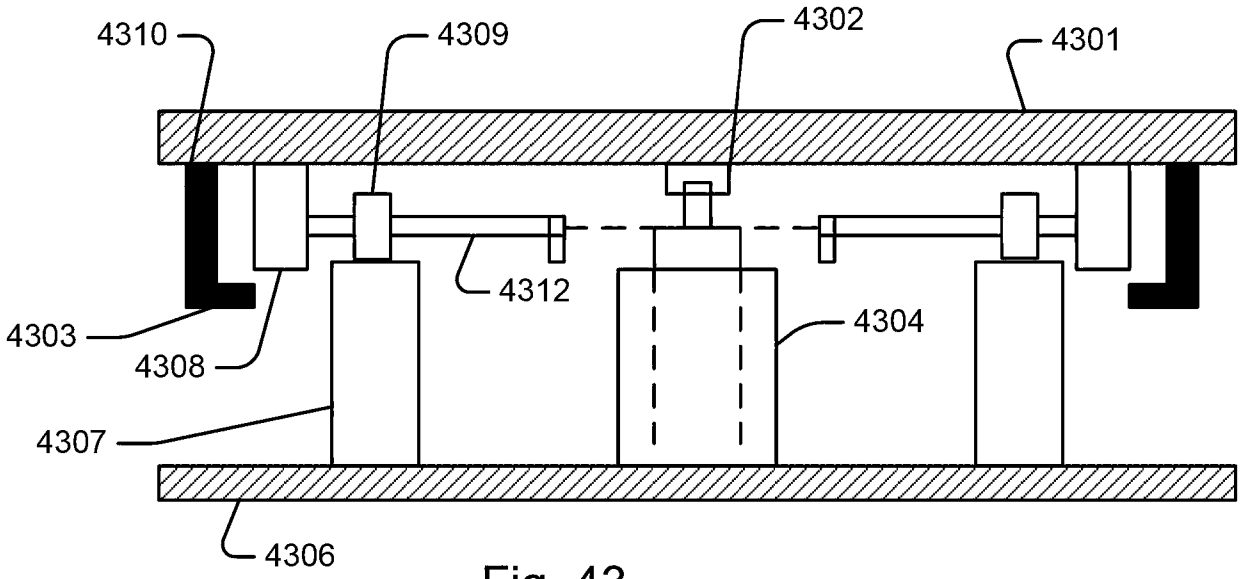

4310
4309
4302
4301
4312
4303
4304
4308
4307
4306

Fig. 43

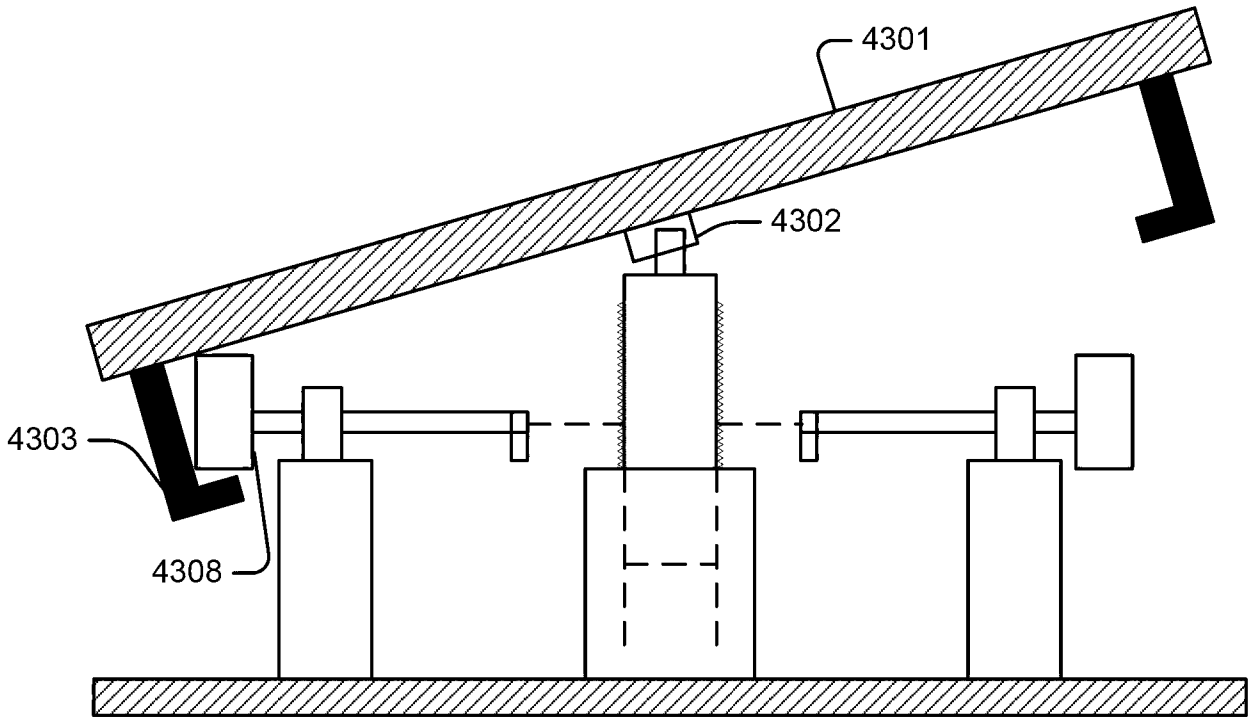
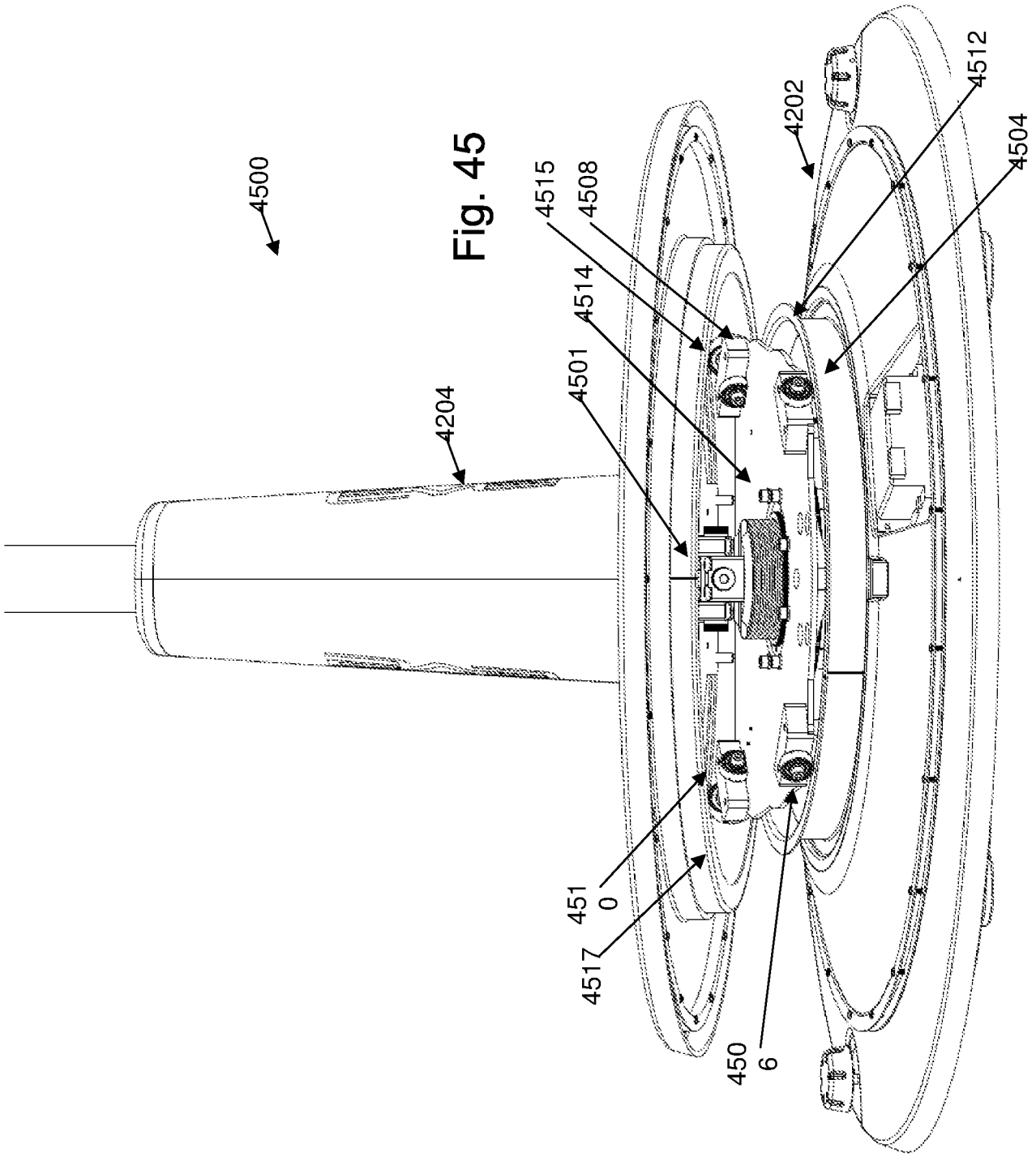

4301
4302
4303
4308

Fig. 44

Fig. 45



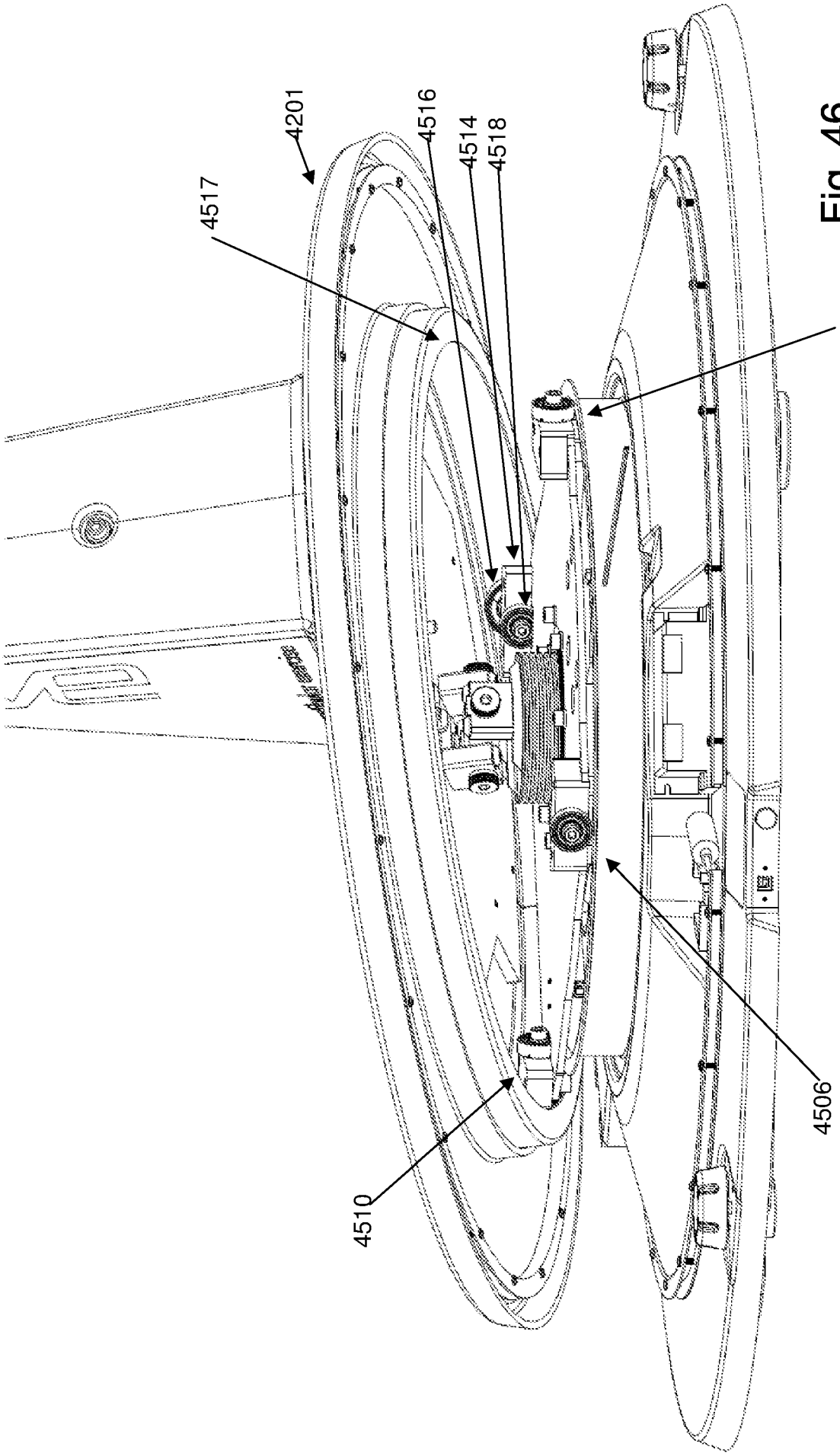


Fig. 46

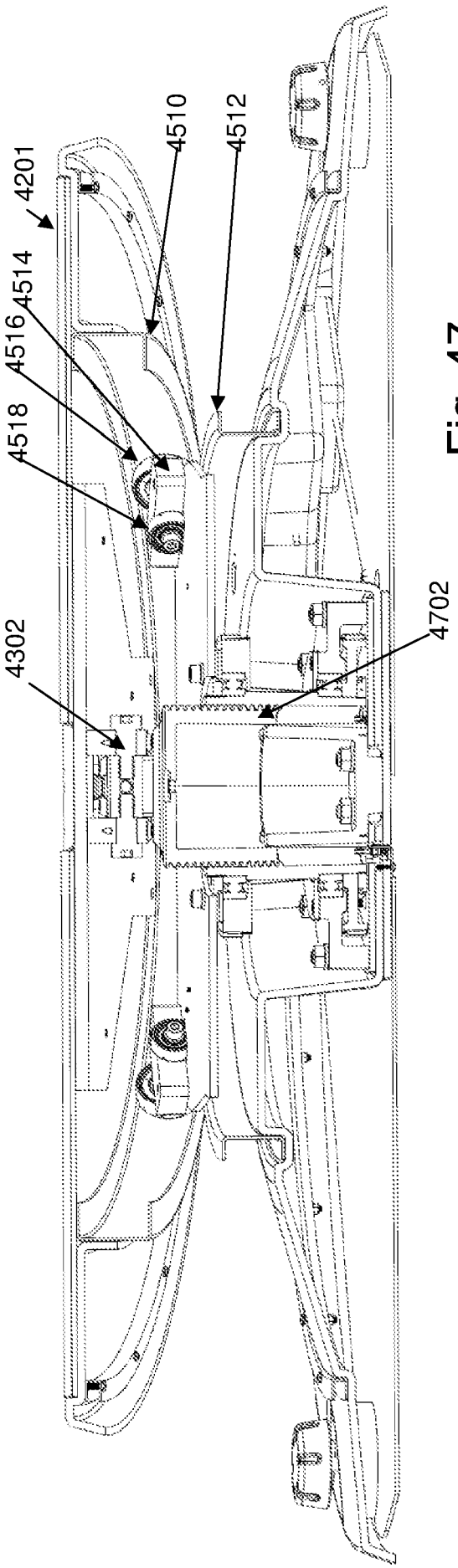


Fig. 47

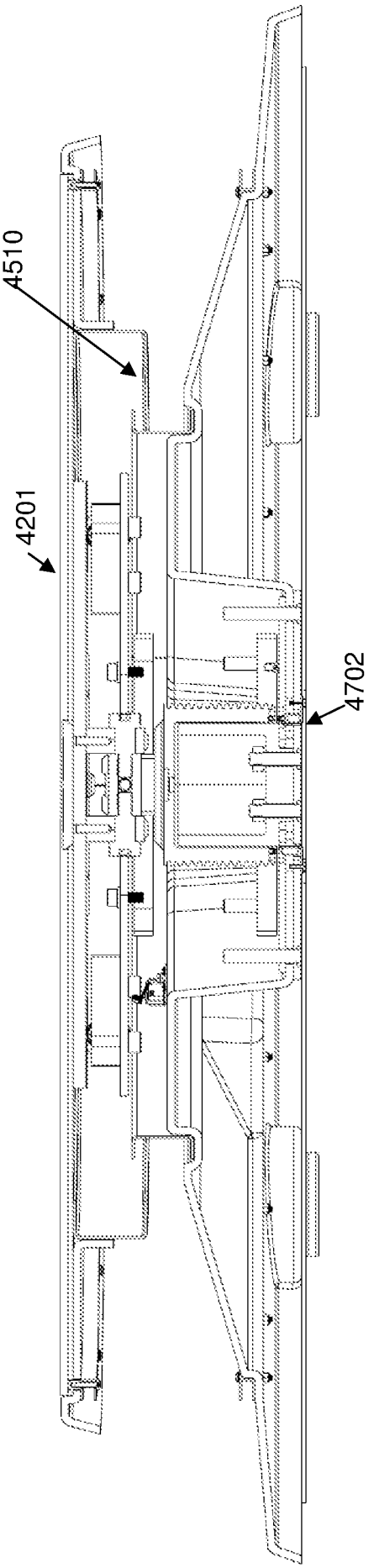


Fig. 48

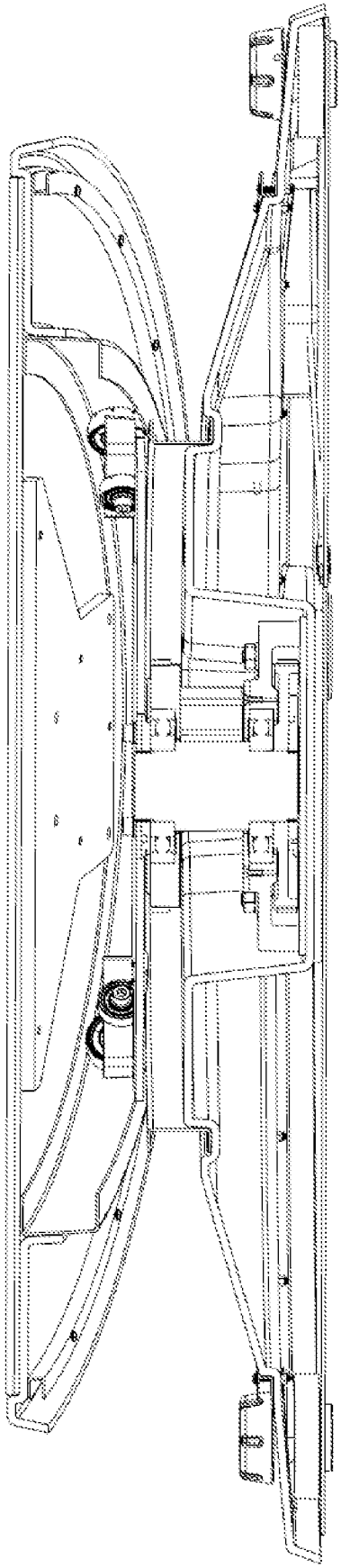


Fig. 49

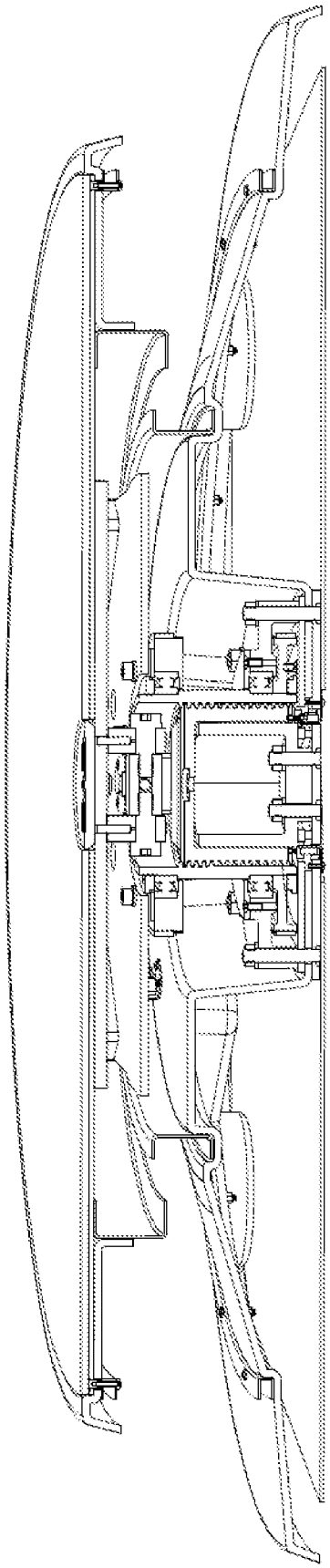
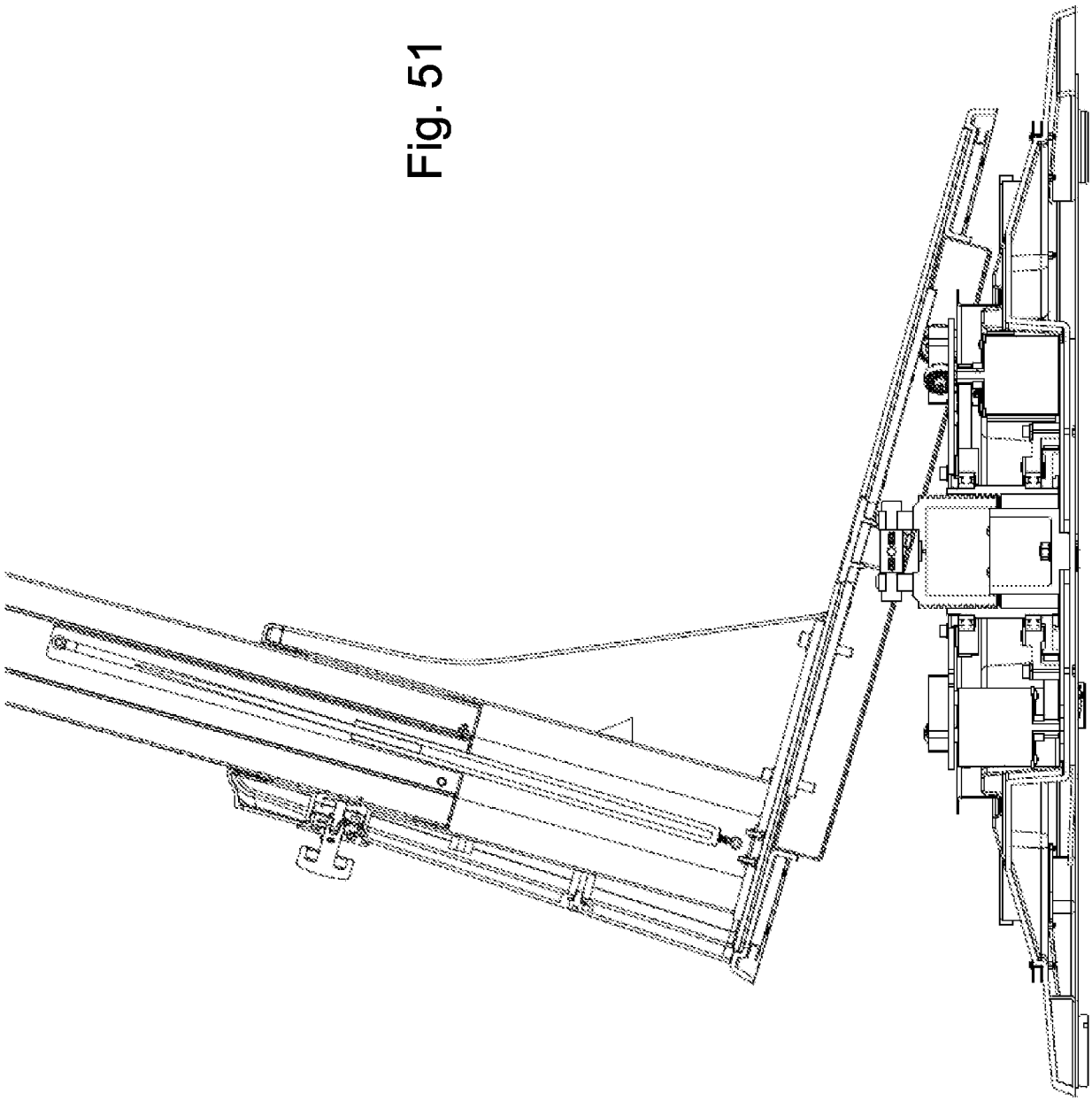


Fig. 50

Fig. 51



INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2017/050197

A. CLASSIFICATION OF SUBJECT MATTER

A63B 22/18 (2006.01) A63B 22/16 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Internet (Google, Google Scholar), Free Patents Online, ESPACENET, PATENW using keywords and terms such as: AN63B22/16, A63B22/18, exercise, rehabilitation, platform, footrest, base, rotate, oscillate, rocking, pivot, precession, gyroscopic, tilt, support, stabilise, frame, structure, cage, handles, bars, universal joint, incline, motorised, bearings, wheels, IQINVESTMENTS, Geoffrey Redmond

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 May 2017	29 May 2017
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	Jonty Goldin AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0399359618

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2017/050197

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:

because they relate to subject matter not required to be searched by this Authority, namely:

the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including

2. ☐ Claims Nos.:

because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos:

because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See Supplemental Box for Details

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1 - 12

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/AU2017/050197**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2003/0199374 A1 (PERRY et al.) 23 October 2003 Whole document, in particular: Abstract; Figs 1 - 3; Paras 0022 - 0023 As above	1 - 3, 5 - 8, 10, 12 4
Y	US 2003/0139268 A1 (CHEN) 24 July 2003 Whole document, in particular: Abstract; Figs 1 - 6; Para 0017	4
A	US 7374522 B2 (ARNOLD) 20 May 2008 Whole document	1 - 12
A	US 2014/0256526 A1 (HENSON) 11 September 2014 Whole document	1 - 12
A	US 6176817 B1 (CAREY et al.) 23 January 2001 Whole document	1 - 12

Supplemental Box

Continuation of: **Box III**

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

This Authority has found that there are different inventions based on the following features that separate the claims into distinct groups:

- Claims 1 - 12 are directed to a muscle activation system. The feature of providing a platform adapted to undergo a precession like motion around a central point so as to circumferentially move a user's upper body, when supported by a rigid upper body user support frame, substantially through an arc around a central point is specific to this group of claims.

- Claims 13 - 20 are directed to a muscle activation system. The feature of providing an electric drive unit located between the platform and support base, said drive unit including at least one engagement unit for engaging with the bottom surface of the platform and a corresponding surface of the support base to keep them at a predetermined orientation apart from one another, whilst the engagement unit rotates around a flexible coupler is specific to this group of claims.

- Claims 21 - 46 are directed to a muscle activation assembly and method. The feature of locating a user in a static position on a base adapted to tilt about a substantially central point in 360° of motion; and tilting said base about 360° of motion, or part thereof, thereby imparting forces on said user is specific to this group of claims.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship. The only feature common to all of the claimed inventions and which provides a technical relationship among them is *a muscle activation system including a base adapted for motion around a central point*

However this feature does not make a contribution over the prior art because it is disclosed in:

US 7374522 B2 (ARNOLD) 20 May 2008

Therefore in the light of this document this common feature cannot be a special technical feature. Therefore there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied *a posteriori*.

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2017/050197**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
US 2003/0199374 A1	23 October 2003	US 2003199374 A1	23 Oct 2003
		US 7004895 B2	28 Feb 2006
		AU 2003225051 A1	03 Nov 2003
		AU 2003225051 B2	10 May 2007
		EP 1494762 A2	12 Jan 2005
		EP 1494762 B1	26 Sep 2012
		US 2006073941 A1	06 Apr 2006
		US 7465253 B2	16 Dec 2008
		WO 03088887 A2	30 Oct 2003
US 2003/0139268 A1	24 July 2003	US 2003139268 A1	24 Jul 2003
		US 6692419 B2	17 Feb 2004
US 7374522 B2	20 May 2008	US 2007027009 A1	01 Feb 2007
		US 7374522 B2	20 May 2008
		EP 1747803 A1	31 Jan 2007
		JP 2007037974 A	15 Feb 2007
US 2014/0256526 A1	11 September 2014	US 2014256526 A1	11 Sep 2014
		EP 2766100 A1	20 Aug 2014
		GB 2495626 A	17 Apr 2013
		WO 2013054116 A1	18 Apr 2013
US 6176817 B1	23 January 2001	US 6176817 B1	23 Jan 2001

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.