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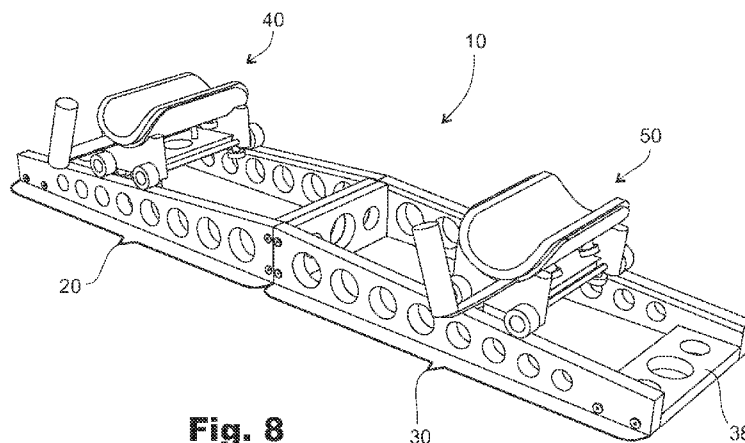


Fig. 8

(57) Abstract: An exercise apparatus for performing an armless push-up allows a user to engage in gravity-driven, resistance exercise with improved pectoral isolation and range of motion as compared to known push-up devices. The exercise motion is performed using a yoga-inspired, bent-elbow plank position by a prone (face-down) user. The user places each forearm on a trolley mounted at the top of opposed rails that are inclined toward an elevated centerline. As the trolleys move down the opposed inclined rails, the user's chest descends down; and as the user pinches his elbows together using the pectoralis muscles, the trolleys move up the inclined rails again. Gravity imparts a centered user balance, and the resistance can be varied, such as by changing the incline of the rail assemblies, changing the weight associated with the user, or by adding resistance to the trolley movement.



EXERCISE APPARATUS FOR PERFORMING AN ARMLESS PUSH-UP AND METHOD OF USING SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application relates to, has subject matter in common with, and claims priority of U.S. Provisional Patent Application Nos. 61/130,647 (filed May 31, 2008) and 61/166,515 (filed April 3, 2009), the contents of which applications are incorporated herein by reference.

FIELD

[0002] This application describes an apparatus for performing a modified push-up exercise and methods of use thereof.

BACKGROUND

[0003] Resistance exercise is any exercise where muscles contract against an external resistance, the objective being to increase strength, tone, mass, or muscular endurance. Lifting weights using dumbbells or weight machines is an example of resistance exercise. Resistance can also come from elastic tubing or bands, cinder blocks, one's own body weight (for example, as with conventional push-ups), or any other object that forces one's muscles to contract. Broadly speaking, exercise involving resistance training develops the strength and endurance of large muscle groups.

[0004] Conventional push-ups are a time-honored and effective exercise predominantly used to develop upper body strength. They are considered a body weight exercise because it is one's own body weight that provides the resistance. Body weight exercises such as push-ups require the individual to stabilize and balance the weight in order to lift the body. This need for balance requires that numerous muscle groups be incorporated, and therefore push-ups and other body weight exercises provide strengthening beyond just those muscles primarily involved in actually displacing the body weight.

[0005] The muscles predominantly involved in traditional push-ups are the arms (particularly the triceps), the shoulders (particularly anterior deltoids) and the chest (pectoralis major and

pectoralis minor). Although the chest muscles are one of the primary groups of muscles exercised and strengthened by performing push-ups, the effectiveness of push-ups for strengthening the pectoralis muscles is limited. The arms (triceps) are smaller muscles that move through a larger range of motion during a push-up, and therefore fatigue more quickly. This is a critical limiting factor in the duration and intensity of exercise that the chest muscles endure. Often, the fatigued arm muscles reach the point of failure before the pectoralis muscles, and at this point the push-up exercise is no longer effective.

[0006] Typically, pectoralis muscle strengthening and development is achieved through weight-lifting. This frequently requires expensive equipment to isolate and maximize the benefit. Unfortunately the “anytime, anywhere” usefulness of body weight exercise is lost. Bench press, chest butterfly, and cross-over pulls are common weight-lifting exercises that target the pectoralis muscles. To some extent, these exercises (particularly bench press) require significant muscle input from the arms, and therefore suffer from the same fatigue-limiting effect seen with standard push-ups. To overcome this, so-called pec decks were created. To a significant extent, these machines isolate their resistance effects to the chest and overcome the limitation for pectoral exertion associated with arm fatigue. These machines are effective for chest development but are commonly large, heavy, not portable, and expensive.

[0007] There are some devices available to enhance the effectiveness and comfort of traditional push-ups; however, a continuing and unmet need exists for new and improved exercise equipment that addresses the foregoing arm-fatigue limitations.

SUMMARY

[0008] The apparatus and methods provided herein permit the same high degree of pectoral isolation and range of motion afforded by pec decks, while being superior to traditional push-ups. The apparatus and methods provide a novel prone (face-down), yoga-inspired, bent-elbow plank position and range of exercise motion. The apparatus and methods employ body weight for resistance and unique slidable trolleys mounted on opposed rail assemblies or tracks inclined toward an apical midpoint (or elevated centerline) for enhanced user balance. The apparatus includes several inexpensive, durable, and portable elements and embodiments.

[0009] In an exemplary method of performing the exercise, a prone user's upper body weight is supported on the forearms, with the user's elbows flexed to about 90° (referred herein to also as the "bent-elbow plank position"), thereby reducing the arm muscle (triceps, biceps, forearms) work needed to perform a traditional push-up and other prone exercises. In operation, the user places each forearm on a trolley mounted at the top of opposed rail assemblies that are inclined toward an elevated midpoint. As the trolleys move down the opposed inclined rail assemblies, the user's chest descends; and as the user pinches his elbows together using the pectoralis muscles, the trolleys move up the inclined rail assemblies again. Gravity imparts a centered user balance, and the resistance can be varied, such as by changing the incline of the rail assemblies, changing the weight associated with the user and placed over the apparatus (such as chest weights), or by adding resistance to the trolley movement.

[0010] The exercise apparatus includes two opposed trolleys that move laterally up opposed inclines towards a common apex at the center of the exercise apparatus. The trolleys move from the bottom of each incline towards the apex as a user pinches his elbows together by contracting his pectoralis major muscles to bring his forearms together in front of the user's chest. The trolleys then move laterally away from one another down the inclined surface as the user's muscles relax and the user's body is lowered directly and in balance. This motion uses almost no arm/triceps work, and reduces deltoid work, while at the same time maximally targeting the pectoral muscles. In addition to the bent-elbow plank position, the device can also be used with the arms at least partially extended. This requires some static muscle loading of the upper extremities, but is far less fatiguing to the arms than standard push-ups. The usefulness of performing exercise on this device with the arms extended is that this position reduces the mechanical advantage of the chest muscles and therefore requires much more work from the chest to displace the same body weight as the previously described bent-elbow plank position exercise, especially when the elbows are bent at less than about 90°.

[0011] Additional features may be understood by referring to the accompanying drawings, which should be read in conjunction with the following detailed description and examples.

DESCRIPTION OF THE DRAWINGS

[0012] The exercise apparatus and its exemplary embodiments and associated methods of use are more clearly understood and readily practiced by reference to the detailed disclosure hereinbelow in conjunction with the following figures, wherein like reference characters designate the same or similar elements, and which figures are incorporated into and constitute a part of this specification.

[0013] FIG. 1 is a top view of an exercise apparatus according to an exemplary embodiment hereof.

[0014] FIG. 2 is a bottom plan view of the apparatus shown in FIG. 1.

[0015] FIG. 3 is a rear elevation view of the apparatus shown in FIGS. 1 and 2.

[0016] FIG. 4 is a perspective view of the apparatus shown in FIGS. 1-3.

[0017] FIG. 5 is a front top elevation view of the apparatus shown in FIGS. 1-4.

[0018] FIG. 6 is a front view of the apparatus shown in FIGS. 1-5.

[0019] FIG. 7 is a side perspective view of the apparatus shown in FIGS. 1-6.

[0020] FIG. 8 is a front perspective view of the apparatus shown in FIGS. 1-7.

[0021] FIG. 9 is a front view of one of the right-handed trolleys shown in FIGS. 1-8.

[0022] FIG. 10 is a rear view of the trolley shown in FIG. 9.

[0023] FIG. 11 is a top view of the trolley shown in FIGS. 9-10.

[0024] FIG. 12 is a bottom view of the trolley shown in FIGS. 9-11.

[0025] FIG. 13 is a top perspective view of the trolley shown in FIGS. 9-12.

[0026] FIG. 14 is a bottom perspective view of the trolley shown in FIGS. 9-13.

[0027] FIG. 15 is a side view of the trolley shown in FIGS. 9-14.

[0028] FIG. 16 is an opposite side view of the trolley shown in FIG. 15.

[0029] FIGS. 17-18 are additional side views of the trolley shown in FIGS. 9-16.

[0030] FIG. 19 is a side view of the exercise apparatus folded about a centerline hinge.

[0031] FIG. 20 is a front perspective view of the apparatus of FIGS. 1-8 without a human operator.

[0032] FIG. 21 is a front perspective view of the apparatus of FIG. 20 with a human operator having completed a downstroke motion.

[0033] FIGS. 22-23 are side and front perspective views, respectively, of the apparatus of FIG. 21 with a human operator having completed an upstroke motion.

[0034] FIGS. 24-25 illustrate the relative motion of the armrest members during upstroke and downstroke motions.

DETAILED DESCRIPTION

[0035] This disclosure describes a new exercise apparatus for performing an armless push-up and related methods for engaging in resistance exercise and strength training. In an exemplary embodiment, an exercise apparatus for performing an armless push-up includes two upwardly inclined linear rail assemblies meeting at an apical midpoint and two moveable trolleys, wherein each rail assembly is engaged with a moveable trolley, each trolley is independently operable (e.g., their movements are not coordinated by a reciprocating pulley system or similar linkage), and each trolley comprises an armrest member anatomically compatible with a forearm of a human user.

[0036] The rail assemblies each may include a set of two or more co-planar linear rail members. Alternatively, each rail assembly may be a monorail having one linear rail member. The rail assemblies are preferably symmetrical, disposed 180° from each other, and of sufficient total length to comfortably accommodate the arm span of a human operator, for example, between about 1 m (3.3 ft) and about 2 m (6.6 ft). The rail assemblies may also be connected by a hinge to facilitate transportation and storage. A hinged joint between the two rail assemblies also permits the angle of inclination to be increased. The rail assemblies are each inclined toward the apical midpoint at an angle of, for example, between about 1° and about 30°, between about 1° and about 10°, or between about 2° and about 6° (e.g., about 4°).

[0037] Each rail assembly is slidably engaged with a trolley by a linear slide mechanism, such as a linear ball-bearing slide mechanism or rotatable wheels having multiple points of contact, for example points of contact on the top (vertical contact) and side (horizontal contact), and

optionally the bottom side, of a rail assembly. In one example, linear slides are akin to drawer slides used in the unrelated field of cabinetry. The trolleys are securely engaged with corresponding rail assemblies so that the trolleys do not become easily disengaged from the rail assemblies during operation. The exercise apparatus may include a right-handed trolley and a left-handed trolley, with each trolley optionally having a hand-gripping handle rotatable toward the apical midpoint. Each trolley may also have an armrest member that is rotatable during operation, the rotation occurring about a central longitudinal axis formed by a user's forearm. Because the rail assemblies are linear, the armrest member rotates with respect to the trolley during operation. That is, each trolley has internal moving parts that reorient themselves as the exercise motion progresses (the components of the trolley rotate with respect to each other).

[0038] According to another embodiment, an exercise apparatus for performing an armless push-up includes two upwardly inclined linear rail assemblies meeting at an apical midpoint and two moveable trolleys, wherein each rail assembly is engaged with a moveable trolley, wherein each trolley is independently operable and slidable up and down a rail assembly, and wherein each trolley includes an armrest member anatomically compatible with a human forearm and rotatable during operation about a longitudinal central axis formed by a user's forearm. For example, the armrest member rotates within the trolley in a natural movement for each forearm.

[0039] According to yet another embodiment, an exercise apparatus for performing an armless push-up includes a first rail assembly having two co-planar linear inclined rail members and a second rail assembly having two co-planar linear inclined rail members, the elevated ends of the two rail assemblies meeting at a hinged apical midpoint, wherein the first rail assembly and the second rail assembly are symmetrical; a right-handed trolley mounted to the first rail assembly and slidable thereupon; and a left-handed trolley mounted to the second rail assembly and slidable thereupon; wherein each trolley includes an armrest member anatomically compatible with a human forearm, the armrest member being rotatable during operation about a central longitudinal axis formed by a user's forearm.

[0040] An exemplary method of using such an exercise apparatus for strength conditioning the pectoral muscles of a human operator includes steps of (a) placing the exercise apparatus on a level surface (e.g., a floor, bench, table, or exercise mat); (2) placing the forearms of a human operator in the armrest members of the trolleys while in a prone position; and (3) iteratively

abducting and adducting the arms by contracting the pectoral muscles to thereby slide each trolley upward and downward along each rail assembly. Typically the operator's upper body weight is supported by the exercise apparatus, and the lower body weight is supported by the feet or knees, which, for example, are in contact with the level surface. The intensity of the strength conditioning exercise may be increased, for example, attaching a removable elastic tension band of predetermined resistance between a trolley and a fixed point on the exercise apparatus to thereby providing resistance to movement of the trolley during operation. The angle of inclination may also be increased, or the operator's upper body may be subjected to additional weight (e.g., a weighted vest).

[0041] This disclosure now turns to a discussion of various details that may be incorporated in accordance with at least one embodiment as illustrated in the attached drawings. The details discussed hereinbelow are meant to be illustrative instead of restrictive, and it thus should be understood that there remain a very wide variety of possible implementations for the methods and systems within the spirit and scope of the appended claims.

[0042] An embodiment of an exercise apparatus for performing an armless push-up is illustrated in FIGS. 1-25. Referring specifically to FIGS. 1-8, gravity-driven resistance exercise apparatus **10** is illustrated. Apparatus **10** includes first rail assembly **20** and second rail assembly **30**. In the embodiment illustrated in the drawings, first rail assembly **20** is on the right-handed side of apparatus **10**, and second rail assembly **30** is on the left-handed side of apparatus **10**. First rail assembly **20** has two rail members **22**, **24**, and second rail assembly **30** also has two rail members **32**, **34**. Although rail assemblies **20**, **30** are depicted in the drawings as each having two rail members, alternative exercise apparatus configurations may include rail assemblies having only one rail member (a monorail) or three or more rail members.

[0043] Still referring to the attached drawings, first rail assembly **20** includes a first rail member **22** having top surface **23**, and a second rail member **24** having top surface **25**. First rail member **22** and second rail member **24** run parallel to one another and are securably connected by support members **26**, **28**. In the embodiment shown in FIGS. 1-8, elevational and lateral support members **26** and **28**, each of which extends substantially perpendicularly to the rail members, are affixed to and attach first and second rail members **22**, **24**. Those skilled in the art will be able to recognize and determine an appropriate separation distance between first and second rail

members **22**, **24**. In a preferred embodiment, rails **22**, **24** are separated by about 20 cm to about 25 cm (8 in to 10 in).

[0044] Second rail assembly **30** is essentially a mirror-image of first rail assembly **20**, and as such includes the same elements, namely, a first rail member **32** having top surface **33**, and a second rail member **34** having top surface **35**. First rail member **32** and second rail member **34** run parallel to one another and are securably connected. In the embodiment shown in FIGS. 1-8, elevational and lateral support members **36** and **38**, each of which extends substantially perpendicularly, are affixed to and attach first and second rail members **32**, **34**.

[0045] Rail members **22** and **24** of first rail assembly **20** are each configured and disposed to lie within an inclined plane, that is, top surfaces **23**, **25** are co-planar. Lower ends **27** of rails **22**, **24** are smaller than opposing higher ends **29**, which are bigger (higher). Thus configured, top surface **23** extends from lower end **27** to higher end **29** of first rail member **22** in a sloped or ramp-like manner so that the entire first rail assembly **20** resembles and acts as an inclined plane. First rail member **22** and second rail member **24** are preferably the same size and shape as one another. The same holds true for first rail member **32** and second rail member **34** of second rail assembly **30**, each of which has lower end **37** that is smaller than opposing higher end **39**. A sloped top surface extends between ends **37** and **39**, so that the entire rail assembly **30** resembles and acts as an inclined plane.

[0046] As shown in FIGS. 1-8, first rail assembly **20** and second rail assembly **30** are positioned lengthwise (horizontally 180°) in relation to one another so that higher ends **29** of first and second rail members **22**, **24** abut higher ends **39** of first and second rail members **32**, **34**. This abutting rail assembly arrangement is also referred to herein as being opposed. At this abutment, first and second rail assemblies **20**, **30** are joined together thereby forming midpoint **12** of apparatus **10**.

[0047] Any suitable joint may be used to secure first rail assembly **20** to second rail assembly **30**. In a preferred embodiment, a hinge (not shown) attached to the bottom surfaces of assemblies **20** and **30** is used. If rubber feet are included on the underside of apparatus **10**, it may be desirable to stagger them so that the machine folds upon itself. An added benefit is that the device can be folded 180° degrees on the hinge to increase portability and make for easier storage as illustrated in FIG. 19. Still another advantage is that a hinge allows for a controlled,

uniform increase in incline angle **11** of each rail assembly **20, 30** by placing a spacer (such as a book or a common lumber stud) under the abutment proximate to midpoint **12** to thereby raise the midpoint further from the floor during use. Such center elevation **14** is illustrated in FIG. 6. Likewise, distal ends of the two rails could be tied together with a short non-elastic cord to thereby raise the midpoint off the ground.

[0048] Generally speaking, the inclined plane is one of the classical six simple machines (i.e., a device that only requires the application of a single force in order to work; the others being the lever, wheel/axle, pulley, wedge, and screw). As its name suggests, a plane is a flat surface whose endpoints are at different heights. The laws of mechanics and physics teach that when a body is placed on an inclined plane it will move with constant acceleration.

[0049] The inventor has surprisingly discovered a novel and superior resistance exercise apparatus and method that capitalizes upon one or more of an inclined plane's inherent properties. Upon using exercise apparatus **10**, the increase in slope or incline **11** along the rails moving from lower ends **27, 37** towards higher ends **29, 39** at midpoint **12** (which slope is greater than 0° , preferably greater than about 1° , or more preferably between about 1° and about 30° , or even more preferably between about 1° and about 10° , or most preferably between about 2° and about 6° , e.g., about 4°).

[0050] Inclination angle **11** is the angle formed by the upward sloping incline and the base of apparatus **10** (e.g., the floor upon which apparatus **10** rests during use). Accordingly, when apparatus **10** is lying flat on the floor, angle **11** is the angle formed by the floor and the upward sloping incline as illustrated in FIG. 5. The slope of the rails makes use of gravity to cause equal acceleration of trolleys **40, 50**, thereby centering the user's body over midpoint **12** of apparatus **10**.

[0051] A weight bearing trolley **40** (which may also be referred to herein as a "cart" or "carriage") is configured to slidably move along top surfaces **23, 25**, and roll on first and second rail members **22, 24** of first rail assembly **20**. As shown in FIGS. 9-18, trolley **40** uses four sets (i.e., pairs) of wheels **41** oriented so the trolley does not unintentionally lose contact with the rail assembly, much like wheels often employed on amusement park roller coasters. Four of wheels **41A** are side-mounted on vertical cradles **46** and are configured to mate with (make contact with) top surfaces **23, 25** as illustrated in FIG. 7. Four additional wheels **41B**, are bottom-mounted

under platform **42** and are configured to mate with (make contact with) the sides of first rail member **22** and second rail member **24**, also as illustrated in FIG. 7. Note that trolley **40** is prevented from disengaging from first rail assembly **20** by a bumper, stop, or another such similar locking mechanism (not pictured) that interferes with the pathway of wheels **41B**. Top surfaces **23**, **25** may have a lip (not pictured) that slightly extends beyond the rail members and prevents wheels **41B** from disengaging from rail members **22**, **24**. For example, top surfaces **23**, **25** may be made from extruded or molded rigid plastic, which permits formation of a sturdy lip that locks wheels **41B** and which provides a low-friction interface with wheels **41A**.

[0052] Right-handed trolley **40** is fitted with armrest member **43** so that the FLYE-UP™ exercise motion (a term coined by the inventor for the novel prone exercise motion created using the apparatus, and sometimes also referred to herein as an “armless” push-up) can be performed. Trolley **40** can be further fitted with a hand-gripping handle **48** so that a bent-elbow plank position FLYE-UP™ or extended arm exercise can be selectively performed by a human user. Second rail assembly **30** also has left-handed trolley **50** that is positioned and configured to slidably move along top surfaces **33**, **35** of first and second rails **32**, **34**, ideally displaying the mirror image size, feature, motion, friction, and resistance characteristics of trolley **40**. That is, apparatus **10** is symmetrical and complementary to the left and right anatomical features of the human body. Note that right-handed trolley **40** and left-handed trolley **50** are non-superimposable mirror images of each other.

[0053] Each weight-bearing trolley **40**, **50** is itself an inventive aspect of the apparatus and methods described herein. For the sake of brevity and convenience, the following discussion is with respect to right-handed weight-bearing trolley **40**, it being understood that left-handed trolley **50** is a mirror image of trolley **40**, in much the same manner as first rail assembly **20** is a mirror image of second rail assembly **30**.

[0054] Referring to right-handed trolley **40** in FIGS. 9-18, trolley **40** includes armrest member **43** that includes shell **44**, at least one cradle **46**, and cushion or padding layer **45**. Shell **44** is formed to complement, support, and otherwise be compatible the anatomy of the forearm of a human user. For example, it maybe semi-circular in cross-section (for example, a plastic half-pipe), and it of sufficient radius to accommodate and support a user's forearm. In order to permit the user to perform an armless push-up, armrest member **43** should engage with the forearm of

the human user in such a manner that during operation unnecessary and unproductive muscle work is not required in order to maintain armrest member **43** in contact with the user's forearm. To this end, it is unlikely that a simple planar armrest member **43** would be satisfactory because the user's forearm would likely become easily disengaged from (e.g., slide off of) such an armrest. Accordingly, half-cylinder and half-cone shapes are examples of preferred geometries for armrest member **43** (as well as shell **44**).

[0055] In the preferred embodiment shown in FIGS. 1-25, shell **44** bridges and rests upon, but is not immovably fixedly or attached to vertical cradles **46**. However, in other embodiments, cradles **46** may be of different shapes and configurations. For example, cradles **46** or shells **44** may be of different configuration, such as to permit a user to place a foot (rather than forearms) on each trolley to perform standing adductor and abductor leg exercises. Additionally, trolleys **40, 50** can include safety features such as pinch guards to prevent a user from pinching between wheels **41** and the device or between wheels **41** and the rails.

[0056] Because the user's body weight provides the resistance for the exercise, weight displacement or movement is a component of the exercise to be performed with apparatus **10**. The inventor has discovered that during the execution of an armless push-up on apparatus **10**, the user's forearms tended to change their position relative to the weight-bearing portions of trolleys **40, 50** throughout the entire range of motion (see FIGS. 21-25). This change in relative position could result in the user experiencing discomfort and pain, such as by friction of the skin and muscles placed within the cradle **46** during the movement of the trolley **40**. Discomfort also undesirably restricts the range of motion a user is willing to experience while using the apparatus.

[0057] In particular, the contact point between the user's forearm and armrest member **43** would roll, causing pinching or even chafing of the skin after numerous repetitions. A user who wished to continue exercising would then typically compensate by controlling forearm motion in an unnatural way to avoid further pain and discomfort. Such compensation, in turn, results in less effective strength conditioning or exercise.

[0058] The novel exercise apparatus herein solves the foregoing problem and provides for a method of resistance exercise that is very comfortable. For example, the inventor discovered that if the weight-bearing portion of armrest member **43** could be maintained in constant position

relative to the user's arms (rather than relative to apparatus **10**) throughout the entire range of motion, any pain or discomfort would be minimized or alleviated.

[0059] Specifically, by making shell **44** capable of rotating freely in cradles **46**, there would no longer be any rolling motion between the user's forearms and the point at which they contacted the armrest, that is, the inside padded, curved portion of shell **44**. The exercise apparatus permits the user to perform an armless push-up whereby the user places the forearms into armrest members **43** while in a prone (face-down) position. The user then grasps optional hand-gripping handles **48**. The user then attempts to raise his upper body up from the apparatus while bringing the elbows underneath the chest. By performing such an exercise, muscle fatigue in the forearms, wrists, and hands is limited. Indeed, the forearms, which are resting in armrest members **43** need not perform any significant work whatsoever.

[0060] There are various suitable configurations and adaptations available for the swivel-like attachment of shell **44** to trolley **40**. In the embodiment shown in FIGS. 9-18, for example, armrest member **43** is permitted to swivel freely in the cradles **46**, yet within a limited range of rotation controlled by attaching shell **44** to horizontal platform **42** of the cart via a flexible attachment such as resilient elastic latex exercise band **47** as illustrated in FIGS. 15-18. In order to limit friction between shell **44** and cradles **46**, mating surfaces may be covered with, for example, polytetrafluoroethylene tape, such as TEFLON® brand tape.

[0061] Still referring to FIGS. 15-18, elastic bands **47** are attached to platform **42** and the underside of shell **44**. Shell **44** is not permanently attached to cradles **46**, it being held in place by the tension of bands **47**. During operation, shell **44** rotates in cradles **46**, the extent of rotation depending, in part, on the strength of elastic bands **47**. Elastic bands **47** may be secured to platform **42** by a knot tied at both ends of band **47** (the knot being too large to transit the through hole in platform **42**). For the sake of clarity, it should be noted that band **47** is not provided to create meaningful resistance related to the trolley movement inherent in the main exercise, rather is present to permit controlled rotation of the weight-bearing portion of armrest **43** and thereby alleviate pain and discomfort that the user might otherwise experience from his forearm rubbing against the inside of shell **44**. A further purpose for band **47** is that it permits some rotation of shell **44** in cradles **46** while still maintaining trolley **40** as one unit. The aforementioned configuration allows shell **44** to swivel within cradles **46**, which in turn remain rigidly affixed to

the rest of trolley **40**. It also assures that shell **44** will be held to trolley **40** when apparatus **10** is moved. In addition, shell **44** re-centers itself during the exercise's downstroke, preferably with the help of band **47** or other such flexible attachment.

[0062] To prevent undesirable lateral movement of shell **44** in cradles **46**, wheels **41C** are affixed to the bottom of shell **44**. Wheels **41C** abut the sides of cradles **46**, and they prevent shell **44** from moving laterally. Preferably, wheels **41C** do not otherwise inhibit the rotational movement of shell **44** with respect to cradles **46**.

[0063] Additional features may include replacement elevational support members **26**, **36** having selectable holes to allow for a desired increase in the height of the rail ends **29**, **39** from the floor. It will be appreciated that the slope of apparatus **10** may also be increased by providing a removable spacer under the midpoint **12** of the apparatus formed by the abutting ends of each rail assembly **20**, **30** to thereby provide center elevation **14** as illustrated in FIG. 6. In such embodiments, the user can selectively adjust the degree of incline of rail assemblies **20** and **30** to provide controlled and desired levels or increased and decreased exercise resistance. Handle grip adjustments **49** (such as thumbscrew fasteners illustrated in FIG. 17) may be included to permit hand-gripping handles **48** to be repositioned farther or closer to armrest member **43**.

[0064] An armless push-up exercise involves the following sequence of steps and bodily movements, which are illustrated in FIGS. 20-25. As stated previously, it is the inclined nature of rail assemblies **20**, **30** that ensures centered user balance and smooth body-weight resistance during use of apparatus **10**. Moreover, the more top surfaces **23**, **25** and **33**, **35** come to lying in a horizontal plane, the easier the exercise motion becomes. Similarly, the greater the degree of slope or incline, the harder that same motion becomes.

[0065] In an exercise embodiment, apparatus **10** is placed upon a level surface. A user rests his forearms in arm rest members **43** of trolleys **40**, **50**, and positions trolleys **40**, **50** at or near apparatus midpoint **12** as illustrated in FIGS. 22-23. The user then assumes a traditional push-up position with the rest of the user's weight supported on the floor by the user's toes, feet, or knees. In a yoga-inspired, bent-elbow plank configuration with the user's elbows flexed to approximately 90° (i.e., the angle formed by the shoulder to the elbow to the hand). Alternatively and additionally, a user can selectively vary the body weight exerted over the apparatus, such as by placing weight on the user's knees, placing the user's feet on an elevated

surface relative to the apparatus **10**, placing the user's feet on a lower surface relative to the apparatus **10**, adjusting the user's weight on one knee or foot, wearing weight vests or having a second user exert downward or upward force on the user's body, among other things. Each of these exercises has been found naturally to exert additional exercise on the user's body, such as tightening of the stomach and other core muscles of a user's torso, as well as tensing of the legs. These additional exercise benefits are significant, and are additional advantages of the apparatus and its methods of use.

[0066] To initiate the exercise motion, the user grasps hand-gripping handles **48**. Note that gripping handles **48**, as illustrated in FIGS. 24-25, are preferably oriented inward toward midpoint **12** so that the user's forearms are in a natural and comfortable position through out the exercise. Beginning with the trolleys **40, 50** near the midpoint **12** (see FIGS. 22-23 and 25), the user allows trolleys **40, 50** to descend from higher ends **29, 39** towards lower ends **27, 37** of apparatus **10** in a controlled fashion (the "downstroke") to arrive at the position illustrated in FIG. 21.

[0067] In order for the user to lift his body weight, he must move his hands, forearms, upper arms, shoulders, etc. towards the center **12** of apparatus **10** and thereby cause the trolleys **40, 50** to ascend the incline of each rail assembly until the user returns to the starting point (the "upstroke") as illustrated in FIG. 24. That sequence is then repeated until the desired user muscle fatigue is accomplished. The intensity of the exercise may be increased by attaching elastic tension bands from each trolley to a fixed point on apparatus **10**, such as lateral support members **28, 38**. During the exercise, trolleys **40, 50** move up and down rail assemblies **20, 30** while the user's chest and upper body moves vertically.

[0068] The rotary and linear motions of the components of apparatus **10** during the upstroke are illustrated in FIGS. 24-25. The trolleys linearly ascend (sliding motion **60**) the rail assemblies as the user rotates (rotating motion **62**) his forearms, while maintaining the hand-gripping handles pointed (direction **64**) toward the users body. The reverse motions are performed in the downstroke, and the process is repeated.

[0069] The design of prior art devices was such that it was difficult, if not impossible, for a user to keep the weight-bearing devices equidistant from the midpoint of his body or the center position of the exercise movement. If the weight-bearing devices moved away from one another

at different rates, the user would most likely become unstable and ultimately lose his balance, thereby risking injury. Previous attempts to address that problem and maintain the weight-bearing elements of their devices equidistant from the midpoint involved the creation of various linkages between the weight-bearing elements. The hope was that such linkages would insure that the weight-bearing elements would both move away at the same rate, thereby keeping the user balanced in the center.

[0070] The present invention, therefore, is a significant improvement over heretofore known exercise equipment. With respect to the apparatus described in GB Publication No. 2,274,999, the exercise apparatus is not directed to an isolated pectoral muscle exercise (i.e., an armless push-up), and it is unclear what upper body muscles are trained or strengthened in the movements illustrated therein. When this prior art apparatus is used to perform a push-up exercise, there inevitably will be some arm and shoulder loading, while adduction of the arms is primarily via the pectoral muscles. Also, the belts pull the carts toward the midline, which would reduce the amount of adduction work and thereby limit load on the pectoralis. This, of course, is the opposite effect achieved by the present invention. Moreover, according to this prior art reference, near the midline the tracks appear almost horizontal and parallel, and that is the key moment when the carts need the outward acceleration to keep the body weight centered, which affect is achieved by the present invention.

[0071] Also, with respect to the apparatus described in U.S. Pat. No. 7,134,987, the exercise apparatus is similarly not directed to an isolated pectoral muscle exercise (i.e., an armless push-up). For example, the apparatus is gripped with the hands and therefore the arm and hand muscles perform work, whereas the apparatus of the present invention isolates the pectoral muscles and the arms and hands perform substantially no work. Moreover, the prior art apparatus uses tension bands to return the carts to the center, which lessens the amount of muscle work on the chest, whereas according to the present invention the user must overcome the weight of gravity on his body in order to perform the upstroke motion.

[0072] Unlike the foregoing prior art machines, the “armless” aspect of the present invention represents a significant improvement in that it permits isolation of the pectoral muscles and prevents fatigue of the arm muscles. Moreover, the swivel action of forearm rest members **43**, which feature is novel with respect to the prior art, allows for a natural range of motion with

gravity pulling to keep the body weight centered. The present invention significantly reduces, if not virtually eliminates, the above-described asymmetric movement problems. Starting with trolleys **40, 50** both positioned near midpoint **12**, gravity accelerates the trolleys away from midpoint **12** at an equal rate. The effect is that each time the user returns trolleys **40, 50** to the top of the upstroke at midpoint **12**, he need only relax briefly to begin the downstroke (just like one does when performing a regular push-up, pull-up, or sit-up). The user's body weight is then naturally self-centered as the trolleys move laterally downward again and away from midpoint **12**.

[0073] The inclined slope of apparatus **10** even allows a user to perform a traditional push-up, where his arms are full extended and hands resting on the trolleys (preferably with alternate-shaped, rather than half-pipe shaped, cradles **46**, insert shells **44**, or pads **45**). Without such incline, the same maneuver would be very difficult. That is, if the rails of the apparatus were entirely horizontal and a user assumed a traditional, extended-arms push-up posture with his hands close to one another near the midpoint, he would find himself in a very unstable position. The user could, and would, easily sway. As a result of this imbalance, one of the trolleys **40, 50** would begin to move while the other remained motionless; i.e., there would be nothing to cause the other trolley necessarily to begin moving. The end result would be that as the user's body weight was lowered (as intended), with the trolley that started moving first would move twice as far while the other remained motionless.

[0074] When a user supports his body weight on the forearms, as in one preferred embodiment of the exercises described herein, it results in a much lower posture and thus reduces the aforementioned problems with imbalance and asymmetric movement of the weight-bearing elements exhibited by prior art devices. Surprisingly, the inclined nature of the present invention which causes the trolleys **40, 50** to naturally and gravitationally move laterally and is so effective it even allows a user to perform a more traditional push-up on apparatus **10** with his hands on trolleys **40, 50** and arms fully extended.

[0075] The apparatus has been constructed by the inventor in several embodiments using a variety of materials (wood, plastics, metals, etc). The inventor has subjected the apparatus to numerous test runs and has endured thousands of repetitions without the user losing his balance or experiencing pinching/chafing on the forearms. As designed and constructed, trolleys **40, 50**

almost never, if ever, move away from midpoint **12** in an asymmetric fashion during an exercise motion. The apparatus provides a novel, vigorous exercise that produces pectoralis resistance without fatiguing arm and shoulder muscles, a combination heretofore unseen in prior art portable exercise equipment.

[0076] The manner in which the apparatus is constructed results in benefits beyond physical fitness. Known prior art devices typically involve much more elaborate assemblies, and thus are more time-consuming to manufacture. Such devices often make use of pulleys, cables, metal fabrication and the like, making the manufacturing process expensive, perhaps even pushing the sales price beyond a point that the market will bear and still allow the manufacturer a sufficient profit. By contrast, the apparatus and method of the present invention make use of inclined planes to achieve superior results over any similar prior art push-up exercise devices.

[0077] While this description is made with reference to exemplary embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope. In addition, many modifications may be made to adapt a particular situation or material to the teachings hereof without departing from the essential scope. Also, in the drawings and the description, there have been disclosed exemplary embodiments and, although specific terms may have been employed, they are unless otherwise stated used in a generic and descriptive sense only and not for purposes of limitation, the scope of the claims therefore not being so limited. Moreover, one skilled in the art will appreciate that certain steps of the methods discussed herein may be sequenced in alternative order or steps may be combined. Therefore, it is intended that the appended claims not be limited to the particular embodiment disclosed herein.

CLAIMS

1. An exercise apparatus for performing an armless push-up comprising two upwardly inclined linear rail assemblies meeting at an apical midpoint and two moveable trolleys, wherein each rail assembly is engaged with a moveable trolley, each trolley is independently operable, and each trolley comprises an armrest member anatomically compatible with a forearm of a human user.
2. The exercise apparatus according to claim 1, wherein each rail assembly is securely and slidably engaged with a trolley by a linear slide mechanism.
3. The exercise apparatus according to claim 1, wherein the rail assemblies are each inclined toward the apical midpoint at an angle of between about 1° and about 30°.
4. The exercise apparatus according to claim 1, wherein each armrest member is rotatable during operation, the rotation occurring about a central longitudinal axis formed by a user's forearm.
5. The exercise apparatus according to claim 1, wherein the apparatus comprises a right-handed trolley and a left-handed trolley.
6. The exercise apparatus according to claim 5, wherein the right-handed trolley and the left-handed trolley each further comprise a hand-gripping handle rotatable toward the apical midpoint.
7. The exercise apparatus according to claim 1, wherein the rail assemblies each comprise a set of two or more co-planar linear rail members.
8. The exercise apparatus according to claim 1, wherein rail assemblies are symmetrical and connected by a hinge at the apical midpoint.
9. The exercise apparatus according to claim 1, wherein each trolley further comprises a removable elastic tension band of predetermined resistance connecting the trolley to a fixed point on the exercise apparatus and providing resistance to movement of the trolley during operation.
10. An exercise apparatus for performing an armless push-up comprising two upwardly inclined linear rail assemblies meeting at an apical midpoint and two moveable trolleys, wherein each rail assembly is engaged with a moveable trolley, wherein each trolley is independently operable and slidable up and down a rail assembly, and wherein each trolley comprises an armrest member

anatomically compatible with a human forearm and rotatable during operation about a longitudinal central axis formed by a user's forearm.

11. The exercise apparatus according to claim 10, wherein each trolley is securely engaged with a rail assembly by rotatable wheels or a ball-bearing slide mechanism.

12. The exercise apparatus according to claim 10, the rail assemblies are each inclined toward the apical midpoint at an angle of between about 1° and about 10° .

13. The exercise apparatus according to claim 10, wherein the exercise apparatus comprises a right-handed trolley and a left-handed trolley.

14. The exercise apparatus according to claim 12, wherein the right-handed trolley and the left-handed trolley each further comprise a hand-gripping handle rotatable toward the apical midpoint.

15. The exercise apparatus according to claim 10, wherein the rail assemblies each comprise a set of two co-planar linear rail members.

16. The exercise apparatus according to claim 10, wherein the rail assemblies are symmetrical and connected by a hinge at the apical midpoint.

17. The exercise apparatus according to claim 10, wherein each trolley further comprises a removable elastic tension band of predetermined resistance connecting the trolley to a fixed point on apparatus and providing resistance to movement of the trolley during operation.

18. An exercise apparatus for performing an armless push-up comprising a first rail assembly having two co-planar linear inclined rail members and a second rail assembly having two co-planar linear inclined rail members, the elevated ends of the two rail assemblies meeting at a hinged apical midpoint, wherein the first rail assembly and the second rail assembly are symmetrical; a right-handed trolley mounted to the first rail assembly and slidable thereupon; and a left-handed trolley mounted to the second rail assembly and slidable thereupon; wherein each trolley comprises an armrest member anatomically compatible with a human forearm, the armrest member being rotatable during operation about a central longitudinal axis formed by a user's forearm.

19. The exercise apparatus according to claim 18, wherein the co-planar inclined rails are inclined at an angle of between about 2° and about 6°.

20. The exercise apparatus according to claim 18, wherein each trolley further comprises a hand-gripping handle rotatable toward the apical midpoint.

21. A method of strength conditioning the pectoral muscles of a human comprising steps of

providing an exercise apparatus for performing an armless push-up, the apparatus comprising two upwardly inclined linear rail assemblies meeting at an apical midpoint and two moveable trolleys, wherein each rail assembly is engaged with a moveable trolley, each trolley is independently operable, and each trolley comprises an armrest member anatomically compatible with a forearm of a human user;

placing the exercise apparatus on a level surface;

placing the forearms of a human operator in the armrest members of the trolleys while in a prone position; and

iteratively abducting and adducting the pectoral muscles to thereby slide each trolley upward and downward along each rail assembly.

22. The method of strength conditioning according to claim 21, wherein each rail assembly is securely and slidable engaged with a trolley by a linear slide mechanism.

23. The method of strength conditioning according to claim 21, wherein the rail assemblies are inclined at an angle of between about 1° and about 30°.

24. The method of strength conditioning according to claim 21, wherein each armrest member is rotatable during operation about a central longitudinal axis formed by a user's forearm.

25. The method of strength conditioning according to claim 21, wherein the apparatus comprises a right-handed trolley and a left-handed trolley.

26. The method of strength conditioning according to claim 25, wherein the right-handed trolley and the left-handed trolley each further comprise a hand-gripping handle rotatable toward the apical midpoint.

27. The method of strength conditioning according to claim 21, wherein the rail assemblies each comprise a set of two co-planar linear rail members.

28. The method of strength conditioning according to claim 21, wherein the rail assemblies are symmetrical and connected by a hinge at the apical midpoint.

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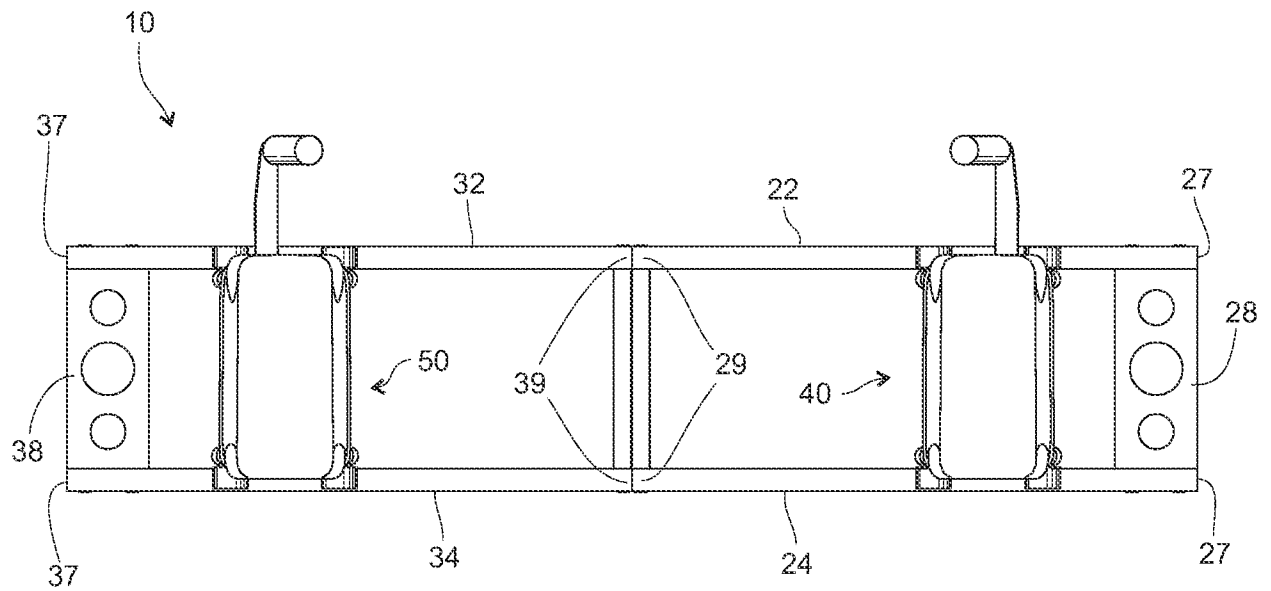


Fig. 1

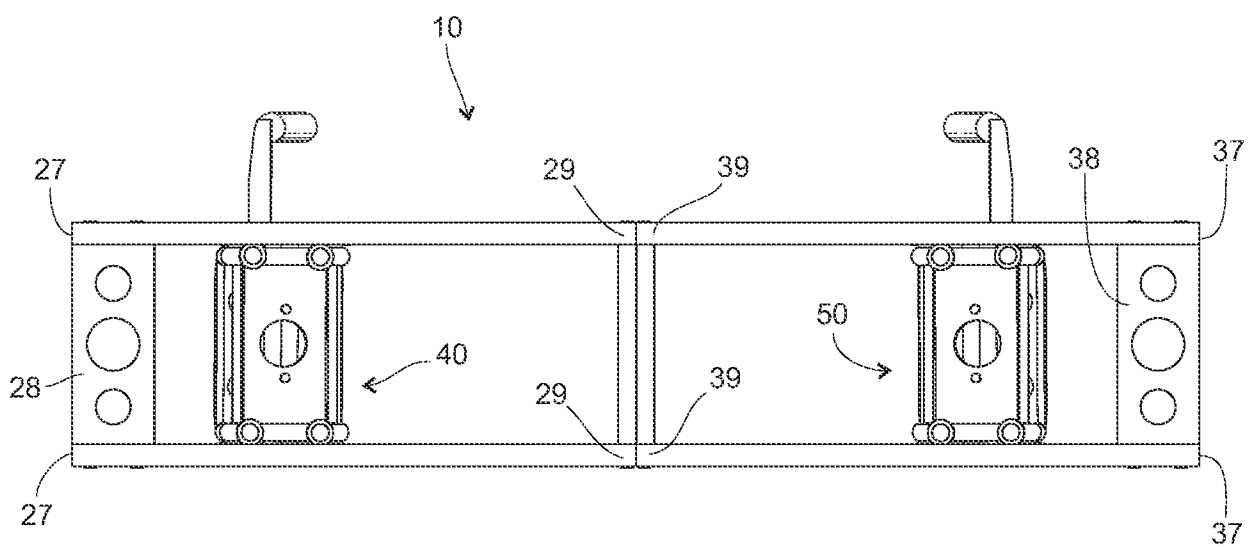


Fig. 2

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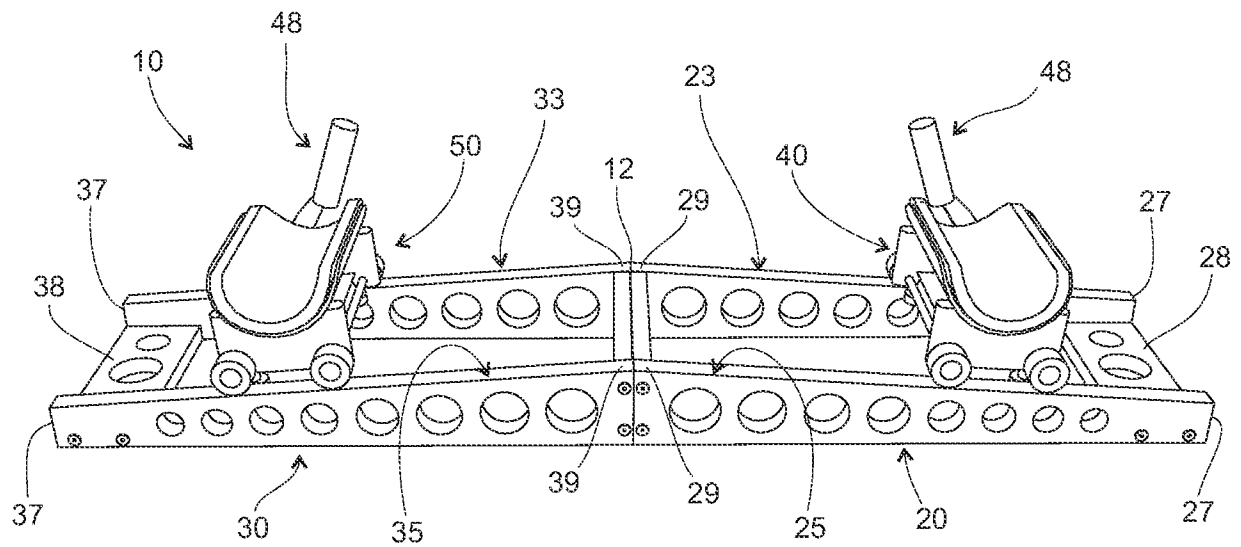


Fig. 3

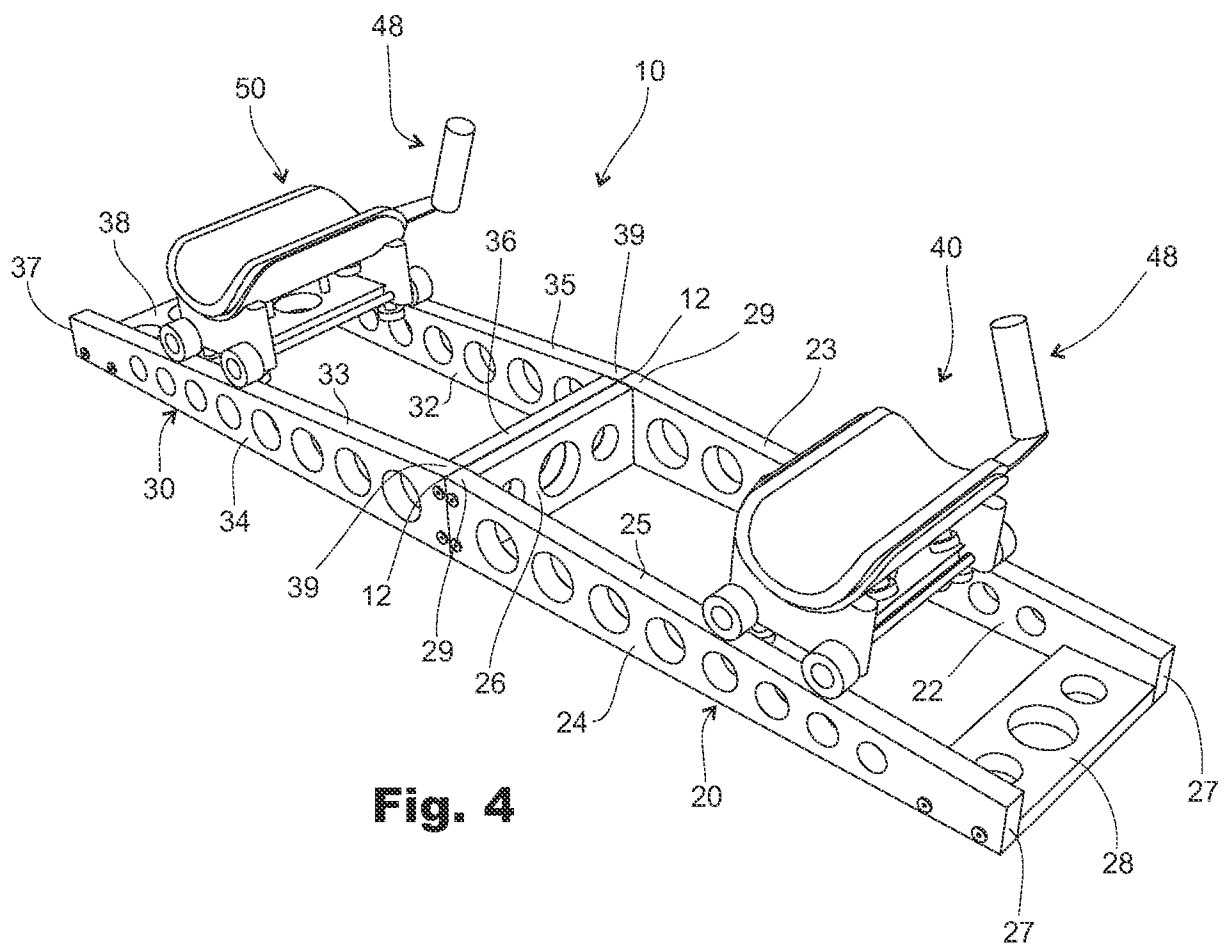


Fig. 4

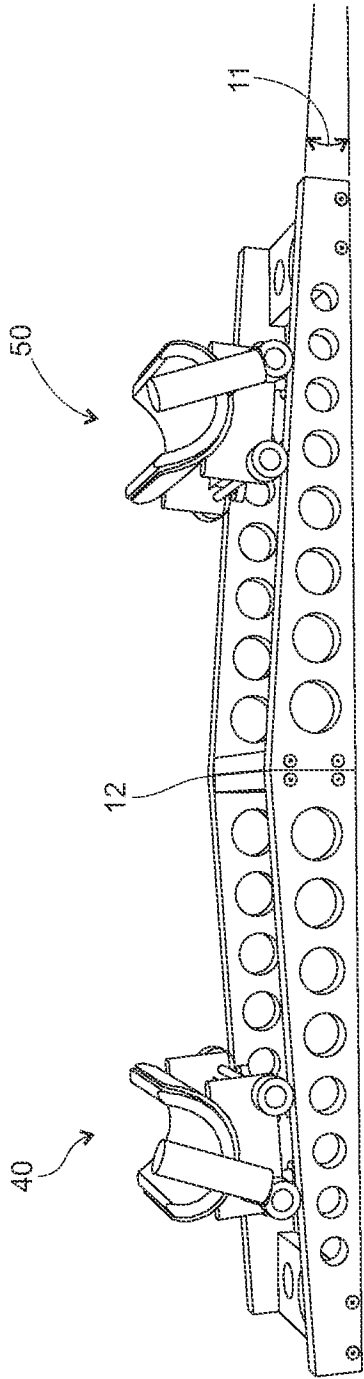


Fig. 5

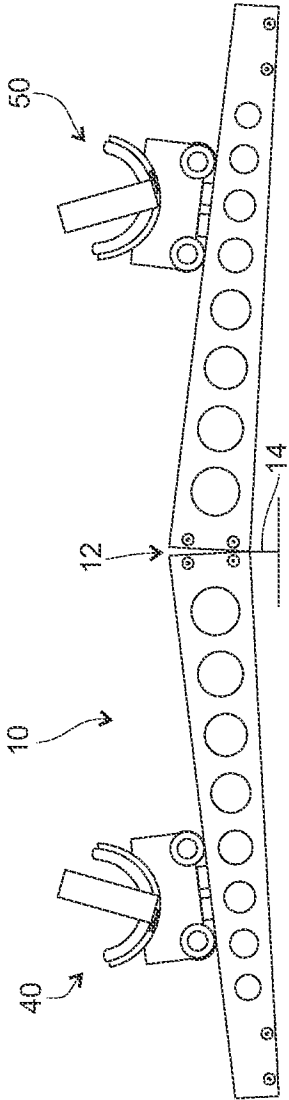


Fig. 6

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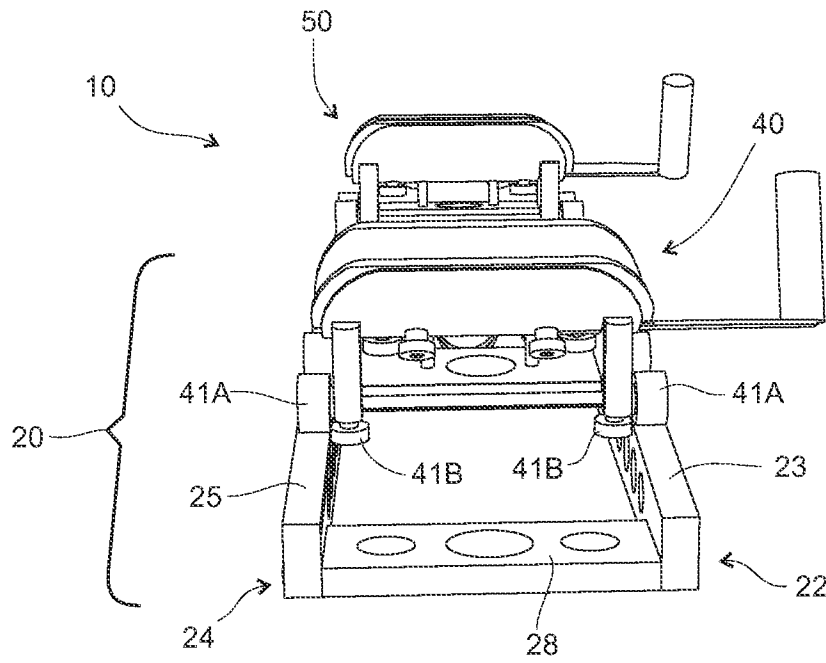


Fig. 7

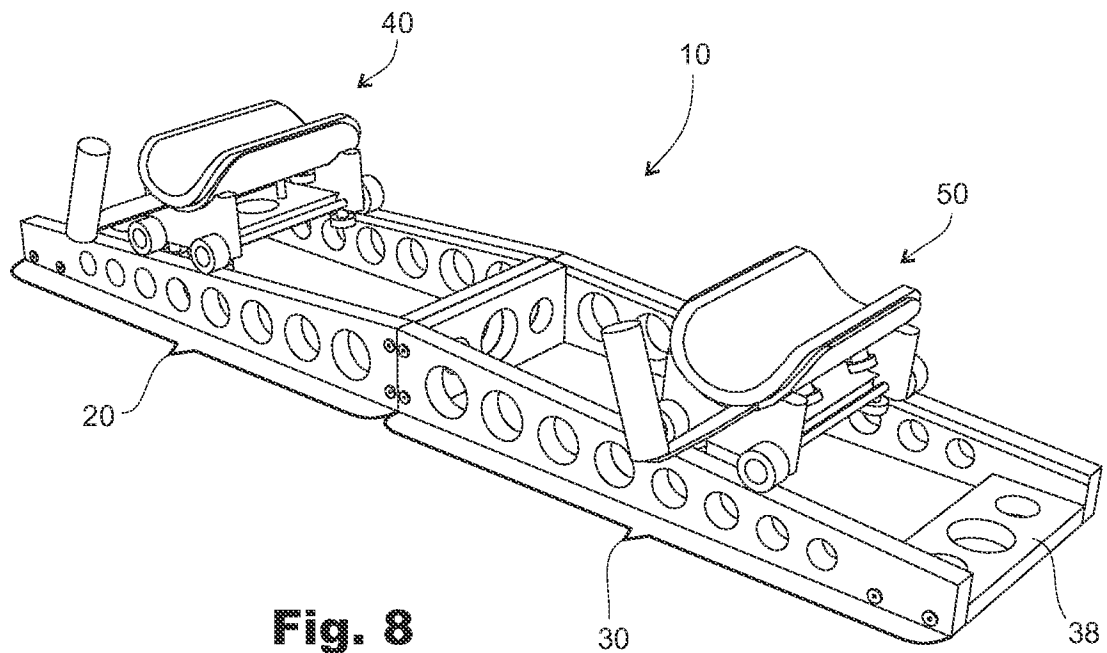


Fig. 8

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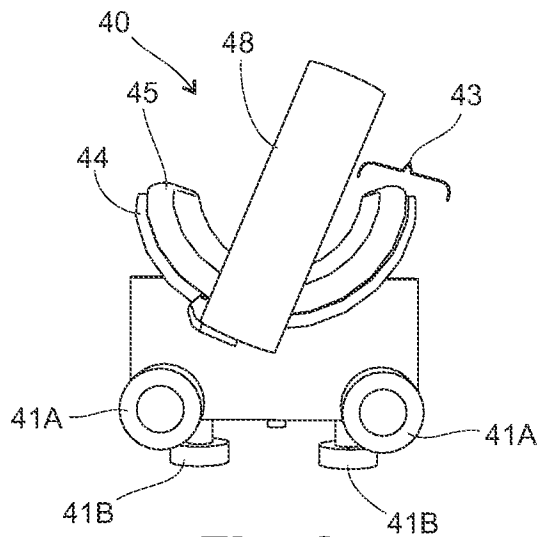


Fig. 9

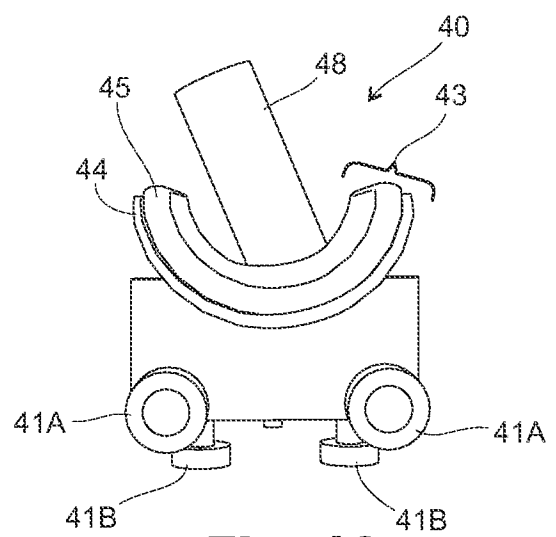


Fig. 10

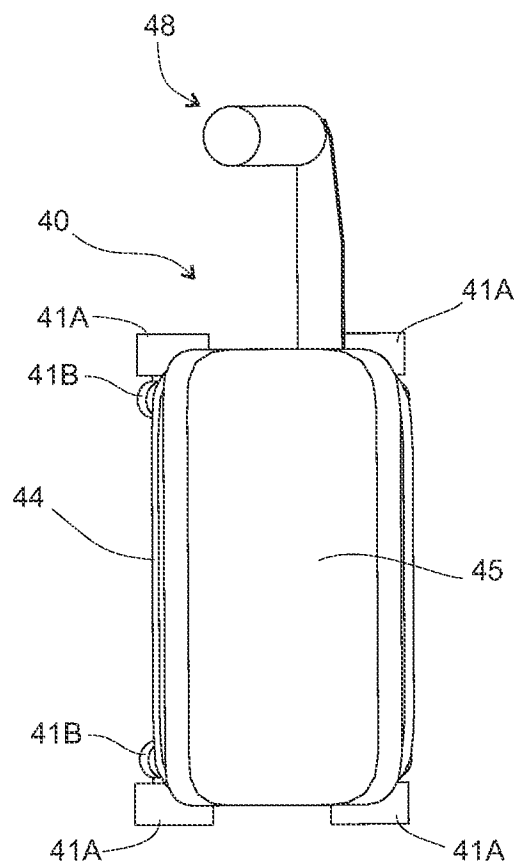


Fig. 11

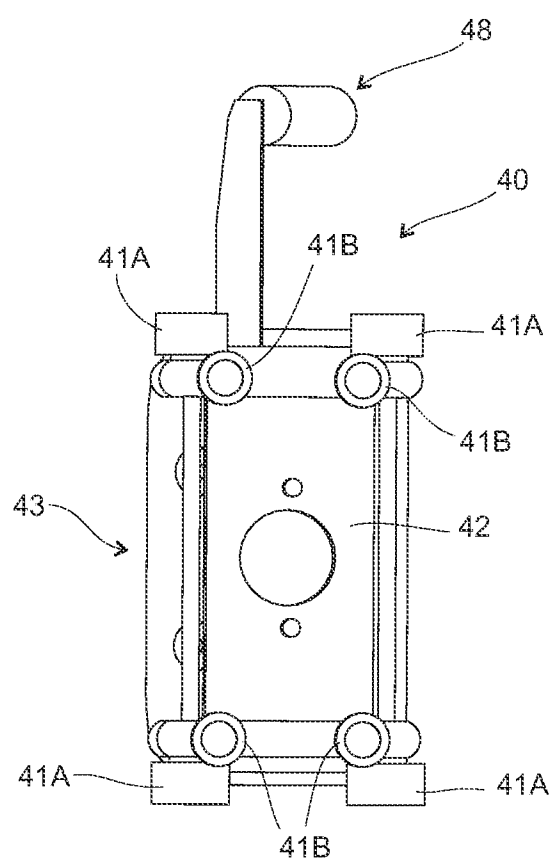


Fig. 12

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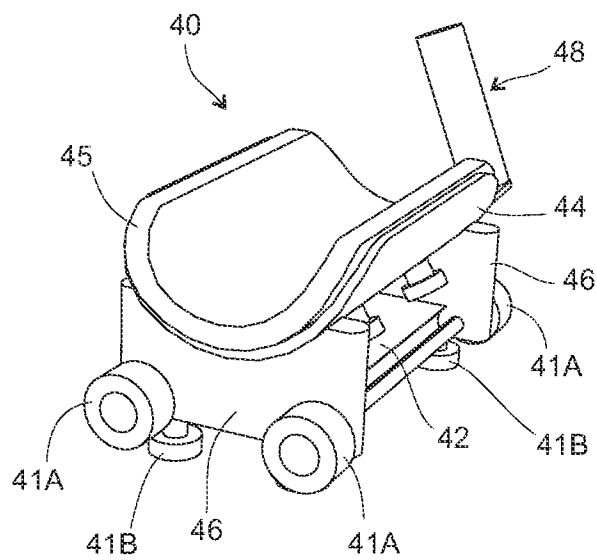


Fig. 13

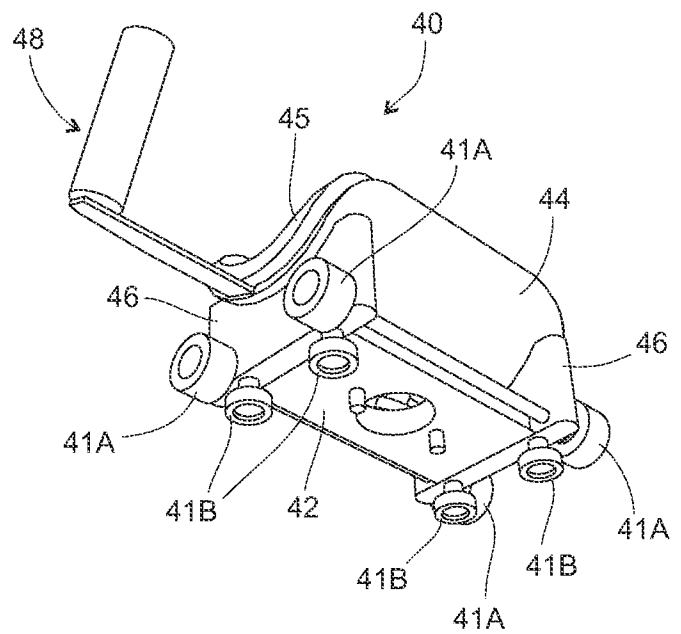


Fig. 14

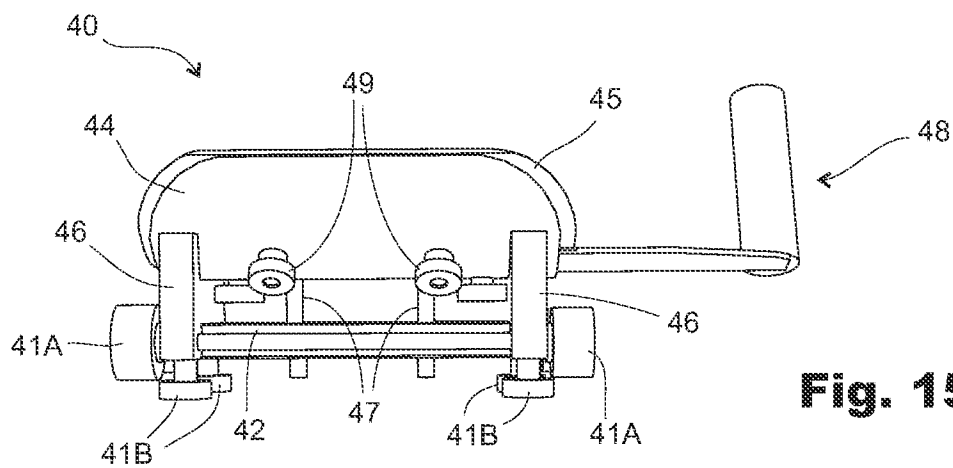


Fig. 15

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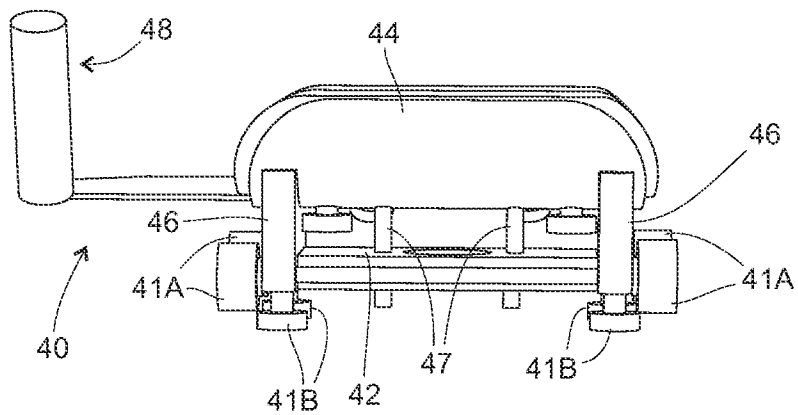


Fig. 16

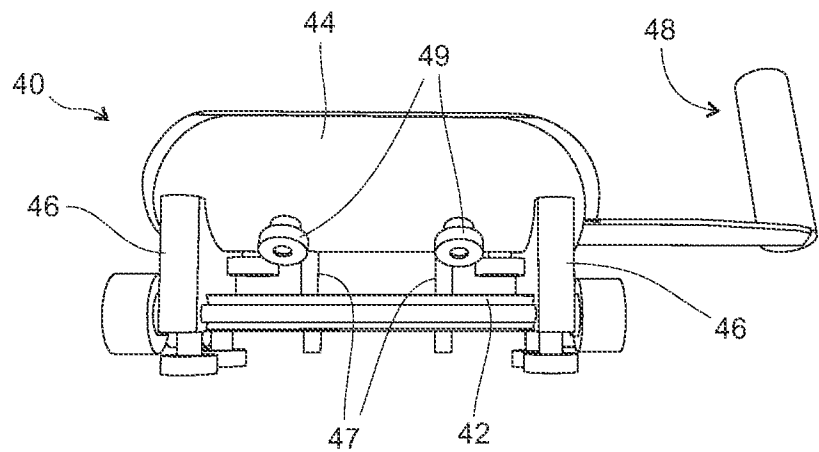


Fig. 17

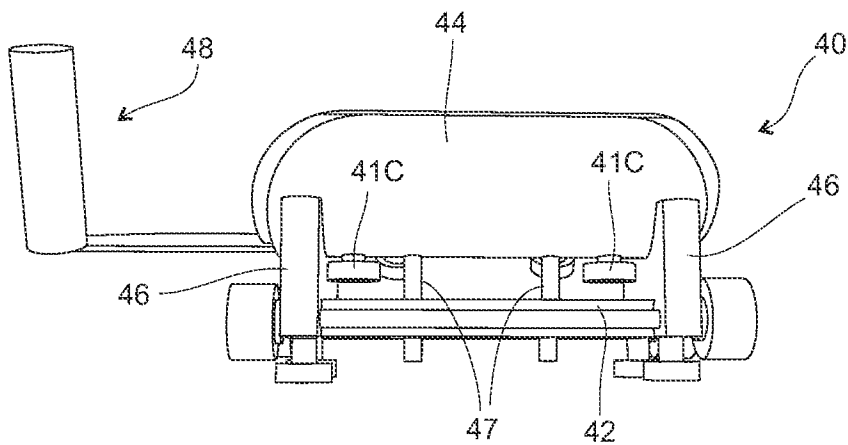


Fig. 18

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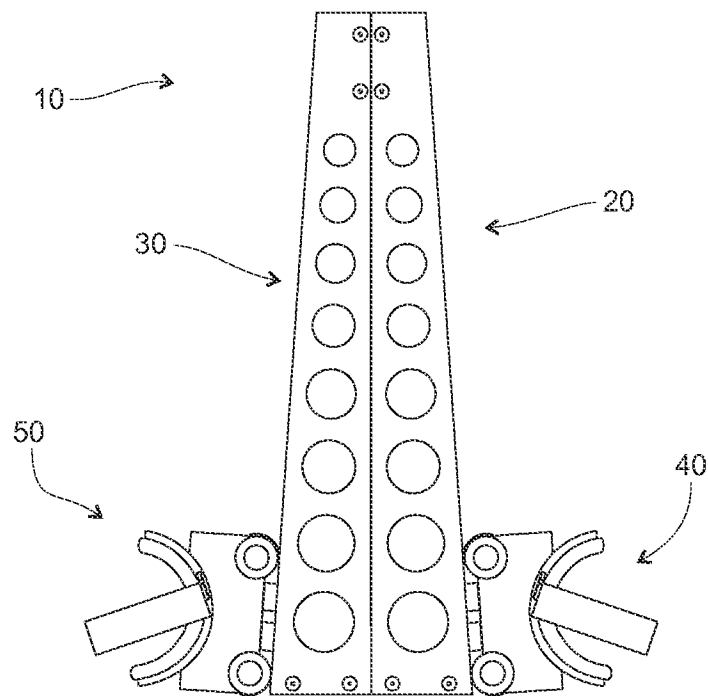


Fig. 19

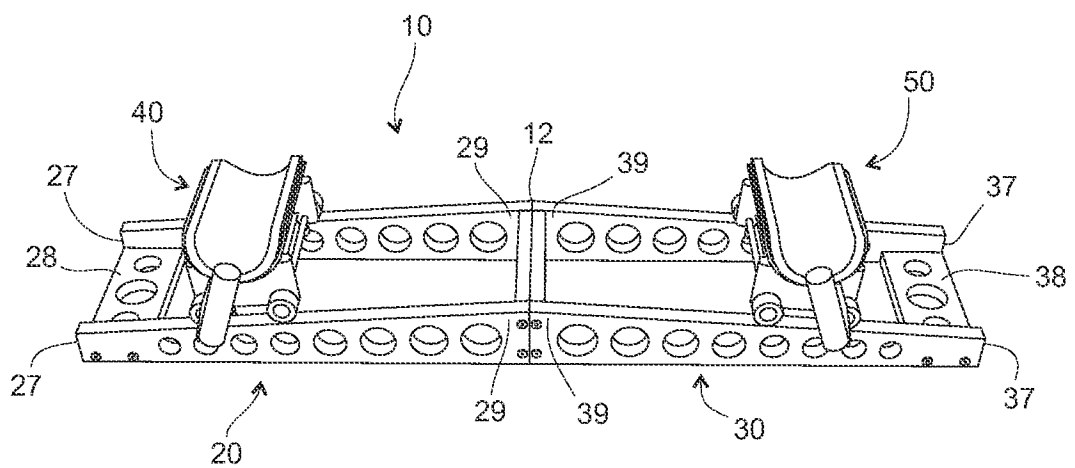


Fig. 20

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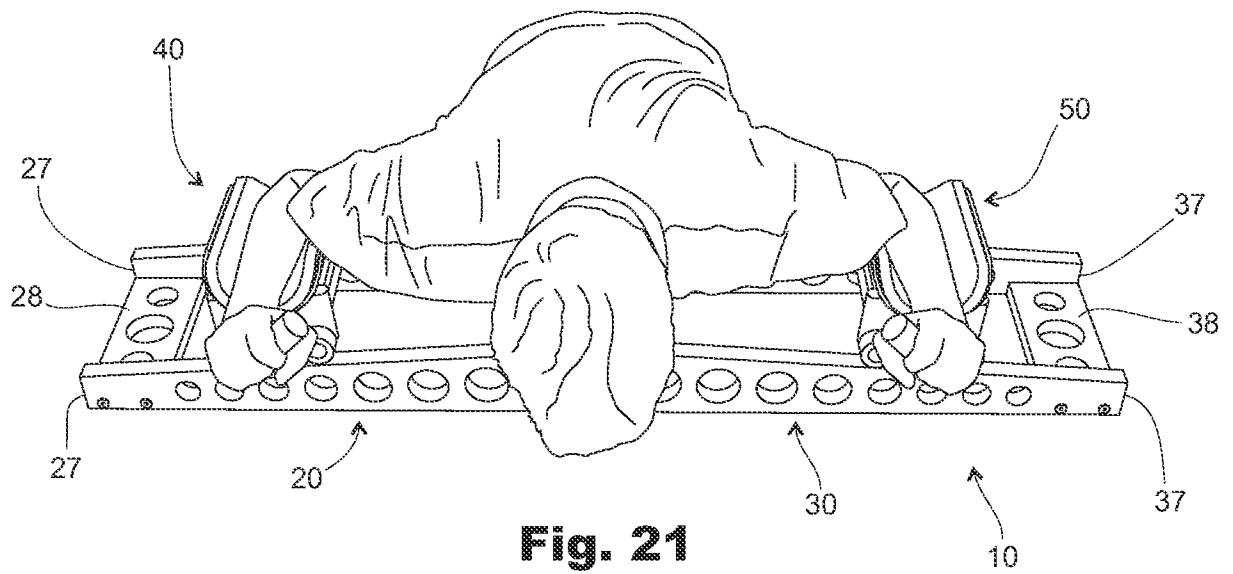


Fig. 21

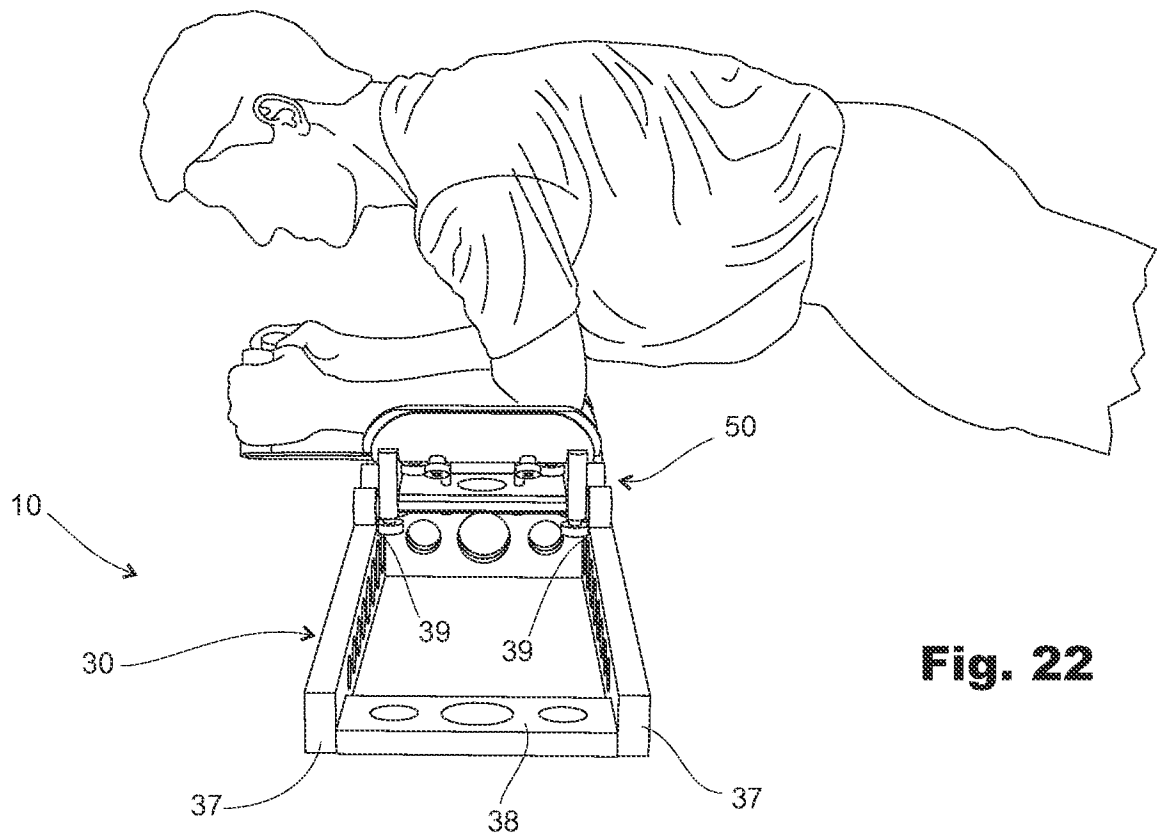


Fig. 22

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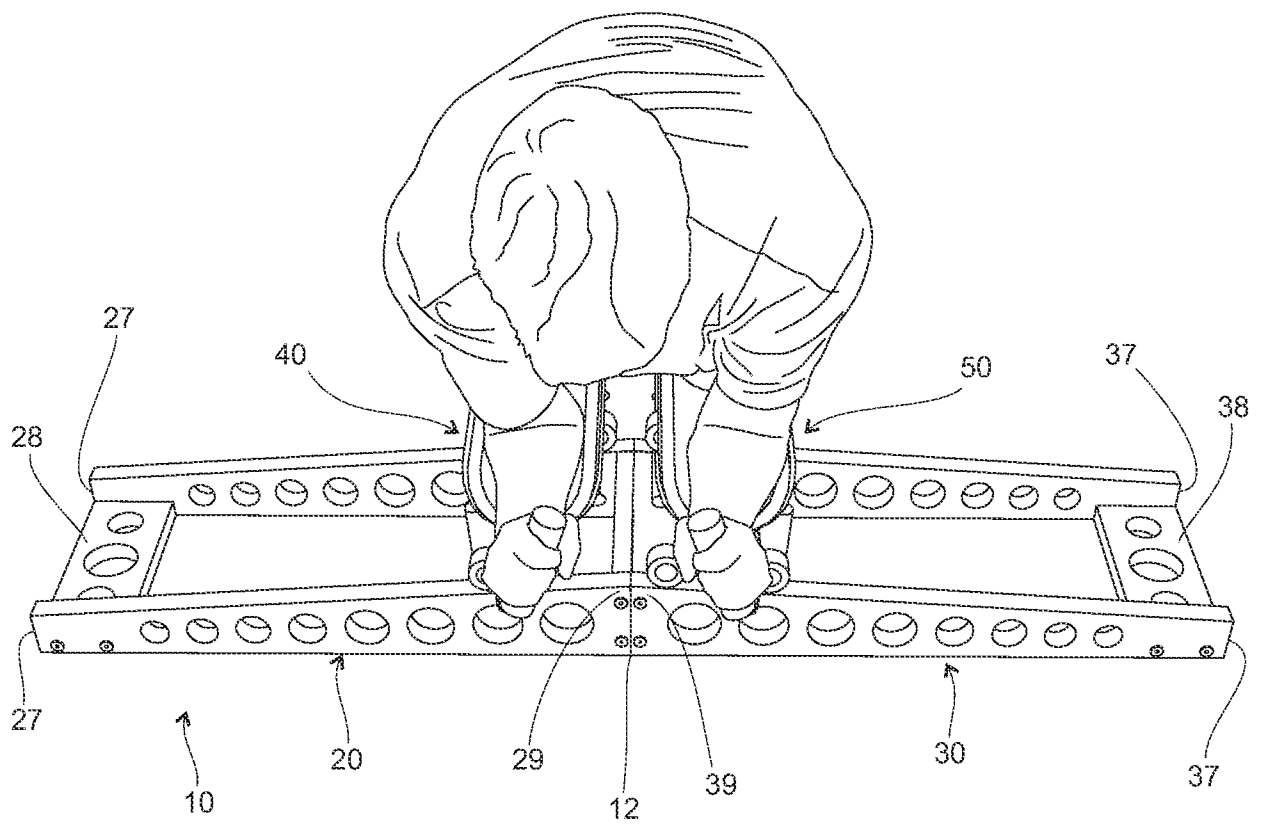


Fig. 23

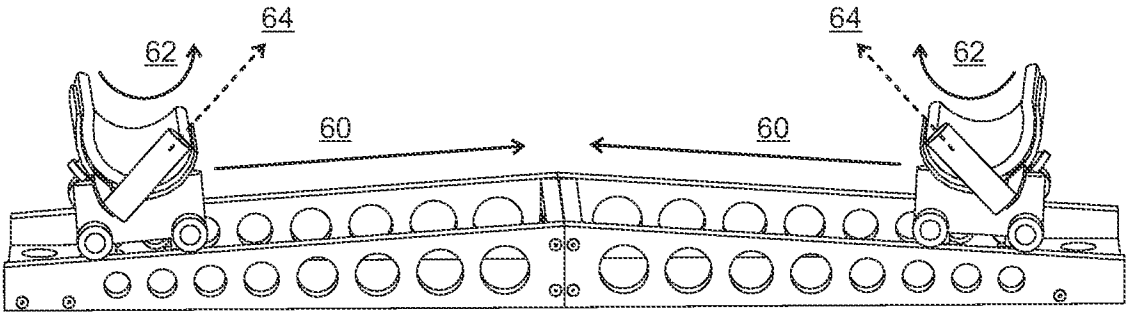


Fig. 24

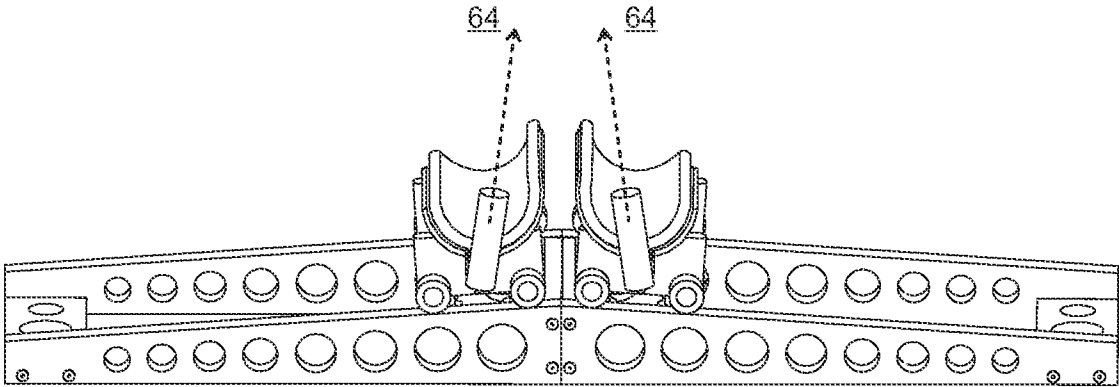


Fig. 25