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(54) **EXERCISE APPARATUS**

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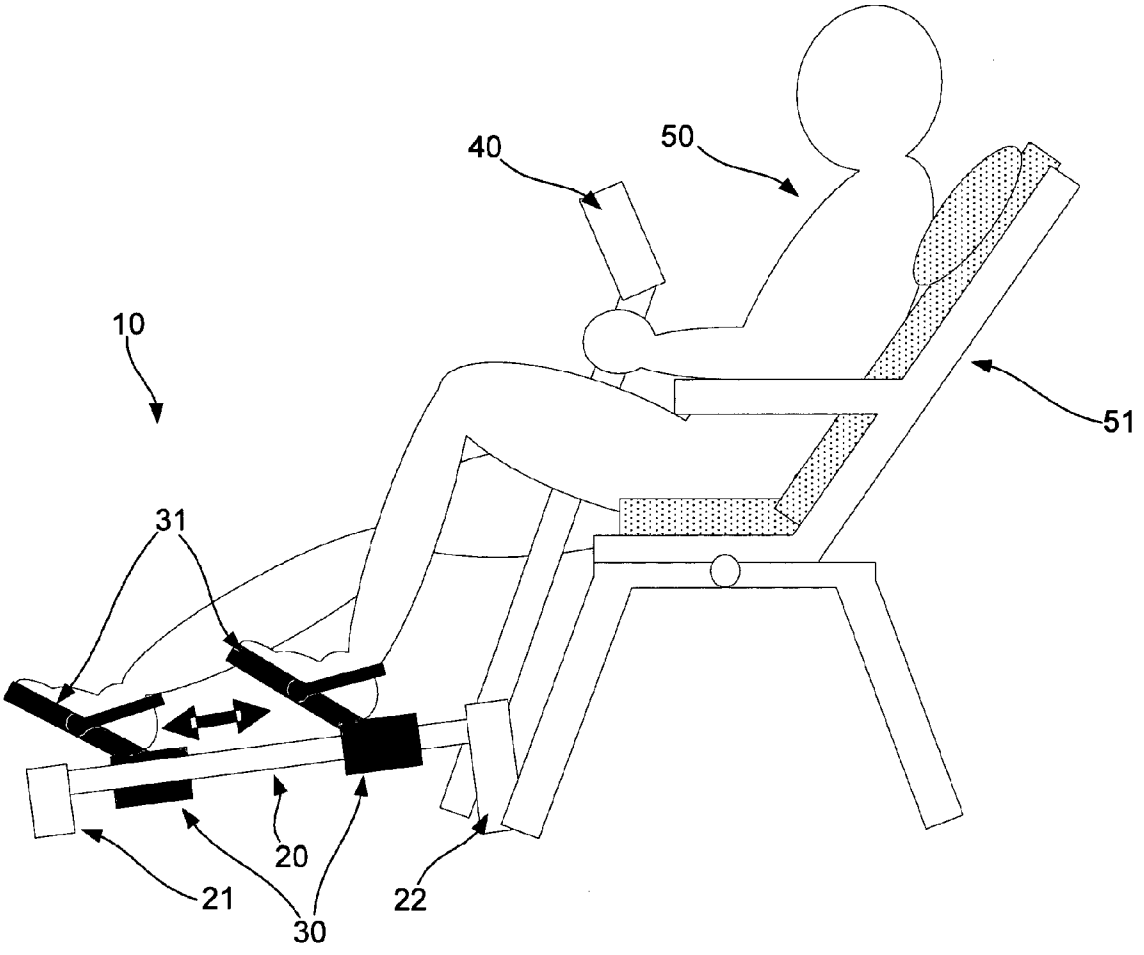
(57) **ABSTRACT**

Exercise apparatus including a guide and a sliding member slidably mounted to the guide, the sliding member including an operating member for allowing a user to apply first and second operating forces to the sliding member to thereby selectively slide the sliding member in respective first and second directions and a resistance mechanism for generating respective first and second resistive forces when the sliding member is moved in the first and second directions.



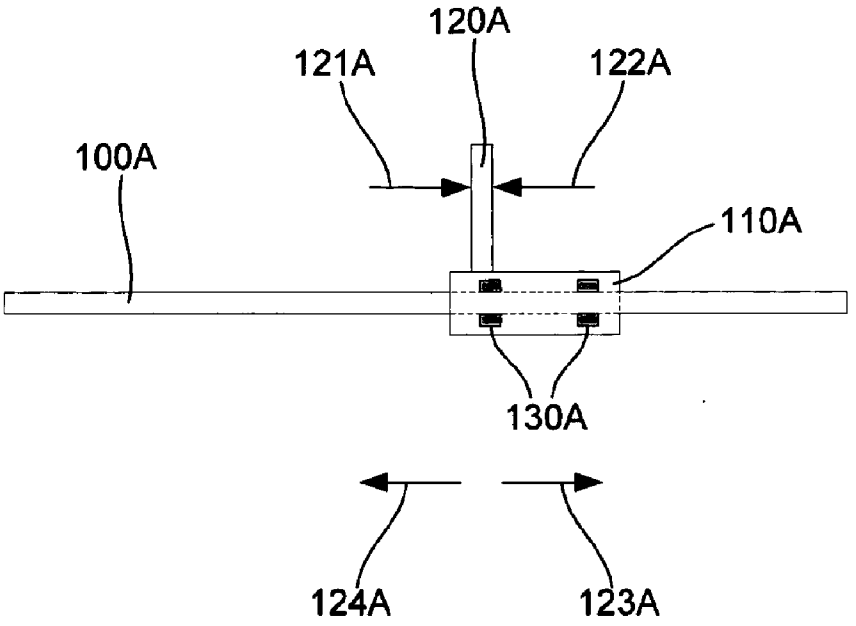

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Fig. 1A

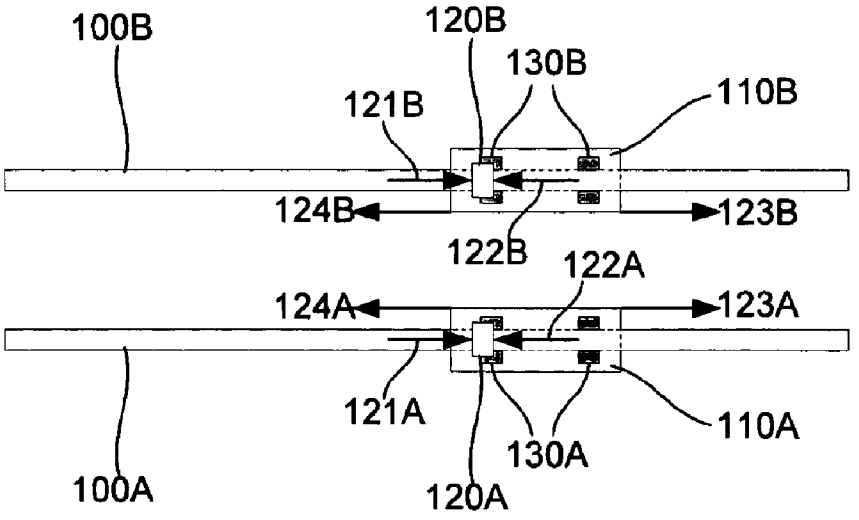
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Fig. 1B

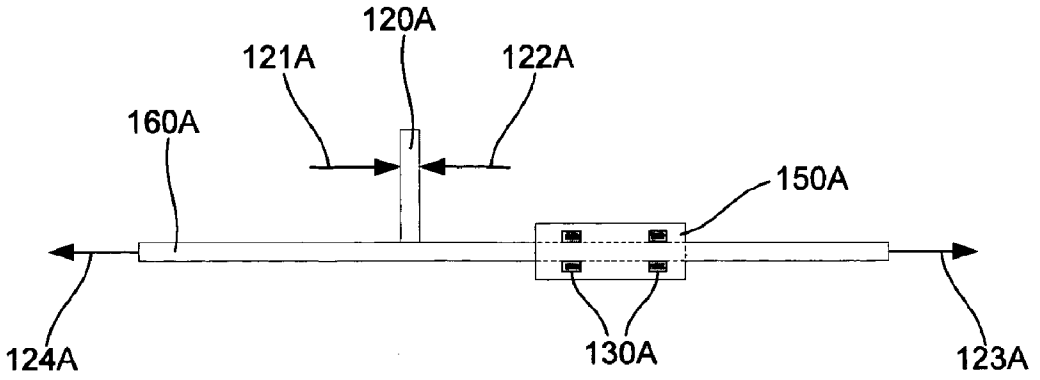
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Fig. 1C

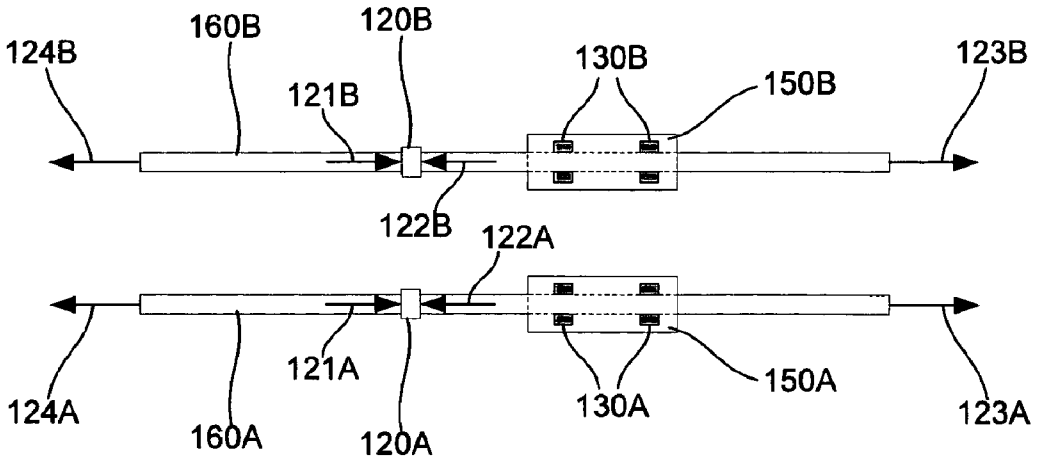
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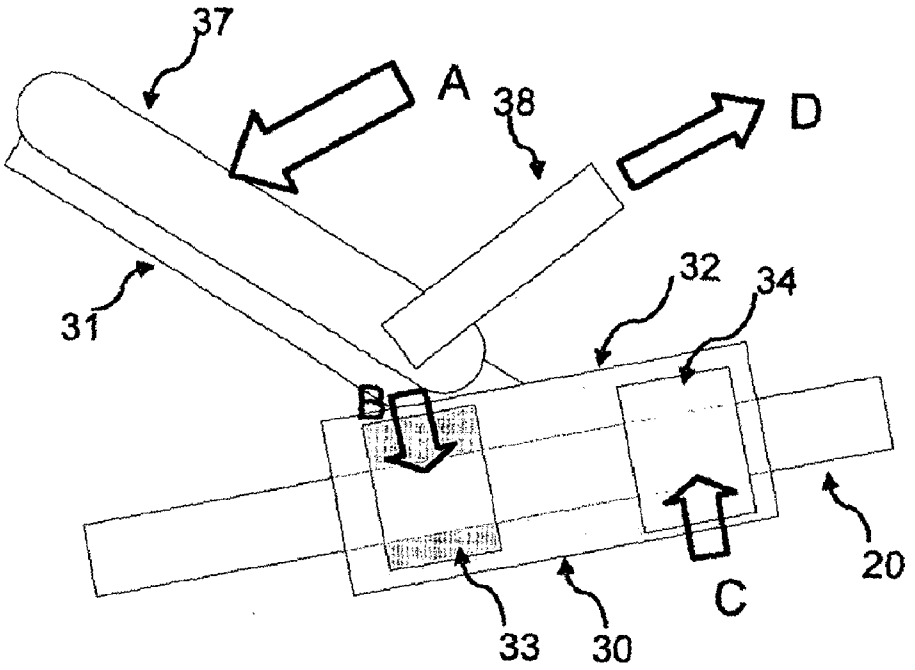
Fig. 1D



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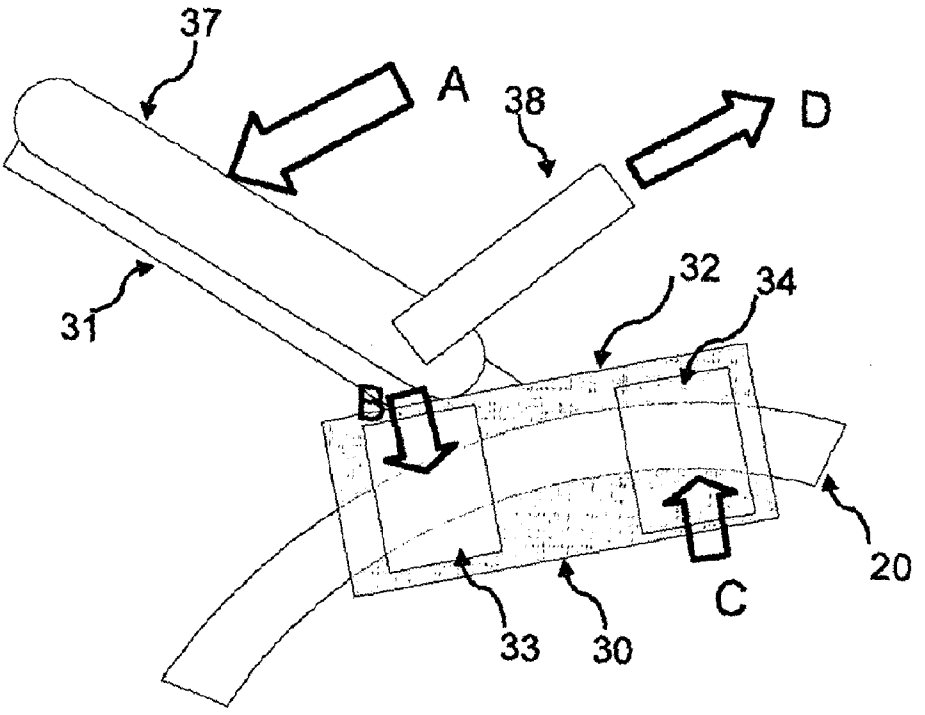
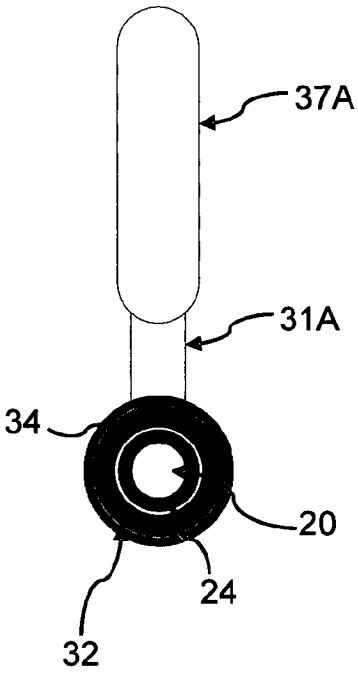


Fig. 2B



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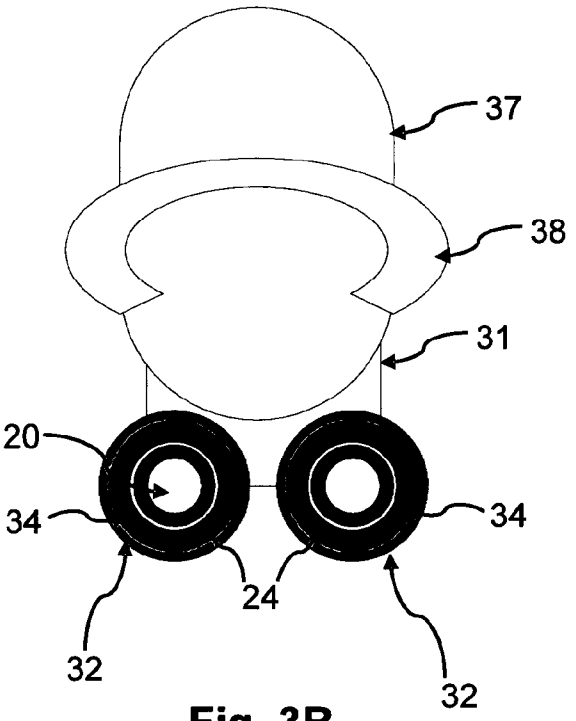

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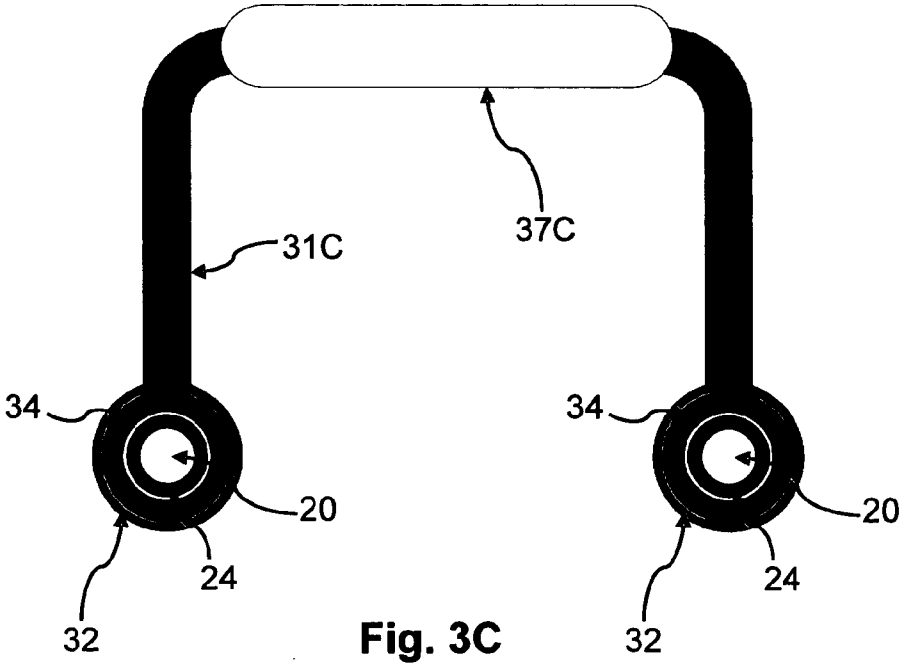
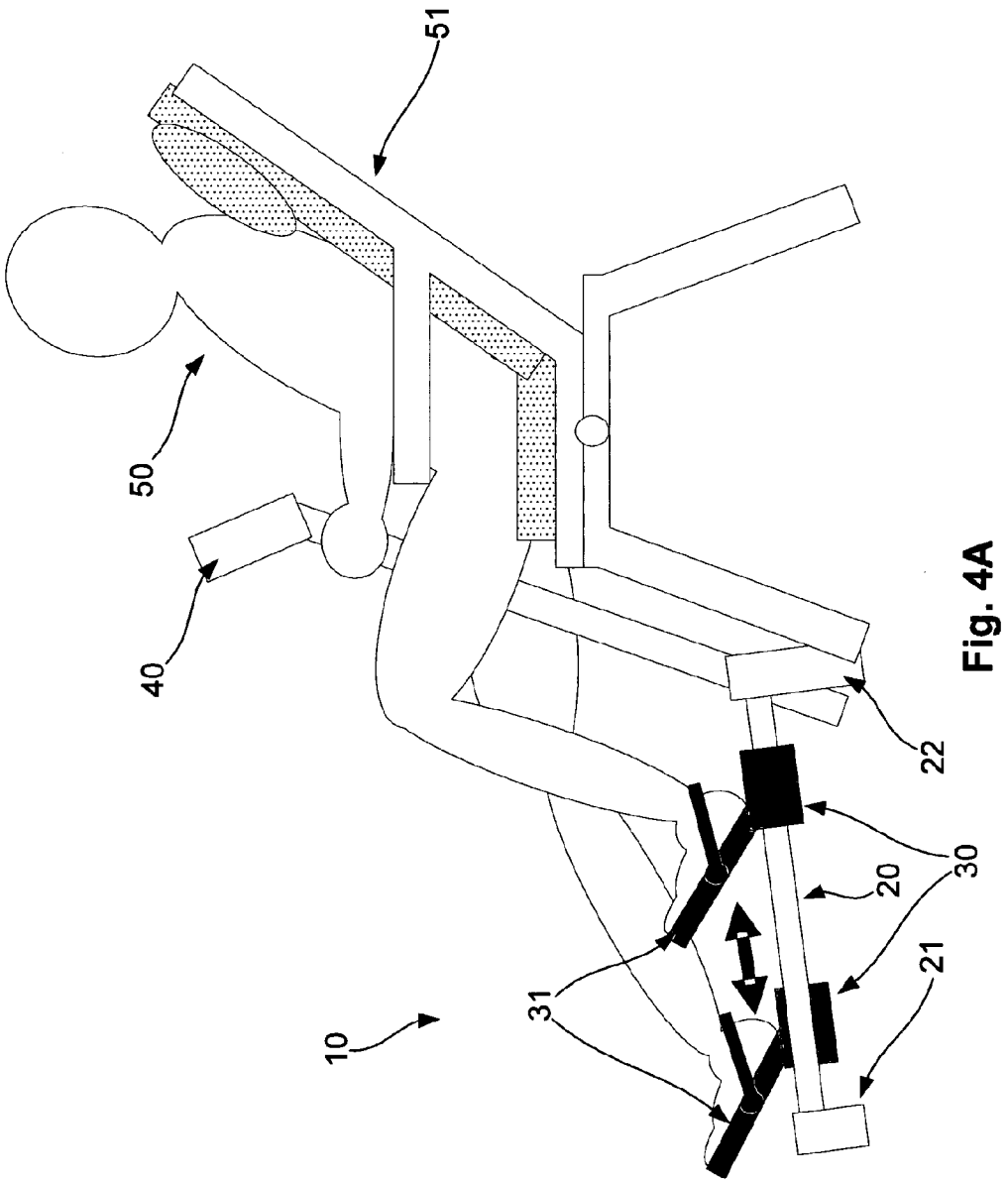


Fig. 3C



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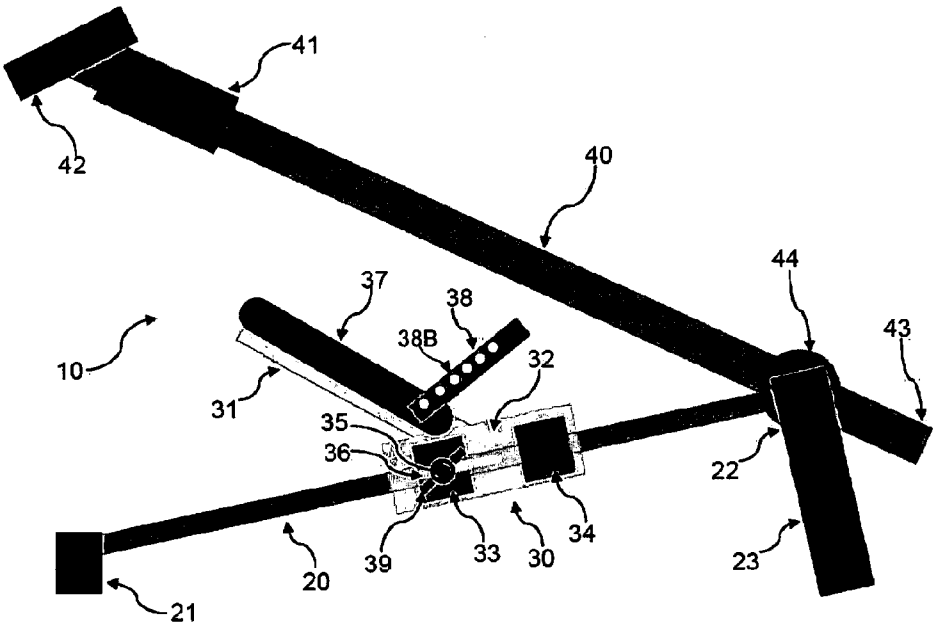
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Fig. 4B

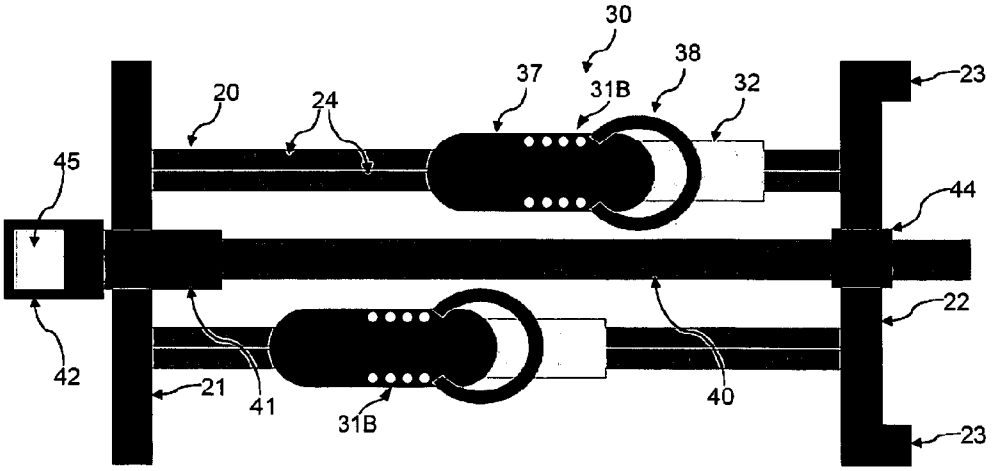
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Fig. 4C

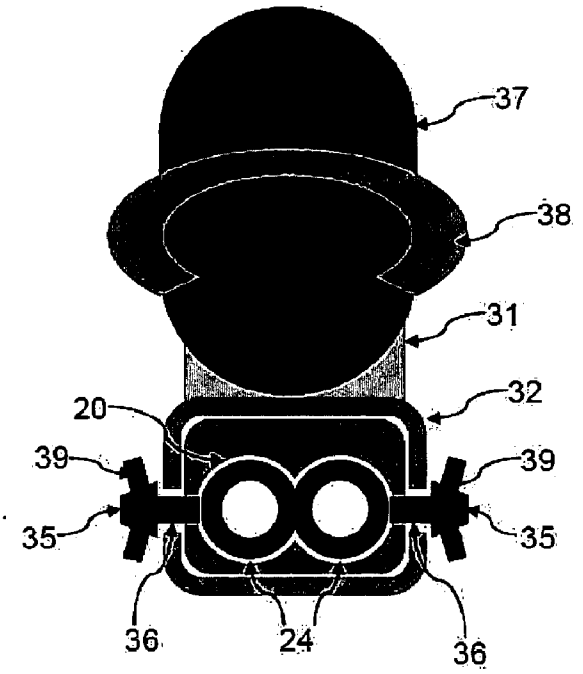
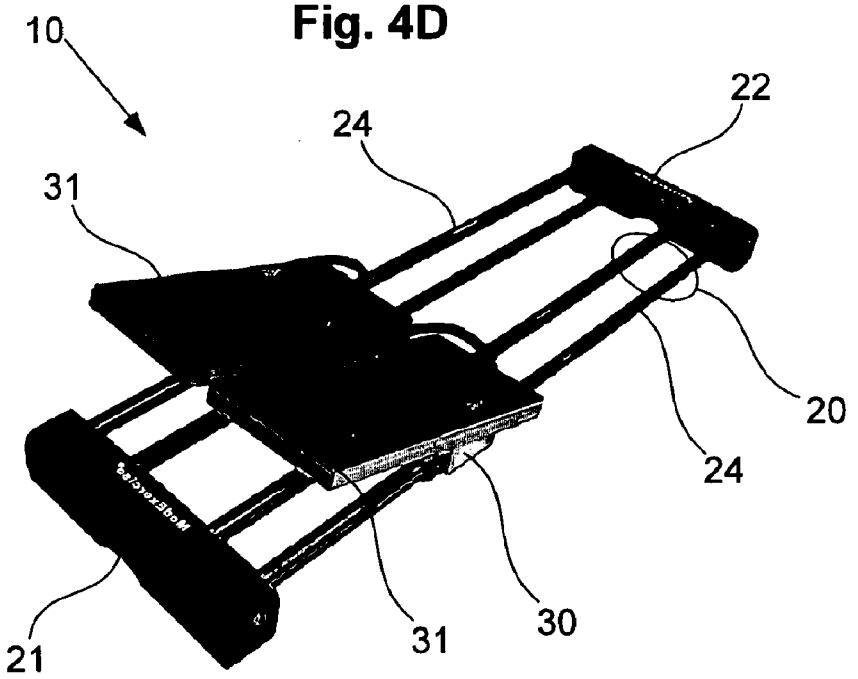


Fig. 4D



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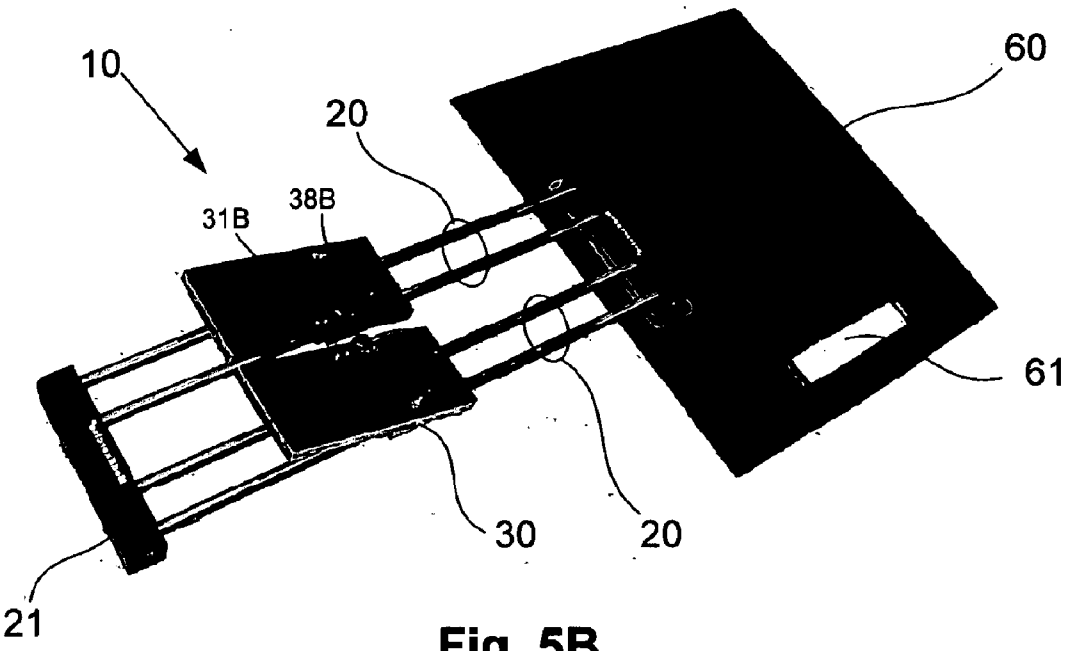

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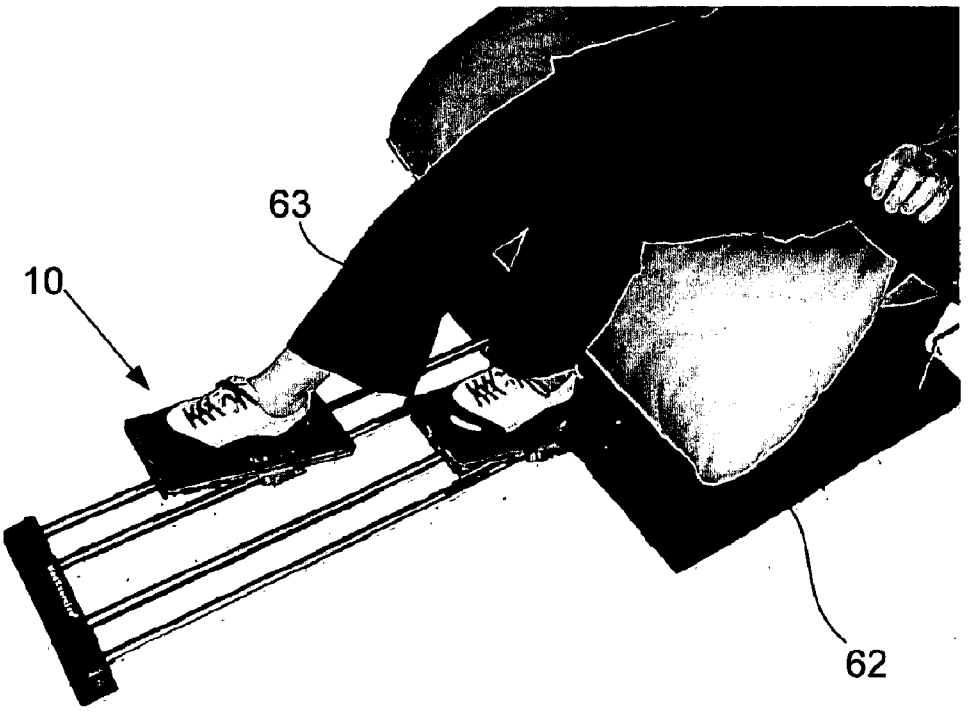

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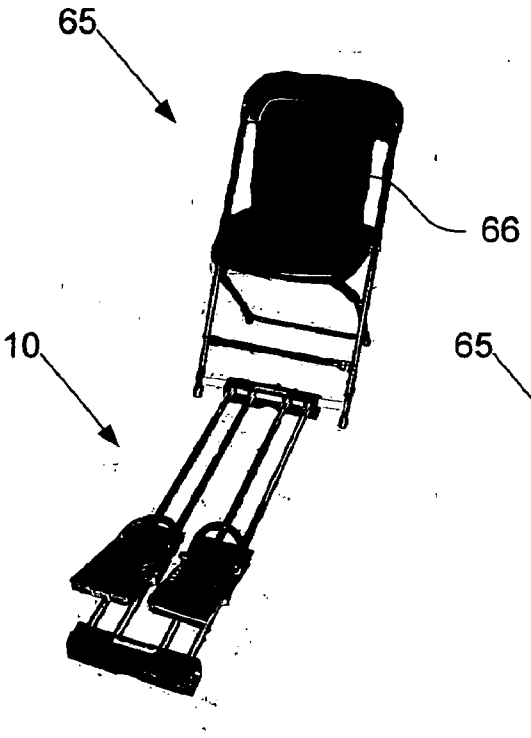
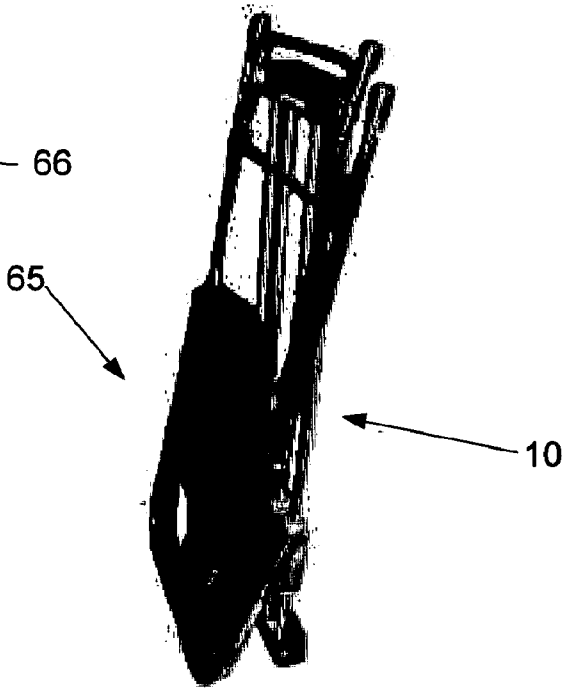


Fig. 6A



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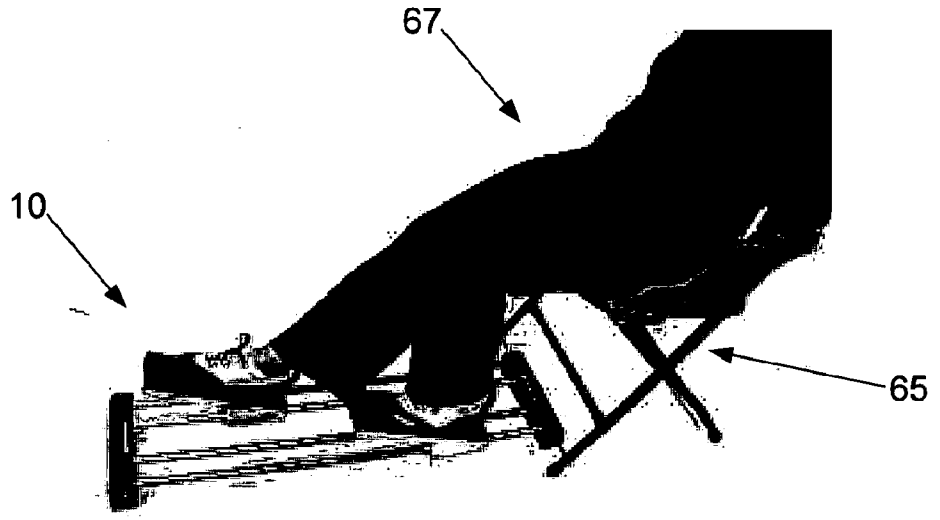

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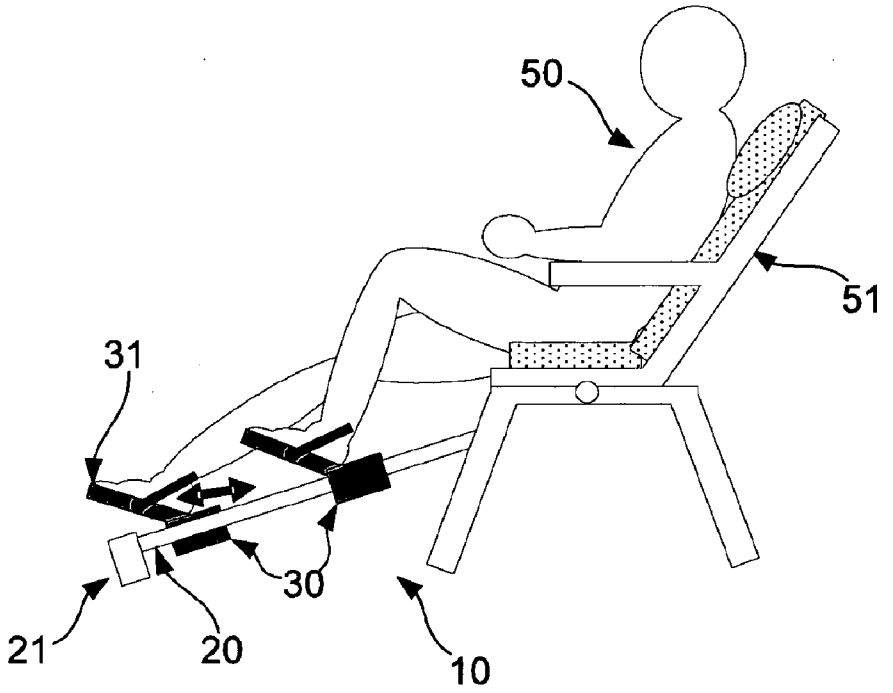

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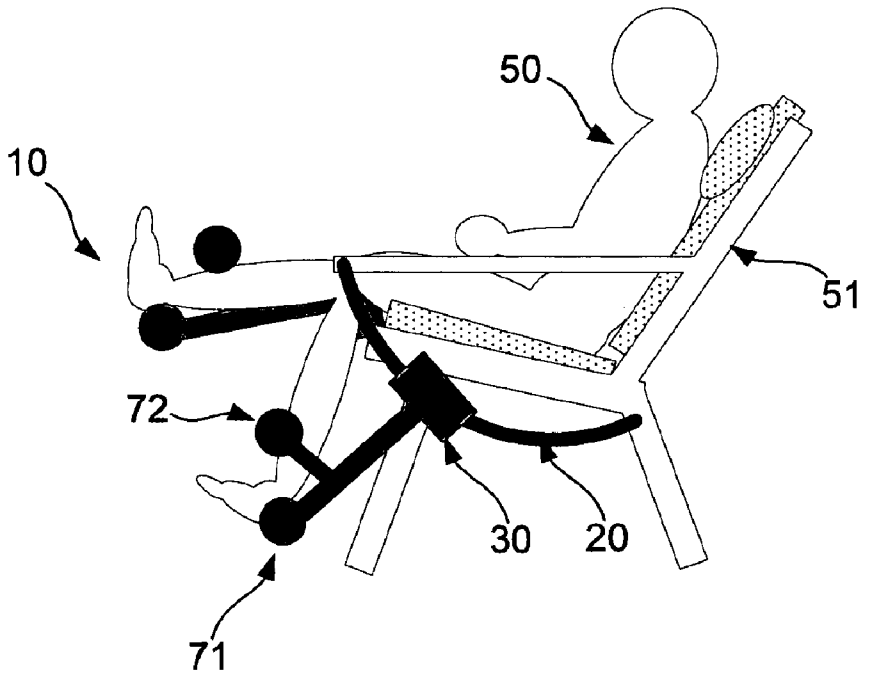
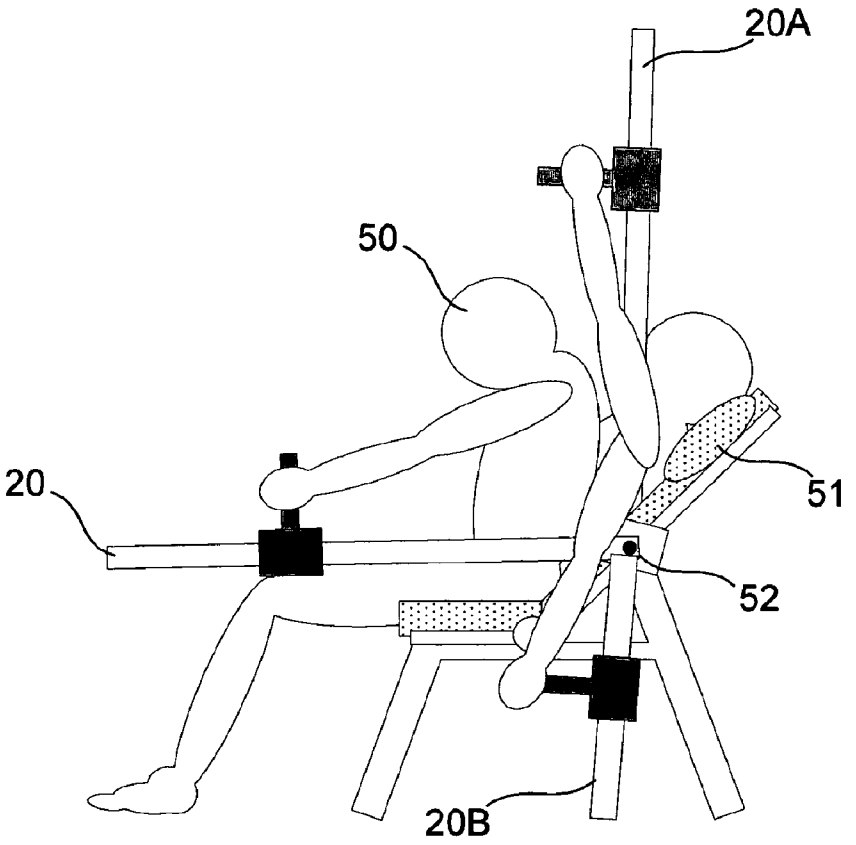


Fig. 7B



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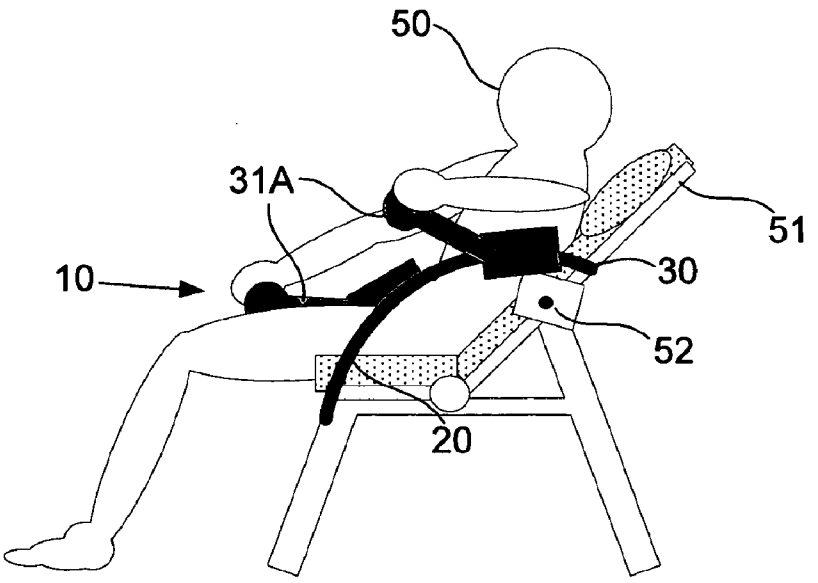

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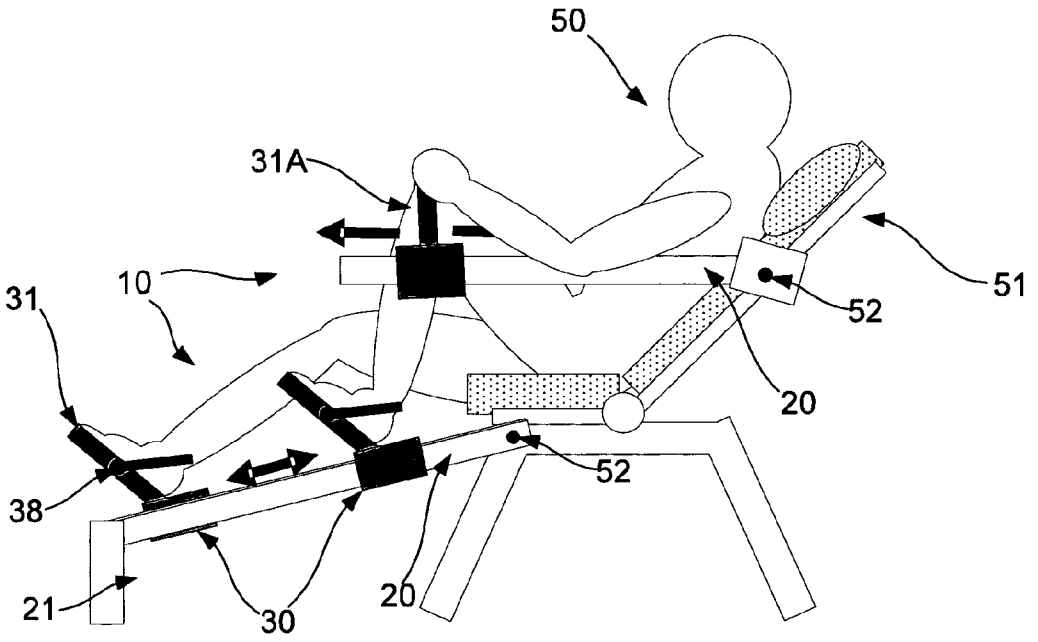


Fig. 9

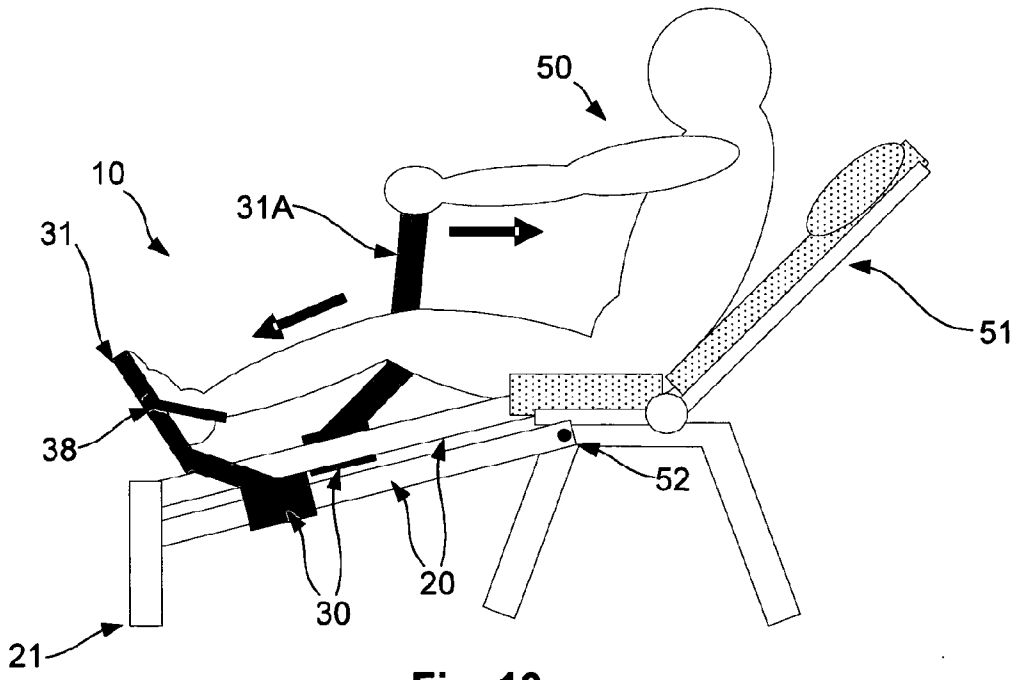
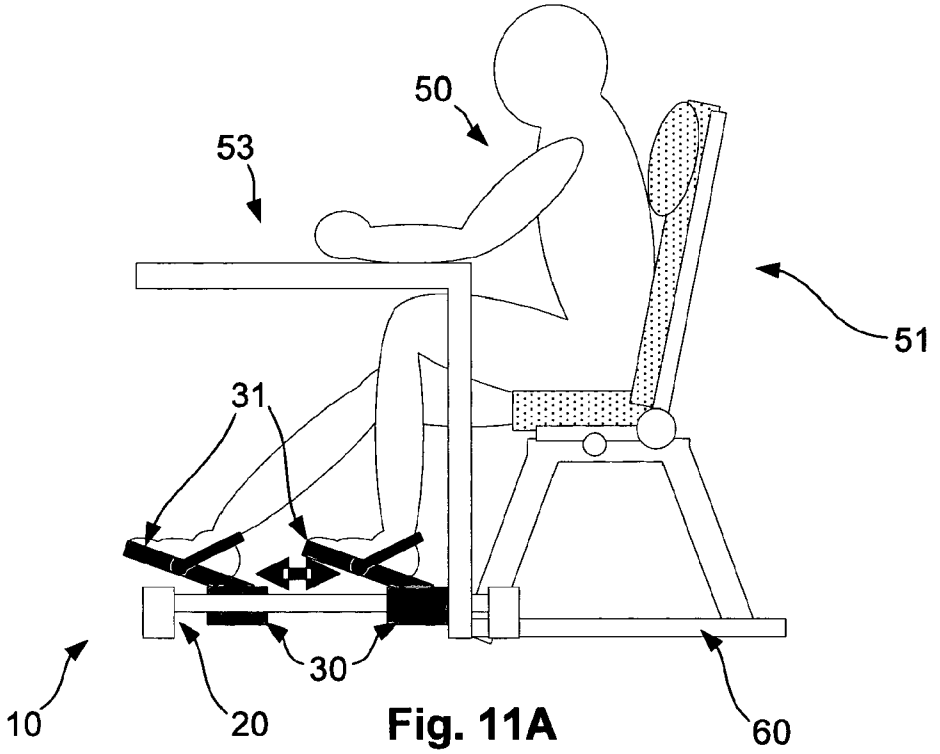


Fig. 10



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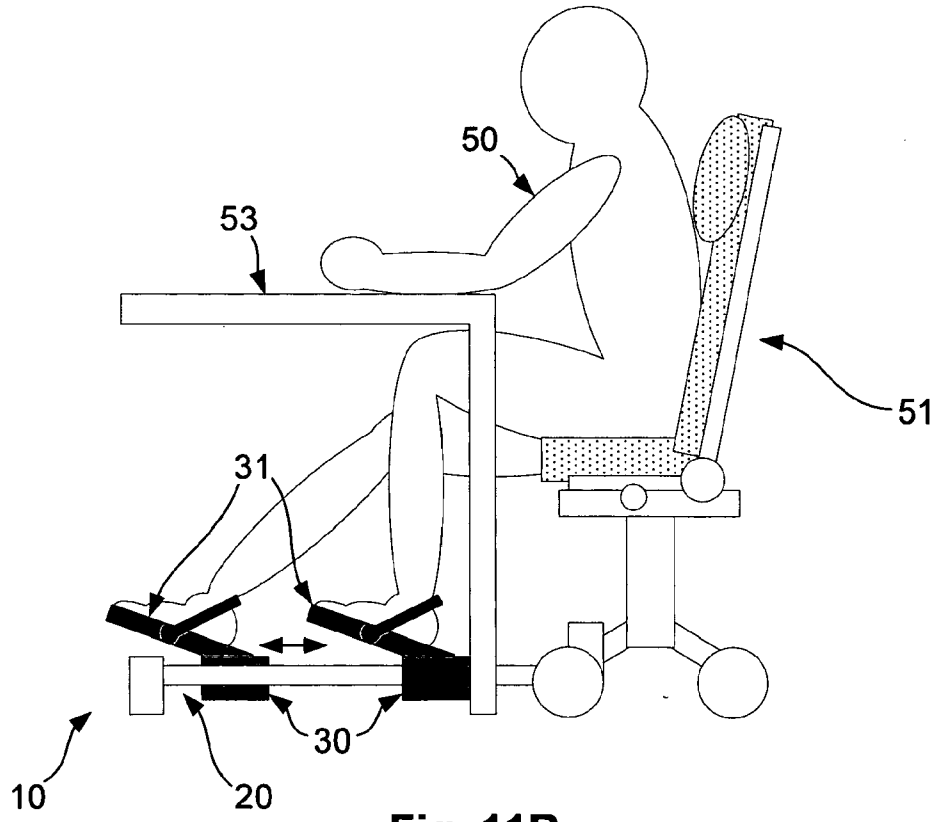

Fig. 11B

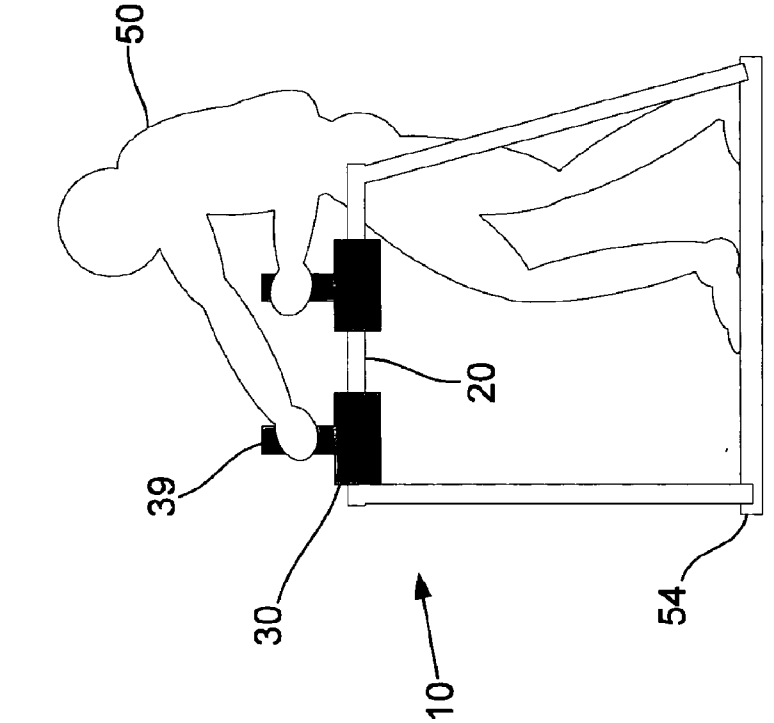

Fig. 12B

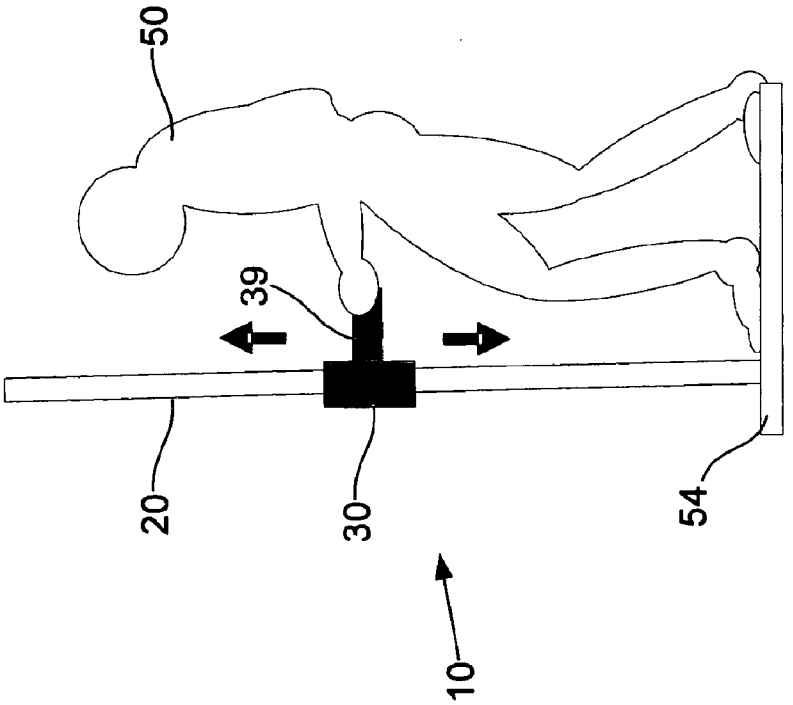

Fig. 12A

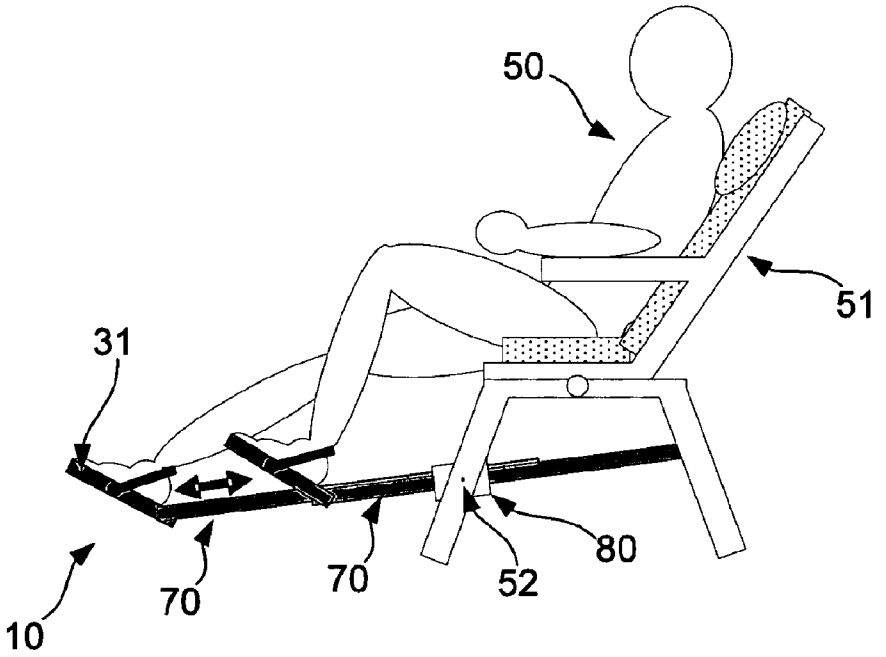

Fig. 13A

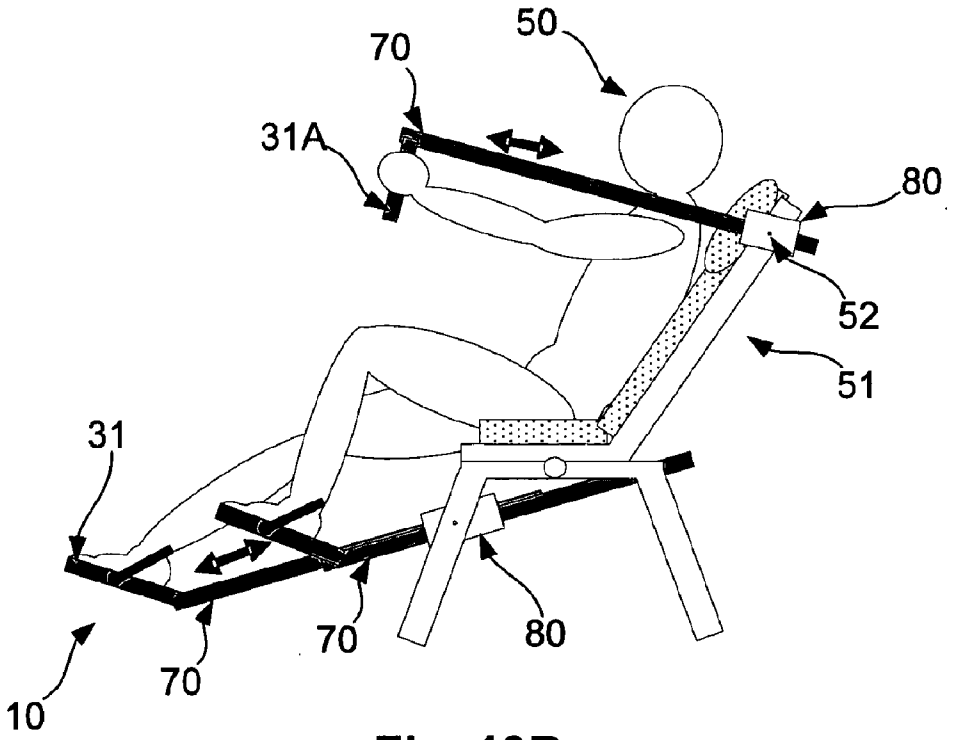

Fig. 13B

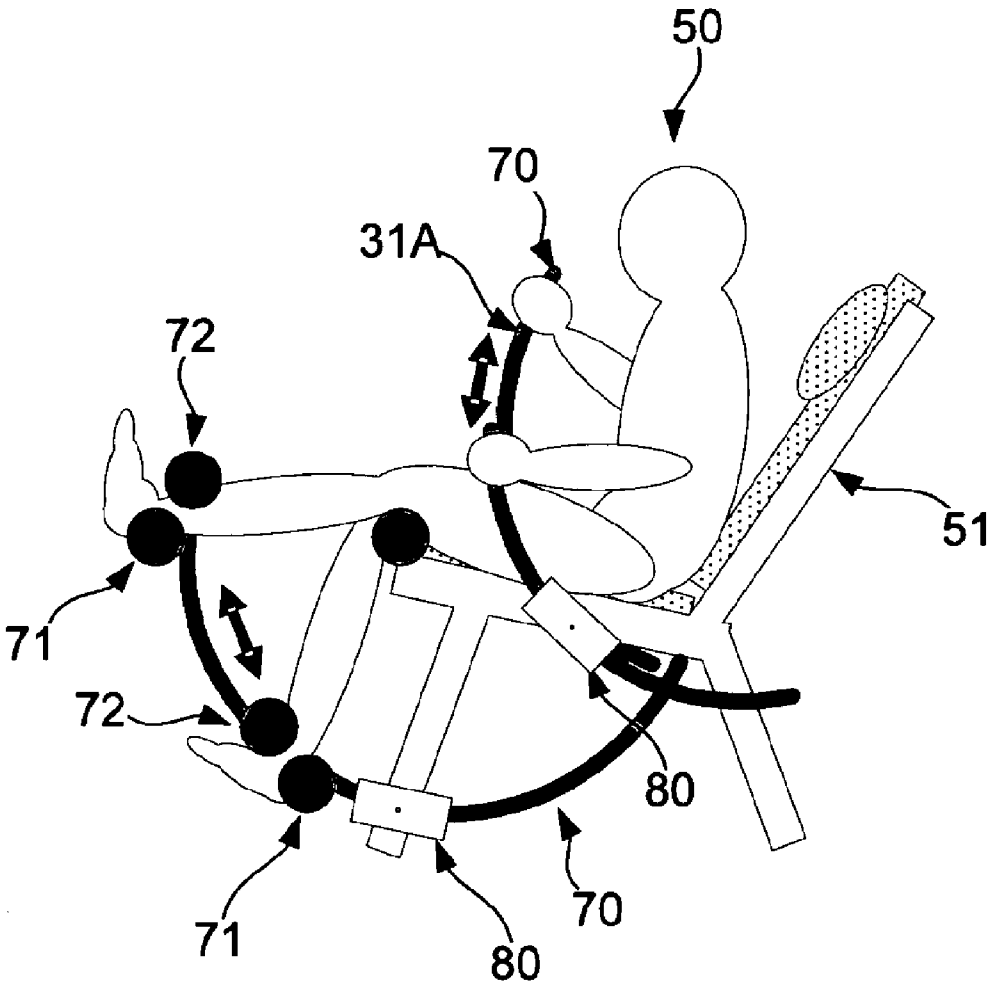

Fig. 13C

EXERCISE APPARATUS

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an exercise apparatus and method of exercising using an exercise apparatus, and more particularly to exercise apparatus for providing variable resistance to movement.

DESCRIPTION OF THE PRIOR ART

[0002] The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that the prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

[0003] Numerous health benefits of exercises resulted in popularity of exercise devices, which can be used at use's convenience, including in private homes and specialised gyms. Most common types of resistance exercise equipment include upright and recumbent bikes, elliptical trainers, rowers, steppers and strength equipment. These devices are usually heavy, bulky and expensive that is, at least in part, due to complex brake systems used in these devices.

[0004] Most conventional exercise devices use resistance mechanisms based on principles of electro-magnetism, mechanical and hydraulic friction, and gravitation. Electromagnetic brakes are silent, but require electrical power and/or heavy rotors and stators. Hydraulic resistance systems have considerable size and weight, and their resistance cannot be easily regulated. Weight based equipment utilises force of gravity but is awkward and unsafe to use without supervision. Mechanical friction is usually used in bicycle-type or belts brakes, which resist revolving a large and heavy disk or wheel.

[0005] These properties of existing resistance systems significantly limit design of new exercise devices and new applications of existing exercise devices. For example, existing miniature exercise devices, e.g. mini steppers and bikes, have significantly limited capabilities and are awkward to use, where miniaturization results in short distance of resisted movement (working distance). In mini steppers and bikes working distance is about 10 cm, whereas movement range of human legs is over 50 cm. Short working distance makes exercises confined only to small muscle groups and, therefore, not efficient. Even standard bicycles do not provide resistance for full range of human leg extension, allowing only about 30 cm of resisted movement. In addition, all bicycle-like devices have non-linear trajectory of resisted movements due to platform revolution and no resistance for leg flexion, e.g. no hamstring muscles load.

[0006] Other limitations of existing exercise devices are non-physiological resistance profiles, rigid regulation of resistance and non-linear trajectory of resistance movements. The use of weights, springs, hydraulics or other preset resistances require the user to use only that amount of strength necessary to move the device through the weakest part of any movement. Such devices do not allow the user to work at his or her maximum capabilities during that portion of movement in which the user has higher strength capabilities because muscle torque is maximal in the middle of contraction and drops towards the full muscle contraction.

[0007] Thus, it has been recognized that exercise equipment should offer variable resistance at a level which can be adapted to the user's abilities and desires throughout the entire range of the exercising stroke.

SUMMARY OF THE PRESENT INVENTION

[0008] In a first broad form the present invention seeks to provide exercise apparatus including:

[0009] a) a guide; and,

[0010] b) a sliding member slidably mounted to the guide, the sliding member including an operating member for allowing a user to apply first and second operating forces to the sliding member to thereby selectively slide the sliding member in respective first and second directions; and,

[0011] c) a resistance mechanism for generating respective first and second resistive forces when the sliding member is moved in the first and second directions.

[0012] Typically a magnitude of at least one of the resistive forces is related to at least one of:

[0013] a) a magnitude of the respective operating force; and,

[0014] b) a position at which the respective operating force is applied to the operating member.

[0015] Typically sliding the sliding member in the first and second directions provides exercise and return strokes respectively, and wherein, at least one of:

[0016] a) the second resistive force is less than the first resistive force; and,

[0017] b) the second resistive force is the same as the first resistive force.

[0018] Typically the resistance mechanism includes first and second brakes mounted to at least one of the sliding member and the guide.

[0019] Typically at least one of the first and second brakes includes an aperture for receiving at least one of the sliding member and the guide.

[0020] Typically the first and second brakes are arranged so that the first and second brakes are urged against at least one of the sliding member and the guide at least when the first operating force is applied to the operating member.

[0021] Typically the first brake acts as a fulcrum so that the second brake is urged against at least one of the sliding member and the guide at least when the first operating force is applied to the operating member.

[0022] Typically a magnitude of at least the first resistive force is dependent on relative distances between at least one of:

[0023] a) the first and second brakes; and,

[0024] b) the first brake and a position at which the first operating force is applied to the operating member.

[0025] Typically a position of the first and second brakes is adjustable to thereby adjust at least one of the resistive forces.

[0026] Typically the brakes are made of a low friction material, including at least one of:

[0027] a) a self lubricating plastic;

[0028] b) nylon;

[0029] c) polyester;

[0030] d) polyethylene; and,

[0031] e) polyfluoroethylene.

[0032] Typically a magnitude of at least one of the resistive forces depends on at least one of:

[0033] a) a brake material;

[0034] b) a brake coefficient of friction; and,

[0035] c) a size of the first and second brakes.

[0036] Typically the operating element includes a handle for being gripped by a user's hand in use.

[0037] Typically the operating element includes a foot platform for receiving a user's foot in use.

[0038] Typically the foot platform includes a heel strap for receiving a user's heel in use, the heel strap being adjustable to thereby control a position of the user's foot on the foot platform in use.

[0039] Typically a position of the operating element relative to the sliding member is adjustable.

[0040] Typically the guide includes at least one of:

[0041] a) a linear guide rail; and,

[0042] b) a curved guide rail.

[0043] Typically the guide includes a pair of parallel rails.

[0044] Typically the guide includes a sliding surface for engaging brakes of the resistance mechanism in use.

[0045] Typically the apparatus includes:

[0046] a) two guides; and,

[0047] b) two sliding members, each sliding member being slidably mounted to a respective guide to thereby allow a user to apply operating forces to each sliding member independently.

[0048] Typically the apparatus includes:

[0049] a) two guides; and,

[0050] b) a sliding member slidably mounted to the two guides.

[0051] Typically each sliding member is adapted to allow a user to independently exercise a respective limb.

[0052] Typically the apparatus includes a frame for supporting at least the guide in use.

[0053] Typically the apparatus includes a docking member removably mounted to the frame, the docking member being for engaging a user support to thereby stabilising the apparatus in use.

[0054] Typically the guide is removably mounted to a chair.

[0055] Typically the guide is pivotally mounted to a chair to allow the guide to be moved between folded and operative positions.

[0056] Typically the apparatus includes a control bar for stabilising the apparatus in use.

[0057] Typically the sliding member includes at least one of:

[0058] a) a linear sliding rail; and,

[0059] b) a curved sliding rail.

[0060] Typically the sliding member includes a pair of parallel sliding rails.

[0061] Typically the sliding member includes a sliding surface for engaging brakes of the resistance mechanism in use.

[0062] In a second broad form the present invention seeks to provide a method of using exercise apparatus, the exercise apparatus including:

[0063] a) a guide; and,

[0064] b) a sliding member slidably mounted to the guide, the sliding member including an operating member; and,

[0065] c) a resistance mechanism for generating respective first and second resistive forces when the sliding member is moved in first and second directions, the method including applying first and second operating forces to the sliding member using the operating member to thereby selectively slide the sliding member in respective first and second directions against the first and second resistive forces.

[0066] Typically the method includes controlling a magnitude of at least one of the resistive forces by at least one of:

[0067] a) controlling a magnitude of the respective operating force; and,

[0068] b) controlling a position at which the respective operating force is applied to the operating member.

[0069] Typically the apparatus includes:

[0070] a) two guides; and,

[0071] b) two sliding members, each sliding member being slidably mounted to a respective guide, and wherein the method includes applying operating forces to each sliding member independently using a respective limb.

[0072] In a third broad form the present invention seeks to provide an exercise device for use in exercising devices, the apparatus including: at least two linear guide rails with sliding surfaces, which are supported by the frame, where each guide rail consisting of two parallel tubes; at least two slide members mounted onto respective guide rails for sliding therealong, each comprising the tube with a foot platform and two sliding brakes, where position of at least of one brake can be shifted along the tube; and at least one control bar with grip and exercise counting device.

[0073] Typically the guide rail includes means to allow resisted linear movement of the slide member at distance of full range of user's leg extension and flexion; wherein the guide rail is sloped forward because of longer legs of rear frame than height of front frame; wherein each guide rail consists of two tubes arranged in parallel.

[0074] Typically the apparatus includes independent resistance mechanisms for each user's leg, allowing independent exercising of each user's leg at required distance and resistance; wherein the apparatus includes means for exercising of user's leg alternately or simultaneously.

[0075] Typically the sliding brakes are made from heat and abrasion resistance plastic material with low friction coefficient, including self-lubricating plastics; wherein the use of low friction material in sliding brakes are for smooth sliding of the slide member along the linear guide rail; where self-lubricating plastics in sliding brakes are for lower resistance at least at the end of exercise stroke, which corresponds to physiological drop of muscle torque at the end of exercise stroke, allowing prolonged exercises of variable intensity for general exercises, sports training, medical exercises and rehabilitation.

[0076] Typically each sliding brake comprise aperture corresponding to the cross-section of the guide rail; wherein the slide member is mounted onto the guide rail so that the guide rail goes to through the sliding brakes inside the tube of the slide member; wherein sliding brakes are positioned in succession on the guide rail; wherein corresponding cross-sections of holes in the brakes and tubes of the guide rail ensures side-wise stability of the slide member.

[0077] Typically the foot platform is attached to the tube of the slide member at forward angle and, therefore, includes means to be pushed forward by the user during exercise stroke; wherein pushing foot platform forward is transferred to push a front brake down and to push the rear brake up towards the guide rail via lever mechanism; wherein the lever mechanism includes the foot platform as an effort arm, the front brake as a fulcrum, the tube connecting brakes as a load arm and the rear brake as the load; wherein each foot platform includes a heel strap for return movement of foot platform into starting position after exercise stroke.

[0078] Typically the apparatus includes means to transfer user's muscle force into tension between sliding brakes and guide rail via lever mechanism, resulting in friction between brakes and guide rail and, therefore, frictional resistance to user's efforts, whereas sliding properties of brakes allow smooth resisted skidding of the slide member along the guide rail, allowing exercising of user's muscles.

[0079] Typically the apparatus includes means to vary resistance during or between exercise strokes by shifting user's foot position along the foot platform and by changing the point of force application from the forefoot to the heel, which result in shifting position of effort point in the lever and, therefore, length of the effort arm of the lever; wherein force application by user away from the tube results in longer effort arm and respective higher resistance to the movement of slide member during exercise stroke and vice verse.

[0080] Typically the tube of the slide member includes at least two slots and respective bolts with nuts for at least one sliding brake, allowing changing position of at least one sliding brake inside the tube along the slots, allowing varying the distance between brakes; wherein the shorter distance between brakes results in jamming action between brakes and the guide rail, and resultant higher constant resistance to movement of slide member along the guide rail in both directions and vice verse; wherein the shorter distance between brakes increases mechanical advantage in the lever action during exercise stroke due shorter load arm of the lever and vice verse.

[0081] Typically the apparatus includes dual means to regulate resistance to forward exercise stroke via changing effort point on the foot platform and by varying distance between brakes; wherein the apparatus includes means to regulate resistance to return stroke by varying distance between brakes; wherein the apparatus includes means for varying ratio between resistances to exercise and return strokes, which both can be used for exercising of leg extension and flexion muscles, respectively.

[0082] Typically the apparatus includes means for use both exercise and return strokes for exercising, where resistance for exercise stroke exceeds resistance to return stroke.

[0083] Typically the control bar is pivotally attached to the rear frame of the exercise device and includes a grip and exercise counting device; wherein the control bar includes means to be folded for storage; wherein the grip is for holding and stabilizing the exercise device by the user and counting device is for counting and programming of exercises.

[0084] Typically the guide rail includes means to be of any length and to be positioned at any angle to allow linear movement of the slide member at any spatial direction and at any distance; wherein the apparatus allows a full range of resisted linear exercise movements by the user at any direction in order to exercise any major muscle group in the body; wherein the guide rail includes means to be attached to the seat or stand and to be combined with other exercise devices.

[0085] Typically the apparatus includes means to be used in reclined steppers, where independent resistant mechanisms for each user's leg allow alternate or simultaneous pushing foot platforms against variable resistance in full range of user's leg extension; wherein the apparatus includes means for the user to reproduce stepping movements in reclined position; wherein the apparatus includes means to be folded for storage via pivotal connection between guide rail and seat; wherein reclined position of users and leg suspension allows the use of device for exercising of elderly, frails and disabled people, including for medical exercises and rehabilitation.

[0086] Typically the apparatus includes means to be used in hand-operated push-pull exercisers, where handles are used instead of foot platforms; wherein independent resistant mechanisms for each user's arm allow alternate or simultaneous pushing and pulling handles against variable resistances at full range of upper body extension and flexion; wherein the apparatus includes means for the user to reproduce resisted pushing and pulling movements at stationary position of the user.

[0087] Typically the apparatus includes means to be used in reclined steppers combined with hand-operated push-pull exercisers; wherein independent resistant mechanisms for each user's arm and leg allow alternate or simultaneous pushing and pulling foot platforms and handles against variable resistances at full range of leg and upper body extension and flexion; wherein the apparatus includes means for the user to provide total body exercising at stationary position of the user.

[0088] Typically the apparatus includes means to be used total body exercise devices, including in rowing devices, where independent resistant mechanisms provide variable resistance in opposite directions for simultaneous user's leg extension and arm flexion, respectively; wherein the apparatus includes means for the user to reproduce rowing movements in stationary position of the user; wherein the apparatus includes means to be used by user's arms, where handles are attached to the slide member instead of foot platforms.

[0089] Typically the apparatus includes means to be used in compact 'under-desk' exercise devices, where independent resistant mechanisms for each user's leg allow pushing and pulling foot platforms against variable resistance in full range of user's leg extension; wherein the horizontal arrangement of guide bar includes means for the user to fully extend legs at the knee joint against resistance without lifting the knee; wherein the apparatus includes means for use of device in confounded spaces, including under desk in offices and in-cabin of cars, trains, ships and airplanes.

[0090] Typically the apparatus includes means to be used in vertical exercisers, where the long guide rail is positioned vertically and handles are used instead of foot platforms; wherein the apparatus includes means for the user to push up and pull down the slide member at range from ground to height of human body with uplifted arms against variable resistance; wherein the apparatus includes means for the user to reproduce resisted pushing up and pulling down movements in full range of human body reach, resembling pull-ups and weight lifting.

BRIEF DESCRIPTION OF THE DRAWINGS

[0091] An example of the present invention will now be described with reference to the accompanying drawings, in which:

[0092] FIGS. **1**A and **1**B are schematic side and plan views of a first example of an exercise apparatus;

[0093] FIGS. **1**C and **1**D are schematic side and plan views of a second example of an exercise apparatus;

[0094] FIGS. **2**A and **2**B are schematic side views of an example sliding member;

[0095] FIGS. **3**A to **3**C are schematic end views of example guide arrangements;

[0096] FIG. **4**A is a schematic side view of an example of an exercise device;

[0097] FIG. **4**B is a schematic side view of the exercise device of FIG. **4**A with the control bar in half-folded position;

[0098] FIG. **4**C is a schematic top view of the exercise device of FIG. **4**A with the control bar in a folded position;

[0099] FIG. **4**D is a schematic front view of the exercise device of FIG. **4**A showing a cut-off cross-section of the resistance mechanism;

[0100] FIG. **5**A is a perspective view of an example of an exercise device;

[0101] FIG. **5**B is a perspective view of the exercise device of FIG. **5**A coupled to a docking mat;

[0102] FIG. **5**C is a perspective view of the exercise device of FIG. **5**A coupled to a chair using the docking mat and with a user positioned for leg exercises;

[0103] FIG. **6**A is a perspective view of an example of an exercise device attached to the folding chair with a lumbar support cushion unfolded;

[0104] FIG. **6**B is a perspective view of the exercise device of FIG. **6**A in a folded position;

[0105] FIG. **6**C is a perspective view of the exercise device of FIG. **6**A with the user positioned for leg exercises;

[0106] FIGS. **7**A and **7**B are schematic side views of example exercise devices showing the user positioned for stepping and leg extension/flexion exercises, respectively, in a reclined position;

[0107] FIGS. **8**A and **8**B are schematic side views of one example of exercise device showing the user positioned for push-pull exercises using their arms;

[0108] FIG. **9** is a schematic side view of an example of an exercise device showing the user positioned for total body exercises, using combination of stepping and push-pull exercises;

[0109] FIG. **10** is a schematic side view of an example of an exercise device showing the user positioned for rowing exercises;

[0110] FIGS. **11**A and **11**B are schematic side views of an example of an exercise device showing the user positioned for 'under-desk' exercises;

[0111] FIGS. **12**A and **12**B are schematic side views of an example of an exercise device showing the user exercising in a standing position;

[0112] FIG. **13**A is a schematic side view of an example of an alternative exercise device showing the user positioned for stepping exercises in a reclined position;

[0113] FIG. **13**B is a schematic side view of an example of an alternative exercise device showing the user positioned for total body exercises, using combination of stepping and push-pull exercises; and,

[0114] FIG. **13**C is a schematic side view of a second example of an alternative exercise device showing the user positioned for total body exercises, using combination of stepping and push-pull exercises.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0115] The following description of the preferred embodiments is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses.

[0116] An example of exercise apparatus will now be described with reference to FIGS. **1**A and **1**B.

[0117] In this example, the exercise apparatus includes two guides **100**A, **100**B, each having a respective sliding member **110**A, **110**B slidably mounted thereon. Each sliding member **110**A, **110**B includes an operating member **120**A, **120**B for allowing a user to apply first and second operating forces **121**A, **122**A; **121**B, **122**B to the sliding member **120**A, **120**B to thereby selectively slide the sliding member **120**A, **120**B in respective first and second directions **123**A, **124**A; **123**B, **124**B.

[0118] Each sliding member **110**A, **110**E also includes a resistance mechanism, **130** for generating respective first and second resistive forces when the sliding member is moved in the first and second directions.

[0119] Typically the operating member **120**A, **120**B is in the form of a foot platform or hand grip allowing the user to apply first and second operating forces using their legs or arms respectively. In use, application of an operating force to the operating member **120** causes the respective sliding member **110** to slide along the guide **100**, with the sliding motion being resisted by the resistance mechanism **130**. Accordingly, it will be appreciated that this allows the user to slide the sliding members repeatedly in the first and second directions, to thereby exercise their arms or legs. The first and second directions can be used to provide exercise and return strokes respectively, in which case the second resistive force is typically less than the first resistive force. However, this is not essential, and equal forces may be provided.

[0120] Although two guides **100** are shown, this is for the purpose of example only to allow two limbs to be exercised both independently and simultaneously. However, this is not essential, and any number of guides can be used depending on the configuration of the exercise apparatus.

[0121] In one example, a magnitude of at least one of the resistive forces is related to a magnitude of the respective operating force, and/or a position at which the respective operating force is applied to the operating member. This allows a user to adjust the resistive forces that are encountered, for example by altering the position or portion of their foot which is applying the operating force to the foot platform, or by increasing or decreasing the force exerted on the foot platform. Additionally, and/or alternatively, the position of the operating member may be adjustable, to provide additional control over the resistive force encountered.

[0122] The resistive force is typically generated by the sliding of the sliding member along the guide, and in one particular example, this is achieved using brakes that engage the guide. By using a sliding brake arrangement, this can ensure that the resistive force is substantially constant along the length of the guide, subject to variations in the applied operating forces as described above. This allows a user to exercise their limb along the entire range of motion of the limb, which is beneficial in ensuring that loading is spread over the user's muscles in the relevant limb, thereby providing a balanced work out.

[0123] The above arrangement enables a user to easily control the amount of exercise being performed, making the exercise apparatus particularly suitable for medical applications such as physiotherapy and rehabilitation.

[0124] An alternative example of exercise apparatus will now be described with reference to FIGS. **1**C and **1**D.

[0125] In this example, the exercise apparatus includes two guides **150**A, **150**B, each having a respective sliding member **160**A, **160**B slidably mounted therein. Each sliding member **160**A, **160**B includes an operating member **120**A, **120**B for allowing a user to apply first and second operating forces **121**A, **122**A; **121**B, **122**B to the sliding member **160**A, **160**B

to thereby selectively slide the sliding member **160**A, **160**B in respective first and second directions **123**A, **124**A; **123**B, **124**B.

[0126] In contrast to the previous example, in this example a respective resistance mechanism **130**A, **130**B is mounted to each guide **150**A, **150**B for generating respective first and second resistive forces when the sliding member **160**A, **160**B is moved in the first and second directions.

[0127] Accordingly, it will be appreciated from the above examples that the user generally applies an operating force to a sliding member via an operating member. The sliding member moves relative to a stationary guide, with the resistance mechanism forming part of the sliding member and/or the guide, depending on the preferred arrangement. It will be appreciated however that other arrangements may be possible, and are considered to fall within the scope and spirit of the invention.

[0128] The remainder of the description will focus on the guide being a guide rail with the sliding to member including the resistance mechanism and being slidably mounted on the guide rail, as described above with respect to FIGS. **1**A and **1**B. However, this is for clarity purposes only and is not intended to be limiting.

[0129] In one example, the resistance mechanism includes first and second brakes mounted to the sliding member, as will now be described with reference to FIGS. **2**A and **2**B which are side views of an example sliding member and resistance mechanism.

[0130] In this example, the apparatus includes a foot platform **31** acting as an operating member, a slide member **30**, including a resistance mechanism in the form of first and second brakes **33**, **34**, and a guide rail **20** having one or more tubes **24**, as shown in FIGS. **3**A to **3**C. The brakes **33**, **34** can be of any suitable form, but in one example include an aperture for receiving the guide rail **20** therein.

[0131] When no pressure is applied to foot platform **31**, the slide member **30** can slide relatively freely along guide rail **20** due to gaps between the brakes **33**, **34** and the tube(s) **24** of the guide rail **20**. However, some constant resistance is typically encountered due to movement of slide member **30**. This force is the same in both directions and is at least partially determined by a distance between the brake pads **33**, **34**. For example, movement of brake **33** close to the brake **34** results in a jamming action between the sliding brakes **33**, **34** and the guide rail **20**, which causes higher constant resistance to sliding movement of slide member **30**.

[0132] Additionally, the first and second brakes can be arranged so that the first and second brakes **33**, **34** are urged against the guide **20** at least when the first operating force is applied to the operating member, thereby generating the first resistive force during the forward (exercise) stroke. In particular, applying pressure to foot platform **31** to move it forward (Arrow A) results in lever action, where effort is transferred into the load of sliding brake **34** (Arrow C) via sliding brake **33** acting as a fulcrum (Arrow B). Lever action results in tension and, therefore, higher friction between sliding brakes and tubes of guide rail **20**, causing higher resistance. Low friction of sliding brake plastic material and smooth surface of tubes **21** and **22** ensures smooth skidding of slide member **30** along guide rail **20** during exercise stroke. The return stroke by pulling foot platform back using heel strap **38** (Arrow D) cancels lever action and occurs only against constant resistance.

[0133] Use of the lever principle allows the first resistive force to be controlled by adjusting the magnitude or position of the first operating force. Thus, resistance to forward movements of slide member **30** during exercise stroke can be determined by the position of user's feet on foot platforms, where positioning of the user's foot away from tube **32** results in higher resistance due to mechanical advantage provided by the lever action which therefore urges the brake **34** against the guide with a higher force. Thus, the user can adjust required resistance to forward stroke by shifting position (effort point) along the foot platform. Additionally, it is also possible to change the distance between the sliding brakes **33**, **34**, which also determines the resistive force on the return stroke.

[0134] It should be noted that shifting of effort point on foot platform **31** can be done without actual changing the position of user's feet, where pushing foot platform **31** by the forefoot results in higher resistance than pushing by the heel. Thus, this resistance mechanism allows easy adjustment and customizing both resistances to exercise and return strokes for the particular user, particular muscle groups and particular type of exercises, where higher resistances are used for strength straining and lower resistances are set for aerobic cardio training.

[0135] It will therefore be appreciated that in the above example the magnitude of the resistive forces typically depend on relative distances between the first and second brakes and/or the first brake and the position at which the first operating force is applied to the operating member. Thus by adjusting the position of the first and second brakes **33**, **34** and/or the operating member **31**, this allows adjustment of at least one of the first and second resistive forces.

[0136] The brakes **33**, **34** are typically made of materials with low friction coefficients, including self lubricating materials including, but not limited to, self lubricating heat and abrasion resistant plastics such as advanced nylons, polyesters, polyethylenes, polyfluoroethylenes, or the like.

[0137] The amount of braking is typically dependent on one or more of the brake material, a coefficient of friction and a size of the contact area between the first and second brakes **33**, **34** and the guide **20**.

[0138] As shown in FIGS. **2**A and **2**B, the guide **20** can include a linear guide rail or a curved guide rail, thereby allowing a range of different movements to be provided by the device. The guide rail **20** may be of any length and positioned in any direction required for a particular exercise, e.g. horizontal, vertical or angled, allowing a linear or curved trajectory of constant and/or controlled variable resistance for a full range of user's movements.

[0139] A number of different guide arrangements can be used, as will now be described with reference to FIGS. **3**A to **3**C.

[0140] In the example of FIG. **3**A, the guide **20** includes a single tube **24**, with the slide member **30** having a corresponding single tube **32** containing cylindrical brakes **33**, **34**. The brakes **33**, **34** and tube **32** define an aperture through which the tube **24** passes, allowing the slide member **30** to move along the tube **24**. In this example, the slide member includes a handle **31**A having a hand grip **37**A.

[0141] In the examples of FIGS. **3**B and **3**C, the guide **20** includes two parallel tubes **24**, with slide member including two tubes **32** having respective first and second brakes **33**, **34** mounted therein. The slide member **30** of FIG. **2**B includes the foot platform **31** of FIGS. **2**A and **2**B, whilst the slide

member **30** of FIG. **3**C includes separated tubes **32** and a connecting tube **31**C, having a foot platform or handle **37**C mounted thereon.

[0142] The guides **20** typically include a sliding surface for engaging the brakes **33**, **34**. The sliding surface is typically resilient enough to withstand where, whilst being smooth enough to allow the brakes **33**, **34** to slide along the surface. In one example, the guide **20** is made from stainless steel or another material having properties similar to those described above.

[0143] A frame (not shown) may be provided for supporting the guide(s) in use. The apparatus may also include a docking member removably mounted to the frame to allow the apparatus to attach to a user support, such as a chair, or the like, thereby stabilising the apparatus in use. Additionally, or alternatively, a control bar may be provided for manually stabilising the apparatus in use, as will be described in more detail below.

[0144] Specific examples of exercise apparatus will now be described in more detail.

[0145] A first example will be described with reference to FIGS. **4**A which is a side view of one example of an exercise device **10**, which includes two guide rails **20** supported by a front frame **21** and a rear frame **22** having legs **23**, as shown in FIG. **4**B. Two slide members **30** are provided both with attached foot platforms **31** and control bar **40** is attached to rear frame **22**. For exercising, a user **50**, is positioned in the chair **51** and repetitively pushes and pulls foot platforms against resistance (arrow), holding the device by control bar **40**.

[0146] The control bar **40** can include a handle grip allowing the user to stabilise the exercise apparatus and an exercise counting device that can monitor parameters relating to the exercise being performed. The control bar **40** may be foldable allowing the control bar to be stowed when not in use.

[0147] FIG. **4**B is a side view of the exercise device **10** of FIG. **4**A. In this example, the guide rails **20** are supported by front frame **21** and rear frame **22** with legs **23**. Each slide member **30** includes a tube **32** (shown transparent) mounted onto guide rail **20**, foot platform **31** with heel strap **38** and two sliding brakes **33** and **34**. Front sliding brake **33** is connected to tube **32** by bolt **35** inserted into the slots **36** in the side walls of tube **32** and fixed in position by wing nuts **39**. Therefore, the position of the sliding brake **33** can be changed by moving the bolt **35** along the slot **36**. Rear sliding brake **34** is fixed to the tube **32**, wherein shifting position of the sliding brake **33** position results in changing distance between the sliding brakes **33**, **34**.

[0148] Sliding brakes **33** and **34** are made from advanced heat and abrasion resistance plastic materials with low friction coefficient, including self-lubricating plastics. Each foot platform **31** may be covered by a non-slippery rubber cushion **37**.

[0149] Control bar **40**, which is in a half-folded position at pivot **44**, includes a hand grip **41** and exercise counter **42** with a monitor. In use the exercise counter typically includes a processing system and one or more sensors allowing the exercise counter to determine various parameters relating to the exercise, such as the number of repetitions, the energy expended, a user heart rate, or the like, allowing these to be displayed to the user via the monitor.

[0150] FIG. **4**C is a top view of exercise device **10** of FIG. **4**A. This view shows the exercise device **10** with a folded control bar **40**. It is shown, that exercise device **10** has mirror arrangement with two parallel guide rails **20** and corresponding two sliding members **30**. Each guide rails **20** includes of two parallel tubes **24**, which are made from strong and wear-resistant material with polished surface, allowing smooth sliding of slide member **30**. Guide rails **20** are fixed to respective front frame **21** and rear frame **22** with legs **23**. Each slide member **30** consists of tube **32** and foot platform **31**, where each foot platform **31** is covered by non-slippery cushion **37** and has heel strap **38** attached. Control bar **40** with grip **41** and exercise counter **42** and monitor **45**, is pivotally connected to rear frame **22** via pivot **44**. For storage in vertical position exercise device **10** is supported by two legs **23** and by end **43** of control bar **40**.

[0151] FIG. **4**D is a front view of the exercise device **10** of FIG. **4**A, showing cut-off cross-section of slide member **30** at the level of front sliding brake **33**. It is shown that rail **20** consists of two tubes **24**, which are inserted through sliding brake **33** and sliding brake **34** (not shown), which both have appropriately shaped holes. The upper vault of sliding brake **33** and bottom part of sliding brake **34** are thicker for longer wear as used during exercise stroke. There is narrow gap between sliding brakes and tubes, allowing free smooth movement of slide member **30** along guide rail **20**, when resistance is not applied. Sliding brake **33** is connected to tube **32** via bolts **35** through slots **36** and fixed by wing nuts **39**. The gap between sliding brake **33** and tube **32** allows shifting position of sliding brake **33** inside tube **32** by bolts **35** along the slots **36**.

[0152] Foot platform **31** is fixed to tube **32** and covered with non-slippery cushion **37**. The foot platform **31** includes a heel strap **38**, the length of which can be adjusted to change a user's foot positing on the platform **31**, thereby varying the effort point position and respective resistance to forward motion of the foot platforms. The higher position of user's foot ensures higher resistance. The heel strap **38** also used to return the foot platform **31** to an initial position after each exercise stroke.

[0153] FIGS. **5** to **12** show particular examples of other uses of an exercise device **10**. The following descriptions of derivative exercise devices are merely exemplary in nature and is in no way intended to limit the invention, its application, or uses.

[0154] FIG. **5**A is a perspective view of an example of an exercise device **10** including two guides **20**, each having two parallel tubes **24**, and being supported at either end by a frame **21**, **22**. Two sliding members **30**, having foot platforms **31** are provided on the guides **20**, in a manner similar to that described above with respect to FIGS. **4**A to **4**D. In this example of an exercise device **10** a foot platform **31** has several threaded holes **31**B along the length for cooperating with fasteners **38**B of a heel strap **38**, thereby allowing the heel strap to be fixed to the platform at different levels, allowing the position of heel strap **38** on foot platform **31** to be shifted up and down. It will be appreciated that any suitable adjustment mechanism can be used, however, such as a buckle or the like, and the use of a fastener and holes is for example only. Shifting the position of user's feet on foot platforms **31** varies the effort point position and respective resistance to forward motion of the foot platforms. The higher position of user's foot ensures higher resistance. The heel strap **38** also used to return the foot platform **31** to an initial position after each exercise stroke.

[0155] In the example of FIG. **5**B the frame **22** is coupled to a docking mat **60**, which is typically made of a non-slip

material. This may be achieved using any suitable technique, such as by having a slot in the docking mat to receive the frame **22**. In use, the docking mat can be positioned under a chair **62**, as shown in FIG. **5**C, thereby allowing the exercise device **10** to be coupled to the chair. This allows a user **63** to sit on the chair **62** and secure the exercise device in position to ensure that the exercise device does not move during use. The mat **60** may include an opening **61** that can act to position a chair relative to the exercise device, for example by providing chair castors therein. This arrangement allows for stabilisation of the apparatus during exercise by positioning of a chair on the mat, allowing the leg exercise unit to be used in sitting position anywhere. The apparatus can be removed from the docking mat when not in use for easy transport or storage.

[0156] FIG. **6**A is a perspective view of an example of an exercise device **10** similar to that described above with respect to FIGS. **4**A to **4**D, together with a folding chair **65** having a lumbar support **66**. The folding chair can be connected to the frame **22**, using any suitable technique, allowing the exercise device to be held in position during use by a user **67**, as shown in FIG. **6**C. The arrangement can be conveniently folded for easy storage and transport, as shown in FIG. **6**B.

[0157] FIG. **7**A is a schematic side view of an example of a recumbent stepper, where exercise device **10** is attached to a chair **51**. In this example, user **50** is positioned on reclining chair **51** and pushes-pulls (arrow) foot platforms **31** mounted on guide rails **20**, allowing the user to reproduce stepping leg movements in a recumbent position. Pivotal connection **52** between the chair **51** and exercise device **10** allows for folding of the device for storage. This provides a comfortable reclined position of the user allows the device to be used without placing load on the user's joints, which in turn makes the arrangement suitable for users with any level of fitness, including elderly, frail and disabled users, and, therefore, for medical purposes.

[0158] In the example of FIG. **7**B the exercise device **10** include curved guide rails **20**, with the sliding members **30** including supports having heel rest and ankle pads **71**, **72** for engaging the leg of a user **50** sat on the chair **51**. This allows the user to perform leg curls for knee flexion and extension, with the user extending their legs by pushing the sliding members **30** upwards using the ankle pads and flexing their legs by pulling the sliding members **30** downwards by heel rests. It will be appreciated that the arrangement could be configured to provide the first resistive force during either downward or upward strokes, thereby allowing the exercise device to target different muscle groups. This could be achieved for example by reversing the orientation of the sliding member on the guide.

[0159] FIG. **8**A is an example of a push-pull exerciser **10**, where the exercise device **10** includes a guide rail **20** attached to a chair **51**. In this example, the user **50** is positioned on reclining chair **51** and pushes-pulls (arrows) slide member **30**, using handles **31**A having hand grips **37**A, as described above with respect to FIG. **3**A. Pivotal connection **52** between the chair **51** and the exercise device **10** allows folding of the device for storage, as well as to allow the guide rail **20** to be provided at any orientation, examples of which are shown at **20**A and **20**B.

[0160] In the example of FIG. **8**B, a similar arrangement utilising guide rails **20** that are curved instead of linear is shown. In this example, the sliding member **30** includes handles **31**A for performing arm exercises.

[0161] In both of the above examples, the apparatus can be configured to provide the first resistive force during either push or pull strokes, thereby allowing the exercise device to target different muscle groups. Swapping between the two could be achieved, for example, by reversing the orientation of the sliding member on the guide.

[0162] FIG. **9** is an example of a total body exerciser, where two exercise devices **10** are attached to the chair **51**. In this example, user **50** is positioned on reclining chair **51** and pushes-pulls (arrows) foot platforms **31** and/or handles **31** A simultaneously or alternately. Pivotal connections **52** between chair **51** and exercise devices **10** allow folding of the device for storage. Thus, it will be appreciated that the arrangements of FIGS. **7**A or **7**B can be combined with the arrangements of FIGS. **8**A and **8**B to provide for total body exercise.

[0163] FIG. **10** is an example of a rowing exerciser, where exercise devices **10** are attached to the chair. In this example, the apparatus includes at least three parallel guide rails **20** connected to a frame **21** at a front of the apparatus, and pivotally attached to the seat **51** at a rear. A sliding member **30** including a foot platform **31** for both of a user's feet is mounted on the outer guide rails **20**.

[0164] Additionally, a handle **31**A is attached to the second sliding member **30** on the middle guide rail **20**. In this example, the user **50** is positioned on reclining chair **51** to pulls (arrow) handle **31**A simultaneously with pushing foot platform **31** (arrow), which are connected to corresponding slide members **30**, arranged in opposite directions and sliding along respective guide rails **20**. This allows the user to reproduce rowing movements by pulling the handle simultaneously with extending the legs, but without changing position on the chair **51**. Pivotal connection **52** between chair **51** and exercise device **10** allows folding of the device for storage.

[0165] FIG. **11**A is an example of an under-desk exerciser, where exercise device **10** has a flat profile due to the horizontal position of guide rails **20**. In this example, for exercising user **50** is positioned on chair **51** and pushes-pulls (arrow) slide member **30**, using foot platforms **31**. Flat profile of exercise device **10** allows leg exercising without raising the knee and, therefore, the use of device under desk **53** is practical. The other uses include exercising in car, in cabin of airplane and in any other confined space. FIG. **11**B shows an alternative example showing the use of a chair with castors.

[0166] FIG. **12**A is a side view of one example of a vertical exerciser, where exercise device **10** has one or two long guide rails **20** positioned vertically and supported by base plate **54**. In this example, for exercising user **50** is standing in order to push up and pull down (arrows) slide member **30**, using handles **39**. These exercises reproduce resisted pushing up and pulling down movements in full range of human body reach, resembling push-ups, pull-ups and weight lifting. It will be appreciated that alternative orientations of the guide rail(s) **20** can be used as shown in FIG. **12**B in which a substantially horizontal guide rails **20** are used. This provides resisted pushing and pulling movements in a horizontal plane, reproducing boxing type exercises.

[0167] Further examples of exercise apparatus based on arrangements similar to those of FIGS. **1**C and **1**D will now be described with reference to FIGS. **13**A to **13**C.

[0168] FIG. **13**A is a schematic side view of an example of a recumbent stepper, where exercise device **10** is attached to a chair **51**. In this example, user **50** is positioned on reclining

chair **51** and pushes-pulls (arrow) foot platforms **31** mounted on sliding rails **70**, allowing the user to reproduce stepping leg movements in a recumbent position. The sliding rails are mounted in a carriage providing the guide **80**, which contains the brakes that form the resistance mechanism. Pivotal connection **52** between the chair **51** and the exercise device **10**, and in particular the guide **80**, allows for folding of the device for storage. This provides a comfortable reclined position of the user allows the device to be used without placing load on the user's joints, which in turn makes the arrangement suitable for users with any level of fitness, including elderly, frail and disabled users, and, therefore, for medical purposes. The above described arrangement also allows the sliding rails to be easily concealed under the chair, when not in use, making it suitable for use in confined spaces, including cabin of airplane, train and vehicle.

[0169] FIG. **13**B is a schematic side view of an example of a recumbent stepper, where exercise device **10** is attached to chair **51**. In this example, user **50** is positioned on reclining chair **51** and pushes-pulls (arrow) foot platforms **31** mounted on sliding rails **70** through guides **80** attached to chair **51**, via pivotal connections **52**. In addition, in this example the apparatus includes additional sliding rails **70** with handles **31**B that are designed to be pushed-pulled by user's arms through stationary guides **80**, attached to the back of the chair **51**, thereby providing upper body exercising.

[0170] Again, the stationary guides **80** used for the arm exercises can be attached to the back of the chair **51** using a pivotal connection. In one example, this can be used to allow the guide **80** to be rotated, thereby allowing exercises to be performed at a range of different examples. Additionally, and/or alternatively, this can be used to allow the guides to be rotated through 180°, allowing the first and second resistances to be interchanged. This can allow the first resistance to be encountered either during a forward or backward stroke, thereby increasing the range of muscle groups that can be targeted during exercise.

[0171] In the example of FIG. **13**C the exercise device **10** includes curved sliding rails **70**, with heel rest and ankle pads **71**, **72** attached for engaging the leg of user **50** sat on the chair **51**. The sliding members **70** are mounted in a guide **80** attached to the chair **51**, allowing the user to perform leg curls for knee flexion and extension. Additionally curved sliding rails **70** defining handles **31**A can also be provided through guides **80** attached to the chair **51**, allowing these to be pushed-pulled by the user's arms. This allows the user to perform upper body exercising, including arm curl and abdominal flexing.

[0172] It will be appreciated that the arrangement could be configured to attach the exercise device **10** in front of the chair **51**, or to the chair in previous row in an airplane. This can be achieved either by guide rail **20**, when the operating member is attached to sliding member **30**, or by a sliding rail **70**, when the operating member is attached to the sliding rail **70**.

[0173] It will also be appreciated that the arrangement could be configured to provide the first resistive force during either downward or upward strokes, thereby allowing the exercise device to target different muscle groups.

[0174] Whilst a limited number of examples are shown in FIGS. **13**A to **13**C, it will be appreciated that this is for the purpose of example only. Thus, an arrangement using sliding rails **70** and a guide **80** can be used to provide exercise apparatus similar to any of the previous examples, including allowing for stepping and/or leg extension/flexion exercises, push-pull arm exercises, total body exercises, using combination of stepping and push-pull exercises, rowing exercises, 'under-desk' exercises and standing exercises. Such arrangements will not therefore be described in detail.

[0175] Accordingly the above described exercise apparatus typically includes at least one linear or curved guide rail with a sliding surface and at least one sliding member acting as a moving or sliding member mounted thereon. The sliding member includes at least one brake housing mounted on a respective rail, at least two brakes made from low-friction material, arranged at both ends of the brake housing to slide along the guide rail, at least one arm attached to the brake housing to provide an operating member and optionally at least one handle or foot platform attached to the arm. In use pushing or pulling of the handle or foot platform by the user transfers user's muscle effort directly into smooth resisted motion of the moving member along the guide rail.

[0176] In one example, a degree of resistance to user's muscle effort can be determined by lever mechanics. In this example, the arm is an effort arm, one of the brakes is fulcrum and the other brake is a load. Depending on direction of the operative force applied by the user, the magnitude of the resistive force is altered. Accordingly, in one direction a higher load results in higher friction between brakes and guide rail and conversely higher resistance and vice verse.

[0177] Typically the smoothness of sliding of the moving member motion is determined by sliding properties of brake material and/or the area of contact between brake and guide rail and/or the separation between the brakes. Typical materials include materials with low friction coefficient such as heat and abrasion resistant self-lubricating plastics. A smaller area of contact between brake and guide rail results in more smooth motion and vice verse, whilst a greater separation between the brakes results in more smooth motion with lower resistance and vice verse.

[0178] In use, the user can vary the resistive force by the adjusting the effort point on the handle or foot platform, by changing hand or foot position, respectively. This adjustment can be to or away from the brake housing, with a closer position resulting in a shorter effort arm and conversely lower resistance. Furthermore, changing of the effort point can be performed by the user during an exercise stroke, allowing adjustment of resistance to physiological changes in human muscle torque, which is highest in a middle part of muscle contraction but decreases toward the full contraction. This allows prolonged exercises of variable intensity without muscle strain making the arrangement suitable for medical exercises and rehabilitation as well as for general exercises and specialised sports training.

[0179] In one example, the apparatus can be used in a wide variety of exercise devices, where different numbers of resistance mechanisms can be used in various arrangements, including a single rail with a moving member, parallel rails with a single moving member and parallel rails with two moving members connected by long bar. The use of several resistance mechanisms in the exercise devices allows independent resistance mechanisms for each user's foot or hand, permitting exercising of user's legs and arms alternately or simultaneously.

[0180] The exercise device can include linear or curved guide rails as required for particular type of exercises. The guide rails can be of any length, and can be arranged at any angle, allowing sufficient range of resisted motions in any direction.

[0181] For example, a leg exercise unit can include at least two pairs of linear guide rails connected by at least two frames at front and rear ends, with each pair of guide rails including one moving member having two connected brake housings. Each moving member can include a foot platform, connected to a pair of brake housings at acute angle forward, thereby providing two moving members that can be pushed forward by a user's feet. Each foot platform can include a heel strap, the length of which can be adjusted to change a user's foot positioning on the platform, thereby varying the effort point position and respective resistance to forward motion of the foot platforms. The heel strap can also be used to return the foot platforms to an initial position after each exercise stroke. The leg exercise unit can include means to be attached to any chair or seat for use.

[0182] The apparatus can be used for leg exercises that allow a full range of knee joint motion without knee elevation, making it possible to use the leg exercise unit for seated exercises, including exercise in confined and closed spaces, including under-desk exercises in offices and in-cabin exercises in cars, trains, ships and airplanes. This can also be used with a variety of chairs, including in recumbent chairs, so that no load is applied to the knee joints, allowing the use of device for exercising of elderly, frails and disabled people, including in medical exercises and rehabilitation.

[0183] The terms exercise device and exercise apparatus are used interchangeably in the examples above.

[0184] Other example arrangements are described above and persons skilled in the art will appreciate that numerous variations and modifications will become apparent. All such variations and modifications which become apparent to persons skilled in the art, should be considered to fall within the spirit and scope that the invention broadly appearing before described.

1.-**51**. (canceled)

52. Exercise apparatus including: (a) a guide; (b) a sliding member slidably mounted to the guide, the sliding member including an operating member for allowing a user to apply first and second operating forces to the sliding member to thereby selectively slide the sliding member in respective first and second directions; and (c) a resistance mechanism for generating respective first and second resistive forces when the sliding member is moved in the first and second directions.

53. Apparatus according to claim **52**, wherein a magnitude of at least one of the resistive forces is related to at least one of: (a) a magnitude of the respective operating force; and (b) a position at which the respective operating force is applied to the operating member.

54. Apparatus according to claim **52**, wherein sliding the sliding member in the first and second directions provides exercise and return strokes respectively, and wherein, at least one of: (a) the second resistive force is less than the first resistive force; and (b) the second resistive force is the same as the first resistive force.

55. Apparatus according to claim **52**, wherein the resistance mechanism includes first and second brakes mounted to at least one of the sliding member and the guide; optionally wherein at least one of the first and second brakes includes an aperture for receiving at least one of the guide and the sliding member; optionally wherein the first and second brakes are arranged so that the first and second brakes are urged against at least one of the guide and the sliding member at least when the first operating force is applied to the operating member; optionally wherein the first brake acts as a fulcrum so that the second brake is urged against at least one of the guide and the sliding member at least when the first operating force is applied to the operating member; optionally wherein a magnitude of at least the first resistive force is dependent on relative distances between at least one of: (a) the first and second brakes; and (b) the first brake and a position at which the first operating force is applied to the operating member.

56. Apparatus according to claim **55**, wherein a position of the first and second brakes is adjustable to thereby adjust at least one of the resistive forces; optionally wherein the brakes are made of a low friction material, including at least one of: (a) a self lubricating plastic; (b) nylon; (c) polyester; (d) polyethylene; and (e) polyfluoroethylene; optionally wherein a magnitude of at least one of the resistive forces depends on at least one of: (i) a brake material; (ii) a brake coefficient of friction; and (iii) a size of the first and second brakes.

57. Apparatus according to claim **52**, wherein a position of the operating element relative to the sliding member is adjustable.

58. Apparatus according to claim **52**, wherein the guide includes at least one of: (a) a linear guide rail; and (b) a curved guide rail; optionally wherein the guide includes a pair of parallel rails.

59. Apparatus according to claim **52**, wherein the guide includes a sliding surface for engaging brakes of the resistance mechanism in use; optionally wherein the apparatus includes: (a) two guides; and (b) two sliding members, each sliding member being slidably mounted to a respective guide to thereby allow a user to apply operating forces to each sliding member independently; optionally wherein the apparatus includes: (i) two guides; and (ii) a sliding member slidably mounted to the two guides; optionally wherein each sliding member is adapted to allow a user to independently exercise a respective limb.

60. Apparatus according to claim **52**, wherein the guide is removably mounted to a chair; optionally wherein the guide is pivotally mounted to a chair to allow the guide to be moved between folded and operative positions; optionally wherein the apparatus includes a control bar for stabilising the apparatus in use.

61. Apparatus according to claim **52**, wherein the sliding member includes at least one of: (a) a linear sliding rail; and (b) a curved sliding rail; optionally wherein the sliding member includes a pair of parallel sliding rails, optionally wherein the sliding member includes a sliding surface for engaging brakes of the resistance mechanism in use.

62. A method of using exercise apparatus, the exercise apparatus including: (a) a guide; (b) a sliding member slidably mounted to the guide, the sliding member including an operating member; and (c) a resistance mechanism for generating respective first and second resistive forces when the sliding member is moved in first and second directions, the method including applying first and second operating forces to the sliding member using the operating member to thereby selectively slide the sliding member in respective first and second directions against the first and second resistive forces.

63. A method according to claim **61**, wherein the method includes controlling a magnitude of at least one of the resistive forces by at least one of: (a) controlling a magnitude of the respective operating force; and (b) controlling a position at which the respective operating force is applied to the operating member; optionally wherein the apparatus includes: (i) two guides; and (ii) two sliding members, each sliding mem-

ber being slidably mounted to a respective guide, and wherein the method includes applying operating forces to each sliding member independently using a respective limb.

64. Exercise apparatus for use in exercising devices, the apparatus including: at least two linear guide rails with sliding surfaces, which are supported by the frame, where each guide rail consisting of two parallel tubes; at least two slide members mounted onto respective guide rails for sliding therealong, each comprising the tube with a foot platform and two sliding brakes, where position of at least of one brake can be shifted along the tube; and at least one control bar with grip and exercise counting device.

65. Apparatus according to claim **64**, wherein the guide rail includes means to allow resisted linear movement of the slide member at distance of full range of user's leg extension and flexion; wherein the guide rail is sloped forward because of longer legs of rear frame than height of front frame; wherein each guide rail consists of two tubes arranged in parallel; optionally wherein the apparatus includes independent resistance mechanisms for each user's leg, allowing independent exercising of each user's leg at required distance and resistance; wherein the apparatus includes means for exercising of user's leg alternately or simultaneously; optionally wherein the sliding brakes are made from heat and abrasion resistance plastic material with low friction coefficient, including self-lubricating plastics; wherein the use of low friction material in sliding brakes are for smooth sliding of the slide member along the linear guide rail; where self-lubricating plastics in sliding brakes are for lower resistance at least at the end of exercise stroke, which corresponds to physiological drop of muscle torque at the end of exercise stroke, allowing prolonged exercises of variable intensity for general exercises, sports training, medical exercises and rehabilitation; optionally wherein each sliding brake comprise aperture corresponding to the cross-section of the guide rail; wherein the slide member is mounted onto the guide rail so that the guide rail goes through the sliding brakes inside the tube of the slide member; wherein sliding brakes are positioned in succession on the guide rail; wherein corresponding cross-sections of holes in the brakes and tubes of the guide rail ensures sidewise stability of the slide member.

66. Apparatus according to claim **64**, wherein the foot platform is attached to the tube of the slide member at forward angle and, therefore, includes means to be pushed forward by the user during exercise stroke; wherein pushing foot platform forward is transferred to push a front brake down and to push the rear brake up towards the guide rail via lever mechanism; wherein the lever mechanism includes the foot platform as an effort arm, the front brake as a fulcrum, the tube connecting brakes as a load arm and the rear brake as the load; wherein each foot platform includes a heel strap for return movement of foot platform into starting position after exercise stroke; optionally wherein the control bar is pivotally attached to the rear frame of the exercise device and includes a grip and exercise counting device; wherein the control bar includes means to be folded for storage; wherein the grip is for holding and stabilizing the exercise device by the user and counting device is for counting and programming of exercises.

67. Apparatus according to claim **65**, wherein the apparatus includes means to transfer user's muscle force into tension between sliding brakes and guide rail via lever mechanism, resulting in friction between brakes and guide rail and, therefore, frictional resistance to user's efforts, whereas sliding properties of brakes allow smooth resisted skidding of the slide member along the guide rail, allowing exercising of user's muscles; optionally wherein the apparatus includes means to vary resistance during or between exercise strokes by shifting user's foot position along the foot platform and by changing the point of force application from the forefoot to the heel, which result in shifting position of effort point in the lever and, therefore, length of the effort arm of the lever; wherein force application by user away from the tube results in longer effort arm and respective higher resistance to the movement of slide member during exercise stroke and vice verse.

68. Apparatus according to claim **64**, wherein the tube of the slide member includes at least two slots and respective bolts with nuts for at least one sliding brake, allowing changing position of at least one sliding brake inside the tube along the slots, allowing varying the distance between brakes; wherein the shorter distance between brakes results in jamming action between brakes and the guide rail, and resultant higher constant resistance to movement of slide member along the guide rail in both directions and vice versa; wherein the shorter distance between brakes increases mechanical advantage in the lever action during exercise stroke due shorter load arm of the lever and vice versa; optionally wherein the apparatus includes dual means to regulate resistance to forward exercise stroke via changing effort point on the foot platform and by varying distance between brakes; wherein the apparatus includes means to regulate resistance to return stroke by varying distance between brakes; wherein the apparatus includes means for varying ratio between resistances to exercise and return strokes, which both can be used for exercising of leg extension and flexion muscles, respectively; optionally wherein the apparatus includes means for use both exercise and return strokes for exercising, where resistance for exercise stroke exceeds resistance to return stroke.

69. Apparatus according to claim **64**, wherein the guide rail includes means to be of any length and to be positioned at any angle to allow linear movement of the slide member at any spatial direction and at any distance; wherein the apparatus allows a full range of resisted linear exercise movements by the user at any direction in order to exercise any major muscle group in the body; wherein the guide rail includes means to be attached to the seat or stand and to be combined with other exercise devices; optionally wherein the apparatus includes means to be used in reclined steppers, where independent resistant mechanisms for each user's leg allow alternate or simultaneous pushing foot platforms against variable resistance in full range of user's leg extension; wherein the apparatus includes means for the user to reproduce stepping movements in reclined position; wherein the apparatus includes means to be folded for storage via pivotal connection between guide rail and seat; wherein reclined position of users and leg suspension allows the use of device for exercising of elderly, frails and disabled people, including for medical exercises and rehabilitation.

70. Apparatus according to claim **69**, wherein the apparatus includes means to be used in hand-operated push-pull exercisers, where handles are used instead of foot platforms; wherein independent resistant mechanisms for each user's arm allow alternate or simultaneous pushing and pulling handles against variable resistances at full range of upper body extension and flexion; wherein the apparatus includes means for the user to reproduce resisted pushing and pulling

movements at stationary position of the user; optionally wherein the apparatus includes means to be used in reclined steppers combined with hand-operated push-pull exercisers; wherein independent resistant mechanisms for each user's arm and leg allow alternate or simultaneous pushing and pulling foot platforms and handles against variable resistances at full range of leg and upper body extension and flexion; wherein the apparatus includes means for the user to provide total body exercising at stationary position of the user.

71. Apparatus according to claim **69**, wherein the apparatus includes means to be used total body exercise devices, including in rowing devices, where independent resistant mechanisms provide variable resistance in opposite directions for simultaneous user's leg extension and arm flexion, respectively; wherein the apparatus includes means for the user to reproduce rowing movements in stationary position of the user; wherein the apparatus includes means to be used by user's arms, where handles are attached to the slide member instead of foot platforms; optionally wherein the apparatus includes means to be used in compact 'under-desk' exercise devices, where independent resistant mechanisms for each user's leg allow pushing and pulling foot platforms against variable resistance in full range of user's leg extension; wherein the horizontal arrangement of guide bar includes means for the user to fully extend legs at the knee joint against resistance without lifting the knee; wherein the apparatus includes means for use of device in confounded spaces, including under desk in offices and in-cabin of cars, trains, ships and airplanes; optionally wherein the apparatus includes means to be used in vertical exercisers, where the long guide rail is positioned vertically and handles are used instead of foot platforms; wherein the apparatus includes means for the user to push up and pull down the slide member at range from ground to height of human body with uplifted arms against variable resistance; wherein the apparatus includes means for the user to reproduce resisted pushing up and pulling down movements in full range of human body reach, resembling pull-ups and weight lifting.

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