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(54) A MULTI-PURPOSE TRANSPORTABLE EXERCISE DEVICE FOR TRAINING OF BALANCE, STRENGTH AND FLEXIBILITY

(57) The present invention belongs to the field medical devices, more precisely to the field of exercise devices and relates to a multi-purpose transportable device for training of muscle strength, postural balance and muscle flexibility in the human body. The device comprises:
- a base plate comprising:
- two rotating surfaces, wherein rotation is enabled by suitable bearings,
- a locking mechanism for locking the position of rotating surfaces,
- bottom attachment sites for attaching a fulcrum element for balance training,
- side attachment sites for attaching a belt or elastic band for strength training,

- the fulcrum element that may be a cylindrical element, a cylindrical element, composed of two half-cylindrical elements, or a half-spherical element, and/or
- a set of belts and/or elastic bands with different levels of stiffness.

The elements are used alone or in combination, and enable a span of exercises comparable to about 10 single-product solutions.

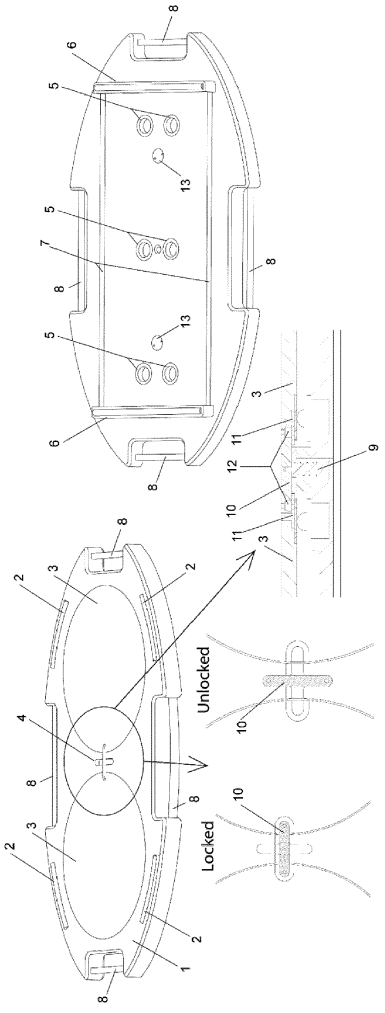

Figure 1

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Description

Field of the invention

[0001] The present invention belongs to the field of medical devices, more precisely to the field of exercise devices. The object of the invention is a multi-purpose transportable device for training of muscle strength, postural balance and muscle flexibility in human body.

Background of the invention and the technical problem

[0002] The human body is composed of several cells that together form different tissues and subsequently different organ systems. Musculoskeletal system is an anatomical term that refers to an organ system that is formed by muscles and bones. The musculoskeletal system gives humans the possibility to move through space and perform physical activities (e.g. walking and running). The ability of the human body to move is determined by motor abilities, such as muscle strength, postural balance and flexibility. Muscle strength is defined as a maximum amount of force that a muscle can exert against a resistance. Postural balance is the ability to maintain the line of gravity (vertical line from centre of mass towards the surface) of a body within the base of support. Flexibility is defined as the capacity of a muscle (or a joint) to move through its full range of motion. Sufficient ability level of each motor is paramount for the human to be able to perform physical activities. In sport, the motor abilities are developed to the highest possible level to maximize the performance of an athlete. In physical therapy and rehabilitation, the motor abilities are attempted to be restored (e.g. after an injury) or improved (e.g. to prevent subsequent injuries).

[0003] Motor abilities are developed with a training that comprises of repetitions of specific activities, including movements against a resistance, movements through large range of motion, or movements in conditions that are challenging postural balance or stability of the body. Various tools and accessories are commonly used to make such movements possible or to increase the effects of the training. Strengthening of the muscles is possible with the use of elastic resistance (e.g. elastic bands or tubes), exercise machines, based on pneumatic resistance, or by lifting/moving heavy objects, such as weights. Improving postural balance is commonly done by assuming postures that are challenging to maintain (e.g. stance on only one of the legs). To increase the effects of training of postural balance, one may use tools and accessories that further challenge the stability and balance of the body. The person can stand on a board or other platform, which is on top of an unstable ground-contacting structure, serving as a fulcrum. The fulcrum component may be shaped as a half cylinder or a half sphere. The person may also stand on a compliant surface (e.g. pads made of foam) to increase the difficulty of the training. Flexibility is increased and maintained by exposing the muscles and joints to their end-range positions. This may be done without any accessories in case of certain muscles and joints. On the other hand, many muscles and joints require additional equipment to be stretched effectively. In addition, muscles may be stretched by rolling a body against a foam roller, which is essentially a solid cylindrically shaped tool, covered with softer materials.

[0004] The problem of these known solutions is that several different devices have to be used in order to cover various segments of the body and different aspects of rehabilitation or training. Even if some of the functions are combined, such devices are usually robust, heavy and thus inappropriate for relocations between different training/rehabilitation rooms or facilities.

[0005] The general aim of the present invention is a development of a multi-purpose device that enables the user to develop strength, flexibility and postural balance. Hence, the technical problem, which is solved by the present invention, is a constructional design of a device that will enable the multi-purpose use. The goal of the invention is to cover a span of functions comparable to about 10 single-purpose exercise tools, currently existing on the market. At the same time, the constructional design of the present invention should be compact in order to enable easy transport and has to allow simple switching among different set-ups based on the desired exercise.

State of the art

[0006] In medicine and physiotherapy, the use of various exercise accessories is common. This includes various forms of balance devices (balance mats, balance boards, etc.), stability trainers, tools for assistance in flexibility training (i.e. tools that enable easier and more efficient stretching the muscles) and aids for exercising aiming at muscle strength improvement, such as elastic bands and weights. Exercise tools and devices are usually produced as single products (i.e. one elastic band, one balance board), or as sets of different types of tools. Several patents disclose individual solutions of advanced or specialized exercise tools that combine several different functions.

[0007] A multi-exercise device has been disclosed in the patent GB2559323. This device allows for multiple strengthening exercise movements to be carried out. The exercise device comprises a cube-shaped frame, bars that form a portion of the edges of the frame, two detachable rods, a stepper, a flat surface and a twist board. Various resistance exercise and some balance exercise may be performed. Conceptually, the device is similar to the present multi-purpose transportable exercise device, but enables different exercises and movements.

[0008] Another multifunctional physical training auxiliary device was disclosed in a document CN209529997. It comprises an outer cylinder, a lower bottom cylinder, a supporting plate, a rotating cylinder, a control panel, a sleeve plate, a sealed cabin, two servo motors, an anti-

skid plate, an embedding head, a positioning end, a flow guide plate, a flow guide groove, a positioning groove, a limiting plate, driven teeth, a positioning plate, clamping teeth and a notch. The said device is used for balance training.

[0009] Another training device, intended for balance training in rehabilitation, was disclosed in the patent CN109107113. This device has simple structure and can exercise the cooperative movement function of the hand and the eye of the exercising person, and can improve the flexibility of the hand. In the document CN105662779, a comprehensive rehabilitation training assistive instrument was disclosed. The design of the said instrument is intended for rehabilitative training of the persons with cerebral palsy. This device is adapted to the functional needs of the said patients and enables balance training, targeted at foot muscles.

[0010] One exercise device that enables strength, balance, coordination and flexibility training was disclosed in the patent US2011306476. The said exercise device includes a large, spherically shaped, resilient exercise ball having a flat planar base insert with a set of elastic resistance members to perform various resistance training exercises. Conceptually, the device is also similar to the present multi-purpose transportable exercise device but enables completely different exercises and movements to be performed. The present multi-purpose transportable exercise device is lighter and provides notably higher number of possible uses. Additional multipurpose balance fitness instrument was disclosed in CN109646885 (A). The said instrument has the advantages of simple structure, remarkable effect, low cost, high practicability, high safety and stability, capability of improving basic motor skills, power, harmony and flexibility.

[0011] A device disclosed in US2018369645 enables balance training of the upper body. The exercises positions resemble movement of the handlebars of a motorcycle or bicycle a user experiences while riding. Another device has been disclosed in CN107007969 and is designated for one trunk exercise specifically. The device is providing the gravity sensing training and by using it, the plank exercise for abdominal trunk muscles is practiced in a more interesting mode under gravity sensing, so that users' interest and training effects are greatly improved. A balance board, similar to the balance board in the present multi-purpose transportable exercise device has been disclosed in US4759542. The device is designed in a standard fashion, typical for the balance boards.

[0012] A strengthening exercise tool has been disclosed in the patent FR2974732. The said tool is indented specifically for strengthening of the muscles of the foot area. The said device comprises a curved plate, comprised of laminated wood material or composite material containing synthetic resins or moulded plastics. A pair of shoes is attached to the curved plate. The radius of the curvature is variable depending on the size of foot of the user. The tool is intended specifically for strengthening of the muscles in the foot.

[0013] All above-mentioned solutions differ from the present invention in their design and/or key components.

Description of the solution of the technical problem

[0014] The present invention is a multi-purpose transportable exercise device for training of human body strength, postural balance and flexibility. The device comprises several different components that enable a multitude of uses, so that a user may perform exercises for which about 10 individual exercise products would typically be needed. The essence of the invention is in that the said device comprises:

- a base plate comprising:
  - two rotating surfaces, wherein rotation is enabled by suitable bearings and the surfaces may be equipped with exercise mats of different stiffness,
  - a locking mechanism for locking the position of rotating surfaces in case their rotation is not required,
  - at least one bottom attachment site, preferably more, for attaching a fulcrum element for balance training,
  - at least one side attachment site, preferably more, most preferably four, for attaching a belt or elastic band for strength training,
- the fulcrum element to be attached to the bottom attachment sites, wherein the said fulcrum element may be:
  - a cylindrical element,
  - a cylindrical element, composed of two half-cylindrical elements,
  - a cylindrical element, composed of two half-cylindrical elements and at least one half-spherical element, or
  - a half-spherical element, and/or
- a set of belts and/or elastic bands with different levels of stiffness, which may be attached to the side attachment sites.

[0015] The base plate preferably comprises also any of the following in any combination:

- at least two elongated tiles at the shorter sides of the bottom surface for stable placement on the ground/floor,
- at least two second elongated tiles at the longer sides of the bottom surface for limiting movement of the fulcrum element,
- at least two rubber elements on the upper surface of the plate for stable positioning on the ground/floor,

the rubber elements preferably 0.5 to 1 cm high.

[0016] The bottom attachment site for attaching a fulcrum element for balance training, is at least one magnetic socket, preferably three pairs of magnetic sockets equidistantly arranged, wherein the said magnetic sockets are able to interact with magnets provided on the fulcrum element. The side attachment site for attaching a belt or elastic band for strength training is at least one elongated metal element serving also as a handle for carrying the device.

[0017] The rotating surfaces (plates) are preferably circular, but may have any other shape, as long as the mounting of the surfaces allows such shape. Rotating surfaces are preferably mounted to the base plate with suitable bearings, such as ball bearings or roller bearings (for example double-row angular contact roller rings). The mounting may be executed from below and/or at the circumference of the rotating plates, wherein minimum friction has to be achieved. Hence, the preferred materials are ceramics, graphite, graphene or low-friction plastic. Position of rotating surfaces may be locked with the locking mechanism. The latter is preferably designed as a lock and release pin attached to the base plate with a spring, so that the pin placed parallelly to the length of the base plate locks the position of the rotating surfaces, while transverse position of the pin allows rotation of the rotating surfaces. Preferably, the device is also provided with a set of foam coverings/mats for the rotating surfaces in order to increase the difficulty of balance training. The foam mat may be one or more, usually up to 3 pairs of different thickness and/or stiffness is sufficient to cover needed difficulties of training.

[0018] The fulcrum element may be designed in various ways, such as a cylinder or a half-sphere. It is attached to the bottom side of the base plate with magnets or any other suitable dockings, preferably magnets that allow secure connection during exercise. The fulcrum element in the shape of a cylinder may be used as:

- a movable base attached below the said balance plate to serve as a fulcrum,
- a stabilization exercise tool in combination with the base plate turned upside down, or
- a foam roller when used on its own.

[0019] If the cylindrical fulcrum element is split into the two half-cylindrical elements, it may serve as an accessory for flexibility exercise or as a non-movable base attached below the said balance plate to serve as a fulcrum. The same is also valid for the half-spherical fulcrum element.

[0020] The elastic bands and/or belt may be any known in the field, wherein their number and stiffness are arbitrary. The preferred embodiment of the elastic band or tube is that it is provided with at least one loop for tightening/adjustment, wherein the band/tube can be easily fastened around the ankle/wrist and adjusted with regards to the personal preference. The loops are essentially a double belt, made of rubber or similar material, and run through a suitable plastic slider, which can be moved upwards and downwards along the loop to adjust it (i.e. to elongate or shorten the loop). The belt, on the other hand, may be any suitable belt for placement around a person's waist, and preferably has at least three attachment points, preferably equidistant.

[0021] The device is easily transportable and lightweight, as the materials used for the device are preferably wood, lightweight metal elements, rubber for contact areas and foam, neoprene, rubber or similar for covering at least a part of the fulcrum element. The handle for carrying the device is one of the side attachments, while for transportation the fulcrum element and the belts or bands are attached to the base plate.

[0022] Alternatively to the device described above, the technical problem may also be solved by a simpler solution, wherein a multi-purpose roller device, used as the fulcrum element in the above-described device, is used on its own for training of balance, strength and flexibility. The roller comprises two removably connected half-cylindrical elements forming the cylinder-shaped roller device, wherein the two half-cylindrical elements are connected or disconnected with magnetic sockets on one half-cylinder and magnetic pins on the other half-cylinder. Such construction allows use in stretching, balance, stability and/or flexibility training, either used as a cylinder or as two half-cylinders. In order to allow use as an oscillation exercise tool, the half-cylindrical elements may be hollow inside allowing addition of a movable mass such as metal balls or similar, wherein said mass can be added or removed from the half-cylindrical element through the hole that is sealed with a crew cap. The central part of the half-cylindrical elements is covered with a layer of foam, neoprene, rubber or similar material to allow more comfort if used as a foam roller for massage or muscle treatment.

[0023] The devices disclosed above may be used in the field of sports/athletics, rehabilitation and physical therapy, or recreational physical activity. The elements can be used alone or in combination, and provide the user with means for performing various exercises for the purpose of muscle strengthening, increasing flexibility or improving postural balance. The span of the exercises that are possible to perform with the device is comparable to about 10 single-product solutions. The present invention may be used in several different ways, for example:

a) the base plate on its own with unlocked rotation of rotating surfaces for training flexibility of legs, particularly hips,

b) the base plate with unlocked rotation of rotating surfaces in combination with the fulcrum element for combining balance and flexibility training,

c) the base plate with unlocked rotation of rotating surfaces in combination with the elastic band or belt for combining strength and flexibility training,

d) the base plate with unlocked rotation of rotating surfaces in combination with the elastic band or belt as well as fulcrum element for combining balance, strength and flexibility training,

e) the base plate with locked rotation of rotating surfaces in combination with the fulcrum element for balance training,

f) the base plate with locked rotation of rotating surfaces in combination with the elastic band or belt for strength training,

g) the base plate with locked rotation of rotating surfaces in combination with the fulcrum element and the elastic band or belt for combining balance and strength training,

h) the base plate turned upside down in combination with the fulcrum element for stretching and balance training,

i) the fulcrum element on its own for stretching, or massage or as an oscillation exercise tool,

wherein the foam mat(s) may be optionally used on rotating surfaces in any use from a) to g) regardless of the locked/unlocked state in order to increase training difficulty.

[0024] The invention will be described in further detail based on exemplary embodiments and figures, which show:

Figure 1 A possible embodiment of the device viewed from above and below with a cross-section of the locking mechanism and its two states

Figure 2 Possible embodiments of the fulcrum element

Figure 3 Possible embodiments of an elastic band and belt for strength training

Figure 4 Exemplary use of the device for strength training

Figure 5 Exemplary use of the device with the fulcrum element for balance training

Figure 6 Exemplary use of the device turned upside down

Figure 7 Further exemplary use of the device turned upside down

Figure 8 Exemplary use of the fulcrum element shaped as a cylinder

Figure 9 Further exemplary use of the fulcrum element shaped as a cylinder

[0025] The central element of the device according to first exemplary embodiment is an oval-shaped wooden plate (1) (i.e. base plate). Several elements that enable the various uses of the device are integrated into the central plate. The upper part of the base plate includes compact rubber elements (2) (i.e. rubber nubs) protruding from the wooden plate serving stable positioning on the floor, two circular rotating surfaces (3) and a locking mechanism (4). The bottom part of the plate includes three pairs of magnetic sockets (5) for the attachment of the additional elements, two shorter elongated wooden tiles (6) that serve as the support of the plate, and two longer second wooden tiles (7) that serve as a cradle for additional elements (descriptions of attachments of the additional elements are provided later). Four notches are cut into the edges of the plate - two at the distant sides of the plate and two in-between. One elongated metal element (8) is integrated into each of the four notches. These elements serve as attachments sites for elastic bands. In addition, these elements can also function as a handle, when the plate is transported by hand. At the top of the plate, in between the notches on the rim of the plate, there are four elongated rubber nubs (2) protruding from the central plate, serving stable positioning on the floor. Namely, the function of these nubs is the support of the plate when it is turned upside, which is done to enable some of the functions of the device (described later). The said numbs are approximately 0.5-1.0 cm high and thus prevent the surface of the plate to touch the ground, thereby preventing any damage to the main plate or to the floor.

[0026] In addition, at the top of the central plate there are two circle-shaped rotatable surfaces (3), connected to the central plate with any suitable bearings. The preferred embodiment is that the base plate has two circular recesses into which rotatable surfaces (3) are installed with ball bearings or roller bearings having a diameter smaller than the surfaces (3). The dockings (13) for the bearings are also seen in Figure 1. The rotatable surfaces have a thickness of 0.5 to 1.5 cm and are made of wood, possibly covered with a soft material such as foam or neoprene. The rotatable surfaces may be locked (i.e. no rotation is possible) or unlocked (i.e. a rotation is possible) (Figure 1, bottom right). The locking mechanism (4) is attached to the middle of the central plate, between the two rotating surfaces. The locking mechanism is attached to the plate with a metal spring (9). In order to change the position of the locking mechanism, it must be pulled away from the plate, rotated to the desired position and released. When the locking mechanism (4) is released, it is secured in position by two pins (12), until pulled out again. The upper part of the locking mechanism comprises of a small elongated wooden element (10). The said element prevents the rotation of the rotatable surfaces when facing towards them. In this position, the elongated wooden element is aligned along with the central plate (i.e. with the major axis of the oval shape of the plate). When it is turned away from the rotatable surfaces (i.e. aligned with the minor axis of the oval shape of the plate), it enables the rotation of the said plates. In this position, the elongated wooden element is aligned with the minor axis of the plate.

[0027] The locking mechanism (4), as seen in the cross-sectional view (Figure 1, bottom right), is connected to the central plate by a metal spring (9) and has a large circumference. The distal part of the locking mechanism (11) is extending into the bottom level of the rotatable surfaces (3) making the rotatable surfaces more re-

silient to non-centric strain.

[0028] Said rotating surfaces enable training of flexibility, stability and posture as outlined above. In particular, flexibility of legs, hips, knees and ankles may be improved by using the device with unlocked rotation of the rotating surfaces.

[0029] Finally, circular mats made of foam or similar materials are provided with the device to be placed on the rotatable surfaces. These mats are circle-shaped, with the same circumference as the rotatable surfaces (3). At least 3 pairs (6 mats in total), preferably of different thickness and/or stiffness are included. These mats are used during postural balance training to increase the difficulty of the exercise.

[0030] The device further comprises a fulcrum element (F1, F2), wherein exemplary embodiments are shown in Figure 2. It is preferably designed as a cylindrical piece formed by two half-cylinder elements that can be joined and divided as shown in Figure 2. At the bottom part of the central plate, three pairs of magnetic sockets (5) are integrated. These sockets enable the attachment of the half-cylindrical element (Figure 2, left) half-spherical element (Figure 2, right) or the to the bottom part of the central plate. The purpose of such attachments is that the additional elements serve as the fulcrum when the user performs postural stability exercise. One pair of the sockets is positioned at the centre of the plate. One pair is positioned away from the centre towards each of the outer ends of the central plate. The position of the latter two pair of sockets is in the middle between the centre of the plate and the edge of the plate. Next to the sockets, the lower anchorage sites (13) for the bearings of rotatable surfaces are seen.

[0031] Two wooden tiles (6) are attached at the distal ends of the base plate (1). The said tiles are positioned perpendicularly to the major axis of the plate. The height of the tiles must be between 1 and 1.5 cm. At the bottom of these tiles, there is an additional 0.5 high layer of a rubber or similar material that provides sufficient level of friction when touching the ground. The said tiles are in contact with the ground if no other additional element is attached at the bottom of the central plate. In this case, the central base is stable, which is necessary for some of the types of the exercises (examples of such exercises are described later).

[0032] Two longer wooden tiles (7) of lower height (0.5 cm) are also placed at the bottom of the central plate. These smaller tiles are placed in a way to form a rectangle together with the tiles described in the previous paragraph. These tiles serve as a cradle for the cylindrical element. The distance between the inner edges of the smaller tiles must be equal to the length of the cylindrical element or up to 1/3 less. The cylindrical element may be placed on the tiles and serve as a movable fulcrum. The cradle formed by the tiles ensures that the moving trajectory of the cylindrical element is straight. During exercise, the user stands on the plate and aims to stabilize it in a way that only the cylindrical element, but not the central plate, is touching the ground. The two longer wooden tiles also provide additional stability of attachment of the half-cylinder or half-sphere elements. As described above, three pairs of magnetic sockets (making for a total of 6 individual sockets) are intended for the attachment of the latter two elements.

[0033] The device further includes two half-cylindrical elements (Figure 2, left) as described below. The two elements may be joined to form a cylindrical element (Figure 2, middle). Thereby, magnetic sockets (14) are provided on one of the two half-cylindrical elements, and magnetic pins (15) are embedded into the second half-cylindrical element. The latter can be attached to the bottom of the central plate. As described above, the central plate included three pairs of magnetic sockets (5) for this purpose. The half-cylindrical elements are both hollow inside. The purpose of this design is the possibility to add movable mass (metal balls or similar elements) (16) into the elements. This mass can be added or removed from the half-cylindrical element through the hole (17) that is sealed with a crew cap (18). The additional movable mass is added when the elements are used as an oscillation exercise tool. Namely, the two half-cylindrical elements are joined and can then be used as a stability exercise tool. The user performs arm oscillations while holding the cylindrical element. The additional mass within the element increases the difficulty of the exercise and thereby provides a better stimulus to improve joint stability.

[0034] At the distal parts of the half-cylindrical elements, across the full circumference, there are indents (19) that enable to attach the half-cylindrical elements (or the cylindrical element in case the two half-cylindrical elements are jointed) at the bottom of the base plate to serve as a fulcrum for the balance exercises. The distance between the indents is the same as the distance between the two longer wooden tiles that span across the bottom of the base plate, as described above. The width of the indents is the same as the width of the said wooden tiles. The depth of the indents is 0.1-0.2 smaller than the height of the said wooden tiles, enabling smooth motion and sliding of the cylindrical element when attached to the base plate. The central part of the half-cylindrical elements is covered with a layer of foam, neoprene, rubber or similar material (20). The foam is placed only on the arch of the half-cylinder, but not on the cross section. The purpose of the foam is to provide cushioning in case the half-cylindrical element is used as a support for ankle and foot flexibility/strength exercises, or in case the cylindrical element is used as a foam roller tool.

[0035] An additional half-spherical element (Figure 2, right) is preferably provided included with the device as an alternative fulcrum element in addition to the above described cylindrical element that can be split into two half-cylinders. The bottom part of the said element is a half-spherical piece of wood (21). At the top, there is a plate (22) with two magnetic pins (23). The latter enable

the attachment of the half-spherical element to the bottom of the base plate.

[0036] To enable strengthening exercises, elastic tubes (24) with fixation and adjustment loops (25) for quick fixation are included with the device. It is recommended that several elastic tubes with different stiffness are included. The said loops (25) for quick fixation enable effortless fixation of the elastics to the body. For example, the elastics can be easily fastened around the ankle/wrist if needed. Moreover, adjusting the loops may be performed when needed before performing exercises for the upper limbs. Typically, during the said exercises, the user will hold the elastics tube with the hand. One loop, intended for holding or fixation of the elastic tube, is attached at both ends of the main part of the elastic tube. The loops are essentially a double belt, made of rubber or similar material. The double belt loop runs through a plastic slider (26). The slider is simply moved upwards and downwards along the loop to adjust it (i.e. to elongate or shorten the loop). Additionally, a simple belt may be provided with the device (28). The belt has at least three attachment points (29) integrated, preferably about equidistant.

[0037] Examples of the use of the device and its elements are depicted on Figures 4-8. Figure 4 shows two examples of the use of the elastic exercise tools. For these exercises, the central plate is stable (i.e. no additional element is attached at the bottom) and is resting on the wooden tiles with an additional 0.5 high layer of a rubber or similar material (6). The elastic tubes can be attached at one or more elements (8) that are installed within the notches on the central plate. The user may unlock the rotatable surfaces (3) to introduce instability to the exercise. The elastics are easily and quickly attached to the body (attachments at the wrist and at the ankle are shown on Figure 4, left). The loops that wrap around the body parts are quickly adjustable with the slider mechanisms (27). In addition, the elastics may also be attached to one of the attachment points on the belt (Figure 4, right). In these configurations, the user may perform various movements against the resistance of the elastic elements, thereby stimulating improvement in muscle strength. The depicted exercises are relatively complex, however, the user may also perform much simpler exercises, (for example, an exercise involving only one limb). The attachment of the elastic element to the belt enables the user to perform squatting movements against a resistance.

[0038] For exercises intended for development of postural balance, the user may attach the half-spherical, half-cylindrical or cylindrical element (30) under the plate (only the latter is shown on Figure 5, left). The said exercises typically involve standing on the plate and trying to maintain balance (i.e. not letting the edges of the plate to touch the floor). For these exercises the rotatable surfaces (3) should be locked, as depicted by the position of the locking mechanism (4). On the Figure 5 (left), the cylindrical element is attached at the bottom of the plate, and the user is trying to maintain the horizontal position of the central plate. The cylindrical element is movable (i.e. slides along the cradles, provided by the wooden piles at the bottom of the plate; see Figure 1 for details). In case of half-spherical and half-cylindrical elements, no such movement is possible (i.e. the said elements are tightly fixed to the plate). Another option for postural balance exercise is to remove the additional elements from the bottom of the plate, so that the latter is firmly resting on the floor (Figure 5, right), specifically, on the wooden tiles with an additional 0.5 high layer of a rubber or similar material (6). Circular mats (31) made of foam or similar are added on the top side of the central plate. The said mats provide unstable surface, which is one of the approaches to increase the difficulty of the postural balance exercises.

[0039] The device may also be arranged in a configuration that enables some of the stretching exercises. Figure 6 depicts the stretching exercises for lower leg muscles. For these exercises, the half-cylindrical element (32) is attached at the bottom of the central plate. As described in detail above, one of the half-cylindrical elements includes magnetic pins (not shown on Figure 6, see Figure 2 for details), which connect to the magnetic sockets (5) on the bottom of the central plate. For the stretching exercises, the half-cylindrical element is attached to the distal part of the central plate, as shown on Figure 6. The said element serves as a base for the placement of the foot. The shape of the element enables the user to reach the appropriate position for the stretching to be effective. The foam on top of the half-cylindrical element (20; Figure 2) provides cushioning for the comfort of the user.

[0040] The half-cylindrical element (32) also provides a base for strengthening exercises, notably the strengthening exercises for muscles of the foot, ankle and lower leg (Figure 7). For these exercises, the half-cylindrical element (32) is attached at the bottom of the central plate. As in the previous example, it connects to the magnetic sockets (5) on the bottom of the central plate. As shown on Figure 7, different positioning of the foot on the half-cylindrical elements is possible. Changing the position places the stress on different muscles of the foot, ankle and lower leg. During these exercises, the user typical extends the foot and the ankle to raise the body upwards (Figure 7, top right), and the slowly controls the descent into the starting position.

[0041] Figures 8 and 9 depict two more examples of use of the cylindrical element (32). The said element may be used as a tool for stability exercises, typically for the upper limbs. During the said exercises, the user is holding the element in one or two hands, and performs quick oscillating movements. The movable mass (see Figure 2 for details) within the element introduces mechanical perturbations that the user must learn to foresee and control in order to maintain the movement smooth and stable. The exercise may be performed with the arm(s) in virtually any position (e.g. above the head, at the eye level,

with bent elbows, etc.). Figure 9 depicts the use of the cylindrical element as a foam roller. Foam rollers are cylindrically shaped tools with cushioning on the surface. The users may roll their bodies against the foam rollers in order to massage the muscles, which is helpful in increasing the flexibility of the muscles, and in some cases helps to eliminate or prevent painful conditions. As shown on Figure 9, the cylindrical element (30) may functionally serve as a foam roller. The layer of foam or similar material (Figure 2 for details) provides cushioning for the comfort of the user.

[0042] The device can be used in several different ways and can be easily moved between training or rehabilitation rooms or facilities, thus successfully solving the technical problem. The components forming the device can be used either individually or more preferably together in different combination in order to ensure complete body workout for athletes, physically active individuals or even senior citizens that require targeted and controlled physical activities.

[0043] Within the scope of the invention as described herein and defined in the claims, other embodiments of the multi-purpose transportable exercise device for training of balance, strength and flexibility that are clear to one skilled in the art of physical training, rehabilitation and kinesiology may be possible, which does not limit the essence of the invention as described herein and defined in patent claims.

Claims

1. A multi-purpose transportable exercise device for training of balance, strength and flexibility, wherein the said device comprises:

- a base plate (1) comprising:
  - ◦ two rotating surfaces (3), wherein rotation is enabled by suitable bearings and the surfaces (3) may be equipped with exercise mats of different stiffness,
  - ◦ a locking mechanism (4) for locking the position of rotating surfaces 3 in case their rotation is not required,
  - ◦ at least one bottom attachment site (5), preferably more, for attaching a fulcrum element (F1, F2) for balance training,
  - ◦ at least one side attachment site (8), preferably more, most preferably four, for attaching a belt (B) or elastic band (E) for strength training,

- the fulcrum element (F1, F2) to be attached to the bottom attachment sites (5), wherein the said fulcrum element (F1, F2) may be:
  - ◦ a cylindrical element,
  - ◦ a cylindrical element, composed of two half-cylindrical elements,
  - ◦ a cylindrical element, composed of two half-cylindrical elements and at least one half-spherical element, or
  - ◦ a half-spherical element, and/or

- at least one, preferably a set of belts and/or elastic bands (B, E) with different levels of stiffness, which may be attached to the side attachment sites (8).

2. The multi-purpose transportable exercise device according to claim 1, **characterized in that** the base plate (1) preferably comprises any of the following in any combination:

- at least two elongated tiles (6) at the shorter sides of the bottom surface of the base plate (1) for stable placement on the ground/floor,
- at least two second elongated tiles (7) at the longer sides of the bottom surface of the base plate (1) for limiting movement of the fulcrum element (F1, F2),
- at least two rubber elements (2) on the upper surface of the plate (1) for stable positioning on the ground/floor, the rubber elements preferably 0.5 to 1 cm high.

3. The multi-purpose transportable exercise device according to claim 1 or claim 2, **characterized in that**

- the bottom attachment site (5) for attaching a fulcrum element (F1, F2) for balance training, is preferably at least one magnetic socket, preferably three pairs of magnetic sockets equidistantly arranged, wherein the said magnetic sockets are able to interact with magnets (14, 15) provided on the fulcrum element (F1, F2); and
- the side attachment site (8) for attaching a belt or elastic band (B, E) for strength training is at least one elongated metal element serving also as a handle for carrying the device.

4. The multi-purpose transportable exercise device according to any of the preceding claims, **characterized in that** the rotating surfaces (3) are preferably circular, but may have any other shape, as long as the mounting of the surfaces allows such shape, wherein the rotating surfaces (3) are preferably mounted to the base plate (1) with suitable bearings, preferably ball bearings or roller bearings installed below the rotating surfaces (3), and the position of the rotating surfaces (3) may be locked with the locking mechanism (4).

5. The multi-purpose transportable exercise device according to the preceding claim, **characterized in**

that the locking mechanism (4) is preferably designed as a lock and release pin (10) attached to the base plate (1) with a spring (9), so that the pin (10) placed parallel to the length of the base plate (1) locks the position of the rotating surfaces (3), while transverse position of the pin (10) allows rotation of the rotating surfaces (3).

6. The multi-purpose transportable exercise device according to any of the preceding claims, **characterized in that** the device is also provided with one or more, preferably a set of foam coverings/mats of different thickness and/or stiffness, for the rotating surfaces (3) in order to increase the difficulty of balance training.

7. The multi-purpose transportable exercise device according to any of the preceding claims, **characterized in that** the fulcrum element (F1, F2) is attached to the bottom side of the base plate (1) with magnets (15) or any other suitable dockings, preferably magnets that allow secure connection during exercise.

8. The multi-purpose transportable exercise device according to any of the preceding claims, **characterized in that** the fulcrum element (F2) is designed as two removably connected half-cylindrical elements forming a cylinder, wherein the two half-cylindrical elements are connected or disconnected with magnetic sockets (14) and magnetic pins (15), the latter corresponding to the dockings (5) in the bottom surface of the base plate (1); and **in that** indents (19) enable attachment of the half-cylindrical elements or the cylinder fulcrum element at the bottom of the central plate, wherein the indents (19) correspond to the second elongated tiles (7).

9. The multi-purpose transportable exercise device according to the preceding claim, **characterized in that** the half-cylindrical elements are both hollow inside allowing addition of a movable mass such as metal balls or similar (16) into the elements, wherein said mass can be added or removed from the half-cylindrical element through the hole (17) that is sealed with a crew cap (18).

10. The multi-purpose transportable exercise device according to any of the preceding claims, **characterized in that** the elastic band or tube (E) is provided with at least one loop for tightening/adjustment, wherein the band/tube can be easily fastened around the ankle/wrist and adjusted with regards to the personal preference, wherein the loops (25) are essentially a double belt, made of rubber or similar material, and run through a suitable plastic slider (27), which can be moved upwards and downwards along the loop to adjust it, i.e. elongate or shorten the loop (25).

11. A multi-purpose roller device for training of balance, strength and flexibility, **characterized in that** it comprises two removably connected half-cylindrical elements forming the cylinder-shaped roller device, wherein the two half-cylindrical elements are connected or disconnected with magnetic sockets (14) on one half-cylinder and magnetic pins (15) on the other half-cylinder.

12. The multi-purpose roller device according to the preceding claim, **characterized in that** both half-cylindrical elements are hollow inside allowing addition of a movable mass such as metal balls or similar (16) into the elements, wherein said mass can be added or removed from the half-cylindrical element through the hole (17) that is sealed with a crew cap (18).

13. The multi-purpose roller device according to claim 11 or claim 12, **characterized in that** the central part of the half-cylindrical elements is covered with a layer of foam, neoprene, rubber, or similar material (20).

14. Use of the multi-purpose transportable exercise device or the multi-purpose roller device according to any of the preceding claims in the field of sports, rehabilitation and physical therapy, or recreational physical activity.

15. The use according to the preceding claim, wherein the device is used in any of the following ways:

a) the base plate on its own with unlocked rotation of rotating surfaces for training flexibility of legs, particularly hips,
b) the base plate with unlocked rotation of rotating surfaces in combination with the fulcrum element for combining balance and flexibility training,
c) the base plate with unlocked rotation of rotating surfaces in combination with the elastic band or belt for combining strength and flexibility training,
d) the base plate with unlocked rotation of rotating surfaces in combination with the elastic band or belt as well as fulcrum element for combining balance, strength and flexibility training,
e) the base plate with locked rotation of rotating surfaces in combination with the fulcrum element for balance training,
f) the base plate with locked rotation of rotating surfaces in combination with the elastic band or belt for strength training,
g) the base plate with locked rotation of rotating surfaces in combination with the fulcrum element and the elastic band or belt for combining balance and strength training,
h) the base plate turned upside down in combination with the fulcrum element for stretching

and balance training,
i) the fulcrum element on its own,

wherein the rotating surfaces in uses a) to g) may be further equipped with foam mat(s) regardless of their locked/unlocked state,
or any combination thereof.

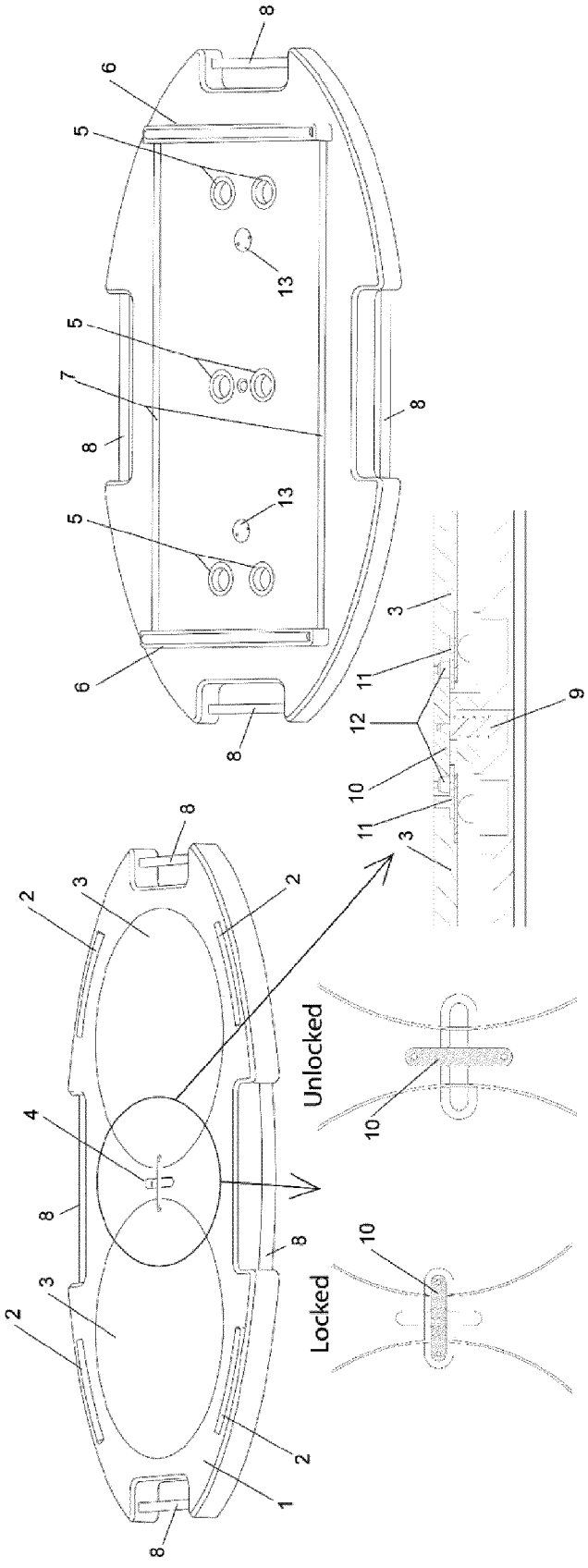

Figure 1

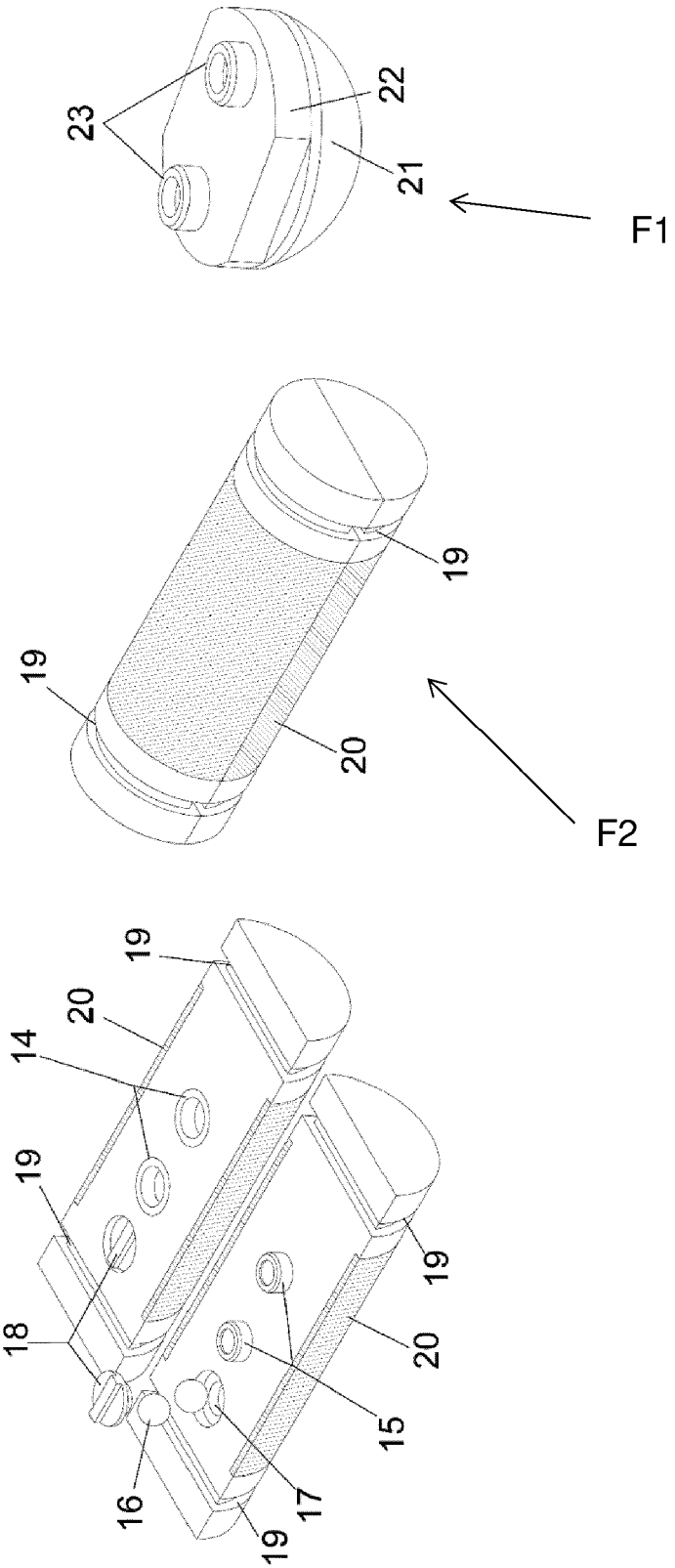

Figure 2

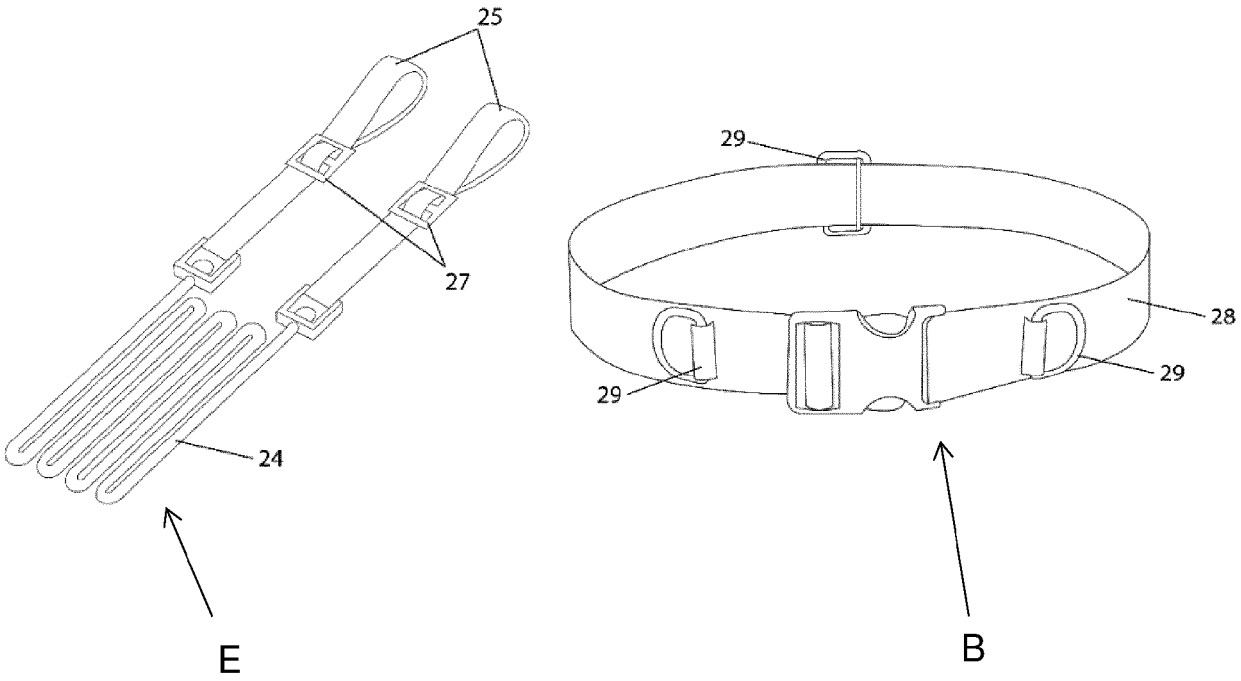

Figure 3

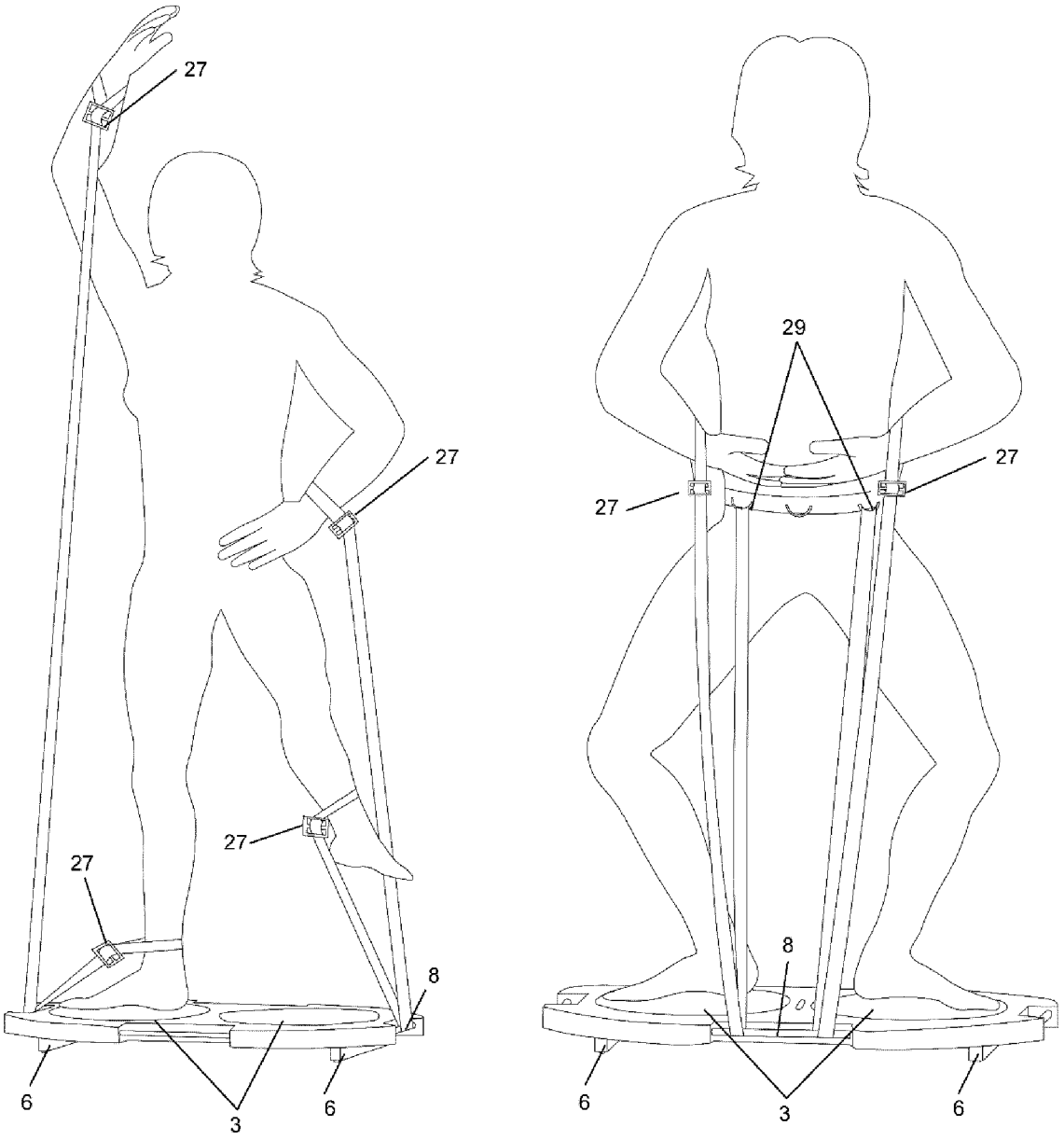

Figure 4

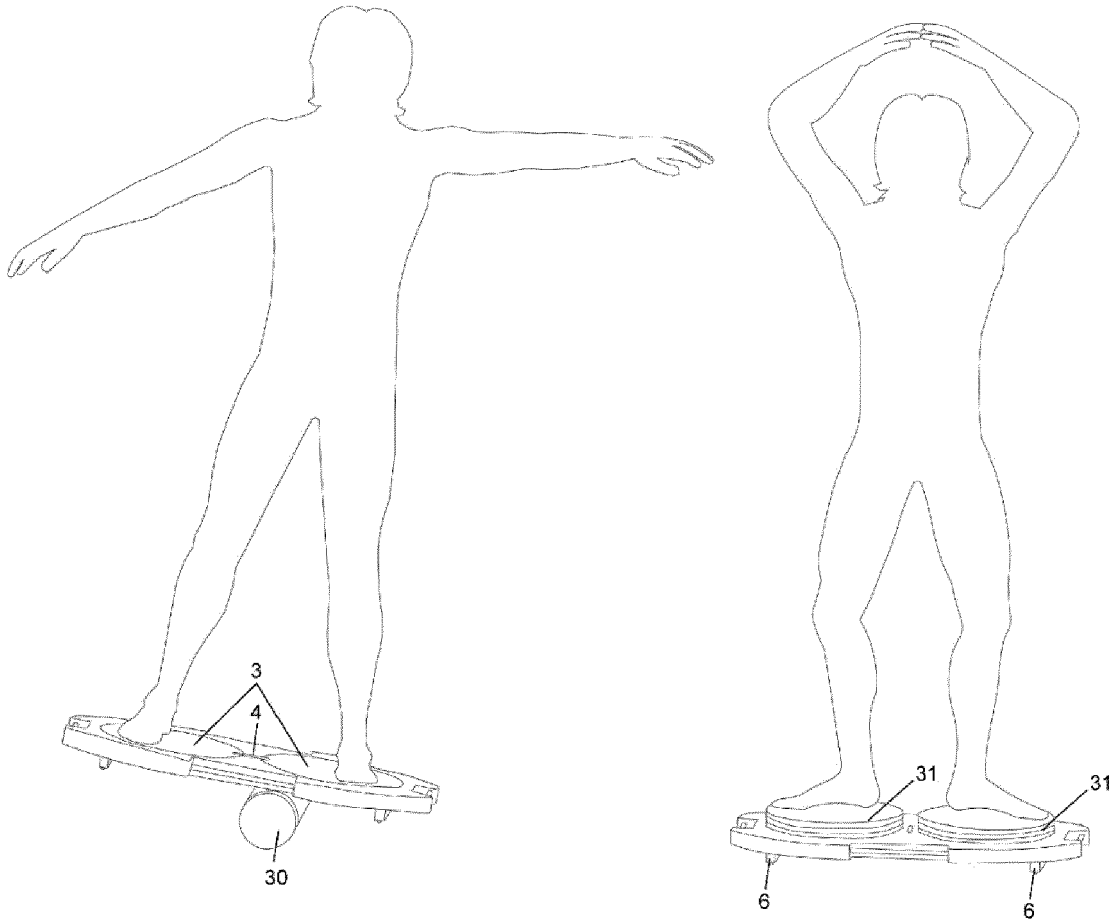

Figure 5

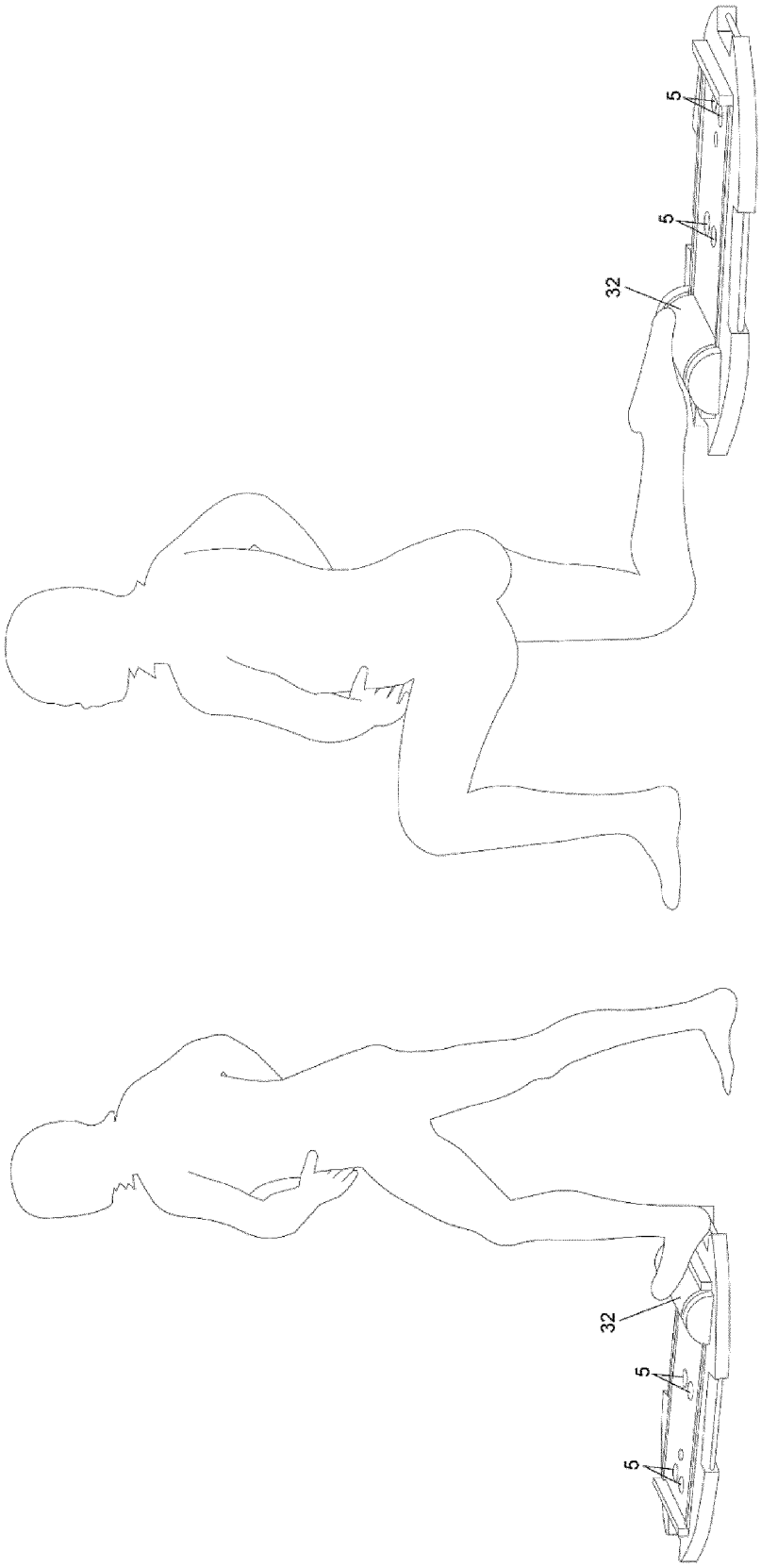

Figure 6

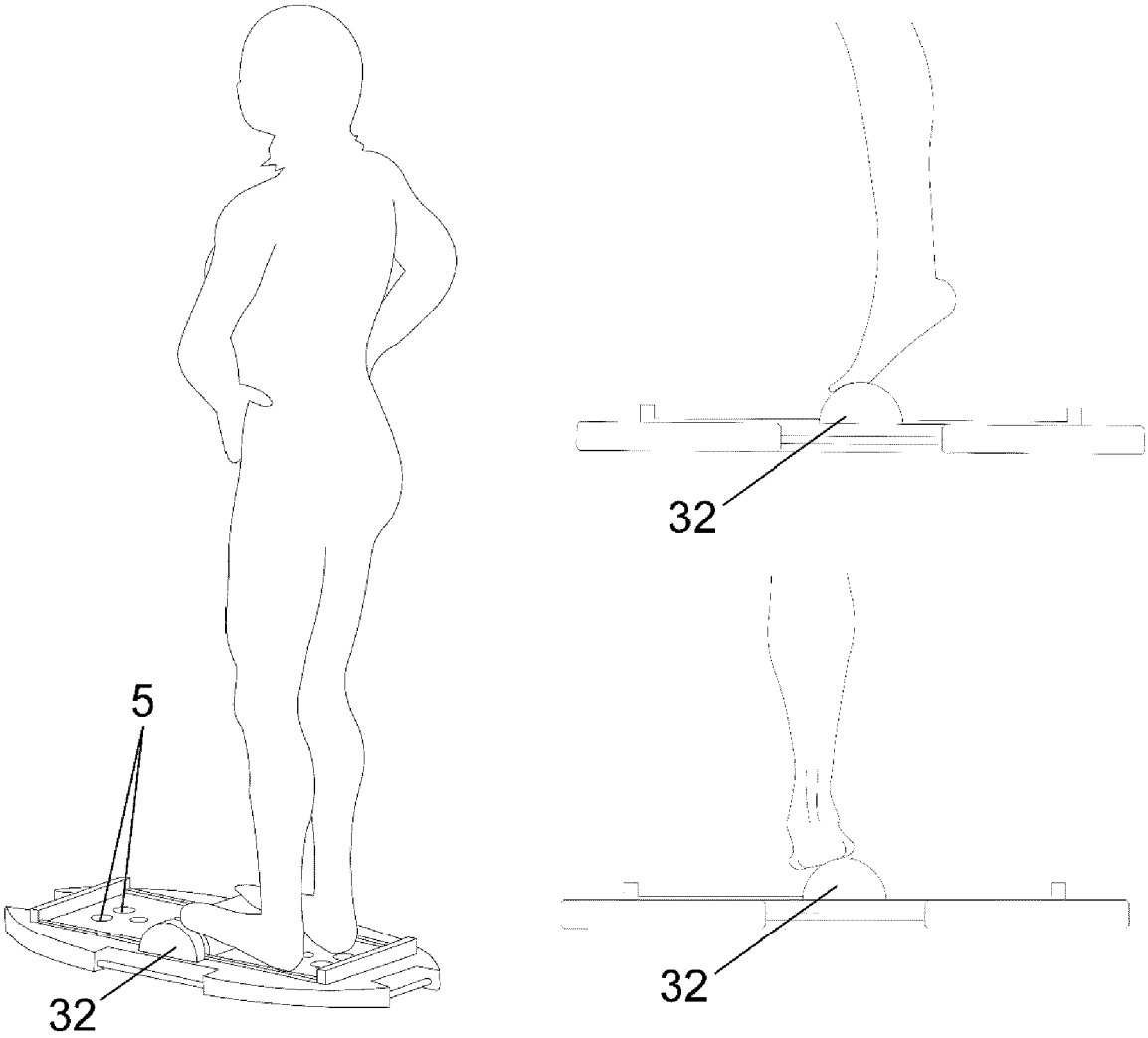

Figure 7

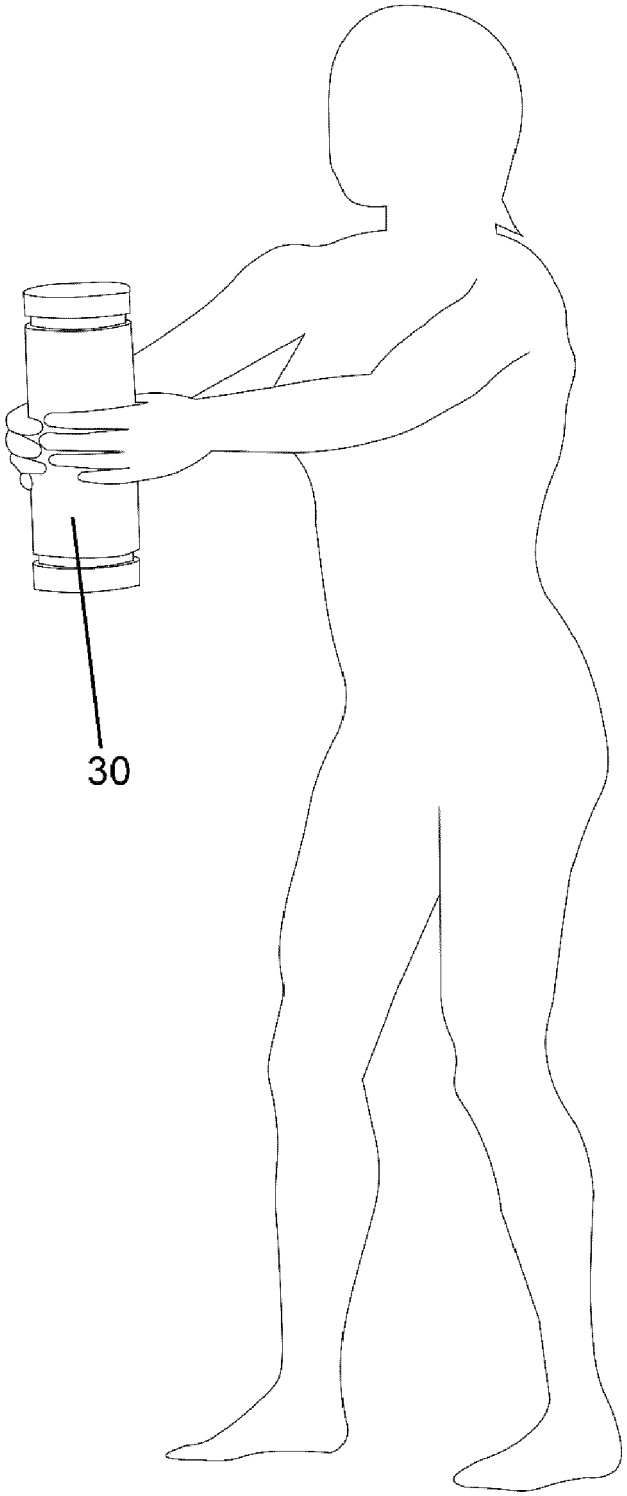

Figure 8

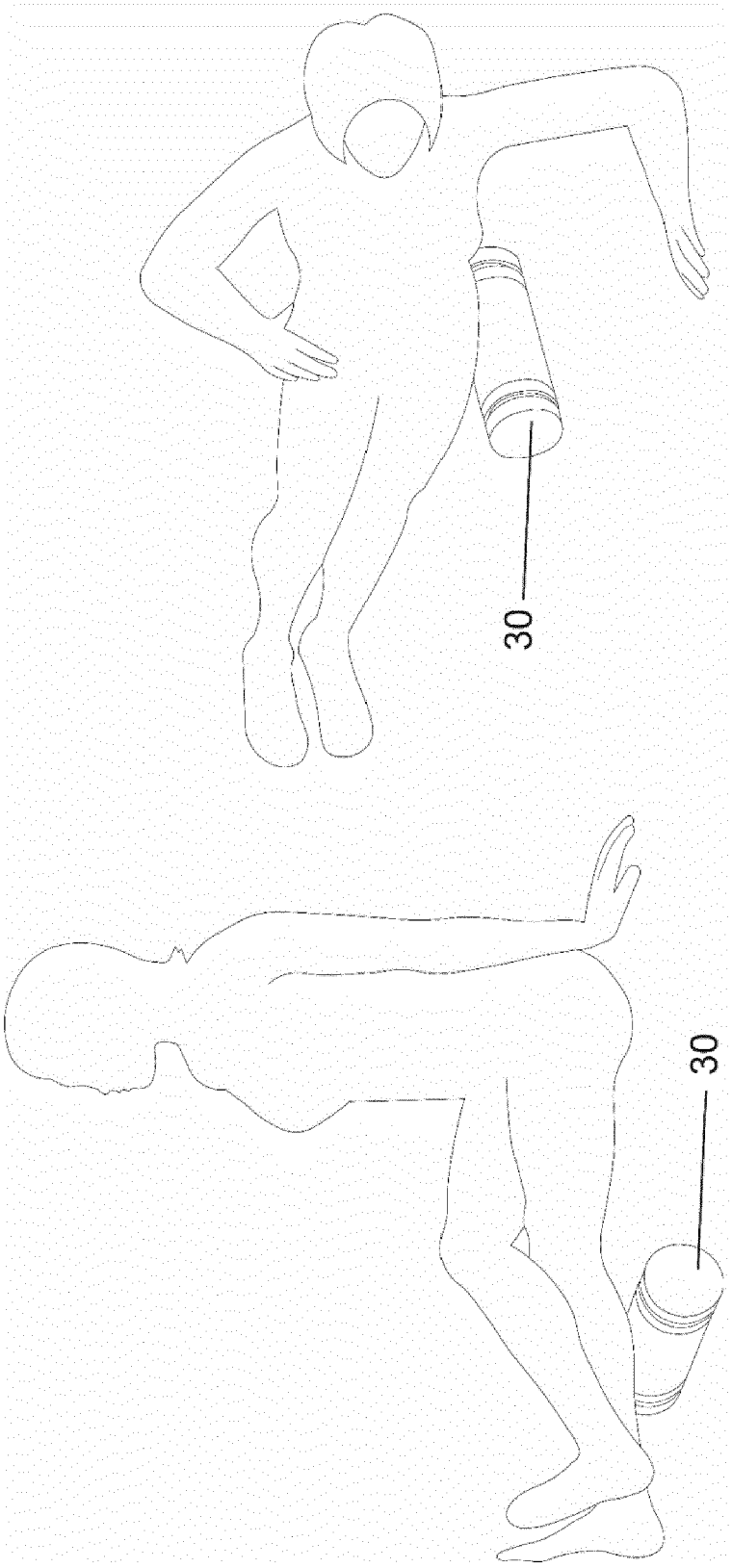

Figure 9

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Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 December 2020	Borrás González, E

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EUROPEAN SEARCH REPORT

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