Portable fitness apparatus for the performance of a training exercise by a person. The fitness apparatus has a disc-shaped resistance apparatus having a winding device inside a housing. With the winding device, a line can be wound onto a winding element. The winding device is coupled by means of a one-way bearing to a resistance unit, wherein the resistance unit serves to generate a training resistance. As a result of the one-way bearing, the winding element has a freewheel in a first rotational direction and the winding element meets a resistance in an opposite, second rotational direction corresponding to the unwinding of the winding element.
Fig. 4A
PORTABLE FITNESS APPARATUS

Field of the Invention

[0001] The present invention relates to a fitness apparatus, in particular to a fitness apparatus which can be worn by a person on the body.

BACKGROUND OF THE INVENTION

[0002] A portable fitness apparatus of this type is known from WO97/34602. The fitness apparatus has a hip belt, which is provided with two resistance apparatuses. Each resistance apparatus is provided with a cord having a handle. A training exercise can be performed by pulling on the cord, whereupon the resistance apparatus generates a training resistance. In the case of the known fitness apparatus, it is intended to deliver a constant resistance during the performance of a training exercise.

[0003] The training resistance which is created by the resistance apparatus is delivered by a coiled leaf spring inside the housing of the resistance apparatus. By pulling on the flexible element, the leaf spring is made to uncoil and thereafter generate a training resistance. If, on the other side, the flexible element is uncoiled and wound up again, the resistance apparatus generates a constant resistance. The winding device comprises a winding element having a winding surface for the winding up and unwinding of the flexible element. The flexible element has a first end, which is connected to the winding element. The flexible element extends from the winding element inside the housing outwards through an opening of the housing. The flexible element has a second end, which is connected to a handle for the securement of the second end. The winding element is mounted rotatably about a centre axis of the housing. By means of a coiled leaf spring, the winding element is pretensioned, such that the winding element backrotates when the flexible element is unwound and an applied tensile force decreases. By the back-rotation of the winding element, the flexible element is rewound.

[0007] The fitness apparatus according to the invention provides an improvement by virtue of the fact that the winding element is rotationally supported on the centre axis by a one-way bearing. A one-way bearing is also referred to as a freewheel or freewheel bearing. A resistance unit for the generation of a training resistance is connected to the one-way bearing, such that the winding element has a freewheel in a first rotational direction corresponding to the back-rotation of the winding element, and thus the winding up of the flexible element, but meets a resistance in an opposite, second rotational direction corresponding to the unwinding of the winding element and the extension of the flexible element.

[0008] In the first place, the fitness apparatus according to the invention offers the advantage that the training resistance is now no longer determined by just the coiled leaf spring, but that a resistance unit is provided for the creation of the training resistance. The leaf spring can now be dimensioned so light that it generates just enough tensile force to wind up the flexible element, but the leaf spring no longer needs to be dimensioned so heavy that the leaf spring delivers sufficient training resistance for a training exercise.

[0009] Advantageously, the resistance unit is coupled by means of the one-way bearing to the winding element, so that the winding up of the flexible element is not hampered by a resistance delivered by the resistance unit. Through the use of the one-way bearing, an automatic decoupling of the resistance unit with the winding element is provided when the winding element rotates in a direction in which the flexible element is wound up.

[0010] Another important advantage is that the fitness apparatus according to the invention can deliver a substantially constant training resistance over a substantially total travel of the flexible element. A non-elastic, inextensible flexible element contributes to a constant training resistance, and the used resistance unit can also, for instance on the basis of friction, contribute to the constant training resistance over the substantially total travel of the flexible element.

[0011] In one embodiment of the fitness apparatus according to the invention, the flexible element comprises a polyethylene-based synthetic fibre, in particular UHMWPE (ultra high molecular weight polyethylene), more particularly a line made of Dyneema material or an equivalent material having comparable strength properties. This material can be used, because the material has a high tensile strength and a low specific gravity. Dyneema is also resistant to friction, sunlight and micro-organisms and the material does not chafe or cut, which makes the use of Dyneema as the flexible element in the fitness apparatus according to the invention very suitable.

[0012] In one embodiment of the fitness apparatus according to the invention, the one-way bearing has an internal bearing part and an external bearing part. The external bear-
The internal bearing part is fixedly connected to the winding element. The internal bearing part is connected rotatably about the centre axis of the housing.

In one embodiment of the fitness apparatus according to the invention, the resistance unit is a friction resistance unit for the friction-based creation of a resistance. The friction resistance unit is connected by the one-way bearing to the winding device. In one embodiment, the internal bearing part of the one-way bearing is connected to a resistance plate of the friction resistance unit, wherein the friction resistance unit also has a pressure plate for the braking of the resistance plate. The pressure plate is here connected in a rotationally rigid and therefore non-rotatable manner to the housing. The pressure plate is positioned opposite the resistance plate, such that the pressure plate can be pressed against the resistance plate to create a friction. Advantageously, the used friction resistance unit provides a simple configuration which can be integrated within the housing, whereby the housing can nonetheless remain relatively compact. Advantageously, the friction resistance unit can be steplessly adjusted. Advantageously, the friction resistance unit can deliver a constant training resistance over the total travel of the flexible element.

In one embodiment of the fitness apparatus according to the invention, the pressure plate, with the aid of an adjusting knob, is movable in the axial direction with respect to the centre axis of the housing for the adjustment of the training resistance. The movement of the pressure plate in the axial direction enables the pressure plate to press more tightly or more loosely against the resistance plate of the friction resistance unit, whereby the training resistance to be created is adjustable. In particular, a training resistance can be adjusted within a range of at least 0.25 kg to no more than 25 kg. Through the use of the friction resistance unit, the training resistance can be kept substantially constant. By a constant training resistance is here meant that a user in practice perceives a set training resistance as constant if the training resistance varies by no more than 0.5 kg over a travel of about 50 cm of the flexible element, given a set training resistance of at least 2 kg.

In particular, a brake lining is provided between the resistance plate and the pressure plate of the resistance unit. The brake lining is, for example, cork. The brake lining can be removably fitted, such that a user, after excessive wearing of the brake lining, can replace the brake lining.

In one embodiment of the fitness apparatus according to the invention, the resistance unit is an eddy current resistance unit, also referred to as a magnetic resistance unit. The eddy current resistance unit comprises a resistance rotor and at least one permanent magnet. The resistance rotor is rotatably mounted inside the housing of the resistance apparatus. A rotor part of the resistance rotor moves through a magnetic field of the at least one permanent magnet. The at least one permanent magnet is positioned next to the resistance rotor, such that the rotor part of the resistance rotor moves, in operation, through the magnetic field.

The fitness apparatus with eddy current resistance unit has the advantage that the creation of the training resistance occurs contactless. The eddy current resistance unit has no wearing components, which increases the working life of the fitness apparatus. Advantageously, the eddy current resistance unit can be steplessly adjusted. Moreover, the eddy current resistance unit can provide a constant training resistance over the total travel of the flexible element.

In one embodiment of the fitness apparatus according to the invention, a training resistance to be created is adjustable by the eddy current resistance unit. The training resistance can be adjusted with an adjusting knob by changing the position of the at least one permanent magnet with respect to the resistance rotor. By adjusting the position of the magnet, a greater or lesser rotor part of the resistance rotor will move through the magnetic field, so that the training resistance is thus adjustable.

In one embodiment of the fitness apparatus according to the invention, the fitness apparatus can be worn by a person. The fitness apparatus can, in particular, be worn on the body during the performance of a training exercise, for example during a running exercise. The fitness apparatus is manageable and has a weight of no more than 2500 grams, in particular no more than 1800 grams, more particularly no more than 1000 grams. In particular, the resistance apparatus has a weight of at least 500 grams and no more than 2500 grams. The resistance apparatus can be of lightweight configuration if the maximally desired resistance setting of, for example, no more than 5 kg remains relatively low, or can have a heavier embodiment if the maximally desired resistance setting needs to be relatively high, for example at least 10 kg.

Preferably, the housing of the resistance apparatus is disc-shaped. In one embodiment of the fitness apparatus according to the invention, the resistance apparatus has a housing having a relatively limited width. The housing of the resistance apparatus has a maximum width of no more than 5 cm, preferably no more than 3 cm. The housing of the resistance apparatus is hence scarcely a hindrance to the freedom of movement of a person.

The fitness apparatus can preferably be fastened to the body of a person. The fitness apparatus preferably has a body fastening means for providing a fastening of the fitness apparatus onto the body of a person. In one embodiment of the fitness apparatus according to the invention, the fitness apparatus comprises a hip belt for fastening at least one resistance apparatus to a hip of a person. Preferably, the fitness apparatus comprises two resistance apparatuses, which are connected to the body fastening means. In particular, with the two resistance apparatuses, the left and right limbs can respectively be trained.

In one embodiment of the fitness apparatus according to the invention, the opening of the housing for the outward feed-through of the flexible element, the so-called line passage, is mounted rotatably with respect to the body fastening means. Advantageously, the opening can hereby be directed during a training exercise in the direction in which the flexible element is extended by the person. Preferably, the opening of the housing can rotate over a rotation travel, but, further preferably, over at least a complete revolution, with respect to the body fastening means. Hence the opening must not pose an obstruction during the performance of the training exercise. In particular, the housing of the resistance apparatus is rotatably connected to the body fastening means, such that the opening of the housing can rotate during a training exercise jointly with the movements of the flexible element. In particular, the resistance apparatus is mounted rotatable about a rotational axis, the centre line of which coincides with that of the centre axis over which the winding element is rotatable.

In one embodiment of the fitness apparatus according to the invention, the resistance apparatus is slidably connected to the body fastening means. The resistance apparatus
is slidable over a certain travel in translation motion. The resistance apparatus can be displaceable, for example, over a travel of at least 5 cm, in particular at least 10 cm, but preferably at least 15 cm. The resistance apparatus is displaceable with respect to the body fastening means from a first position into a second position. The body fastening means is, for example, a hip belt. The resistance apparatus is displaceable in a longitudinal direction of the hip belt. The resistance apparatus is displaceable from a hip position as the first position into a buttock position as the second position. The fact that the resistance apparatus is displaceable with respect to the body fastening means can prevent the resistance apparatus from forming an obstacle to a movement during a training exercise. In addition, more forms of training exercises can also be performed. In a training exercise, a training resistance can be generated, for example, over a longer portion of a travel of an arm movement.

In one embodiment of the fitness apparatus according to the invention, the body fastening means is a hip belt. The hip belt is further provided with at least one trunk strap for fastening of the hip belt to a trunk of a person. The trunk strap can be fastened over the top of the shoulders or underneath through between the legs of the person. An upward or downward movement of the hip belt during a training exercise can hence be opposed.

In one particular embodiment of the fitness apparatus according to the invention, the body fastening means is a hip belt, wherein the hip belt is realized as a trapeze. Such a trapeze is known, for example, in wind surfing. The trapeze comprises two trunk straps for fastening underneath the hip belt to the trunk of a person. The two trunk straps can be passed between the legs and fixed to the hip belt.

In one embodiment of the fitness apparatus according to the invention, the fitness apparatus comprises at least one ankle strap. The ankle strap can be fastened to an ankle of a person. The ankle strap is provided with a diverting element for the diversion of the flexible element. In particular, the diverting element is hook-shaped. The hook-shaped diverting element offers the advantage that the flexible element can be quickly fastened to the ankle strap. The diverting element has a hook eye for the feed-through of the flexible element. Preferably, the hook eye is positioned at a distance of at least 5 mm, in particular at least 10 mm, but preferably at a distance of at least 20 mm from an outer side of the ankle strap. Advantageously, the flexible element is fed through at such a distance from the ankle strap that the flexible element during a training exercise remains substantially free from contact with the body of a person. In an embodiment the hook eye can be open, but preferably the hook eye is closable with a hook-closing clip such that a fed-through flexible element is detained in the hook eye. The flexible element can thereby be prevented from coming loose from the diverting element during the performance of a training exercise.

In an alternative embodiment of the fitness apparatus according to the invention, the ankle strap can comprise a diverting pulley for the guidance of the flexible element. The diverting pulley is rotatably connected to the ankle strap.

In one embodiment of the fitness apparatus according to the invention, the handle at the end of the flexible element is looped. Preferably, the handle is flexible. The looped handle can be produced, for example, from a fabric strip. Advantageously, the number of possible training exercises is increased by the use of the looped handle. During a training exercise, the looped handle can be slipped, for example, around the housing of the resistance apparatus.

The flexible element can hence extend, for example, from the housing to the ankle strap and back again to the housing of the resistance apparatus. The looped handle also makes a simple foot connection possible, since a foot can be placed easily and quickly into the loop.

In one embodiment of the fitness apparatus according to the invention, the flexible element has a length of at least 2 m, preferably at least 4 m. As a result of the relatively long length of the flexible element, the fitness apparatus is suitable for tall people. A further advantage is that the relatively long length of the flexible element increases the number of training exercises, for example, since training exercises in which the flexible element is double-wound are also possible.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be explained in greater detail below with reference to the appended drawings. The drawings form a practical embodiment of the invention, which should not be regarded in a limiting sense. Specific detailed characteristics can also be viewed separately from the illustrative embodiment, in a general sense, as characteristic of the invention, wherein:

FIG. 1 shows a perspective view of a person with fitness apparatus according to the invention;
FIG. 2A shows a perspective view of the fitness apparatus with hip belt and resistance apparatus;
FIG. 2B shows a perspective view of a person with fitness apparatus, wherein the hip belt is realized as a trapeze;
FIG. 3A shows a perspective view of an ankle strap, with diverting pulley, of the fitness apparatus according to the invention;
FIG. 3B shows a perspective view of an ankle strap, inclusive of hook and foot strap, of the fitness apparatus according to the invention;
FIGS. 4A-D show partially cut-away perspective views of a resistance apparatus with friction resistance unit; and
FIGS. 5A-D show partially cut-away perspective views of a resistance apparatus having a magnetic resistance unit.

DETAILED DESCRIPTION

In the figures, consistent reference numerals are used for similar, identical or functionally identical components of a fitness apparatus according to the invention.

FIG. 1 shows a person 27 with the fitness apparatus 1 during a training exercise. The fitness apparatus 1 is portable and fastened to the body of the person 27. The fitness apparatus 1 has a body fastening means 3, which is here in the form of a hip belt. The hip belt 3 is fastened at the height of the hip of the person 27. The fitness apparatus 1 comprises a resistance apparatus 7, which is connected to the body fastening means 3. The resistance apparatus 7 has a housing with a winding device therein. The winding device serves to wind up and unwind a flexible element 17. The person 27 holds a distal end of the flexible element 17 tightly in his hand. The flexible element 17 has a proximal end connected to the winding device of the resistance apparatus 7. The fitness apparatus 1 further comprises an ankle strap 23 having a diverting element 25. As a result of the ankle strap with
diverting pulley, a large variety of training exercises can be performed with this fitness apparatus. The diverting element 25 is here a diverting pulley. The flexible element 17 extends during use from the resistance apparatus 7, wherein the flexible element 17 is guided along the diverting element 25 and from there to a handle 19 held tight by the user.

[0041] FIG. 2A shows the body fastening means 3 with resistance apparatus 7 in further detail in a perspective view. The body fastening means 3 comprises a belt, in particular a hip belt. The belt can be closed with a click joint. The belt is provided with a pad, a support surface 31. The support surface 31 provides a local widening on the belt, against which the resistance apparatus 7 can rest.

[0042] The resistance apparatus 7 is mounted rotatably with respect to the body fastening means 3. The resistance apparatus 7 is connected to the hip belt 3 rotatably about a centre line 5. The resistance apparatus 7 has a housing 9. The housing 9 accommodates the winding device for winding up and unwinding the flexible element 17. The housing 9 is disc-shaped. The housing 9 has two parallel side walls 91, which are connected to each other by a peripheral wall 92. The peripheral wall 92 is circular. In the peripheral wall 92 is an opening 93, a line passage, provided for the feed-through of the flexible element 17 outwards from the winding device. The flexible element 17 is here a cord.

[0043] On the distal end of the flexible element is provided a handle 19, wherein the handle is bar-shaped. The flexible element 17 is fastened centrally to the handle 19 in a middle region of the handle 19.

[0044] The flexible element 17 can be pulled counter to a spring force out of the housing 9, whereas it meets resistance. When the handle is released, the flexible element is retracted into the housing and wound up by a spring, in particular a coiled leaf spring. As a result of the spring, the flexible element 17 back-rotates.

[0045] The resistance apparatus 7 is fastened to the hip belt 3 in a freely rotatable manner with respect to the hip belt 3. If the flexible element 17 is pulled while the flexible element is coming out of the opening 93 at other than right angles to the peripheral wall 92, the tensile force in the flexible element will ensure that the resistance apparatus 7 is rotated until the flexible element leaves the resistance apparatus at right angles to the peripheral wall, as in FIG. 2A.

[0046] As will be further explained below with reference to FIGS. 4A-4D, the resistance apparatus 7 has a winding device positioned inside the housing 9. This winding device has a disc-shaped winding element, onto which the flexible element 17 is wound. The winding element is rotatable counter to a spring force and is rotatable about a centre axis. The resistance apparatus is rotatable about a rotational axis, the centre line 5 of which coincides with that of the centre axis.

[0047] Pulling on the flexible element 17 causes the winding element to revolve and the flexible element to unwind from the winding device. By means of an adjusting knob 21, here a rotary knob, the size of the resistance which the winding element meets as it revolves in the housing 9 can be adjusted.

[0048] As shown in FIG. 2A, the resistance apparatus 7 is mounted displaceably with respect to the body fastening means 3. The resistance apparatus 7 is displaceable in a longitudinal direction of the body fastening means 3. The resistance apparatus 7 is displaceable from a first position into a second position on the body fastening means 3. In the first position, the resistance apparatus is positioned, for example, above the hip of a person 27. In the second position, the resistance apparatus 7 is displaced rearwards and is positioned above a buttok of a person 27.

[0049] FIG. 2B shows an alternative embodiment of the fitness apparatus 1, wherein the body fastening means 3 is realized as a trapeze. The trapeze is provided with a girdle, a hip belt, with two trunk straps. The trunk straps should be fastened around the thighs. During use, the ends of the trunk strap are fastened to the girdle and extend underneath the trunk of a person. The trunk straps prevent the body fastening means 3 from being able to move upwards during a training exercise wherein a tensile force is applied in the upward direction.

[0050] FIG. 2B further shows that the fitness apparatus 1 comprises two resistance apparatuses 7. During use, a first resistance apparatus is positioned on a left side of a person and a second resistance apparatus on a right side of a person.

[0051] In FIG. 3A, an ankle strap, with a diverting pulley 25 thereon, of the fitness apparatus is represented. The diverting pulley 25 is rotatably fastened to the ankle strap 23. In FIG. 3B is shown an ankle strap of the fitness apparatus 1, wherein the ankle strap is further provided with a foot strap 24. During use, the ankle strap should be slipped around the ankle and the foot strap 24 should extend through underneath the foot. The foot strap serves to absorb upwardly directed forces during a training exercise. The ankle strap is further provided with a diverting element 25, which is here of hook-shaped configuration. The hook-shaped diverting element 25 has an open hook eye for receiving the flexible element 17. The hook eye is positioned at a distance from an outer surface of the ankle strap 23 in order to prevent the flexible element from coming into contact with a leg of a person during a training exercise. In particular, the distance from the centre of the hook eye to the outer surface of the ankle strap is at least 20 mm.

[0052] FIGS. 4A-4D show a cut-away perspective view of the resistance apparatus 7 in cross section. The resistance apparatus 7 has a disc-shaped housing 9. The housing 9 has a limited size with a maximum outer diameter of no more than 20 cm, preferably no more than 15 cm, whereby the resistance apparatus 7 is manageable and portable and can be easily transported on the body by a person. The housing is formed from two mutually opposing housing parts, so that the housing can be produced by injection moulding. The housing 9 has a rear side and a front side. On the front side of the housing 9 is provided an adjusting knob 21. The assembled housing 9 has 2 parallel side walls 91, which determine a width of the housing. The width of the housing 9 is relatively limited and has a maximum width of no more than 5 cm, preferably no more than 3 cm. The housing of the resistance apparatus 7 is hence scarcely a hindrance to the freedom of movement of a person.

[0053] Inside the housing 9 is situated a shaft 5 for the positioning of a winding device 6. The shaft 5 is centrally positioned and runs parallel with the centre line of the housing 9. The shaft 5 is fixedly connected at a proximal end to a rear side of the housing 9 and extends to a front side van the housing 9. The shaft 5 has a distal end. The adjusting knob 21 is fastened to the distal end of the shaft 5.

[0054] The resistance apparatus 7 comprises a winding device 6 having a winding element 61. The winding element 61 is cylindrical. The winding element 61 is shaped as a spool and has a winding surface 611 for the winding of the flexible element 17. The winding surface 611 is formed by an external shell surface. The winding surface 611 is provided with side
cheeks 612 for the detention of a wound flexible element. The winding element 61 is positioned in the housing 9 in a cylindrically shaped housing chamber 94 having a peripheral wall 941. The side walls on either side of the winding surface 611 connect to the peripheral wall 941 of the housing chamber 94. In an assembly of the winding element 61 and the housing 9, the peripheral wall of the housing chamber encloses a wound flexible element 17. The risk of entanglement of the flexible element is thereby substantially eliminated.

[0055] The winding element 61 is connected by means of a leaf spring 62 to the housing 9. The leaf spring 62 is strip-shaped and made of spring steel. The leaf spring 62 has an external end and an internal end. The external end is connected to the winding element 61, whilst the internal end is connected to the housing 9 by a spring bush 621. The leaf spring 62 is coiled up inside the housing 9.

[0056] The leaf spring 62 is positioned in a spring chamber 613 of the winding element 61. The spring chamber 613 is a cylindrical. The leaf spring 62 is in a coiled state positioned in the spring chamber 613 of the winding element 61. The spring chamber 613 is on one side open for the reception of the leaf spring 62. The spring chamber 613 is on an outer side enclosed by an external wall section and on an inner side enclosed by an internal wall section. The internal and external wall sections are cylindrical. The winding surface 611 is provided on the outer wall section.

[0057] The leaf spring 62 is fixedly connected by means of a spring bush 621 to a rear side of the housing 9. The spring bush 621 has a spring bush flange, which is connected to the housing 9. Here, the spring bush 621 is connected by means of a bolt joint to the housing 9. The spring bush 621 extends into the spring chamber 613.

[0058] The winding element 61 is supported on the shaft 5 by means of a one-way bearing 63. The one-way bearing 63 is a freewheel bearing. The one-way bearing 63 comprises an internal bearing part 631 and an external bearing part 632. The external bearing part 632 is connected by a bearing to the internal bearing part 631. The external bearing part 632 is fixedly connected to the winding element 61. The internal bearing part 631 is rotatably connected to the shaft 5. The bearing is arranged such that the internal bearing part is not engaged and hence freewheels in a first rotational direction, but that the internal bearing part 631 is engaged and hence co-rotates with the external bearing part 631 and the winding element 61 in a second rotational direction.

[0059] The internal bearing part 631 is connected to a resistance unit 70. The resistance unit 70 is a friction resistance unit, also referred to as a friction brake. The resistance unit 70 comprises a resistance plate 71. The resistance unit 70 further comprises a pressure plate 72 cooperating with the resistance plate 71. In the resistance unit 70, the resistance plate 71 is arranged such that the resistance plate 71 is rotatable with respect to the pressure plate 72. A resistance material 73, also referred to as a brake lining, such as cork, is provided between the pressure plate 72 and the resistance plate 71. The resistance material is a wearing material. The resistance material provides a friction force when the resistance plate 71 rotates with respect to the pressure plate 72. The generated friction force provides in the resistance apparatus 7 the training resistance.

[0060] The internal bearing part 631 of the one-way bearing 63 has on the front side of the housing 9 an end face provided with the resistance plate 71 of a resistance unit 70. The resistance plate 71 is integral with the internal bearing part 631. The resistance plate 71 is formed by a flange on the end face of the internal bearing part 631.

[0061] The pressure plate 72 is positioned opposite the resistance plate 71. The pressure plate 72 is connected in a rotationally rigid manner to the housing 9 by means of the shaft 5. The shaft 5 is provided with at least one flat edge in an outer surface. The flat edge forms a locking mechanism for the pressure plate 72. The fastening of the pressure plate 72 on the shaft 5 permits a movement of the pressure plate 72 in the axial direction of the shaft 5.

[0062] By means of the adjusting knob 21, the pressure plate 72 is axially displaceable over the shaft 5 and, as such, can be pressed more tightly or more loosely against the resistance plate 71. The pressure plate 72 has an end pressure face, which can be pressed against an end pressure face of the resistance plate 71. The training resistance is hereby adjustable. Advantageously, the adjustability requires hardly any space compared to a radial engagement and the resistance apparatus can be compactly configured. The adjusting knob 21 is centrally positioned on the front side of the housing 9. Advantageously, the positioning of the adjusting knob on the front side of the housing is ergonomically accessible in the performance of a training exercise. The resistance is created substantially by friction and only to a small extent by the spring force. With the adjusting knob, the pressure force, and thus the size of the resistance, can be continuously and steplessly readjusted.

[0063] The adjusting knob 21 is connected by means of a screw joint to the centre shaft 5. Turning of the adjusting knob 21 produces an axial shift of the adjusting knob, such that the pressure plate 72 is also axially displaced and a resistance force is adjusted. The one-way bearing 63 ensures that the set training resistance is only transmitted to the flexible element 17 when the flexible element 17 unwinds from the winding element 61 and is pulled out of the housing 9. The one-way bearing 63 is disconnected in an opposite rotational direction, wherein the flexible element 17 is wound onto the winding element 61. The resistance of the resistance unit 70 is hence not present during winding up of the flexible element 17. In the return movement, no frictional resistance is thus met and the spring element, the leaf spring, can easily wind the flexible element onto the spool. The leaf spring 62 can be designed light enough for the leaf spring 62 to offer sufficient tensile force to rapidly wind up the flexible element 17. Advantageously, the shown configuration is compact, which is favourable for the mobility and portability of the fitness apparatus.

[0064] FIGS. 4C and 4D further show a fastening plate 8 for a rotatable fastening of the resistance apparatus 7 to a body fastening means 3. The fastening plate 8 is circular. The fastening plate 8 is connected to the housing 9. The rotatable fastening of the resistance apparatus 7 ensures that the line passage of the resistance apparatus 7 is at the same time aligned with a direction of pull of the flexible element 17.

[0065] FIGS. 5A to 5D show an alternative embodiment of the resistance apparatus 7 of the fitness apparatus.

[0066] FIG. 5A shows a perspective view of an outer side of the resistance apparatus 7. The resistance apparatus 7 has a housing 9, which is disc-shaped. The housing has two parallel side walls 91 and a peripheral wall 92. The housing 9 is substantially closed. The housing has an opening 93, a line passage, for the feed-through of the flexible element 17. On a front side, the housing 9 is provided with an adjusting knob 21 for the adjustment of a training resistance.
In FIGS. 5B-5D, cut-away perspective views of the resistance apparatus 7 of the fitness apparatus are shown, wherein different training resistances are set. The resistance apparatus 7 has a resistance unit 70.

The resistance unit 70 comprises a resistance rotor 71. The resistance rotor 71 is rotatably positioned inside the housing 9. The resistance rotor 71 coupled to a winding element 61 by a one-way bearing 63, such that the resistance rotor 71 has a freewheel with respect to the winding element 61 in a first rotational direction, wherein the winding element 61 winds up a flexible element 17. The resistance rotor 71 co-rotates with the winding element 61 in a second rotational direction, whereupon the flexible element 17 unwinds from the winding element 61. The one-way bearing 63 has an external bearing part 632, which is integral with the winding element 61. The external bearing part 632 is provided with bearing cams 633 for engagement in a single rotational direction on an internal bearing part of the one-way bearing 63. The bearing cams 633 are evenly distributed over a circular outer surface of the external bearing part 632.

The resistance unit 70 further comprises at least one permanent magnet 72. The at least one permanent magnet 72 provides a magnetic field. The resistance rotor 71 is mounted such that it is rotatable through the magnetic field. The resistance rotor 71 is positioned next to the at least one permanent magnet 72. An end face of the resistance rotor 71 moves through the magnetic field. When the resistance rotor 71 rotates through the magnetic field, a magnetic resistance, serving as the training resistance, is generated. The rotation of the resistance rotor 71 gives rise to eddy current turbulences. The resistance unit 70 is also referred to as a magnetic resistance unit or eddy current resistance unit.

The training resistance can be adjusted by varying a size of a rotor part of the resistance rotor 71 which moves through the magnetic field. For this purpose, the at least one permanent magnet 72 is mounted such that it is radially displaceable with respect to the resistance rotor 71. In FIG. 5B, a maximum training resistance is set, wherein a maximum rotor part of the resistance rotor 71 moves through the magnetic field. In FIG. 5D, a minimum training resistance is set by a radial displacement of the magnetic field, and in FIG. 5C an intermediate training resistance is set.

The at least one permanent magnet 72 is positioned on a lever 721. The lever 721 is hinged via a lever shaft 722 for the displacement of the magnetic field over a radial travel. The lever shaft 722 is mounted parallel with the shaft 5 of the resistance apparatus 7. Between the lever 721 and the adjusting knob 21, a transmission 22 is provided for the positioning of the lever 721, and thus the permanent magnet 72. With the transmission 22, the training resistance can be steplessly adjusted. Advantageously, the shown configuration is compact.

In addition to the embodiments shown in the figures, many variants are possible. Although the invention has been disclosed with reference to particular embodiments, a person skilled in the art, after having read the description, will wish to make changes or modifications which are possible from a technical viewpoint, but expressly do not fall outside the scope of protection of the invention as defined in the appended claims. In particular, changes can be made in relation to the disclosed embodiments, which changes fall within the teaching of the invention without hereby departing from the essence of the invention. The person skilled in the art should understand that various modifications can be made and elements can be replaced by equivalents, without hereby departing from the essence of the invention. Thus the invention is not limited to the disclosed embodiments included in the description, but rather the invention will comprise all embodiments which fall within the scope of protection as defined by the claims.

Thus, according to the invention, a mobile fitness apparatus, which can be worn on the body for the performance of a training exercise, is provided. The fitness apparatus according to the invention has an improved facility for the provision of a training resistance, comprising a coupling to a resistance unit by means of a one-way bearing, whereby the fitness apparatus can be realized in compact and lightweight configuration. Moreover, the fitness apparatus according to the invention provides various improvements, whereby the options for the performance of training exercises are increased and can be executed better.

What is claimed is:

1. Fitness apparatus (1) for the performance of a training exercise by a person (27), the fitness apparatus comprising at least one resistance apparatus (7) for providing a training resistance, wherein the resistance apparatus (7) comprises a housing (9) for the accommodation of a winding device for the winding up and unwinding of a flexible element (17), wherein the winding device comprises a winding element, which winding element is mounted rotatably about a shaft (5) of the housing (9) and is connected by means of a leaf spring (62) to the housing (9) for the back-rotation of the winding element, wherein the winding element comprises a winding surface for the winding up and unwinding of the flexible element (17), wherein the flexible element (17) has a first end, which is connected to the winding element and extends through an opening (93) of the housing (9), and has a second end, which is connected to a handle (19) for holding the second end, characterized in that the winding element (61) is rotationally supported on the shaft (5) by a one-way bearing (63), wherein a resistance unit (70) for the generation of a training resistance is connected to the one-way bearing (63), such that the winding element (61) has a freewheel in a first rotational direction corresponding to a back-rotation of the winding element (61) and meets a resistance in an opposite, second rotational direction corresponding to the unwinding of the winding element (61).

2. Fitness apparatus (1) according to claim 1, wherein the one-way bearing (63) comprises an internal bearing part (631) and an external bearing part (632), wherein the external bearing part (632) is fixedly connected to the winding element (61) and wherein the internal bearing part (631) is fixedly and wherein the internal bearing part (631) is connected to a resistance plate (71) of the resistance unit, wherein the resistance unit (70) has a pressure plate (72) for the braking of the resistance plate (71), which pressure plate (72) is non-rotatably connected to the housing (9).

3. Fitness apparatus (1) according to claim 1, wherein the one-way bearing (63) comprises an internal bearing part (631) and an external bearing part (632), wherein the internal bearing part (631) is fixedly connected to the winding element (61) and wherein the internal bearing part (631) is connected rotatably about the shaft (5), wherein the resistance unit (70)
is an eddy current resistance unit, wherein the resistance unit (70) comprises a resistance rotor (71) and at least one permanent magnet (72), wherein the external bearing component (632) is fixedly connected to the resistance rotor (71), wherein the permanent magnet is positioned next to the resistance rotor (71), such that rotor part of the rotor moves, in operation, through a magnetic field.

5. Fitness apparatus (1) according to claim 4, wherein a training resistance to be created is adjustable with the eddy current resistance unit, with the use of an adjusting knob (21), by adjusting the position of the magnet (72) with respect to the resistance rotor (71), such that a size of the rotor part which moves through the magnetic field varies.

6. Fitness apparatus (1) according to claim 1, wherein the fitness apparatus can be worn by a person on the body during the performance of a training exercise, wherein the fitness apparatus has a weight of no more than 2500 grams, such that the fitness apparatus is manageable by the person during the performance of a training exercise.

7. Fitness apparatus (1) according to claim 1, comprising a body fastening means (3) for fastening the resistance apparatus (7) to the body of a person, and wherein an opening (93) of the housing of the resistance apparatus (7) is rotatably connected to the body fastening means (3).

8. Fitness apparatus (1) according to claim 7, wherein the resistance apparatus (17) is slidably connected to the body fastening means (3) for the displacement of the resistance apparatus from a first position into a second position on the body fastening means (3).

9. Fitness apparatus (1) according to claim 7, wherein the body fastening means (3) is a hip belt, wherein the hip belt is provided with at least one trunk strap for a longitudinal fastening of the hip belt to a trunk of a person in order to oppose an upward or downward movement of the hip belt during a training exercise.

10. Fitness apparatus (1) according to claim 1, wherein the fitness apparatus (1) further comprises at least one ankle strap (23), as well as a diverting element (25), connected to the ankle strap (23), for the diversion of the flexible element (17).

11. Fitness apparatus (1) according to claim 10, wherein the diverting element (25) is formed by a hook-shaped element.

12. Fitness apparatus (1) according to claim 10, wherein the ankle strap (23) is provided with a foot strap.

13. Fitness apparatus (1) according to claim 1, wherein the handle (19) is looped.

14. Method for the performance of a training exercise by a person, comprising the following steps:

providing fitness apparatus comprising at least one resistance apparatus (7) for a training resistance, wherein the resistance apparatus (7) comprises a housing (9) for the accommodation of a winding device for the winding up and unwinding of a flexible element (17), wherein the winding device comprises a winding element, which winding element is mounted rotatably about a shaft (5) of the housing (9) and is connected by means of a leaf spring (62) to the housing (9) for the back-rotation of the winding element, wherein the winding element comprises a winding surface for the winding up and unwinding of the flexible element (17), wherein the flexible element (17) has a first end, which is connected to the winding element and extends through an opening (93) of the housing (9), and has a second end, which is connected to a handle (19) for holding the second end, characterized in that the winding element (61) is rotationally supported on the shaft (5) by a one-way bearing (63), wherein a resistance unit (70) for the generation of a training resistance is connected to the one-way bearing (63), such that the winding element (61) has a freewheel in a first rotational direction corresponding to a back-rotation of the winding element (61) and meets a resistance in an opposite, second rotational direction corresponding to the unwinding of the winding element (61);

setting a training resistance with the fitness apparatus; and

performing the training exercise by applying a tensile force to a flexible element of the fitness apparatus.

15. Method according to claim 14, further comprising at least one of the following steps:

fastening the fitness apparatus to the body of the person;

fastening a resistance apparatus of the fitness apparatus with a hip belt to the body of a person; and

fastening an ankle strap with a diverting element to an ankle of the person.