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(56) Documents cited  
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**US 4149714**  
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**US 3912261**  
**US 3858873**  
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(54) **Exercise device**

(57) The device comprises, a frame 1 having front and rear sections 2, 3, a body support 4, rotatable operating means 5 flanking the support to receive forces exerted by an athlete seated on said support, an eccentric rotatable element 6 connected to the operating means, and a counter force means 8 connected to the eccentric by a flexible element 9 so that the counter-force means resists forces applied to the operating means. The eccentric element is disposed behind the support, and the transmission connections are enclosed for safety.

Fig.1

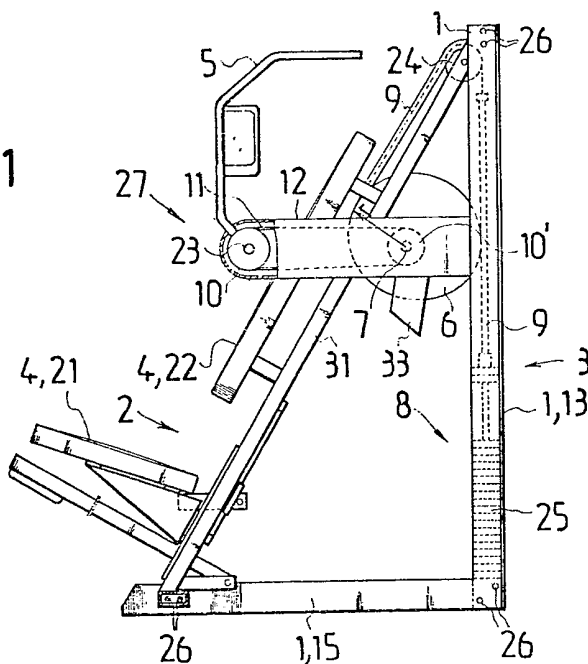


Fig.1

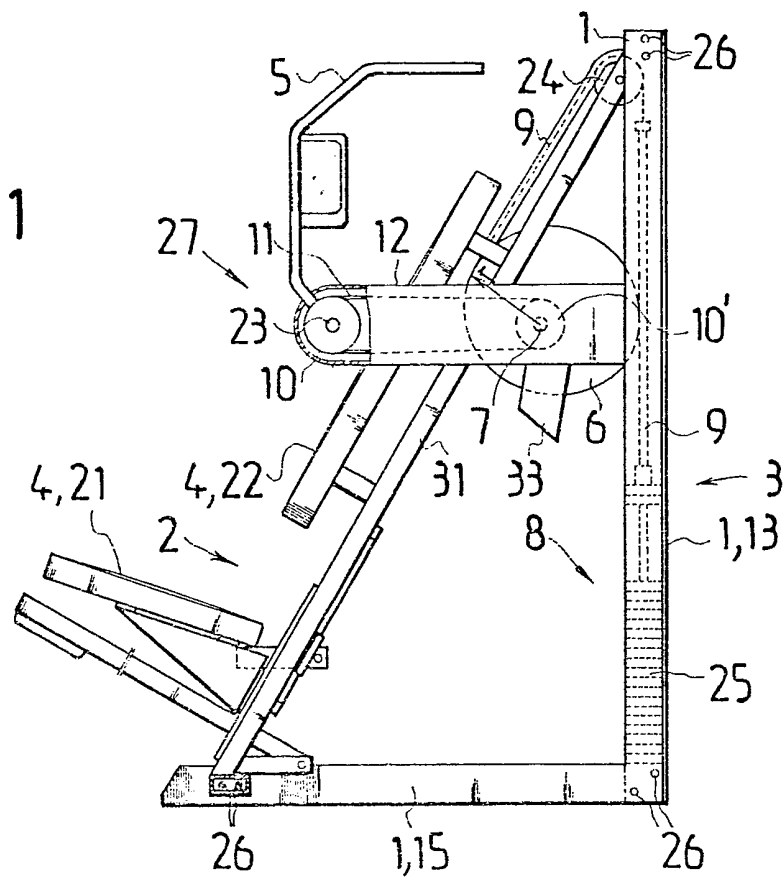
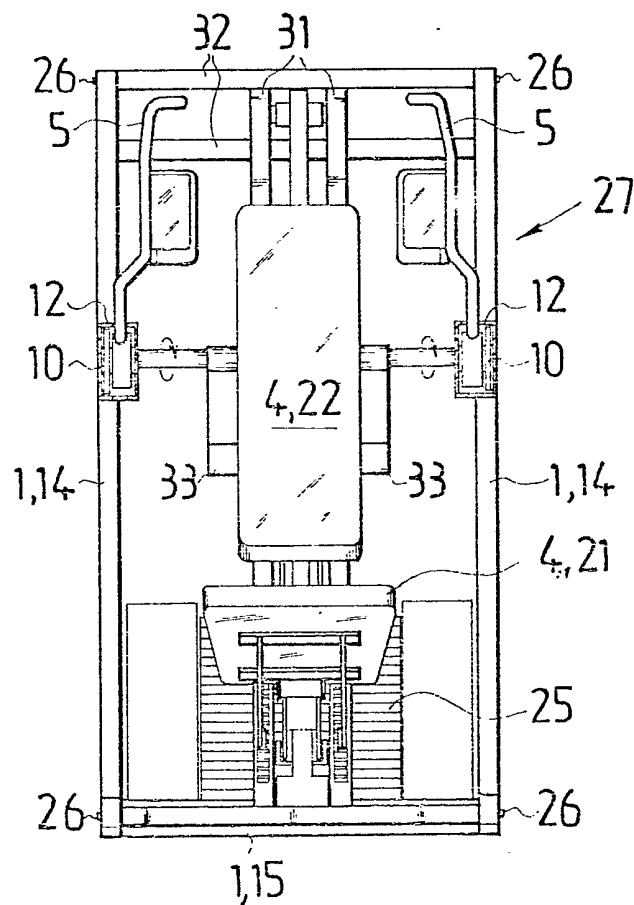


Fig. 2



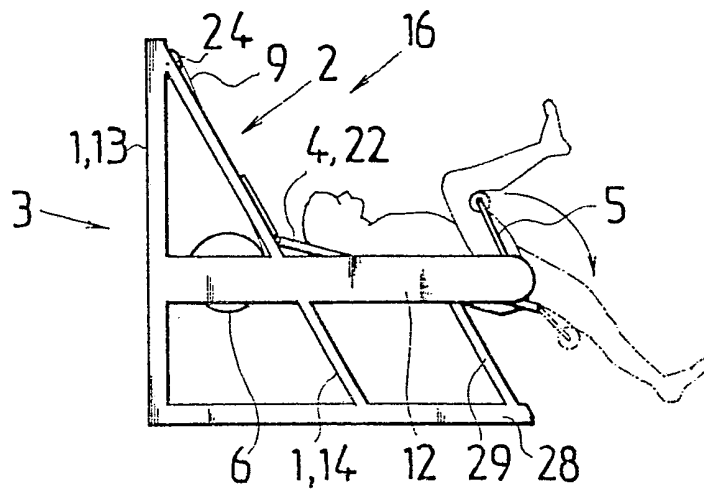


Fig. 3

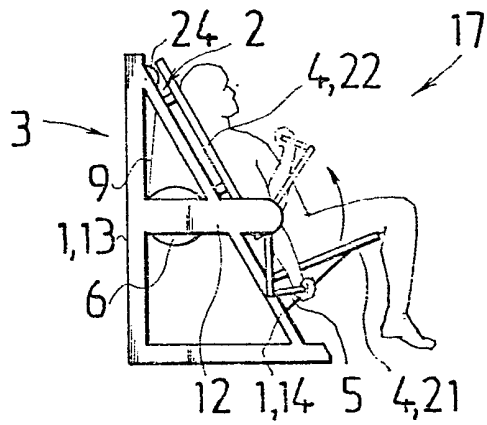


Fig. 4

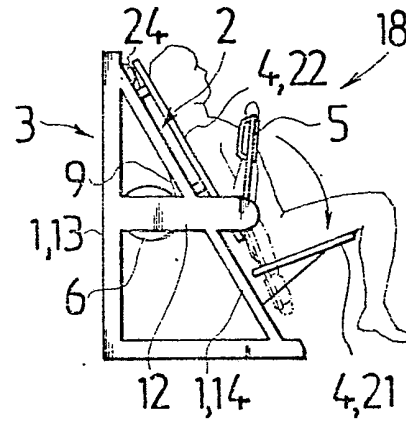


Fig. 5

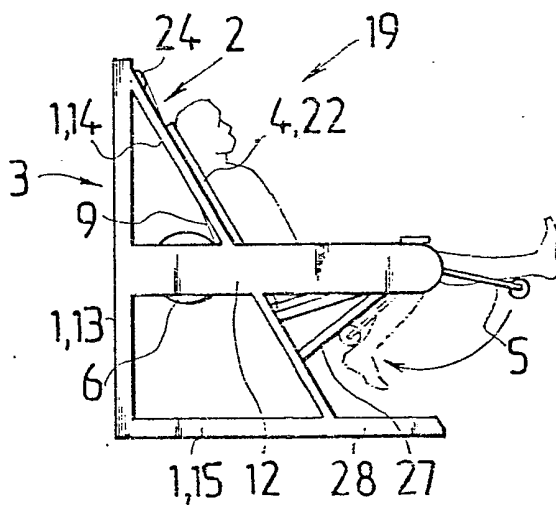


Fig. 6

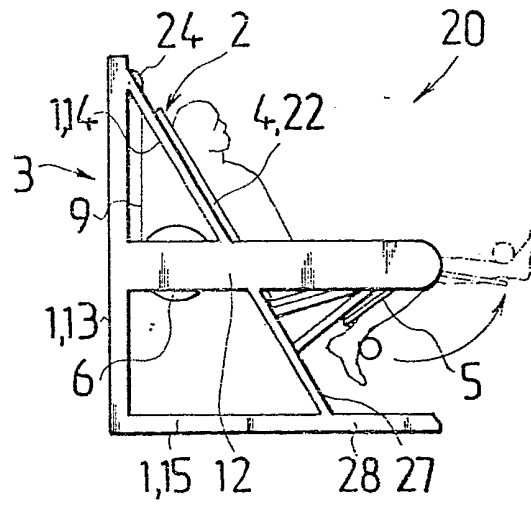


Fig. 7

## SPECIFICATION

## Exercise device

5 The present invention relates to an athletic exercise device.

Physical exercise equipment has earlier been disclosed in American Patent publications 3 858 873, 3 912 261, 3 998 454, 4 200 279. When an exercise  
10 device is used, a given muscle and joint is exercised by turning an operating means by a muscle and joint to be exercised, the motion and load being transmitted by way of an eccentric and rope means to a counter-load device which resists a force applied to  
15 the operating means with a counter-force. For exercising various muscles and joints there are known in the art exercise devices of various designs, as set forth in the above-cited references.

Power transmission in exercise equipment is usually effected by means of pulleys and chains. During the exercise session, a gymnast holds on to a support means which is usually positioned in the middle of an exercise device, partially inside it. When doing gymnastics, the transmission means  
20 are thus within the reach of a gymnast's fingers, hands and clothing and mean a hazard to a gymnast. The eccentrics used in such equipment are usually relatively bulky, with a radius of e.g. 200-400 mm, and they move the chains at a high velocity making a  
30 lot of noise and causing disturbing vibration during the movements. Thus, the gymnastic exercise devices are generally hazardous, greasy, unpleasant and noisy. Since gymnastics and body-building exercises have lately become more and more popular especially among women, the prior art exercise  
35 devices do not satisfy the safety, hygienic, attractiveness and aesthetic demands.

The exercise devices set forth in the above references for building various muscles and joints differ  
40 completely from each other as to their designs. Thus, at present, the exercise of various muscles and joints requires totally different exercise devices, thus requiring separate planning and manufacturing for each piece of equipment. There are very few common components that can be presently fitted to  
45 various devices which, in turn, increases manufacturing costs and retail prices of the equipment.

The present invention seeks to overcome the above drawbacks. In particular the invention seeks to  
50 provide an exercise device which does not involve hazards, is safe to the user, does not have exposed noisy, greasy and hazardous chains and pulleys, is silent, pleasant and attractive in appearance and service. The invention also seeks to provide an  
55 exercise device that can be adapted to be manufactured in different embodiments for building various muscles and joints in a manner that the exercise devices intended for building various muscles and joints have, in addition to their design, a substantially  
60 ly uniform and aesthetically attractive appearance.

According to the present invention there is provided an exercise device comprising a frame having a front and a rear section and provided with an athlete's body receiving support means disposed  
65 substantially in the middle or the front section;

operating handle means fitted to the front section of said frame to rotatably receive the forces exerted by the members of the body of an athlete seated in said support means; and eccentric element rotatably  
70 journaled around its axle and fitted to the operating means in order to direct the forces applied to the latter over to the eccentric element; a counterforce means disposed on the rear section of said frame and mounted on the eccentric element by means of a  
75 threrearound travelling rope element in a manner that the counterforce means resists the force applied to the operating handle means with a counterforce by way of the rope element and the eccentric element, the strength of said counterforce changing  
80 as a moment arm of the rope element passing around said eccentric element, characterised in that the operating handle means is connected to the eccentric element by means of a transmission gear flanking said support means, a transmission element  
85 and a rearward transmission gear with the eccentric element being mainly disposed behind the support means, and in that the transmission gears plus their transmission elements are enclosed.

An arrangement according to the invention for  
90 connecting an operating means to an eccentric is substantially less hazardous, a lot safer, more hygienic, aesthetic and pleasant than the prior art solutions.

A frame assembly used in the exercise device with  
95 its vertical, inclined and horizontal frame elements is likewise aesthetically more attractive and at the same time permits the use of an element structure for composing various pieces of exercise equipment for building various muscles and joints from the  
100 same frame elements. Thus, an exercise device of the invention combines safety, attractiveness, aesthetic and practical aspects and, as a result, the invention provides an exercise device that meets the above requirements and, moreover, is more economic than the prior art exercise device as for its  
105 manufacturing and operating costs.

In the following, the invention is described in detail by means of exemplified embodiments with reference to the accompanying drawings in which:  
110 *Figures 1-2* illustrate an exercise device for building the muscles of the chest, back and shoulders in a side and front view, respectively, and  
*Figures 3-7* illustrate in a side view and schematically exercise devices for building extensors of the body, flexor of the arm, flexors of the thigh and  
115 extensors of the thigh, respectively.

An exercise device illustrated in Figures 1-2 comprises a frame 1 having a face and rear side 2, 3 and provided with the body of a gymnast receiving support means 4, an operating means 5, an eccentric 6 with its axle 7 as well as a counter-force assembly 8 with its rope means 9. The support means 4 comprises a seat 21 and a back rest 22 disposed substantially in the middle of the face side and projecting forwardly. The operating means 5 comprises two lever arms mounted on the face side 2 of frame 1 and rotatable relative to a horizontal and laterally extending axle 23, said lever arms being connected by means of transmission elements to  
120 said eccentric 6. Eccentric 6 is likewise journaled on  
130

frame 1 rotatably relative to its horizontal, laterally extending axle 7. The counter-force assembly 8 is disposed on the rear side 3 of said frame and coupled to eccentric by means of a rope element 9 extending therearound via a roller 24 mounted on the top of the frame. The counter-force assembly 8 consists of adjustable counterweights 25 disposed on rear side 3 of frame 1 for up and down movement, the rope element 9 being arranged to lift said counter-weights upwards as the work-out force is applied to the operating means and the latter rotates relative to its axle 23, so that the attractive force applied to said counter-weight resists the turning motion of said operating means by way of said rope element 9, eccentric 7 and transmission elements of the operating means. The magnitude of said counter-force changes as a moment arm of the rope element extending around eccentric 6 changes, that is as a support radius  $r$  acting on the rope element changes along with rotation of the eccentric.

According to the invention, the operating means 5 is connected to eccentric 6 by means of two, said support means flanking forward transmission gears 10 as well as chain-like, i.e. rope-like transmission elements 11 and transmission gears 10', said eccentric elements being disposed substantially on the rear side of support means in shelter with the rearward transmission gears on the same axle 7 as the eccentric elements. Thus, by virtue of the invention, an athlete seated in the support means 5 cannot at all come in contact with eccentric 6, rope means 9, transmission gears 10, 10' and/or transmission elements 11 due to the disposition and encapsulation thereof.

In the embodiment depicted in Figures 1-2, frame 1 is constructed of elements and comprises a vertical frame portion 13 which makes up a rear section 3, a substantially rectilinear inclined frame portion 14 which makes up a front section 2 and is tilted against said vertical frame portion, as well as a horizontal frame portion 15 which connects the former frame portions together and makes up the bottom element of the frame. Said frame portions are substantially rectangular in configuration and assembled of profiled metal beams. Frame portions or elements are joined together by bolt joints 26. In addition, in the present embodiment, the vertical 13 and inclined 14 frame portions are joined together with horizontal boxes 12 housing transmission gears 10, 10' and elements, these joints being effected by welding. Thus, said boxes 12 extend horizontally from the rear section 3 on to the front section 2 of frame 1 on the same level and project forwardly of support means 4 flanking the same.

The frame of the exercise or work-out device shown in Figures 1-2 is of simple, clear-cut, compact and stable design and economic as to its building costs. In the present embodiment, the rope element 9 comprises a transmission strap, such a transmission strap made of polyamide or e.g. a fabric-reinforced plastic structure and, furthermore, due to the encapsulation of transmission elements for the operating means and the disposition of those and the eccentric elements, operation of the device is, on top of the above advantages, noiseless and the quiet

yielding movements feel smooth, frictionless and pleasant. As for the general impression, the device is simple, streamlined and appealing as well as more attractive and in every way more pleasant than the corresponding prior art devices.

Figures 3-7 exhibit the excellent adaptability of the frame structure of an exercise or work-out device of the invention as the frame for various work-out assemblies. The device shown in Figures 1-2 is intended for working on the major muscle bundles of the upper body and devices illustrated in Figures 3-7 mainly differ from the above device as to the operating means 5 and the box 12 which effects on the position of said operating means and, in Figures 4 and 7, the differences are limited to the rotational direction of operating means 5, transmission elements 10, 11 and eccentric 6, said direction being reversed by passing the rope element 9 to the eccentric element from the opposite side, i.e. from the rear in view of what is illustrated in Figure 1.

Figures 6 and 7 illustrate devices for working on the flexors and extensors of a thigh and, in these devices, the assembly of operating means 5, its transmission elements 10, 10', 11 and its box or housing 12 is positioned further forward than in the devices shown in Figures 1-2 and 4-5, said box being also fitted further down than in the device shown in Figures 1-2.

Figure 3 illustrates a device for working on back muscles, wherein the operating means 5, its transmission elements 10, 10', 11 and its box or housing 12 are positioned still further forward than those in the devices shown in Figures 6-7. The horizontal frame portion 15, which forms the base of frame 1, has been provided with a forward extension 28. The support means 4 has been propped up by additional supports 29 whose lower ends are supported on the horizontal, transversely extending frame portion 15 which connects the extensions 28 together with bolt joints 26.

The upper ends of said additional support prop up the support means 4 by way of a transverse frame portion 30 which connects boxes or housing 12 together with bolt joints 26.

In Figures 1-2, the support means 4, 21 and 22 is bracketed to two tubes 31 extending parallel to frame portion 14, i.e. the inclined tubes 14, the lower ends of said tubes 31 being anchored to the horizontal, transversely extending frame portion 15 and the upper ends thereof being anchored to a double-beam 32 which joins the flank elements together. The design is the same in all machines (Figures 1-7) with the exception of a body extensor (Figure 3), as specified above.

Devices depicted in Figures 3-7 are essentially based on the same frame elements, transmission elements and basic design as that illustrated in Figures 1-2. Thus, the exercise or work-out devices can be manufactured by using the same elements and components.

In the embodiments illustrated in Figures 1-7, the eccentric elements 6 are provided with counterweights 33 which are shown in Figures 1-2 and which are there to balance the imbalance caused by the eccentricity of operating means 5.

The invention is not restricted to the above-described embodiments which can be modified and varied within the scope of the appended claims.

## 5 CLAIMS

1. An exercise device comprising a frame having a front and rear section and provided with an athlete's body receiving support means disposed
- 10 substantially in the middle of the front section; operating handle means fitted to the front section of said frame to rotatably receive the forces exerted by the members of the body of an athlete seated in said support means; an eccentric element rotatably jour-
- 15 nalled around its axle and fitted to the operating means in order to direct the forces applied to the latter over to the eccentric element, a counterforce means disposed on the rear section of said frame and mounted on the eccentric element by means of a
- 20 therearound travelling rope element in a manner that the counterforce means resists the force applied to the operating handle means with a counterforce by way of the rope element and the eccentric element, the strength of said counterforce changing
- 25 as a moment arm of the rope element passing around said eccentric element, characterised in that the operating handle means is connected to the eccentric element by means of a transmission gear flanking said support means, a transmission element
- 30 and a rearward transmission gear with the eccentric element being mainly disposed behind the support means, and in that the transmission gears plus their transmission elements are enclosed.

2. A device as set forth in claim 1, characterised
- 35 in that the rear section of frame comprises a vertical frame portion and the front section comprises a substantially rectilinear inclined frame portion tilted against said vertical frame portion, and that said frame portions are joined together by their bases
- 40 with a horizontal frame portion.

3. A device as set forth in claim 2, characterised in that the vertical and inclined frame portions are joined together by means of horizontal boxes for enclosing said transmission gears and elements.

- 45 4. A device as set forth in claim 1, characterised in that said boxes for transmission gears and elements extend from the rear section over to the front section of said frame horizontally on the same level and project forwardly of said support means
- 50 flanking the same.

5. A device as set forth in any of the claims 1 to 4, characterised in that said transmission element comprises a transmission strap.

6. A device as set forth in claim 3, characterised
- 55 in that the vertical portion, inclined frame portion and horizontal frame portion consist of elements joinable together as a frame and that the transmission gears and elements to be flanked plus their boxes provide units to be mounted on the frame as
- 60 such in a manner as to enable the device to be used as an upper body trainer, a body extensor, an arm flexor, an arm extensor, a thigh flexor, or a thigh extensor.

7. A device as set forth in claim 2 or 6, characterised
- 65 in that the support means is fitted to be

mounted on the inclined frame portion at a desired height and a desired position.

8. An exercise device substantially as hereinbefore described with reference to and as illustrated in,
- 70 Figures 1 and 2, 3, 4 and 5, or 6 and 7 of the accompanying drawings.

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