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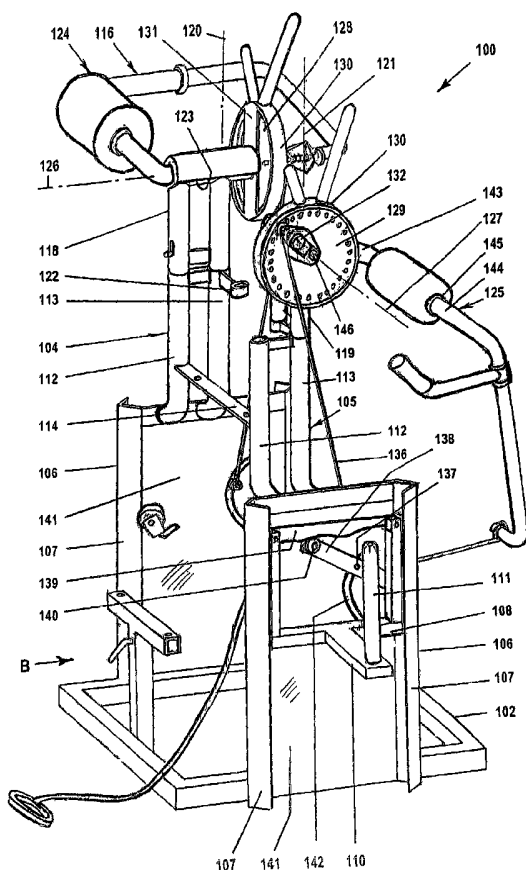
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(54) Title: EXERCISE APPARATUS



(57) Abstract: There is provided an exercise machine in which resistance to movement of an actuation member, such as a handle, is provided and that resistance is able to be varied through the course of a single repetition of a series of repetitive exercises. The variation of resistance with distance along the movement path of the actuation member is, in a preferred embodiment, able to be changed by the selection and fitting of a component having a contoured surface, with which a follower means in the machine interacts to vary the resistance. There is also provided a multi-function exercise machine, that lends itself well to provision of the variable resistance feature.

WO 03/018138 A1



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

EXERCISE APPARATUS

FIELD

This invention relates to apparatus for exercising, of the types in which a user interacts with one or more movable components. In particular, the invention concerns such apparatus in which there is provided a variable resistance to motion of one or more of said movable components.

PRIOR ART

There are numerous different methods for exercising muscles of the human body. Many involve no requirement for equipment at all, simply involving a person following a defined movement that concentrates loads on particular muscle groups. Many methods, however, do involve equipment, and for a range of reasons - to enable larger forces to be obtained, to better target particular muscle groups than ordinary exercise regimes can do, and to allow more easy regulation of progress from easy exercise to more demanding. One popular exercise method involves the use of "free" weights, such as barbells and so-called "dumb-bells". The use of free weights is desirable for such reasons as these.

In addition to the advantages which free weights offer, there are also several disadvantages. First, it is difficult to isolate some muscle groups with free weights because of the awkward angle at which the free weight must be moved during the exercise. Additionally, many lifts involving free weights require the use of a "spotter", i.e. an assistant. If the lifter is unable to complete the lift, the spotter must step in and quickly assist in the lift to prevent physical harm being incurred by the lifter. Nowhere is this more important than in bench presses, in which a barbell is lifted above the body of a lifter lying on his (or her) back. If the lifter is unable to lift the weights and no spotter is available, the barbell can land on the lifter's throat, causing serious injury or even death.

Because many individuals wish to work out at home or wish to avoid the use of a spotter, there has been a marked increase in the popularity of mechanical devices in which one or more movable parts are moved by the user against resistance generated by, for example, weights, springs, or even the user's own weight. Multi-function equipment in particular has proven popular, due to its ability to provide a range of exercises, targeted to develop particular muscle

groups. As with free weights, such machines when used continuously or repetitively involve the expenditure of effort and so also aid the improvement of fitness (eg heart and lung function).

Such equipment most usually includes at least one weight stack which engages a cable which is in turn pulled by the user. Typically this is accomplished by an elongate metal shaft with a plurality of holes which extends through the stack of weights. A locking pin is inserted into one of the holes and all weights above the locking pin are lifted with each pull on the cable. The cable may be pulled directly by a user, or alternatively the user may move a mechanical component which is itself linked to the cable directly or indirectly via various types of mechanisms.

One disadvantage of such equipment, however, is that the resistance felt by a user often varies throughout the normal range of movement, often in a way that is not ideal for the user. For example, some equipment tends to focus the exertion of each lift at the beginning of each muscle movement. In other words, once the cable has begun to move the associated weights, the effort involved with moving the weights through the remainder of the repetition decreases significantly. This can affect muscle use and development. For this reason, many serious body builders will not use multi-function machines. This problem also limits the ability of the user to focus on a particular area of weakness along the muscle's movement. For example, a user may determine that he is not as strong as desired in the last 60 degrees of a biceps curl when using free weights or may desire to tone his biceps to provide a more rounded curve. With the present multi-function machines and even single station cable-based exercise machines, strengthening or toning as desired can be extremely difficult.

The available multi-function exercise machines also have a number of other problems. For example, some machines will only allow a user to perform a few different exercises, e.g. they may only work the arms or legs, often in only a limited number of ways. Others are overly complex and costly. Thus there is a need for an improved multi-function exercise apparatus that addresses these problems.

The problem of providing resistance to movement of a member of an exercise apparatus, with that resistance varying along the path of the member in

a desired way, has been recognized, and addressed in various ways. One class of machine is based on a weight being supported on a member rotatably mounted on a shaft journaled in a frame, the shaft being rotated by a lever or other mechanism through the effort of a user. A starting position (i.e. lateral displacement from the shaft axis) of the weight can be varied so that the starting torque applied to the shaft to resist the user-generated torque, and the nature of its variation as the shaft is rotated, can be adjusted to a degree. One example of this approach is disclosed by Hobson (US Patent 6350219). A problem with such devices is that only a limited degree of control of resistance variation is possible.

An alternative approach, and the one thought to be the most commonly used, is thought to be that exemplified by such devices as those of Kasigkeit (Australian patent application 57830/86) and Johns (US Patent 5356360), Solow (US Patent 5102121), in which a cable or chain extends from a weight stack over a rotatable cam which in turn is rotated (directly or via one or more intermediate members) by a user. The torque applied by the weight to resist its rotation depends on the shape of the cam. This approach is in reality a variation on the previous one, in that the resisting torque applied to a rotating member depends on the distance from that member's axis at which a constant force is applied. There are limitations to the nature of the resistance variation that can be provided in this way. For example, variation in resistance over a very short distance is difficult to provide. There are also limitations to the ease with which the nature of the resistance variation can be changed at will for a given exercise or to suit a different exercise.

The exercise apparatus disclosed herein addresses the problems of multi-function machines set out above, while allowing a large number of different exercises to be carried out. Moreover, the machine lends itself to being modified to provide modulated resistance for improved workout for various muscle groups. "Modulated" here means that the resistance to movement felt by a user of apparatus during each repetition of a particular exercise (or part of an exercise) varies with movement along the stroke.

Other types of exercise apparatus provide a degree of variation of resistance simply through progressive change of relative orientation of their parts during use. An example is the apparatus of Stearns (US Patent 5658227), which

uses an arrangement of pin-jointed links to provide movement, but with variation of resistance not being a particular objective. The modulation of resistance discussed herein is to be understood as variation that is additional to and distinct from such variation, but need not necessarily be of smaller magnitude.

A mechanical arrangement is disclosed herein which can provide modulation of the resistance felt by a user of exercise apparatus in the above sense. The arrangement also enables the nature of that variable (modulated) resistance to itself be changed conveniently.

The multifunction exercise apparatus disclosed herein lends itself to use of the said arrangement, and is preferably provided with it. However, the exercise apparatus is also considered to offer a useful alternative to others in the market when the variable resistance arrangement is disabled or even excluded altogether.

Moreover, the variable resistance arrangement disclosed is also applicable in types of exercise apparatus other than the one here disclosed.

SUMMARY OF THE INVENTION

The invention provides an exercise apparatus including:

- an actuation member for moving by a user;

- force generating means for applying a force to a second member included in said apparatus;

- connection means whereby a force applied by said force generating means to said second member is communicated to said actuation member as resistance to movement of said member by said user; and

- modulation means whereby said resistance is varied during movement of the actuation member.

Preferably, said modulation means includes a member having a shaped surface which in the course of movement of said actuation member is traversed by a mechanical element of said connection means whereby the force communicated to said actuation member is varied.

More preferably, movement of said mechanical element across said shaped surface varies a mechanical advantage provided by said connection means and thereby the resistance sensed by a user.

The invention further provides a method for providing improved exercise, the method comprising;

selecting an exercise apparatus according to any one of the forms disclosed herein; and
actuating said actuation member.

The invention is based on and includes the whole scope of the disclosure in applicant's United States Provisional Patent Application No. 60/316,334, the entire disclosure of which is hereby explicitly incorporated by this reference.

The invention will now be described in detail by reference to the attached diagrams, of which:

Figure 1 is a perspective view of an exercise apparatus according to the invention;

Figure 2 is a side view of the apparatus shown in Figure 1, set up in a first particular configuration for use;

Figure 3 is an end elevation of the apparatus and configuration shown in Figure 2, looking in the direction of arrow "A" in Figure 2;

Figure 4 is an end elevation of the apparatus shown in Figure 1, looking in the direction of arrow "B" in Figure 1, set up in a second particular configuration;

Figure 5 is a side view (with some mechanical details omitted) of an exercise apparatus according to the invention including the apparatus shown in Figure 1 set up in third and fourth particular configurations, with a bench component shown in multiple positions;

Figure 6 is a cross sectional view of a part of the apparatus shown in Figure 2, taken at station "PP" in Figure 2;

Figure 7 is a partial view of the apparatus shown in Figure 2, looking in the direction of arrow "C" in Figure 2 with some alternative arrangements also shown in phantom outline;

Figure 8 is a schematic end elevation of the parts shown in Figure 7;

Figure 9 is an end elevation of part of a part of the apparatus shown in Figure 1;

Figure 10 is a cross-sectional view of the part shown in Figure 9, taken at Station "QQQ" In Figure 9;

Figure 11 is a perspective view of a rotary cam component for use in the apparatus shown in Figure 1;

Figure 12 is a perspective view of a cam used in the apparatus shown in Figure 1;

Figure 13 is a Table referred to in the text as Table 1.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Figure 1 shows an exercise apparatus 100 according to the invention. Omitted from this view is the one component of apparatus 100, namely a bench 101 for supporting a user. Apparatus 100 includes a base 102 for sitting on a suitable surface such as a floor 103 and generally upstanding left and right side frames 104, 105 respectively. The side frames 104, 105 are a handed pair and have lower sections 106 which include pairs of vertical guides 107 for guiding the vertical movement of weight-supporting trolleys 108. The trolleys 108 have rollers 109 mounted thereto which roll along the guides 107 and ensure that the trolleys 108 are captive in between their respective pairs of guides 107. Each trolley 108 includes a laterally extending part 110 with an upstanding spike 111 over which weight(s) (not shown in Figure 1) can be placed in known fashion. In use of the apparatus 100, it is the raising and lowering of trolleys 108 and their associated weights that provides the resistance to movement felt by a user, as explained below.

Tubular members 112 and 113 extend upward from the lower sections 106 of side frames 104 and 105. A transverse bar 114 extends between corresponding members 112 to ensure adequate rigidity of apparatus 100. Left and right subassemblies 116 and 117 are supported by tubes 113.

Subassemblies 116 and 117 respectively include frames 118 and 119. Each of frames 118 and 119 includes a downwardly depending pintle 115 which is rotatably received in a tube 113, so that subassemblies 116 and 117 can be rotated about respective vertical axes 120 and 121. Each is lockable by a user in

either of two positions, having a depending locking pin (not shown) in an opening in the top of tube 112 or a formation 122 extending inwardly from tube 113. Frames 118 and 119 each include a bearing block 123, and left and right actuation members 124 and 125 are rotatably mounted in the bearing blocks 123 of subassemblies 116 and 117, for rotation about horizontal axes 126 and 127. Figure 1 shows subassembly 116 locked in a position where the axis 126 of its bearing block 123 extends in a direction hereinafter called the longitudinal direction and subassembly 117 locked in a position where the axis 127 is perpendicular to axis 126, and extends in a direction hereinafter called the transverse direction.

Secured to the actuating members 124, 125 and coaxial with axes 126 and 127 are respective selector discs 128 and 129, so that each of discs 128 and 129 and its associated actuation member 124 or 125 will rotate together. Each of the selector discs 124, 125 has 32 parallel equally spaced holes 133 drilled axially at a radius close to its outer edge, and is closely surrounded by a ring member 130 which is rigidly secured to the bearing block 123 by a support member 131. Normally, this arrangement is not used in practice. Instead both axes 126 and 127 are arranged to be either parallel and in the longitudinal direction (see Figure 4) or co-axial and extending in the transverse direction (see Figure 2, Figure 3). The particular arrangement shown in Figure 1 simply shows how subassemblies 118 and 119 can be rotated about their upright axes 120 and 121

Associated with each selector disc 124, 125 is a user-movable pin 132 which can extend axially into any chosen one of the holes 133. Pins 132 are supported in frames 134 which can rotate freely about the rotation axes 126 or 127 of the associated disc 124 or 125. Cables 136 are secured pivotally at their upper ends to respective pins 132. Cables 136 extend downwardly to pivots 137 on arms 138 which are pivotally mounted to respective sideframe lower sections 106. When an exercising user moves an actuation member, 125 say, the disc 128 secured to it is accordingly caused to rotate. Its cable 136 therefore transmits movement to the associated arm 138, which is resisted by the weight of the associated trolley 108 and any associated weights transmitted downwardly by a member 139 secured to trolley 138 through a roller 140 on arm 138.

Note that cables 136 at their upper end are not wrapped around their respective selector discs 128, 129. Rather, their upper ends follow a path that is circular due to the pin 132 being anchored in one of the holes 13 but the cable 136 remains straight and, in general, not tangential to the pitch circle of the holes 133. This arrangement has an advantage over conventional "wraparound" resistance arrangements wherein a cable with a similar function to the cable 136 is wrapped around a cam or drum of varying radius. It has been found that in both of the two possible positions of teach sub assembly 106, 107 it is possible to have a cable 136 run directly from the selector pin 132 to pivot 137 on arm 138 without interference with surrounding parts of the structure. This is much more difficult to achieve with more conventional arrangements.

The mechanism including arm 138, roller 140 and member 139 provides for modulation of the resistance felt by the user of the apparatus in moving the actuating members 124, 125. The side frames 104 include respective back plates 141 for protection of users of apparatus 100 from interference with moving parts and the presence of back plates 141 requires that pivot member 137 passes through an arcuate slot 142 in the back plate 141. Roller 140 rolls on the underside of member 139, which is in effect a cam and is secured to trolley 108. Depending on the shape of the edge of the cam 139 along which roller 140 runs during its normal movement, there will be modulation of the tension in the cable and accordingly of the resistance felt by the user to the particular type of movement of the actuation member 124 or 125. This modulated or varying resistance during a repetition of an exercise can be provided without any requirement to move large weights sideways as well as vertically and without use of the more usual arrangement of a cable wrapped around a can shaped drum. A surprising advantage is that the cam 139 be quite small in its linear extent. This is because the amount of travel of the roller 140 relatively along cam 139 need not be particularly large.

If cam 139 was simply a straight bar without the shaped lower edge shown, there would still be a degree of variation of resistance felt by a user simply through the general arrangement of the mechanism. However, by suitably shaping the cam 139, it is possible to provide more and/or different variation as required.

Turning to the use of apparatus 100 for a range of exercises, a number of settings are made for different exercises. Firstly, the user can choose either the parallel and longitudinal positions of the disc axes 126, 127 or the co-axial, transverse axis positions. Secondly, and as will be described further below, the user chooses a particular hole 133 in each disc 128 129 to select the orientation of the actuation members 124, 125. Different exercises will in general require different orientations of the actuation member.

Thirdly, of course, the weights added to trolleys 108 are a matter of choice. Fourth, different exercises require different configurations of the actuation members 124, 125. These can be seen in Figure 1, Figure 7 and Figure 8. Taking actuation member 125 as an example, member 125 consists of two U-shaped tubular parts 143 and 144. Part 143 is pivotally mounted in bearing block 123. One end of part 144 is telescopically received in an opening 145 in part 143, as shown in Figure 7 (solid lines). The other end mates with a boss 146 on disc 129. Thus, parts 143 and 144 rotate as a unit.

However, a different arrangement is possible in which parts 143 and 144 of actuation member 125 are partially separated, as shown in Figure 1 and Figure 7. Part 144 is held telescoped within part 143 by a coil spring (not shown) which is located inside part 143 and connected to part 144. However, if the part 144 is pulled axially away from part 143, it can at one end remain telescopically received in part 143 but at the other end it can be withdrawn from boss 146. Part 144 can then be rotated about axis "Q" as shown in Figure "D".

A certain form of movement about axis "Q" is desirable for achieving a range of exercises. Figure "E" shows the approximate ranges within which part 144 can rotate about axis Q with this arrangement. In the range marked "E" the part 144 is free to rotate, but is constrained to lie between the ends of the range. This is achieved by (providing) the telescoping end of part 144 with a shaped recess (not shown) which engages with a pin (not shown) in part 143. However, if the part 144 is pulled out a little further that engagement can be broken also, and part 144 can rotate within the ranges marked "X" and "Y" as well. However, if rotation in those ranges happens to lead to the part 144 re-entering range E, part 144 will become restricted to range E again. Regions X and Y are limited by contact between part 144 and ring 130, as shown.

Figure 9 and Figure 10 show parts of the sub assembly 119, namely disc 129, the ring 130 surrounding disc 129, the bearing block 123 and the pin 132 for connecting cable 136 to disc 129. Pin 132 is captive in frame 134 in such a way that withdrawal axially from disc 129 requires compression of a spring 147. That is, there is a bias towards keeping of the pin 132 in the selected hole 133. Pin 132 can if required be withdrawn far enough to remove it altogether from disc 129. Because frame 134 is able to rotate freely about the axis 127 and independently of disc 129, any of the 32 holes may be chosen. In practice, with 32 holes used on a selector disc of apparatus 100, only about 12 will in fact lead to useful exercises. However this is in no sense intended to be a limitation on the scope of the invention as claimed.

The view in Figure 9 also shows (in phantom outline) part 144 of the actuation member 125. In this view, it is shown in the position it occupies when pushed anticlockwise as far as it can go. The hole numbered 1 then lies directly underneath axis 127, with the hole numbered 3 being in line with the second part of the actuation member. The holes are numbered to increase in clockwise direction for sub assembly 117 and in the opposite direction for sub assembly 116. This information is not given because it has to be followed in following the invention, but to enable the table herein to be related to actual configurations of apparatus 100.

Secured to the face of the disc 129 is a disc 147 suited to take printing or writing and on which it is possible to write the names of particular types of exercises so that instead of selecting a (hole 133) number, one can select an exercise type by name. This is believed to be a novel feature in itself. As will be apparent from Figure 10, pin 132 is long enough to extend through disc 129 far enough that it can bear against the member 137 which supports the ring 130. Member 137 is shown in phantom outline in partial section in Figure 10. Thus, member 137 automatically limits the range of movement that can be obtained from the actuation member 125. Member 137 is in fact preferably proportioned to ensure that appropriate ranges are in fact obtained. Recesses (not shown) may be cut or formed in edges of member 137 to extend the allowable range in a particular direction if needed. Some exercises will involve pin 132 remaining on the right hand side of member 137 and some on the left, as seen in Figure 9.

It is possible for pin 132 inadvertently to be pushed axially through the selected hole 133 by an amount insufficient for it to engage upon member 137 to provide a stop function. This has potential to create a safety hazard. Referring to Figure 4, there is shown an in view of apparatus 100 with the sub assemblies 116, 117 having their axes 126 and 127 parallel to each other. The positions of the two actuation members 124 and 125 are shown as being different, not because this is a practical situation but in order to show the limits of travel obtainable for the actuation members 124, 125. Actuation member 125 is shown in its most extreme clockwise position, where further movement is stopped by contact between it and the side frame 105. Actuation member 124 is also shown in its most extreme clockwise position, where it impacts with one of two stops 148 secured to rings 130. The corresponding extreme position for actuation member 125 would occur when contact takes place between member 125 and the opposite stop 148. In certain exercises, the stops 148 are in fact useful as handles. The stop function provided by stops 148 will always be present even if the pin 132 is inadvertently not inserted to full depth.

Each ring 130 is also provided with a further formation 149. When the two sub assemblies 116 and 117 are in the position in which their rotation axes 126 and 127 extend transversely, the formations 148 and 149 are so located that it is convenient to place the bar of a bar bell (not shown) between them and sitting on the two rings 130. When the bench 101 is in use, as discussed below, a user is thus able to use bar bell-type free weights. This further enhances the versatility of apparatus 100.

Figure 5 shows a side view of apparatus 100 with much mechanical detail omitted for clarity. Apparatus 100 is provided with four separate sets of points 150 for receiving hook-like projections 151 on the end of a relocatable bench 101. Five possible positions of bench 101 are shown in Figure 5 simply superimposed on each other so that it is in effect schematic only. The horizontal positions shown are labelled "high", "medium" and "low" for reference in the attached table.

Figure 5 also shows how the apparatus 100 can provide for exercising in which the user lies on the (angled) bench 101 on his or her back and pulls handles 152 forward which are attached to ropes 153 offering resistance to movement. For this exercise to be carried out, it is necessary to disengage parts

144 of members 124 and 125 and place them in the limited-travel range (E) previously discussed. Then, to each of parts 144 a rope 153 is secured extending over sheaves 154 secured to side frames 104, 105 and to handles 152.

Apparatus 100 can provide a large number of possible exercise types. A proportion of these is set out in the attached Table 1. Each row in the table corresponds to one exercise. The columns set out how the machine is to be set up to achieve the exercise in question. There are columns for bench position, sub assembly (116, 117, termed "floating mount") rotation, hole (133) selection, the side of member 137 on which pin 132 is locked, whether the actuation members 124, 125 are fully telescoped or whether the parts 144 are able to rotate. In addition, the table notes when it becomes convenient or necessary to use hand grips 155 that are freely rotatably mounted to parts 144 of members 124, 125. Still further, the table notes when the formations 148 and 149 are to be used as handles by the user. Finally, the body position of the user on the apparatus is given. This is only a selection of the exercises able to be carried out using apparatus 100.

Furthermore, there is the ability to change the nature of the resistance met by the user in each exercise. This can be done by installation of a suitable linear cam 139 for each exercise. It will be noted that the linear cam 139 shown in Figure 12 has one straight edge. This enables the cam 139 to be mounted upside down, so that the only modulation or variation or resistance felt by the person exercising is associated with the general proportions of the mechanism, and not variations on top of that. This approach to obtaining variable resistance in an exercise machine is very convenient.

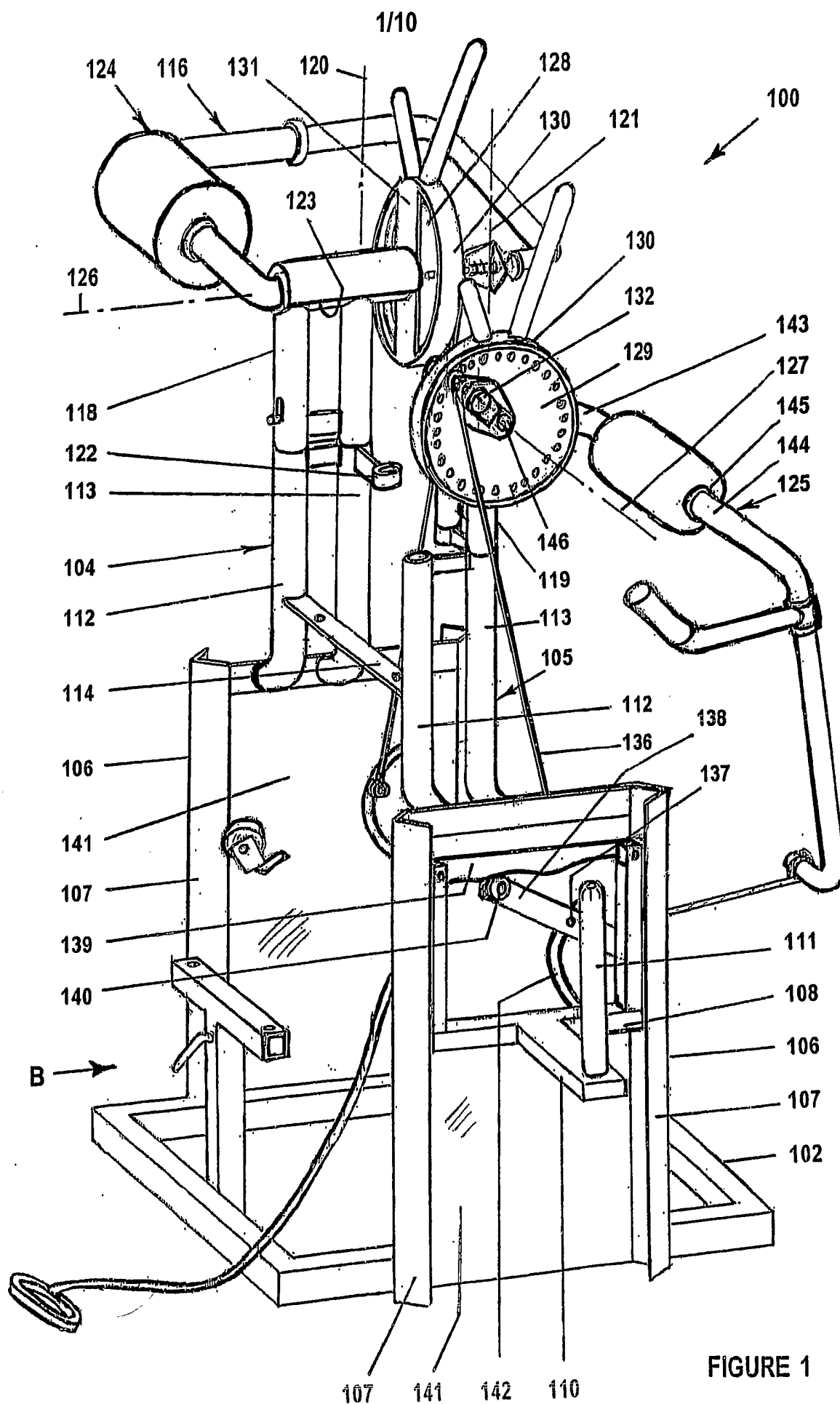
Figure 11 shows a cam 156 which is able to be simply substituted for the linear cam 139 shown in Figure 12. It will be noted it has the same end fixing details. However, instead of a single plate with a shaped surface providing the cam effect, the device in Figure 11 has a central shaft 157 with a number (in this case 6) of radially extending cam members 158. Each cam member 158 has a differently shaped camming surface. The cam members 158 are mounted to a tube 159 that can be placed in a range of rotational positions by removing and

replacing a pin 160 with the required cam surface lowermost. This makes the selection of a cam profile from a small number of cam profiles an easy matter. Many variations may be made without exceeding the spirit and scope of the invention. For example, an accessory leg squat unit can be provided, which has a pedal member and is adapted to be connected to both actuation members 124 and 125, and between them, so that they move together as a single unit. The leg squat unit gives a larger circumference of movement and also links both actuation members together to double resistance on the leg being exercised. Figure 14 shows such a unit 160 in phantom outline.

CLAIMS:

1. An exercise apparatus including:
an actuation member for moving by a user;
force generating means for applying a force to a second member included in said apparatus;
connection means whereby a force applied by said force generating means to said second member is communicated to said actuation member as resistance to movement of said member by said user; and
modulation means whereby said resistance is varied during movement of the actuation member.
2. Exercise apparatus according to claim 1 wherein said modulation means includes a member having a shaped surface which in the course of movement of said actuation member is traversed by a mechanical element of said connection means whereby the force communicated to said actuation member is varied.
3. An exercise apparatus according to claim 2 wherein movement of said mechanical element across said shaped surface varies a mechanical advantage provided by said connection means and thereby the resistance sensed by a user.
4. An exercise apparatus according to claim 2 or 3 wherein:
said connection means includes an elongate flexible member;
said actuation member is connected at least indirectly to said flexible member; and
said force generating means includes a weight disposed to be moved responsively to movement of said flexible member.
5. An exercise apparatus according to any one of claims 2 to 4 wherein said shaped surface is a surface of a cam and said mechanical element is a cam follower.

6. An exercise apparatus according to any one of claims, 2 to 5 wherein the contoured surface is disposed on a trolley subject to the force generated by said force generating means.
7. An exercise apparatus of claim 4, wherein the flexible member is attached to a lever.
8. The exercise apparatus of claim 7, wherein the lever has a wheel configured for engaging the shaped surface.
10. An exercise apparatus of claim 5, wherein a shaped surface is disposed adjacent said flexible member, and wherein a wheel is attached to the flexible member so that movement of said flexible member causes the wheel to travel along the contoured surface.
11. The exercise apparatus of claim 5, wherein the shaped surface includes a plurality of shaped surfaces having different contours.
12. A method for providing improved exercise, the method comprising;
selecting an exercise apparatus according to any one of claims 1 to 11;
and
actuating said actuation member.



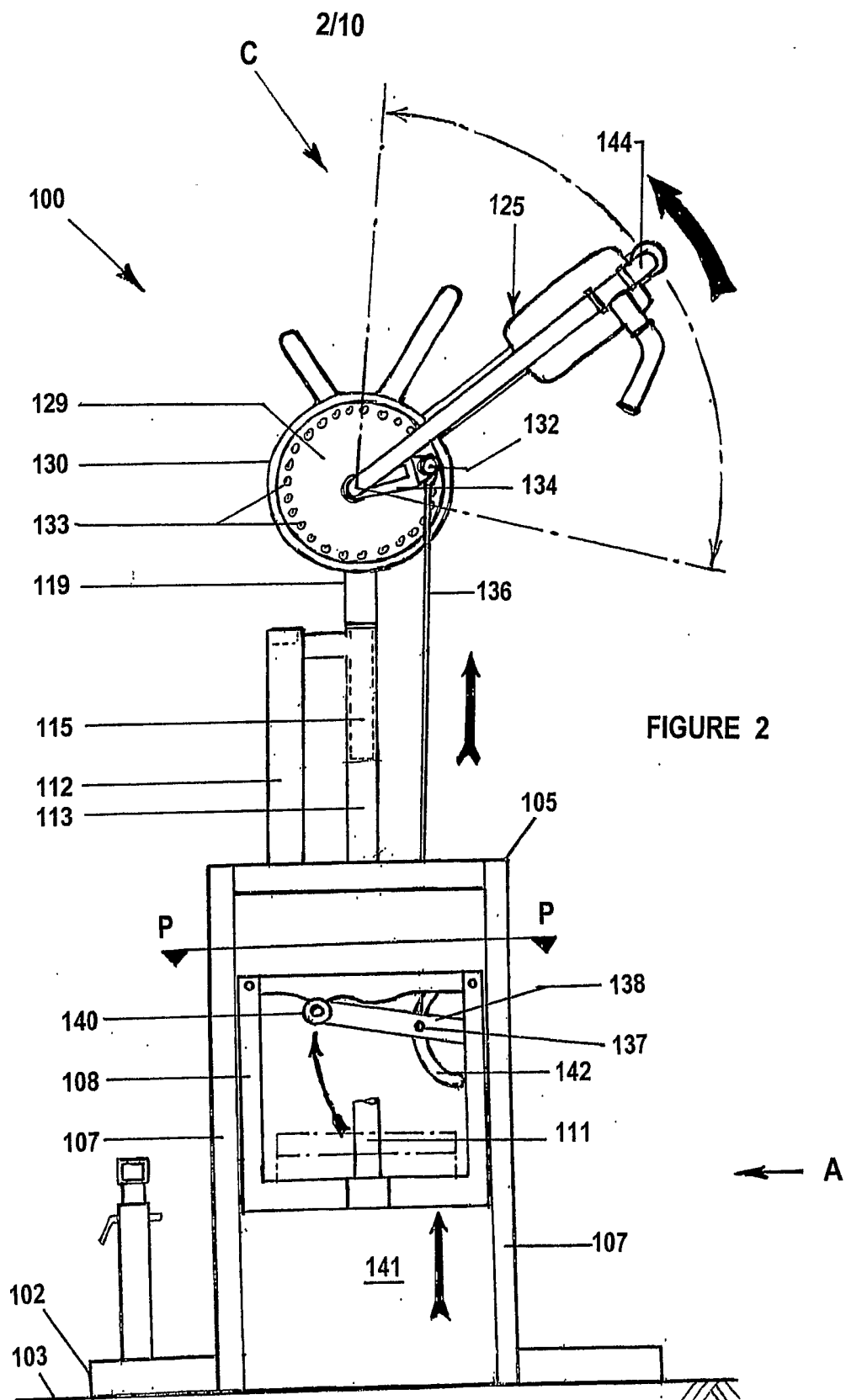


FIGURE 2

3/10

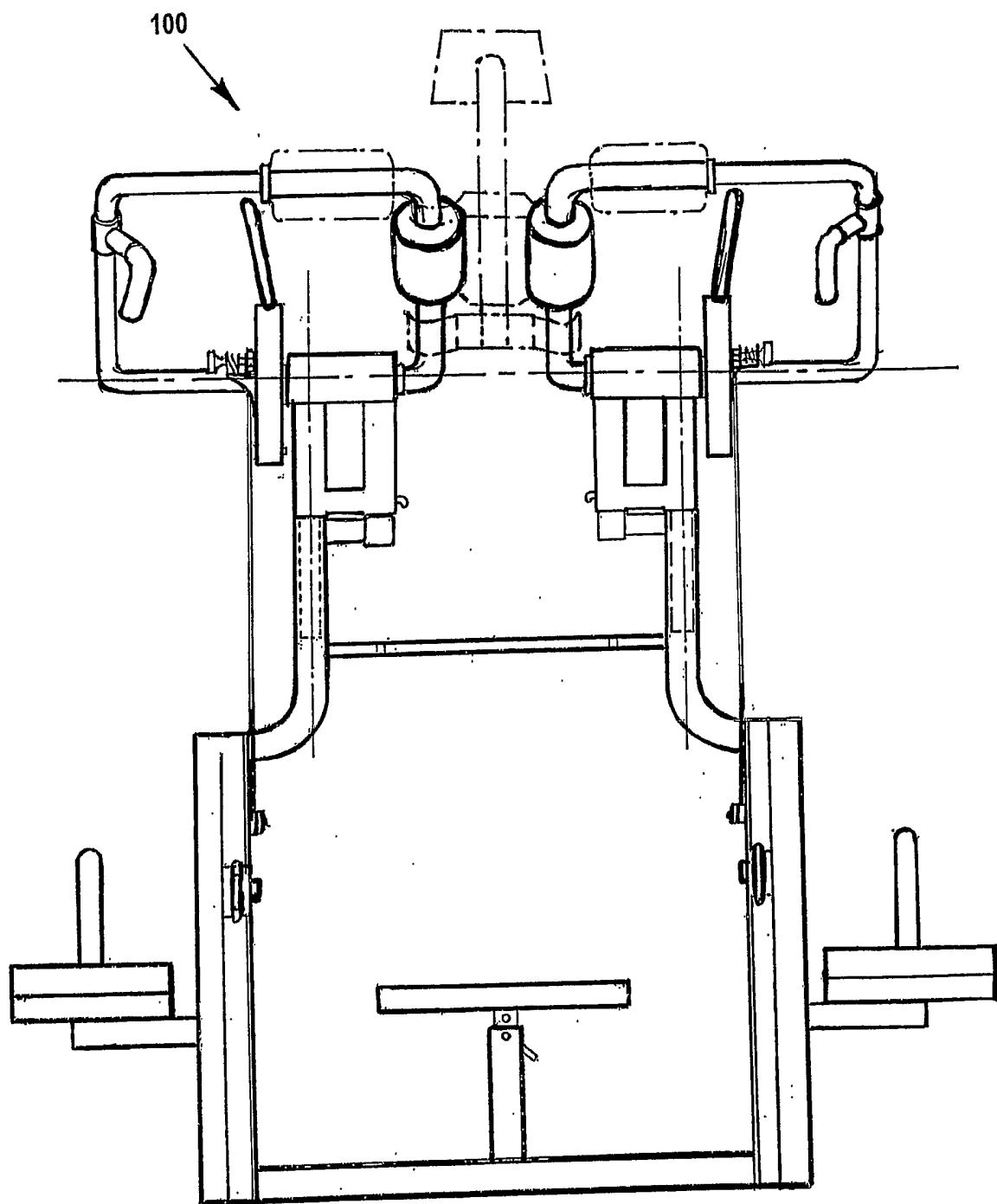


FIGURE 3

4/10

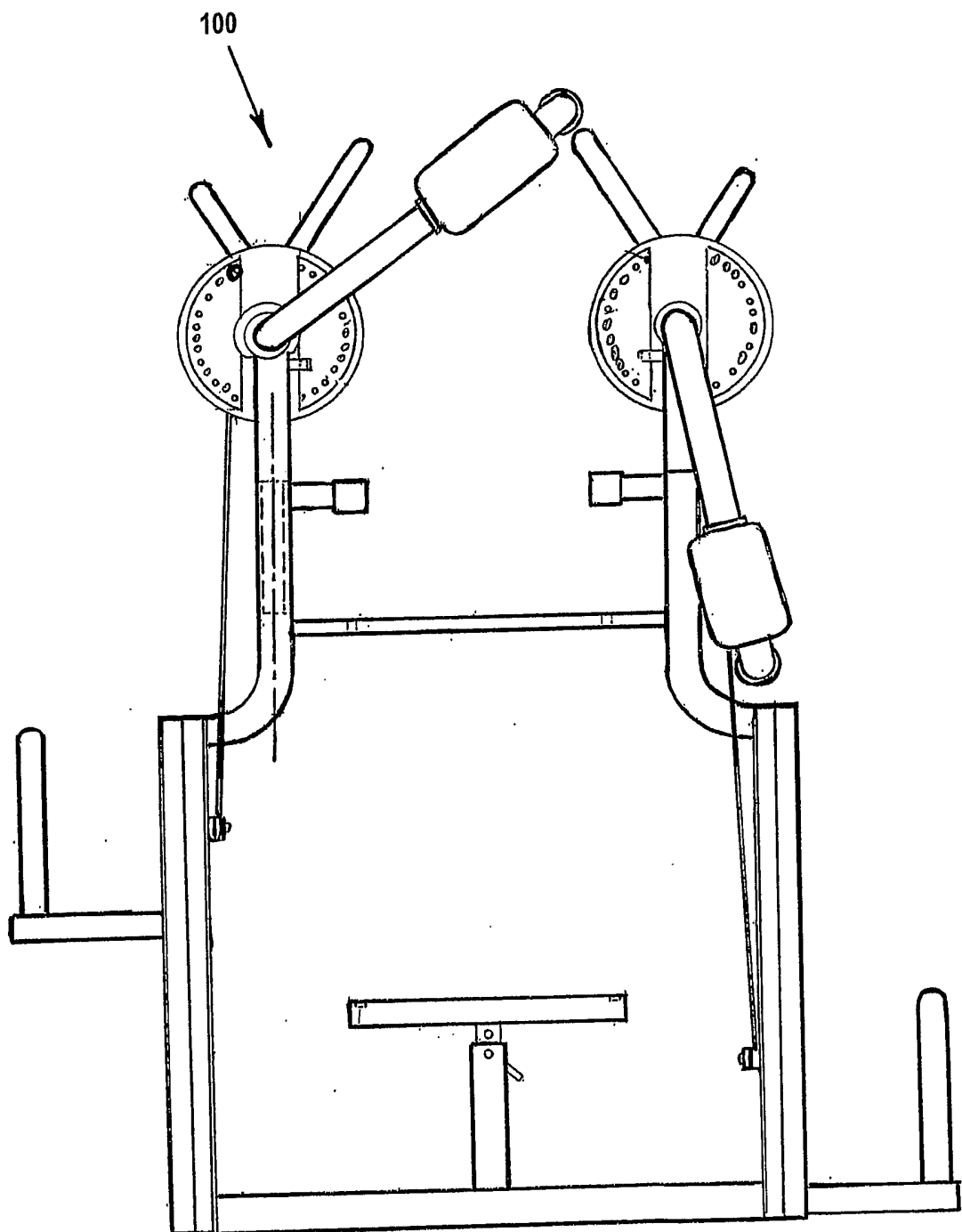
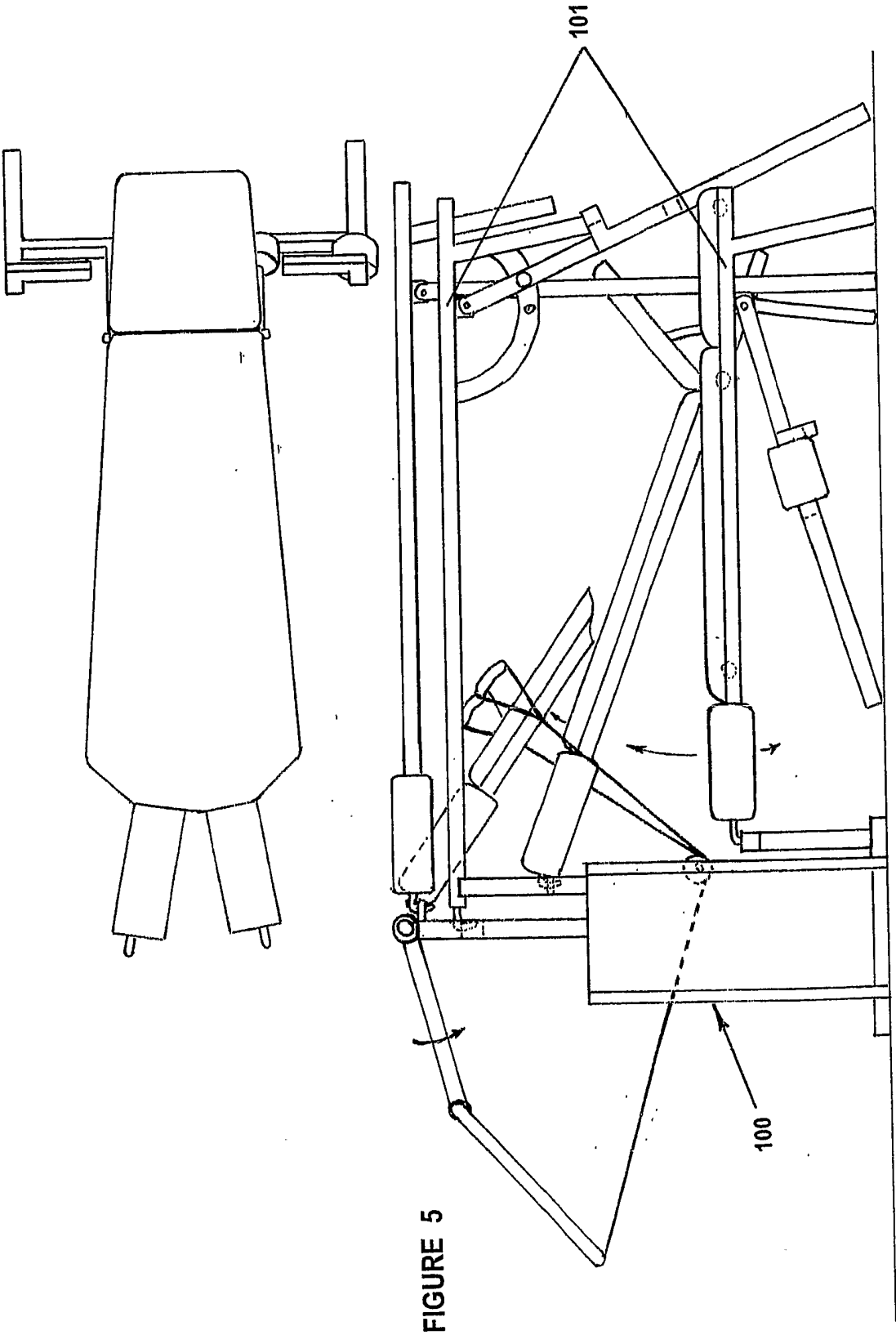


FIGURE 4



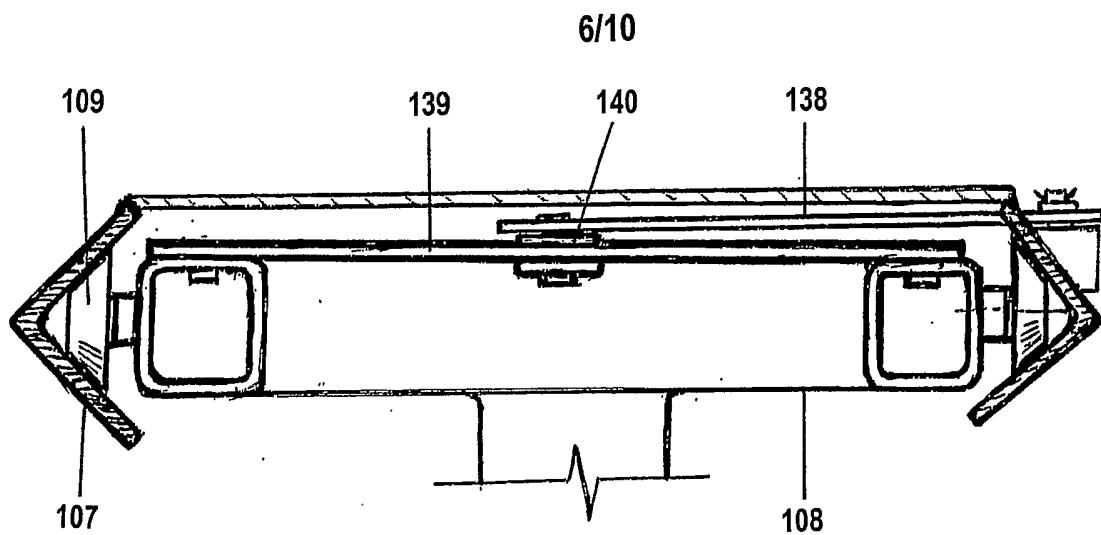


FIGURE 6

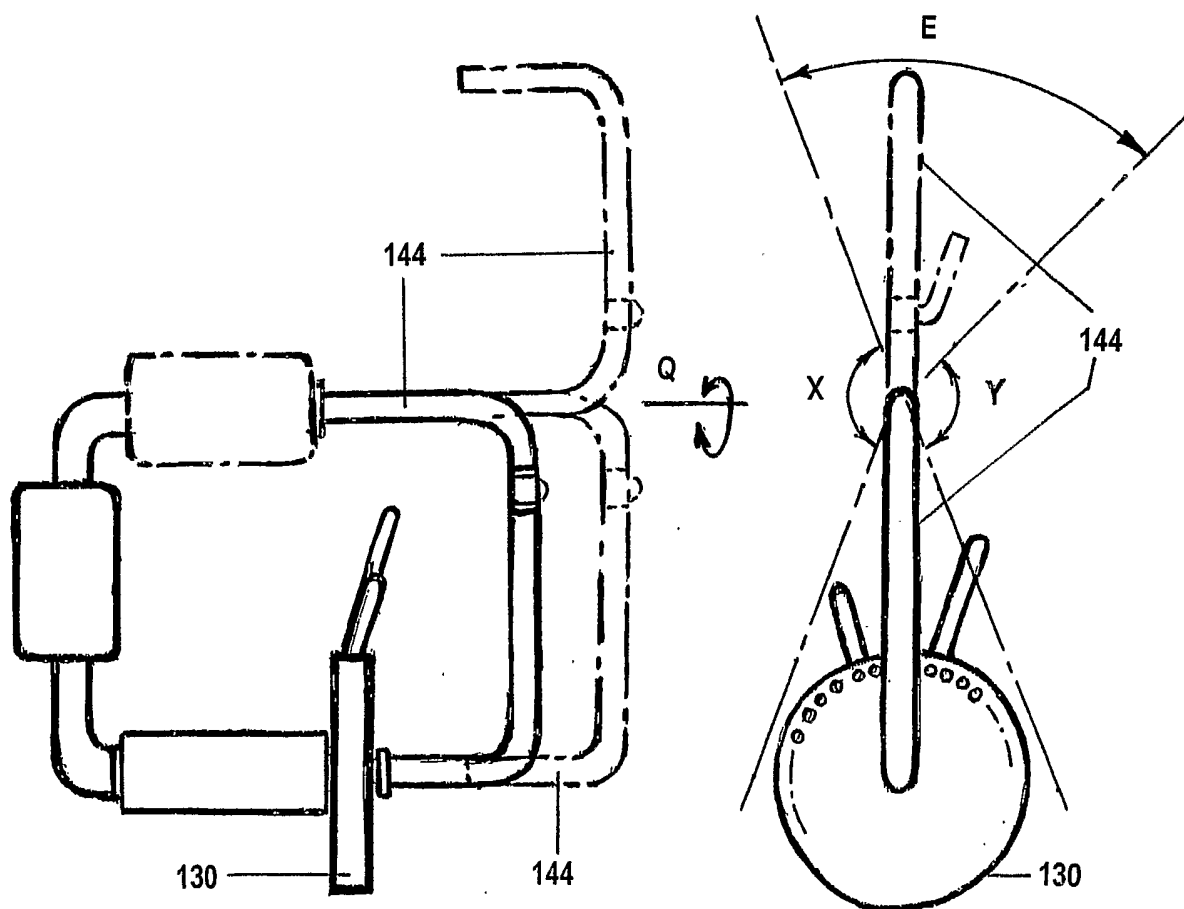


FIGURE 7

FIGURE 8

7/10

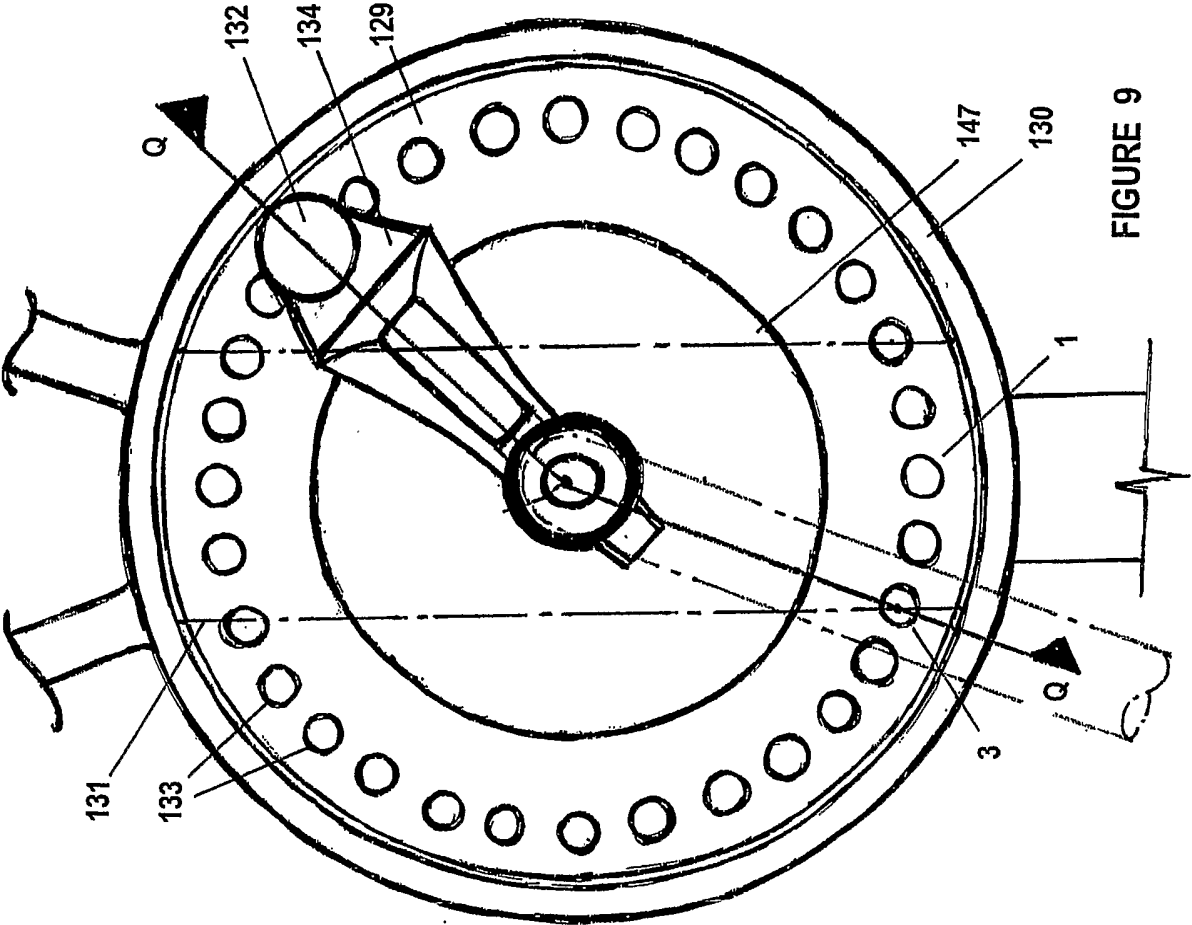


FIGURE 9

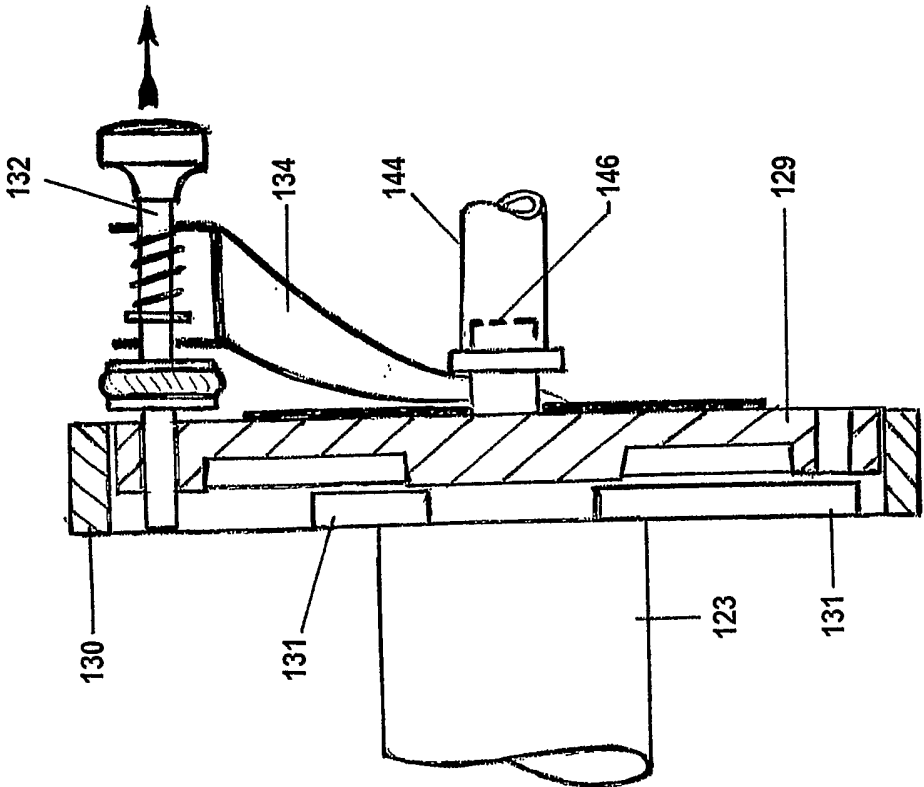


FIGURE 10

8/10

FIGURE 11

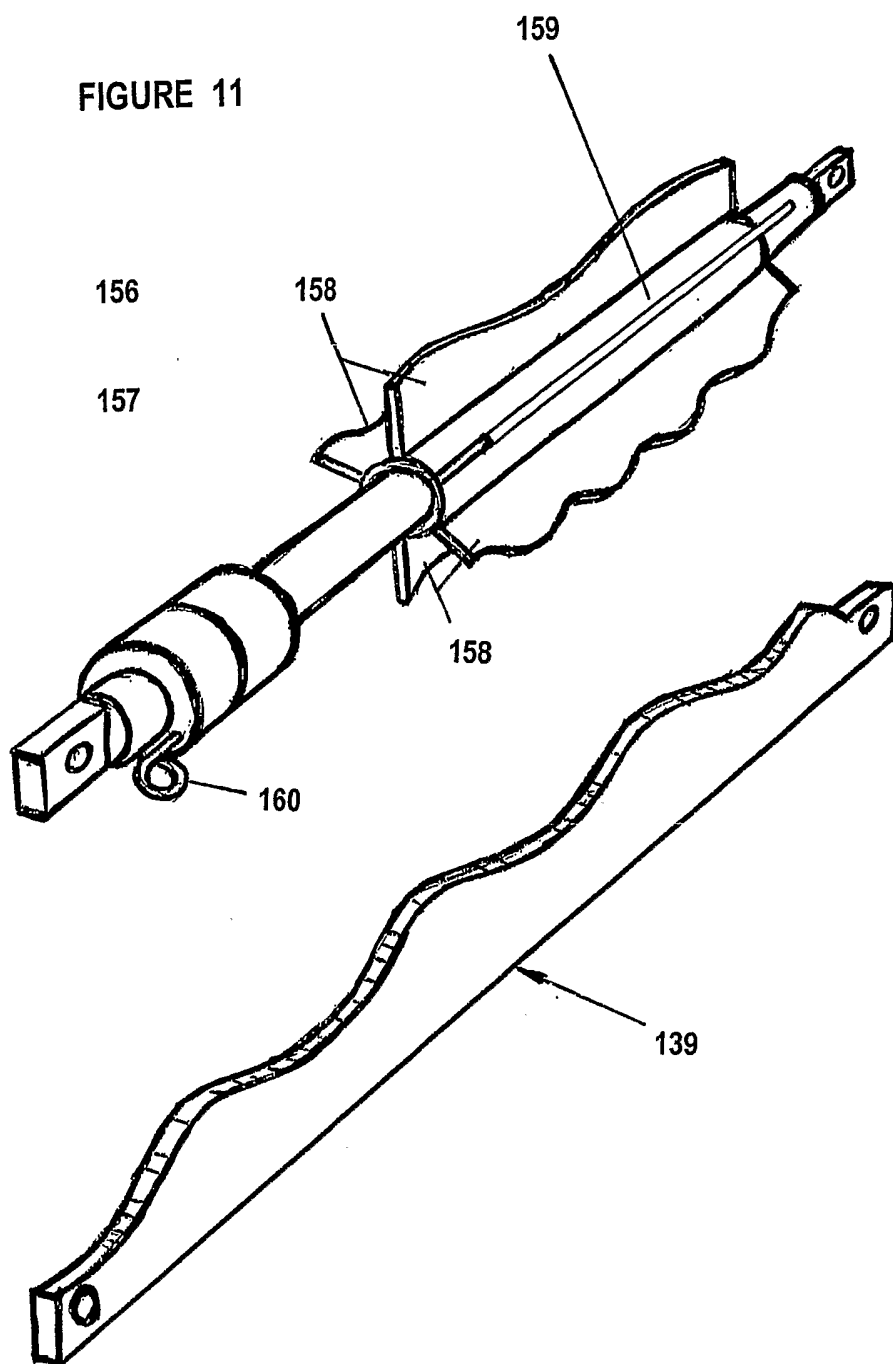


FIGURE 12

9/10

	Bench Position	Floating Mount	Hole Select	Pin Set Up Point	Roller Pad	Arm extension	Swivel Grips	V Pins	Body Position	Comments
1	Top Rower	Co-axial	10	Back		Out, or Locked out			Sit facing machine on riding bench	Use wave cam to simulate water
2	Leg Curls	Co-ax	10	Back	Outer	In			Lie belly down facing away	Grip on to foot rests
3	Upright Curls	Co-ax	15	Front	Outer	In		Hand Grips	Sit facing machine	Harness knees down
4	Leg Extension	Co-ax	1	Back	Outer	In		Hand Grips	Sit facing machine	Use appropriate desired cams
5	Lower Back	Co-ax	23	Front	Outer	In		Hand Grips	Lie on back with calves on user arms	As above
6	Leg Press	Co-ax	26	Front	Outer	In			Lie on back with foot on extender	Use one foot at a time. Left & right joined – use resistance increasing cam
7	Pectorals	Parallel	30	Front	Inner	In	Yes Down	Safety catch	Lie facing up	Handles swivel to accommodate different arm lengths
8	Torso Twist	Para	31+16	Front and Back	Inner	In	Yes	Safety catch	Lie facing up	Holster feet into padded mounts on bench legs
9	Thigh Abductors	Para	27	Front	Outer	In	Yes ankles		Lie on back with calves on user arms	
10	Pelvis	Para	15	Back	Outer	In	Yes ankles		As above	
11	Blades Up	Para	5	Front	Outer	In	Yes		Lie facing through bench gap	
12	Blades Down	Para	14	Back	Inner	In	Yes		Lie facing up	
13	Pecs Down	Para	22	Back	Inner	In	Yes		Lie facing down	
14	Shoulders	Para	4	Front	Inner	In	Yes		Sit with knees inside machine	
15	Side Bend	Para	4+21	Front Back	Inner	In	Yes		As above	
16	Lats	Para	21	Back	Inner	In	Yes		As above	
17	Extent Shoulder	Para	32	Back	Inner	In	Yes		As above	
18	Biceps	Co-ax	5	Back					As above	Put on self adjusting upper arm rest and safety stopper. When seated grip upper arm extenders

FIGURE 13

10/10

		Bench Position	Floating Mount	Hole Select	Pin Set Up Point	Roller Pad	Arm extension	Swivel Grips	V Pins	Body Position	Comments
19	Triceps	Low	Co-ax	20	Front					As above	As above
20	Cable Rower	Low	Co-ax	19	Front		Extend out			Seated on riding bench	Cables with handles are fastened to end of arm extenders through pulleys use wave cam
21	Cable breast stroke	Low	Co-ax	19	Front		Extend out			Lie on back facing up	Wind cable around arm extenders to adjust length use wave cam
22	Seated cable exercises	Low	Co-ax	19	Front		Extend out			Sit on bench facing machine	As above. Use standard cam
23	Cable bench press & pull exercises	Angle high, low	Co-ax	19	Front		Extend out			Lie on bench facing up or down	Cable allows greater freedom of movement
24	Bench Press	Angle Low	Co-ax	30	Back		In			Lie on bench facing up	Grip arm extenders
25	4-way neck	Angle low	Co-ax	1	Front		In			Lie on one of four sides on bench and place head under roller pad	Hook on bench offset under one user arm
26	Calf or shoulder raises		Co-ax	1	Back		In		Stand behind machine		Grip arm extender
27	Squats		Co-ax	5	Back				Stand behind machine		Place roller pads inside elbows
28	side winder		Co-ax	10 & 27 or reverse	Back Front		In		Stand behind machine		Grip arm extenders and simultaneously push and pull
29	barbell bench	Angle Low	Co-ax	5	Back		Out		Barbell carrier	Lie facing up	Doubles as a standard Barbell unit
30	Cable whole body	No bench	Co-ax	19	Front		Extend out			Stand in front of machine	Exercise arms and legs etc
31	Standing stretch	No bench	Para	14	Back		Extend out			Stand behind machine	Grip arm extender
32	Grip		Para	26	Front	Inner	In			Stand behind machine	Grip both arm extenders between thumbs and fingers
33	Pincer		Para	30	Front		In			Stand behind machine	Grip one arm extender in each arm

FIGURE 13 (cont)

INTERNATIONAL SEARCH REPORT

 International application No.
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A. CLASSIFICATION OF SUBJECT MATTERInt. Cl. ⁷: A63B 21/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

REFER ELECTRONIC DATABASE CONSULTED BELOW.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI & Keywords: exercise, weight, gym, strengthen, machine, equipment, apparatus, device, vary, modulate, change, alter, increase, decrease, difficulty, resistance, power, torque, force, effort, cycle, path, repetition, stroke, cam, contour, profile, shape, curve and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2133709 A (NAUTILUS SPORTS/MEDICAL INDUSTRIES INC.) 1 August 1984 whole document	1-7, 11
X	US 4957281 A (CHRISTOLEAR Jr.) 18 September 1990 whole document	1-7, 11
X	US 4807874 A (LITTLE) 28 February 1989 whole document	1-7, 11

☒ Further documents are listed in the continuation of Box C☒ See patent family annex

* "A"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed		

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INTERNATIONAL SEARCH REPORT

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 391315 A1 (LAPCEVIC) 10 October 1990 whole document	1-7, 11
X	US 4666152 A (JONES) 19 May 1987 figures 3 & 4	1-7, 11
X	US 6074328 A (JOHNSON) 13 June 2000 whole document	1, 11
X	US 5891004 A (BERRY) 6 April 1999 figure 3	1, 11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU02/01176

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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US	4957281	NONE					
US	4807874	NONE					
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		US	4600196	CA	1262465		
US	6074328	NONE					
US	5891004	NONE					
END OF ANNEX							