MULTI-FUNCTION EXERCISING APPARATUS

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ABSTRACT

Exercising apparatus capable of enabling a user to select any one of a plurality of different exercises to be performed by the user for exercising different muscles or muscle groups of the user’s body. The apparatus includes a body supporting member for supporting the body of the user in a predetermined position according to the exercise selected to be performed; a body-engageable member engageable by a selected part of the user’s body, when supported on the body supporting member, and displaceable in a predetermined direction by a force applied by the selected body part to the body-engageable member, according to the exercise selected to be performed; and a resistance member coupled to the body-engageable member for imposing a resistance to the displacement of the body-engageable member when the selected part of the user’s body applies the force to the body-engageable member. The body-engageable member is presettable with respect to the body supporting member to enable selection of the body part to engage the body-displaceable member, and the direction of application of the force applied by the body part to the body-engageable member, according to the exercise selected to be performed.
Fig. 8
MULTI-FUNCTION EXERCISING APPARATUS

FIELD AND BACKGROUND OF THE INVENTION

[0001] The present invention relates to multi-function exercising apparatus, and particularly to exercising apparatus capable of enabling a user to select any one of a plurality of different exercises to be performed by the user for exercising different muscle or muscle groups in the user's body.

[0002] The need to exercise various muscles and muscle groups of the human body is well recognized, and many exercising devices have been developed for this purpose. Most of the exercising devices that have been developed are dedicated devices, i.e., designed to exercise a particular muscle or muscle group, or a limited number of muscle groups. This requires the user to use many different exercising devices for exercising different muscles and muscle groups.

[0003] Multi-function exercising devices have also been developed enabling a user to selectively exercise any one of a number of muscles or muscle groups. Such multi-function exercising devices generally include a plurality of different body-engageable members, such as hand grips or leg bars, and a single resistance member, such as a set of weights, which may be selectively coupled to the different body-engageable members to enable the user to exercise a selected muscle or muscle group by using a selected one of the body-engageable members. Such known multi-function exercising devices are generally complicated, expensive and bulky, since they usually include complicated arrangements of cables and pulleys to enable a selected one of the different body-engageable members to be selectively coupled to the resistance member. Examples of the latter type of multi-function exercising devices are described, for example, in U.S. Pat. Nos. 6,027,433, 5,263,915, and 4,915,377, the contents of which patents are incorporated herein by reference as background information.

[0004] There is a need for a multi-function exercising apparatus of a simple and compact construction and yet capable of enabling a user to select any one of a plurality of different exercises to be performed by the user for exercising different muscles or muscle groups in the user's body.

SUMMARY OF THE PRESENT INVENTION

[0005] According to the present invention, there is provided exercising apparatus capable of enabling a user to select any one of a plurality of different exercises to be performed by the user for exercising different muscle groups of the user's body, the apparatus comprising: a body-engageable member engageable by a selected part of the user's body, when supported on a body supporting member, and displaceable in a predetermined direction by a force applied by the selected body part to the body-engageable member, according to the exercise selected to be performed; and a resistance member coupled to the body-engageable member for imposing a resistance to the displacement of the body-engageable member when the selected part of the user's body applies the force to the body-engageable member; the body-engageable member being presettable with respect to the user's body, when supported on the body supporting member, to enable selection of the body part to engage the body-engageable member, and the direction of application of the force applied by the body part to the body-engageable member, according to the exercise selected to be performed.

[0006] It will thus be seen that, whereas the above-cited prior art of known multi-function exercising devices provides a plurality of selectable body-engageable member (such as handle bars to gripped by the user's hands or leg bars to be engaged by the user's legs) selected by the user according to the exercise to be performed, the present invention provides a presettable body-engageable member which is presettable with respect to the body supporting member according to the exercise selected to be performed. As will be described more particularly below, such apparatus is therefore capable of being constructed more compactly than the above-cited prior art devices, thereby enabling the apparatus to be more suitable for smaller-space locations such as private homes, as well as for larger-space locations such as health clubs.

[0007] In the described preferred embodiments, the apparatus also includes the body supporting member, but it is contemplated that the invention may be implemented in apparatus using the floor itself for supporting the user's body, e.g., in a standing, sitting or reclining position.

[0008] According to further features in the preferred embodiments of the invention described below, the body supporting member is a bench capable of supporting the user's body in a sitting position or in a reclining position, according to the exercise selected to be performed. In addition, the body-engageable member is preferably a limb-engageable member capable of being gripped by a user's hand or engaged by a user's leg, according to the preset position of the limb engageable member, and displaceable thereby in the predetermined direction, according to the exercise selected to be performed. However, variations are described wherein the body-engageable members may be pusher plates to be pushed by the user's hands, or roller members to be engaged by a selected part of the user's body, such as the user's abdomen or back, to thereby increase the variety of exercise capable of being performed with the apparatus.

[0009] According to still further features in two of the described preferred embodiments, the resistance member is coupled to the body-engageable member by a direction selector mechanism also presettable to select the direction of displacement of the resistance member by the body-engageable member, according to the exercise selected to be performed.

[0010] In the described preferred embodiments, the apparatus further comprises a pair of vertically-extending columns on opposite sides of the body supporting member; and a carriage carrying the body-engageable member and the resistance member coupled thereto, the carriage being movable vertically along the columns to preset the body-engageable member with respect to the body supporting member according to the exercise selected to be performed. The carriage may include a pivotal mounting for pivotally mounting the resistance member and the body-engageable member to which it is coupled, to enable presetting both the resistance member and the body-engageable member with respect to the body supporting member according to the exercise selected to be performed. The body-engageable
member may also be angularly presettable with respect to the resistance member according to the exercise selected to be performed.

[0011] According to still further features in two of the described preferred embodiments, the apparatus includes two of the body-engageable members engageable by two limbs of the user’s body, and two of the resistance members each coupled to one of the body-engageable members for imposing a resistance to its displacement. Each of the resistance members is coupled to its respective body-engageable member by a direction selector mechanism also presettable to select the direction of displacement of the respective body-engageable member with respect to the resistance member for imposing the resistance to the displacement of the body-engageable member according to the exercise selected to be performed. However, another embodiment is described including a single resistance member and no direction selector mechanism.

[0012] As will be described more particularly below, the foregoing features of the invention enable simple and compact multi-function exercising apparatus to be constructed capable of enabling a user to select any one of a wide variety of different exercises for exercising different muscles and muscle groups of the user’s body. Such apparatus also enables adjustment of the body-engageable members for the specific physical dimension of the individual users.

[0013] Further features and advantages of the invention will be apparent from the description below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

[0015] FIG. 1 is a three-dimensional view illustrating one form of multi-function exercising apparatus constructed in accordance with the present invention;

[0016] FIG. 2 is a sectional view along line II-II of FIG. 1;

[0017] FIG. 3 is a view corresponding to that of FIG. 1 but illustrating a different presettable position of the body-engageable members in the apparatus of FIG. 1;

[0018] FIGS. 4 and 5 are enlarged three-dimensional views illustrating the pivotal coupling shown in the sectional view of FIG. 2;

[0019] FIG. 6 is a three-dimensional view illustrating the direction selector mechanism in the exercising apparatus of FIG. 1;

[0020] FIG. 7 illustrates the exercising apparatus of FIG. 1 preset for use in exercising primarily arm and shoulder muscles (e.g., deltoids);

[0021] FIG. 8 illustrates the exercising apparatus of FIG. 1 preset for use in exercising primarily leg and thigh muscles (e.g., hamstrings, quadriceps and hip flexors);

[0022] FIG. 9 is illustrates the exercising apparatus of FIG. 1 preset for use in exercising primarily arm and chest muscles (e.g., pectorals);

[0023] FIG. 10 is illustrates a direction selector mechanism similar to that of FIG. 6, but modified to enable the respective body-engageable member also to be presettable with respect to the direction selector mechanism, as well as with respect to the resistance member to which that mechanism is coupled;

[0024] FIG. 11 illustrates a multi-function exercising apparatus similar to that of FIG. 1 but including the modified direction selector mechanism of FIG. 10;

[0025] FIG. 12 illustrates the apparatus of FIG. 11 but in another preset condition, generally similar to that of FIG. 2;

[0026] FIG. 13 illustrates the apparatus of FIG. 11 preset for use in exercising primarily the arm and shoulder muscles, similar to the set-up illustrated in FIG. 7;

[0027] FIG. 14 illustrates the apparatus of FIG. 11 preset for use in exercising primarily the leg and thigh muscles, similar to the set-up illustrated in FIG. 8;

[0028] FIG. 15 illustrates the apparatus of FIG. 11 preset for exercising primarily the arm and chest muscles, similar to the set-up illustrated in FIG. 9;

[0029] FIG. 16 illustrates the apparatus of FIG. 11 preset to enable the user to exercise primarily the arm and chest muscles while in a sitting position, rather than in a reclining position as in FIG. 15;

[0030] FIG. 17 illustrates a further embodiment of the invention;

[0031] FIG. 18 is a fragmentary view of part of the apparatus of FIG. 17; and

[0032] FIGS. 19 and 20 illustrate alternative body-engageable members that may be provided in any of the above-described constructions for increasing the variety of exercises capable of being performed on the respective apparatus.

[0033] It is to be understood that the foregoing drawings, and the description below, are provided primarily for purposes of facilitating understanding the conceptual aspects of the invention and various possible embodiments thereof, including what is presently considered to be preferred embodiments. In the interest of clarity and brevity, no attempt is made to provide more details than necessary to enable one skilled in the art, using routine skill and design, to understand and practice the described invention. It is to be further understood that the embodiments described are for purposes of example only, and that the invention is capable of being embodied in other forms and applications than those described herein.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0034] The present invention is described below, for purposes of example, primarily with respect to three preferred embodiments, namely: (1) the embodiment of FIGS. 1-9; (2) the embodiment of FIGS. 10-16; and the embodiment of FIGS. 17 and 18. Also described below, in FIGS. 19 and 20, are examples of additional types of body-engageable members which may be provided for use with any of the above-described embodiments to further increase the variety of exercises capable of being performed by a user of such apparatus.
All of the described preferred embodiments include a body supporting member, in the form of a bench assembly, for supporting the user’s body in a predetermined position according to the exercise selected to be performed; a body-engageable member engageable by a selected part of the user’s body, such as bars to be gripped by the user’s hands or to be engaged by the user’s legs and exchangeable by a force applied by the selected body part; and a resistance member, such as a weight stack, coupled to the body-engageable member for imposing a resistance to the displacement of the body-engageable member. The first two embodiments also include a direction selector mechanism for selecting the direction of coupling of the body-engageable member with respect to the respective resistance member. In all of the described embodiments, the body-engageable member is presettable by the user with respect to the body supporting member to enable selection of the body part to engage the body-engageable member, and the direction of application of the force applied by the body part to the body-engageable member to be resisted by the resistance member, according to the exercise selected to be performed.

While in all the described embodiments, the body supporting member is a bench assembly, the body-engageable member is a bar to be gripped by the user’s hands or to be engaged by the user’s legs, and the resistance member is a weight stack, it will be appreciated that these are merely preferred examples of devices that could be used for this purpose, and that the invention could be implemented in apparatus using other types of body supporting members, body-engageable members, and resistance members. The invention could also be implemented in apparatus utilizing the floor itself as the body supporting member, e.g., for supporting the user’s body in a standing, sitting or reclining position. Also described in FIGS. 19 and 20, are examples of other types of body-engageable members that could be provided to increase the variety of exercises capable of being performed with the described apparatus.

The embodiment of FIGS. 1-9.

As shown particularly in FIG. 1, the multi-function exercising apparatus illustrated in FIGS. 1-9 includes the following main assemblies: a frame structure, generally designated 10; a bench assembly, generally designated 20 supported by the frame structure; a pair of body-engageable members, generally designated 30, presettable to different positions with respect to the bench assembly 20; a pair of resistance members 40, each coupled to one of the body-engageable members 30, for imposing a resistance to the displacement of the body-engageable members in order to exercise a selected muscle or muscle group; and a drive, generally designated 50, for vertically driving the body-engageable members 30, as well as the resistance members 40 to which they are coupled, to different vertical positions with respect to the bench assembly 20. Each body-engageable member 30 is coupled to its respective resistance member 40 by a direction selector mechanism 60, which enables selection of the direction in which a force applied to the body-engageable member 30 is resisted by its respective resistance member 40.

As will be described below, the body-engageable members 30 are presettable with respect to the bench assembly 20, and the direction selector mechanism is also presettable with respect to the body-engageable member and the resistance member, to enable selection of the body part (e.g., arms, or legs) of the user to be engaged by the body part, and the direction of application of the force applied by the body part to the body-engageable member which is to be resisted by the resistance member, according to the exercise selected to be performed.

Frame structure 10 includes a base 11 for supporting the apparatus on a horizontal surface, such as a floor, and a bench mounting structure 12 which mounts the bench assembly 20 in a manner permitting the bench assembly to be moved in the transverse direction with respect to the base 11. Bench mounting structure 12 is of an open frame construction, including top and bottom horizontal walls 12a, 12b, and front and rear vertical walls 12c, 12d. Bench assembly 20 may be mounted for transverse (front-back) movement by providing channels or guides (not shown) in the top horizontal wall 12a of the bench mounting structure 12, as well known in bench-type exercising apparatus.

Frame structure 10 further includes a pair of vertically-extending columns 13, 14, on opposite sides of the bench assembly 20. As will be described more particularly below, vertical columns 13, 14, mount the body-engageable members 30, the resistance members 40, and the direction selector mechanisms 60. They also mount part of the vertical drive 50 such as to permit the body-engageable members 30 to be preset vertically and also angularly with respect to the bench assembly 20. As shown in FIG. 1, each of the vertical columns 13, 14, includes a pair of vertically-extending posts 15a, 15b and 16a, 16b, respectively, bridged at their upper ends by a cross-bar 17, 18.

The bench assembly 20 includes a horizontal panel 21 which is movable in the transverse (front-back) direction with respect to the base 11, and another panel 22 pivotally mounted at one end to panel 21. When the bench assembly 20 is preset in the condition to receive the user in a sitting position, e.g., as shown in FIGS. 1 and 7, horizontal panel 21 serves as a seat, and panel 22 is pivoted upwardly to serve as a back rest. When the bench assembly 20 is in the condition to receive the user in a reclining position, e.g., as shown in FIG. 9, horizontal panel 21 serves as a head-rest, whereas panel 22 is pivoted to a horizontal position to support the remainder of the user’s body in a reclining position.

The illustrated apparatus includes two body-engageable members 31, 32. Each member 31, 32 is a bar formed with two right-angle bends 31a, 31b and 32a, 32b, respectively. One end of each bar 31, 32, receives a freely-rotatable sleeve 33, 34, which serves as a hand grip (e.g., as shown in FIG. 7), or a foot-engaging element (e.g., as shown in FIG. 8) for engaging the respective body part according to the exercise selected to be performed. The opposite end of each body-engageable member or bar 31, 32 is rotatably mounted in its respective direction selector mechanism 60. As described more particularly below with respect to FIG. 6, each direction selector mechanism 60 couples the movements of its body-engageable member 31, 32 to the respective resistance member 40 and determines the direction of displacement of the body-engageable member 31, 32 to be resisted by the respective resistance member 60.

Each body-engageable member 31, 32 together with its respective direction selector mechanism 60 and
resistance member 40, is mounted on a carriage, shown at 35, 36, respectively, movable vertically in its respective vertical column 13, 14 by the vertical drive 50, as described more particularly below.

[0045] Each resistance member 40 is in the form of one or more weights 41, 42, for the respective body-engageable member 31, 32. As best seen in FIG. 3, the weights 41, 42 for each of the body-engageable members 31, 32, are mounted on one end of an arm 43, 44. The opposite end of each arm is pivotally coupled by a shaft 45, 46 to the direction selector mechanism 60 for the respective body-engageable member 31, 32. As indicated earlier, and as will be described more particularly below with respect to FIG. 6, the direction selector mechanism 60 for each body-engageable member 31, 32, enables the user to select the direction in which the respective body-engageable member 31, 32 is to be moved in order to have the respective resistance member 41, 42 impose its resistance to the displacement of the body-engageable member 31, 32, according to the exercise selected to be performed.

[0046] The vertical drive, generally designated 50, for vertically presetting each body-engageable member 31, 32 with respect to the bench assembly 20, is a screw type drive. It includes a screw 51, 52 rotatably mounted on an end bearing 53, 54 in the base 11. Each screw extends vertically in its respective vertical column 13, 14 between the two posts 15a, 15b and 16a, 16b, respectively.

[0047] As shown in the sectional view of FIG. 2, each screw 51, 52 (only screw 51 being shown in FIG. 2) threadedly receives a nut, shown at 55 in FIG. 2, carried by the respective carriage (35, 36). Thus, rotation of the screws 51, 52 in one direction will move the two carriages 35, 36 upwardly, whereas rotation of the screws in the opposite direction will move the carriages downwardly.

[0048] As shown in FIG. 1, the two screws 51, 52 are rotated by a sprocket chain 56 driven by an electrical motor 57 in the appropriate direction to raise or lower the two carriages 35, 36 to the preselected elevation. Control of motor 57 may be effected in any suitable manner, such as by a manual control unit 58 (FIGS. 7 and 8).

[0049] As shown particularly in FIG. 2, carriage 35 (and also carriage 36) includes slide bearings 35a for receiving post 15a, slide bearings 35b for receiving post 15b, and an opening 35c for receiving the respective screw 51. Each carriage 35, 36, further includes a presettable pivotal mounting including a pivot pin (e.g., 35d) for presetting the angular position of the respective direction selector mechanism 60, and thereby of the body-engageable member 31, 32 coupled thereto, with respect to the carriage 35, 36. This presetting of each direction selection mechanism 60 also presets the resistance member 41, 42 carried by the respective carriage 35, 36.

[0050] FIGS. 4 and 5 more particularly illustrate the structure of the presettable pivotal mounting including pivot pin 35d. As shown in FIG. 4, the respective carriage 35 is formed with a circular loop 35e received within a corresponding recess (not shown) in the portion of the respective direction selector mechanism 60 receiving the pivot pin 35d. Loop 35e is formed with a plurality of sockets or bores 35f about its periphery, for selectively receiving a spring-urged pin 35g (FIG. 5) carried by the direction selector mechanism 60, in order to preset the angular position of the direction selector mechanism with respect to the carriage 35 (or 36). It will thus be seen that the angular position of the direction selector mechanism 60, and thereby also of the body-engageable member 31 or 32 coupled thereto, may be preset about the axis of pin 35f by merely pulling-out pin 35g, rotating the direction selector mechanism 60, and then returning the pin to seat in the appropriate socket 35f, according to the desired angular position.

[0051] FIG. 6 illustrates one of the direction selector mechanisms 60 which couples each of the body-engageable members 31, 32, to the respective resistance member 40, namely weights 41, 42 (FIG. 3). As shown in FIG. 6, each direction selector mechanism 60 includes a housing 61 enclosing a plurality of gears coupling one end 31c of the respective body-engageable member 31 to shaft 45 of the respective resistance member 40 (e.g., weight 41). End 31c of the body-engageable member 31 serves as a shaft which rotatable receives a pair of gears 62, 63 freely rotatable on shaft 31c, and a clutch plate 64 splined to the shaft so as to be rotatable therewith. Clutch plate 64 is movable axially in either direction on shaft 31c to engage either gear 62 or gear 63, or to a neutral, intermediate position decoupled from both gears.

[0052] The movement of clutch plate 64 to selectively engage gears 62, 63, may be effected manually or electrically. In the embodiment illustrated in FIG. 6, it is effected electrically by means of an actuator (not shown) actuated by depressing a manual switch 65 carried by the respective body-engageable member 31 so as to permit the user to conveniently actuate the direction selector mechanism.

[0053] Gear 63 is coupled to shaft 45 of the resistance member 41 by two gears 66, 67. When gear 63 is made effective by the actuation of clutch plate 64 to couple the resistance member 41 to the body-engageable member 31, shaft 45 will be driven in the same direction as shaft 31c so that the resistance member 41 will resist the upward movement of the body-engageable member 31. On the other hand, when clutch plate 64 is actuated to couple gear 62 to the body-engageable member 31, gear 62 is directly coupled to gear 68 which is directly coupled to shaft 45 of the resistance member 41, so that shaft 45 will be driven in the opposite direction as shaft 31c, whereby the resistance member 41 will resist the downward movement of the body-engageable member 31. Clutch plate 64 is actuated to its neutral position, decoupled from both gears, when presetting the respective body-engageable member.

[0054] FIGS. 7-9 illustrate three examples of set-ups of the apparatus presettable by the user according to the particular exercise selected to be performed.

[0055] In FIG. 7, the apparatus is preset for exercising primarily the arm and shoulder muscles (deltoids) of the user. In this set-up, the bench assembly 20 is preset for receiving the user in a sitting position; and the two body-engageable members 31, 32 are preset at a higher elevation in front of the sitting user for gripping by the user’s hands. In FIG. 7, the direction selector mechanism 60 for each body-engageable members 31, 32, is preset to convert the downward movements of the body-engageable members 31, 32, to upward movements of the weights 41, 42, and are therefore resisted by the resistance members 40. It will be appreciated, however, that by merely reversing the preset-
ting of the direction selector mechanism 60, the upward movements of the body-engageable members could be resisted by the resisting member.

[0056] FIG. 8 illustrates a set-up for exercising primarily the leg and thigh muscles (the hamstrings, quadriceps, and hip flexors). It will be seen that in this set-up, the bench assembly 20 is again preset for receiving the user in a sitting position; the body-engageable members 31, 32 are preset to a lower elevational so as to be engageable by the legs of the user; and the direction-changing mechanisms 60 are preset such that the upward movements of the body-engageable members 31, 32 produce upward movements of the resistance members 40, namely the weights 41, 42.

[0057] FIG. 9 illustrates a set-up for exercising primarily the arm, shoulder and chest muscles (deltoids and pectorals). For this set-up, the bench assembly 20 is preset for receiving the user in a reclining position; the body-engageable members 31, 32 are preset at an intermediate elevation so as to be grippable by the user’s hands and movable towards and away from the user’s chest; and the direction selector mechanisms 60 are preset such that the pivotal movement of the body-engageable members 31, 32 pivotally towards the user’s chest produces an upward movement of the weights 41, 42, so as to be resist by the resistance members 40 coupled to the body-engageable members 31, 32. It will also be seen that in the set-up illustrated in FIG. 9, the direction-changing mechanisms 60 are pivoted so as to be perpendicular to their respective carriages 35, 36; whereas in the set-ups of FIGS. 7 and 8, the direction selector mechanisms 60 are pivoted so as to be in alignment with their respective carriages 35, 36.

[0058] The Embodiment of FIGS. 10-16

[0059] The apparatus illustrated in FIGS. 10-16 utilizes a modified direction selector mechanism, as compared to the direction selector mechanism 60 in the embodiment of FIGS. 1-9, to increase the adaptability of the apparatus for exercising different muscles and muscle groups. FIG. 10 more particularly illustrates the construction of the modified direction selector mechanism, therein generally designated 160.

[0060] Direction selector mechanism 160 illustrated in FIG. 10 performs basically the same function as direction selector mechanism 60, illustrated in FIG. 6, of selecting the direction of movement of the respective resistance member 40 (e.g., weight 41) with respect to the direction of movement of the respective body-engageable member (e.g., bar 31). The modified direction selector mechanism 160 illustrated in FIG. 10, however, performs the additional functions of (1) enabling the pivotal axis of the body-engageable members 31, 32 to be perpendicular to the pivotal axis of the resistance members 41, 42, and (2) enabling the pivotal axis of the body-engageable member 31 to be angularly preset with respect to the pivotal axis of the resistance members. Both increase the possible positions to which the body-engageable members are presettable according to the muscle or muscle group selected to be exercised.

[0061] To facilitate understanding FIG. 10, those parts in the modified direction selector mechanism illustrated in FIG. 10 which are the same, or substantially the same, as the parts in the direction selector mechanism 60 illustrated in FIG. 6, are identified by the same reference numerals, whereas the new parts, or the substantially changed parts, are identified by reference numerals beginning with “160”.

[0062] Thus, as shown in FIG. 10, the housing, therein designated 161, for the modified direction selector mechanism 160, is integrally formed with a mounting disc 162 rotatable receiving a ring 163 integrally formed with a housing 164 for housing a pair of bevel gears 165, 166. Bevel gear 165 is fixed to a shaft 167 (corresponding to shaft 31c in FIG. 6) received within housing 161. Shaft 167 in FIG. 10 (as shaft 31c in FIG. 6) rotatably supports the two gears 62, 63 selectively coupeable to shaft 167 by the clutch plate 64.

[0063] Bevel gear 166 within housing 164 is coupled to a hollow shaft 168 which receives the inner end of the respective body-engageable bar 31. Bar 31 is fixed to hollow shaft 168 by a pin 169.

[0064] Ring 163 integrally formed with housing 164 includes a series of holes 170 around its outer periphery selectively receiving a pin 171 also receivable in a hole (not shown) in mounting disc 162. Pin 171 received within a selected hole 170 in ring 163 thus fixes the angular position of housing 164, and thereby of its body-engageable member 31, with respect to housing 161 of the direction selector mechanism 160.

[0065] Such an arrangement thus locates the pivotal axis of the body-engageable member 31 (namely, hollow shaft 168) perpendicularly (rather than parallel as in FIG. 6) to the pivotal axis 45 of the resistance member 41. It also enables the housing 164 for the respective body-engageable member 31 to be angularly preset with respect to the housing 161 of the direction selector mechanism 160, and thereby enables the pivotal axis (hollow shaft 168) of the body-engageable member 31 to be angularly preset with respect to the pivotal axis (45) of the resistance member 41.

[0066] The above described modified direction selector mechanism 160 thus permits a greater variety of preset positions to be made with respect to the body-engageable members 31, 32 in order to adapt the apparatus for exercising almost any selected muscle or muscle group of the user’s body. FIGS. 11-16 illustrate examples of different apparatus set-ups using the modified direction selector mechanism 160 of FIG. 10. Except for the modified direction selector mechanism 160, the apparatus set-ups illustrated in FIGS. 11-16 are otherwise basically the same as described above with respect to FIGS. 1-9, and therefore corresponding parts of the apparatus are identified by the same reference numerals in order to facilitate understanding.

[0067] Thus, FIG. 11 illustrates a set-up similar to that of FIG. 1, except that the modified direction selector mechanism 160 has been pivoted so as to be perpendicular to its respective carriage 35 (or 36), rather than parallel to it as in FIG. 1. This enables considerably more versatility in the presetting positions of the body-engageable members 31, 32 with respect to the bench assembly 20, and thereby increases the adaptability of the apparatus, using the same body-engageable members, for exercising any selected muscle or muscle group.

[0068] The set-up illustrated in FIG. 12 is similar to that of FIG. 2, except that, whereas in FIG. 2 the direction selector mechanisms 60 for each of the body-engageable members 31, 32, is perpendicular to the respective carriage
35, 36, in FIG. 12 the modified direction selector mechanism 160 is longitudinally aligned with the respective carriage. As described above, the modified direction selector mechanism 160 converts the pivotal movements of the body-engageable members 31, 32 to pivotal movements of the resistance members 41, 42 about axes perpendicular to the pivotal axes of the resistance members, rather than parallel to those axes as in FIG. 2. The modified direction selector mechanism 160 also enables the pivotal axes of the body-engageable members to be angularly preset with respect to the pivotal axes of the resistance members.

[0069] FIG. 13 illustrates a set-up similar to that of FIG. 7, for exercising primarily the arm and shoulder muscles of the user. Whereas in FIG. 7, the direction selector mechanism 60 for each of the body-engageable members 31, 32, is in longitudinal alignment with its respective carriage 35, 36, in the set-up illustrated in FIG. 13 the modified direction selector mechanism 160 is preset so as to be perpendicular to the respective carriage 35, 36. Here also, the modified direction selector mechanism 160 converts the pivotal movements of the body-engageable members 31, 32 to pivotal movements of the resistance members 41, 42 about axes perpendicular to the pivotal axes of the resistance members, rather than parallel to those axes as in FIG. 7. The modified direction selector mechanism 160 also enables the pivotal axes of the body-engageable members to be angularly preset with respect to the pivotal axes of the resistance members.

[0070] FIG. 14 illustrates a set-up similar to that of FIG. 8 for exercising primarily the leg and thigh muscles, except that, whereas in FIG. 8 the direction selector mechanism 60 is in longitudinal alignment with its respective carriage 35, 36, in the set-up illustrated in FIG. 14 the modified direction selector mechanism 161 is preset perpendicularly to its respective carriage 35, 36. The modified direction selector mechanism 160 thus converts the pivotal movements of the body-engageable members 31, 32 to pivotal movements of the resistance members 41, 42 about axes perpendicular to the pivotal axes of the resistance members, rather than parallel to those axes as in FIG. 8. The modified direction selector mechanism 160 also enables the pivotal axes of the body-engageable members to be angularly preset with respect to the pivotal axes of the resistance members.

[0071] FIG. 15 illustrates a set-up similar to that of FIG. 9 for exercising primarily the arm, shoulder and chest muscles of the user, except that, whereas in FIG. 9 each direction selector mechanism 60 is preset perpendicularly to its respective carriage 35, 36, in FIG. 15 each modified direction selector mechanism 160 is preset in longitudinal alignment with its respective carriage 35, 36. The use of the modified direction selector mechanism 160 in the set-up of FIG. 15 thus provides the same advantages as described above with respect to the set-up of FIG. 9.

[0072] FIG. 16 illustrates how the apparatus may be set-up also to permit exercising primarily the arm, shoulder and chest muscles of the user when the user is in a sitting position, rather than in a reclining position as shown in FIG. 15. In this set-up, the two carriages 35, 36 are preset in an elevated position on their respective columns 13, 14, the modified direction selector mechanism 160 for each body-engageable member 31, 32 is preset perpendicularly to its respective carriage 35, 36, and each of the body-engageable members 31, 32 is pivoted to extend downwardly with respect to its modified direction selector mechanism 160. Such an arrangement is permitted by the modified direction selector mechanism 160 since it converts the pivotal axes of the body-engageable members 31, 32 to be parallel to the pivotal axes of the resistance members 41, 42, and also permits the body-engageable members 31, 32 to be angularly adjusted with respect to their pivotal axes.

[0073] THE EMBODIMENT OF FIGS. 17 AND 18

[0074] FIGS. 17 and 18 illustrate a further embodiment of the invention in the form of an apparatus, generally designated 300, also including a pair of presettable body-engageable members 331, 332, in this case, however, both are coupled to the same resistance member, generally designated 340. In addition, the embodiment illustrated in FIGS. 17 and 18 does not require a direction-selector mechanism, corresponding to mechanism 60 (FIGS. 1-9), or 160 (FIGS. 10-16), in the earlier-described embodiments.

[0075] Thus, the apparatus illustrated in FIG. 17 includes a frame structure 310 also mounting a body-supporting member 320 in the form of a bench assembly, and a pair of body-engageable members 331, 332, presettable with respect to the bench assembly 320 to enable selection of the user’s body part or parts to be engaged by the body-engageable members, according to the exercise selected to be performed. The body-engageable members 331, 332 are vertically presettable along a pair of vertically extending columns 313, 314 on opposite sides of the bench assembly 320, by means of carriages 335, 336 movable by screws 351, 352 supported by the vertical columns, in the same manner as in the previously-described apparatus. In this case, however, the two body-engageable members 331, 332 are coupled to the same resistance member 340 via a pulley wheel 370 carried by the resistance member 340 and receiving a cable 371 having one end 371a coupled to body-engageable member 331, and an opposite end 371b coupled to the other body-engageable member 332. The arrangement is such that pivoting the two body-engageable members 331, 332 towards or away from each other or upwardly or downwardly, raises the resistance member 340. The resistance member 340 is guided in its vertical movements by a pair of guide bars 372a, 372b.

[0076] The two body-engageable member 331, 332 are coupled to their respective ends of the pulley cable 371 by similar coupling systems. Thus, each coupling system includes a connector 374 connecting the end of the respective body-engageable member 331, 332 to a shaft 375 which is in turn connected to one end of a right-angle gear assembly 376. As shown in FIG. 18, assembly 376 includes a gear 376a fixed to one end of shaft 375 meshing with gear 376b fixed to a horizontal hollow shaft 377 splined to another shaft 378 fixed to another gear 379a of another right-angle gear assembly 379. The two shafts 377 and 378 are located within sleeves 380, 381, in telescopic relationship to each other, enabling body-engageable member 332 to be horizontally and angularly preset by a clamping ring 381a movable to a clamping position or a releasing position by a pivotal handle 381a.

[0077] Gear 379a (FIG. 18) of right-angle gear assembly 379 meshes with another gear 379b slidably splined on a shaft 382 passing through the respective carriage 336 such that the gear assembly 379 is moved vertically with its
carriage 336 (or 335) by the rotation of its screw 352 (or 351). The two body-engageable members are presettable angularly about the horizontal axis of sleeve 381 by a pin 382a carried by the respective carriage 336 (or 335) receivable within a selected hole 381b in the respective gear assembly 379.

[0078] The upper end of each shaft 382 is received within another right-angle gear assembly 383 which includes a gear 383a (FIG. 18) meshing with another gear 383b coupled to one end of a horizontal shaft 384 at the upper end of the respective vertical column 314 (or 313). The opposite end of each horizontal shaft 384 receives a disc 385a, 385b rotatable with respect to its shaft 384 and having a plurality of openings 386. Discs 385a, 385b are normally decoupled from their respective shafts 374 to permit body-engageable members 331, 332 to be individually preset by individually moving each to its desired position. After said member 331 has been individually preset, its respective shaft 384 is coupled to its disc 385a, 385b by inserting a pin 387a, 387b, fixed to its shaft 384, into a hole 386 in its disc. Preferably, pins 387a, 387b are electromagnetically actuated. The two ends 372a, 372b of the pulley cable 372 are fixed eccentrically to their respective discs, 385a, 385b such that rotation of each disc in either direction, by pivoting its respective body-engageable member 332 in either direction, will raise the respective end of the weight 340.

[0079] It will thus be seen that the body-engageable members 331, 332 are presettable vertically by screws 351, 352. It will also be seen that the body-engageable members 331, 332 are presettable about the horizontal axis of sleeve 381 by releasing, and then tightening, clamping ring 381b via its pivotal handle 381a, to thereby fix the telescopic position of sleeve 380 within sleeve 381. It will also be seen that the body-engageable members 331, 332 are presettable angularly about the vertical axis of shaft 382 by angularly rotating gear assembly 379 with respect to shaft 382 and fixing its position by inserting pin 382a within a selected hole 382b.

[0080] It will also be seen that rotating either body-engageable member 331, 332 in either direction about its respective horizontal axis (shaft 375), or about its respective vertical axis (shaft 382), will move its respective disc 385a, 385b clockwise in one direction of movement, and counterclockwise in the opposite direction of movement. Either direction of movement of the discs will cause their respective end of the weight 340 to rise, and therefore will be resisted by the weight. Accordingly, weight 340 applies a separate load to each of the body-engageable members 331, 332.

[0081] Examples of Additional Body-Engageable Members

[0082] FIG. 19 and 20 illustrates examples of other body-engageable members, generally designated 430 and 530, respectively, that may be provided in addition to, or in lieu of, the above-described body-engageable members 31, 32 in any of the above-described embodiments.

[0083] Thus, FIG. 19 illustrates two body-engageable members, 431, 432, having one end receivable within hollow shaft 468 of the modified direction selector mechanism 460 illustrated at 160 in FIG. 10, and a pusher plate 433, 434 at the opposite end. Thus, body-engageable members 431, 432 may be preset with respect to the bench assembly 420 so as to be pushed by the hands of the user, or by the feet or knees of the user, in order to exercise selected muscles or muscle groups. The direction selector mechanism 460 for each of the body-engageable members 431, 432 would be preset so as to cause the weight 441, 442 to be moved in the upward direction when the pusher plates 433, 434 are pushed, to thereby resist the displacement of the pusher plates.

[0084] The body-engageable member illustrated in FIG. 20, and therein generally designated 530, is in the form an elongated roller 531 carried by a pivotal arm 532. Roller 531 may be of a length so as to extend across the abdomen or back or the user to enable the user to exercise muscle groups in the abdomen or back. Alternatively, there could be a pair of such rollers 531, each carried at one end of a pivotal arm 532, for engagement with the opposite sides of the user's abdomen or back for exercising the muscle groups therein, for engagement by the user's feet or legs for exercising muscle groups therein, or for grasping by the user's hands for exercising muscle groups therein.

[0085] While the invention has been described primarily with respect to three preferred embodiments, it will be appreciated that these are set forth merely for purposes of example, and that the invention can be implemented with many other structures. For example, the body supporting member could be, instead of a bench assembly for receiving the user in a sitting or reclining position, a platform for receiving the user in a standing position, or the floor itself for receiving the user in a standing, sitting, kneeling or reclining position. The body-engageable member could be, instead of a pair of bars graspable by the user's hands or engageable by the user's legs, a single bar extending across the body supporting member. The resistance member could be, instead of a stack of weights, other devices, such as electromagnetic, hydraulic, pneumatic or frictional devices, which impose a resistance to the displacement of the body-engageable member. Similarly, other forms of vertical drives could be used, such as pulley and chain drives, not only motor-operated but also manually operated.

[0086] Many other variations, modifications and applications of the invention will be apparent to those skilled in the art.

What is claimed is:

1. Exercising apparatus capable of enabling a user to select any one of a plurality of different exercises to be performed by the user for exercising different muscles or muscle groups of the user's body, said apparatus comprising:

   a body-engageable member engageable by a selected part of the user's body, when supported on a body supporting member, and displaceable in a predetermined direction by a force applied by the selected body part to the body-engageable member, according to the exercise selected to be performed;

   and a resistance member coupled to said body-engageable member for imposing a resistance to the displacement of said body-engageable member when said selected part of the user's body applies said force to the body-engageable member;

   said body-engageable member being presettable with respect to the user's body, when supported on the body...
2. The apparatus according to claim 1, wherein the apparatus further comprises a body supporting member for supporting the body of the user in a predetermined position according to the exercise selected to be performed.

3. The apparatus according to claim 2, wherein said body supporting member is a bench capable of supporting the user’s body in a sitting position or in a reclining position, according to the exercise selected to be performed.

4. The apparatus according to claim 1, wherein said resistance member is coupled to said body-engageable member by a direction selector mechanism also presettable to select the direction of displacement of said resistance member by said body-engageable member, according to the exercise selected to be performed.

5. The apparatus according to claim 4, wherein said body-engageable member is coupled to said direction selector mechanism to pivot about a first pivotal axis; and said resistance member is coupled to said direction selector mechanism to pivot about a second pivotal axis which is perpendicular to said first pivotal axis.

6. The apparatus according to claim 4, wherein said body-engageable member is coupled to said direction selector mechanism to pivot about a first pivotal axis; and said resistance member is coupled to said direction selector mechanism to pivot about a second pivotal axis which is perpendicular to said first pivotal axis.

7. The apparatus according to claim 4, wherein said body-engageable member is coupled to said direction selector mechanism to pivot about a pivotal axis; and the position of said body-engageable member is angularly presettable with respect to the direction selector mechanism about said pivotal axis.

8. The apparatus according to claim 2, wherein said apparatus further comprises a pair of vertically-extending columns on opposite sides of said body supporting member; and a carriage, carrying said body-engageable member and said resistance member coupled thereto, movable vertically along said columns to preset said body-engageable member with respect to said body supporting member according to the exercise selected to be performed.

9. The apparatus according to claim 8, wherein said carriage includes a pivotal mounting for pivotally mounting said resistance member, and said body-engageable member to which it is coupled, to enable presetting both said resistance member and said body-engageable member with respect to said body supporting member according to the exercise selected to be performed.

10. The apparatus according to claim 8, wherein said body-engageable member is also presettable angularly about a vertical axis with respect to said resistance member according to the exercise selected to be performed.

11. The apparatus according to claim 1, wherein the apparatus includes two of said body-engageable members engageable by two limbs of the user’s body, and two of said resistance members each coupled to one of said body-engageable members for imposing a resistance to its displacement.

12. The apparatus according to claim 11, wherein each of said resistance members is coupled to its respective body-engageable member by a direction selector mechanism also presettable to select the direction of displacement of the respective body-engageable member with respect to the resistance member for imposing said resistance to the displacement of said body-engageable member according to the exercise selected to be performed.

13. The apparatus according to claim 11, wherein said two body-engageable members are presettable at least vertically with respect to said body supporting member according to the exercise selected to be performed.

14. The apparatus according to claim 11, wherein said two body-engageable members are presettable at least angularly about a vertical axis with respect to said body supporting member according to the exercise selected to be performed.

15. The apparatus according to claim 11, wherein said two body-engageable members are presettable vertically with respect to said body supporting member, and angularly about a vertical axis with respect to said body supporting member, according to the exercise selected to be performed.

16. The apparatus according to claim 11, wherein said apparatus further comprises a pair of vertically extending columns on opposite sides of said body supporting member; and each of said body-engageable members, and the resistance member to which it is coupled, is carried on a carriage movable vertically along one of said columns to vertically preset said body-engageable members with respect to said body supporting member according to the exercise selected to be performed.

17. The apparatus according to claim 16, wherein each of said carriages includes a pivotal mounting for pivotally mounting said resistance member, and said body-engageable member to which it is coupled, about a vertical axis to enable presetting both said resistance members and said body-engageable members with respect to said body supporting member according to the exercise selected to be performed.

18. The apparatus according to claim 16, wherein each of said carriages further includes a direction selector mechanism coupling a body-engageable member with its resistance member, said direction selector mechanisms being presettable to select the direction of displacement of each resistance member by its respective body-engageable member.

19. The apparatus according to claim 18, wherein each of said body-engageable members is coupled to its direction selector mechanism to pivot about a first pivotal axis; and each resistance member is coupled to its direction selector mechanism to pivot about a second pivotal axis which is parallel to said first pivotal axis.

20. The apparatus according to claim 18, wherein each of said body-engageable members is coupled to its direction selector mechanism to pivot about a first pivotal axis; and each resistance member is coupled to its direction selector mechanism to pivot about a second pivotal axis which is perpendicular to said first pivotal axis.

21. The apparatus according to claim 18, wherein each body-engageable member is coupled to its direction selector mechanism to pivot about a pivotal axis; and the position of said body-engageable member is angularly presettable with respect to the direction selector mechanism about said pivotal axis.

22. The apparatus according to claim 18, wherein each of said direction selector mechanisms includes a clutch con-
trollable to selectively couple its body-engageable member to its resistance member via a first gear assembly which moves said resistance member in the same direction as said body-engageable member, or via a second gear assembly which moves said resistance member in the opposite direction as said body-engageable member.

23. The apparatus according to claim 16, wherein each of said columns includes a screw threadedly received in a nut carried by the respective carriage for vertically moving said carriages with respect to the body supporting member by the rotation of said screws.

24. The apparatus according to claim 1, wherein the apparatus includes a pair of presettable body-engageable members each coupled to a separate resistance member.

25. The apparatus according to claim 1, wherein the apparatus includes a pair of presettable body-engageable members both coupled to the same resistance member.

26. The apparatus according to claim 25, wherein said resistance member is coupled to both body-engageable members by a pulley wheel carried by the resistance member and movable vertically by a cable having one end coupled to one of said body-engageable members, and the opposite end coupled to the other of said body-engageable members.

27. The apparatus according to claim 1, wherein said resistance member includes one or more weights.

28. The apparatus according to claim 1, wherein said body-engageable member includes a bar or pair of bars to be grasped by the user’s hand or hands, or to be engaged by the user’s leg or legs.

29. The apparatus according to claim 1, wherein said body-engageable member includes a pusher plate or pair of pusher plates to be pushed by the user’s hand or hands, or by the user’s leg or legs.

30. The apparatus according to claim 1, wherein said body-engageable member includes a roller carried by a pivotal arm, or by each of a pair of pivotal arms, to be engaged by said selected part of the user’s body.

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