(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
29 June 2006 (29.06.2006)

PCT

(10) International Publication Number
WO 2006/067407 A1

(51) International Patent Classification:
A63B 21/002 (2006.01) *A63B 43/02* (2006.01)

(21) International Application Number:
PCT/GB2005/004927

(22) International Filing Date:
20 December 2005 (20.12.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0427870.1 20 December 2004 (20.12.2004) GB

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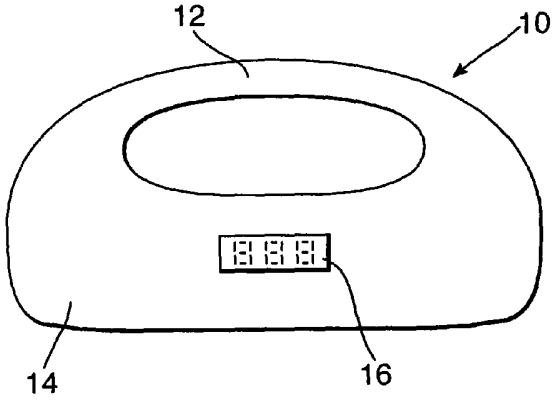
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *with amended claims*

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.

(54) Title: ISOMETRIC EXERCISE DEVICE



(57) Abstract: The present invention provides for a hand-held isometric exercise device comprising a handle portion and a deformable portion, the deformable portion being arranged to be deformed responsive to a user-exerted force when the device is gripped by the handle and urged against a surface, the device further including means for determining and indicating a level of force applied by the user to deform the deformable portion.

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ISOMETRIC EXERCISE DEVICE

The present invention relates to an isometric exercise device and, in particular, to a hand-held isometric exercise device.

The benefits of physical exercise have long been recognised both with regard to an improved level of physical fitness and muscle strength and also through associated advantages such as improved skeletal strength.

In line with such realisations, the amount and variety of physical exercise undertaken by individuals has increased. For example, for strength training, this has lead to an increase in gym membership and an increase in individuals performing weighted workouts either with free weights or through the use of multi-gym equipment.

However, for those seeking to increase muscle strength, it has been recognised that such use of free weights and multi-gym equipment may not be the most appropriate means for achieving optimal muscle stimulus. Also the manner in which such apparatus is used may itself be preventing the majority of individuals from achieving the results desired from their strength training.

The nature of most individual's weight-related training comprises a twice/thrice weekly gym visit where a level of weight considered comfortable with will be chosen and a predetermined number of repetitions and sets of exercises will be performed. For example, it is common to perform three sets of ten repetitions with a weight which, to the individual, feels suitably heavy. On the next visit to the gym, a fairly similar workout regime will be undertaken.

However, it is generally recognised that, for muscle growth, there has to be a progressive overload of the muscles being exercised at each weight

training session. It is recognised that a sufficiently powerful stimulus is required by the brain to produce an adaptive response in the musculature, and such stimulus generally results from making the muscles work harder than they are accustomed to at each and every training session.

The natural course of recovery, repair and growth required by the body of the average individual regularly attending a gym does not arise because the subsequent training session generally occurs too soon after the previous one and before the body has had a chance to complete its adaptive response. It is considered that muscles need in the region of 2-6 weeks, depending of course upon each individual, to fully recover, repair and grow. Thus, if a heavy weighted workout is performed and, within that minimum period, i.e. one week later, the body is stressed again before it is ready and has fully recovered from the previous session, the muscle groups worked are not capable of lifting weights which are greater than those used in the first session and so the above-mentioned progressive overload cannot be achieved. Such general over-training, albeit possibly accidental, is pursued by the vast majority of individuals following strength training regimes, and generally leads to plateaus and stagnation in strength increase and muscle growth, rather than the growth and increase in muscle mass that is sought from following such regimes.

It can therefore be appreciated that the average individual regularly attending a gym is likely to be missing out on potential increases in strength and muscle growth by not pursuing such progressive overload and its resulting adaptive response. By generally repeating the same exercise at each gym visit with more or less the same weight as previously used, the body will not receive sufficient stimulus to produce an adaptive response. What is generally required however is a constantly increasing progressive overload which optimally taxes the muscle each and every workout. The vast majority of individuals performing the above-mentioned sets and repetitions of exercises

tend to be working well under their optimal levels of strength. Since the muscles employed can therefore generally easily perform the required repetitions, they are not then forced to adapt and so the adaptive response mentioned above is not experienced and no, or very limited, muscle growth is then experienced. Thus, the general increase in body strength and muscle size sought by those pursuing a strength-training regime is not readily achieved.

The present invention relates to an isometric exercise device wherein a force is applied by the tensing or extension of one or more muscles against a generally immovable object for a period of a few seconds in order that the individual can exert a maximum possible force against that object.

It should of course be appreciated that isometric exercises are distinguished from isokinetic exercises where muscle force is applied to a movable object so as to move the same through its permitted motion such as with an exercise machine, and also from isotonic exercises, such as that generally employed in weight training, where a constant weight is lifted through a particular range of motion.

Isometric training was first introduced in the 1960's and it is appreciated that such isometric exercise can create massive stimulus to a muscle.

However, while such massive stimulus can be readily applied to a muscle, it is nevertheless important to employ such isometric exercise within a proper exercise regime allowing for the above-mentioned progressive overload and adaptive response in the musculature.

Various forms of isometric exercise apparatus are known and which generally serve to mimic known multi-gym apparatus. However these are

relatively expensive, bulky and unnecessarily complex and are not readily adapted for use within a domestic environment.

Isometric exercise devices are known from US Patent 4023808 and US Patent 4852874 and which both utilise elastic stretch band arrangements as resistance elements. However, such apparatus can prove to be unnecessarily bulky, prone to breakage and malfunction and the range of exercises that can be performed, and the manner in which the devices can be utilised so as to achieve the above-mentioned adaptive response, is disadvantageously limited.

The present invention therefore seeks to provide for an isometric exercise device having advantages over known such devices.

According to the present invention there is provided a hand-held isometric exercise device comprising a handle portion and a deformable portion, the deformable portion being arranged to be deformed responsive to a user-exerted force when the device is gripped by the handle and urged against a surface, the device further including means for determining and indicating a level of force applied by the user to deform the deformable portion.

The device of the present invention, being hand-held and comprising a deformable portion which is to be urged against a, generally stationary surface, advantageously provides for a particularly compact and simple device which can be gripped by the user and used in relation to any appropriate surface, whether horizontal, vertical or otherwise, to allow for a wide variety of exercises to be performed.

Yet further, through the determination and indication of the level of force applied by the user to the device, when deforming the deformable portion against the said surface, it readily becomes possible to identify the correct

exercise regime that a particular individual should pursue, so as to allow for the appropriate rest, recovery and repair period prior to using the device again.

The present invention therefore advantageously allows for the pursuit of an increase in strength and muscle growth, in a simple manner and within a wide variety of environments, such as, for example, a standard domestic environment. The apparatus is compact and readily stored and used and can easily be enhanced with appropriate surface decoration in order to improve the aesthetic qualities thereof.

Preferably, the handle portion is formed integral with the deformable portion and, further, the handle and deformable portions can be formed as a unitary member.

Further, the handle portion itself can, to some extent, be deformable. Also, and particularly if the handle exhibits some rigidity, the handle can be arranged to be urged by the user onto the deformable portion to at least partly assist in the deformation thereof.

Further, the handle can advantageously be generally elongate and arranged to be gripped in a clenched manner by the hand of the user.

The handle can then advantageously allow for the knuckle portion of a user's clenched fist to engage with a surface of the deformable portion so as to assist with the deformation thereof when urged against the said surface.

Preferably, the handle portion is spaced from the deformable portion so as to define an opening by means of which the user can fully grip the handle.

In another embodiment, the deformable portion can be deformed so as

to allow for the user's hand to be placed between the handle and the said deformable portion.

Advantageously, the deformable portion is formed of a resilient material.

Further, the deformable portion advantageously comprises at least one cavity and the said at least one cavity is advantageously at least part-filled with a fluid such as a liquid and/or with air or an appropriate gas.

Advantageously, at least a portion of the outer surface of the deformable portion is adapted to assist with stable engagement of the device with the surface against which the device is urged.

In this manner, the surface of the deformable portion can advantageously include a substantially flat portion located at a region of the deformable portion opposite that at which the said handle portion is located.

Preferably, the deformable portion can have a generally elongate form and be substantially cylindrical in shape.

The said means for determining the level of force applied to deform the deformable portion can advantageously comprise pressure sensing means arranged to determine an increase in pressure arising within the deformable portion during use of the device.

Advantageously, the said means for determining the level of force comprises means for determining an increase in pressure of a fluid within the deformable portion.

The means for indicating the level of force applied by the user

advantageously comprises a visual display means and which can advantageously comprise an alphanumeric display.

Such display means can comprise an electronic display means, powered, for example, by way of a battery or by one or more solar power cells, and can, for example, comprise an LCD display. Advantageously, the display is arranged to store the maximum reading produced so that at the end of each isometric exercise session, the maximum level of force applied can be readily determined by the user.

The means for indicating the level of force applied is advantageously located on the outer surface of the deformable portion although it could, as required, be located on an outer surface of the handle portion.

Yet further, the means for indicating the level of force applied can advantageously comprise means for providing an audible output, and, in particular, means for providing an audible output when a threshold level of force is exceeded.

It will therefore be appreciated that a wide variety of forms of isometric exercise device can be provided within the concept of the present invention but which will share the primary advantages of a simple, hand-held device allowing for a ready determination of the maximum force applied during each isometric workout session, which indication can then be employed so as to ensure that the user can readily identify the appropriate rest/recovery/repair period before returning to use of the apparatus.

Thus, through use of the apparatus, the user can readily determine and control the appropriate frequency of use of the apparatus and thereby pursue an optimum personal exercise regime with regard to muscle growth.

The invention is described further hereinafter, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 is a side view of an isometric exercise device embodying the present invention;

Fig. 2 is a plan view of the device of Fig. 1;

Fig. 3 is an end view of the device of Fig. 1;

Fig. 4 is a side view of the device of Fig. 1 when in use;

Fig. 5 is a side view of an isometric exercise device according to a second embodiment of the present invention; and

Fig. 6 is a plan view of the device of Fig. 5.

Turning first to Fig. 1 there is illustrated one embodiment of an isometric exercise device 10 according to the present invention. Although only a single device is illustrated, it will be appreciated that they are generally arranged to be provided, and used, in pairs.

The hand held isometric exercise device 10 comprises a handle 12 and a deformable main body portion 14 which are formed together such that the device 10 is of a unitary nature.

Mounted on the side of the main body portion 14 is an LCD alphanumeric display 16 which is operatively connected to a pressure sensor device (not shown) operatively located within a cavity (not shown) in the main body portion 14.

The handle 12 and main body portion 14 are formed from the same resilient material. In some embodiments, the hollow cavity can also extend to within the handle 12.

In the illustrated embodiment, and as discussed further below, the cavity within the main body portion 14 is at least part filled with air and the aforementioned pressure sensor device is located and employed to determine the air pressure within the cavity.

Fig. 2 shows a plan view of the device 10 of Fig. 1, and Fig. 3 comprises an end view of the same device 10, from which it can be appreciated that the main deformable body portion 14 of the device is generally elongate and generally cylindrical in nature and that the handle 12 is likewise generally elongate and cylindrical in nature and shares the same longitudinal axis as the main body portion 14.

Turning now to Fig. 4, there is provided a side view of the isometric exercise device 10 similar to that in Fig. 1, but shown when in use as part of an isometric exercise regime and gripped by a hand 18 of a user and forced in the direction of arrow A against a stationary surface S.

As will be appreciated, the handle 12 of the device 10 is arranged such that it can be readily gripped within the clenched fist of a user such that the device is arranged to be gripped in a manner similar to common exercise equipment such as a dumb-bell. Once so gripped, the user then exerts a downward force on the device in the direction of arrow A and urges the device against the stationary surface S through application of the maximum possible force that the user can exert. Such force serves to deform the deformable main body portion 14 which in turn serves to produce an increase in pressure within the cavity of the main body portion 14. This increase is determined by the pressure sensor (not shown) and, in turn, drives an appropriate output from the alphanumeric display 16 which provides a readily visible indication of the maximum force exerted by the user through determination of the maximum

pressure arising within the main body portion 14.

The exact manner in which the pressure increase within the main body portion 14 occurs depends upon the particular construction and configuration of the device.

For example, should the handle 14 be formed from the exact same material as the main body portion, and generally comprise an extension thereof and, possibly, with an extension of the cavity portion therein, then the primary force exerted by the user will be by way of their knuckles as they bear against the upper portion of the deformable main body portion 14 as illustrated in Fig. 4.

However, as an alternative or in addition, some degree of rigidity can be afforded the handle 12 such that movement of the handle 12 onto the lateral regions of the main body portion 14 likewise serves, at least in part, to deform the body portion and so lead to an increase in pressure within the cavity thereof.

It should also be appreciated that the manner of use indicated in Fig. 4 is provided merely for illustrative purposes since, in practice, it is unlikely that the device would be used in a manner such that the user exerts a downward force against a stationery surface.

More likely, the device would be used such that the user provides a upward force for example upwards against the underside of a doorframe, or the underside of a table/desk, so as to mimic the exertion of force when using dumb-bells or a barbell.

It will of course be appreciated that, a wide variety of forms of the

handheld device of the present invention can be provided without departing from the inventive concept and this is illustrated further with reference to Figs 5 and 6.

Here, it will be seen that the isometric device 20 includes a strap handle 22 attached as appropriate to a generally ovoid hollow body portion 24 having a alphanumeric display member 26 mounted on the side thereof and which is arranged, through operative connection to a pressure sensor (not shown) within the body portion 24, to provide an indication responsive to an increase in pressure within the body portion.

Fig. 6 provides a plan view of the embodiment of Fig. 5 so as to further illustrate the configuration of the strap handle 22 which, in this embodiment, comprises a strap member.

Unlike the embodiment of Figs. 1-3, the handle and body portion 24 of the embodiments of Figs. 5 and 6 do not readily combine to define an opening through which the handheld device can be readily gripped for use such as that of the first embodiment as illustrated in Fig. 4.

However, through deformation of the upper part of the main hollow body portion 24, a user can attain an appropriate grip of the strap handle 22 in a manner similar to that illustrated with regard to the first embodiment in Fig. 4 such that the isometric apparatus device 20 is then ready for use.

Although not visible in the accompanying drawings, the device of the present invention can be arranged to be used with the handle in tension. As such, the deformable portion 14, 24 is provided with an engagement formation allowing for the device to be anchored as required. In particular, a pair of such devices can be provided, one for use in each hand in compression mode such

as illustrated in Fig. 4, and also when releasably secured by way of cooperating engagement formations so that the deformable portions 14, 24 can then be deformed by placing both of the handle portions 12, 22 in tension by pulling on the same.

Thus, it will be appreciated that by means of such engagement formations a yet further range and variety of isometric exercises can be provided by apparatus embodying the present invention.

Through use of the apparatus embodying the present invention during each isometric workout session, the user can readily determine the maximum force that was applied by the particular muscle and/or muscle group, being worked.

Such determination of the maximum force applied can advantageously be enhanced insofar as the pressure sensor/alphanumeric display device can be arranged to store, and continue to display, the maximum value reached.

Thus, even though the alphanumeric display 16/26 might not be visible during a particular form of exercise, it nevertheless records the maximum force exerted by the user such that when the isometric workout session is finished, the user can then readily read the maximum force applied.

As will be appreciated, the pressure indicator can, alternatively, or in addition, comprise audible output means which can advantageously be arranged to provide an audible output when a predetermined, or previously attained, level of force has been exceeded.

Also, the visual output means can be arranged to produce a visually discernable output when a predetermined, or previously attained, level of force

has been exceeded.

The said predetermined level of force can be pre-selected as required.

In this manner, the user can advantageously use the device in a situation in which there is no need to view a display of the device since he/she need merely listen for the appropriate audible output.

When the user next returns to the apparatus for a repeated isometric workout session, and should the previous maximum force value obtained not be exceeded, this readily serves to indicate that the user has returned to the equipment too soon and the muscles and/or muscle group previously worked has/have not had sufficient time for recovery and repair.

However, should the previously recorded maximum force value be exceeded at the next isometric workout session, the user can readily appreciate that the muscles/muscle groups previously worked have been given sufficient time to recover and repair and, through noting the period of time that was allowed to lapse between the two exercise sessions, the user can then readily determine his/her optimum rest/recovery/repair cycle.

Subsequent isometric workout session can then be repeated in accordance with that cycle so as to achieve optimum increase in strength and optimum muscle growth.

The user can thereby readily monitor his/her ongoing exercise regime so as to continue to exercise, and achieve an increase in strength and muscle growth, in the most efficient manner.

It should of course be appreciated that the invention is not restricted to

the details of the foregoing examples.

For example, the handheld device can be provided in any shape and/or configuration thought appropriate having regard to the manner in which the device is to be gripped and is to engage with a surface against which the isometric workout is to be conducted, and so as to achieve the appropriate range of possible pressure increases within the device.

Claims

1. A hand-held isometric exercise device comprising a handle portion and a deformable portion, the deformable portion being arranged to be deformed responsive to a user-exerted force when the device is gripped by the handle and urged against a surface, the device further including means for determining and indicating a level of force applied by the user to deform the deformable portion.

2. A device as claimed in Claim 1, wherein the handle portion is formed integral with the deformable portion.

3. A device as claimed in Claim 2, wherein the handle and deformable portions are formed as a unitary member.

4. A device as claimed in Claim 1, 2 or 3, wherein the handle portion exhibits sufficient rigidity that it can be urged by the user onto the deformable portion to at least partly assist in the deformation thereof.

5. A device as claimed in any one or more of the preceding claims, wherein the handle portion is elongate and arranged to be gripped in a clenched manner by the hand of the user.

6. A device as claimed in Claim 5, wherein the handle is arranged such that the knuckle portion of a user's clenched fist engages with a surface of the deformable portion so as to assist with the deformation thereof when urged against the said surface.

7. A device as claimed in any one or more of the preceding claims wherein the handle portion is spaced from the deformable portion so as to define an opening by means of which the user can grip the handle portion.

8. A device as claimed in any one or more of Claims 1 to 6, wherein the deformable portion is arranged to be deformed so as to allow for the user's hand to be placed between the handle and the said deformable portion.

9. A device as claimed in any one or more of the preceding claims, wherein the deformable portion is formed of a resilient material.

10. A device as claimed in any one or more of the preceding claims, wherein the deformable portion comprises at least one cavity.

11. A device as claimed in Claim 10, wherein the said at least one cavity is at least part-filled with a fluid.

12. A device as claimed in any one or more of the preceding claims, wherein at least a portion of the outer surface of the deformable portion is adapted to assist with a stable engagement with the surface against which the device is to be urged.

13. A device as claimed in Claim 12, wherein the deformable portion includes a substantially flat portion located at a region of the deformable portion substantially opposite that at which the said handle portion is located.

14. A device as claimed in any one or more of the preceding claims, wherein the deformable portion has a generally elongate form and is substantially cylindrical in shape.

15. A device as claimed in any one or more of the preceding claims, wherein the said means for determining the level of force applied to deform the deformable portion comprises pressure-sensing means arranged to determine an increase in pressure arising within the deformable portion during use of the device.

16. A device as claimed in any one or more of the preceding claims, wherein the means for indicating the level of force applied by the user comprises a visual display means.

17. A device as claimed in Claim 16, wherein the visual display means comprises an alphanumeric display.

18. A device as claimed in any one or more of Claims 16 or 17, wherein the display means is arranged to store the maximum reading produced.

19. A device as claimed in any one or more of Claims 16, 17 or 18, wherein the visual display means is arranged to produce a visually discernable output when a threshold level of force is exceeded.

20. A device as claimed in any one or more of the preceding claims, wherein the means for indicating the level of force applied is located on the outer surface of the deformable portion.

21. A device as claimed in any one or more of the preceding claims, wherein the means for indicating the level of force applied can advantageously comprise means for providing an audible output.

22. A device as claimed in Claim 21, wherein the means for

providing the audible output is arranged to provide the output when a threshold level of force is exceeded.

23. A device as claimed in any one or more of the preceding claims, wherein the deformable portion is provided with an engagement formation for releasably securing the device to a member allowing for the handle portion to be placed in tension by pulling the handle portion away from the said member and so as to deform the said deformable portion.

24. A device as claimed in Claim 23, wherein the said engagement formation comprises a male and/or a female engagement formation.

25. A device as claimed in Claim 23, wherein the said engagement formation comprises a press-fit formation.

26. A device as claimed in Claim 23, wherein the said engagement formation comprises a twist-fit formation.

27. A device as claimed in any one or more of Claims 23 to 26, wherein the said member also comprises a device as claimed in any one or more of Claims 23 to 26.

28. A pair of isometric exercise devices each as claimed in any one or more of the Claims 23 to 26 and arranged to be releasably secured together by way of cooperating engagement formations.

29. An isometric exercise device substantially as hereinbefore described with reference to, and/or as illustrated in, Figs. 1-4 and Figs. 5 and 6 of the accompanying drawings.

AMENDED CLAIMS
Received by the International Bureau on 22 May 2006 (22.05.2006)

1. A hand-held isometric exercise device comprising a handle portion and a deformable portion, the deformable portion being arranged to be deformed responsive to a user-exerted force when the device is gripped by the handle and urged against a surface, wherein the handle portion is elongate and arranged to be gripped in a clenched manner by the hand of the user and exhibiting sufficient rigidity that it can be urged by the user onto the deformable portion to at least partly assist in the deformation thereof the device further including means for determining and indicating a level of force applied by the user to deform the deformable portion.

2. A device as claimed in Claim 1, wherein the handle portion is formed integral with the deformable portion.

3. A device as claimed in Claim 2, wherein the handle and deformable portions are formed as a unitary member.

4. A device as claimed in Claim 1, wherein the handle is arranged such that the knuckle portion of a user's clenched fist engages with a surface of the deformable portion so as to assist with the deformation thereof when urged against the said surface.

5. A device as claimed in any one or more of the preceding claims wherein the handle portion is spaced from the deformable portion so as to define an opening by means of which the user can grip the handle portion.

6. A device as claimed in any one or more of Claims 1 to 4, wherein the deformable portion is arranged to be deformed so as to allow for the user's hand to be placed between the handle and the said deformable portion.

7. A device as claimed in any one or more of the preceding claims, wherein the deformable portion is formed of a resilient material.

8. A device as claimed in any one or more of the preceding claims, wherein the deformable portion comprises at least one cavity.

9. A device as claimed in Claim 8, wherein the said at least one cavity is at least part-filled with a fluid.

10. A device as claimed in any one or more of the preceding claims, wherein at least a portion of the outer surface of the deformable portion is adapted to assist with a stable engagement with the surface against which the device is to be urged.

11. A device as claimed in Claim 10, wherein the deformable portion includes a substantially flat portion located at a region of the deformable portion substantially opposite that at which the said handle portion is located.

12. A device as claimed in any one or more of the preceding claims, wherein the deformable portion has a generally elongate form and is substantially cylindrical in shape.

13. A device as claimed in any one or more of the preceding claims, wherein the said means for determining the level of force applied to deform the deformable portion comprises pressure-sensing means arranged to determine an increase in pressure arising within the deformable portion during use of the device.

14. A device as claimed in any one or more of the preceding claims, wherein the means for indicating the level of force applied by the user comprises a visual display means.

15. A device as claimed in Claim 14, wherein the visual display means comprises an alphanumeric display.

16. A device as claimed in any one or more of Claims 14 or 15, wherein the display means is arranged to store the maximum reading produced.

17. A device as claimed in any one or more of Claims 14, 15 or 16, wherein the visual display means is arranged to produce a visually discernable output when a threshold level of force is exceeded.

18. A device as claimed in any one or more of the preceding claims, wherein the means for indicating the level of force applied is located on the outer surface of the deformable portion.

19. A device as claimed in any one or more of the preceding claims, wherein the means for indicating the level of force applied can advantageously comprise means for providing an audible output.

20. A device as claimed in Claim 19, wherein the means for providing the audible output is arranged to provide the output when a threshold level of force is exceeded.

21. A device as claimed in any one or more of the preceding claims, wherein the deformable portion is provided with an engagement formation for releasably securing the device to a member allowing for the handle portion to

be placed in tension by pulling the handle portion away from the said member and so as to deform the said deformable portion.

22. A device as claimed in Claim 21, wherein the said engagement formation comprises a male and/or a female engagement formation.

23. A device as claimed in Claim 21, wherein the said engagement formation comprises a press-fit formation.

24. A device as claimed in Claim 21, wherein the said engagement formation comprises a twist-fit formation.

25. A device as claimed in any one or more of Claims 21 to 24, wherein the said member also comprises a device as claimed in any one or more of Claims 23 to 26.

26. A pair of isometric exercise devices each as claimed in any one or more of the Claims 21 to 24 and arranged to be releasably secured together by way of cooperating engagement formations.

27. An isometric exercise device substantially as hereinbefore described with reference to, and/or as illustrated in, Figs. 1-4 and Figs. 5 and 6 of the accompanying drawings.

Fig.1.

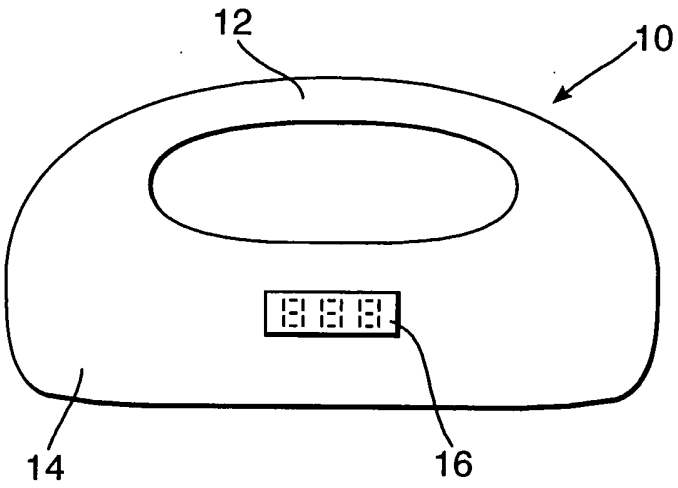


Fig.2.

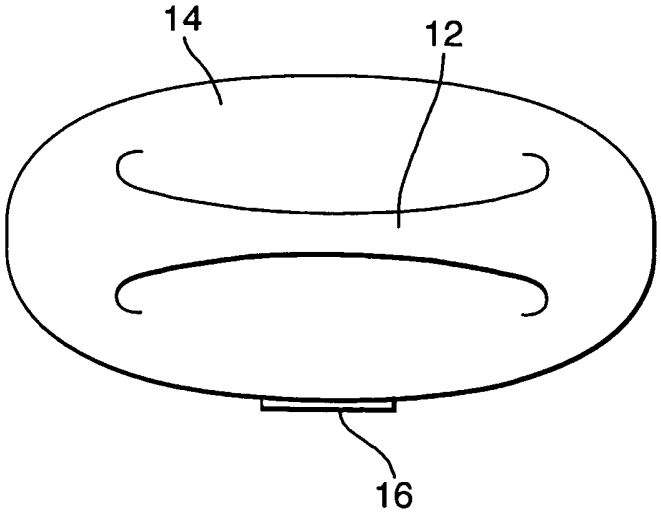


Fig.3.

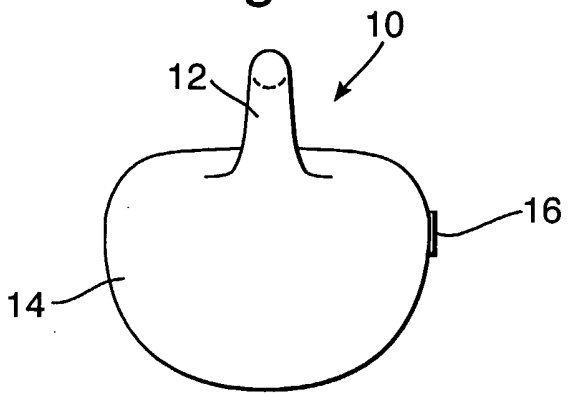


Fig.4.

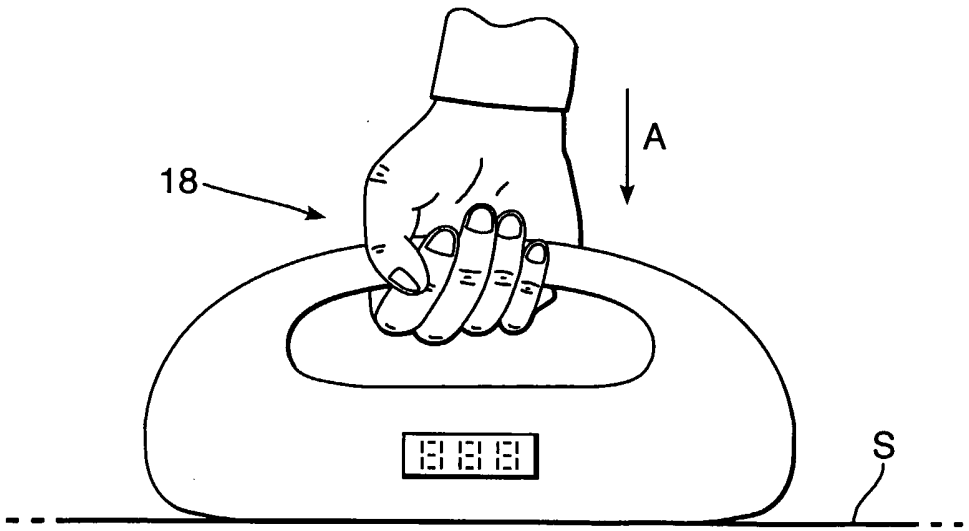


Fig.5.

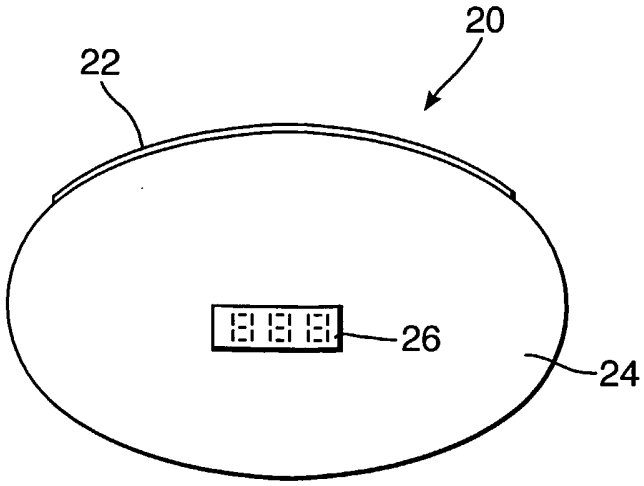
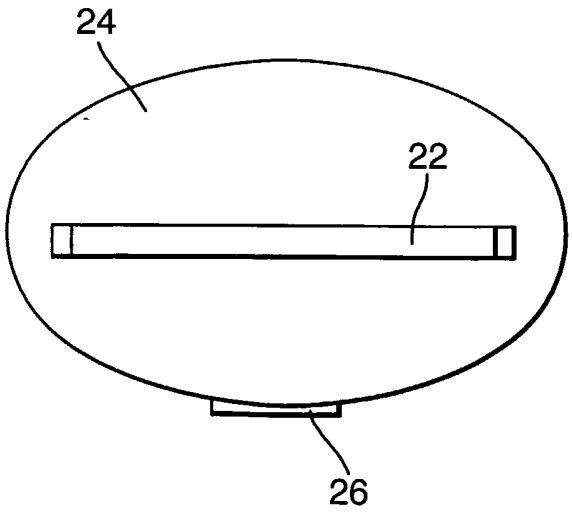


Fig.6.



INTERNATIONAL SEARCH REPORT

tional application No
GB2005/004927

A. CLASSIFICATION OF SUBJECT MATTER
A63B21/002 A63B43/02

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)
A63B

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 5 735 776 A (SWEZEY ET AL) 7 April 1998 (1998-04-07) column 2, line 60 - column 4, line 16; figures 1,2	1-22 23-28
X	US 5 005 826 A (MERRICK ET AL) 9 April 1991 (1991-04-09) column 3, line 21 - column 4, line 14; figures 1,3	1-22
X	US 4 108 428 A (WINTERBOTTOM ET AL) 22 August 1978 (1978-08-22) column 1, line 49 - column 3, line 20; figures 1-9	1-27

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"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

"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.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 March 2006	21/03/2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Oelschläger, H

INTERNATIONAL SEARCH REPORT

International application No
GB2005/004927

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CA 2 245 471 A1 (FOSTER, CHRISTOPHER) 25 February 2000 (2000-02-25)	23-28
A	page 2, line 23 - page 4, line 24; figures 1-3	1-14
A	DE 197 33 634 A1 (KIPERNIK, EFIM, DR.-ING., 58093 HAGEN, DE) 25 February 1999 (1999-02-25) column 2, line 23 - line 54; figures 1-5	1-14, 23-28
A	DE 296 04 602 U1 (AIGNER, MANFRED, DR.MED., 85080 GAIMERSHEIM, DE) 5 June 1996 (1996-06-05) page 2 - page 5; figures 1-3	1-14, 23-28

INTERNATIONAL SEARCH REPORT

national application No.
PCT/GB2005/004927

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 29
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 29

Rule 6.2(a) PCT References to Other Parts of the International Application:
Claims shall not, except where absolutely necessary, rely, in respect of the technical features of the invention, on references to the description or
drawings. In particular, they shall not rely on such references as: ?as described
in part ... of the description,? or ?as illustrated in figure ... of the drawings.?

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
/GB2005/004927

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5735776 A	07-04-1998	WO 9951309 A1	14-10-1999
US 5005826 A	09-04-1991	NONE	
US 4108428 A	22-08-1978	NONE	
CA 2245471 A1	25-02-2000	NONE	
DE 19733634 A1	25-02-1999	NONE	
DE 29604602 U1	05-06-1996	NONE	