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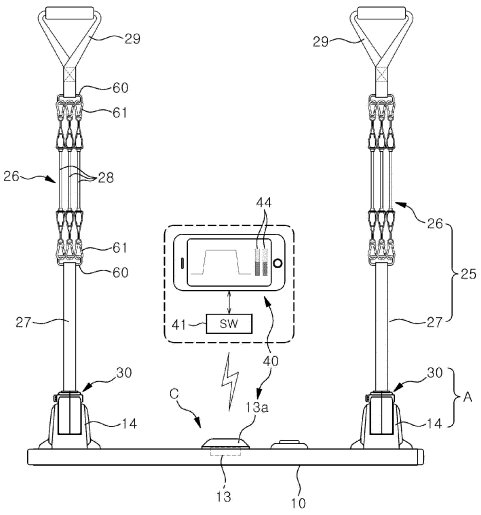
(54) **SMART EXERCISE DEVICE CAPABLE OF MEASURING MUSCLE STRENGTH IN REAL TIME**

(57) The invention is a smart exercise device capable of measuring and displaying the muscle strength of a user in real time for the user to systematically perform prog ressive overload exercise with a load that suits the user, and managing data, having a simple structure and various exercise being performed with a constant load, and com prising: a support means (10) which is stepped on by the foot or which is connected to a structure; a strap (25) that can be pulled by a user; a first sensor (12) connecte d between the support means (10) and the strap (25) to sense the muscle strength pul ling the strap (25); and an electronic circuit (13) connected to the first sensor (12) to process sensed muscle strength data so that the data can be displayed on the outside through a display window (13a) or a display means (40).

FIG. 1



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Description

Technical Field

[0001] The present invention relates to a smart exercise device capable of measuring muscle strength in real time, and more particularly to a smart exercise device perform ing various exercises previously having been possible only in fitness center, capable o f measuring and displaying the muscle strength of a user to enable the user to syste matically perform progressive overload exercise with a load that suits the user with in terest, and capable of systematically managing exercise by recommending proper exerc ise about the relatively weak or exercise-required muscles based on the exercise data, and capable of recommending the optimal elastic band for the user even though the user performs different exercises with different muscle strength so that the user can e xercise in optimal environment.

Background Art

[0002] Generally, muscle strength exercises are performed with load-imposing devices such as a weight training device or an elastic bands, but the load-imposing exercise devices simply repeat muscle training against the imposed loads, and are not provided with a function of real-time measuring for the muscle strength of the user, therefore it is not possible to perform muscle training suitable for the user's current muscle st rength and systematically manage the exercise data, e.g. how much a muscle strength is increased according to muscle parts or the date of exercise.

[0003] Muscle is strengthened by a progressive overload exercise, in which the load i s increased progressively. But the load of conventional weight training device is deter mined by weight block inserted additionally, and the load of weight blocks are genera lly 2.5kg, 5kg, 10kg respectively. Therefore, a finely progressive increase of load by small increment such as 20kg, 20.1kg, 20.3kg, 20.5kg is not possible, and e.g. 20kg 1 oad should be leaped to 22.5kg load. And conventionally, dedicated devices are requir ed for each exercise item, which demands high cost and wide installing space.

[0004] Meanwhile, relatively low-cost elastic rubber bands also used in home training, in which the elastic band may be gripped shortly to sit down and get up, or may b e gripped lengthways to lift arms above the shoulder. But as the conventional elastic bands are made of rubber in total length, if the length of elastic band is varied, the r equired pulling force is also varied. That is, if the elastic band is gripped shortly, mo re pulling force is required to expand the same length, while, if the elastic band is g ripped lengthways, less pulling force is required. Accordingly, the exercise loads are v aried according to the exercising posture of user so that proper exercise cannot be ac hieved.

[0005] And generally various elastic bands with different elasticity are provided in th e exercise device, e.g. with different colors, and usually the elastic band is used toget her with other elastic band according to the user's muscle strength. But required mus cle strengths required for various, e.g. 30 or more exercise items are different to each other, so it is not easy for the user to combine proper elastic bands for the intended exercises

Disclosure

Technical Problem

[0006] The invention is proposed to solve the above-mentioned problems, and the obj ect of the invention is to provide a smart exercise device performing various exercise s previously having been possible only in fitness center, capable of measuring and dis playing the muscle strength of a user to enable the user to systematically perform pro gressive overload exercise with a load that suits the user with interest, and capable of systematically managing exercise by recommending proper exercise about the relativel y weak or exercise-necessary muscles based on the exercise data, and capable of reco mmending the optimal elastic band for the user even though the user performs differe nt exercises with different muscle strength so that the user can exercise in optimal en vironment.

Technical Solution

[0007] According to an aspect of the invention, there is provided a smart exercise de vice capable of measuring muscle strength in real time, comprising:

a support means 10 which is stepped on by the foot or connected to other str ucture;
a strap 25 that can be pulled by a user;
a first sensor 12 connected between the support means 10 and the strap 25 to sense the muscle strength pulling the strap 25; and
an electronic circuit 13 connected to the first sensor 12 and processing sensed muscle strength data so that the data can be displayed on a display means 40 includ ing a display window 13a, a smart phone, a computer and TV; wherein
if a user performs the muscle strength exercise by pulling the strap 25, the p ulling force of the strap 25 is sensed by the first sensor 12 to be displayed quantitati vely through the display means 40, so that the user can systematically perform progre ssive overload exercises with the exercise load proper to the user.

[0008] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the strap 25 i ncludes a elastic portion 26 positioned on one side of it and being elastically expanda ble in proportion

to the pulling force by user's arm or foot; and a length adjusting p ortion 27 positioned on the other side of it and not being expandable or being relativ ely less expandable than the elastic portion 26 by pulling and the length of it being adjustable according to the user's height or change of posture, so that the elastic port ion 26 should keep constant length and elasticity even though the length adjusting por tion 27 is adjusted depending on the user's height or posture change to achieve a mu scle strength exercise with constant exercise load.

[0009] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the elastic po rtion 26 includes a plurality of elastic bands 28 having different elasticity, and one or more of the elastic bands 28 are detachably attached to the length adjusting portion 27; and the display means 40 includes a band recommending portion 42 calculating p roper elasticity of the elastic band 28 based on the user's muscle strength data measu red by the first sensor 12 and displaying it.

[0010] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the smart exe rcise device further includes a rotating bracket 14 vertically extending from the suppo rt means 10, and a rotating support 15 engaged on a first axis 16 horizontally mount ed on the rotating bracket 14 and being rotatable upward and downward; and a first sensor 12 provided on the rotating support 15, so that the first sensor 12 should sens e the pulling force of the strap 25 while the rotating support 15 and the first sensor 12 being rotated upward and downward according to the pulling direction of the strap 25.

[0011] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the smart exe rcise device further includes a second axis 18 vertically mounted on the support mean s 10, and a turntable 18 engaged on the second axis 18 and rotatable horizontally, so that the first sensor 12 should sense the pulling force with being freely rotated horiz ontally and vertically depending on the pulling direction of the strip 25.

[0012] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the support m eans 10 and the turntable 18 have ball plungers 18a and recesses 18b respectively, so that angle of the turntable 18 should be regularly adjusted by engaging the ball plun gers 18a with the recesses 18b.

[0013] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the first axis 16 and the second axis 17 each have tubular axis holes 19, 20, and a signal line 21 of the first sensor 12 extends through the axis holes 19, 20, so that the signal line 2 1 should not be cut or twisted even though the first sensor 12 is rotated horizontally and vertically.

[0014] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the smart exe rcise device further includes a length adjusting means 30 at one end of the strap 25, the length adjusting means 30 including a cover 31, a spool 32 being rotatable in the cover 21 and wound by the strap 25, a elastic member 32a connected to the spool 32 so that the strap 25 is elastically wound around the spool 32, a plurality of stop r ecess 34 formed in constant interval on the periphery of the flange 33 provided on th e spool 31, and an operating key 35 provided on one side of the cover 31 and being moved linearly or rotated and having a fixing projection 36 being engaged with the stop recess 34 to stop the spool 32 and being released from the stop recess 34 for th e spool 32 to be rotated so that the length of strap 25 is adjusted.

[0015] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the smart exe rcise device further includes a key operating means 39 connected to the operating key 35 to engage the fixing projection 36 with the stop recess 34 or release the fixing p rojection 36 from the stop recess 34, and a key switch 39a to switch on/off the key operating means 39.

[0016] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the smart exe rcise device further includes an exercise result display 43 shown through the display means 40 and displaying the increase/decrease of muscle strength for each body part after exercise, and an exercise item recommending portion 45 shown through the displ ay means 40 and recommending exercise items for a relatively non-exercised part, a 1 ow increased part of muscle strength or other predetermined important part of muscle based on the exercise result data.

[0017] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the first sens or 12 and the strap 25 are installed on both sides of the support means 10, and the display means 40 further includes a balance checking portion 44 to compare the left muscle strength and the right muscle strength and check the strength balance.

[0018] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the smart exe rcise device further includes a handle 29 at the upper end of the strap 20, and the h andle 29 having a plurality of grips 29a spaced apart wider than the thickness of the human hand so that the distance between the support means 10 and the grip 29a ca n be easily adjusted only by changing the grip 29a.

[0019] According to the other aspect of the invention, there is provided a smart exer cise device capable of

measuring muscle strength in real time, wherein; the smart exe rcise device further includes a click switch 13c installed on the support means 10 to remotely click selection buttons 41b on the display means 40, and a communication p rotocol input in the electronic circuit 13 to transmit the signal of the click switch 13c to the display means 40, so that the user can remotely click on the selection buttons 41a on the display means 40 by touching the click switch 13c on the support means 10 during exercise.

[0020] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the smart exe rcise device further includes a remote click function block 41a in the application 41 of the display means 40 to remotely click the selection buttons 41b on the display w hen the signal that the strap 25 be pulled with higher strength or quicker speed than the predetermined value is received from the electronic circuit 13.

[0021] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the smart exe rcise device further includes a plurality of item selection switches 13d on the support means 10, a communication protocol input in the electronic circuit 13 to transmit th e signal of the exercise item selection switch 13d to the display means 40, an item matching portion 47 shown on the display means 40 to match the item selection swit ches 13d with proper exercise items, a memory 48 in the display means 40 to save t he data of muscle strength measured by the first sensor 12, and an exercise result dis play 49 shown on the display means 40 and displaying the data of the user's muscle strength saved in the memory 48, so that as the user touches the item selection swit ch 13d and performs exercise, then the data of muscle strength measured by the first sensor 12 is saved and managed.

[0022] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the smart exe rcise device further includes a push plate 22 on the upper of the support means 10, a second sensor 23 provided between the push plate 22 and the support means 10 to measure the pushing force on the push plate 22, an electronic circuit 13 to process t he data about the pulling or pushing force of the first sensor 12 and the second sens or 23 to display through a display means 40 including a display window 13a, a smar t phone, a computer or a TV.

[0023] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the smart exe rcise device includes;

a support means 10 which is stepped on by the foot or connected to a struct ure;
a rotating bracket 14 vertically extending from the support means 10;
a rotating support 15 engaged on a first axis 16 horizontally mounted on the rotating bracket 14 and being rotatable upward and downward;
a first sensor 12 provided on the rotating support 15 and connected to a strap 25 pulled by user to sense the pulling force of the strap 25, and
an electronic circuit 12 connected to the first sensor 12 to process the muscle strength data to display through a display means 40 including a display window 13a, a smart phone, a computer and a TV, so that the first sensor 12 should sense the p ulling force of the strap 25 while the rotating support 15 and the first sensor 12 bein g rotated upward and downward according to the pulling direction of the strap 25.

[0024] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the smart exe rcise device further includes a second axis 18 vertically mounted on the support mean s 10, and a turntable 18 engaged on the second axis 18 and rotatable horizontally, so that the first sensor 12 should sense the pulling force while being freely rotated hori zontally and vertically depending on the pulling direction of the strip 25.

[0025] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the first axis 16 and the second axis 17 each have tubular axis holes 19, 20, and a signal line 21 of the first sensor 12 extends through the axis holes 19, 20, so that the signal line 2 1 should not be cut or twisted even though the first sensor 12 is rotated horizontally and vertically.

[0026] According to an aspect of the invention, there is provided a smart exercise de vice capable of measuring muscle strength in real time, comprising:

a support means 10 which is stepped on by the foot or connected to a struct ure;
a strap 25 that can be pulled by a user;
a first sensor 12 connected between the support means 10 and the strap 25 to sense the muscle strength pulling the strap 25;
an electronic circuit 13 connected to the first sensor 12 and processing sensed muscle strength data so that the date can be displayed on a display means 40 includ ing a display window 13a, a smart phone, a computer and a TV;
a cover 31 of a length adjusting means 30 at one end of the strap 25;
a spool 32 being rotatable in the cover 21 and wound by the strap 25;
an elastic member 32a connected to the spool 32 so that the strap 25 is elasti cally wound on the spool 32;
stop recesses 34 regularly formed the flange 33 provided on the spool 31; an d
an operating key 35 provided on one side of the cover 31 and being moved l inearly or rotated and having

a fixing projection 36 being engaged with the stop rece ss 34 to stop the spool 32 and being released from the stop recess 34 for the spool 32 to be rotated so that the length of strap 25 is adjusted.

[0027] According to the other aspect of the invention, there is provided a smart exer cise device capable of measuring muscle strength in real time, wherein; the smart exe rcise device further includes a key operating means 39 connected to the operating key 35 to engage the fixing projection 36 with the stop recess 34 or release the fixing p rojection 36 from the stop recess 34, and a key switch 39a to switch on/off the key operating means 39.

Advantageous Effect

[0028] According to the first embodiment of the invention, as shown in FIG. 1, as t he user performs muscle strength exercises by pulling the strap 25, the user's muscle strength measured by the sensor will be displayed on the display means 40 such as a window 13 or smart phone, computer or a TV in real time, so the user can view and check his/her muscle strength and can exercise with progressive overload. For exa mple, if today's muscle strength is 20kg, then tomorrow's is 20.1kg, the day after to morrow's is 20.3kg. And systemic exercise data such as muscle increasing trend for muscle parts can be managed, and exercise recommendation for the relatively weak m uscle parts or exercise-necessary muscle parts is possible, which makes the beginner a ccess muscle exercise the easily.

[0029] And, as shown in FIG. 3 to 5, the invention includes a turntable 18 horizonta lly around the second axis 17 on the support means 10, a rotating bracket 14 extendi ng upward, a rotating support 15 on the upper end of the rotating bracket 14 rotating around the horizontal first axis 16 upward and downward, and the first sensor 12 in stalled on the rotating support 15. Therefore, the first sensor 12 can be rotated vertica lly and horizontally around the first axis 16 and the second axis 17, so the first sens or 12 can be orientated perpendicular to the pulling force of any direction to achieve precise measuring of muscle strength. That is, according to the exercise item or post ure of user, the strap 25 can be pulled in various directions such as being pulled up ward, being spread right and left, or being pulled slanted, and in any case, the muscl e strength can be precisely measured.

[0030] And, as shown in FIG. 3, the support means 10 includes ball plungers 18a in which balls is elastically retained, and the turntable 18 has a plurality of recesses 18 b with constant interval, so the user can fix the direction of the sensor body A and perform exercise in that direction.

[0031] And, the first axis 16 and the second axis 17 each have tubular axis holes 19, 20, and a signal line 21 of the first sensor 12 extends through the axis holes 19, 20, so that the signal line 21 may not be cut or twisted even though the first sensor 12 is rotated in any direction.

[0032] And, according to the first embodiment of the invention, a pair of sensor bodi es A comprising of the length adjusting means 30, the first sensor 12, turntable 18, a nd the rotating support 15 are disposed on both end of the support means 10 as sho wn in FIG. 1, so that the user can exercise by both handles 29 or with a barbell bar inserted in it. Then the display means 40 includes a balance checking portion 44 co mparing the balance between the right and left muscle strength, so the user can comp are the left and right muscles strength in real time and exercise with keeping balance.

[0033] And, as shown in FIG. 2a to 2c, even though the length of the strap 25 is a djusted according to user's posture, the elastic portion 26 will keep constant length an d elasticity, so the user can perform exercise with constant exercise load, which will not incur q problem such that the elasticity of strap 25 can be easily changed when t he length of strap 25 is adjusted according to the use's posture which will result in unbalance of the exercise loads.

[0034] And, as shown in FIG. 6, the elastic portion 26 of the strap 25 has a pluralit y of elastic bands 28 with different elasticity, and one or more elastic bands 28 can be detachably attached the length adjusting portion 27. Meanwhile, the user uses diffe rent muscle according to the exercise item, that is, big muscle such as a pectoral mu scle requires an elastic band 28 of big elasticity, and small muscle such as a deltoid requires an elastic band 28 of small elasticity. But it is not easy for the beginner to select a proper elastic band 28 for intended exercise. But, the invention can recomme nd the optimal elastic band 28 (nearest elasticity) through the band recommending por tion 42 on the display means 40 by calculating based on the muscle strength data me asured by the first sensor 12.Therefore, the user may simply connect the recommende d elastic band 28 to the strap 25. For example, suppose that the elastic bands of 1kg, 3kg, 5kg, 10kg, and 20kg correspond to yellow, red, blue, violet, and black respecti vely, and suppose that the user's measured value for his muscle strength of deltoid is 8.3kg. Then the nearest elastic band 28, that is, blue plus red are recommended to b e connected to the strap 25.

[0035] And, the invention includes an exercise result display 43 on the display means 40 displaying the increase/decrease of muscle strength for each body part after exerci se, so the user can easily view which part of muscle and how much strength is incr eased, and the invention further includes an exercise item recommending portion 45 i n the display means 40 recommending exercise items for a relatively non-exercised pa rt, a low increased part of muscle strength or a predetermined important part based o n the exercise result data, an amateur user also can perform systematic exercises.

[0036] And according to the invention, the progressive overload exercise is easily ach ieved by increasing the pulling length of the strap 25 progressively than yesterday be cause the same length of strap 25 corresponds

to the same exercise load.

[0037] And the invention includes a handle 29 at the upper end of the strap 20, and the handle 29 having a plurality of grips 29a spaced apart wider than the thickness of the human hand so that the distance between the support means 10 and the grip 2 9a can be easily adjusted only by changing the grip 29a instead of adjusting the leng th adjusting means 30.

[0038] And, as shown in FIG. 7, the invention includes a click switch 13c on the su pport means 10 connected to the electronic circuit 13 to transmit the signal of the cli ck switch 13c to the display means 40 through communication protocol, so the user c an remotely click on the selection buttons 41a on the display means 40 by touching t he click switch 13c during exercise. The selection button 41b can be predetermined a mong the plural buttons.

[0039] And, the invention includes a remote click function block 41a in the applicati on 41 of the display means 40 to automatically and remotely click the selection butto ns 41b on the display when the signal that the strap 25 is pulled with higher strengt h or quicker speed than the predetermined values is received from the electronic circu it 13. Therefore, the user can operate the selection button 41a on the display means 40 by pulling the strap 25 with higher strength or quicker speed than the predetermin ed values without accessing to the remote display means 40

[0040] And the invention includes a plurality of item selection switches 13d on the s upport means 10, and an item matching portion 47 shown on the display means 40 t o match the item selection switches 13d with proper exercise items. Therefore, if the user pushes the item selection switch 13d and performs exercise, the muscle strength data measured by the first sensor 12 can be automatically saved and managed without viewing the display means 40. The item selection switch 13d and the click switch 1 3c can be the same switch or separated switch. If the item selection switch 13d and the click switch 13c is the same, then another mode switch or confirm switch 13b m ay be provided to discriminate the item selection switch 13d from the click switch 13 c.

[0041] And, a strap unwinding sensor sensing the unwinding length of the strap 25 f rom the spool 32 may be installed in both the sensor body A, and the unwinding len gth of strap25 should be displayed on the display means 40, then the user can easily adjust the length of both strap 25, so right/left balancing in exercise is easily achiev ed.

[0042] And, as in FIG. 8 and 9, a bench 50 may be placed above the support mean s 10. The legs 52 of the bench 50 on both sides are supported on the support means 10, so that the support means 10 can be firmly fixed by being pushed down by the user's weight and the bench weight.

[0043] According to the second embodiment of the invention of FIG. 10 and 11, onl y one sensor body A comprising of length adjusting means 30, the first sensor 12 an d the rotating support 15 is provided, and the two elastic bands 28 are connected at the end of the length adjusting portion 28, so that the user can grip the both ends of the elastic band 28 or inserts the barbell at both end of the elastic band 28. If the user exercises by only one hand, then only one elastic band 28 may be connected to the end of the length adjusting portion 28. In this case, a thread shaft 17b or a nut 17c may be provided under the sensor body A, so that it can be easily and firmly attached to a separate foot plate or a door frame.

[0044] According to the third embodiment of the invention of FIG. 12, the invention further includes pushing plate 22 on the support means 10, which the user can perfo rm aerobic exercise on, so both the anaerobic muscle strength exercise data and the a erobic exercise data can be measured by only one device to achieve mutually supple mentary synergy effect. That is, both the muscle strength exercise and the aerobic exe rcise can be measured by one main body and one electronic circuit 13 so that the co st can be reduced, and both the muscle strength exercise and the aerobic exercise can be performed with relatively narrow space to achieve enhanced exercise effect combi ned with anaerobic exercise and aerobic exercise.

Description of the Drawings

[0045]

FIG. 1 is a front view of the first preferred embodiment of the invention
FIG. 2 is a used state side view of the first embodiment of the invention
FIG. 3 is a front section view of A portion in FIG. 1
FIG. 4 is a section view of sensor body of linear moving type operating key
FIG. 5 is a section view of sensor body of rotary type operating key
FIG. 6 is a view showing display type of the invention
FIG. 7 is a plan view of the support means and display means of the inventi on
FIG. 8 is a side view of used state of the invention together with a bench
FIG. 9 is a perspective of the display means separated from the bench
FIG. 10 is a partial side and front view of the second embodiment of the inv ention
FIG. 11 is a view of used state of the second embodiment
FIG. 12 is a view of the third embodiment of the invention

Detailed Description of the Invention

[0046] Hereinafter, the preferred embodiments of the invention will be described with reference to the drawings. FIGS. 1 to 12 show the various embodiments of the inve ntion. As shown in FIG. 1, the first embodiment of

the invention includes a support means 10, two sensor bodies A positioned on both end of the support means 10 and connected to the strap 25, and a control box C on the center of the support means 10. The strap 20 is a means to transfer the use's force to the first sensor 12 in Fig. 3 and includes a elastic portion 26 on one side of the strap 25 and elastically expand able by pulling of the user while moving user's arms or legs, and a length adjusting portion 27 connected on the elastic portion 26 and the length of it being adjusted acc ording to the use's posture and height. The length adjusting portion 27 is not expand able or is relatively less expandable than the elastic portion 26 by pulling and the len gth of it should be freely adjusted for matching the user's height or change of postur e.

[0047] Meanwhile, the length of the elastic portion 26 is constant as long as pulling force is not applied on the elastic portion 26, and as shown in FIG. 1, comprising of a plurality of elastic bands 28 having different diameter or thickness. For example, a yellow band is proper for 1kg pulling force, a red band for 3kg, a blue band for 5k g, a violet band for 10kg, and a black band for 20kg respectively. Therefore, if a us er of 8.3kg muscle strength is to exercise, a red band of 3kg and a blue band of 5k g should be connected to the strap 25.

[0048] As shown in FIG. 1, rings 60 and snap buttons 61 detachably hung on the ri ng 60 are mounted on the connecting part between the elastic portion 26 and the len gth adjusting portion 27 or on the handle 29. The handle 29 is attached on the upper end of the strap 25, and has plurality of grip 29a spaced apart wider than the thick ness of the human hand, therefore, the user can easily adjust the distance between the support means 10 and the grip 29a without adjusting the length of the strap 25.

[0049] The support means 10 is in the shape of foot plate which is stepped on as s hown in FIG. 1, and includes length adjusting means 30 on both side of it, and a se nsor body A comprising of a first sensor 12 and a rotating support 14 as shown in FI G. 3. A control box C containing an electronic circuit 13 connected to the first se nsor 12 is disposed on the center of the support means 10.

[0050] The length adjusting means 30 is connected to the sensor body A on both sid e of the support means 10 as shown in FIG. 3 to 5, and performs function of adjusti ng the length of strap 25 and connecting the first sensor 12 and the strap 25. The le ngth adjusting means 30 includes a spool 32 rotatable in the cover 31, and the length adjusting portion 27 of the strap 25 is wound around the spool 32. Disc type flange s 33 are formed on both end of the spool 32, and a plurality of stop recesses 34 are formed on the periphery of the flange 33 with constant interval, and a operating key 35 installed on one side of the cover 31 is engaged into or released from the stop r ecess 34 to control the rotation of the spool 32. The position of the stop recess 34 c an be properly selected if it can stop the rotation of the spool 32 in constant interval. If so, it can be positioned on the periphery of the flange 33 or on middle part of t he flange 33, or any part of the spool 32.

[0051] The operating key 35 is installed on one side of the cover 31, and is movabl e linearly or rotated. In linear moving type operating key, as shown in FIG. 3 and 4, a fixing projection 36 is formed on one side of the operating key 35, can be selecti vely engaged with the stop recess 34 of the spool 32 to fix the spool 32, and a spri ng 38a is inserted on the rear end of it and a pushing nob 38 extending outside of t he cover 31 is formed on the front end of the operating key 35. According to this ty pe, the operating key 35 is ordinarily pushed forward by spring 38a and the fixing pr ojection 36 is engaged with the stop recess 34 to stop the rotation of the spool 32. I f the pushing nob 38 is pushed, the operating key 35 retreats and the fixing projectio n 26 is released from the stop recess 34, so the spool 32 can be rotated by elastic means 32a such as a coil spring, and the length adjusting portion 27 of the strap 25 is automatically wound around the spool 32 to achieve length adjusting of the strip 2 5.

[0052] In rotary type operating key, as shown in FIG. 5, the middle part of the oper ating key 35 is hinged on the cover 31, and a fixing projection 36 is formed at one end of it, and a key operating means 39 such as solenoid or motor is connected to t he other end of it. The key operating means 39 is operated in association with the k ey switch 39a on the surface of the support means 10. Therefore, in the ordinary cas e on which the key switch 39a is not pushed, the fixing projection 36 of the operati ng key 35 is engaged with the stop recess 34 so that the spool 32 is fixed and cann ot be rotated. If the user pushes down the key switch 39c, the fixing projection is rel eased from the stop recess 35 and the key operating means 39 could operates, and th e spool 32 can be rotated by the elastic means 32a to automatically wind the length adjusting portion 37 of the strap 25 around the spool 32. If the key switch 39a is rel eased, the key operating means 39 is extended again, and the fixing projection 36 of the operating key 35 is engaged with the stop recess 34 to stop the spool 32.

[0053] As shown in FIG. 3, a pair of sensor body A is provided on both end of the support means 10, and a second axis 17 is vertically and rotatably attached on the s upport means 10 by way of a bearing on the center of the sensor body A, and a hor izontal turntable 18 is provided on the upper end of the second axis 17. A U-shaped rotating bracket 14 is vertically attached on the turntable 18, and a U-shape rotating support 15 is inserted in the rotating bracket 14 and rotatably engaged with the rotat ing bracket 14 through the first axis 16 extending the upper part of the rotating brac ket 14. And the length adjusting means 30 is inserted and connected in the rotating s upport 15.

[0054] The first sensor 12 is installed on the sensor mount 37 in the length adjusting means 30. According to the above structure, the first sensor 12 can be freely rotated horizontally and vertically around the first axis 16

and the second axis 17 even thou gh the user may pull the strap 25 in any direction, so that the first sensor 12 can be oriented perpendicular to the pulling force of the strip 25 so accurate measuring for muscle strength is possible.

[0055] And, the first axis 16 and the second axis 17 each have tubular axis holes 19, 20, and a signal line 21 of the first sensor 12 extends through the axis holes 19, 20, so that the signal line 21 may not be cut or twisted even though the first sensor 12 is rotated horizontally and vertically.

[0056] The first sensor 12 is connected to the strap 25 and senses the pulling force of the strap 25, and various sensors such as a load cell or a pressure sensor can be used for the first strap 12. The first sensor 12 can be directly attached on one end o f the strap 24, or it can be connected to strap 25 by way of length adjusting means 30 or any other member such as bar member.

[0057] The display means 40, as shown in FIG. 1 or 7, is to display the measured muscle strength, and it can be separate digital device such as a smart phone, a comp uter and a TV, and it can be a display window 13a of LCD, LED or FND embedde d on the control box C.

[0058] As shown in FIG. 1, a balance checking portion 44 is provided on the displa y means 40 to compare the left muscle strength and the right muscle strength and ch eck the strength balance so that the user can perform the muscle exercise while chec king the right and left balance in real time.

[0059] As shown in FIG. 6, an exercise result display 43 is provided on the display means 40 to display the increase/decrease of the muscle strength for each body parts shown in human body diagram, so that the user can easily figure out which body p art is increased and how much increases. And an exercise item recommending portion 45 is provide on the display means 40 to recommend exercise items for a relatively non-exercised part, a low increased part of muscle strength or other predetermined i mportant part based on the exercise result data, so that amateur user can perform syst ematic exercises.

[0060] As shown in FIG, 7, a plurality of switches is provided on the surface of the support means 10, which include a power switch, a mode switch 13b, and plural fu nction switches. The function switches may function as a click switch 13c and an ite m selection switch 13d mentioned below. Plural function switches can be used as the click switch 13a and the item selection switch 13d at the same time. In this case, f or example, the user may firstly push the mode switch 13b and push the function sw itch later, then the function switch will function as an item selection switch 13d. If t he user pushes the function switch without pushing the mode switch 13b, it will func tion as click switch 13c, or vice versa. Otherwise, the click switch 13c and the item selection switch 13d can be provided separately.

[0061] The click switch 13c is connected to the electronic circuit 13, and the electro nic circuit 13 transmits the signal to the display means 40 to click the selection butto n 41b on the display. That is, the user can click the selection button 41b on the rem ote display means 40 through the click switch 13c while the user is exercising on the support means 10.

[0062] The invention further includes a remote click function block 41a in the applic ation 41 of the display means 40 to remotely click the selection buttons 41b on the display when the signal that the strap 25 is pulled with higher strength or quicker sp eed than the predetermined value is received from the electronic circuit 13. Therefore, the user can easily operate the selection button of the display means 40 by pulling with higher strength or quicker speed.

[0063] The item selection switch 13d is connected to the electronic circuit 13, and th e electronic circuit 13 transmits the signal to the display means 40. The display mean s 40 includes an item matching portion 47 for the user to select and match the item selection switches 13d with proper exercise items. For example, if the user push No.1 switch and then click one of the exercise item displayed on the screen, the No.1 sw itch is matched to that item. If any item is matched, and the user push the above ite m selection switch 13d and performs that exercise item, the muscle strength data mea sured by the first sensor 12 is automatically saved in the memory of the display mea ns 40, and displayed on the exercise result display 49.

[0064] The support means 10 may be the type of foot plate on which the user may step on as shown in FIG. 1 to 7, or it may be any type such as a bolt or a channel if it could be firmly fixed on a horizontal panel, a vertical post or a door frame (D) as shown in FIG. 11a or 11b.

[0065] As shown in FIG. 8 and 9, a bench 50 can be engaged on the support mean s10 and the user may lie down on the bench 50 to perform a muscle strength exercis e. The bench 50 includes a plate 51 and legs 52 extending downward from the plate 51, and the plate 51 is in the rectangular shape, and is placed perpendicular to the support means 10, and the leg 52 on one side of bench 50 is placed on the upper s urface of the support means 10. The leg 52 may have projection 55 and the support means 10 may have recess 10c to be engaged with the projection 55 of the leg 52. I n this case, the user can lie down on the bench 50 to perform a muscle exercise, an d the weight of the bench 50 and the user body will be loaded and on firmly fix th e support means 10. The opposite legs 50 of the bench 50 connected to each other b y a cross bar 53. The leg 50 can be fixed vertically by a fastener 54 such as bolt a nd pin, or it can be folded. If the bench 50 is to be stored, the bench 50 may be overturned, and the exercise device can be placed on the bottom of the plate 51 and the leg 50 is folded, then the cross bar 53 will push down and fix the support mean s 10, therefore the storage volume will be compact and reduce the logistical cost.

[0066] In the second embodiment of the invention, as shown in FIG. 10a, 10b, 11a, 11b, only one sensor body

is provided which comprises of the length adjusting means 30, the first sensor 12, and the rotating support 15. Two bundles of the elastic band s 28 are connected on left and right side of the upper end of the length adjusting po rtion 27, and the handle 29 are connected at the other end of the elastic band 3. A barbell bar may be inserted into the elastic band 28 or the handle 29 to be gripped by two hands of the user. If the user wants to exercise with one hand, then the elast ic band 28 may be connected on one side of the length adjusting portion 27. A threa d shaft 17b and a nut 17c may be provided on the bottom of the sensor body A, so that the sensor body A can be installed on a separate foot plate, a door D or a pos t. In this case, the thread shaft 17b and the nut 17c function as the support means 1 0 of the first embodiment. In the second embodiment of the invention, the electronic circuit 13 to process the muscle strength data and transmit them to the display means 40 are provided inside the sensor body A and is connected to the first sensor 12. The third embodiment of the invention, as shown in FIG. 12, also measures t he pulling force of the strap 25 as the first embodiment, but further includes a push plate 22 on the upper of the support means 10, and a second sensor 23 provided bet ween the push plate 22 and the support means 10 to measure the pushing force on t he push plate 22. In this embodiment, the user can perform the aerobic exercise on t he push plate 22, e.g. by jumping on the push plate 22, then the aerobic exercise ca n be measured by the second sensor 23 and to be displayed through the display mea ns 40. The first sensor 12 can measure the pulling force of the strap 25 of anaerobic exercise, but it cannot measure the pushing force by hand or foot by user. But the second sensor 23 can measure the pushing force additionally and display, so that mor e various exercise items can be performed, measured and processed by the invention.

[0067] The invention is not restricted by the above mentioned embodiment or the dra wings, and various modifications or substitutions can be possible within the technical idea of the invention, which will be included in the protective scope of the invention.

Claims

1. A smart exercise device capable of measuring muscle strength in real time, comprising:

   a support means 10 which is stepped on by the foot or connected to other str ucture;
   a strap 25 that can be pulled by a user;
   a first sensor 12 connected between the support means 10 and the strap 25 to sense the muscle strength pulling the strap 25; and
   an electronic circuit 13 connected to the first sensor 12 and processing sensed muscle strength data so that the data can be displayed on a display means 40 includ ing a display window 13a, a smart phone, a computer and TV; wherein
   if a user performs the muscle strength exercise by pulling the strap 25, the p ulling force of the strap 25 is sensed by the first sensor 12 to be displayed quantitati vely through the display means 40, so that the user can systematically perform progre ssive overload exercises with the exercise load proper to the user.

2. A smart exercise device capable of measuring muscle strength in real time of claim 1, wherein; the strap 25 includes a elastic portion 26 positioned on one side of it and being elastically expandable in proportion to the pulling force by user's ar m or foot; and a length adjusting portion 27 positioned on the other side of it and n ot being expandable or being relatively less expandable than the elastic portion 26 by pulling and the length of it being adjustable according to the user's height or chang e of posture, so that the elastic portion 26 should keep constant length and elasticity even though the length adjusting portion 27 is adjusted depending on the user's heigh t or posture change to achieve a muscle strength exercise with constant exercise load.

3. A smart exercise device capable of measuring muscle strength in real time of claim 2, wherein; the elastic portion 26 includes a plurality of elastic bands 28 ha ving different elasticity, and one or more of the elastic bands 28 are detachably attac hed to the length adjusting portion 27; and the display means 40 includes a band rec ommending portion 42 calculating proper elasticity of the elastic band 28 based on th e user's muscle strength data measured by the first sensor 12 and displaying it.

4. A smart exercise device capable of measuring muscle strength in real time of claim 1, wherein; the smart exercise device further includes a rotating bracket 14 vertically extending from the support means 10, and a rotating support 15 engaged on a first axis 16 horizontally mounted on the rotating bracket 14 and being rotatable u pward and downward; and a first sensor 12 provided on the rotating support 15, so t hat the first sensor 12 should sense the pulling force of the strap 25 while the rotatin g support 15 and the first sensor 12 being rotated upward and downward according t o the pulling direction of the strap 25.

5. A smart exercise device capable of measuring muscle strength in real time of claim 4, wherein; the smart exercise device further includes a second axis 18 verti cally mounted on the support means 10, and a turntable 18 engaged on the second a xis 18 and rotatable horizontally, so that the first sensor 12 should sense the pulling force with being freely rotated horizontally and vertically depending on the pulling dir ection of the strip 25.

6. A smart exercise device capable of measuring muscle strength in real time of claim 5, wherein; the support means 10 and the turntable 18 have ball plungers 1 8a and recesses 18b respectively, so that angle of the turntable 18 should be regularl y adjusted by engaging the ball plungers 18a with the recesses 18b.

7. A smart exercise device capable of measuring muscle strength in real time of claim 4 and 5, wherein; the first axis 16 and the second axis 17 each have tubula r axis holes 19, 20, and a signal line 21 of the first sensor 12 extends through the a xis holes 19, 20, so that the signal line 21 should not be cut or twisted even though the first sensor 12 is rotated horizontally and vertically.

8. A smart exercise device capable of measuring muscle strength in real time of claim 1, wherein; the smart exercise device further includes a length adjusting mea ns 30 at one end of the strap 25, the length adjusting means 30 including a cover 3 1, a spool 32 being rotatable in the cover 21 and wound by the strap 25, a elastic member 32a connected to the spool 32 so that the strap 25 is elastically wound arou nd the spool 32, a plurality of stop recess 34 formed in constant interval on the peri phery of the flange 33 provided on the spool 31, and an operating key 35 provided on one side of the cover 31 and being moved linearly or rotated and having a fixing projection 36 being engaged with the stop recess 34 to stop the spool 32 and being released from the stop recess 34 for the spool 32 to be rotated so that the length of strap 25 is adjusted.

9. A smart exercise device capable of measuring muscle strength in real time of claim 8, wherein; the smart exercise device further includes a key operating means 39 connected to the operating key 35 to engage the fixing projection 36 with the st op recess 34 or release the fixing projection 36 from the stop recess 34, and a key s witch 39a to switch on/off the key operating means 39.

10. A smart exercise device capable of measuring muscle strength in real time of claim 1, wherein; the smart exercise device further includes an exercise result dis play 43 shown through the display means 40 and displaying the increase/decrease of muscle strength for each body part after exercise, and an exercise item recommending portion 45 shown through the display means 40 and recommending exercise items fo r a relatively non-exercised part, a low increased part of muscle strength or other pre determined important part of muscle based on the exercise result data.

11. A smart exercise device capable of measuring muscle strength in real time of claim 1, wherein; the first sensor 12 and the strap 25 are installed on both sides of the support means 10, and the display means 40 further includes a balance check ing portion 44 to compare the left muscle strength and the right muscle strength and check the strength balance.

12. A smart exercise device capable of measuring muscle strength in real time of claim 1, wherein; the smart exercise device further includes a handle 29 at the u pper end of the strap 20, and the handle 29 having a plurality of grips 29a spaced a part wider than the thickness of the human hand so that the distance between the sup port means 10 and the grip 29a can be easily adjusted only by changing the grip 29 a.

13. A smart exercise device capable of measuring muscle strength in real time of claim 1, wherein; the smart exercise device further includes a click switch 13c in stalled on the support means 10 to remotely click selection buttons 41b on the displa y means 40, and a communication protocol input in the electronic circuit 13 to trans mit the signal of the click switch 13c to the display means 40, so that the user can remotely click on the selection buttons 41a on the display means 40 by touching the click switch 13c on the support means 10 during exercise.

14. A smart exercise device capable of measuring muscle strength in real time of claim 1, wherein; the smart exercise device further includes a remote click functi on block 41a in the application 41 of the display means 40 to remotely click the sel ection buttons 41b on the display when the signal that the strap 25 be pulled with hi gher strength or quicker speed than the predetermined value is received from the elect ronic circuit 13.

15. A a smart exercise device capable of measuring muscle strength in real ti me of claim 1, wherein; the smart exercise device further includes a plurality of item selection switches 13d on the support means 10, a communication protocol input in the electronic circuit 13 to transmit the signal of the exercise item selection switch 1 3d to the display means 40, an item matching portion 47 shown on the display mean s 40 to match the item selection switches 13d with proper exercise items, a memory 48 in the display means 40 to save the data of muscle strength measured by the first sensor 12, and an exercise result display 49 shown on the display means 40 and dis playing the data of the user's muscle strength saved in the memory 48, so that as th e user touches the item selection switch 13d and performs exercise, then the data of muscle strength measured by the first sensor 12 is saved and managed.

16. A smart exercise device capable of measuring mus-

cle strength in real time of claim 1, wherein; the smart exercise device further includes a push plate 22 on t he upper of the support means 10, a second sensor 23 provided between the push pla te 22 and the support means 10 to measure the pushing force on the push plate 22, an electronic circuit 13 to process the data about the pulling or pushing force of the first sensor 12 and the second sensor 23 to display through a display means 40 inclu ding a display window 13a, a smart phone, a computer or a TV.

17. A smart exercise device capable of measuring muscle strength in real time, wherein; the smart exercise device includes;

a support means 10 which is stepped on by the foot or connected to a struct ure;
a rotating bracket 14 vertically extending from the support means 10;
a rotating support 15 engaged on a first axis 16 horizontally mounted on the rotating bracket 14 and being rotatable upward and downward;
a first sensor 12 provided on the rotating support 15 and connected to a strap 25 pulled by user to sense the pulling force of the strap 25, and
an electronic circuit 12 connected to the first sensor 12 to process the muscle strength data to display through a display means 40 including a display window 13a, a smart phone, a computer and a TV, so that the first sensor 12 should sense the p ulling force of the strap 25 while the rotating support 15 and the first sensor 12 bein g rotated upward and downward according to the pulling direction of the strap 25.

18. A smart exercise device capable of measuring muscle strength in real time of claim 17, wherein; the smart exercise device further includes a second axis 18 ve rtically mounted on the support means 10, and a turntable 18 engaged on the second axis 18 and rotatable horizontally, so that the first sensor 12 should sense the pullin g force while being freely rotated horizontally and vertically depending on the pulling direction of the strip 25.

19. A smart exercise device capable of measuring muscle strength in real time of claim 17 or 18, wherein; the first axis 16 and the second axis 17 each have tub ular axis holes 19, 20, and a signal line 21 of the first sensor 12 extends through th e axis holes 19, 20, so that the signal line 21 should not be cut or twisted even tho ugh the first sensor 12 is rotated horizontally and vertically.

20. A smart exercise device capable of measuring muscle strength in real time, comprising:

a support means 10 which is stepped on by the foot or connected to a struct ure;
a strap 25 that can be pulled by a user;
a first sensor 12 connected between the support means 10 and the strap 25 to sense the muscle strength pulling the strap 25;
an electronic circuit 13 connected to the first sensor 12 and processing sensed muscle strength data so that the date can be displayed on a display means 40 includ ing a display window 13a, a smart phone, a computer and a TV;
a cover 31 of a length adjusting means 30 at one end of the strap 25;
a spool 32 being rotatable in the cover 21 and wound by the strap 25;
an elastic member 32a connected to the spool 32 so that the strap 25 is elasti cally wound on the spool 32;
stop recesses 34 regularly formed the flange 33 provided on the spool 31; an d
an operating key 35 provided on one side of the cover 31 and being moved l inearly or rotated and having a fixing projection 36 being engaged with the stop rece ss 34 to stop the spool 32 and being released from the stop recess 34 for the spool 32 to be rotated so that the length of strap 25 is adjusted.

21. A smart exercise device capable of measuring muscle strength in real time of claim 20, wherein; the smart exercise device further includes a key operating mea ns 39 connected to the operating key 35 to engage the fixing projection 36 with the stop recess 34 or release the fixing projection 36 from the stop recess 34, and a key switch 39a to switch on/off the key operating means 39.

FIG. 1

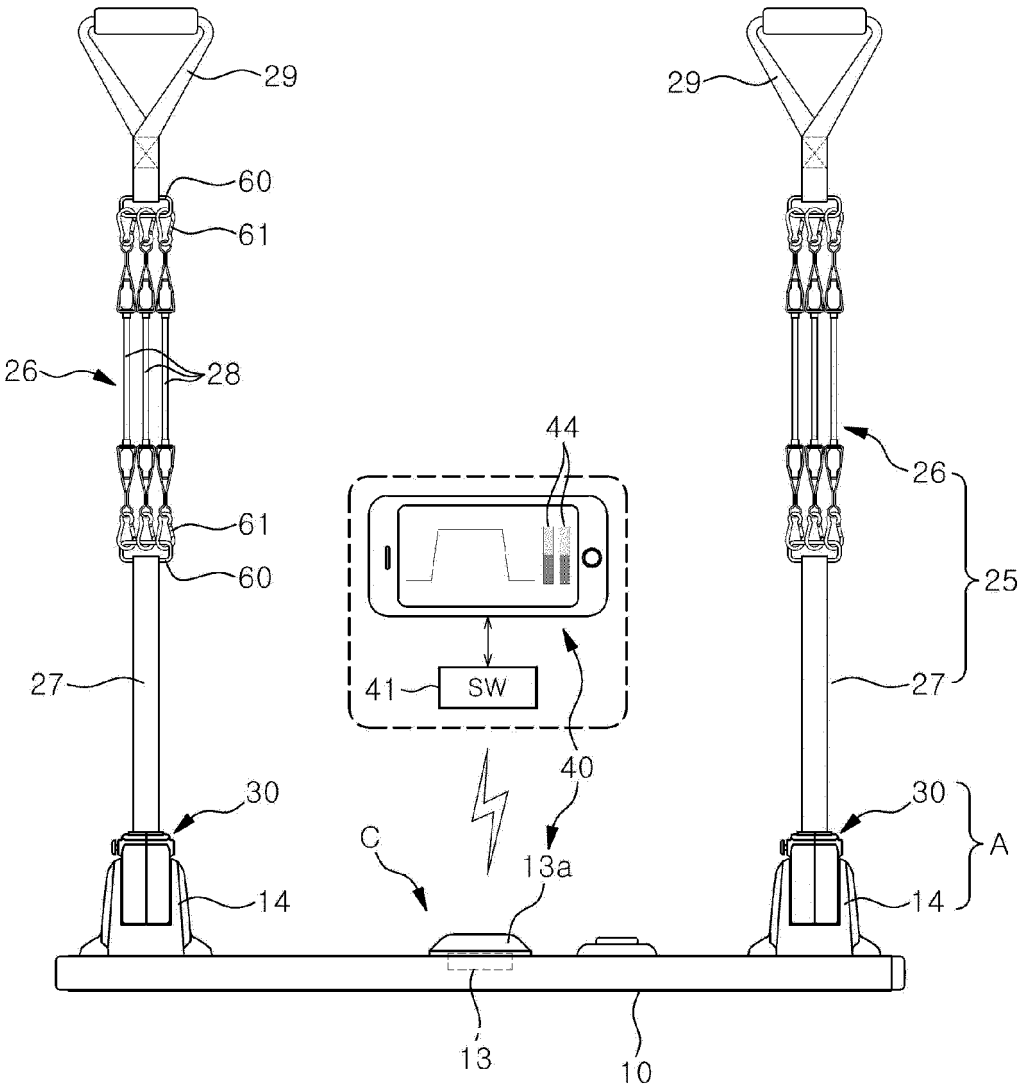


FIG. 2

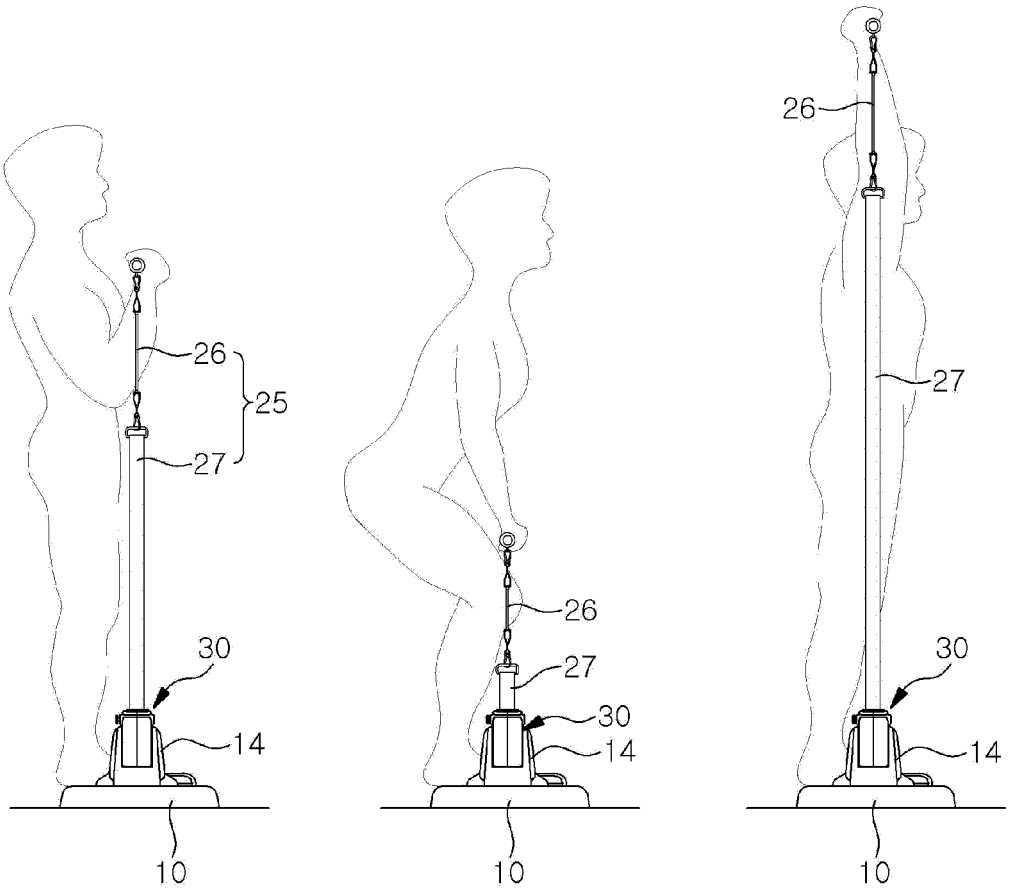
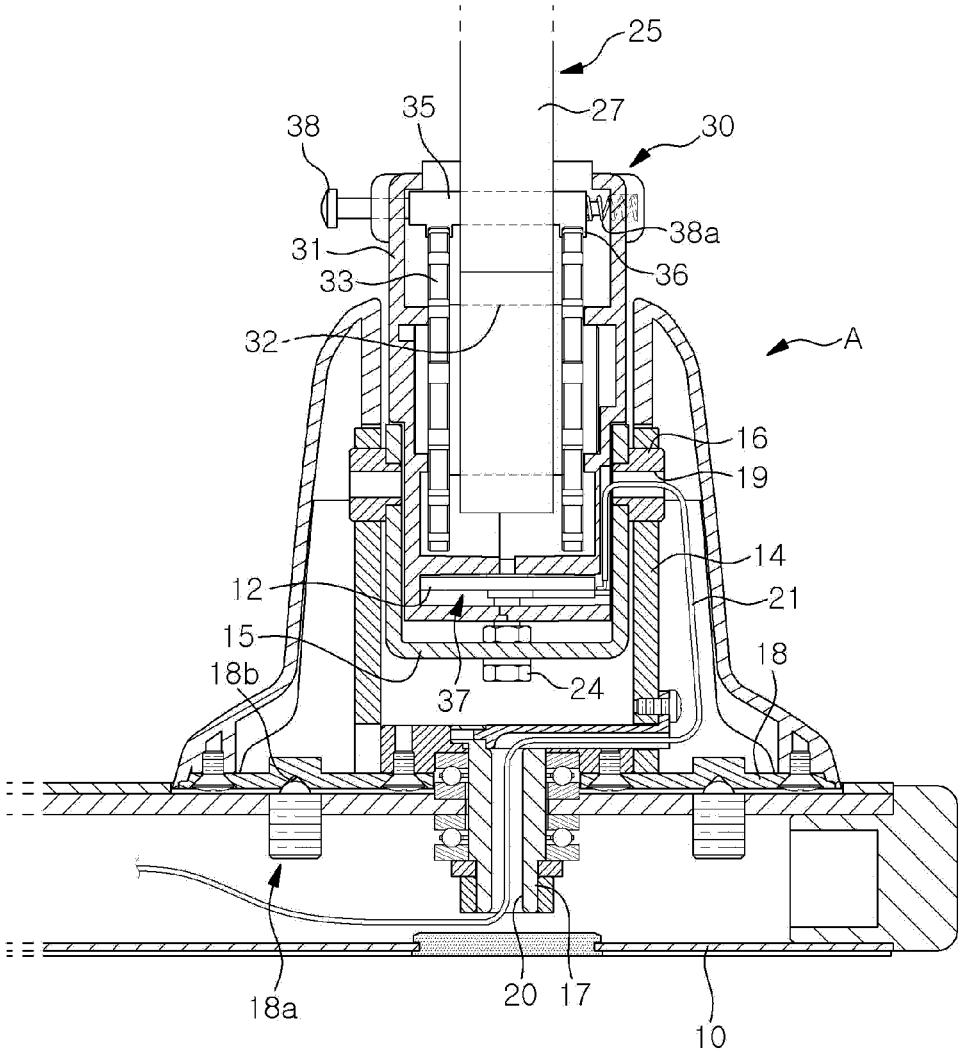


FIG. 3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38a
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FIG. 4

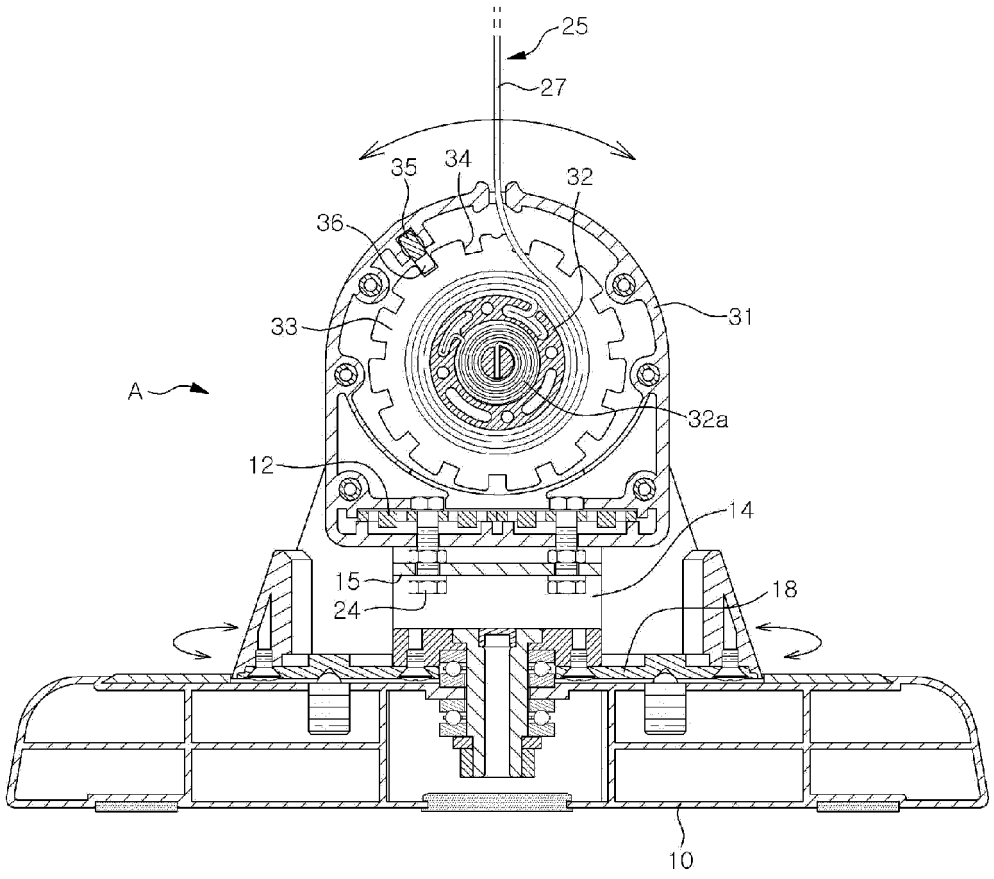

FIG. 5

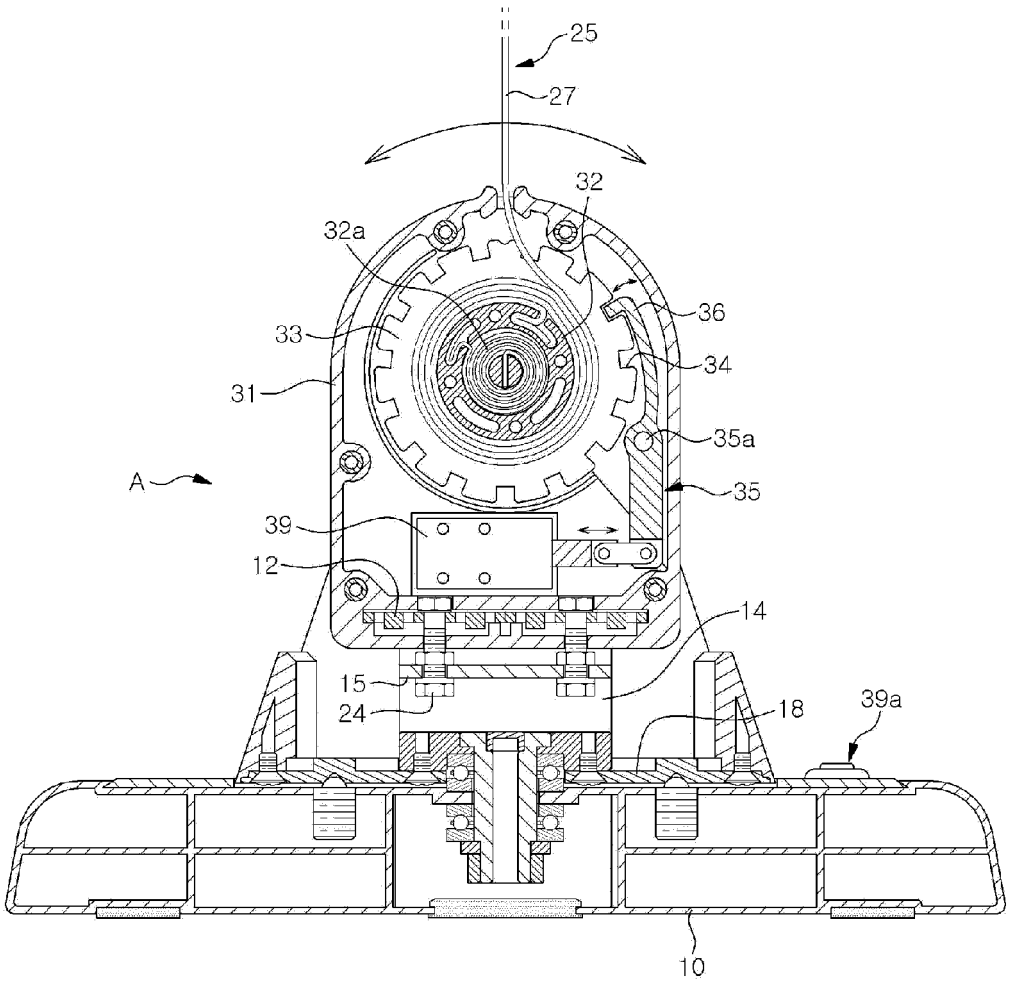

FIG. 6

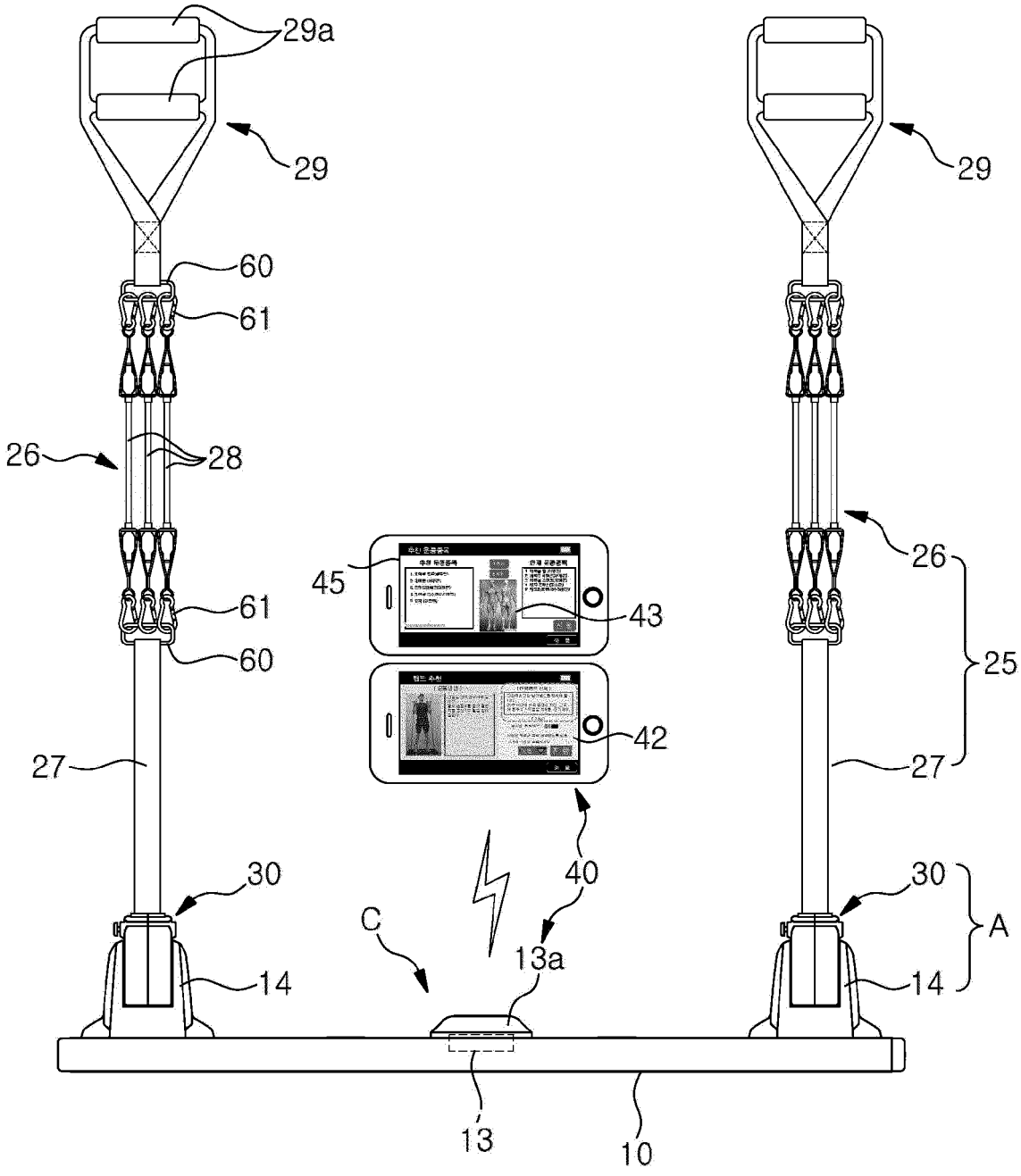
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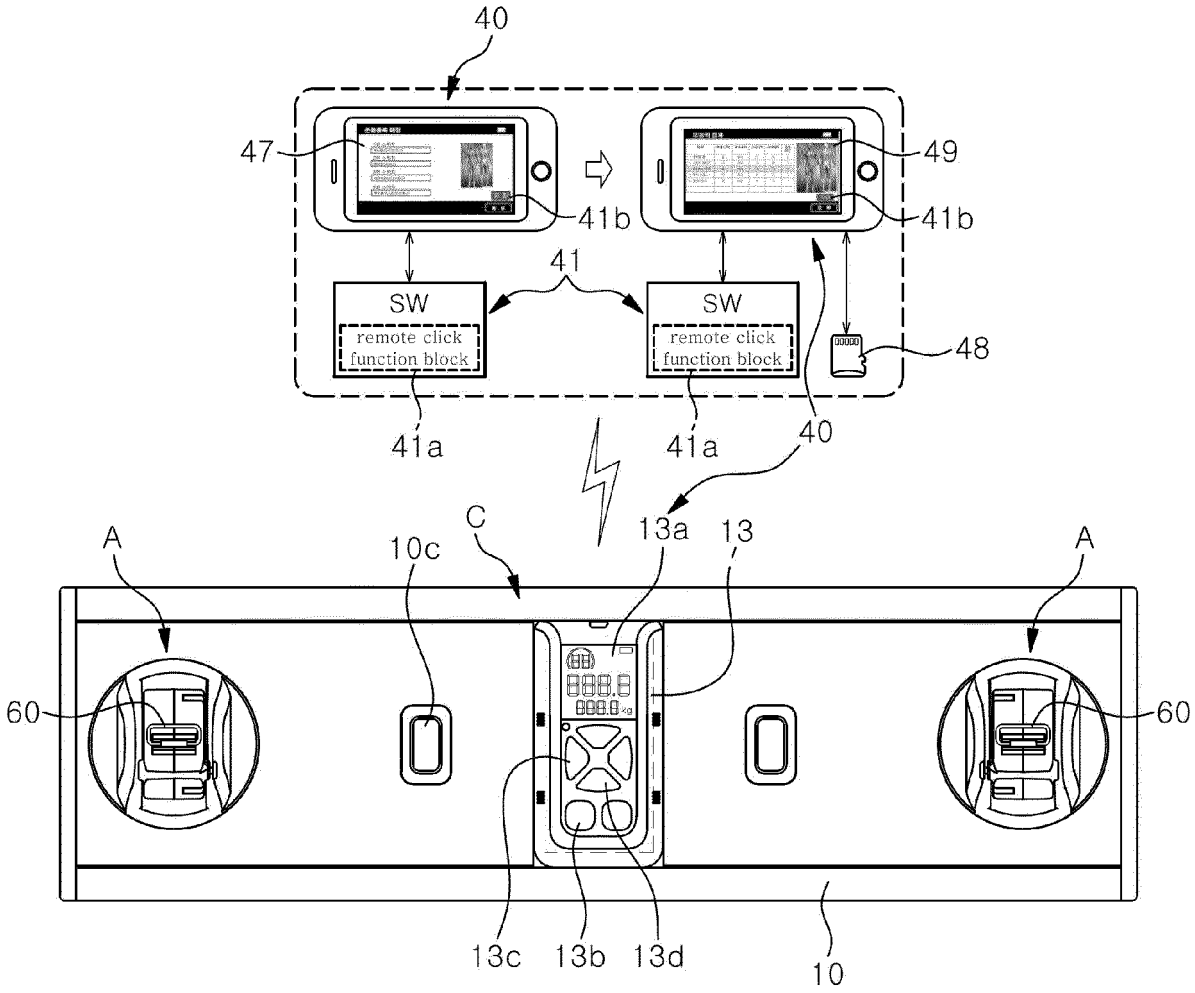
FIG. 7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13d
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FIG. 8

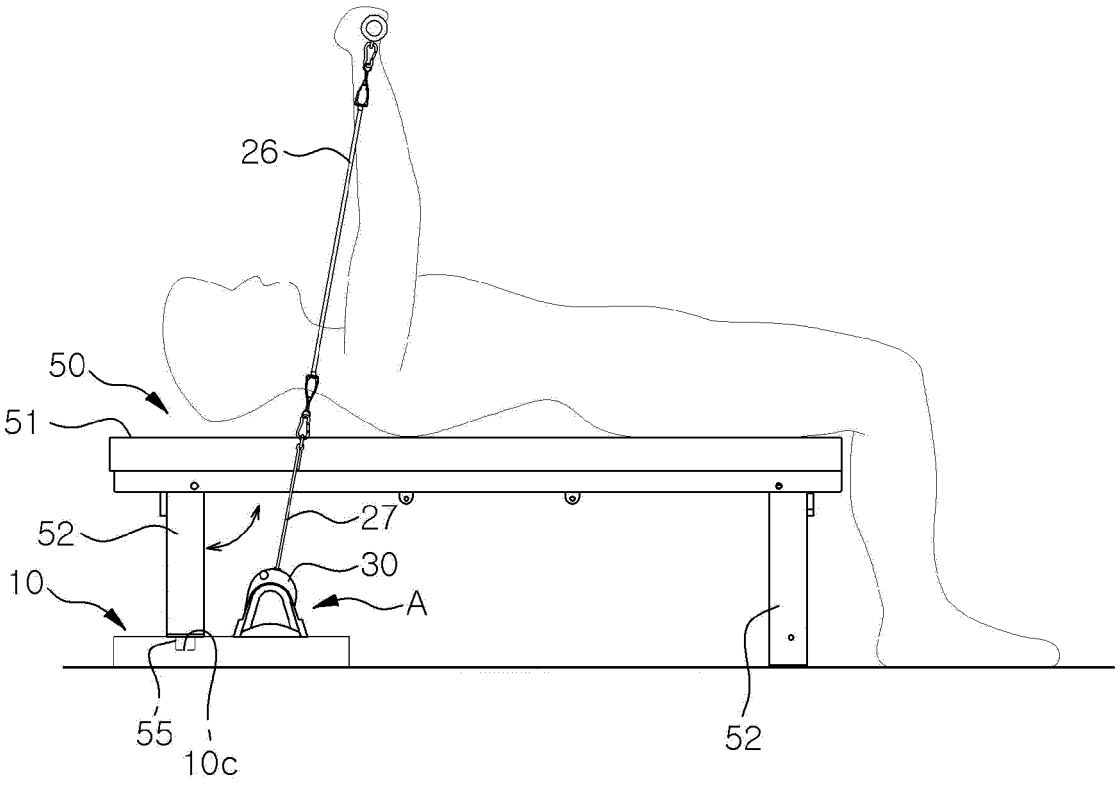


FIG. 9

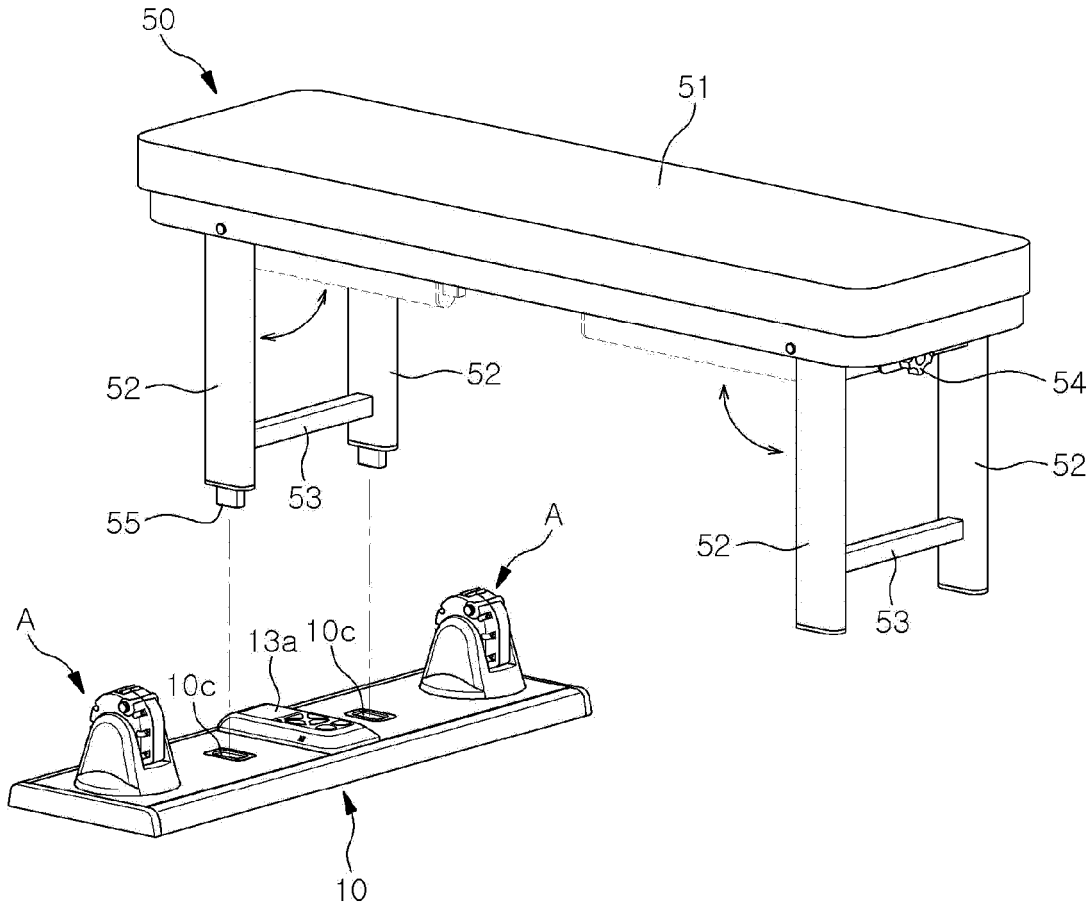


FIG. 10

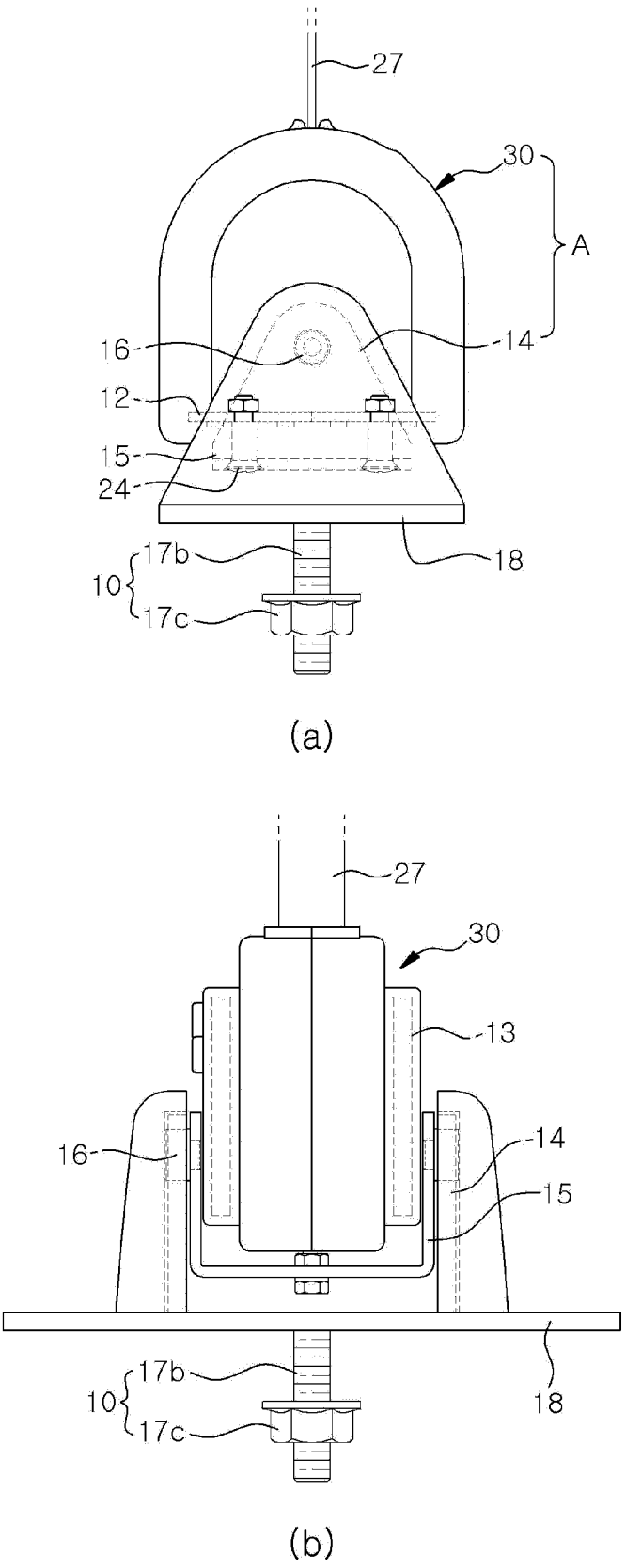


FIG. 11

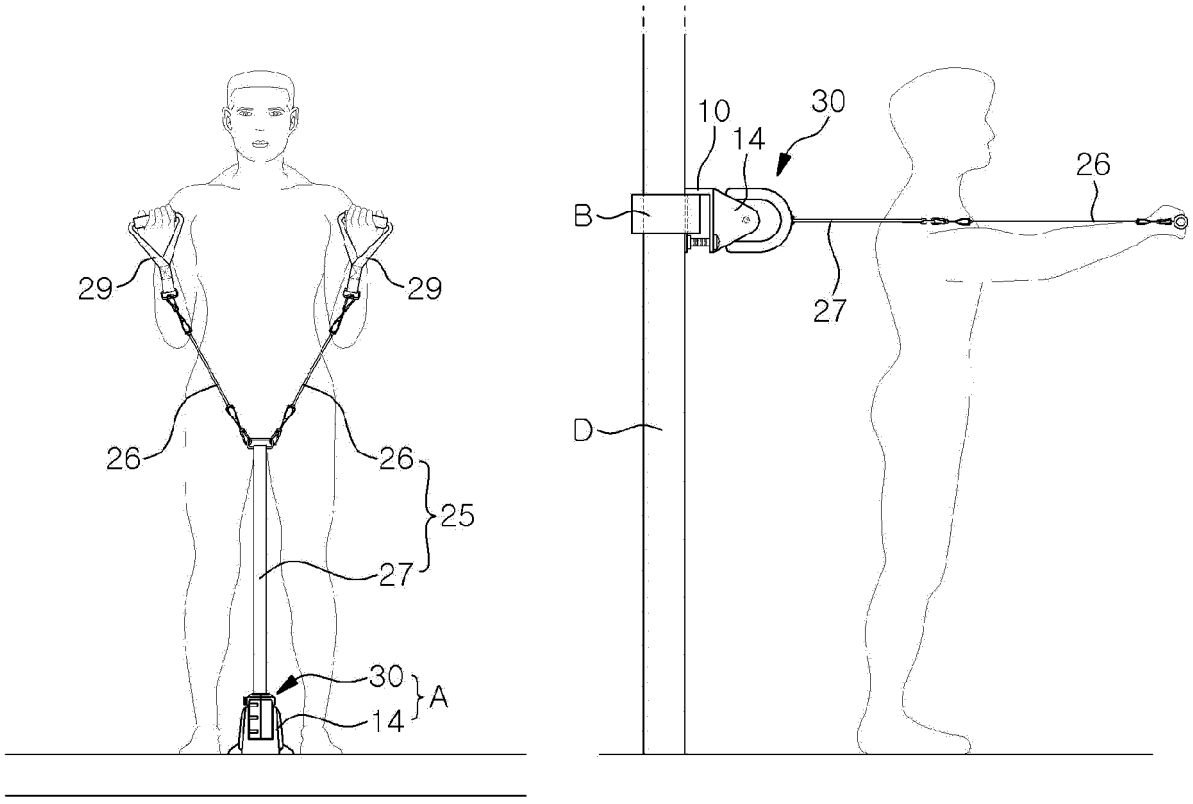
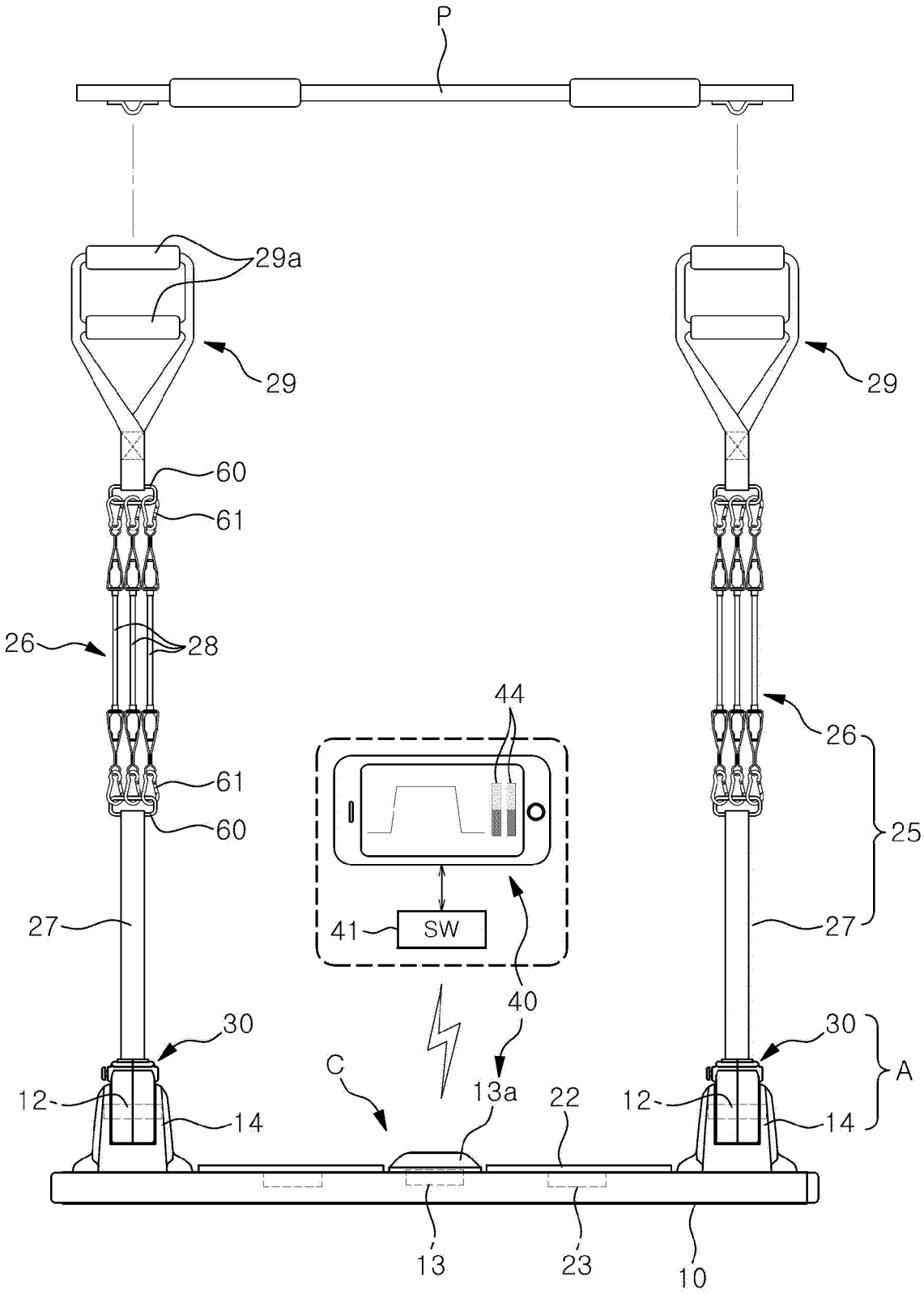


FIG. 12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INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2021/020201

A. CLASSIFICATION OF SUBJECT MATTER

A63B 21/04(2006.01)i; **A63B 21/055**(2006.01)i; **A63B 71/06**(2006.01)i; **A63B 24/00**(2006.01)i; **A63B 21/00**(2006.01)i

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 21/04(2006.01); A42C 5/00(2006.01); A63B 21/00(2006.01); A63B 21/005(2006.01); A63B 21/02(2006.01); A63B 21/055(2006.01); A63B 21/068(2006.01); A63B 24/00(2006.01)

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

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

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

eKOMPASS (KIPO internal) & keywords: 스마트 운동장치(smart exercise device), 지지수단(support means), 스트랩(strap), 제1센서(first sensor), 디스플레이수단(display), 전자회로(electronic circuit), 근력 측정(muscular strength measurement), 점진적 과부하운동(gradual overload exercise)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2020-0079106 A (AIMO INC.) 02 July 2020 (2020-07-02) See paragraphs [0016]-[0060]; and figures 4-6 and 10-12.	1,10-16
Y		2-9,17-21
Y	KR 10-0856073 B1 (CHO, Young Hee) 02 September 2008 (2008-09-02) See paragraphs [0020] and [0048]-[0056]; and figures 5-7.	2-3
Y	KR 10-2020-0025764 A (RONFIC CO., LTD. et al.) 10 March 2020 (2020-03-10) See paragraph [0077]; claim 1; and figures 1-9.	4-7,17-19
Y	KR 10-2012-0027105 A (BOA TECHNOLOGY, INC.) 21 March 2012 (2012-03-21) See paragraph [0116]; and figure 49.	8-9,20-21

☑ Further documents are listed in the continuation of Box C. ☑ 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
"D" document cited by the applicant in the international application
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Date of the actual completion of the international search	Date of mailing of the international search report
08 April 2022	**08 April 2022**
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2021/020201

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International application No.
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