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(54) Title of the Invention: **Device**
Abstract Title: **An athletic performance measurement device for measuring a load and the number of repetitions**

(57) A device for monitoring use of an exercise machine or machines comprising means to couple it to a part of an exercise device which moves in use, means to detect or acquire information in respect of the weight being moved, means to record movement of the weight and means to communicate the information to a computer. The device may be a pin 1 which can be inserted into a stack of weights 2-8 and the weights may have RFID chips 152-158 which can be read by the pin. The device may utilise wireless technology to communicate data and include accelerometers of gyroscopes for movement measurement. There may also be connections to external sensors for monitoring the user's condition such as their heart rate. The device may be used with a vertical weight stack or a set of dumbbells.

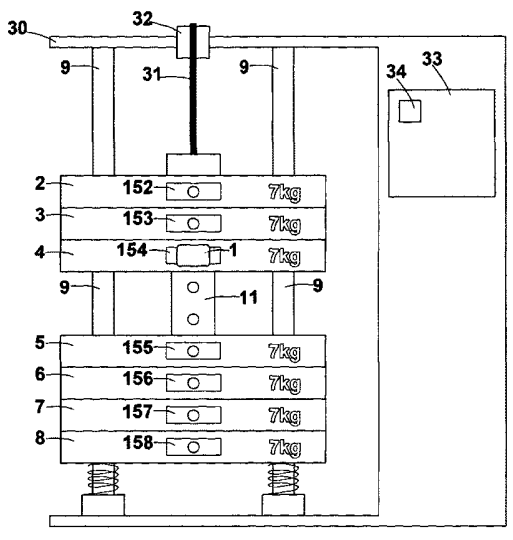

Figure 3

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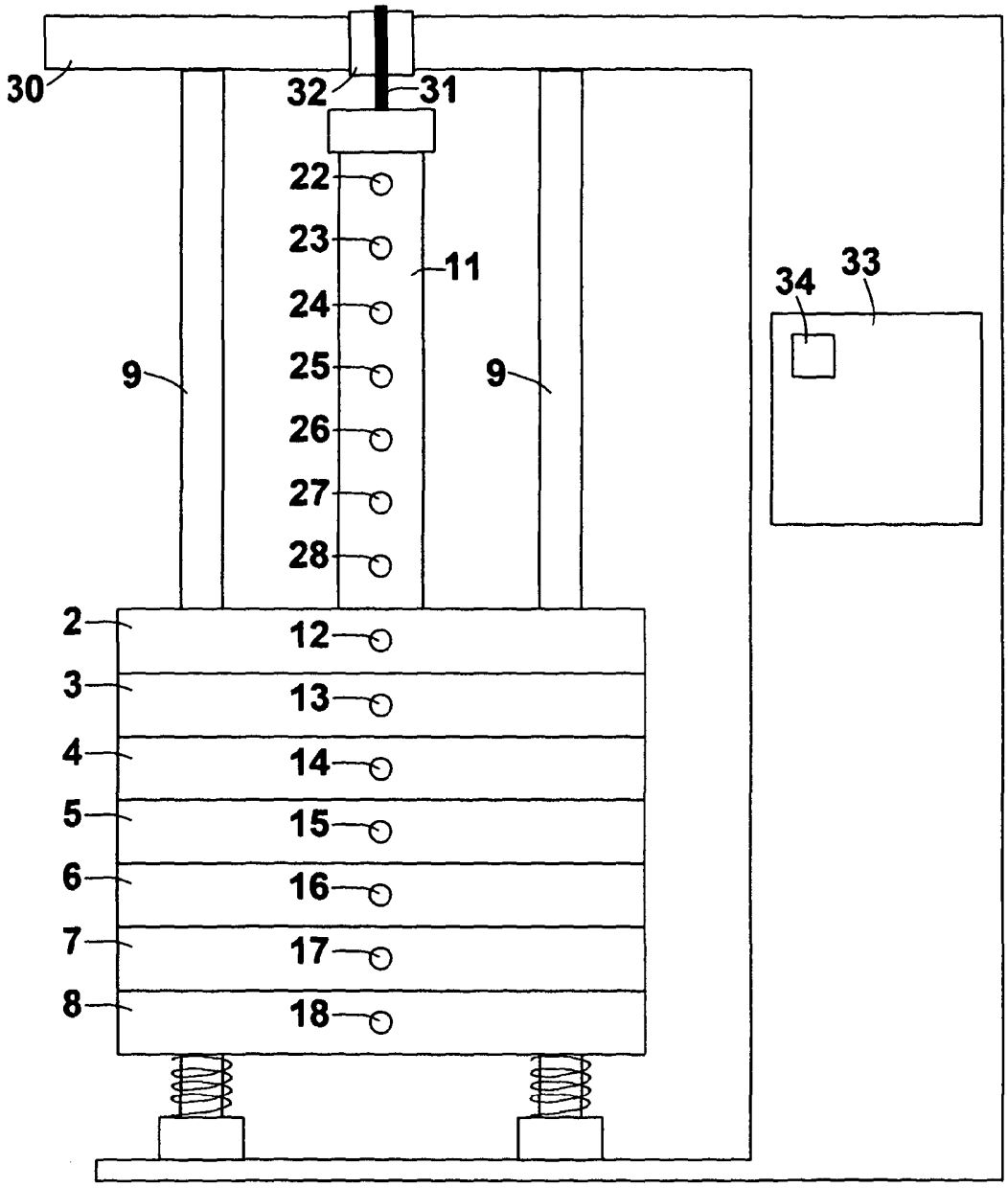
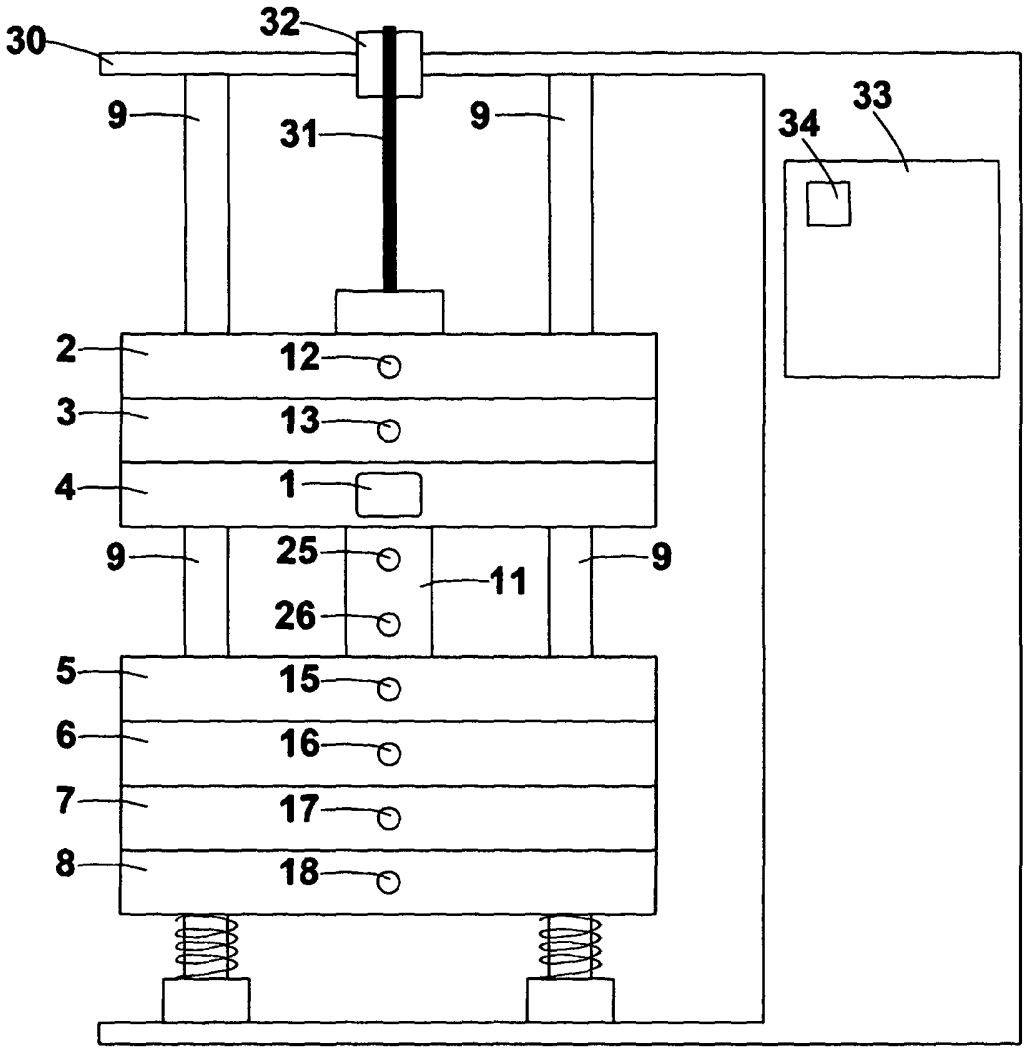


Figure 1



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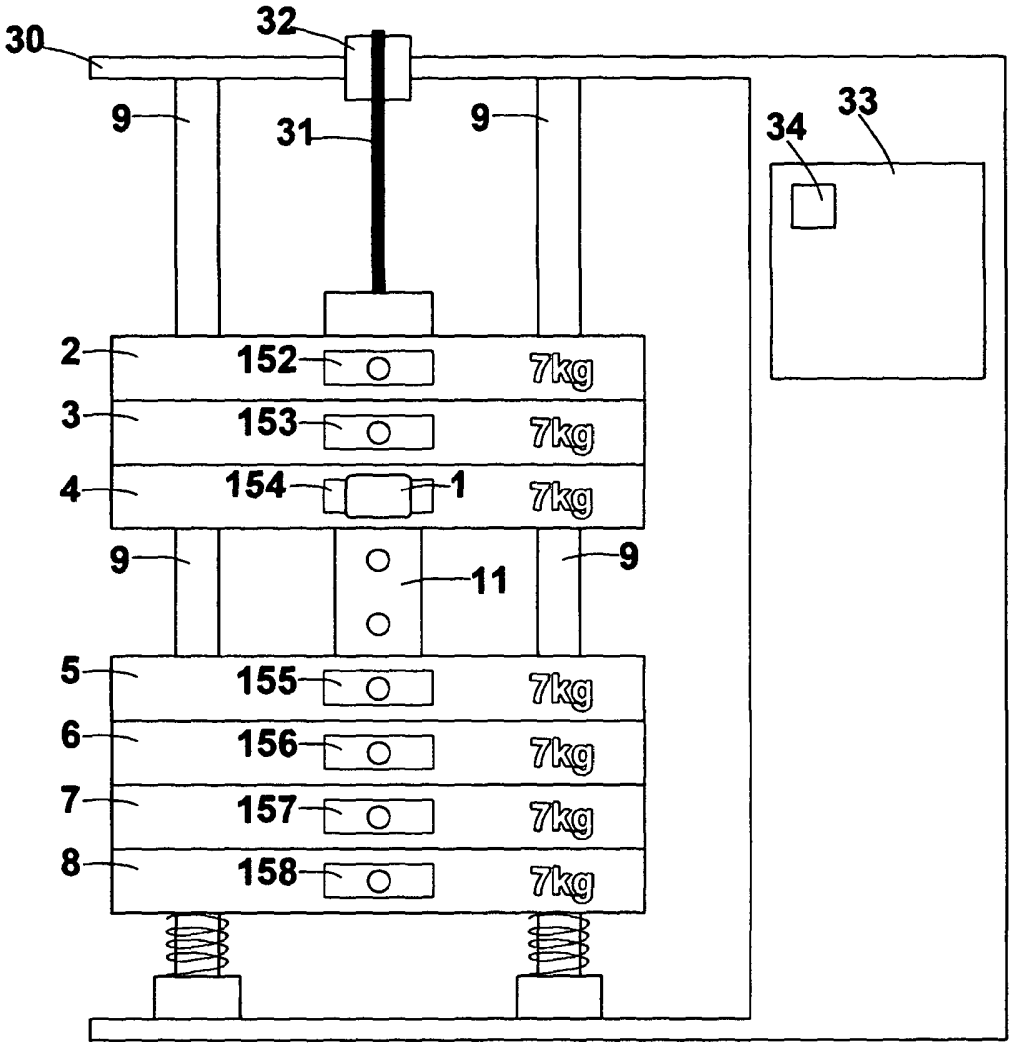
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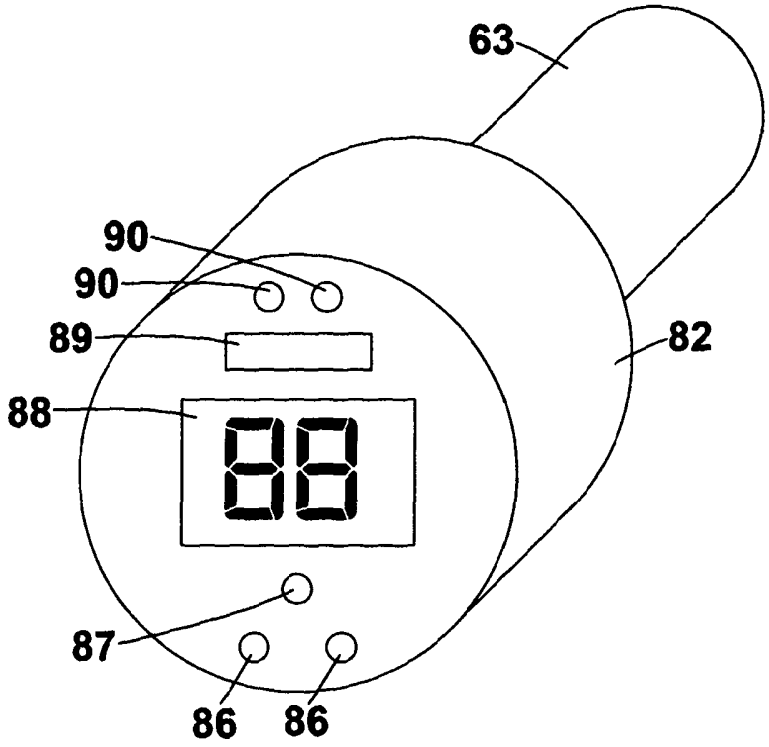
Figure 3



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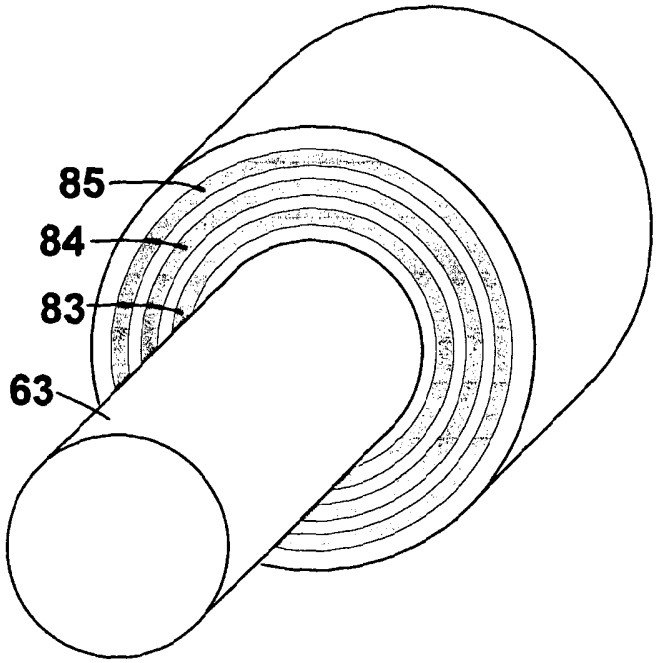

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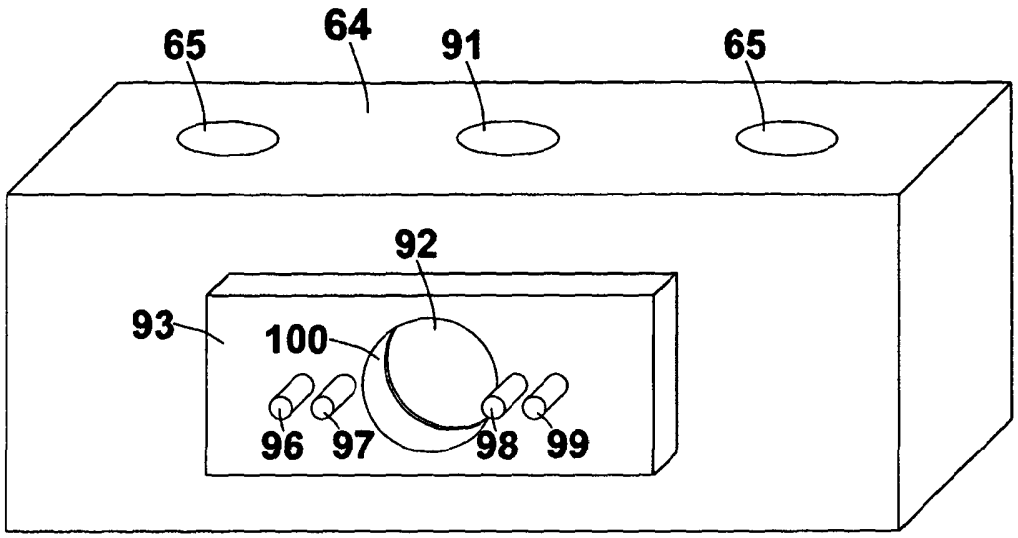

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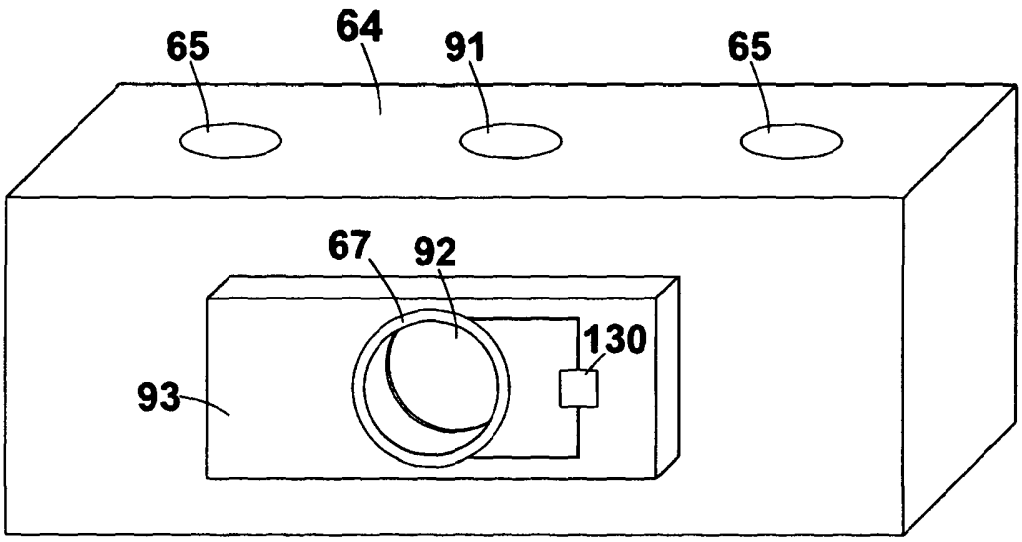

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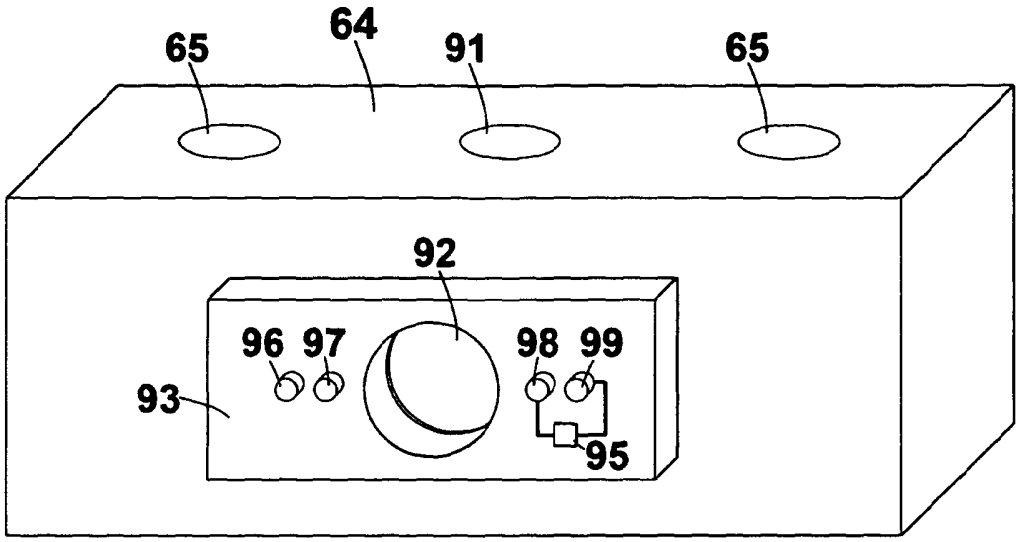

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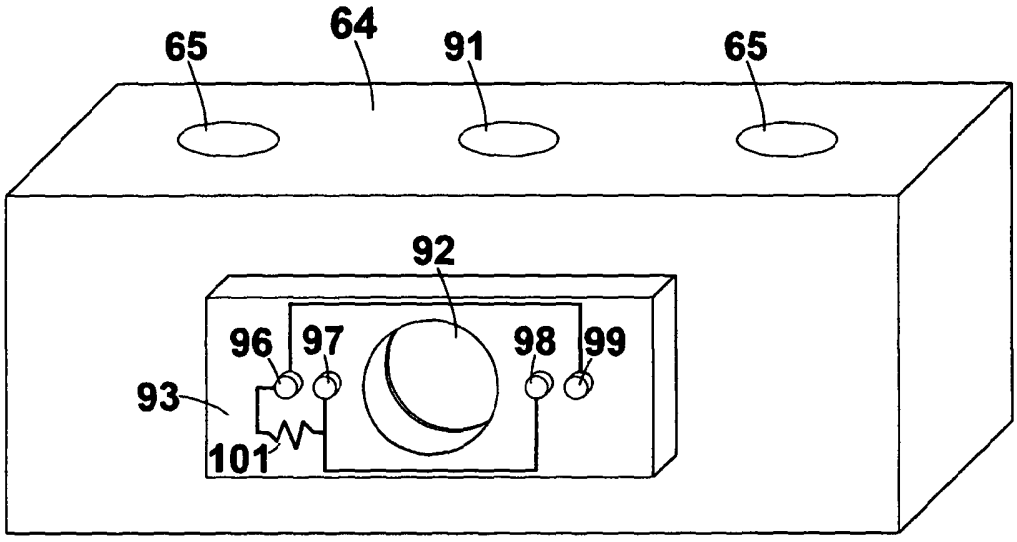

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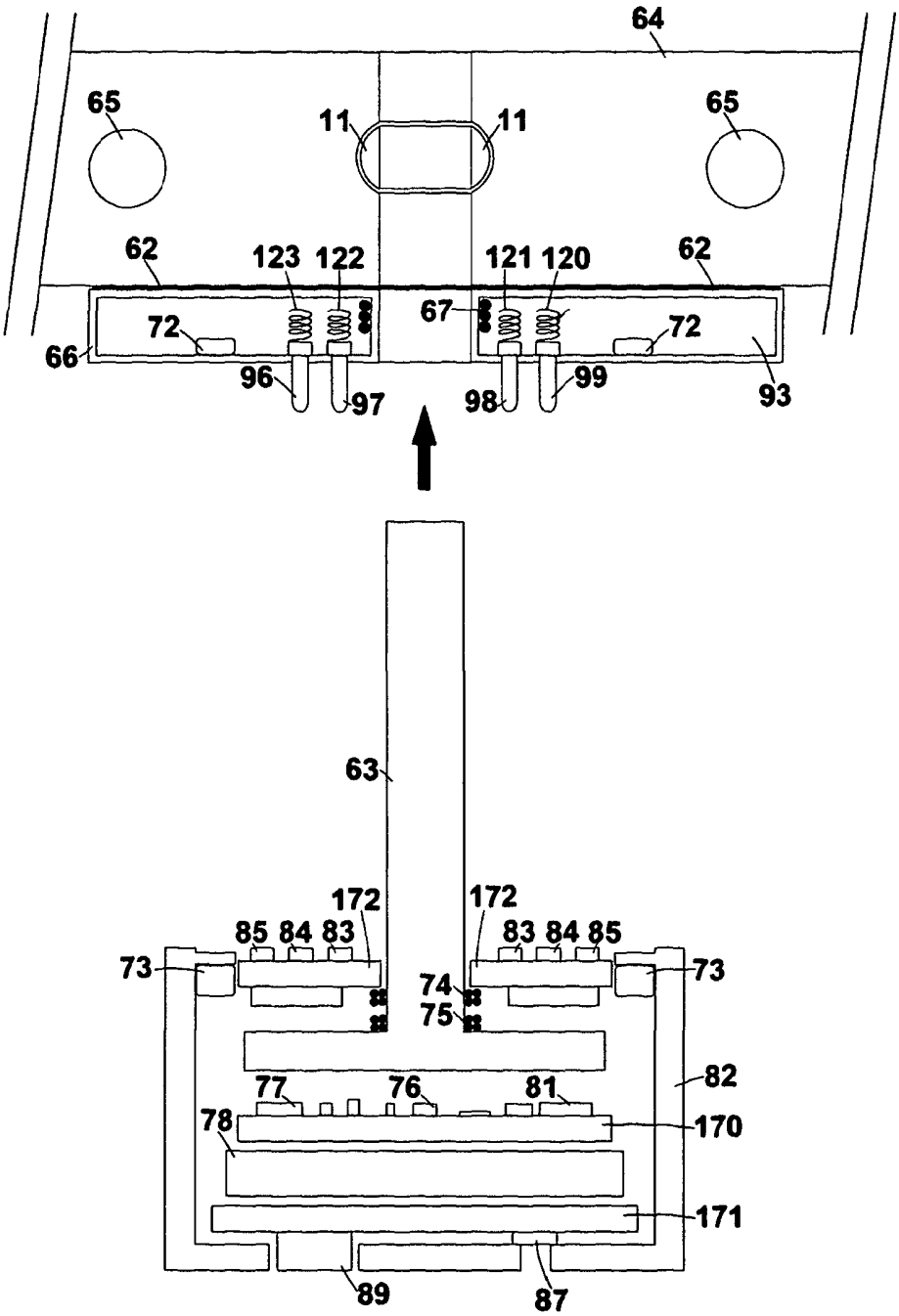
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Figure 10

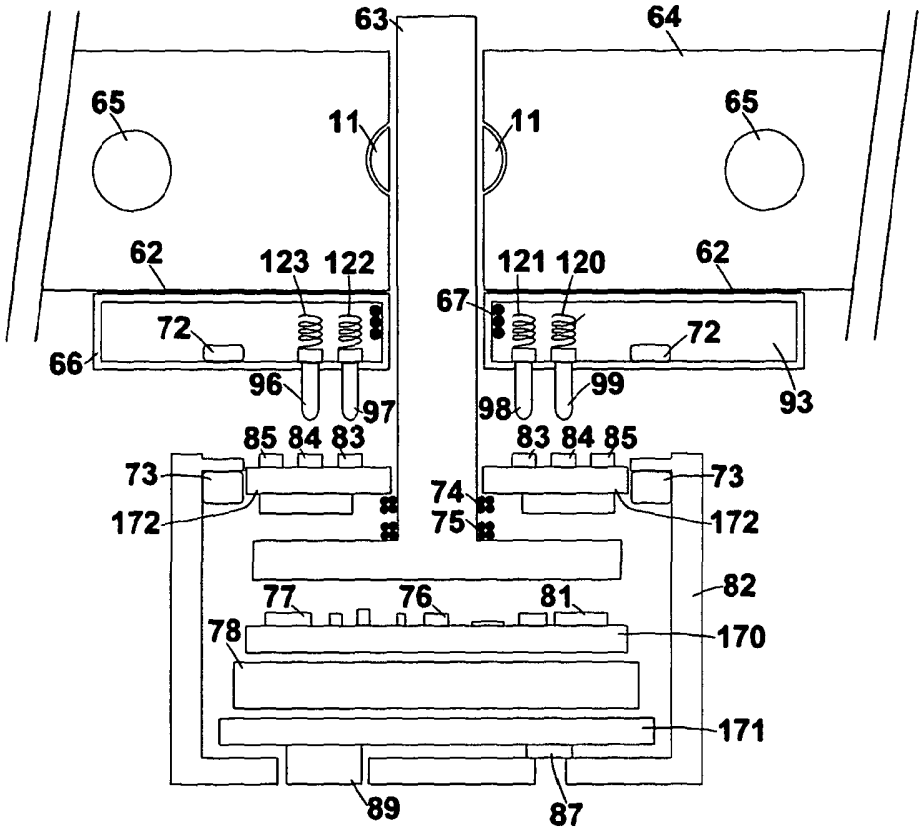
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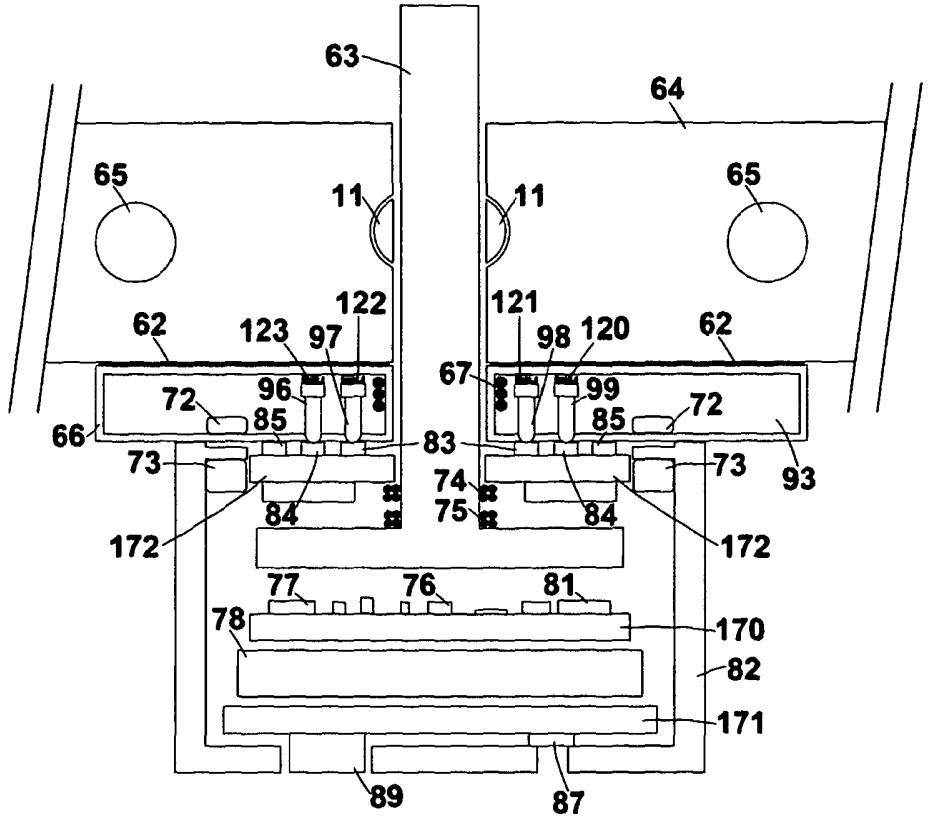
Figure 11



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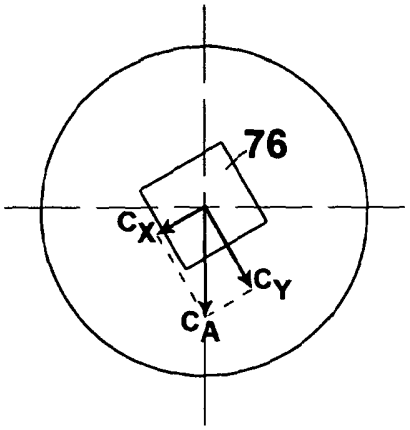

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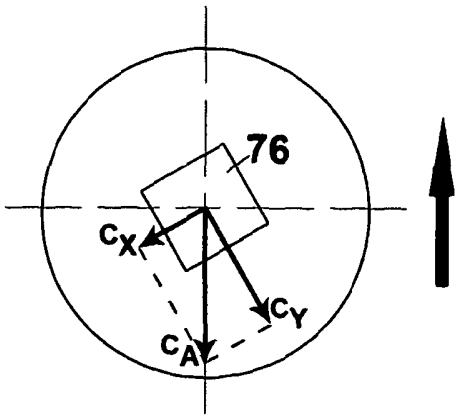

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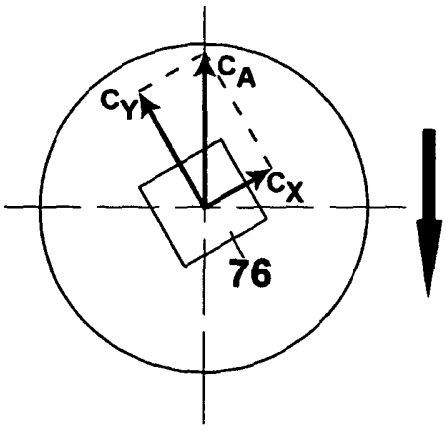

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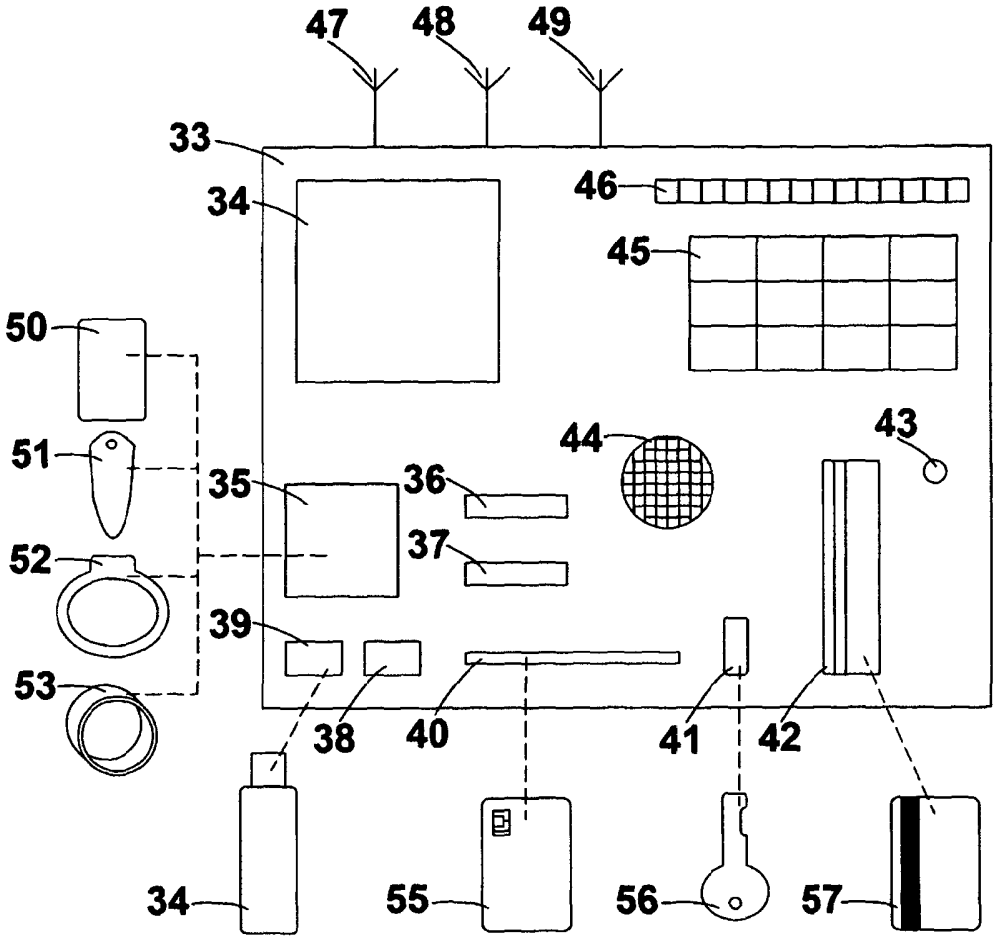
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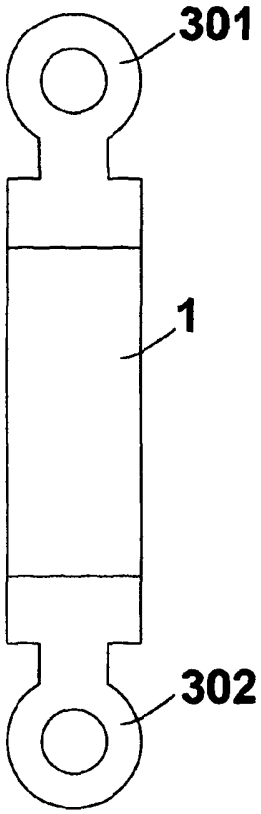
Figure 16



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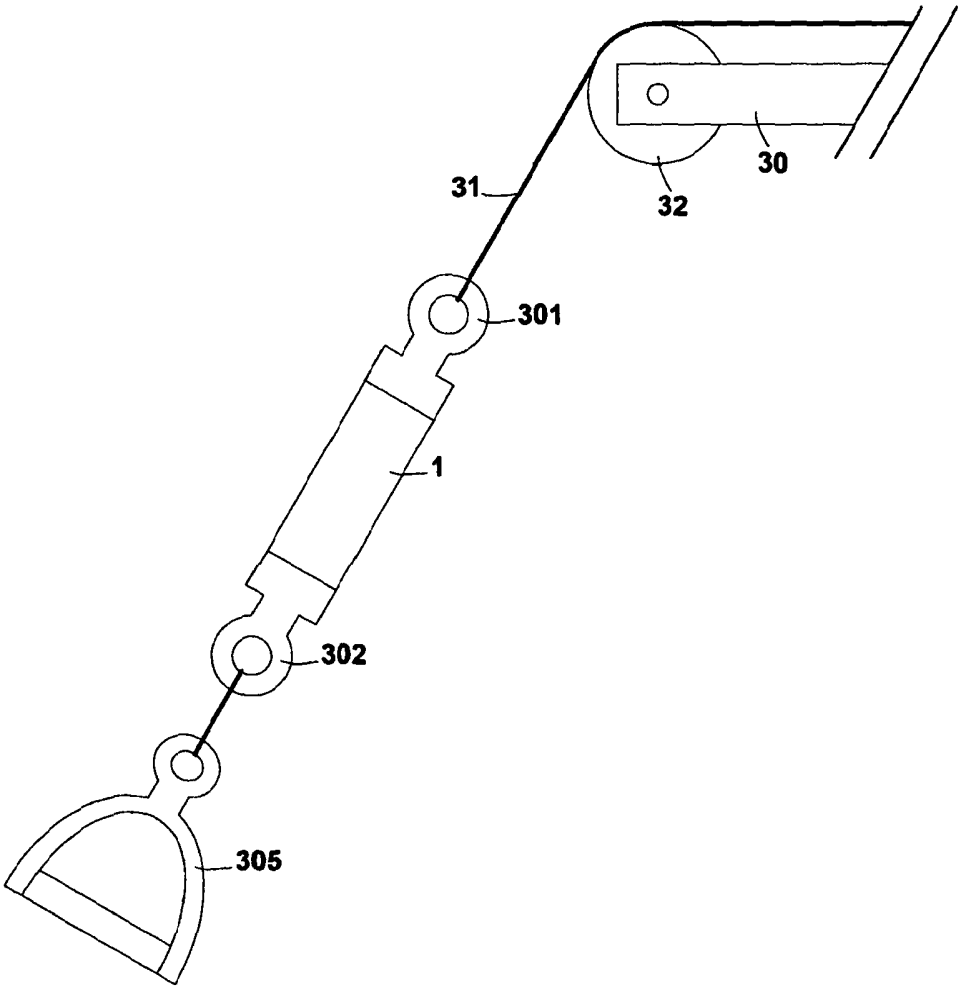

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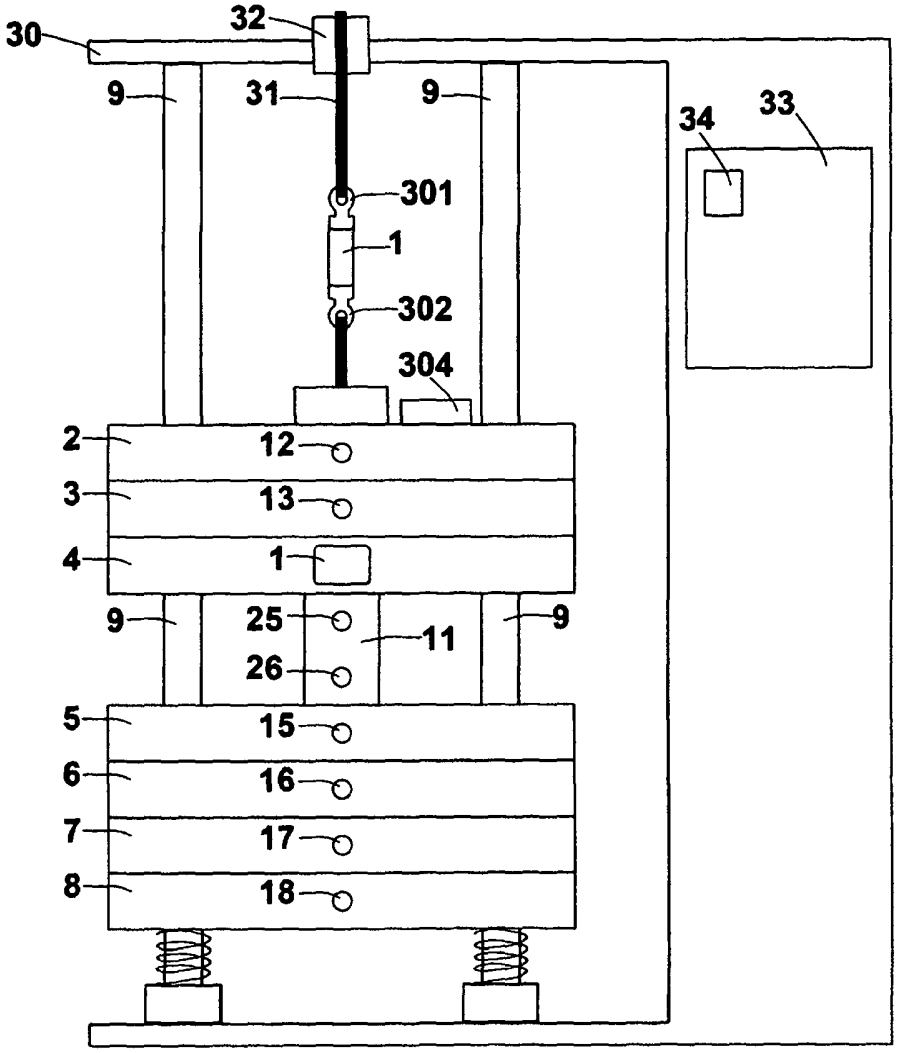
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Figure 19

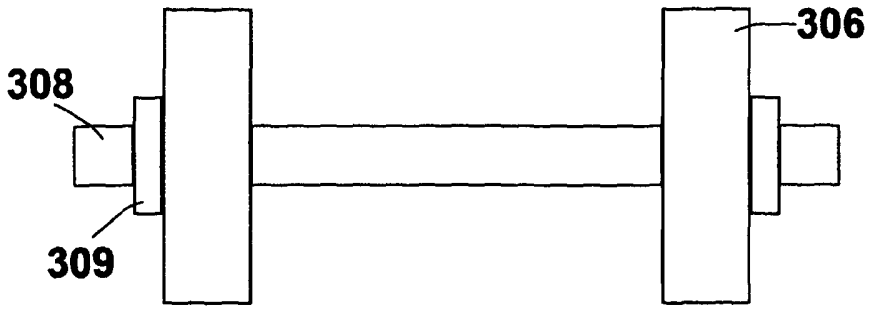

Figure 20

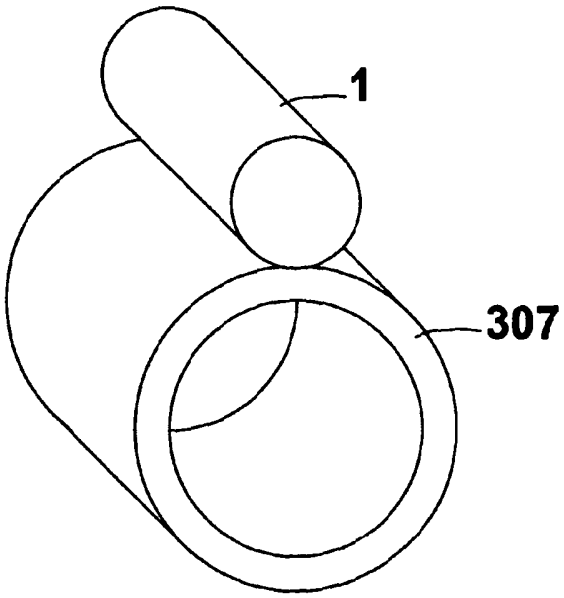

Figure 21

Device

This invention relates to a system, devices and methods to monitor, log and share details about the usage of exercise apparatuses and provide feedback to the user during and after training.

Most weight-stack machines as well as free-weights and dumbbells do not have any means to monitor or log how the machine is used. There is no precise way for the user to have exercise guidance apart from carrying a paper exercise plan chart/table. Furthermore there is no precise way for the user to have accurate real time feedback of their exercise performance, nor to have a log of the exercise session data (such as the amount of work done, range of motion, speed etc). Also there is no way for the user to have feedback on whether the load they have selected is the correct one according to the exercise plan.

To overcome one or more of the above mentioned, the present invention proposes a system (from now on referred to as the M-System) comprising at least one device (from now on referred to as the Selector-Key) which is coupled to at least one of said apparatus's parts designed to generate a reaction to a driving action applied by the user or displaced during user exercise in such a way that said displacement is correlated to, representative of or proportional to the user interaction with the apparatus.

The Selector-Key is a device for acquiring static and dynamic exercise parameters, data and information correlated to and/or representative of the user interaction with the exercise apparatus such device is coupled to and which comprises:

- coupling means to allow it to be mechanically or physically coupled to at least one of said apparatus's parts designed to generate a reaction to a driving action applied by the user or displaced during user exercise in such a way that said displacement is correlated to, representative of or proportional to the user interaction with the apparatus;
- selected load detection means to acquire data representative of and/or correlated to the load selected for exercising;
- means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load

Although the Selector-Key can be used in a stand alone mode by storing the acquired data, parameters and information on an onboard storage device (such as memory card and/or memory IC) it can also have wireless connectivity means which allow communication with external devices to which to stream the acquired data, information and parameter (either in real time or otherwise). Such external devices which include mobile phones, devices, computers, computing devices and networking devices can be used also for configuring the Selector-Key and/or input data (sent to the Selector-Key) and/or read any data from the Selector-Key.

Said Selector-Key acquires statics and dynamics parameters, data and information correlated to and/or representative of the user interaction with the exercise apparatus and/or of the movements of one or more parts of the exercise apparatus caused by the exchange of forces between the user and the exercising apparatus.

The Selector-Key can use any of the acquired statics and dynamics parameters, data and information to derive or compute additional information (by way of example if acceleration is measured, velocity can be derived).

The Selector-Key can store any of the acquired and derived data and information onto fixed or removable data storage devices. Said storage devices can be removable (such as USB flash drives, micro SD memory cards or any other memory card) or non-removable from the Selector-Key.

The Selector-Key can connect to external devices through wireless means such as Bluetooth, GPRS, WiFi, ZigBee and/or any other wireless connection or connectivity means.

The Selector-Key can connect to external devices also through a number of wired connections such as USB, Firewire and Ethernet.

The Selector-Key can use the wireless connection to connect to external devices such as mobile phone, mobile devices, PCs and networks to stream and/or share any of the acquired and/or derived data and information. Any of the streamed and/or shared data and information can be stored locally to the device it has been sent to and/or remotely.

Any of the acquired and derived data can be streamed in real time and/or at a later stage, wirelessly and/or through wired connection, to a number of local and remote devices including mobile phones, mobile devices, PCs and wireless networks. This allows the device the data and information are streamed to provide feedback (in real time or otherwise) to the trainer who might be watching and analyzing the data locally to where the exercise apparatus is or remotely from another are in the gym or from home.

The Selector-Key has means to interface to a device (from now on referred to as Block-ID) which is mechanically coupled to the displaced load or any other part of the exercise apparatus displaced during exercise and whose primarily function is to provide identification information of the selected weight-block and/or the load displaced.

The Selector-Key gains information about the selected and/or displaced load through the communication with the Block-ID and/or through manual input from the user-interface means which are part of the Selector-Key and/or through external devices (such as, by way of example, mobile phones and mobile devices) which have means to receive user input and communicate with the Select-Key to send such information.

The ideal configuration of the M-System comprises the Selector-Key, Block-IDs coupled to the weight-blocks of an exercise apparatus such as a weight-stack exercise machine and/or coupled to dumbbells and a mobile device (by way of example an iPod Touch or iPhone) with wireless connectivity to the Selector-Key (to communicate/transmit data in either or both directions). Alternatively, if no Block-ID are installed, the user inputes the selected weight manually on the Selector-Key and/or on the mobile device (from which it is then sent to the Selector-Key).

The Selector-Key by itself and/or in conjunction with external sensors and/or external devices can monitor, measure, calculate, estimate, compute, log, store, share, send, analyze and stream information and data correlated to and/or representative of the user interaction with the exercise apparatus the Selector-Key is coupled to. Such information and data include but are not limited to: static and dynamic parameters of the displaced load, number of sets, repetitions, weight selected, load displaced, displaced load speed, displaced load velocity, displaced load acceleration, range of motion, energy input, power input and calories burned.

The Selector-Key has a number of means to detect the configuration of the exercise apparatus set by the user, any of its state variations and its state at any point in time. Such means include means to acquire/measure the weight selected by the user and a number of means to acquire/measure information about the displacement of the selected weights during exercise such as speed, velocity, acceleration and position, and a number of means to acquire/measure interaction/forces applied by the user to any part/component of the exercise apparatus.

Other inputs to the Selector-Key include wired and wireless, contact and contactless means to identify the user and they include fingerprint sensors, USB flash drives,

memory cards, RFID bracelets, RFID cards, RFID keyfobs, RFID pendants, key-shaped storage devices and other devices/means that can achieve such goal.

The Selector-Key also has means to connect to apparatus which detects the user's bio-signals (such as heart-rate, hydration level etc) and receive data representing such signals. Once such signals are received, they can be time-stamped, correlated to the exercise data and stored on to local or remote storage devices. That data can also be streamed to any mobile device connected. Examples of bio-signals monitoring equipment include wireless heart-rate monitors such as the Polar heart-rate monitors. Other bio-signals which the M-System can interface to include, and are not limited to, hydration sensors, oxymeter, electromyogram sensors, EEG sensors, user's body temperature sensors, oxygen consumption sensors, breath volume sensors, lung capacity sensors, breathing speed sensors, breath flow-meter.

The user can provide input to the Selector-Key through a number of input means such as buttons, keypads, keyboards, touch-screens, switches, sliders (mechanical or not – i.e. Q-touch or M-touch types).

The Selector-Key can detect the user's presence through optical/infrared detectors and/or through proximity sensors and/or by the user being having his wireless/RFID ID device within a certain range of the Selector-Key.

Some of the Selector-Key outputs include a number of means to provide feedback to the user. Such means include, and are not limited to, any visual/optical output device such as displays, lights, LEDs and sound-emitting devices such as speakers, beepers, sounders. Voice cueing also provides audio feedback on a number of parameters or information before, during and after exercise. User feedback includes sets to do, current set and remaining sets, repetitions to do, current repetition and remaining repetitions, weight selected. It also includes minimum, maximum, average, target and ideal values of any of the following (whether measured or calculated/derived): velocity/speed of displacing weights, user energy input, user power input, calories burned. Connectors to headphones and earphones allow the user to have feedback while without disturbing other users nearby.

A voice queuing mean can convert any data, parameter or information acquire, derived or computed which needs to be conveyed to the user, into sound (voice) and relayed via Bluetooth to any device the Selector-Key is connected to. This allows the user to hear the information instead of having to look at it on a display.

The Selector-Key includes a number of means to store any acquired or derived/generated data such as removable and non removable memory storage devices. Data can also be stored in the same device used to ID the user. Examples of

removable storage devices, which could also be used as means to ID the user, include, and are not limited to, USB flash drives, memory cards, RFID bracelets, RFID cards, RFID keyfobs, RFID pendants and key-shaped storage devices.

The Selector-Key includes a number of means to connect to any external network, peripheral or device wirelessly or through wired connections. Examples include, and are not limited to, WiFi, Ethernet, ZigBee, Bluetooth.

Such connectivity means can be used to send and/or receive data between the Selector-Key and any connected devices such as routers, PDAs, PCs, hand-held terminals. Examples include, and are not limited to, WiFi, Ethernet, ZigBee, Bluetooth. Any of the connectivity means can also be used to share any acquired and/or generated exercise session data across a network and/or the internet. Any of the connectivity means also allows to store remotely any exercise session data to allow the user to access it through the internet. Other functionality of the connectivity include remote configuration of the device, monitoring of the exercise apparatus performance/usage, analysis of acquired/derived data, real time monitoring of the apparatus and the way in which it is being used, monitoring of the user's performance which include making sure people heart-rate do not exceed the safe level for their age/abilities.

Apart from the real-time feedback to the user, the Selector-Key allows the data to be stored, locally and/or remotely, for further user. This includes analysis, comparison with previous sessions, setup of next session's exercise targets. Data can also be used for reporting so the user can have a visual record of previous sessions and also proof of any personal improvements.

One preferred configuration of the M-System comprises a number of Block-ID (further described below), a number of Selector-Keys (usually one – described below) and a number of devices comprising user interface means such as a mobile device (by way of example iPhone and iPod Touch) and/or custom control panels from now on referred to Control-Panel.

A device from now on referred to as Block-ID has means to be uniquely identified by a weigh-block selecting Selector-Key. One Block-ID is attached to each weight block of a weight-stack exercise machine in such a way that the information/data allowing the unique identification of such Block-ID can be communicated to, or retrieved by, the Selector-Key when it is inserted into a weight-block so to select the desired weight or when the Selector-Key is in any way coupled to that specific weight-block.

The Selector-Key comprises a preferably removable pin which in inserted in the hole of the weight-block to be selected for exercising as in most conventional weight-stack

machines and it also has means to retrieve the unique ID of the Block-ID coupled to the weight-block the Selector-Key selects.

The Selector-Key has also means to measure, derive or calculate acceleration, velocity and position of the displaced weights at any given time. The Selector-Key comprises a number of accelerometers arranged so that they can acquire acceleration of the displaced load in at least the main displacing direction, but preferable along all three XYZ axis.

The Block-ID has contact and/or contactless means to communicate to/with the selector key the unique ID.

The Block-ID's unique ID can be represented by a resistor value read through contacts between the Block-ID and the Selector-Key, by an ID stored in a memory/IC electrically connected to the Selector-Key when it selects the weight the Block-ID is coupled to, by an ID stored in an RFID tag and/or by an ID stored in a memory/IC/tag/electronic-system which can be read by the Selector-Key through inductive coupling, capacitive coupling RF coupling, optical coupling or any other contactless means.

Coupling is such that only the Block-ID of the selected weight is read/identified by the Selector-Key or communicated to it. One way to do this is to have the Block-ID so that it contains an RFID tag whose coil/antenna is positioned along the same axis of the hole the weight-block through which the Selector-Key is inserted when selecting a weight. The Selector-Key's metal pin then acts as a coupling mean between the coils/antennas of the tag in the Block-ID and the reader in the Selector-Key. By adjusting the reader's power the coupling occurs only between the Selector-Key and the Block-ID it is inserted through, making sure the Selector-Key reads only the Block-ID it is inserted through.

Another way to ensure that only the ID of the selected weight's Block-ID can be detected by, or is communicated to, the Selector-Key is to have the electrical contacts that allow communication between the Selector-Key and the Block-ID arranged in such a way that when inserted into the Block-ID, the Selector-Key contacts only mate/touch the contacts of the selected weight's Block-ID and not those of the nearby Block-IDs.

Any device part of the M-System, such as the Selector-Key can be powered by a number of means which include, and are not limited to, non-rechargeable batteries, rechargeable batteries, fast-charging batteries such as the A123, supercaps, ultracaps/ELDCs (electric double-layer capacitors), mains, mains power adaptors.

Depending on the Selector-Key design, configuration and power consumption, rechargeable energy-storage devices such as ELDCs, super-capacitors or capacitors, rechargeable batteries, fast-charging batteries such as A123 can be used, allowing the system to not require mains power and leads going to a mains socket.

If relatively fast rechargeable energy-storage devices such as ELDCs, super-capacitors or capacitor are used, they can be recharged through a portable charging device for ease of use. The Selector-Key can be connected to any of the charging device energy storage devices/systems and top-up/recharge it when required. The Selector-Key would send a signal to the charger and/or to any connected/networked devices/PCs when the energy-storage device energy level is below a certain threshold (i.e. requires recharging). Alternatively the Selector-Key, can be put into a charging stand when it requires charging.

At any time the user can query the Selector-Key on what exercise is next in the programmed schedule. This is especially useful after completing an exercise when the user is informed by the Selector-Key which exercise/machine has to be done/used next. This same information can be given to the user through dedicated devices and/or PCs which can ID the user. Such dedicated devices and/or PCs identify the user through fingerprint sensing and/or by reading his ID device (smartcard, RDIF device etc). Information about the latest exercise is accessed online and/or on the ID device, compared with the exercise program and the information given to the user.

While resting between sets and/or according to user preferences, the Selector-Key informs the user (directly and/or through any connected devices which can provide audio and/or visual output to the user) when it's time to start the next set, making sure that the user has the correct amount of rest between sets (not too short, not too long) resulting in increase of exercise efficiency and effectiveness. The rest time between sets is programmed when setting up the workout.

Before starting exercise, if the user chooses so, he can be provided with a countdown to start. The same can be configured to happen between repetitions when the resting time is about to be over.

Once the user IDs himself into the exercise machine, the weight he needs to select (according to the pre-programmed exercise program) as well as any other instruction on setting up the machine and/or on the specific exercise can be provided via the Control-Panel visually (i.e. through a display or LEDs) and/or auditory (i.e. voice cueing).

The Selector-Key coupling means include and are not limited to a number of each of the following:

- magnets
- pins
- rods
- removable magnets
- locking mechanisms
- suction forming mechanisms
- vacuum forming mechanisms
- adhesive backing
- adhesive means
- sticky backing
- sticky means
- clips
- clipping means
- any means to couple to a surface so the device can be removed

Coupling means are preferably (but not necessarily) interchangeable allowing coupling to different surfaces and/or objects. Coupling means include any means which allow coupling of the Selector-Key to free-weights, dumbbells, weight-blocks of a weight-stack exercise apparatus, top-surface of a weight-stack exercise apparatus, inline load-displacement means such as cables, belts and chains. In this latter configuration the Selector-Key can be placed between any two points of the load-displacement means so that if required, the force exerted during exercise can also be measured/acquired.

Other coupling means include bracelets so that the user can couple the Selector-Key to their wrists, arms, ankles or legs or any other part of their body which during user exercise moves in such a way that is correlated to, representative of or proportional to the user interaction with the apparatus. This configuration would allow the user to walk around the gym (or any training area) without the need to keep coupling the Selector-Key to different exercise apparatuses every time he/she uses a different one. Being connected to their wrist it can be effortlessly carried with them at all time (worn like a watch). It would in all effects monitor the movements of the user's wrists, arms, ankles or legs directly. In this case the selected-load information is acquired from external sensors (sending it to the Selector-Key preferably wirelessly) and/or through the user inputting it manually into the Selector-Key user interface (i.e. through the Selector-Key input means) and/or into any external device (i.e. a mobile phone or portable/mobile device) which is connected and/or interfaced to the Selector-Key.

In any configuration, but especially when being worn on the body (for example as a watch-like device) the exercise-apparatus currently used by the user can be detected by the Selector-Key through RFID or similar proximity ID means which can be installed on a part of the exercise apparatus which the user interacts with, during exercise, in such a way that the Selector-Key is close enough to communicate with it and retrieve data or information stored in it (which would identify the exercise apparatus). The RFID or similar ID device should have the range tuned in such a way that it communicates and supply the data to the Selector-Key when it is close enough as to be sure the user is using the exercise apparatus for exercise yet prevent communication with any other devices or Selector-Keys which are close by but not supposed to be interacting with it (i.e. another user's Selector-Key).

The Selector-Key coupling means can also act as load selecting means for example by being a pin/rod shaped and protruding from the Selector-Key main enclosure so that such pin/rod can be inserted into the selecting hole of a weight-block in a weight-stack exercise apparatus so to select a particular load.

The Selector-Key can also have coupling means such as hooks to allow the coupling of the Selector-Key between the load displacing means (such as rope, cable, belt, chain) and the weight-stack displaceable load or between the load displacing means (such as rope, cable, belt, chain) and the handling means used by the user to interact with the exercise apparatus during exercise. This is done so to acquire, through on-board force/load sensors, the force applied on the load-displacing means (such as rope, cable, belt, chain) and a more direct and accurate measurement of the displaced load.

Accelerometers, gyroscopes and load/force sensors can be used to acquire any data, information and parameter correlated to and/or representative of the user exercise and/or interaction with the exercise apparatus.

A exercise program can be stored in the Selector-Key and instructions and information about the current and/or the next exercise can be given to the user through user interface which include audio and visual feedback either directly from the Selector-Key and/or through any external device the Selector-Key is interfaced to and/or connected to.

Before beginning an exercise set the user is prompted with the weight to be selected. If the exercise apparatus has Block-ID, once the user inserts the Selector-Key into the selector-hole the Selector-Key informs him/her of whether the selection is the correct one. If the exercise apparatus does not use Block-ID or the user prefers to couple the Selector-Key with the apparatus in such a way that the Block-ID does not communicate with the Selector-Key, the user is prompted with the weight to be

selected and asked confirmation of whether the correct load has been selected. Once the use has selected the correct weight, he/she can confirm the completion of such operation by pressing a button on the Selector-Key. To inform the Selector-Key that a set has been completed, the user can then press another button and the Selector key can the supply information and settings of the next exercise. If Block-IDs are used, the removal from the weight-stack can be detected automatically and suggestions about the next exercise or settings are then provided to the user.

The M-System or any of its devices (such as the Selector-Key and/or the Block-ID) can be a retrofit and/or part of and/or designed into and/or designed as part of an exercise apparatus.

Covered by this document is also any exercise apparatus including and not limited to dumbbells, free-weights, weight-stack exercise equipment and accessories for exercise apparatuses which contain and/or incorporate and/or use one or more of the above described (or similar to the above described) M-System and/or the Selector-Key and/or the Block-ID type. OEM solutions/apparatuses which use any of the above described (or similar to the above described) M-System and/or the Selector-Key and/or the Block-ID type are also covered by this document.

Some of the advantages are that the M-System can be easily and quickly installed onto most weight-stack machines, including those which don't have any electronic feedback system.

The Selector-Key can also be used in stand-alone with exercise equipments which does not have Block-ID installed (which they would otherwise provide automatic load-selection information to the Selector-Key). This is achieved by manually inputting the load selected directly on the Selector-Key through it's user interface means and/or through any external devices such as wireless mobile devices and phones (i.e. iPhone and iPod Touch) which have user input means and which can then send to the Selector-Key the data/information inputted by the user.

The Selector-Key can be used as a exercise data acquisition and storage system so that all the exercise data is stored locally, but the same data can also be send to external devices (i.e. mobile phones, mobile devices, networks and computers or computing devices). The advantage of storing data locally (for example on a removable micro SD card) or remotely (on/through the internet or any other network) is for later analysis and record-keeping to monitor improvements or changes across time s well as comparing performance and/or exercise plans and data with other users. The advantage of streaming it to external devices such as hand-held terminals, mobile

phones, mobile devices or computers is that the user can have real time feedback on any exercise parameter/data and the trainer can monitor the user without having to be next to him. Furthermore the trainer can compare the current performance data with previous workouts and give real time feedback to the user on how well she/he is doing.

Furthermore the M-System (or the Selector-Key by itself) helps the user to improve his exercising by providing real-time feedback. This real-time feedback includes, and is not limited to, informing the user when he is exercising inside or outside certain training parameters/boundaries (such as minimum, maximum or ideal exercising pace) which could be set by the user himself and/or by the trainer. This increases the regularity in the exercise.

By logging the number of repetitions in every set and the dynamics of each of them (such as progression, speed, velocity, acceleration, travel of user's movement, etc) a historic record can be created and analyzed. Exercising patterns and performance can be analyzed and compared. Comparison of the training performance of the same user in time provides an objective record/proof of his improvements. Comparison between various users can also be done. This is particularly useful for training competitions and for professional athletes, especially within the same team.

The data can also be used by the user himself and/or by a trainer to spot incorrect exercising patterns. The trainer and/or the gym can also monitor if certain safety conditions are achieved by a user. This is done by programming the maximum safe heart rate for the user and if it is reached, the trainer/gym-supervisor is informed (this could be especially important to monitor people with conditions – and increase peace of mind for the gym's management).

All the training session data can also be stored and used at a later time for data-sets comparison across time to notice and analyze user's improvements. Examples of this use include increase in weights/loads used and/or repetitions/sets one month from the next.

The data recorded can be stored on a server and accessed by the user and/or his trainer. The online-stored data allow the user to share it and enter online competitions such comparing best improvement in the shortest time or best performance in a particular exercise.

The user can log on online and view all hi history and print it out.

The user and the trainer can login online to see previous sessions, print it out, create a new training program, modify the current one and create a special training session. When doing this, they can program online the weight and the

When modifying or creating a training program, the user or trainer can create a program that remains the same until next time it is modified, or a program that changes according to the day of the week and also across weeks (i.e. increase the weight in time).

After completing an exercise and/or at any moment, the user can query what exercise/s needs to be done next, making sure the exercises are carried out in the correct sequence.

The M-System (or the Selector-Key by itself) can also be used to measure the level of fitness of a user when first joining a gym or at any time, which helps the trainer designing a correct training program.

The M-System (or the Selector-Key directly) can also inform the user if he/she is doing the exercise correctly and/or within safe parameters as well as whether or not he/she has setup the training equipment correctly for the exercise (i.e. correct weight). The M-System (or the Selector-Key directly or through any mobile devices it is interfaced to) can also advice the user on the speed/pace to be maintained during the exercise and whether to hold the weight in a certain position for a certain amount of time. The M-System (or the Selector-Key directly or through any mobile devices it is interfaced to) can also provide audio incentives/feedback to the user according to his/her performance. The user can also send an SMS to the user's mobile phone with the summary of the workout and/or any other pre-selected/preferred data/information (such as new achievements etc). Alternatively, instead of SMS, GMS/GPRS can be used to send the same data to the mobile phone and a dedicated app (especially for the iPhone) can then be used to see all the latest and historic data.

For users which use only machines, the paper log can be entirely removed as all training data is stored.

By informing the user while resting between sets when it's time to start another set, increases exercise efficiency and effectiveness.

The gym can increase their health & safety measures through monitoring of how the users use the machine, of how a machine was used if something happens and monitor members which have conditions (i.e. their heart rate was over the limit)

User feedback includes instantaneous power indication, calories burned, new records, over-achievements and similar ones can increase motivation.

Encouragements based on performance also increase user's motivation.

By providing instant feedback on whether the user is training at the correct pace it helps improving the exercising and its effectiveness/efficiency.

Planning in advance a week training session and/or creating a monthly pan also helps the user to create targets/goals and measure his achievements compared to the target plan.

The user can monitor their progress in time and the trainer can use the data to suggest changes in the training program.

Voice cueing prevents having to look into display and also acts as a virtual trainer. This and any of the other functionality mentioned can be sold to the users by the gym as part of an upgraded package and activated upon payment.

Users can also compare their training data with other users, creating helthy competition and encouraging exercising.

The M-System can either be a retro-fit which can be easily installed into any existing weight-stack training equipment or designed into exercise apparatuses and/or installed on exercise apparatuses by an OEM.

Other advantages include, when coupled to the body, being effortlessly carried with them at all time (for example worn like a watch).

Figure 1 shows a weight-stack machine also known as stack machine (a classic exercise equipment found in most gyms) where no weight is selected and the cable-connected bar is lifted due to the user using the machine.

Figure 2 shows a weight-stack machine where the top three weights are selected and lifted due to the user using the machine.

Figure 3 shows a weight-stack machine where the Block-ID are installed and the top three weights are selected through a Selector-Key and lifted due to the user using the machine.

Figure 4 shows a Selector-Key

Figure 5 shows a Selector-Key

Figure 6 shows a weight coupled with a Block-ID

Figure 7 shows a weight coupled with a Block-ID using an RFID tag as means to uniquely ID the Block-ID

Figure 8 shows a weight coupled with a Block-ID using an IC as means to uniquely ID the Block-ID

Figure 9 shows a weight coupled with a Block-ID using resistor as means to uniquely ID the Block-ID

Figure 10 shows cross sections of a Selector-Key, a weight block and a Block-ID where the Selector-Key is not inserted into the Block-ID and cannot acquire any information about the Block-ID

Figure 11 shows cross sections of a Selector-Key, a weight block and a Block-ID where the Selector-Key is partially inserted and can acquire information about the Block-ID only through contactless/wireless means such as RFID coupling achieved through the metal pin

Figure 12 shows cross sections of a Selector-Key, a weight block and a Block-ID where the Selector-Key is fully inserted and can acquire information about the Block-ID through contactless/wireless means such as RFID coupling achieved through the metal pin as well as through contacts means.

Figure 13 shows a front view inside Selector-Key with the accelerometer at an angle.

Figure 14 shows a front view inside Selector-Key with the accelerometer at an angle and moving up.

Figure 15 shows a front view inside Selector-Key with the accelerometer at an angle and moving down.

Figure 16 shows the Control-Panel which provides user interface means

Figure 17 shows the Selector-Key with attached coupling means which allow its interfacing in line with the cable (i.e. between two cables which would be otherwise forming the same cable or between the cable and the handle or between the cable and the topmost part of the displaced load) displacing the load so to measure the force applied to the cable. This usage is better shown in figures 18 and 19. This configuration allows measuring of the force pulling the two coupling sides/hooks in opposite directions if a force sensor is incorporated into the Selector-Key or the coupling means.

Figure 18 shows the Selector-Key in the configuration shown in Figure 17 used between the cable and the handle grabbed by the user for exercising.

Figure 19 shows the Selector-Key in the configuration shown in Figure 17 used between the cable and the topmost part fo the displaceable load (i.e. the top of the weight-stack).

Figure 20 shows a dumbbell with the Selector-Key coupled to it.

Figure 21 shows a bracelet as means of coupling the Selector-Key to the user's wrist, ankle, arm or leg

A classic weight-stack exercise apparatus 30 consists of a number of weight blocks 2 to 8 (also marked as 64 in figures 6 to 9). During exercise, the selected weights slide along guides 9 which pass through guiding holes 65 that every hole has and that constrain the weight block displacement mainly along one axis. A selector bar 11 can slide vertically through each weight's selector-bar holes 91 that each weight block has. The selector-bar 11 is connected to a cable 31 which runs through a number of pulleys such as 32 to allow, during the user exercising, the displacement of the selector-bar and any selected load coupled to it.

The coupling of the selected load to the selector-bar is made by inserting a metal pin such as 63 of Selector-Key 1 through the weight-block pin-hole 92 of the lowest weight of the load stack the user wants to displace. For example, the selector pin 63 of Selector-Key 1, can be inserted through any one of the weight-block pin-holes 12 to 18 (respectively of weight blocks 2 to 8) and the corresponding selector-bar holes 22 to 28 (preferably the corresponding one when selector bar 11 is in its resting position) to select a certain load to be displaced. This insertion/selection operation effectively couples the weight-block to the selector bar so when the user starts exercising, the load comprising all the weight-blocks including and above the weight block through which the pin has been inserted, is displaced. In other words when cable 31 is displaced bar 11, the selector pin 63 of Selector-Key 1 (hence Selector-Key 1 itself), the selected weight block and all weight blocks above the selected weight block are displaced. By inserting the pin in different weight-block pin-holes, different load is selected effectively changing the force the user has to apply to perform the same exercise.

Figure 1, show vertical displacement of selector-bar 11 caused by the user exercise, where all weight blocks are at rest because no selector pin was inserted into any of the weight blocks.

When the user does not interact with the machine, gravity forces the bar 11 to rest on top of the weight stack. In such position hole 22 is aligned with hole 12 of weight block 2, hole 23 aligned with 13 of weight block 3 and so on so that holes 12 to 18 are aligned with holes 22 to 22 respectively. From such rest position, pin 63 of the

Selector-Key 1 can be inserted into any of the weight-block pin-holes 12 to 18 and corresponding selector-bar holes 22 to 28 so that when the user exercises, the selected weight is displaced. This is better shown in figure 3 where 63 of Selector-Key 1 is inserted through weight-block pin-hole 14 (better shown in Figure 1) and through selector-bar hole 24 (better shown in Figure 1) causing the lifting of weight block 4 and all weights above it when the user exercises.

The Selector-Key has coupling means to allow it to be coupled to at least one of the exercise apparatus's parts designed to generate a reaction to a driving action applied by the user or displaced during user exercise in such a way that said displacement is correlated to, representative of or proportional to the user interaction with the apparatus. Such coupling means include but are not limited to pin 63 as mentioned above, magnets, adhesive means such as self adhesive labels, adhesive patches and adhesive substances or materials. Different means allow the coupling of the Selector-Key to different parts of the exercise apparatus as well as to other exercise apparatuses such as free-weights and dumbbells. For example the Selector-Key 1 could be positioned on top of the topmost surface of the displaced load such as shown by 304 (at the topmost surface of the displaced load in a weight-stack exercise equipment). Alternatively it can be positioned /coupled to the side surface of a free weight or dumbbell 306 as shown by 308.

The coupling means include hooking means such as 301 and 302 (or any other similar coupling means) which allow the Selector-Key to be coupled with the cable (or similar means/parts) of the exercise apparatus so that it can directly or indirectly measure the force applied on the cable by the user during exercise. This is related to the load displaced hence allowing the acquisition of such data directly or indirectly by the Selector-Key. One way to achieve this is by making the coupling means so that they can be connected in line with the load-displacing cable so that under load-displacement they would be pulled in opposite directions. Such coupling means would (ideally) also comprise means to sense the force pulling them in opposite directions and relay the measurement to the Selector-Key. Alternatively such force measuring/sensing means can be implemented inside the Selector-Key. This solution is shown in Figure 18 and Figure 19. In Figure 18 the coupling means allow the connection of the Selector-Key between the cable 31 and the handle305. In Figure 19 the coupling means allow the connection of the Selector-Key between the cable 31 and the top of the selector bar 11. The same coupling means could also allow the coupling of the Selector-Key between one cable and another cable that would otherwise form one single cable.

When a force is applied across the coupling means such as a force pulling 301 and 302 in opposite directions, such force can be measured by a sensor on the coupling means and/or by a sensor inside the Selector-Key which is coupled to the coupling means in such a way as to measure such force.

Coupling means include bracelets 307 so that the user can couple the Selector-Key to their wrists, arms, ankles or legs or any other part of their body which during user exercise moves in such a way that is correlated to, representative of or proportional to the user interaction with the apparatus. This configuration would allow the user to walk around the gym (or any training area) without the need to keep coupling the Selector-Key to different exercise apparatuses every time he/she uses a different one. It would in all effects monitor the movements of the user's wrists, arms, ankles or legs directly. In this case the selected-load information is acquired from external sensors (sending it to the Selector-Key preferably wirelessly) and/or through the user inputting it manually into the Selector-Key user interface (i.e. through the Selector-Key input means) and/or into any external device (i.e. a mobile phone or portable/mobile device) which is connected and/or interfaced to the Selector-Key.

The coupling means can also be interchangeable so that for example different pins with different diameters can be interchanged according to the size of the weight-block pin-hole of the exercise apparatus the users desires to use. A selector pin can be removed or detached from the main body and another one of different size can be installed (i.e. coupled or screwed to the main body).

Another advantage of having the coupling means removable and interchangeable is that the Selector-Key can be coupled-to and used with different exercise apparatuses including free-weights and dumbbells. This is achieved for example by removing completely the selector pin and installing/coupling a magnetic device (i.e. a magnet) or using a magnet which can be permanently present in the Selector-Key main body to couple the Selector key to any magnetic or ferromagnetic surface/body (or any body which has high magnetic permeability and/or allows relatively strong coupling through a magnetic field).

Block-IDs 152 to 158 can be attached to the front surface of weight blocks 2 to 8 respectively. They provide means to allow unique identification of the weight block they are coupled to and/they represent information about the selected weight block and/or about the total displaced load when that particular weight-block is selected. Such information can be stored, coded, represented and supplied to the Selector-Key in a number of way and through a number of means.

In the configuration shown in Figure 3, the Block-IDs are attached to the weight blocks so that the Block-IDs hole such as 100 is aligned with the weight-block pin-hole 92 of the weight block the Block-ID is attached to.

Block-IDs can also be coupled/attached to a free-weight or dumbbell as shown by309. The Selector-Key (preferably with the pin removed) is then coupled to 306 so to communicate with 309 or directly to 309 as shown in Figure 20.

A general Block-ID 93 is shown in Figure 6 with 4 pins 96 to 99 which provide electrical contacts with the Selector-Key 1 through its traces 83 and 84.

Enclosure 66 houses some or all of the components of 93 and allows safe coupling/attaching of 93 to 64 through various means including adhesive means such as dual-side adhesive strip 62.

The weight selected is known by the Selector-Key by storing information on electronic components/systems in 93 which is then read by 1 when inserted through 93 or when in close proximity of 93 or when positioning is such as to represent or detect the selection of a particular load or weight-block. Such information can directly represent information of the selected weight-block or of the displaced load when a particular block is selected or be a unique ID which is then mapped (according to the specific exercise apparatus) to the equivalent overall displaced load by the Selector-Key or by any other device/computer/accessory (such as 33) which is connected/interfaced to/with the Selector-Key.

Communication/connection between the Selector-Key and the Block-ID can be contact and/or contactless. Information storage and/or information representation in 93 can also be achieved in different ways some of the major ones are now described.

Figure 9 show pins 96 and 97 which are connected to a resistor 101. Pins 98 and 99 are connected in parallel to the same resistor. Two pins would work, but four can increase reliability and spread the load more uniformly when 1 is pulled towards 93 through magnets 72 and 73 or other means. When 63 is fully inserted through the weight block, traces 83 and 84 contact with pins 96, 97, 98 and 99. This allows the electronics in 1 to sense the value of resistor 101. The value of resistor 101 is unique to every 93 within the weight stack (or stacks if more than one in the same machine) of the exercise equipment. This allows 1 to detect which weight it has been inserted into.

One example of working out with such system the overall weight selected/displaced is by Block-ID 152 to contain a resistor of value 7KOhm, Block-ID 153 a resistor of value 14KOhm, Block-ID 154 a resistor of value 21KOhm. The value of the resistor

read through the electronics in 1 and the microcontroller on 1 contains a map structure which maps the resistor value to the total weight displaced, for example 7KOhm value equates to 7Kg, 14KOhm resistor value equates to 14 Kg, 21KOhm resistor value equates to 21 Kg. The resistor values can be proportional to the total weight displaced or not.

Another mean to achieve a similar result is shown in figure 8 where pins 98 and 99 are connected to an IC (integrated circuit) 95 such as a memory device which contains a unique ID and which can supply/communicate it on request to a connected reader. A one-wire device such as Maxim One-Wire IC devices could be used to keep the number of contacts/pins/traces to a minimum. Other tag/memory ICs could be used, although if more lines are required for communication, more pins and traces would have to be provided.

One example of working out with such system the overall weight selected/displaced is by the IC in Block-ID 152 to contain a value representing 7Kg (for example 7), the IC in Block-ID 153 to contain a value representing 14Kg (for example 14), the IC in Block-ID 154 to contain a value representing 21Kg (for example 21). The values can be equal to the total weight displaced or not. If they are not, mapping means somewhere in 1 or within the M-System are required.

Contactless means to identify which Block-ID 93 in the stack the Selector-Key 1 is inserted into, is achieved as shown in figure 7. Here an RFID tag 130 contains a unique ID and/or a number representing the overall weight displaced if that particular weight-block is selected. The tag is connected to its coil/antenna 93 which is preferably arranged as shown in figure 7 so that 63 runs through it when inserted in 93. By having the reader's antenna 74 inside 1 wound around 63 as shown in Figures 10, 11 and 12, the metal pin 63 is can be used to increase coupling between the reader and the tag (i.e. between the respective antennas). This minimizes interference with nearby tags, decrease power required to read the tag and generally improve reliability.

If an RFID tag device or any RF and/or induction type device and/or capacitive type device are used, magnets such as 72 and 73 can activate a reed switch (or similar magnetically activated switch device) which closes a normally open antenna loop (or any radiating loop used for the communication of the data). Upon closing of the radiating loop, transmission range and/or performance is increased (or enabled) so that a matching receiver on the Selector-Key can communicate and retrieve information from that specific tag/device without interference from nearby tag/devices (which having their radiating loop/antenna circuit still open transmit in a detuned condition – reducing the range considerably - or not at all).

Another If an RFID tag device or any RF and/or induction type device and/or capacitive type device are used, magnets such as 72 and 73 can press the Selector-Key close enough to some exposed pads of the Block-ID so that a conductive are in the Selector-Key connects the pads together so to close a normally open antenna loop (or any radiating loop used for the communication of the data). Upon closing of the radiating loop, transmission range and/or performance is increased (or enabled) so that a matching receiver on the Selector-Key can communicate and retrieve information from that specific tag/device without interference from nearby tag/devices (which having their radiating loop/antenna circuit still open transmit in a detuned condition – reducing the range considerably - or not at all)

One example of working out with such system the overall weight selected/displaced is by the IC in Block-ID 152 to contain a value representing 7Kg (for example 7), the IC in Block-ID 153 to contain a value representing 14Kg (for example 14), the IC in Block-ID 154 to contain a value representing 21Kg (for example 21). The values can be equal to the total weight displaced or not. If they are not mapping means somewhere in 1 or within the M-System are required.

In Figure 10, 1 not inserted into 93 so pins 96, 97, 98 and 99 are not in contact with traces 83 and 84 preventing detection of the resistor/IC within 93 (i.e. contact solutions as shown in Figures 8 and 9). By tuning the power of the tag's reader inside 1 to the minimum required to read the tag in 93 once 63 is fully inserted through 93, when 1 is not inserted into 93 the tag could not be read. In this configuration the electronics in 1 can detect that 63 is not inserted. A signal can be sent to other devices or to user-interface panel 33 to inform the user of this "not-inserted" system status. This "not-inserted" status can also be indicated to the user through LEDs 90 and/or through display 88. When 1 is not inserted into any Block-ID, the display might flash green digits indicating the weight block the user is supposed to insert it into (according to the program stored in the M-System) and communicated by it to 1. When 1 is inserted into the wrong Block-ID (i.e. wrong weight selected) two digits might flash alternating in two different colors: red showing the currently selected weight (incorrect one) and then in green showing the correct weight to insert 1 into.

Figure 11 shows 1 partially inserted through 93. If RFID tag system is used even in this status the system can detect the selected weight and inform the user whether the chosen weight block is correct or not. If a resistor, IC or other contact means are used, at this stage 1 would not be able to detect the choice and would still assume that it has

not been inserted at all, unless a proximity sensor is used (which could also be used/implemented in the M-System and in 1). A proximity sensor can be used in any case to detect whether 1 is not fully inserted and inform the user to push 1 further into 93 to ensure full safety. In this "not fully inserted" status, magnets 73 coupled to 1 and magnet 72 coupled to 93 help pulling 1 and 93 together as shown in figure 12.

Figure 12 shows 1 fully inserted into 93 and kept into such position by the force of magnets 73 and 72. Pins 96, 97, 98 and 99 are pushed inwards by the corresponding traces 83 and 84 and outwards by springs 120, 121, 122 and 123 ensuring electrical contact between pins and traces.

Battery 78 can be recharged through the same pins system used for sensing resistor 101 but using one or more different traces. For example trace 83 could be assigned to be ground and 85 the trace connected to the battery or the on-board battery charging circuit. 1 could then inserted vertically into a charger so that the 63 points downwards and traces 83 and 85 are pushed by gravity against corresponding pins allowing electrical contacts for charging operation. Pins 86 can also be exposes through enclosure 82 so that power can be provided to the electronics inside 1 to recharge the battery 78.

Battery 78 can also be recharge through magnetic coupling (magnetic induction) through pin 63 and coil 75. The charger would have another coil into which 63 would slide. Through standard inductive coupling techniques power can be transferred between the charger and the electronics inside 1 which would then recharge the battery 78.

Accelerometer 76 on PCB 170 measures the acceleration along its two axis X and Y. Acceleration along the two axis of 76 is continuously measured. Figure 13 shows 72 when 1 is at rest so that only the gravitational acceleration (here represented by vector Ca) is affecting 76 (hence detected by 76). In this condition, 76 measures vectors Cy and Cx along both its detecting axis. By doing basic vector math (such as vector sum) vector Ca is calculated from the measurement of vectors Cx and Cy.

When 76 is subjected to upwards vertical displacement as shown in figure 14, or downwards as shown in figure 15, using the same vector sum principle just mentioned and taking into account the gravitational acceleration, the acceleration that 76 (hence of 1) is subjected to at any given moment can be calculated.

Using the acceleration and/or other measurements/data at the resting position at the beginning of the exercise as reference, velocity and position can also be determined.

All these information/data can be stored into the memory on 1 and/or transmitted to 33 and/or to any other devices/computers which care connected to 1. Because from the rest position the weights can only rise vertically upwards and because we know that gravity at rest is always measured and pointing downwards, the direction of travel of the displaced weights is always known.

By using the acquired information of the displaced weight and its acceleration, velocity and position at various moments in time and/or across various intervals in time, energy used, power input and other parameters can calculated, stored and shared with the user, any other parts of the system and any other connected devices/system/computers.

The Selector-Key is connected with one or more external devices such as portable devices, mobile devices, mobile phones and/or other accessories/devices such as the Control-Panel 33. This connection/connectivity is preferably wireless but in some cases can be through wires. Wireless connectivity of the Selector-Key include Bluetooth, GSM, GPRS, ZigBee and/or any other protocol which allows the correct data transfer. Bluetooth and GPRS can also be used for connection and data transfer with/to mobile phones so that data can be exchanged in one or both directions. This is a preferred configuration as nowadays people carry Bluetooth-enabled devices (such as Bluetooth-enabled MP3-players, iPod tough, iPod, iPhone and mobile phones in general) when training at the gym.

Prior to using the exercise apparatus, the user identifies him/herself by logging into the machine through one or more of the means shown in the control panel 33. Such means include punching in a code in the keyboard/keypad 45, by swiping a magnetic card 57 through it's reader 42, inserting/coupling a memory-key 56 into it's reader 41, inserting a chip and pin card or smart card such as 55 in its reader 40, placing the finger on the fingerprint reading sensor 36, inserting a USB flash drive 34 on the USB connector 39, placing RFID devices such as card 50 pendant 51 bracelet 52 and ring 53 within reading range of the RFID reader 35.

Alternatively he/she can login directly on the fingerprint sensor 89 on the Selector-Key and the login details-information is communicated wirelessly by 1 to any device connected to the Selector-Key or any other device part of the M-System such as the Control-Panel.

Additional accessories such as heart-rate, oxymeter, breath, lung-capacity and hydration monitors can be coupled to the electronics so that the bio signals measured by those sensors can be used by the Selector-Key and/or the M-System, logged, stored, shared and displayed to the user during and after exercise.

Prior to an exercise, the user is suggested by the Selector-Key the exercise apparatus and the configuration (i.e. load to be selected) to be used. The Selector-Key does this through any of the on board user interface means and/or through the user interface means of any device the Selector-Key is connected to.

After the user is logged into the system, the settings for the exercise have been uploaded from any of the devices used by the user also to login (such as 50, 51, 52, 53, 34, 55, 56, 57) and/or from any computer or device which is connected to the Selector-Key and/or from the Selector-Key's onboard memory. The load setting (i.e. which weight block needs to be selected) for the first set is displayed on display 34 and/or on display 88 (in the preset or user-chosen units). If 1 is already inserted in the correct weight block, 88 displays the number in steady green digits. If 1 is not inserted into any weight blocks the digits on 88 are flashing in green. If 1 is inserted in an incorrect weight blocks the digits on 88 are alternating in red and green: red one showing the current selection and green the correct one. Audio instructions are also given through speaker 44 and to the user headphone/earphone through jack connector 43.

Audio feedback (speech and/or sound) can also be supplied by 1 through audio transducer 87.

The detection of the selected weight block is done by the electronics in 1 detecting in which weight block the Selector-Key is inserted. This is achieved by providing ID means on the Block-ID unique (at least within the stack in the same machine) to each weight block. Such ID can be resistors, IC, RFID tags or any other mean/devices which can allow 1 to identify which Block-ID it is inserted into.

The Selector-Key senses in which weight block the Selector-Key is inserted as well as the acceleration (and any other dynamics information/data) of the displaced load or any other part of the exercise apparatus which is designed to move as a consequence of user interaction during exercise (and which represent or is correlated to the user input). During exercise any of the acquired and/or derived/computed data is stored on the onboard storage means and/or streamed in real time to external devices such as mobile devices, mobile phones and network's wireless receivers. One preferred configuration is to interface the Selector-Key to an iPhone, iPod Touch (or any other similar portable device) which runs an application that acts as a control panel to configure the Selector-Key as well as a mean to receive, store, share online and output the data to the user in real time (or otherwise). The Selector-Key could transmit through a Bluetooth link to the mobile device data and/or voice commands/information (directly as audio). This allows the user to receive feedback in real time as if a human trainer is talking to him/her.

By knowing how much weight has been displaced and the dynamic information about the load displacement such as direction, speed, acceleration, a complete log of the exercise is created. This includes details about the progression, energy and power during every repetition of every set.

Once the user has selected the correct weight the Selector-Key knows that it is in a rest position and starts acquiring data from accelerometer 76 calculating vertical velocity and position from then on. This data is stored on the Selector-Key and/or any other devices/computers connected to it and is displayed to the user through display 34. By knowing the vertical position the displaced weight at any given moment, range of motion feedback to the user is provided through LED bar 46.

Acceleration, velocity, position, range of motion, energy and power input from the user as well as any data from any heart-rate sensor, hydration sensor, breath sensor and any other sensor connected to the Selector-Key are logged, stored and sent to any device, network or computer connected to the Selector-Key and also shared or made available for sharing. Graphs, comparison charts and any other type of data presentation can then be used by the user and/or the trainer to analyze user performance, test their fitness and define future workout routines.

The Selector-Key, preferably without a selector-pin attached, can be coupled to free-weights and/or dumbbells to acquire position and movement information and then store, analyze, send and share it with external devices, computers, systems and networks the Selector-Key is coupled to. This coupling can be achieved through magnetic means part of, or coupled to, the Selector-Key and/or the dumbbell. Other coupling means include clipping means or devices.

The Selector-Key, preferably without a selector-pin attached, can be coupled to bracelets, bracelet-like devices or any other mean which can allow the coupling of the Selector-Key to a person's wrist, ankle, arm, leg or any other part of the body which is representative of the exercise movement carried out by the exercising user. This is done so to acquire position and movement information and then store, analyze, send and share it with external devices, computers, systems and networks the Selector-Key is coupled to. This coupling can be achieved through magnetic means part of, or coupled to, the Selector-Key and/or the dumbbell. Other coupling means include clipping means or devices.

Claims

1. A device for acquiring static and dynamic exercise parameters, data and information correlated to and/or representative of the user interaction with the exercise apparatus such device is coupled to and comprising:
    a. coupling means to allow it to be coupled to at least one of said apparatus's parts designed to generate a reaction to a driving action applied by the user or displaced during user exercise in such a way that said displacement is correlated to, representative of or proportional to the user interaction with the apparatus
    b. selected load detection means to acquire data representative of and/or correlated to the load selected for exercising
    c. means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load
    d. a number of connectivity means to external devices from which to receive information and/or to which to send any acquired and/or computed data, parameter or information

2. A device according to claim 1also comprising connectivity means to external devices from which to receive information and/or to which to send any acquired and/or computed data, parameter or information

3. A device according to claim 1 where the coupling means include but are not limited to a number of each of the following:
    a. magnets
    b. removable magnets
    c. locking mechanisms
    d. suction forming mechanisms
    e. vacuum forming mechanisms
    f. pins
    g. rods
    h. adhesive backing
    i. adhesive means
    j. sticky backing
    k. sticky means
    l. clips
    m. clipping means
    n. any means to couple to a surface so the device can be removed

4. A device according to claim 1 where a number of the coupling means also act as load selecting means

5. A device according to claim 0 where the load selecting means include but are not limited to

a. rods
b. hollow rods
c. sections
d. protrusions

which can be inserted into/through the load-selecting holes/cavities of weight blocks of a exercise apparatus' weight-stack so to achieve the same functionality of a load-selecting key commonly found in weight-stack exercise apparatus

6. A device according to claim 1 where the coupling means include but are not limited to:
    a. hooks
    b. loops
    c. interconnecting means

    which allow the coupling of the device to the cable, chain, belt, rope or other means used for the displacement of the selected load

7. A device according to claim 5 where the coupling means allow the coupling of the device with the cable, chain, belt, rope or other means used for the displacement of the selected load so that the device can acquire data and information about the statics and dynamics of the user exercise. This include, but is not limited to:
    a. between the cable and the handle used by the user to displace the weights during exercise
    b. between the cable and the part of the weight-stack (or weight-stack coupling means) which upon user interaction is displaced regardless of the selected weight

8. A device according to claim 1 where the coupling means include but are not limited to:
    a. bracelets
    b. bracelets-like devices
    c. loops
    d. coupling means

    which allow the coupling of the device to the wrist, the arm, the ankle, the leg or any other part of the user's body which during exercise moves in such a way that said movement is correlated to, representative of or proportional to the user exercise or exercise motion

9. A device according to claim 1 where the coupling means include but are not limited to:
    a. magnets
    b. clipping-means
    c. coupling means

which allow the coupling of the device to dumbbells and/or to free-weights which during exercise move in such a way that said movement is correlated to, representative of or proportional to the user exercise or exercise motion

10. A device according to claim 1 where a number of the coupling means are interchangeable so that different diameter load-selecting rods or pins can be attached or screwed to the device and/or removed so that the device is directly coupled to a surface through a number of magnets incorporated into the device itself and/or through a number of adhesive means

11. A device according to claim 1 where a number of the coupling means are interchangeable to allow the user to use/install the preferred one and/or the most appropriate one for a specific exercise and/or for a specific exercise apparatus

12. A device according to any one of the claims from 1 to 6 where a number of the coupling means are interchangeable

13. A device according to any one of the claims from 1 to 6 where a number of the coupling means are interchangeable to allow the user to use/install the preferred one and/or the most appropriate one for a specific exercise and/or for a specific exercise apparatus

14. A device according to any one of the claims from 1 to 6 where at least one coupling mean is fixed

15. A device according to claim 1 where the selected load detection means include manual input

16. A device according to claim 1 where the selected load detection means include but are not limited to:
    a. switches
    b. push buttons
    c. rotary switches
    d. rotary selectors
    e. capacitive-type input devices
    f. inductive-type input devices
    g. encoders
    h. any device or means which allows the user to input data, information or parameters manually

17. A device according to claim 1 where the selected load detection means include but are not limited to any electrical, electromechanical or electronic data input means and/or devices

18. A device according to claim 1 where the selected load detection means include but are not limited to manual input into a external devices to which the device is or can be connected to receive the information the user inputs. Such external devices includes but are not limited to:
    a. mobile phones
    b. mobile devices
    c. PDAs

19. A device according to claim 17 where the connection between such device and the external devices is wired and/or wireless

20. A device according to claim 17 where the connection between such device and the external devices is contact-type and/or contactless type

21. A device according to claim 17 where the connection between such device and the external devices is proximity-type

22. A device according to claim 17 where the connectivity between such device and the external device include but is not limited to:
    a. Bluetooth
    b. ZigBee
    c. GSM
    d. GPRS
    e. RFID
    f. NFC (Near Field Communication)
    g. inductive-type communication
    h. capacitive-type communication
    i. Maxim's one-wire or similar

23. A device according to claim 1 where the selected load detection means include reading from a storage device containing a pre-programmed information

24. A device according to claim 1 where the selected load detection means include reading from a storage device containing a pre-programmed information about the load to be selected and where it is assumed that the user selects the same load as pre-programmed in such storage device

25. A device according to claim 22 or claim 23 where the storage device is removable

26. A device according to claim 22 or claim 23where the storage device inbuilt into the device or is not removable

27. A device according to claim 1 where the selected load detection means include connection to an external device such as a mobile device (such, by way of example, a mobile phone) which sends to the device the load-selection information. The load selection information can be:
    a. previously stored onto the mobile device which supplies it to the user through any of its user-interface means and where the system assumes that the user selects the load suggested to him/her and/or
    b. input by the user into a software application resident on the mobile device which in turn sends it to the device.

28. A device according to claim 1 where the selected load detection means include reading information representing the selected load and/or correlated to the selected load, from one or more information-providing-devices placed on the weight or weight block the device is coupled to and/or has selected for the exercise.

29. A device according to claim 28 where the information-providing-devices include but are not limited to memory-type storage devices and/or devices which can store and/or supply data (including but not limited to computational devices, microcontrollers, RFID tags and identification ICs). Such data can be representative of and/or be correlated to the selected weight so that information about the overall displaced weight can be acquired directly and/or computed.

30. A device according to claim 28 where the information-providing-devices can store and supply additional information including but not limited to the exercise apparatus name, a exercise apparatus number (also printed on the apparatus itself) which allows the user to identify the apparatus within a certain environment such as a gym and any other useful information which is related to the specific apparatus the information-providing-devices are coupled to.

31. A device according to claim 28 where the information-providing-devices include but are not limited to resistors whose value represent or is correlated to the overall displaced weight and/or to the selected weight so that information about the displaced weight can be acquired or computed.

32. A device according to claim 28 where the information-providing-devices include but are not limited to RFID-type devices such as RFID tags which contain information about the selected weight and/or the weight the device is coupled to

33. A device according to claims 28 to 32 where the information-providing-devices supply upon request information which is correlated to and/or representative of the overall displaced weight and/or to the selected weight so that information about the overall displaced weight can be acquired and/or computed.

34. A device according to claims 28, 29, 30 and 32 where the information-providing-devices contain and supply upon request a (locally or globally) unique identification number which is then mapped (on the device and/or remotely) to the weight or weight-block the information-providing-device is coupled to allowing the computation of the displaced weight. This correlation can also provide additional information about the location and/or type of the exercise apparatus the information-providing-device is coupled to.

35. A device according to claims 32 where if the information-providing-devices based on RFID are so close to each other so more than one is read at the same time by the device, the device itself uses signal strength measurement to decide the correct one to consider (i.e. the nearest one).

36. A device according to claim 5 comprising means to detect the load and/or the forces acting on the load-selecting means such as the load-selecting pins. This includes but is not limited to strain gauges and other means to measure the deformation of the pin cause by the load forces acting on it

37. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to accelerometers, gyroscopes, speed sensors and position sensors.

38. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to:
    a. one or more single axis accelerometers
    b. a number of gyroscopes
    c. a number of position sensors
    d. a number of speed sensors

39. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to:
    a. one or more accelerometers
    b. a number of gyroscopes
    c. a number of position sensors
    d. a number of speed sensors

40. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the

device is coupled to and/or about the displaced load include but are not limited to:

a. one or more accelerometers
b. a number of gyroscopes
c. a number of position sensors
d. a number of speed sensors

arranged so that they can acquire information about the displacement of the load.

41. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to:

a. one or more singe-axis accelerometers
b. one or more dual-axis accelerometers
c. one or more three-axis accelerometers
d. a number of gyroscopes
e. a number of position sensors
f. a number of speed sensors

42. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to one or more singe-axis accelerometers

43. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to one or more singe-axis accelerometers so that the measuring direction is aligned with the displacement direction of the displaced load

44. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to one or more dual-axis accelerometers

45. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to one or more dual-axis accelerometers where the plane formed by their measuring directions is preferably aligned with the plane on which the load is displaced

46. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to two single-axis accelerometers or one dual axis accelerometer so that the plane defined by the measuring directions is parallel to the displacement of the displaced weights the device is coupled to

47. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to one or more three-axis accelerometers

48. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to a number of accelerometers arranged to measure acceleration in at least the main displacement direction of the displaced load

49. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to a number of accelerometers arranged so that acceleration can be measured along the three directions of a Cartesian XYZ reference system

50. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to a number of single and/or multi-axis accelerometers arranged so that acceleration can be measured along the three directions arranged like in a Cartesian XYZ reference system so the device can:
    a. determine its orientation
    b. determine the direction of gravity
    c. acquire information about the dynamics of the load displaced along one or more directions

51. A device according to claim 1 where the means to acquire parameters, data and information about the statics and dynamics of the part of the apparatus the device is coupled to and/or about the displaced load include but are not limited to a number of accelerometers and gyroscopes arranged so that acceleration can be measured along the three directions arranged like in a Cartesian XYZ reference system so the device can:
    a. determine its orientation
    b. determine the direction of gravity
    c. acquire information about the dynamics of the load displaced along one or more directions

d. compute its velocity, position and jerk (hence of the part it is coupled to)

52. A device according to claim 1 comprising a number of user interface means which include, but are not limited to, a number of each of the following:
    a. display
    b. audio transducer
    c. push buttons
    d. switches
    e. any other means which allow user input into the system
    f. any other means which allow output to the user

53. A device according to claim 1 comprising also a number of wireless connectivity means

54. A device according to claim 1 comprising also a number of wired connectivity means

55. A device according to claim 1 comprising a number of each of the following connectivity and/or communication means:
    a. Bluetooth
    b. ZigBee
    c. GSM
    d. GPRS
    e. RFID
    f. NFC (Near Field Communication)
    g. inductive-type communication
    h. capacitive-type communication
    i. Maxim's one-wire or similar
    j. WiFi
    k. USB
    l. Firewire

    to communicate and/or exchange data and information with external devices and/or system including but not limited to:
    m. mobile phones
    n. mobile devices
    o. computers
    p. networks
    q. information-providing-devices coupled or attached to dumbbells
    r. information-providing-devices coupled or attached to weight blocks in weight-stack exercise apparatus

56. A device according to claim 1 with connectivity means to mobile devices which allow data exchange and/or audio streaming

57. A device according to claim 1 with connectivity means (such as, by way way of example Bluetooth and GPRS) to mobile devices (such as mobile phones, iPhone, iPad, iPod Touch) so to have data exchange to allow the user to configure the device through/from the mobile device and/or to allow the data acquired and/or computed by the device and/or by any of the sensors it is coupled to be sent to the mobile device for storage and/or for further computation and/or for feedback to the user

58. A device according to claim 1 with connectivity means (such as, by way way of example Bluetooth) to mobile devices (such as mobile phones, iPhone, iPad, iPod Touch) so to stream data and/or audio to the mobile device to provide feedback to the user

59. A device according to claim 1 with connectivity means to mobile devices (such as, by way of example, iPhone, iPod Touch, iPad etc) and:
    a. from which such device receives configuration data and/or
    b. from which such device receives user input and/or
    c. to which such device sends and/or streams data in real time and/or
    d. to which such device sends and/or streams data in upon request and/or
    e. to which such device sends and/or streams data following a number of events (such as, by way of example, timer timeout and/or user interaction and/or user input)

60. A device according to claim 1 with connectivity means to mobile devices (such as, by way of example, iPhone, iPod Touch, iPad etc) and which is configured such device receives configuration data and/or
    a. from which such device receives user input and/or
    b. to which such device sends and/or streams data in real time and/or
    c. to which such device sends and/or streams data in upon request and/or
    d. to which such device sends and/or streams data following a number of events (such as, by way of example, timer timeout and/or user interaction and/or user input)

61. A device according to claim 1 with connectivity means to:
    a. mobile devices and/or
    b. mobile phones and/or
    c. networks and/or computers

    to exchange and/or stream and/or download and/or upload data

62. A device according to claim 1 with connectivity means to external sensors including but not limited to:
    a. heart rate monitor
    b. hydration monitors
    c. breath monitors

d. lung-capacity monitors/sensor

so to allow storage and/or correlation of the information acquired from such sensors to the dynamics of the user interaction with the exercise apparatus.

63. A device according to claim 62 where the data acquired from the sensors is time stamped and stored onto any memory devices on board to the device

64. A device according to claim 1 with connectivity means to external sensors which acquire data and information about the statics and/or the dynamics of the selected load and/or of the displaced load

65. A device according to claim 1 with connectivity means to external sensors which acquire data and information about the statics and/or the dynamics of the weight-stack exercise apparatus's load which remains un-displaced when the selected load is displaced

66. A device according to claim 1 which through one or more wireless connections can stream acquired data and/or computed data to mobile devices it is connected to

67. A device according to claim 1 which through one or more wireless connections can stream (while the user is exercising) acquired data and/or computed data to mobile devices it is connected to

68. A device according to claim 1 which through at least one wireless connection receives input from any mobile device it is connected to

69. A device according to claim 1 which through at least one wired connection receives input from any mobile device it is connected to

70. A device according to claim 1 which stores a number of preset exercise plans and/or exercise-apparatus settings

71. A device according to claim 70 which compares the selected load settings acquired with those preset in an exercise plan stored in its local storage device and alerts the user whether they match or not

72. A device according to claim 70 which informs the user of the preset exercise plans and related information such as the load to be selected for a particular exercise

73. A device according to claim 1 comprising a number of means to connect to external devices and/or networks

74. A device according to claim 73 where the means to connect to external devices and/or networks are wireless

75. A device according to claim 73 where the means to connect to external devices and/or networks are through wired connectivity means

76. A device according to claim 1 comprising means to interface to and read from a device placed on the weight block (of a weight-stack exercising apparatus) or on a weight/dumbbell which contains and/or provides information, data parameters related to and/or representing the weight it is coupled to

77. A device that identifies a weight and/or a dumbbell and/or a weight block of a weight-stack exercise apparatus, and/or provide information about it and/or about the load displaced if it is selected/used and comprising:
    a. means to represent and/or store data, information and parameters related to and/or representative of and/or correlated to the weight (or dumbbell) it is coupled to and/or of the load displaced if the weight block it is coupled to is selected
    b. connectivity means to allow the interfacing to a device according to claim 1 so that the mentioned data, information and parameters can be retrieved by, read by or communicated to the device according to claim 1 or any of its dependent claims
    c. means to be coupled to exercise apparatus such as free-weights/dumbbells and/or weight blocks of a weight stack exercise apparatus

78. A device according to claim 77 which allows and/or initiates and/or establishes communication with a device according to claim 5 when the device according to claim 5 is inserted into the weight block or dumbbell this device is coupled to

79. A device according to claim 77 where the means to represent and/or store data, information and parameters related to and/or representative of and/or correlated to the weight (or dumbbell) it is coupled to and/or of the load displaced if the weight block it is coupled to is selected include but are not limited to: resistors, Maxim's one-wire unique-ID ICs, Maxim's one-wire memory ICs and RFID tags

80. A device according to claim 77 where the connectivity means to allow the interfacing to a device according to claim 1 so that the mentioned data, information and parameters can be retrieved by, read by or communicated to the device according to claim 1 or any of its dependent claims include but are not limited to contactless and/or wireless connectivity such as inductive coupling, RF link and capacitive coupling

81. A device according to claim 77 where the connectivity means to allow the interfacing to a device according to claim 1 so that the mentioned data, information and parameters can be retrieved by, read by or communicated to the device according to claim 1 or any of its dependent claims include but are not limited to optical connectivity such as infrared link

82. A device according to claim 77 where the connectivity means to allow the interfacing to a device according to claim 1 so that the mentioned data, information and parameters can be retrieved by, read by or communicated to the device according to claim 1 or any of its dependent claims include but are not limited to wired connectivity such as spring contacts or any other type of electro mechanical contacts

83. A device according to claim 77 where the means to be coupled to exercise apparatus are such that it can be coupled to free-weights/dumbbells and/or weight blocks of a weight stack exercise apparatus

84. A device according to claim 83 where the means to be coupled to exercise apparatus include adhesive means such as self-adhesive backing

85. A device according to claim 77 where its wired connectivity means are implemented through pads and/or contacts on a flexi-PCB to minimize the gap between the device according to claim 1 or any of its dependent claims and the surface this device is coupled to. This is particularly the case when a magnet on the device according to claim 1 or any of its dependent claims uses a magnet to maintain a certain position with respect to a magnetic and/or ferromagnetic material this device is coupled to

86. A device according to claim 77 comprising a ferromagnetic material so to keep the device according to claim 1 (or any of its dependent claims) in an optimum position with respect to the device according to claim 77 (or any of its dependent claims)

87. A device according to claim 77 comprising:
    a. a number of RFID tags and/or
    b. a number of RF devices and/or
    c. inductive type devices

    where the inductive loop and/or the antenna loop are closed so to allow (or improve) coupling and/or communication by the device according to claim 1 (or any of its dependent claims) is in proximity of and/or in contact with the device according to claim 77 (or any of its dependent claims)

88. A device according to claim 77 comprising:
    a. a number of RFID tags and/or

b. a number of RF devices and/or
c. inductive type devices

where the inductive loop and/or the antenna loop are closed so to allow (or improve) coupling and/or communication by the device according to claim 1 (or any of its dependent claims) being in proximity of and/or in contact with the dumbbell, weight, device, surface or weight block the device according to claim 77 (or any of its dependent claims) is coupled to

89. A device according to claim 87 and/or claim 88 which whose communication is established with a reader attached to the exercise apparatus such as a loop near the weight-stack of a weight-stack exercise apparatus

90. A device according to claim 77 where the data stored include but is not limited to: load displaced if the weight/weight-block this device is coupled to is selected, gym name, exercise apparatus name, exercise apparatus number (within a gym), exercise apparatus ID

91. A device according to claim 77 or any of its dependent claims other than this one, where the data, information and parameter storage means can be programmed and/or reprogrammed with data

92. A device according to claim 77 or any of its dependent claims, where the data, information and parameter storage means is a computational device such as microcontroller or microprocessor

93. A device according to claim 77 or any of its dependent claims, where its data, information and parameter storage means are powered from the device according to claim 1 or any of its dependent claims, wirelessly and/or through contact.

94. A device according to claim 77 where the power is transferred to it from the device according to claim 1 and/or any of its dependent claims and/or from any other powering device installed on the exercise apparatus through induction power transfer methods/means

95. A device according to claim 77 which can be coupled to the weight-block of a weight stack exercise apparatus so that when the device according to claim XX (claim with pin) is inserted into the weight-block to select a load, the device can acquire and/or read data, information and parameters which allow the identification of the specific weight-block and/or of the load displaced

96. A device according to claim 1 or any of its dependent claims which is powered through a number of internal power sources and/or a number of external power sources

97. A device according to claim 96 where the internal power source is an ultra-capacitor (double-layer capacitor) to allow fast recharging

98. A device according to claim 96 where the internal power source is a rechargeable recharged through wired and/or wireless energy-transfer means (including but not limited to induction charging).

99. A device according to claim 96 where the external power source transfer energy to the device though magnetic induction

100. A device according to claim 1 or any of its dependent claims which has interface/interconnect means to removable memory storage devices

101. A device according to claim 100 with interface/interconnect means to one or more of each of the following:
    a. micro SD
    b. SD
    c. secure SD
    d. USB flash drives
    e. any other memory card format

102. A device according to claim 1 or any of its dependent claims which has means to identify the user and/or to communicate to devices which are intended to identify the user. This feature is particularly significant when the device is shared by multiple users.

103. A device according to claim 102 which uploads from local and/or remote storage means/devices exercise plans and/or exercise apparatus setting according specific to the user

104. A device according to claim 1 or any of its dependent claims which uses a number of magnets to ensure it is fully inserted when inserted into the selecting hole of a weight in weight-stack exercising apparatus

105. A device according to claim 1 or any of its dependent claims which uses a number of magnets to ensure one of a number of preferred positions and/or directions are maintained

106. A device according to claim 1 or any of its dependent claims which is portable

107. A free-weight or dumbbell with incorporated at least one of the devices according to claim 77 or any of its dependent claims

108. A free-weight or dumbbell with incorporated at least one of the devices according to claim 1 or any of its dependent claims

109. Exercise apparatus with incorporated at least one of the devices according to claim 77 or any of its dependent claims

110. Exercise apparatus with incorporated at least one of the devices according to claim 1 or any of its dependent claims

111. Weight-stack type exercise apparatus where each weight block has incorporated in it and/or coupled to it at least one of the devices according to claim 77 or any of its dependent claims

112. A system comprising a number of the devices according to any of the above claims which interact with each others

113. A system comprising a number of devices according to claim 88 and a number of devices according to claim 1 (or any of its dependent claims) where the devices according to claim 1 (or any of its dependent claims) have a number of means to magnetically couple and/or electrically couple and/or RF couple to a number of devices according to claim 88 for the purpose of communication and/or data exchange

114. A load sensor or load sensing device which wirelessly sends to the device according to claim1 or any of its dependent claims information about the displaced load and/or the weight selected and/or information which allow the device according to claim1 or any of its dependent claims to compute the displace load.

Application No:	GB1015831.9	**Examiner:**	Mr Daniel Cox
Claims searched:	1-114	**Date of search:**	22 December 2011

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1 and 77 at least	WO2008/000919 A1 PELTONEN, See whole document
X	1 and 77 at least	US2003/211916 A1 CAPUANO, See whole document
X	1 and 77 at least	DE102006047099 A1 MEUHLHAUSE, See whole document
X	1 and 77 at least	US2008/090703 A1 ROSENBERG, See whole document
X	1 and 77 at least	US2007/135264 A1 ROSENBERG (2), See whole document
X	1 and 77 at least	US2006/234842 A1 MINAMI, See whole document
X	1 and 77 at least	US2003/069108 A1 KAISERMAN, See whole document
X	1 and 77 at least	WO2008/118173 A1 KIM, See whole document

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A63B

The following online and other databases have been used in the preparation of this search report

EPODOC and WPI

International Classification:

Subclass	Subgroup	Valid From
A63B	0024/00	01/01/2006
A63B	0021/062	01/01/2006
A63B	0021/072	01/01/2006
A63B	0023/035	01/01/2006