The invention belongs to the area of sports techniques. This system can also be used in institutions of education, military or firemen preparation and other areas, where tests of human physical limits are performed. In the system of an individual training program for the client is composed. The performance of the programme is observed and the data about the accomplishment is transferred automatically. Prior to that the client is assigned an individual number, which is fixed in server (5) and in device of data transfer (12), assigned to the client (12). Client testing and questioning has also to performed before that and this information is transferred to server (5) and to simulator (1), that has terminal (2) and the node of dynamic load (3), which automatically prepares for the accomplishment of exercise. After the accomplishment of the exercise, the information is transferred to server (5), the evaluation and findings of the accomplishment of the program are registered.
Declaration under Rule 4.17:
— of inventorship (Rule 4.17(iv))

Published:
— with international search report
Complex system of health enhancement and sport equipment and methods of its implementation belongs to the area of sports techniques and may be used in the centers of wellness, rehabilitation and sport. This system can also be used in institutions of education, military or firemen preparation and other areas, where tests of human physical limits are performed.

The club exercise recording system is known, where the wellness club members get palm computers which are programmed beforehand by the trainer or the wellness club manager for recording various exercises. Palm computer includes an installed keyboard, a display screen and an optical counter, connected to a concerted identification card, which is not far from exercise data source. In the memory of the palm computer device there is installed exercise data accumulating software programmed beforehand. Exercise data accumulating software lays on the display screen one or more exercise sequences, which ask the user to enter information about the exercise accomplished. The exercise sequences are specially adapted to the exercise data source and introduce one or more data entering pages and inquiries, asking the user to enter the information required. The entered information is stored in temporary user data file, located in the palm computer device, or transferred straight to the permanent user data file in the local server, located in the wellness club. The system can also include the terminal, used for transferring of the temporary user data file to the permanent server, connected to the center of the network operations. The software of the physical capacity tools is installed in the server. This software is used for gathering and processing of the data in the permanent user data file, the data later are accessible for the trainer and/or the user (PCT/USA 2005/01 1734).

The disadvantage of this system is that each client has to have with him a palm computer, and that is very inconvenient, it also raises the cost of the services. The client also has to record himself how he has accomplished the exercise, and such information is not objective. It is not convenient for the user to answer various supplementary questions during the exercise. In the system, the client gets an individual exercise program according to his ID number. The client sees this program in the palm computer, but nobody except the sportsman himself records
how the exercise is being accomplished. That is not objective, however, since there
are no data how in reality the exercise is being accomplished. It is the client also
who has to decide during the exercise how to evaluate himself/herself, and that
creates additional psychological load.

The system where at least one signal type of the exercise indicator, related
to the exercise being accomplished by the user is received in the user's portable
computer system from the simulator via the usual data transfer format is also
known. Summarized physical fitness data are processed and stored for the needs of
the user in his/her portable computer system using at least one signal type of the
exercise indicator and physical fitness data accumulated earlier. Independent
portable computer system related to a specific user in real time controls the
physical potential exercises accomplished by the user, while employing at least one
signal type of the exercise indicator received from at least one simulator during
some specific time period (US2006/0252602 A1).

The main disadvantage of this invention is that the testing of the physical
properties of the client is not performed, the questioning is not performed either
and no individual exercise program is constituted according to the found data. This
system can be adapted only to the stimulators already having data recording
system, e.g. cardio-simulators. Thus the main purpose of this system is to take the
information from cardio-simulators.

One more system is known that allows the medic or health care specialist to
work out exercise program, to foresee safety limits, to transfer via internet the
created exercise program and to accomplish it by sending it directly into the
appropriate device. This system also allows to accumulate, save and adduce
physiological data, which were gathered performing the exercise prescribed.

The final user (patient or client) simply connects to the system and presses
"start" button. Then the exercise program is assigned individually for this user. The
system also allows one to analyze and inspect the exercises chosen and
physiological data, obtained about the user; it allows one in real time to see the
information displayed on the device or look at them at any time later via the
internet, so that the assigned program would be possible to analyze, and change if
needed. The system also considers problems arising from the data adduced by the
user. Eksernet is an automated method, enabling one to document the way the
users comply with the program assigned, and allows one to record in the
documents specific protocols and recommendations, which are usually used for research, prevention, early detection, rehabilitation or for the purpose of preserving good health (US2004/0204959).

The main disadvantage of this system is that its installation requires big investment, because next to each simulator there is mounted a computer with touch-screen. Besides, when there is no good internet connection available, it is difficult to materialize the control in real time. During each session exercise parameters and its control program are loaded, and if the internet connection fails, only minimal exercise performance control remains. This system is oriented towards the clients working at home with individual equipment. It is not functional optimally, and flexible enough for exercise hall. The exercise program in this system is worked out by a man (trainer or medical man), without full research and testing of physical properties of the client. That is why this program is not safe enough, because the risk factors of the client, his/her lifestyle, individual functional and physical capacities are not considered. Furthermore, when a specialist is working out a program, there is always the human factor, that is why there remains the possibility for mistakes and subjective evaluation. It takes much time to create separate programs for different clients, what enlarges time expenditures and thus the efficiency of the work of the specialist decreases.

The purpose of the invention is increasing the efficiency of the exercises and safety by automatically generating individual exercise program according to the questioning and testing data and the results obtained after completing the analysis.

The purpose of the invention is accomplished as follows into the complex system of health enhancement and sport equipment compiled from simulators, server and the computer connected via internet connection there are newly installed hall and reception computers, testing equipment, all connected to the server, and the portable data transfer device, whereas the simulator has a terminal with a position switch and a dynamic load node.

The simulator terminal includes a digital processing block, a heart beat signal receiver, a non-contact registration receiver, a sound signaling device, an indicator, an exercise task accomplishment evaluation block, composed of exercise task node, and a movement phase distinction node, connected to the evaluation node, which in its turn is connected to the indicator. Besides, the digital processing
block at the access is connected to the simulator, server, heart beat signal receiver and non-contact registration receiver, and at the exits with the sound signaling device, exercise task node and movement phase distinction node, the gateways of which are connected to the indicator and sound signaling device. Finally, the indicator of simulator terminal is composed from textual, two digital and two graphical indicators.

The dynamic load node of the simulator is constituted of a permanent flow servo engine or variable flow asychronic engine, to which on one side joined through the regulator is the controller, on the other side there are the connections of engine speed meter, reduction gear, power (moment) meter, the element directly influenced by the client and the meter of position, which together with the power (moment) meter and engine speed meter through the terminal are in parallel connected with the controller.

The purpose of the invention is accomplished by the method of complex system of health enhancement and sport equipment, using which an individual client's exercise program is worked out, as well as its monitoring, performance and notification about its accomplishment is performed. Prior to that having assigned to the client individual number, which is fixed in the server and the data transfer device assigned to the client and after accomplishing client questioning and testing, which is transferred to the server, and the simulator, that has terminal, position detector and dynamic load node, which automatically prepares for the accomplishment of the exercises, after recognizing the client according to the number from the data transfer device, the programme shows the parameters of the exercise being accomplished, lays the data of the task already accomplished, compares it to the program laid, provides evaluation and findings over the accomplishment of the program, and transfers the data to the server, which is accessible via the internet to the program compiler and the client.

When questioning the client, the programme automatically adduces individual health risk factors of the client according to the questionnaire data given by the client about his/her health, physical activity, nutrition, addictions and stress.

In the press of testing, body mass index, anthropometric indices, pulse and blood pressure, psychomotoric reaction, and physical property indices, are established according to which the programme automatically selects the direction
of the training and prescribes individual set of exercises to be performed by the client.

The node of dynamic load of the simulator accepts the task, measures the parameters (power, speed) of the accomplishment of the exercise and selects load corresponding to parameters of the load to be undertaken.

The invention is explained in the graphics presented below.

Figure 1 shows the complex system of health enhancement and sport equipment block scheme. Figure 2 shows the block scheme of the simulator terminal. Figure 3 shows the block scheme of the dynamic load node.

The complex system of health enhancement and sport equipment includes simulator 1 with terminal 2, dynamic load node 3, and position detector 4, which all are connected to server 5. To server 5 are also connected gym computer 6, reception computer 7, testing equipment 8 and via internet connection 9 there is connected the computer of trainer 10 and the computer of client 11. Data transfer device 12 is used for transferring the data within the system.

To server 5 there is connected terminal 2 with position detector 4 (Fig. 2), composed of digital processing block 2.1, hear beat signal receiver 2.2, non-contact registration receiver 2.3, sound signaling device 2.4, indicator 2.5 and exercise task accomplishment evaluation block 2.6, composed of exercise task node 2.6.1, movement phase distinction node 2.6.2, all connected to evaluation node 2.6.3. The indicator 2.5 is composed of textual indicator 2.5.1, two digital indicators 2.5.2, 2.5.3, and two graphical indicators 2.5.4. and 2.5.5.

To simulator terminal 2 there is connected simulator dynamic load node 3 which includes engine 3.1, engine speedometer 3.2, reduction gear 3.3., power (moment) meter 3.4, directly operated simulator element 3.5, position detector 4., regulator 3.6 and controller 3.7.

The complex health enhancement and sport equipment system is materialized in this way:

When the client visits the gym for the first time, he is registered in the reception computer, where his personal data are entered. During the registration, the client receives a data transfer device, which allows to control the client's entering the sport complex, to gather the data about his visits, the overall time spent and the time spent in different zones (in the gym, the pool etc.).
The registered client firstly is questioned. The questioning is needed so that the trainer could get more information about the new client. For this purpose questionnaires containing questions about the client’s health, nourishment, physical activity, addictions and stress are filled in. The risk factors from the questionnaires are automatically selected and they will help to evaluate the physical condition of the client.

After the client fills in the questionnaire, the testing, according to which the automatic exercise program will be created, begins. Various equipment, such as simulators, anthropometric data registering scales, reaction-meter, jump etc. is used. Tests aimed at research of the body fat wrinkle, anthropometric factors, blood biochemical research, physiological factors, psychometric reaction test, high jump test and fitness tests are performed.

According to the tests performed, the program automatically creates personal exercise program, which can be adjusted by the trainer, according to the risk factors gathered from the client’s questionnaire. In this way the sportsman gets an effective exercise program best suited for him. Also, from the questionnaire data, it is noted how many times the client will be visiting the club during a week, the duration of the mezocycle of the exercise, after which a new testing will be performed, evaluating how the physical data of the client have changed. When the trainer approves of the program, it is assigned to the client and recorded in the server.

The client after the creation of individual exercise program, can review it at home, when connected via the internet, in the gym through the customer computer, or simply print it.

When the client begins to perform the exercise program, in the simulators gym, the data transfer device allows the activation of the terminal of the simulator, and allows one to set automatically the parameters of the dynamic load node, and the exercise work regime, according to the exercise program prescribed.

From server 5, where individual exercise accomplishment tasks are created, in advance with the number of series, number of movements in the series, pauses between the series, pauses between the movements indicated, there are also indicated the concentric (when the muscle contracts overcoming the resistance), eccentric (when the muscle lengthens when coming back to the start position) and isometric (when the muscle is tensed, in the static state) phase durations, the
amplitude of the movement, and the load size, etc., and finally the information goes
to the terminal of the simulator. When the client approaches the simulator, and
brings the data transfer device closer to the terminal of simulator 2, it is recognized
automatically. The terminal digital processing block 2.4, according to the
registration number receives from server 5 the task for practical accomplishment
for that simulator according to the individual program created, which through
digital processing block 2.4 goes to task node 2.10. From simulator terminal 2, the
parameters of the exercise go to controller 3.7 of dynamic load node 3. Controller
3.7 is a microprocessoric controller with the function of programming. A program
created to control a specific simulator is recorded in controller 3.7. Controller 3.7
through simulator terminal 2 receives the exercise task. After controller 3.7.
receives the exercise task, it periodically (during each regulating cycle) reads
information from speed meter 3.2, about the moment speed of engine 3.1., also the
information from the power (moment) meter 3.4. about the power (moment) which
is operating element 3.5 of the client. From controller 3.7 the position detector 4.
reads information about the position of this element, processes the information read
according to the program created and sends a control signal to regulator 3.6.
Regulator 3.6. controls the turning moment of engine 3.1. in such a manner that it
is proportionate to the signal of controller 3.7. in the areas of the positive and
negative moments. In this system the dynamic load node is materialized via engine
3.1. which can be one of the well known electric engine types, which is appropriate
for a specific simulator according to its parameters (power, speed, moment), and
which can work in an engine or generator regime.

From the selected engine type 3.1 depends the materialization of regulator
3.6. - if permanent flow servo engine is chosen, an appropriate amplifier of
appropriate power and force of four quadrant permanent flow has to be selected
too; if an asynchronous engine is chosen, then, the vector control frequency changer
is appropriate, which is turned on under the regime of the regulation of the
moment.

Engine speedometer 3.2. can be a tacho generator, an encoder, etc.
Reduction gear 3.3 can be worm type, cycloidal, belt type, or it is possible not to
mount the reduction gear at all. The easiest way to materialize the power (moment)
meter 3.4 is on the basis of the tenzo detectors. The realization of the element
operated directly by simulator 3.5 depends on the specific simulator: it can be a
handle, lever or rope. The position meter is any type electric detector which is appropriate by constructive angle or linear position, for example, potentiometer or linear encoder.

When the client registers to simulator terminal 2, with the data transfer device, after a few seconds, given for the preparation for the accomplishment of the exercise, one hears a sound signal, indicating that one should begin the exercise. Textual indicator shows textual information related to the technique of the accomplishment of the exercise, and the parameters given. When the athlete accomplishes the exercise, moving length of graphic indicator shows the athlete at what rate the movement has to be completed. Digital processing block 2.4 accepts the signal from the position detector, about the practical movement being accomplished.

The green length of graphic indicator column 2.17 shows the rate of the phase of the actually accomplished movement. Digital indicator 2.15 shows the duration of the concentric, isometric and eccentric moments, as well as the duration of the pause between the phases of the movements. Digital indicator 2.14 shows the number of repetitions of the series accomplished by the client.

When the client sees in the indicator the rate of the change of the phase of the movement indicated in the task, and the speed of the phase of his accomplishment he can change the performance of the exercise. According to the duration of the concentric, isometric, eccentric phases, as well as the duration of the pauses and the times indicated in the task, the node of evaluation of the accomplishment of the task 2.12 performs the evaluation of the conformity of the exercise to the task in 10-point system. For the evaluation, from every signal of the cycle actual amplitude, movement phase duration and the discontinuity of the movement are taken. When the exercise is accomplished, the textual indicator shows the parameters of the exercise accomplished and the evaluation of the exercise performed.

After the completion of the series of the exercise, the information about the work accomplished is transferred to the server. When the client accomplishes the task with one simulator he proceeds to the next one according to the program, etc. The client at any time may receive information in the gym computer about the exercise accomplished (its quality evaluation).
Using his/her own number the client can get access to his/her exercise diary through the internet while being at home or elsewhere, and to supplement it with the information about other sports activities, with the data from other devices of the exercise register (for example personal pulse monitoring data), about the day nutrition ration, medical testing data, etc.

After the mezocycle, the system automatically presents a report of the appropriate period (how many and what exercises were accomplished, their general duration, calories burned, quality indices of the exercise, testing data before and after the cycle, recommendations for the next cycle) and prepares an exercise program for the next mezocycle.

Compared to the prototype, the system of complex health enhancement and sport equipment and its implementation method allows one to optimize the activities of the club, to enlarge the effectiveness and safety of the exercise, while generating individual exercise program according to the questioning and testing data, as well as to present the analysis of the results.
CLAIMS OF THE INVENTION

1. The complex system of health enhancement and sport equipment constituted of a simulator, server and a computer all connected via internet characterized in that, the computers of the gym and reception, the testing equipment joined to the server and data transfer device are newly connected to the system, and the simulator has a terminal, a dynamic load node and a position switch.

2. According to clause 1, the system characterized in that, the terminal of the simulator is constituted of a digital processing block, a heart beat signal receiver, a non-contact registration receiver, a sound signaling device, an indicator, the block of evaluation of exercise accomplishment, consisting of exercise task node and movement phase distinction node, connected to the evaluation node, which is connected to the indicator. Besides, the digital processing block at the access is connected to the power simulator, server, heart beat signal receiver and non-contact registration receiver, and at the exits with the sound signaling device, exercise task node and movement phase distinction node, the gateways of which are connected to the indicator and sound signaling device.

3. According to clause 2, the system characterized in that, the indicator is constituted of a textual indicator, two digital and two graphic indicators.

4. According to clause 1, the system characterized in that, the dynamic load node of the simulator is mounted in the simulator and is constituted of a permanent flow servo engine or variable flow asynchronic engine, to which on one side joined through the regulator is the controller, on the other side there are the connections of engine speedometer, reduction gear, power (moment) meter, the element directly influenced by the element and the meter of position, which together with the power (moment) meter and engine speed meter through the terminal are in parallel connected with the controller.

5. The method of implementation of complex health enhancement and sport equipment, which constitutes individual client exercise program, performs its monitoring, accomplishment and notification of the data of
accomplishment characterized in that, the it automatically constitutes individual client exercise program, prior to that assigning to the client his/her individual number, which is fixed in the server and the data transfer device assigned to the client and after accomplishing client questioning and testing, which is transferred to the server, and the parameters of separate exercises into appropriate simulators, which have dynamic load node, position detector and simulator terminal, which automatically prepares for the accomplishment of the exercises, after recognizing the client according to the number from the data transfer device, the programme shows the parameters of the exercise being accomplished, lays the data of the task already accomplished, compares it to the program laid, provides evaluation and findings over the accomplishment of the program, and transfers the data to the server, which is accessible via the internet to the program compiler and the client.

6. According to clause 5, the method suggested characterized in that, when questioning the client it automatically adduces individual health risk factors of the client according to the questionnaire data given by the client about his/her health, physical activity, nutrition, addictions and stress.

7. According to clause 5, the method suggested characterized in that, in the process of testing, body mass index, anthropometric indices, pulse and blood pressure, psychomotoric reaction, and physical property indices are established, according to which the programme automatically selects the direction of the training, and prescribes individual set of exercises to be performed by the client.

8. According to clause 5, the method suggested characterized in that, the node of dynamic load of the simulator accepts the task, measures the parameters (power, speed) of the accomplishment of the exercise and creates load corresponding to the parameters of the load to be undertaken.
Fig. 2
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

**INV. A63B24/00**

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

**B. RELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

A63B

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

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

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No</th>
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<tr>
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<td>EP 1 068 882 A (TECHNOGYM SRL [IT]) 17 January 2001 (2001-01-17) paragraph [0016] - paragraph [0035]; figures 1,2</td>
<td>1-8</td>
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<tr>
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<td>DE 203 18 796 U1 (TOP FORM GMBH [DE]) 4 March 2004 (2004-03-04) abstract</td>
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Jekabsons, Armands
<table>
<thead>
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<th>Patent document cited in search report</th>
<th>Publication date</th>
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<tr>
<td>DE 20318796 U1</td>
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