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(71) Applicant: **LG ELECTRONICS INC.** [KR/KR]; 128, Yeoui-daero, Yeongdeungpo-gu, Seoul 07336 (KR).

(72) Inventors: **LEE, Jaehoon**; 51, Gasan digital 1-ro, Geumcheon-gu, Seoul 08592 (KR). **BEOM, Sungwon**; 51, Gasan digital 1-ro, Geumcheon-gu, Seoul 08592 (KR). **PARK, Changsun**; 51, Gasan digital 1-ro, Geumcheon-gu, Seoul 08592 (KR).

(74) Agent: **NAMCHON PATENT AND LAW FIRM**; #406, Doryeom Bldg,37, Saemunanro5-gil, Jongno-gu, Seoul 03173 (KR).

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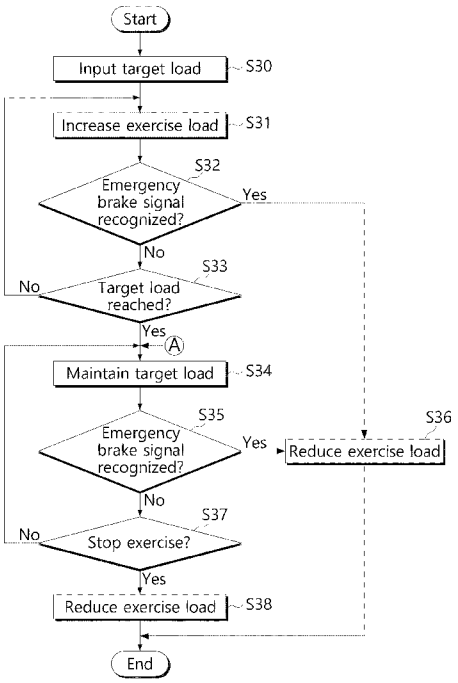
(54) **Title:** MUSCLE EXERCISE DEVICE



(57) **Abstract:** Proposed is a muscle exercise device. The muscle exercise device may include a touch detection part configured to detect a physical touch applied to an upper surface of a device body. Furthermore, the muscle exercise device according to the embodiment of the present disclosure may include a load control part configured to recognize the physical touch as a load control signal when the physical touch satisfies a preset recognition criterion and to control an exercise load of the a drive motor by analyzing the load control signal. Through this, the exercise load provided by the drive motor may be more easily and stably controlled by using a physical touch such as foot tapping.

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Description

Title of Invention: MUSCLE EXERCISE DEVICE

Technical Field

[1] The present disclosure relates generally to a muscle exercise device and, more particularly, to a muscle exercise device on which a user can perform a muscle exercise.

Background Art

[2] In general, a muscle exercise device used for increasing muscular strength is designed to repeat muscle relaxation and contraction while a lever connected to a weight of a predetermined unit of weight is pushed or pulled.

[3] Such an exercise device includes various types of exercise devices, such as an arm curl machine for biceps exercises, a chest press or butterfly machine for exercises for chest, such as pectoralis major, and a pull-up device for a muscle exercise.

[4] Recently, as part of self-management, a home workout, which is exercise for health management at home which is my own resting place without jogging or visiting a fitness center has become an issue. In response to this issue, various types of exercise devices for a home workout have been proposed, and a new phrase called a home workout group has been created.

[5] As one example of a muscle exercise device for a home workout, a muscle exercise device using a cable is being used. Inside the muscle exercise device, a drive motor is installed, and an exercise load supplied from the drive motor is transmitted to a user through the cable so that the user performs a muscle exercise by pulling or releasing the cable.

[6] In the case of muscle exercise using a muscle exercise device, a normal muscle exercise device using weights and a muscle exercise device using a drive motor are both required to provide a safe exercise environment while an exercise load is provided from the weights or the drive motor.

[7] For example, there may occur the situation that while exercising with an exercise load provided from the drive motor, a user urgently wants to remove the exercise load due to lack of strength.

[8] In this situation, in the case of a typical muscle exercise device using weights, for example, in a muscle exercise using a bench press, a barbell may be placed on a support to remove an exercise load caused by weights.

[9] However, the muscle exercise device using a drive motor optimized for a home work is required to have a simplified structure, and thus it is not realistic to apply a structure such as a support of a bench press to the device.

[10] Accordingly, it is preferable that the muscle exercise device using an exercise load

from the drive motor is configured such that a user can easily and stably control the exercise load in a situation in which the exercise load is required to be removed urgently as described above.

Disclosure of Invention

Technical Problem

[11] The present disclosure is intended to propose a muscle exercise device in which an exercise load supplied from a drive motor can be easily and stably controlled by a user.

[12] In addition, the present disclosure is intended to propose a muscle exercise device in which when a user is intended to remove an exercise load in a state in which the exercise load supplied from the drive motor is too high to be handled by the user, a convenient user interface for the removal of the exercise load can be provided.

[13] Additionally, the present disclosure is intended to propose a muscle exercise device in which a user interface for controlling an exercise load may be provided without adding a hardware component.

[14] Furthermore, the present disclosure is intended to propose a muscle exercise device in which during exercise under an exercise load from the drive motor, the exercise load of the drive motor may be variously controlled through a simple user interface.

Solution to Problem

[15] A muscle exercise device according to an embodiment of the present disclosure may include a device body. The device body may be provided in a form in which a user can step on the device body to exercise.

[16] The muscle exercise device according to the embodiment of the present disclosure may include at least one drive motor. The drive motor may be installed in the device body and may provide an exercise load.

[17] The muscle exercise device according to the embodiment of the present disclosure may include a load transfer unit. The load transfer unit may transfer an exercise load from the drive motor to the outside.

[18] The muscle exercise device according to the embodiment of the present disclosure may include a touch detection part. The touch detection part may detect physical touch applied to an upper surface of the device body.

[19] The muscle exercise device according to the embodiment of the present disclosure may include a load control part. The load control part may recognize a physical touch detected by the touch detection part as a load control signal when the physical touch satisfies a preset recognition criterion. In addition, the load control part may control the exercise load of the drive motor by analyzing the load control signal.

[20] In one embodiment, the load control part may decrease the exercise load of the drive motor when a load control signal is determined as a preset emergency brake signal.

[21] In one embodiment, the load control part may determine the load control signal recognized once as the emergency brake signal.

[22] The muscle exercise device according to the embodiment of the present disclosure may further include a user input part. A target load may be input through the user input part.

[23] In one embodiment, the load control part may control the drive motor so that the exercise load is output by being changed to the target load input through the user input part. In addition, the load control part may reduce the exercise load of the drive motor when the emergency brake signal is recognized in a process in which the exercise load of the drive motor is reaching the target load, and in a state in which the exercise load has reached the target load.

[24] In one embodiment, when the emergency brake signal is recognized, the load control part may reduce the exercise load of the drive motor to a preset basic load.

[25] The touch detection part according to the embodiment of the present disclosure may include a vibration detection part. The vibration detection part may be installed inside the device body and may detect vibration generated by physical touch.

[26] In one embodiment, the vibration detection part may include an inertial measurement unit (IMU) sensor.

[27] Physical touch according to the embodiment of the present disclosure may be caused by a user's foot tapping while the user is on the upper surface of the device body.

[28] In the embodiment of the present disclosure, the load control part may determine that the recognition criterion is satisfied when the intensity of physical touch is greater than or equal to a preset reference intensity.

[29] In one embodiment, the load control part may analyze the load control signal based on at least one of the number of times of the load control signal in succession and a pattern of the load control signal.

[30] When it is determined that the load control signal is a preset exercise initiation signal while a preset exercise preparation condition is recognized, the load control part according to the another embodiment of the present disclosure may control the drive motor so that the exercise load is output by being changed to the target load input through the user input part.

[31] In one embodiment, when the load control signal is recognized twice in succession, the load control part may determine the load control signal as the exercise initiation signal.

[32] In one embodiment, the load control part may control the drive motor so that the exercise reaches the target load from the preset basic load according to the exercise initiation signal. In addition, when it is determined that the load control signal is a preset load change signal while the exercise reaches the target load from the basic load,

the load control part may change the current exercise load output from the drive motor to the target load.

[33] In one embodiment, when it is determined that the load control signal is the load change signal, the load control part may stop the increase of the exercise load of the drive motor, and may provide a select alarm for selecting whether to change a load. In addition, the load control part may change the current exercise load to the target load when a load change approval is input in response to the select alarm.

[34] In one embodiment, the load control part may determine whether the load change approval is input based on the load control signal.

Advantageous Effects of Invention

[35] The muscle exercise device according to the present disclosure may have at least one of the following effects.

[36] First, it is possible to provide a muscle exercise device which can more easily control an exercise load provided from the drive motor by using a physical touch such as foot tapping.

[37] Second, when a user grips a gripping means such as a gripping bar with both hands and exercises with an exercise load applied thereto, the user may input the load control signal for the control of the exercise load by a physical touch such as foot tapping so that the both hands are not required to be removed from the gripping means, thereby providing a stable user interface.

[38] Third, in a state in which an exercise load provided from the drive motor is too high for a user, when the user intends to rapidly remove the exercise load, the exercise load may be removed by simple foot tapping, thereby providing a simple and stable user interface even in an emergency.

[39] Fourth, to detect a physical touch such as foot tapping, the inertial measurement unit (IMU) sensor applied to a posture measurement in the device body may be used without adding a separate hardware, thereby enabling the implementation of the exercise device without the increase of manufacturing costs and size thereof.

[40] Fifth, the load control signal of the same pattern in each step of the control process of an exercise load may be recognized as a different input signal, thereby enabling foot tapping to be used as various input signals even in a simple user interface.

Brief Description of Drawings

[41] FIG. 1 is a view illustrating an example of a muscle exercise device according to the embodiment of the present disclosure.

[42] FIG. 2 is a control block diagram of the muscle exercise device according to the embodiment of the present disclosure.

[43] FIG. 3 is a control flow diagram of the muscle exercise device according to the em-

bodiment of the present disclosure.

[44] FIGS. 4(a), 4(b), 5(a), and 5(b) are graphs illustrating the control process of the muscle exercise device according to the embodiment of the present disclosure.

[45] FIG. 6 is a control flow diagram of the muscle exercise device according to another embodiment of the present disclosure.

[46] FIGS. 7(a) and 7(b) are graphs illustrating the control process of the muscle exercise device according to the another embodiment of the present disclosure.

Best Mode for Carrying out the Invention

[47] A muscle exercise device according to the embodiment of the present disclosure may include a load control part. The load control part may recognize a physical touch detected by a touch detection part as a load control signal when the physical touch satisfies a preset recognition criterion. In addition, the load control part may control an exercise load of a drive motor by analyzing the load control signal.

Mode for the Invention

[48] Advantages and characteristics of the present disclosure, and methods for achieving them will become clear with reference to embodiments described later in detail in conjunction with the accompanying drawings. However, the present disclosure is not limited to the embodiments disclosed below and may be implemented in a variety of different forms. However, these embodiments are provided to make the disclosure of the present invention complete and to completely inform those skilled in the art of the scope of the invention to which the present disclosure belongs, and the present disclosure is only defined by the scope of the claims. The same reference numbers designate the same elements throughout the specification.

[49] FIG. 1 is a view illustrating an example of a muscle exercise device 10 according to the embodiment of the present disclosure. In the embodiment of the present disclosure, a load transfer unit configured to transfer an exercise load provided from a drive motor 210 to be described later to the outside may be a cable 120. In addition, the load transfer unit for transferring an exercise load may be formed in the form of a multiple-link structure.

[50] As illustrated in FIG. 1, the muscle exercise device 10 according to the embodiment of the present disclosure may include a device body 110. In the embodiment of the present disclosure, the device body 110 may have the shape of a mat. With the device body 110 seated on an indoor or outdoor floor, a user may step on the device body 110 and exercise by using one pair of cables 120 extending from the device body 110 to the outside.

[51] Here, a gripping instrument which a user grips to exercise may be connected to the one pair of cables 120. In FIG. 1, a gripping bar 130 whose opposite ends are re-

spectively connected to the cables 120 is installed. In addition, a grip such as a D-type grip may be connected to each of the cables 120 at opposite sides, and various types of gripping instruments for exercise may be connected thereto.

[52] FIG. 2 is a control block diagram of the muscle exercise device 10 according to the embodiment of the present disclosure.

[53] The muscle exercise device 10 according to the embodiment of the present disclosure may include the drive motor 210. The drive motor 210 may be installed inside the device body 110 and may generate an exercise load to be transferred through the cable 120.

[54] Here, in the embodiment of the present disclosure, two drive motors 210 may be provided so that exercise loads can be individually supplied to the one pair of cables 120 extending outside the device body 110. In addition, one drive motor 210 may be configured to provide an exercise load to each of the one pair of cables 120 through a differential mechanism.

[55] The muscle exercise device according to the embodiment of the present disclosure may include a touch detection part 220 and a load control part 230. The touch detection part 220 according to the embodiment of the present disclosure may detect a physical touch applied to the upper surface of the device body 110.

[56] In the embodiment of the present disclosure, the touch detection part 220 may include a vibration detection part. In one embodiment, the vibration detection part may include an inertial measurement unit (IMU) sensor.

[57] Here, the inertial measurement unit (IMU) sensor according to the embodiment of the present disclosure may be used to detect inclination of the device body 110 and determine whether the device body 110 is in a stable state when the device body 110 is placed on the floor. That is, in the embodiment of the present disclosure, without installing a separate sensor for a physical touch, the inertial measurement unit (IMU) sensor installed for the operation of the muscle exercise device 10 according to the embodiment of the present disclosure may be used, so it is possible to solve the problem of manufacturing cost and installation space due to additional installation.

[58] As described above, the touch detection part 220 may detect a physical touch applied to the upper surface of the device body 110, for example, vibration, and a user interface for the control of an exercise load to be described later may be provided so that a user applies the physical touch to the upper surface of the device body 110 while he or she is on the device body 110.

[59] For example, in the embodiment of the present disclosure, a physical touch detected by the touch detection part 220 may be generated by a user tapping a foot on the upper surface of the device body 110.

[60] As illustrated in FIG. 1, in a process in which a user performs a muscle exercise in a

state in which the user steps on the device body 110 and grips the gripping bar connected to the cables 120, when a user intends to control an exercise load, for example, to remove an exercise load since the current exercise load is too high, it is difficult to use the user interface by using the hands with the both hands gripping the gripping bar 130.

[61] That is, even if a remote control with separate manipulation buttons is installed on the gripping bar 130, it may be difficult to move the hand to a position at which the remote control is installed while an exercise load is applied to the gripping bar, and an accident may occur during the movement of the hand.

[62] Accordingly, in the embodiment of the present disclosure, while a user is standing on the device body 110, the user may input a desired signal to the muscle exercise device 10 through foot tapping of physically touching the upper surface of the device body 110 with his/her right or left foot.

[63] According to the above configuration, when vibration caused by a physical touch detected by the touch detection part, for example, a user's foot tapping satisfies a preset recognition criterion, the load control part 230 may recognize the physical touch as the load control signal for controlling the exercise load of the drive motor 210.

[64] In addition, when the physical touch is recognized as the load control signal, the load control part 230 may control the exercise load of the drive motor 210 by analyzing the corresponding load control signal.

[65] In one embodiment, when it is determined that the load control signal is a preset emergency brake signal, the load control part 230 may reduce the exercise load of the drive motor 210. As described above, when a user feels that a current exercise load is too high and wants to reduce the exercise load, the user may perform foot tapping with the foot, and when the load control part 230 determines that the foot tapping is the preset emergency brake signal, the load control part 230 may reduce the exercise load of the drive motor 210.

[66] Accordingly, without the manip0ulation of a separate remote control or manipulation buttons provided on the device body 110, a user may physically touch the upper surface of the device body 110 with his or her foot in a current exercise state and may control the exercise load of the drive motor 210.

[67] In the embodiment of the present disclosure, when the intensity of a physical touch detected by the touch detection part 220 is greater than or equal to a preset reference intensity I_R, the load control part 230 may determine that the recognition criterion is satisfied for the recognition of the load control signal.

[68] In the embodiment of the present disclosure, a user may step on the device body 110 to perform a muscle exercise, and even when a user is in a process of pulling or releasing the cables 120, that is, in a general process of exercise, a physical touch, that

is, the change of vibration may be detected.

[69] Accordingly, in the embodiment of the present disclosure, only when the intensity of vibration detected by the touch detection part 220 is greater than or equal to the reference intensity I_R may the vibration be recognized as the load control signal, and thus it is possible to eliminate the error of a user recognizing an unintentional physical touch as the load control signal.

[70] Meanwhile, in the embodiment of the present disclosure, the load control part 230 may analyze the load control signal based on at least one of the number of times of successive occurrences of the load control signal and the pattern of the load control signal.

[71] In one embodiment, according to the number of times of successive occurrences of the load control signal such as one occurrence of the load control signal, and two successive occurrences of the load control signal, the load control signal may be recognized as the emergency brake signal described above or an exercise initiation signal to be described later.

[72] In one embodiment, in the case of the load control signals of the successive patterns, only when time difference between the load control signals is within a preset reference pitch tp (see FIG. 5(b)) may the load control signals be recognized as being successive. For example, when a period of time between the recognition of a second load control signal and the recognition of a first load control signal exceeds the reference pitch tp, the first load control signal may be ignored. In addition, when an additional load control signal is not recognized within the reference pitch tp after the occurrence of the second load control signal, the second load control signal may also be ignored.

[73] For another example, even when the load control signal occurs multiple times in succession within the reference pitch tp, the load control signal may be recognized as the emergency brake signal.

[74] As for the above method of recognizing the load control signal, different signals may be recognized to be input for the same number of times and patterns of the load control signals in a load increasing section and a load maintaining section to be described later, and detailed description thereof will be described later.

[75] Hereinafter, the control process of the muscle exercise device 10 according to the embodiment of the present disclosure will be described with reference to FIGS. 3 and 4.

[76] Referring to FIG. 3, the control process of the muscle exercise device 10 according to the embodiment of the present disclosure may include inputting of a target load L_T at S30. To this end, the muscle exercise device 10 according to the embodiment of the present disclosure may include a user input part 240 as illustrated in FIG. 2.

[77] In one embodiment, the user input part 240 may be provided on the upper surface of

the device body 110 in the form of a manipulation part manipulated by a user. For another example, the user input part 240 may be provided in the form of a remote control.

[78] For another example, the user input part 240 may be provided in the form of a smart device such as a smart phone. To this end, a communication module supporting short-range communication such as Bluetooth may be provided in the muscle exercise device 10 according to the embodiment of the present disclosure, and various input signals may be transmitted from the smart device to the muscle exercise device 10 through communication of the muscle exercise device 10 with an app installed in the smart device.

[79] As described above, when the target load L_T is input through the user input part 240, the load control part 230 may increase the exercise load of the drive motor 210 at S31 so that the exercise load is output by being changed to the target load L_T input through the user input part 240.

[80] Here, in the embodiment of the present disclosure, the load control part 230 may provide a basic load L_R as an initial value of an exercise load. As illustrated in FIG. 4(a), the basic load L_R, which is a value other than 0, is an exercise load basically provided by the drive motor 210. That is, the basic load is an exercise load provided basically even if a user does not input the target load L_T to the muscle exercise device 10, and when the muscle exercise device 10 is turned on, the load control part 230 may maintain a state in which the drive motor 210 outputs the basic load L_R.

[81] FIG. 4(a) is a graph showing change in an exercise load over time, and FIG. 4(b) is a graph showing the intensity of a physical touch detected by the touch detection part 220 over time.

[82] As illustrated in FIG. 4(a), in a state in which the basic load L_R is output from the drive motor 210, at time ts after the input of the target load L_T, the load control part 230 may control the drive motor 210 to increase the exercise load at S31 so that the exercise load of the drive motor 210 reaches the target load L_T. Here, the load control part 230 may gradually increase the exercise load so as to prevent the sudden increase of the exercise load applied to a user.

[83] In addition, when the exercise load reaches the target load L_T at S33, the load control part 230 may control the drive motor 210 so that the exercise load is maintained as the target load L_T at S34. Here, a user's muscle exercise may be performed in a process in which the exercise load of the drive motor 210 increases from the basic load L_R and reaches the target load L_T, or in a process in which the target load L_T is maintained after the exercise load has reached the target load L_T.

[84] In the embodiment of the present disclosure, the load control part 230 may determine whether the emergency brake signal is recognized in a process in which the exercise

load of the drive motor 210 is reaching the target load L_T and in a state in which the exercise has reached the target load L_T.

[85] Referring to FIG. 3, as described above, in a process in which the load control part 230 increases the exercise load so that the exercise load reaches the target load L_T, the load control part 230 may determine whether the emergency brake signal is recognized at S32.

[86] Referring to FIG. 4(b), in a state in which the intensity of vibration is detected by the touch detection part 220, the load control part 230 may determine whether to recognize a corresponding physical touch as the load control signal according to whether the intensity of vibration exceeds the reference intensity I_R.

[87] In the embodiment of the present disclosure, in a process in which the exercise load of the drive motor 210 increases from the basic load L_R and reaches the target load L_T, or in a state in which the target load L_T is maintained after the exercise has reached the target load L_T, when the load control signal is recognized once, the load control signal may be determined as the emergency brake signal.

[88] In FIG. 4(b), in the state in which the exercise load has reached the target load L_T and is maintained as the target load L_T, a one-time physical touch detected by the touch detection part 220 may exceed the reference intensity I_R so that the load control signal is recognized, and thus the load control signal may be recognized as the emergency brake signal.

[89] Accordingly, when the load control part 230 recognizes the load control signal as the emergency brake signal, the load control part 230 may reduce the exercise load of the drive motor 210 at S36. Here, the reduction of the exercise load by the emergency brake signal may be rapider than the process of increasing the exercise load. Furthermore, when reducing the exercise load according to the emergency brake signal, the load control part 230 may reduce the exercise load up to the basic load L_R.

[90] Referring back to FIG. 3, to explain a user's exercise process sequentially, the load control part 230 may increase the exercise load to the target load L_T at S31, and may determine whether the emergency brake signal is recognized at S32.

[91] For example, in a process in which a user increases an exercise load, even if the user inputs the target load L_T, the target load L_T may be greater than an exercise load expected by the user.

[92] In this case, the user may feel that force applied to him or her in the process in which the exercise load increases is too high. In this case, when the user applies a physical touch, such as foot tapping, to the upper surface of the device body 110, the intensity of vibration detected by the touch detection part 220 may exceed the reference intensity I_R.

[93] In addition, the load control part 230 may recognize the physical touch exceeding the

reference intensity I_R as the load control signal, and as described above, when the load control signal is recognized once, the load control signal may be recognized as the emergency brake signal at S32 and the exercise load of the drive motor 210 may be reduced at S36.

[94] On the other hand, when the emergency brake signal is not recognized until the exercise load of the drive motor 210 reaches the target load L_T at S33, a user may perform a muscle exercise while the exercise load of the drive motor 210 is maintained as the target load L_T at S34.

[95] In the process of muscle exercise, when a user intends to urgently remove the exercise load since the user cannot withstand the target load L_T of the drive motor 210 due to continuous exercise, the user may apply a physical touch such as foot tapping to the upper surface of the device body 110, and in this case, as illustrated in FIG. 4(b), the intensity of the physical touch detected by the touch detection part 220 may exceed the reference intensity I_R.

[96] In this case, the load control part 230 may recognize the physical touch exceeding the reference intensity I_R as the load control signal. When the load control signal is recognized once, the load control part 230 may recognize the load control signal as the emergency brake signal at S35 and may reduce the exercise load at S36.

[97] Through the above process, when a user wants to remove an exercise load currently provided in an exercise process, the exercise load may be removed only by applying a physical touch, such as foot tapping, to the device body 110, thereby providing a simple user interface for the control of the exercise load.

[98] Furthermore, as illustrated in FIG. 1, in a process in which a user exercises by gripping the gripping bar with both hands, a user interface for simpler control of the exercise load may be provided, thereby enabling more safe and convenient muscle exercise.

[99] In the above process, when the end of the exercise is recognized at S37, the load control part 230 may decrease the exercise load to the basic load L_R at S38 and stop the exercise process. Here, the recognition of the end of the exercise may refer to the lapse of a period of time previously preset by a user. For another example, even when the load control signal is recognized twice in succession while the exercise load reaches the target load L_T, the load control signal may be recognized as an exercise end signal.

[100] In this case, the reduction of the exercise load at S36 and the reduction of the exercise load at S38 may be preset to be different from each other in the reduction speed of the exercise load. For example, the reduction speed of the exercise load at S36 may be preset to be rapider.

[101] Meanwhile, in the embodiment of the present disclosure, when the load control signal is determined to be the preset exercise initiation signal, the load control part 230

may control the drive motor 210 so that the exercise load is output by being changed to the target load L_T input through the user input part 240.

[102] Referring to FIGS. 5(a) and 5(b), in a state in which the target load L_T is input through the user input part 240, when the intensity of a physical touch detected by the touch detection part 220 is detected to be greater than or equal to the reference intensity I_R and is recognized as the load control signal, the load control part 230 may determine whether the corresponding load control signal is the preset exercise initiation signal.

[103] For example, as illustrated in FIG. 5(b), when the load control signal is recognized twice in succession, the load control part 230 may determine the load control signal as the exercise initiation signal.

[104] Accordingly, when the load control signals occurring twice in succession are determined as the exercise initiation signal, the load control part 230 may control the drive motor 210 so that the exercise load is output by being changed to the target load L_T input through the user input part 240.

[105] Here, as described above, when the two successive load control signals occur within the reference pitch tp, the load control signals may be recognized as the exercise initiation signal. Through this, it is possible to solve the problem that a physical touch occurring when a user steps on the device body 110 to prepare for exercise or a physical touch occurring when a user takes a posture after stepping on the device body 110 is mistaken for the exercise initiation signal.

[106] As described above, a process after the target load L_T is reached and maintained from a process of increasing the exercise load to the target load L_T after the recognition of the exercise initiation signal may be illustrated in the embodiment illustrated in FIGS. 3 and 4.

[107] Hereinafter, the control process of the muscle exercise device 10 according to the another embodiment of the present disclosure will be described with reference to FIGS. 6, 7(a), and 7(b).

[108] In the same manner as the embodiment described previously, when a user inputs a target load L_{T1} through the user input part 240 at S50, the load control part 230 may determine whether an exercise preparation condition is recognized at S51.

[109] Here, the exercise preparation condition is a process of recognizing whether the completion of muscle exercise preparation is satisfied after the user inputs the target load L_{T1}. For example, the exercise preparation condition may be a state in which a user steps on the device body 110 and pulls the gripping bar to pull out the cable 120 in order to prepare for muscle exercise, and then takes an exercise posture.

[110] In the embodiment of the present disclosure, as illustrated in FIG. 1, the muscle exercise device 10 may include a position detection part 260. The position detection

part 260 may measure the length of the cable 120 pulled out from the initial position of the cable 120. For example, the length of the pulled-out cable 120 may be measured based on the number of rotations of the drive motor 210 or the number of rotations of a bobbin (not shown) on which the cable 120 is wound. In this case, when it is detected by the position detection part 260 that the cable 120 is pulled out as much as a preset reference position, the load control part 230 may determine that the exercise preparation condition is recognized.

[111] After the exercise preparation condition is recognized at S51, the load control part 230 may determine whether the load control signal is recognized as the exercise initiation signal after the load control signal is recognized at S52. In the another embodiment of the present disclosure, as in the above described embodiment, when the load control signal is recognized twice in succession, the corresponding load control signal may be determined as the exercise initiation signal.

[112] Next, as illustrated in FIGS. 7(a) and 7(b), the load control part 230 may increase the exercise load so that the exercise load of the drive motor 210 reaches the target load L_{T1} at S53 at time ts at which the second load control signal occurred. Here, the drive motor 210 may provide the basic load L_R as an initial load value.

[113] Meanwhile, in the embodiment illustrated in FIGS. 6, 7(a), and 7(b), while increasing the exercise load to the target load L_{T1}, the load control part 230 may continuously monitor whether the load control signal is recognized, and may determine whether the corresponding load control signal is a preset load change signal at S54 when the load control signal is recognized.

[114] In one embodiment, in a process in which the exercise load increases to the target load L_{T1} input by a user, when the user intends to change the target load L_{T1} to the exercise load applied at the present time, a physical touch such as foot tapping may be applied to the device body 110.

[115] In the embodiment of the present disclosure, when the load control signal is recognized once while the exercise load is changed to the target load L_{T1}, the corresponding load control signal may be recognized as the load change signal.

[116] That is, in the embodiment of the present disclosure, a load control signal recognized in a process in which the exercise load increases to reach the target load L_{T1}, and a load control signal recognized in a process in which exercise is performed while the exercise load has reached the target load L_{T1} and is maintained may be respectively recognized as the load change signal and the emergency brake signal.

[117] Referring to FIGS. 7(a) and 7(b), when a user applies a physical touch such as foot tapping while the exercise load is increasing to the target load L_{T1}, the intensity of the physical touch detected by the touch detection part 220 may exceed the reference intensity I_R.

[118] In this case, when the load control signal is recognize once, the load control part 230 may determine the load control signal as the load change signal at S54, and may perform the process of changing the current exercise load output from the drive motor 210 to a target load L_{T2}.

[119] In one embodiment, when the load control signal occurs at time t_{c1} illustrated in FIG. 7(b), the load control part 230 may determine this as the load change signal at S54 and may stop the increase of the exercise load of the drive motor 210.

[120] Next, the load control part 230 may provide a select alarm AL for selecting whether to change the target load L_{T1} to a user at S55. For example, the muscle exercise device 10 according to the embodiment of the present disclosure may further include an alarm output part 250 which outputs the select alarm as illustrated in FIG. 2.

[121] In one embodiment, the alarm output part 250 may include a speaker outputting a voice. The load control part 230 may output a guide voice as the select alarm so that a user can select whether to change the target load LT through a speaker. For example, a voice such as "Do you want to change a target load to a current exercise load? may be output.

[122] Next, the load control part 230 determines whether the load change approval for changing the target load L_{T1} is input in response to the select alarm at S56. In the embodiment of the present disclosure, the load control part 230 may determine whether to make the load change approval based on the load control signal.

[123] In one embodiment, as illustrated in FIGS. 7(a) and 7(b), a case in which the select alarm AL is provided after the load change signal is recognized at time t_{c1}, and the load control signal is recognized by a user performing a physical touch once by foot tapping at time t_{c2} may be recognized as a case in which the load change approval is input.

[124] In addition, when the load change approval is recognized based on the load control signal, the load control part 230 may change the current exercise load to the target load L_{T2} at S52.

[125] On the other hand, when the load change approval is not recognized at S56, the process of increasing the exercise load at S53 may be performed so that the exercise load reaches the existing target load L_{T1} again.

[126] In addition, when the load change signal is not recognized at S54, the process of increasing the exercise load at S53 may be performed until the exercise load reaches the existing target load L_{T1} at S58.

[127] Through the process, when the exercise load reaches the target load L_{T1}, as at S34 to S38 of FIG. 3, exercise may be performed while the exercise load is maintained, and depending on whether the emergency brake signal is recognized (at time te), the process of reducing the exercise load may be performed.

[128] According to the above configuration, even when the load control signal of the same

pattern is recognized, the load control signal may be recognized as a different input signal in the control process of the exercise load, for example, in an exercise preparation process, a process of increasing the exercise load from the basic load L_R to the target load L_T, and a process of maintaining the target load L_T, so a simple physical touch such as foot tapping may be used as various input signals for the control of the exercise load.

[129] Although the embodiments of the present disclosure have been described above with reference to the accompanying drawings, the muscle exercise device of the present disclosure is not limited to the above embodiments, but may be manufactured in various different forms. Those skilled in the technical field to which the present disclosure belongs will be able to understand that the muscle exercise device of the present disclosure may be configured in other specific forms without changing the technical idea or essential characteristics of the present disclosure. Therefore, it should be understood that the embodiments described above are illustrative in all respects and not restrictive.

[130] <Description of the Reference Numerals in the Drawings>

[131] 10: Muscle exercise device 110: Device body

[132] 120: Cable 130: Gripping bar

[133] 210: Drive motor 220: Touch detection part

[134] 230: Load control part 240: User input part

[135] 250: Alarm output part 260: Position detection part

Industrial Applicability

[136] The muscle exercise device according to the embodiments of the present disclosure may be applied to a device on which a user performs a muscle exercise by using a cable.

Claims

[Claim 1] A muscle exercise device comprising:
a device body on which a user is capable of exercising;
at least one drive motor installed inside the device body and configured to provide an exercise load;
a load transfer unit configured to transfer the exercise load from the drive motor to the outside;
a touch detection part configured to detect a physical touch applied to an upper surface of the device body; and
a load control part configured to recognize the physical touch as a load control signal when the physical touch satisfies a preset recognition criterion and to control the exercise load of the drive motor by analyzing the load control signal.

[Claim 2] The muscle exercise device of claim 1, wherein when it is determined that the load control signal is a preset emergency brake signal, the load control part reduces the exercise load of the drive motor.

[Claim 3] The muscle exercise device of claim 2, wherein when the load control signal is recognized once, the load control part determines the load control signal as the emergency brake signal.

[Claim 4] The muscle exercise device of claim 2, further comprising:
a user input part configured to input a target load,
wherein the load control part controls the drive motor so that the exercise load is output by being changed to the target load input through the user input part, and reduces the exercise load of the drive motor when the emergency brake signal is recognized in a process in which the exercise load of the drive motor is reaching the target load and in a state in which the exercise load has reached the target load.

[Claim 5] The muscle exercise device of claim 2, wherein when the emergency brake signal is recognized, the load control part reduces the exercise load of the drive motor to a preset basic load.

[Claim 6] The muscle exercise device of claim 2, wherein the touch detection part comprises a vibration detection part installed inside the device body and configured to detect a vibration generated by the physical touch.

[Claim 7] The muscle exercise device of claim 6, wherein the vibration detection part comprises an inertial measurement unit (IMU) sensor.

[Claim 8] The muscle exercise device of claim 2, wherein the physical touch is generated by foot tapping while a user is on the upper surface of the

device body.

[Claim 9] The muscle exercise device of claim 2, wherein when an intensity of the physical touch is greater than or equal to a preset reference intensity, the load control part determines that the recognition criterion is satisfied.

[Claim 10] The muscle exercise device of claim 2, wherein the load control part analyzes the load control signal based on at least one of the number of times of successive occurrences of the load control signal and a pattern of the load control signal.

[Claim 11] The muscle exercise device of claim 2, further comprising:
a user input part configured to input a target load,
wherein when it is determined that the load control signal is a preset exercise initiation signal while a preset exercise preparation condition is recognized, the load control part controls the drive motor so that the exercise load is output by being changed to the target load input through the user input part.

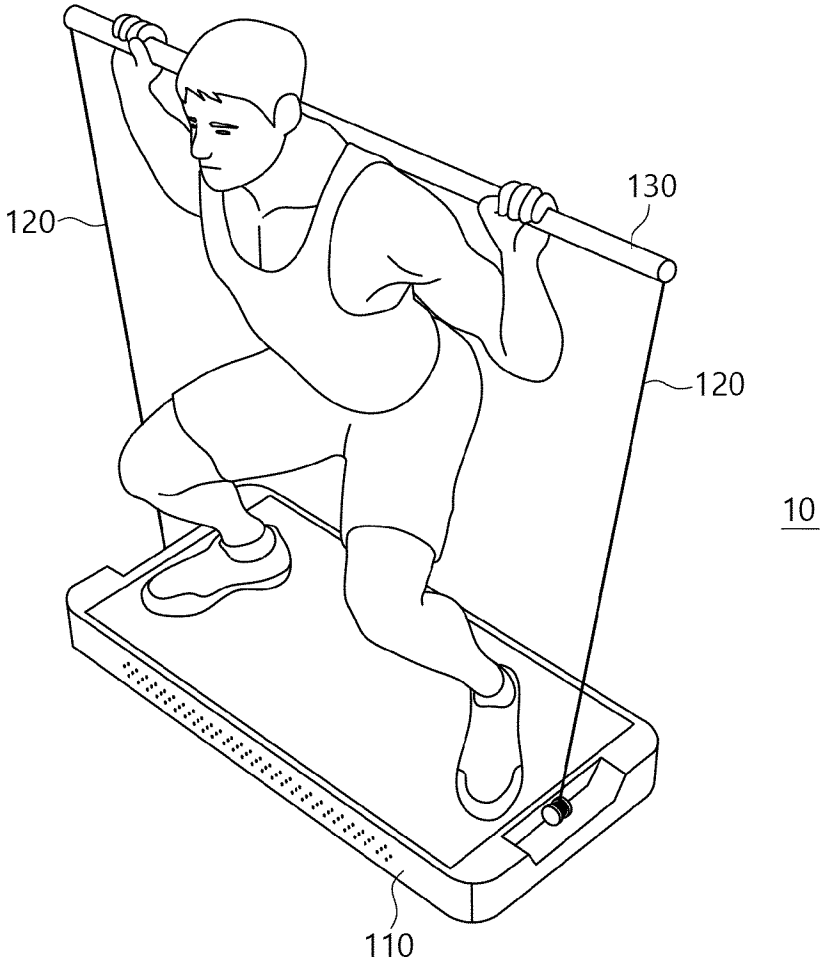
[Claim 12] The muscle exercise device of claim 11, wherein when the load control signal is recognized twice in succession, the load control part determines the load control signal as the exercise initiation signal.

[Claim 13] The muscle exercise device of claim 11, wherein the load control part controls the drive motor so that the exercise load reaches the target load from a preset basic load according to the exercise initiation signal, and changes the current exercise load output from the drive motor to the target load when it is determined that the load control signal is a preset load change signal while the exercise load reaches the target load from the basic load.

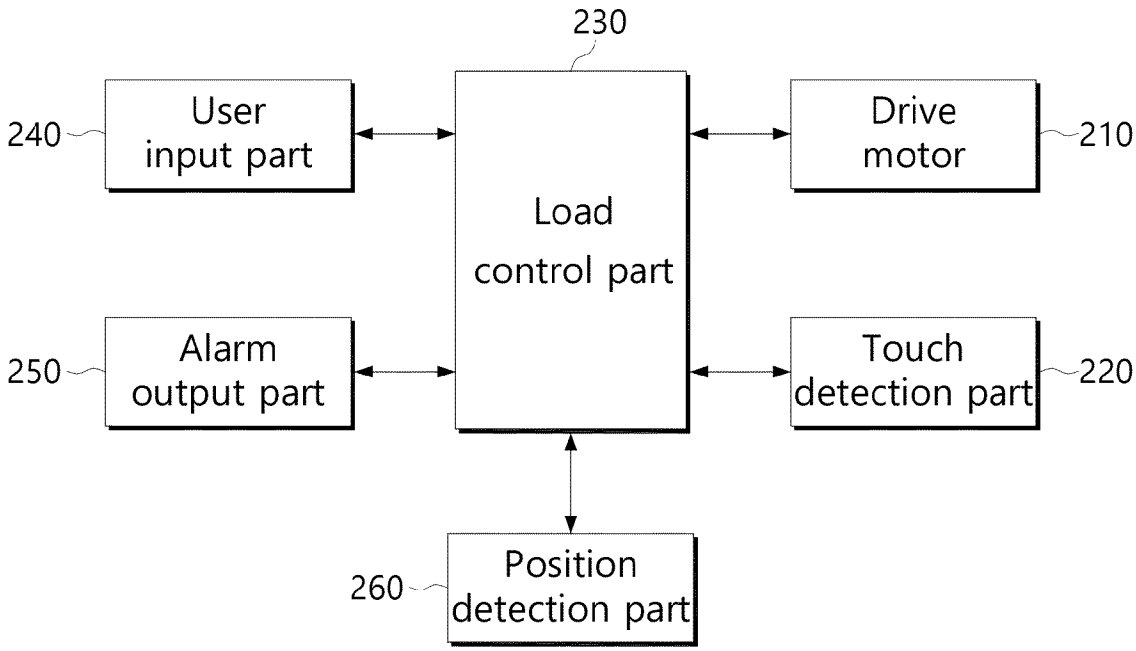
[Claim 14] The muscle exercise device of claim 13, wherein the load control part stops increase of the exercise load of the drive motor and provides a select alarm for selecting whether to change a load when it is determined that the load control signal is the load change signal, and changes the current exercise load to the target load when a load change approval is input in response to the select alarm.

[Claim 15] The muscle exercise device of claim 14, wherein the load control part determines whether to make the load change approval based on the load control signal.

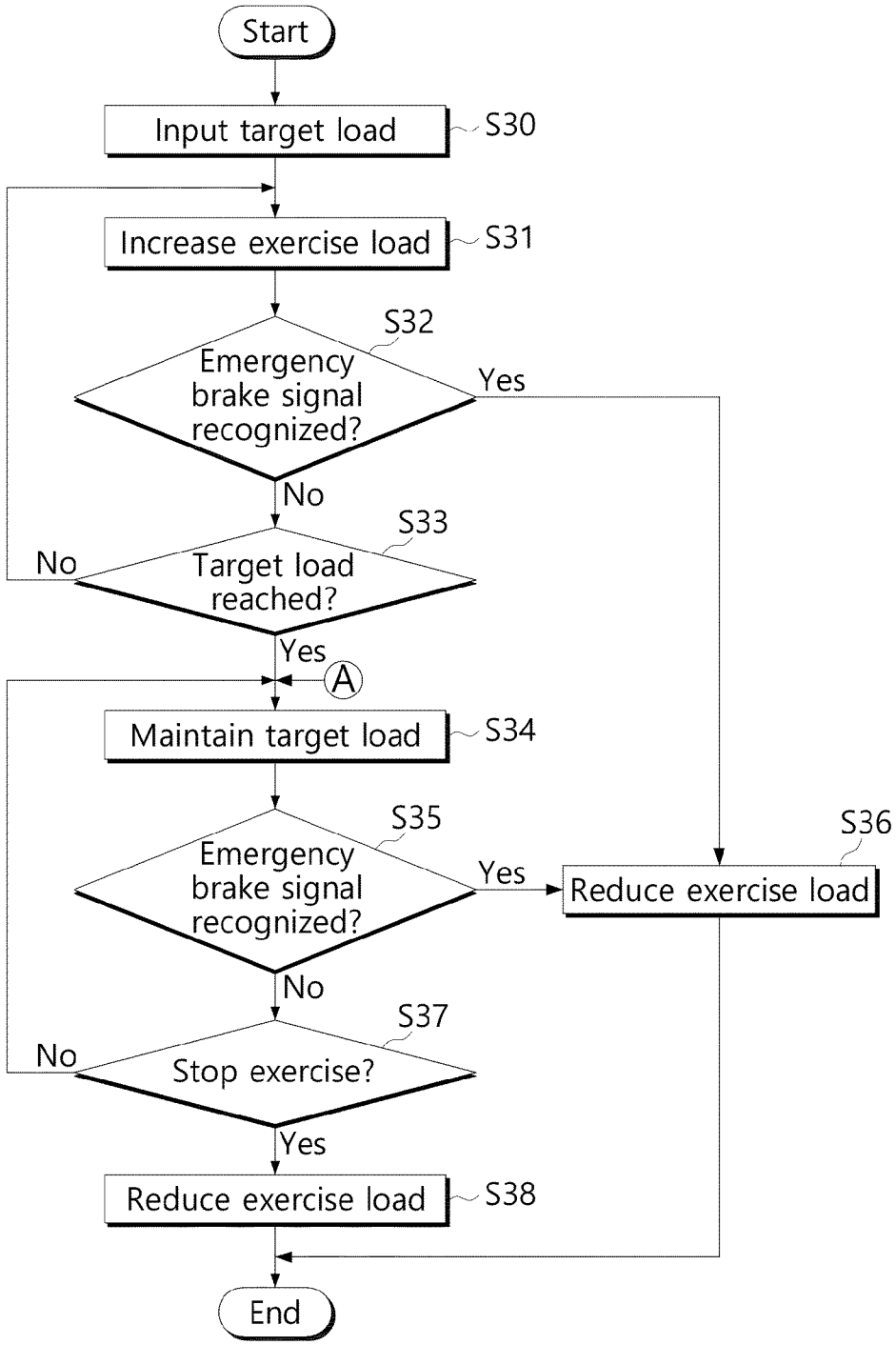
[Fig. 1]


120
130
120
10
110

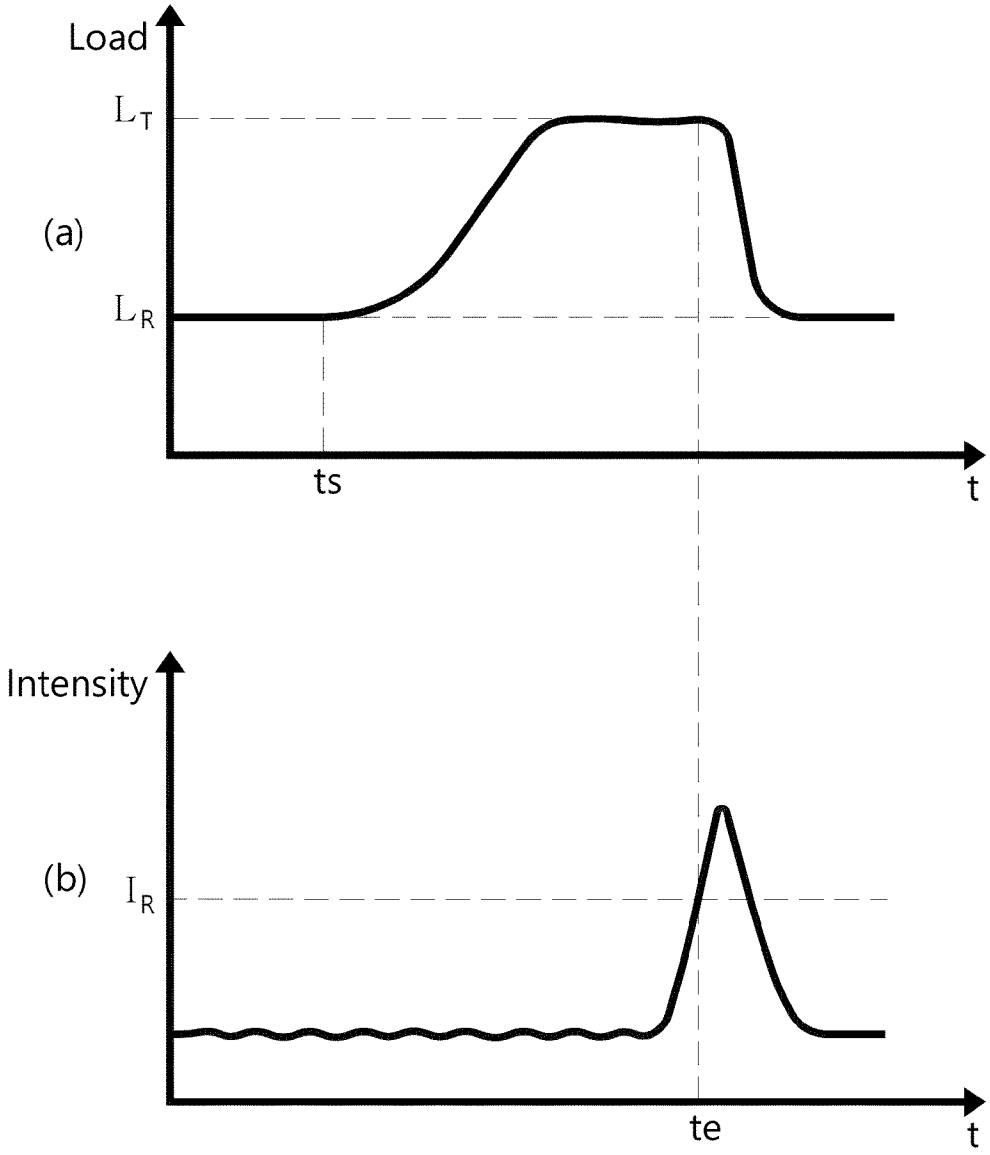
[Fig. 2]


230
240
User input part
Drive motor
210
Load control part
250
Alarm output part
Touch detection part
220
260
Position detection part

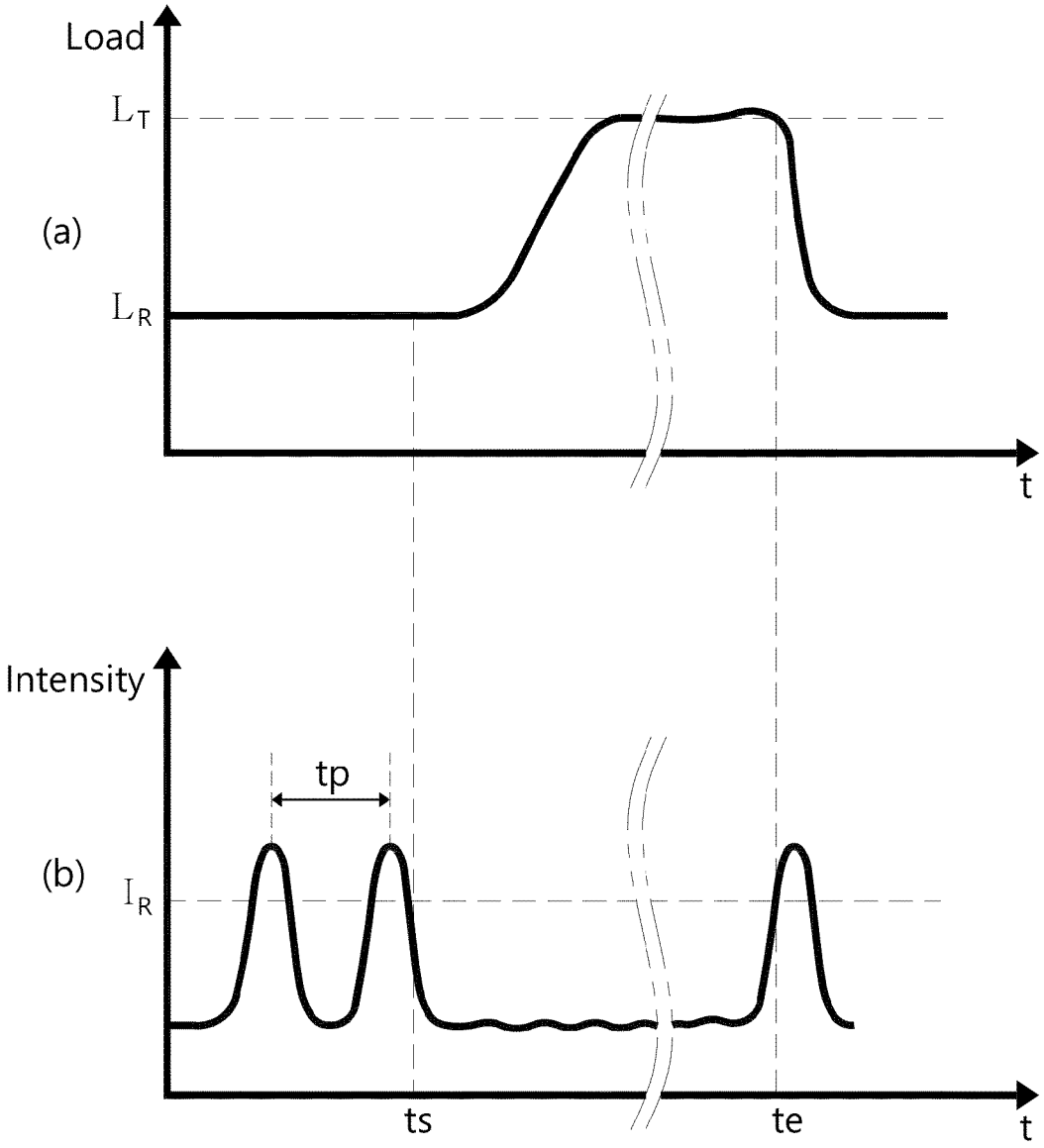
[Fig. 3]


Start
Input target load
S30
Increase exercise load
S31
S32
Emergency brake signal recognized?
Yes
No
S33
Target load reached?
No
Yes
A
Maintain target load
S34
S35
Emergency brake signal recognized?
Yes
S36
Reduce exercise load
No
S37
Stop exercise?
No
Yes
Reduce exercise load
S38
End

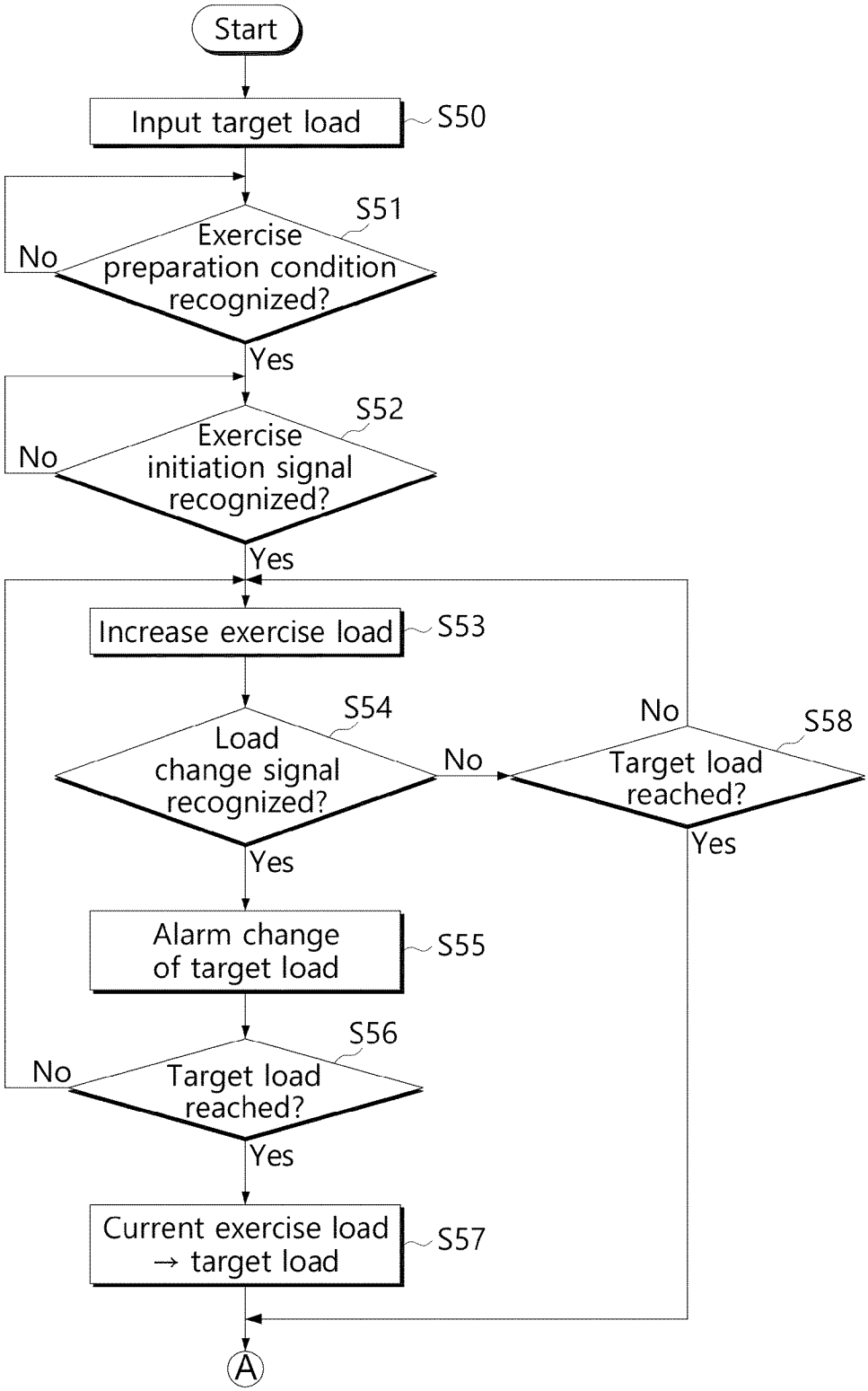
[Fig. 4]



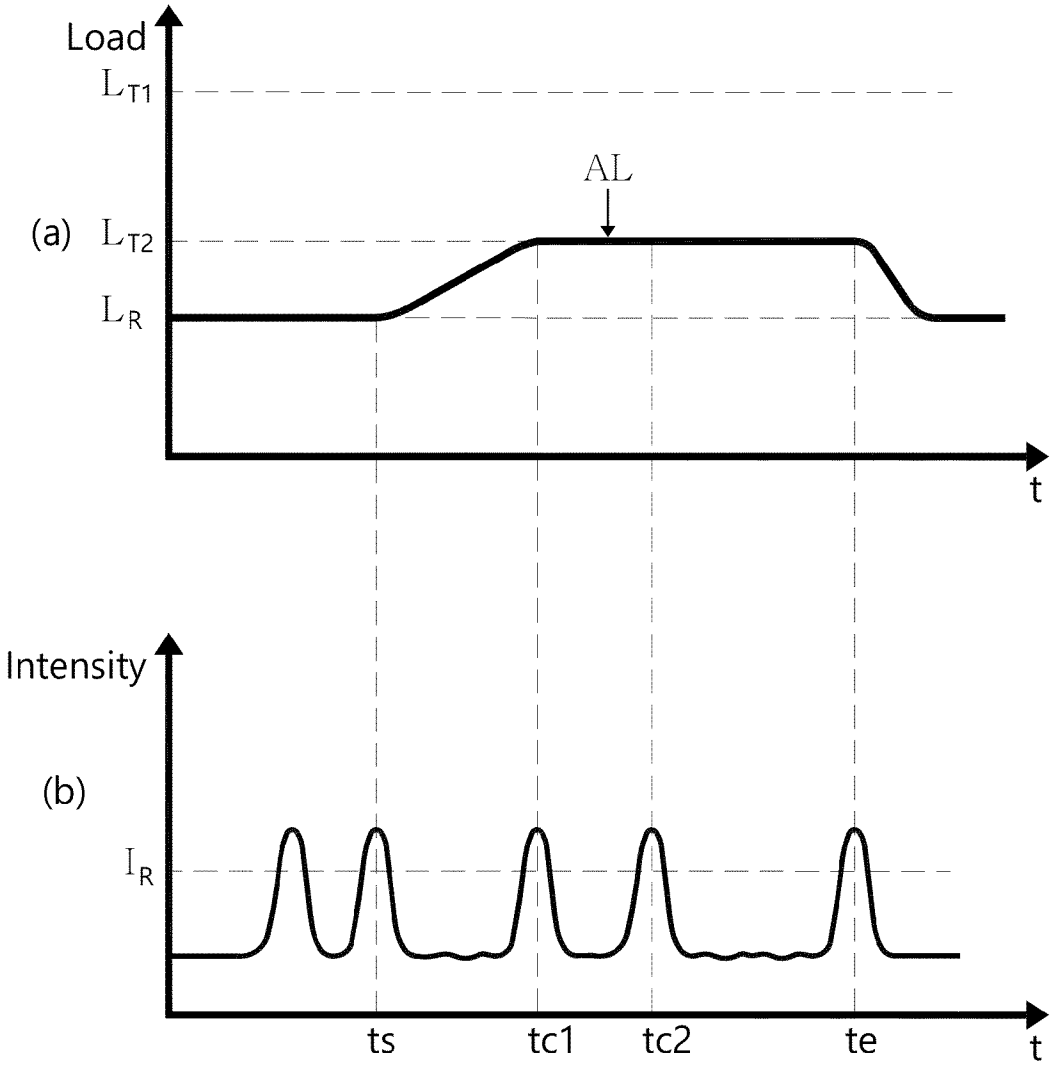
[Fig. 5]



[Fig. 6]


Start
Input target load
S50
S51
Exercise preparation condition recognized?
No
Yes
S52
Exercise initiation signal recognized?
No
Yes
Increase exercise load
S53
S54
Load change signal recognized?
No
Yes
S58
Target load reached?
No
Yes
Alarm change of target load
S55
S56
Target load reached?
No
Yes
Current exercise load → target load
S57
A

[Fig. 7]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2023/007083

A. CLASSIFICATION OF SUBJECT MATTER

A63B 21/005(2006.01)i; **A63B 21/00**(2006.01)i; **A63B 24/00**(2006.01)i; **A63B 71/06**(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A63B 21/005(2006.01); A63B 21/00(2006.01); A63B 21/04(2006.01); A63B 21/055(2006.01); A63B 21/068(2006.01); A63B 23/04(2006.01); A63B 23/12(2006.01); A63B 24/00(2006.01)

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

Korean utility models and applications for utility models
Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: exercise device, motor, load, touch, control

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2020-0079106 A (AIMO INC.) 02 July 2020 (2020-07-02) paragraphs [0030]-[0032], [0036], claims 4-5 and figure 1	1-15
A	KR 10-1840398 B1 (SETTEC CO., LTD.) 04 May 2018 (2018-05-04) paragraphs [0026], [0030], claim 8 and figures 1-2	1-15
A	US 2022-0001240 A1 (ARENA INNOVATION CORP.) 06 January 2022 (2022-01-06) paragraphs [0058]-[0060], [0073] and figures 1a-1c, 2	1-15
A	WO 2022-042074 A1 (GUANGZHOU YUANDONG SMART SPORTS TECHNOLOGY CO., LTD. et al.) 03 March 2022 (2022-03-03) paragraphs [0053]-[0054], [0063] and figures 1, 12a-12b	1-15
A	WO 2014-174475 A1 (NKOSI, MANDLA CASSY) 30 October 2014 (2014-10-30) paragraphs [0014], [0047]-[0049], [0063] and figure 5	1-15

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 September 2023	**04 September 2023**

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office **189 Cheongsa-ro, Seo-gu, Daejeon** **35208, Republic of Korea**	**LEE, KANG HA**
Facsimile No. **+82-42-481-8578**	Telephone No. **+82-42-481-5003**

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2023/007083

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		KR 10-2021-0028154 A	11 March 2021
		US 11123609 B2	21 September 2021
		US 11707646 B2	25 July 2023
		US 2019-0344123 A1	14 November 2019
		WO 2019-222114 A1	21 November 2019
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WO 2014-174475 A1	30 October 2014	None	