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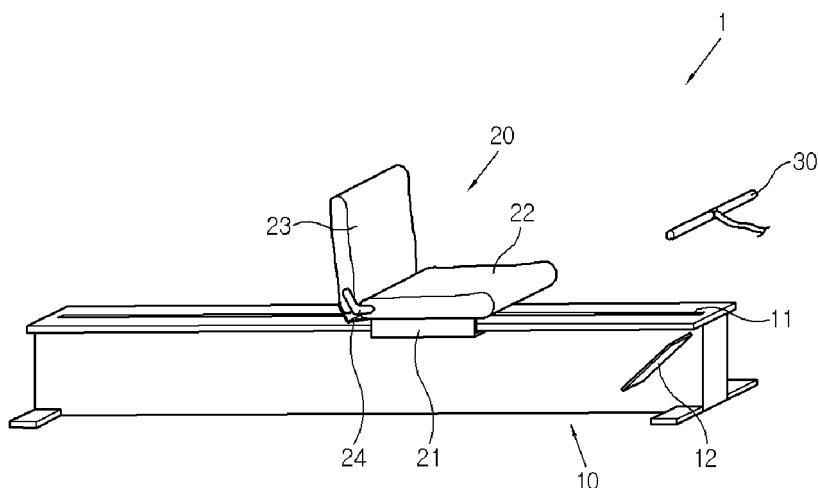
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(54) **ROWING MACHINE EXERCISE-ASSISTING DEVICE**

(57) The present invention relates to an exercise-as-
sisting device, and more specifically to a seat able to
move reciprocally automatically in the front-to-back di-
rection, which is one of the constituent elements of a

rowing machine constituting a remedial exercise device
for physically disabled individuals, and particularly para-
plegics, while also constituting a whole-body exercise
device able to prevent heterotopic ossification.

[Fig. 3]



Description

[Technical Field]

[0001] The present invention relates to an exercise-assisting device, and more particularly, to a rowing machine exercise-assisting device that is provided with a seat capable of automatically moving reciprocally in forward and backward directions, which is one of the components of a rowing machine.

[Background Art]

[0002] A rowing machine is a whole body exercise device configured to consume a substantial large amount of energy within a short period of time, which is manufactured by obtaining an idea from rowing operations carried out in rowing races on the water, so as to lively provide rowing rhythms and feelings to a user using the rowing machine indoors. The rowing machine has similar exercise strength to that of a stepper or a running machine focused to lower body exercises, but it is very effective in performing the whole body exercise. Further, since the user exercises while sitting in a seat mounted on the rowing machine, no harm is applied to his knee areas. In case where the rowing machine is provided with a monitor, the exercise results can be recorded and stored through the monitor and a storing device, while the exercise state is being monitored in real time. The rowing machine is well known in Europe, Australia, Japan and so on, and some rowing machine products are capable of performing on-line racing through the connection of Internet with other countries, thereby avoiding boring during the exercise. Also, since the rowing machine does not have any noise generated therefrom and is light in weight, it can be used indoors, without any trouble in installation areas.

[0003] The rowing machine is usually used for training athletes in many countries, and as mentioned above, since the exercise is performed while the user is sitting in the seat, no harm is applied to the user's body areas, so that the rowing machine is also used as a remedial exercise machine for a medical purpose.

[0004] Referring to FIGS. 1A and 1B, now, an operating method of the rowing machine is described. A user sits in a seat capable of reciprocally moving in forward and backward directions on a rail connected to a body of the rowing machine and then places his soles of feet on footboards. Next, he takes a handle of the rowing machine. The user applies a given force to his feet on the footboards, and at the same time, he bends his back and waist backwardly, so as to pull the handle toward his chest by using the force generated from his back and waist. At this time, his knees and legs are fully stretched out, and the reciprocally moving seat is moved to the rear side of the rail. This state is maintained for several seconds after the pulling operation so as to allow his muscles to be sufficiently contracted. After that, if the force applied

from his back and waist is removed, the handle is moved to its original position by means of the restoring force thereof. At this time, his back and waist are bent in a forward direction in which the body of the rowing machine is placed. Also, the seat is moved forwardly, so that his knees are automatically bent to return to the initial state of the rowing operations. The rowing operations are repeatedly carried out to obtain whole body exercise effects.

[0005] Through the repetition of the above-mentioned rowing operations, the muscles on the user's back, shoulder and low body are strengthened, and aerobic exercise for the user's whole body is performed, so that the rowing machine is used for the remedial purposes for disabled persons caused by unexpected accidents as well as for training purposes for professional athletes.

[0006] In addition to the above-mentioned purposes, especially, the rowing machine can be used for disabled persons who do not move their legs at all by the paralysis of the lower body. The paraplegic disabled person cannot bend his knees willingly, and thus, he lives in a state where his knees are stretched out. In this case, calcium accumulates on given joints like knees, and if a long period of time has passed in this state, the calcium is just hardened to cause the joints to be interfered in the movements. In severe cases, new bone pieces form at abnormal positions. This is called heterotopic ossification. The heterotopic ossification is the process by which bone tissue forms in connective tissues or soft tissues since oxygen supply to the tissues is insufficiently performed and minute injuries are caused on the tissues, and as mentioned above, the heterotopic ossification often occurs in the paraplegic disabled persons caused by the spine injury. Specifically, the heterotopic ossification most commonly occurs in hip joints, and it is generally found in knee joints. Therefore, the knees of the paraplegic disabled persons are forcedly bent and stretched out in hospitals and the like.

[0007] According to the seat attached on the conventional rowing machine, a user bends his knees and applies a given force to the footboards. Next, he stretches his knees and pulls the handle, thereby performing the rowing operations. Therefore, if the user uses the conventional rowing machine for remedial and medical purposes, he should apply a given force to the footboards by using his lower body so as to obtain good exercise effects therefrom,

[0008] The patient having the spine injury, especially, the paraplegic patient, makes use of the rowing machine in hospitals or houses for the remedial purposes, but since he cannot use his lower body, the handle of the rowing machine is repeatedly pulled and released by using only his upper body, especially his arms. In this case, therefore, the rowing operations are achieved by the upper body exercise, especially by the arm exercise, not by the whole body exercise, which does not have any difference in other arm exercise machines.

[0009] In this case, also, since the user repeats the

simple arm exercises, he easily feels bored and does not have any fun, thereby making it difficult to keep exercising. More particularly, the user cannot take the active rowing motions of the rowing machine. Therefore, the paraplegic patient does not have excellent whole body exercise effects and the specific activities of the rowing machine.

[0010] Further, since the user performs the upper body exercise in the state where his lower body is fixed to the rowing machine, he does not have any advantage in the prevention of the heterotopic ossification commonly occurring to the paraplegic patients, and therefore, the user's knees should be forcedly bent or stretched by nurses or caregivers.

[Disclosure]

[Technical Problem]

[0011] Accordingly, the present invention has been made in view of the above-mentioned problems occurring in the prior art, and it is an object of the present invention to provide a rowing machine exercise-assisting device that is configured to have a seat of a rowing machine adapted to be automatically moved reciprocally so as to provide whole body exercise effects and rowing activities even to patients having spine injury, especially paraplegic patients.

[Technical Solution]

[0012] To accomplish the above object, according to the present invention, there is provided a rowing machine exercise-assisting device including: a guide rail; a support part adapted to support the guide rail; a seat mounted on the guide rail in such a manner as to move reciprocally in forward and backward directions along the length direction of the guide rail, in which a user sits; a safety belt provided on the seat to prevent the user from being escaped from the seat; footboards disposed on left and right sides of the support part to place the user's feet thereon at the time when the user sits in the seat; a fixing belt provided on each of the footboards to prevent the user's foot from being escaped from the footboard; a bar-shaped handle taken by the both hands of the user; reciprocating exercise means having a servo motor and a controller controlling the rotation of the servo motor; and a control panel provided on the handle and connected to the controller to transmit commands to the controller such that the controller controls the rotating direction, the rotating speed and the number of rotation of the servo motor, the control panel having a switch adapted to control the start and stop of the reciprocating exercise of the seat, a switch adapted to adjust the speed of the reciprocating exercise of the seat and a switch adapted to adjust the reciprocating distance of the reciprocating exercise of the seat, whereby as the servo motor rotates forwardly and backwardly, the seat is automatically

moved reciprocally in the forward and backward directions along the length direction of the guide rail.

[0013] According to the present invention, preferably, the reciprocating exercise means like a timing belt, a chain, or a rack gear and a pinion gear is provided in the interior of the support part of the rowing machine, and through the reciprocating exercise means, the seat moves reciprocally in forward and backward directions along the guide rail at a given speed. If a remedial patient pulls the handle of the rowing machine in accordance with the rhythms of the reciprocating movements, even the remedial patient, especially the paraplegic patient has the rowing feelings like general persons using their lower body.

[0014] For example, if the timing belt as the reciprocating exercise means is used, it is rotated in accordance with the rotation of the motor, and the seat fixed to the timing belt is moved forwardly and backwardly (in the direction parallel to the surface on which the rowing machine is placed). The moving direction of the seat is determined in accordance with the direction of the rotation of the motor. That is, if the direction of rotation of the motor is changed reversely, the seat is moved to the opposite direction thereto. Since the motor should repeat the forward and backward rotation for a relatively short period of time, it is generally used as the servo motor having the controller through which the rotating speed and the rotating direction are accurately controlled, and specifically, a BLDC (brushless direct current) motor is most desirably used as the motor of the reciprocating exercise means in the present invention in that the speed and torque can be easily adjusted just by varying the time (phase difference) of the current intermittence period of a basic driving circuit, no rectifier and brush giving bad influences in the life term by means of the abrasion caused by the mechanical friction is used, the life term is semi-permanently extended, and noise is generated a little therefrom,

[0015] On the other hand, the chain may be used as the reciprocating exercise means. If the chain is rotated in accordance with the rotation of the motor, the seat fixed to the chain is moved forwardly and backwardly. In the same manner as the above, the moving direction of the seat is determined in accordance with the direction of rotation of the motor.

[0016] Alternatively, the rack gear and the pinion gear adapted to be engaged cooperatively with each other are used as the reciprocating exercise means, thereby moving the seat forwardly and backwardly. That is, as the motor is rotated, the pinion gear connected to the shaft of the motor is rotated, and accordingly, the rack gear engaged with the pinion gear performs a linear motion. As a result, the seat fixed to the rack gear carries out the linear motion. In the same manner as the above, the moving direction of the seat is determined in accordance with the direction of rotation of the motor.

[0017] Through the above-mentioned reciprocating exercise means, the remedial patient can have the row-

ing activities like general persons, thereby avoiding the simple exercises using only his upper body, especially his arms.

[0018] Further, only if the remedial patient just places his feet on the footboards, his knees can be bent and stretched by means of the seat reciprocating a given distance in the forward and backward direction.

[Advantageous Effect]

[0019] According to the present invention, as mentioned above, there is provided the rowing machine exercise-assisting device that is provided with the seat automatically moves reciprocally in the forward and backward directions, such that while a patient having spine injury, especially a paraplegic patient performs rowing exercises for remedial and treating purposes, he can enjoy rowing activities, thereby increasing his interest and fun and allowing him to keep exercising.

[0020] In addition to the upper body exercise, especially the arm exercise performed in the conventional rowing machine, the present invention can provide the lower body exercise to the paraplegic patient through the automatically reciprocating seat, thereby giving the whole body exercise to him. Further, his knees are automatically bent and stretched periodically, thereby preventing the heterotopic ossification by which the knee joints are hardened by the accumulation of the calcium on the knees.

[Description of Drawings]

[0021]

FIGS. 1A and 1B are side views showing operating methods of a conventional rowing machine, wherein FIG. 1A shows an initial state before a force is applied to the rowing machine and FIG. 1B shows an exercise state.

FIG. 2 is a side view showing a state wherein a handle is pulled toward a user's body by the application of the force to the rowing machine.

FIG. 3 is a partly perspective view showing a support part that is one of the components of a rowing machine exercise-assisting device according to a first embodiment of the present invention.

FIG. 4 is a sectional view showing a handle of the rowing machine exercise-assisting device according to the first embodiment of the present invention.

FIG. 5 is a side sectional view showing reciprocating exercise means provided in the support part of the rowing machine exercise-assisting device according to the first embodiment of the present invention.

FIG. 6 is a side sectional view showing reciprocating exercise means provided in the support part of a rowing machine exercise-assisting device according to a second embodiment of the present invention.

FIG. 7 is a side sectional view showing reciprocating

exercise means provided in the support part of a rowing machine exercise-assisting device according to a third embodiment of the present invention.

[Best Mode for Invention]

[0022] Hereinafter, an explanation on a rowing machine exercise-assisting device according to preferred embodiments of the present invention will be in detail given with reference to the attached drawings, The same reference numerals in the drawings denote the same components as each other.

[0023] First, FIGS. 1A and 1B are side views showing operating methods of a conventional rowing machine, wherein FIG. 1A shows an initial state where a user takes a handle and bends his body forwardly and FIG. 1B shows an exercise state where the user pulls the handle toward his chest by applying a force in a state of taking the handle, while bending his body backwardly. As mentioned above, the rowing machine is widely used for training purposes for athletes, and since the user exercises in a state of sitting in the seat of the rowing machine, there is no harm to his body. Thus, the rowing machine is also used for remedial purposes. The operating methods of the conventional rowing machine are carried out repeatedly through the initial state as shown in FIG. 1A and the exercise state as shown in FIG. 1B.

[0024] However, even though the patient having spine injury, especially the paraplegic patient, makes use of the conventional rowing machine, he cannot move the seat backwardly by applying a force caused by his feet to the footboards and further cannot stretch his legs to pull the handle. Therefore, the user places his feet on the floor and pulls the handle by using only his both arms, as shown in FIG. 2. Thus, the rowing machine as the whole body exercise machine serves as just an arm exercise machine, such that the user cannot enjoy the rowing activities, unlike general persons having rowing activities through the rowing exercise. Since the simple arm exercises are repeatedly performed, there are no exercise effects on the lower body, thereby losing his interest and fun and failing to keep exercising.

[0025] In order to solve these problems, as shown in FIG. 3, there is provided a rowing machine exercise-assisting device according to a first embodiment of the present invention that includes a support part 10 and a seat 20 disposed on the support part 10 in such a manner as to be automatically moved reciprocally. The support part 10 has a thin plate-like guide rail 11 disposed on the upper surface thereof so as to move the seat 20 reciprocally in forward and backward directions. The guide rail 11 has a width larger than the width in a direction perpendicular to the length direction of the support part 10 and has a slot formed at the center thereof along the length direction thereof. Further, the support part 10 has footboards 12 disposed at the left and right sides thereof so as to support a user's feet thereagainst in such a manner as to be protruded outwardly toward the left and right

sides thereof. More particularly, the footboards 12 may be bent to a given slant angle in a direction distant from the user so as to make the user's feet conveniently placed thereon. The support part 10 has a shape of a generally square column lying on the floor, but only if it is provided with the linear type guide rail 11 and the footboards 12, it may have any column shapes. The interior of the support part 11 is empty, and reciprocating exercise means 40, 50 or 60 as will be discussed later is provided in the interior of the support part 11.

[0026] The footboards 12 on which the user's feet are placed have fixing belts (not shown) mounted on one surface thereof so as to firmly fix the user's feet thereto, thereby preventing the user's feet from being escaped therefrom during exercising.

[0027] The seat 20 is disposed on the guide rail 11 in such a manner as to be automatically moved reciprocally. Preferably, the seat 20 includes a moving part 21 adapted to be mounted on the guide rail 11, a plate-shaped seating part 22 in which the user sits, and a back support part 23 adapted to support the user's back when sitting. The seating part 22 and the back support part 23 are coupled to each other by means of elastic members 24 like springs so as to allow the back support part 23 to be bent backwardly by a given angle when he leans his back against the back support part 23. Preferably, the moving part 21 is brought into direct contact with the guide rail 11. Even though not shown in the drawings, the moving part 21 has an engagement part 25 (See FIGS. 5 to 7) disposed on the underside surface thereof. Preferably, the engagement part 25 is engaged with the reciprocating exercise means 40, 50 or 60 like a belt provided in the interior of the guide rail 11 and is moved forwardly and backwardly. As the engagement part 25 of the moving part 21 is moved forwardly and backwardly, the seat 20 having the moving part 21 mounted thereon is also moved forwardly and backwardly along the guide rail 11. The reciprocating exercise means is configured into a variety of shapes, which will be in detail discussed later.

[0028] Generally, since the user of the rowing machine exercise-assisting device according to the present invention is a paraplegic patient, he may be fallen from the seat 20 by losing his body balance thereon during the reciprocating motions of the seat 20 in the forward and backward directions, which gives the risk of injuries to him. Thus, the seat 20 further has a safety belt (not shown) mounted thereon to prevent the user from being escaped from the rowing machine during the reciprocating motions of the seat 20,

[0029] According to the present invention, desirably, the rowing machine exercise-assisting device further includes a handle 30 to which a controller is attached to control the automatic reciprocal motions. The handle 30 has a generally linear or curved rod-like shape like the handle of the general rowing machine, and only if the handle 30 is taken by both hands of the user, it may have any shapes. First, the user takes the handle 30 by his both hands and pulls the handle 30 toward his chest. At

this time, as mentioned above, since the rowing machine exercise-assisting device according to the present invention is provided with the automatically reciprocating seat 20, the seat 20 is moved forwardly and backwardly at a given speed along the guide rail 11. If the seat 20 moves in the forward direction with respect to the user in the state where the user's feet are placed on the footboards 12, his knees are naturally bent, and contrarily, if the seat 20 moves in the backward direction with respect to the user, his knees are naturally stretched out.

[0030] Therefore, the handle 30 is pulled by the user in accordance with the forward and backward movements of the seat 20, such that the user can have rowing activities and dynamic rhythms like general persons freely using their lower body. In addition to the upper body exercise, especially the arm exercise performed in the conventional rowing machine, the present invention can provide the lower body exercise to the paraplegic patient through the automatically reciprocating seat, thereby giving the whole body exercise to him. Further, his knees are automatically bent and stretched periodically, thereby preventing the heterotopic ossification by which the knee joints are hardened by the accumulation of the calcium on the knees.

[0031] FIG. 4 is a sectional view showing the handle 30 of the rowing machine exercise-assisting device according to the first embodiment of the present invention. The handle has a control panel mounted thereon so as to allow the paraplegic user to easily control the reciprocating motions of the seat 20, but if necessary, the control panel may be mounted on a separate position and may be provided in a wired or wireless shape. More particularly, the control panel mounted inside the handle 30 includes an on/off switch 31 adapted to control the start and stop of the reciprocating exercise of the seat 20, a speed adjustment switch 32 adapted to adjust the speed of the reciprocating exercise of the seat 20 and a distance adjustment switch 33 adapted to adjust the reciprocating distance of the reciprocating exercise of the seat 20. The positions of the respective switches as shown in FIG. 4 may be changed freely, and if necessary, additional function switches may be provided on the handle 30. The distance adjustment switch 33 serves to adjust the reciprocating distance of the seat 20, and in this case, the reciprocating distance is the maximum movement range of the seat 20 moving reciprocally along the guide rail 11. That is, if the reciprocating distance is set large, the seat 20 reciprocates in a relatively large range in forward and backward directions, and contrarily, if the reciprocating distance is set small, the seat 20 reciprocates in a relatively small range in forward and backward directions. Therefore, the reciprocating distance of the seat 20 is set in consideration of the lengths of the user's arms and legs.

[0032] Even the paraplegic user easily presses the switches 31 to 33 provided on the handle 30, so that the automatic reciprocating motions of the seat 20 of the rowing machine exercise-assisting device can be readily

controlled.

[0033] Hereinafter, an explanation on the reciprocating exercise means 40, 50 and 60 allowing the seat 20 of the rowing machine exercise-assisting device to be automatically reciprocated will be given with reference to FIGS. 5 to 7. The reciprocating exercise means 40, 50 and 60 are disposed in the empty space in the support part 10, but they may be disposed at an arbitrary position outside the support part 10,

[0034] FIG. 5 is a side sectional view showing the reciprocating exercise means 40 provided at the inside of the support part 10 of the rowing machine exercise-assisting device according to the first embodiment of the present invention, and in this case, the reciprocating exercise means 40 includes a timing belt 41. The timing belt 41 is a band-shaped belt on which concave and convex portions are formed regularly. In this case, the timing belt 41 is rotated in accordance with the rotation of a motor 42, and as a result, the engagement part 25 of the moving part 21, which is fixed to the timing belt 41, is moved forwardly and backwardly (in the direction parallel to the surface on which the rowing machine is placed). Desirably, the concave and convex portions formed on the timing belt 41 are engaged with the concave and convex portion formed on the underside surface of the engagement part 25 to allow the seat 20 to be moved forwardly and backwardly by means of the timing belt 41 rotated by the motor 42. The engagement part 25 does not have any limitation in the shape thereof, and only if it has the concave and convex portions formed on the underside surface thereof in such a manner as to be engaged with the timing belt 41, it may have a variety of shapes. Further, preferably, the engagement part 25 is a protruded portion of the moving part 21, which may be formed unitarily with the moving part 21, and more desirably, the engagement part 25 may be connected directly with the underside surface of the seating part 22 of the seat 20 in such a manner as to pass through the slot formed along the guide rail 11.

[0035] So as to permit the timing belt 41 to be circulated by means of the motor 42, moreover, the rowing machine exercise-assisting device according to the first embodiment of the present invention includes a pulley disposed at the opposite side to the motor 42 so as to send the timing belt 41 back to the motor 42. As a result, the timing belt 41 is rotated around the two shafts of the motor 42 and the pulley. The pulley does not have any limitation in the kind and shape, and only if it is rotated to be engaged with the timing belt 41, it may have any kind and shape.

[0036] Therefore, the moving directions of the moving part 21 and the engagement part 25 are determined in accordance with the direction of the rotation of the motor 42, and further, the moving direction of the seat 20 connected integrally with the moving part 21 is determined in accordance with the moving direction of the moving part 21. Also, the reciprocating speed and distance are determined in accordance with the rotating speed of the

motor 42 and the moving distance of the timing belt 41.

[0037] That is, if the direction of the rotation of the motor 42 is changed reversely, the seat 20 is moved to the opposite direction thereto. Since the motor 42 should repeat the forward and backward rotation for a relatively short period of time, it is generally composed of the servo motor having the controller through which the rotating speed and the rotating direction are accurately controlled. Specifically, a BLDC motor is most desirably used as the motor 42 of the reciprocating exercise means 40 in the present invention in that the speed and torque can be easily adjusted just by varying the time (phase difference) of the current intermittence period of a basic driving circuit, no rectifier and brush giving bad influences in the life term by means of the abrasion caused by the mechanical friction is used, the life term is semi-permanently extended, and noise is generated a little therefrom.

[0038] As mentioned above, the motor 42 has the controller (not shown) mounted thereon, and preferably, the controller is connected to the switches 31 to 33 formed on the control panel of the handle 30 in such a manner as to receive electrical signals transmitted when the user presses the switches and to set the start/stop, the reciprocating speed, and the reciprocating distance in accordance with the received signals. As a result, the motor 42 is operated in accordance with the set values, thereby allowing the seat 20 to be moved reciprocally.

[0039] FIG. 6 is a side sectional view showing reciprocating exercise means 50 provided in the support part 10 of a rowing machine exercise-assisting device according to a second embodiment of the present invention. In this case, the reciprocating exercise means 50 includes a chain 51. As mentioned above, the reciprocating exercise means 50 may be disposed at any positions outside the support part 10. A motor 52 has the same structure, function and control method of the signals received from the handle 30 as those of the motor 42 according to the first embodiment of the present invention, and therefore, an explanation on them will be avoided. According to the second embodiment of the present invention, instead of the timing belt 41, the chain 51 is circulated, and therefore, instead of the pulley, a chain sprocket is adopted.

[0040] The chain 51 is rotated in accordance with the rotation of the motor 52, and as a result, the engagement part 25 of the moving part 21 of the seat 20, which are fixed to the chain 51, is moved forwardly or backwardly. Desirably, the engagement part 25 of the moving part 21 has protrusion-like chain insertion portions formed regularly on the underside surface thereof, as shown in FIG. 6. Therefore, desirably, the chain insertion portions are inserted into the empty space portions arranged regularly on the chain 51, such that as the chain 51 is rotated, the engagement part 25 and the moving part 21 being engaged with the chain 51 are moved and the seat 20 is thus moved. Preferably, the engagement part 25 is a protruded portion of the moving part 21, which is formed unitarily with the moving part 21, and alternatively, the engagement part 25 may be coupled with the moving

part 21 by means of a separate member and may be coupled directly with the underside surface of the seating part 22 of the seat 20 in such a manner as to pass through the slot formed along the guide rail 11.

[0041] In the same manner as the first embodiment of the present invention, further, the moving direction, reciprocating speed and the reciprocating distance of the seat 20 are determined in accordance with the rotating direction (forward/backward rotation), the rotating speed, and the number of rotation of the motor 52.

[0042] FIG. 7 is a side sectional view showing reciprocating exercise means 60 provided in the support part 10 of a rowing machine exercise-assisting device according to a third embodiment of the present invention. In this case, the reciprocating exercise means 60 has a configuration wherein a linear gear and a circular gear are engaged with each other. As mentioned above, the reciprocating exercise means 60 may be disposed at any positions outside the support part 10. Preferably, the linear gear is a rack gear 61 and the circular gear is a pinion gear 63. The rack gear 61 is a linear band-like gear having protrusions (gear teeth) regularly formed along one side surface thereof, and the pinion gear 63 is a disc-like gear having protrusions (gear teeth) regularly formed circumferentially along the outer periphery thereof. The protrusions of the rack gear 61 and the protrusions of the pinion gear 63 are engaged with each other. That is, the protrusions of the rack gear 61 are engaged with the slots between the protrusions of the pinion gear 63, and contrarily, the protrusions of the pinion gear 63 are engaged with the slots between the protrusions of the rack gear 61. A motor 62, which is connected to the pinion gear 63 to rotate the pinion gear 63, has the same structure, function and control method of the signals received from the handle 30 as those of the motor 42 according to the first embodiment of the present invention, and therefore, an explanation on them will be avoided.

[0043] The rack gear 61 is desirably provided on the underside surface of the moving part 21 of the seat 20, and alternatively, it may be provided directly on the underside surface of the seating part 22 of the seat 20. The rack gear 61 is provided on the underside surface of the engagement part 25 in FIG. 7, but it may be provided directly on the underside surface of the seating part 22 of the seat 20. The rack gear 61 and the pinion gear 63 are engaged with each other, and in more detail, the rack gear 61 performs a linear motion by receiving the rotating motion of the pinion gear 63. Therefore, in the same manner as the first and second embodiments of the present invention, the rotation of the pinion gear 63 is determined in accordance with the rotating direction (forward/backward rotation), the rotating speed, and the number of rotation of the motor 62, and the moving direction, reciprocating speed and the reciprocating distance of the seat 20 connected to the rack gear 61 are determined in accordance with the rotation of the pinion gear 63.

[0044] While the present invention has been described with reference to the particular illustrative embodiments,

it is not to be restricted by the embodiments but only by the appended claims. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present invention.

Claims

1. A rowing machine exercise-assisting device comprising:

a guide rail;
 a support part adapted to support the guide rail;
 a seat mounted on the guide rail in such a manner as to move reciprocally in forward and backward directions along the length direction of the guide rail, in which a user sits;
 a safety belt provided on the seat to prevent the user from being escaped from the seat;
 footboards disposed on left and right sides of the support part to place the user's feet thereon at the time when the user sits in the seat;
 a fixing belt provided on each of the footboards to prevent the user's foot from being escaped from the footboard;
 a bar-shaped handle taken by the both hands of the user; reciprocating exercise means having a servo motor and a controller controlling the rotation of the servo motor; and
 a control panel provided on the handle and connected to the controller to transmit commands to the controller such that the controller controls the rotating direction, the rotating speed and the number of rotation of the servo motor, the control panel having a switch adapted to control the start and stop of the reciprocating exercise of the seat, a switch adapted to adjust the speed of the reciprocating exercise of the seat and a switch adapted to adjust the reciprocating distance of the reciprocating exercise of the seat, whereby as the servo motor rotates forwardly and backwardly, the seat is automatically moved reciprocally in the forward and backward directions along the length direction of the guide rail.

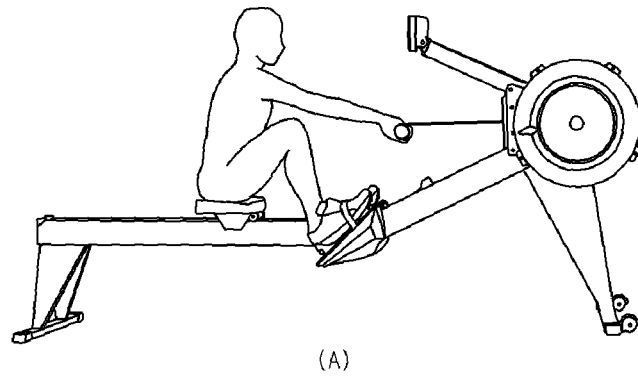
2. The rowing machine exercise-assisting device according to claim 1, wherein the reciprocating exercise means further comprises a band-shaped timing belt having concave and convex portions formed regularly thereon and a pulley adapted to be engaged with the timing belt to circulate the timing belt therealong, the timing belt being rotated in accordance with the rotation of the servo motor in the state of being engaged with the servo motor and the pulley, and the seat comprises an engagement part connected to the underside surface thereof and having concave and convex portions adapted to be engaged

with the concave and convex portions formed on the timing belt, such that as the timing belt is rotated forwardly and backwardly, the seat is reciprocally moved in the forward and backward directions along the length direction of the guide rail.

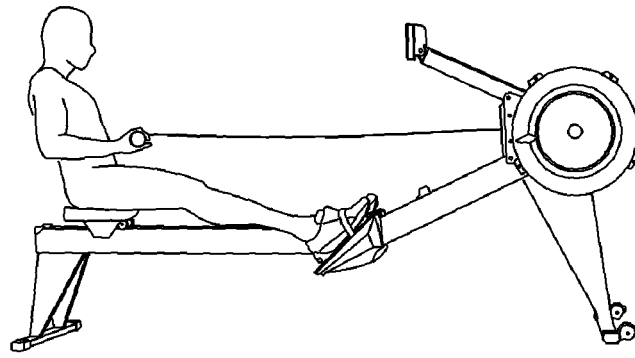
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3. The rowing machine exercise-assisting device according to claim 1, wherein the reciprocating exercise means further comprises a chain and a sprocket adapted to be engaged with the chain to circulate the chain therealong, the chain being rotated in accordance with the rotation of the servo motor in the state of being engaged with the servo motor and the sprocket, and the seat comprises an engagement part connected to the underside surface thereof and having protrusions regularly formed thereon in such a manner as to be insertedly engaged with the empty space portions regularly arranged along the chain, such that as the chain is rotated forwardly and backwardly, the seat is reciprocally moved in the forward and backward directions along the length direction of the guide rail.
- 10
- 15
- 20
4. The rowing machine exercise-assisting device according to claim 1, wherein the reciprocating exercise means further comprises a disc-shaped circular gear rotatingly connected to the servo motor and having protrusions regularly formed circumferentially along the outer periphery thereof and a linear gear having a shape of a linear band and having protrusions adapted to be engaged with the circular gear so as to convert a rotating motion of the circular gear into a linear motion, the linear gear being coupled to the underside surface of the seat in such a manner as to be disposed between the underside surface of the seat and the circular gear, such that as the circular gear is rotated forwardly and backwardly, the seat is reciprocally moved in the forward and backward directions along the length direction of the guide rail.
- 25
- 30
- 35
- 40
5. The rowing machine exercise-assisting device according to any one of claims 2 or 4, wherein the reciprocating exercise means is disposed inside the support part.
- 45
6. The rowing machine exercise-assisting device according to claim 1, wherein the seat further comprises a back support part adapted to support the user's back, and the back support part has an elastic restoring force in such a manner as to be bent backwardly when a given force is applied thereto and to be returned to its original position when the given force is removed therefrom.
- 50
- 55

[Fig. 1]

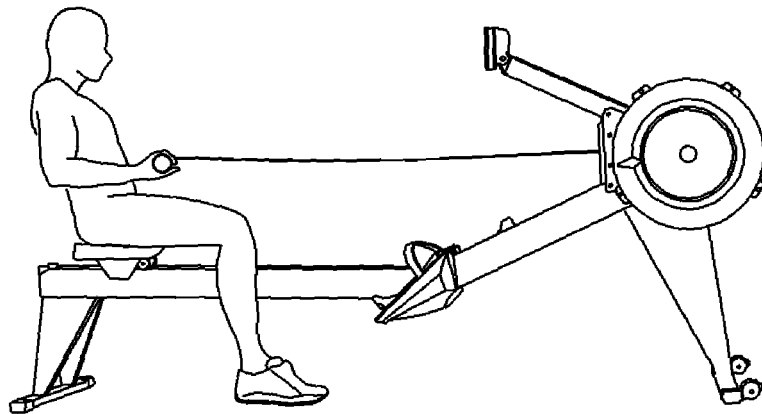


(A)

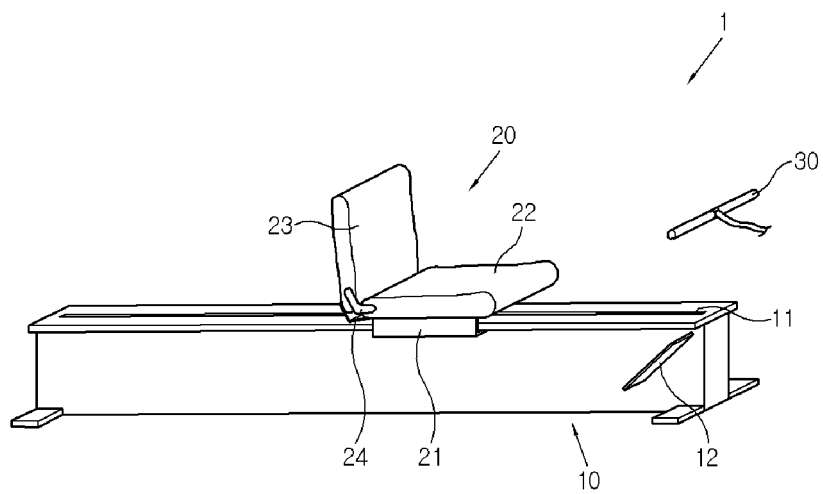


(B)

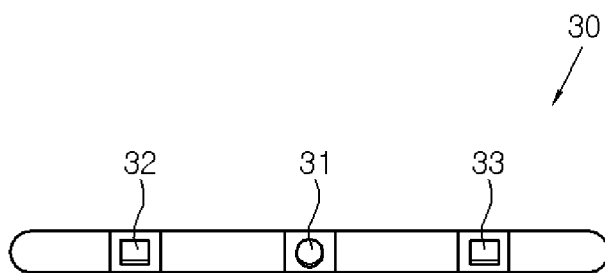
[Fig. 2]



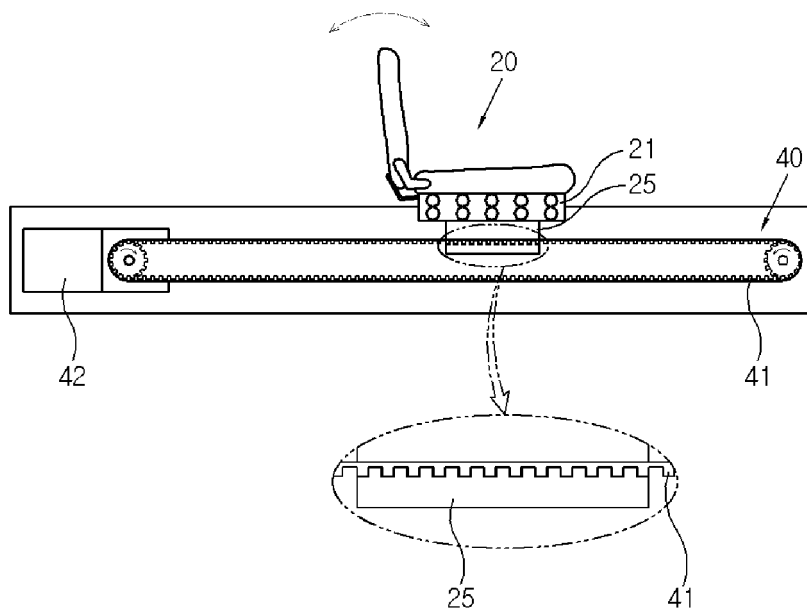
[Fig. 3]



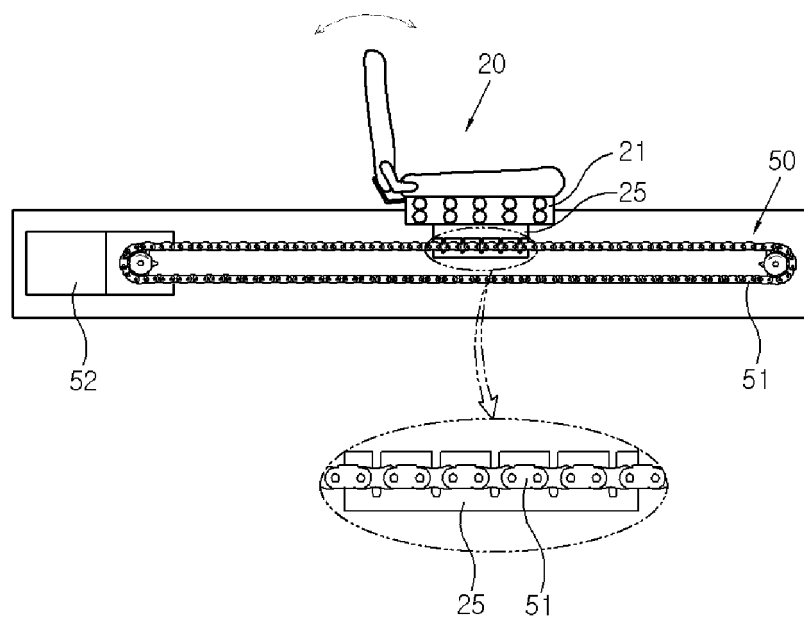
[Fig. 4]



[Fig. 5]



[Fig. 6]



[Fig. 7]

