

Assistance robot

Technical Field

[0001]

5 The present invention relates to an assistance robot.

Background Art

[0002]

Patent literature 1 discloses an assistance robot that assists a care receiver to
10 stand up. The assistance robot is provided with a shaft section that moves
linearly in a vertical direction, and a holding member (table) that is provided to
be swingable around an upper end of the shaft section. The assistance robot
lifts up the care receiver by, with a care receiver in a sitting posture with their
elbows resting on the holding member, swinging (forward rotating) the holding
15 member so as to move the elbows of the care receiver to a raising preparation
position, then raising the holding member.

Citation List

Patent Literature

20 [0003]

Patent literature 1: JP-A-2012-217686

Summary of Invention

25 Technical Problem

[0004]

With the above assistance robot, if a foreign body is under the holding member while the holding member is being lowered, the holding member may contact the foreign body.

5 [0005]

An object of the present invention is to provide an assistance robot that softens an impact when a holding member contacts a foreign body that is below the holding member.

10 Solution to Problem

[0006]

An assistance robot of the present invention includes: a base; a moving member configured to move at least up and down with respect to the base; a holding member configured to hold a portion of a body of a care receiver, the holding member being provided on the moving member; and a control section configured to control the moving of the moving member so as to perform standing assistance of the care receiver held by the holding member from a sitting posture to a standing posture and sitting assistance of the care receiver held by the holding member from a standing posture to a sitting posture, wherein the holding member is provided on the moving member so as to be freely inclinable between a lower usage position and an upper retract position.

15

20

[0007]

Accordingly, because the holding member is held to be freely inclinable, even if a foreign body is on a surface below the holding member while the holding member is being lowered, when the holding member positioned at the usage position contacts the foreign body, the holding member is inclined upwards

25

from the usage position due to the contact force. Accordingly, the impact when the holding member and the foreign body contact each other is softened.

Brief Description of Drawings

5 [0008]

Fig. 1

Fig. 1 is a perspective view from the rear side of an assistance robot that is an embodiment of the present disclosure.

Fig. 2A

10 Fig. 2A is a side view of the assistance robot of fig. 1 shown with the holding member positioned at the usage position.

Fig. 2B

Fig. 2B is a side view of the assistance robot of fig. 1 shown with the holding member moved in the retract position direction.

15 Fig. 3A

Fig. 3A is a side view showing the free rotation mechanism of the holding member with the holding member positioned at the usage position.

Fig. 3B

20 Fig. 3B is a side view showing the free rotation mechanism of the holding member with the holding member rotated in the retract position direction.

Fig. 4

Fig. 4 is a side view showing a state before a care receiver pulls the assistance robot towards themselves.

Fig. 5

25 Fig. 5 is a side view showing a state after a care receiver has pulled the

assistance robot towards themselves.

Fig. 6

Fig. 6 is a side view showing a state with a care receiver being supported by the holding member of the assistance robot.

5 Fig. 7

Fig. 7 is a side view showing an initial state from which a care receiver is to receive help standing up.

Fig. 8

10 Fig. 8 is a side view showing a state in which a care receiver is in a standing posture.

Fig. 9A

Fig. 9A is a side view showing a first alternative form of the holding member positioned at the usage position.

Fig. 9B

15 Fig. 9B is a side view showing a first alternative form of the holding member positioned at the retract position end.

Fig. 10

Fig. 10 is a side view showing a second alternative form of the holding member positioned at the usage position.

20 Fig. 11

Fig. 11 is a side view showing a third alternative form of the holding member positioned at the retract position end.

Fig. 12A

25 Fig. 12A is a side view showing a fourth alternative form of the holding member positioned at the usage position.

Fig. 12B

Fig. 12B is a side view showing a fourth alternative form of the holding member positioned at the retract position end.

5 Description of Embodiments

[0009]

1. Configuration of assistance robot

The configuration of an assistance robot that is an embodiment of the present disclosure is described below with reference to the figures. As shown in fig. 1,
10 assistance robot 1 is provided with base 10, wheels 20, raising and lowering section 30, arm 40, holding member 50, grip 60, lower limb contacting section 70, and control device 80. Raising and lowering section 30, arm 40, and grip 60 function as a moving member. In descriptions below, the front-rear, left-right, and up-down directions are as seen by care receiver M (refer to fig. 4).

15 [0010]

Here, assistance robot 1 performs standing assistance of assisting care receiver M from a sitting posture to a standing posture, and sitting assistance of assisting care receiver M from a standing posture to a sitting posture. In particular, assistance robot 1 of the present embodiment is to be mainly used by
20 a care receiver M for whom standing by themselves is difficult, for example, for assisting care receiver M to change their bottoms (clothing worn on the lower half of their body), for assisting care receiver M to go to the toilet, and so on. By supporting the upper body of care receiver M in a standing posture, assistance robot 1 allows a care receiver M to perform the above actions with the aid of
25 only one caregiver.

[0011]

That is, a standing posture in the present embodiment means a state in which at least the lower half of care receiver M is upright; it does not necessarily refer to a state in which both the upper half and lower half of care receiver M are upright. Note that, assistance robot 1 of the present embodiment is described
5 as assisting care receiver M to a standing posture in which only their lower half is upright, but assistance robot 1 may assist care receiver M to a standing posture in which both their lower half and upper half are upright.

[0012]

As shown in figs. 1 and 2A, base 10 is provided with frame 11, support column
10 12, footrest 13, and fixed cover 14. Frame 11 is positioned slightly separated from ground surface 2 (floor or ground). Support column 12 is fixed to frame 11 and stands upright on an upper front surface of frame 11. Support column 12 is arranged centrally in the left-right direction towards the front of frame 11. Note that, in the present embodiment, assistance robot 1 includes one support
15 column 12, but two or more support columns 12 may be provided.

[0013]

Footrest 13 is fixed to an upper rear surface of frame 11. Contact marks 13a for the feet of care receiver M are provided on an upper surface of footrest 13. Contact marks 13a act as a foot positioning guide for care receiver M. Fixed
20 cover 14 is fixed to frame 11 or support column 12 so as to enclose the lower section of raising and lowering main body 31 of raising and lowering section 30, which are described later.

[0014]

Wheels 20 are arranged at the four corners of frame 11. Wheels 20 include a
25 locking function that restricts rotation. In the present embodiment, wheels 20 are provided to be freely rotating, by may be provided to be driven by a driving

device. Raising and lowering section 30 is provided with raising and lowering main body 31, oscillation support section 32, and raising and lowering cover 33. Raising and lowering main body 31 is formed elongated in the up-down direction, and is provided on a front surface of support column 12 to be
5 movable linearly in the up-down direction.

[0015]

Raising and lowering main body 31 is guided by a guide (not shown) on the front surface of support column 12, and is driven by a linear motion device (not shown). Raising and lowering main body 31 is enclosed by fixed cover 14.

10 Oscillation support section 32 is provided on an upper end side of raising and lowering main body 31 and includes oscillating shaft center 32a that is parallel to the left-right direction. Specifically, oscillation support section 32 is formed to project rearward from an upper end of raising and lowering main body 31. In other words, oscillating shaft center 32a is positioned to the rear of support
15 column 12 and to the rear of raising and lowering main body 31.

[0016]

Raising and lowering cover is fixed to raising and lowering section 30 so as to enclose raising and lowering section 30, support column 12, and fixed cover 14. Raising and lowering section cover 33 overlaps fixed cover 14 even when raising
20 and lowering section 30 is at a raised position. Note that, in the present embodiment, because one support column 12 is provided, assistance robot 1 includes a single raising and lowering section 30; however, in a case where two or more support columns 12 are provided, a quantity of raising and lowering sections 30 is provided corresponding to the quantity of support columns 12.

25 [0017]

Arm 40 is provided to oscillate around oscillating shaft center 32a of oscillation

support section 32 of raising and lowering section 30. Arm 40 is oscillated by an arm oscillating device (not shown). Arm 40 oscillates to a higher position than oscillation support section 32. In other words, an oscillation range of arm 40 is set between a state in which the tip of arm 40 (the end section opposite to the end on the oscillation support section 32a side) extends to the rear of oscillation support section 32 (refer to fig. 6), and a state in which the tip of arm 40 is positioned approximately above oscillation support section 32 or the raising and lowering main body 31 (refer to fig. 8). Arm 40 rotates forward from a state extending to the rear in a case in which assistance robot 1 is performing standing assistance, and rotates rearward so as to extend to the rear in a case in which assistance robot 1 is performing sitting assistance.

[0018]

Holding member 50 is provided to be freely inclinable on arm 40, and supports the upper body of care receiver M. The freely inclining mechanism of holding member 50 is described below. Holding member 50 is provided with torso receiving section 51 that contacts the torso of care receiver M and underarm receiving sections 52 that support the underarms of care receiver M. Note that, holding member 50 may be provided with only one of torso receiving section 51 and underarm receiving section 52.

[0019]

Torso receiving section 51 supports the torso of care receiver M from below. Torso receiving section 51 has a wide surface and is made of a cushion material. Torso receiving section 51 is formed to have an initial shape that matches that of a typical care receiver M, and is flexible to change shape to match the torso of each individual care receiver M. In the present embodiment, torso receiving section 51 contacts care receiver M from the chest to the abdomen.

[0020]

Underarm receiving sections 52 are formed to have an arc shape and are provided on the right and left sides of torso receiving section 51 such that the arc opening faces upward. Underarm receiving sections 52 support the underarms of care receiver M from below so as to support the upper body of care receiver M. Further, underarm receiving sections 52 regulate forward and rearward movement of care receiver M by sandwiching both underarm portions of care receiver M from the front and rear. Accordingly, torso receiving section 51 and underarm receiving sections 52 regulate position P of the shoulder of of care receiver M being held by holding member 50.

10 [0021]

The center line in the left-right direction of torso receiving section 51 oscillates in a range of 20 to 110 degrees with respect to a vertical line by arm 40 oscillating with respect to raising and lowering section 30. When the center line of torso receiving section 51 is in the range of angles 20 to 90 degrees, torso receiving section 51 is pointing upwards and to the rear. On the other hand, when the center line of torso receiving section 51 is in the range of angles 90 to 110 degrees, torso receiving section 51 is pointing upwards and to the front.

[0022]

Grip 60 is U-shaped, and both ends of the U shape of grip 60 are fixed on a lower surface of torso receiving section 51. The center section of grip 60 is positioned to the front of torso receiving section 51 and is gripped by care receiver M who is being held by holding member 50. Lower limb contacting section 70 contacts a front portion (shin or knee) of the lower limbs of care receiver M in a sitting posture, thereby helping to decide the position and posture of the lower body of care receiver M in a sitting posture. In particular, the positions of the legs are decided to a certain extent. Lower limb contacting section 70 is fixed to support column 12 of base 10. Lower limb contacting

section 70 is provided with two support members 71 and lower limb contacting main body 72.

[0023]

Support members 71 are L-shaped. One end of the L shape of support member
5 71 is fixed to support column 12, and the other end of the L shape of support member 71 is positioned to the rear of support column 12. Lower limb contacting main body 72 is fixed to the other end of support member 71 and is positioned to the rear of raising and lowering cover 33 and below oscillation support section 32. Lower limb contacting main body 72 is a portion for
10 contacting the front of the lower limbs of care receiver M, has a wide surface, and is formed of a cushion material.

[0024]

Control device 80 is fixed to frame 11 of base 10 and stands upright facing upwards from the upper front surface of frame 11. Control device 80 is arranged
15 to the side of support column 12. Control device 80 controls the up-down movement of raising and lowering section 30 and the oscillation of arm 40 so as to perform sitting assistance and standing assistance for a care receiver M. When an operator (care receiver M or a caregiver) performs adjustment operation for adjusting the start height for standing, control device 80 performs
20 control only of the up-down movement of raising and lowering section 30 and does not oscillate arm 40 at this time. That is, control section 80 adjusts the start height for standing in accordance with the body height of care receiver M.

[0025]

Further, a standing assistance program for performing standing assistance
25 operation is memorized in advance on control device 80. When an operator (care receiver M or a caregiver) performs standing assistance operation, control

device 80 executes the standing assistance program and controls the up-down movement of raising and lowering section 30 and the oscillation of arm 40. Also, a sitting assistance program for performing sitting assistance operation is memorized in advance on control device 80. When an operator (care receiver M
5 or a caregiver) performs sitting assistance operation, control device 80 executes the sitting assistance program and controls the up-down movement of raising and lowering section 30 and the oscillation of arm 40. In addition, control device 80 corrects the standing assistance program and the sitting assistance program depending on a standing start height.

10 [0026]

2. Freely inclining mechanism of the holding member

As shown in figs. 2A and 2B, holding member 50 is freely rotatable around rotation shaft center 53 provided on an end of arm 40. That is, holding member 50 is provided to be rotatable by an external force, for example, the manual
15 power of care receiver M or a caregiver without being controlled by control device 80.

[0027]

Holding member 50 is provided to be freely rotatable in a direction from a usage position (the position shown in fig. 2A) at which holding member 50
20 contacts an end section of the rear side of grip 60, and a retract position (the position shown in fig. 2B) upwards towards care receiver M. The usage position is a position at which rotation downwards of the lower end of holding member 50 is regulated by the regulating section provided on grip 60; the retract position is any position at which the lower end of holding member 50 has been
25 rotated to be above the usage position. The holding member is positioned at the usage position whenever assistance robot 1 performs standing assistance operation or sitting assistance operation.

[0028]

Because holding member 50 is provided to be freely rotatable in this manner, care receiver M or a caregiver can rotate holding member 50 at the usage position upwards from the usage position by, for example, raising holding member 50 manually. Further, when care receiver M or a caregiver has rotated holding member 50 to a given retract position, holding member can be held by hand at that retract position. Then, when returning holding member 50 being held at the retract position to the usage position, care receiver M or the caregiver weakens their manual support such that holding member 50 rotates back to the usage position under its own weight.

[0029]

Further, because holding member 50 is provided to be freely rotatable, even if a foreign body is on ground surface 2 below holding member 50 while holding member 50 (raising and lowering section 30) is being lowered, when holding member 50 positioned at the usage position contacts the foreign body, holding member 50 is rotated upwards from the usage position due to the contact force. Accordingly, the impact when holding member 50 and the foreign body contact each other is softened.

[0030]

Further, as shown in figs. 3A and 3B, as a detecting means for detecting that holding member 50 is positioned at the usage position, sensor 54, for example, an optical type sensor, a mechanical type sensor, or an electrostatic capacity type sensor, is provided on the tip of arm 40, and is connected to control device 80. Also, as a warning means for warning when a detection signal cannot be received from sensor 54 even though it is necessary for holding member 50 to be positioned at the usage position, for example, a buzzer or a lamp (not shown) is connected to control device 80.

[0031]

Accordingly, in a case in which a foreign body is sandwiched between ground surface 2 and holding member 50 after holding member 50 has contacted the foreign body and rotated up from the usage position, control device 80 is
5 unable to receive a detection signal from sensor 54, therefore lowering of holding member 50 (raising and lowering section 30) is stopped, and a buzzer or lamp can warn care receiver M or a caregiver. In this case, care receiver M or the caregiver will perform actions to remove the foreign matter sandwiched between holding body and ground surface 2.

10 [0032]

3. Standing assistance operation and sitting assistance operation by the assistance robot

First, standing assistance operation for care receiver M by assistance robot 1 is described with reference to figs. 4 to 8. Here, in figs. 6 to 8, the thick solid lines
15 represent a path of position P of a shoulder during standing operation of care receiver M. Control device 80 performs control for up-down movement of raising and lowering section 30 and forward rotation of arm 40 such that shoulder position P moves along the path shown in figs. 6 to 8.

[0033]

20 Descriptions are given below for a case in which the body height of care receiver M is taller than the body height of the care receiver M who used the assistance robot immediately previously, such that height h of the lower end of holding section 50 from ground surface 2 is at a lower position than height H of the top of the bent knee of care receiver M. Note that, in such a case, it is
25 possible for care receiver M or a caregiver to adjust the start height for standing in accordance with the body height of care receiver M using control device 80,

but this troublesome procedure can be omitted when using assistance robot 1 of the present embodiment.

[0034]

As shown in fig. 4, in the initial state for standing assistance operation, care receiver M is sitting on seat 3 (in a sitting posture) and assistance robot 1 is stopped in front of care receiver M. Care receiver M or a caregiver must move assistance robot 1 towards care receiver M, but, as given above, height h of the lower end of holding member 50 is positioned lower than height H of the top of the knee of care receiver M.

[0035]

Thus, if assistance robot 1 is moved towards care receiver M in that state, the lower end of holding member 50 will contact the top of the knee of care receiver M. Therefore, care receiver M or a caregiver manually raises holding member 50 by gripping the lower end of holding member 50 with their hand, and moves holding member 50 from the usage position upwards to a retract position by rotating holding member 50 around rotation shaft center 53. Then, as shown in fig. 5, care receiver M or a caregiver moves assistance robot 1 towards care receiver M with holding member 50 in a rotated state.

[0036]

Accordingly, because care receiver M or a caregiver is able to pass the top of the knee of care receiver M under the lower end of holding member 50, holding member 50 can be made to contact the upper body of care receiver M smoothly. Care receiver M or a caregiver, after stopping assistance robot 1, rotates holding member 50 to the usage position. Here, the lower body of care receiver M is arranged in a space below holding member 50. Also, the feet of care receiver M are positioned on contact marks 13a. Further, the lower limbs of

care receiver M contact the rear surface of lower limb contacting main body 72.

[0037]

Next, as shown in fig. 6, assistance robot 1 is set in an initial state of standing assistance operation by an operation performed by care receiver M or a

5 caregiver. In the standing-assistance program, the initial state of assistance robot 1 is a state in which holding member 50 is positioned furthest to the rear. That is, the initial state of assistance robot 1 is a state in which arm 40 extends rearward.

[0038]

10 In this state, control device 80 moves raising and lowering section 30 vertically due to care receiver M or a caregiver performing an up-down movement operation of only raising and lowering section 30 in accordance with the height of the upper body of the care receiver M who is in a sitting posture on seat 3. In this manner, the front surface of the torso of care receiver M contacts the torso
15 holding surface of torso receiving section 51. Further, care receiver M rests their underarms on underarm receiving sections 52 and grips grip 60. In this initial state, the upper body of care receiver M is in a state slightly leaning forward.

[0039]

Continuing, when the care receiver M or the caregiver starts standing assistance
20 operation, control device 80 performs lowering of raising and lowering section 30 and forward rotation of arm 40 to move care receiver M from the sitting posture to an intermediate posture. In a first movement operation, because holding member 50 is raised with respect to raising and lowering section 30 by the forward rotation of arm 40, as shown in figs. 6 and 7, position P of the
25 shoulder of care receiver M moves forward in a substantially horizontal direction.

[0040]

Further, in the first movement operation, the torso holding surface of torso receiving section 51 inclines forward and is moved forward by the forward rotation of arm 40. Also, due to the first movement operation, position P of the shoulder of care receiver M moves forward as the rear end of torso receiving section 51 is raised. Accordingly, the upper body of care receiver M inclines forward, and the abdomen and surrounding portions of care receiver M are raised. Due to such a first movement operation, the back muscles of care receiver M extend and the the pelvis moves to an upright state while the buttocks of care receiver M remain in contact with seat 3. Accordingly, the care receiver M with such a posture is supported stably by holding member 50.

[0041]

Continuing, control device 80 switches operation of raising and lowering section 30 from lowering to raising. In the present embodiment, control device 80 performs raising of raising and lowering section 30 in conjunction with forward rotation of arm 40 in accordance with the standing assistance program such that care receiver M moves from the intermediate posture to the standing posture. By a second movement operation, because holding member 50 is raised mainly by the raising of raising and lowering section 30 while being moved slightly forward by the forward rotation of arm 40, as shown in figs. 7 and 8, position P of the shoulder of care receiver M is raised substantially straight up while care receiver M moves slightly forward from the position of the intermediate posture.

[0042]

By performing the movement second operation, the buttocks of care receiver M move up and away from seat 3. In the second movement operation, by the forward rotation of arm 40, the torso holding surface of torso receiving portion

51 inclines forward further. The upper body of care receiver M is inclined forward further while being raised. Accordingly, by way of the second movement operation, when the upper body of care receiver M is raised, a state in which the back muscles of care receiver M are extended is maintained.

- 5 Therefore, during the second movement operation, holding member 50 stably supports care receiver M.

[0043]

- Described next is sitting assistance operation for care receiver M by assistance robot 1. Here, operation of assistance robot 1 from the standing posture to the sitting posture is performed in the opposite order to operation of assistance robot 1 from the sitting posture to the standing posture, that is, in the order of the operations shown in figs. 8, 7, and 6 respectively, therefore detailed explanations are omitted.
- 10

[0044]

- 15 As shown in fig. 6, when care receiver M is seated on seat 3 (in the sitting posture), power to assistance robot 1 is turned off by an operation of care receiver M or a caregiver. In this state, the lower end of holding member 50 is contacting the upper portion of the thighs of care receiver M. Thus, as shown in fig. 5, care receiver M or a caregiver manually raises holding member 50 by gripping the lower end of holding member 50 with their hand, and moves holding member 50 from the usage position upwards to a retract position by rotating holding member 50 around rotation shaft center 53. Then, as shown in fig. 4, care receiver M or a caregiver moves assistance robot 1 away from care receiver M with holding member 50 in a rotated state.
- 20

- 25 [0045]

Accordingly, because care receiver M or a caregiver is able to pass the top of

the knee of care receiver M under the lower end of holding member 50, holding member 50 can be separated smoothly from the upper body of care receiver M. Note that, care receiver M or the caregiver may move assistance robot 1 away from care receiver M with the upper portion of the thighs of care receiver M contacting holding member 50 without raising holding member 50 manually. In this case too, because holding member 50 rotates freely upon contacting the upper portion of the thighs of care receiver M, holding member 50 can be separated smoothly from care receiver M.

[0046]

10 4. Alternative forms of the holding member

In the embodiment above, holding member 50 is configured to be freely rotatable from a usage position in which holding member 50 contacts a rear end section of grip section (the position shown in fig. 2A) in a direction towards a retract position (the position shown in fig. 2B) upwards towards care receiver M. However, as shown in figs. 9A and 9B, as a first alternative form, the configuration may be such that first, second, and third regulating members 55a, 55b, and 55c are provided to regulate the free rotation within a specified range.

[0047]

That is, column-shaped first regulating member 55a that protrudes from the circumferential surface of rotation shaft center 53 is provided on rotation shaft center 53, and second and third regulating members 55b and 55c that contact regulating member 55a when regulating member 55a is rotated due to the rotation around rotation shaft center 53 are provided on the tip of arm 40 at a specified angle θ . Accordingly, holding member 50 is freely rotatable within a range (angle θ range) from the usage position (the position shown in fig. 9A) at which first regulating member 55a is contacting second regulating member 55b, and the retract position (the position shown in fig. 9B) upwards towards care

receiver M at which first regulating member 55a is contacting third regulating member 55c.

[0048]

As a second alternative form, as shown in fig. 10, with respect to the first
5 alternative form described above, tension spring 57a for positioning holding member 50 at the usage position may be additionally provided on first regulating member 55a. Accordingly, holding member 50 is usually positioned at the usage position when there is no external force being applied.

[0049]

10 As a third alternative form, as shown in fig. 11, with respect to the first alternative form described above, tension spring 57b for positioning holding member 50 at the retract position may be additionally provided on first regulating member 55a. Accordingly, holding member 50 is usually positioned at the retract position when there is no external force being applied.

15 [0050]

A fourth alternative form is described with respect to the main embodiment described earlier, in which holding member 50 is configured to be freely rotatable around rotation shaft center 53 provided on the tip of arm 40. As shown in figs. 12A and 12B, cam mechanism 56 may be provided instead of
20 rotation shaft center 53 as a configuration that allows free swinging.

[0051]

That is, two cam pins each, 561a and 562a (561b and 562b), that protrude to the outside to the left and right are provided on the top end of arm 40. Cam plates 563a (563b) are provided on the left and right of holding member 50. Cam
25 groove 564a (564b) that engages with cam pins 561a and 562a (561b and 562b) is formed in cam plate 563a (563b).

[0052]

Cam groove 564a (564b) is formed such that the front side is a straight line and the rear side is an arc. Holding member 50 is connected to arm 40 via cam mechanism 56 to be inclinable and movable in a front-rear direction. That is,
5 holding member 50 moves forwards along the straight line portion of cam groove 564a (564b). Further, holding member inclines along the arc portion of cam groove 564a (564b).

[0053]

5. Effects

10 Assistance robot 1 described above is provided with: base 10, a moving member (raising and lowering section 30, arm 40, grip 60) configured to move at least up and down with respect to the base; holding member 50 configured to hold a portion of a body of care receiver M, holding member 50 being provided on the moving member (raising and lowering section 30, arm 40, grip 60); and control
15 section 80 configured to control the moving of the moving member (raising and lowering section 30, arm 40, grip 60) so as to perform standing assistance of the care receiver held by holding member 50 from a sitting posture to a standing posture and sitting assistance of the care receiver held by holding member 50 from a standing posture to a sitting posture. Further, holding member 50 is
20 provided on the moving member (raising and lowering section 30, arm 40, grip 60) so as to be freely inclinable between a lower usage position and an upper retract position.

[0054]

Because holding member 50 is provided to be freely rotatable, even if a foreign
25 body is on ground surface 2 below holding member 50 while holding member 50 (raising and lowering section 30) is being lowered, when holding member 50

positioned at the usage position contacts the foreign body, holding member 50 is rotated upwards from the usage position due to the contact force.

Accordingly, the impact when holding member 50 and the foreign body contact each other is softened.

5 [0055]

Also, because holding member 50 is provided to be freely inclinable when an external force of a specified size or greater is applied to holding member 50, a driving source for inclining holding member 50 is not required, so costs are curtailed. Further, because holding member 50 is positioned at the usage

10 position or the retract position by the biasing force of a biasing means (tension spring 55a or 55b), shifting of holding member 50 while not in use is curtailed.

[0056]

Also, control device 80 is provided with a detecting means (sensor 54) for detecting that holding member 50 is positioned at the usage position.

15 Accordingly, in a case in which a foreign body is sandwiched between ground surface 2 and holding member 50 after holding member 50 has contacted the foreign body and rotated up from the usage position, control device 80 is unable to receive a detection signal from the detecting means (sensor 54), therefore lowering of holding member 50 (raising and lowering section 30) is
20 stopped, and a buzzer or lamp can warn care receiver M or a caregiver.

[0057]

6. Other

Note that, in an embodiment above, the moving member (raising and lowering section 30, arm 40, grip 60) is configured to movable up and down and
25 swingable, but only up and down movement is essential. Also, any of the following configurations are possible: a single up-down movement axis, a single

swinging axis only, a combination of multiple linear axes, a combination of multiple swinging axes, and a combination of linear and swinging axes. Also, in an embodiment above, holding member 50 is configured to be regulated to not rotate downwards from a usage position at which holding member 50 contacts the rear end section of grip 60, but the configuration of the holding member is not particularly limited to that of the embodiment, so long as the holding member is regulated to not rotate downwards from the usage position.

Reference Signs List

- 10 [0058]
- 1: assistance robot;
- 10: base;
- 30: raising and lowering section;
- 40: arm;
- 15 50: holding member;
- 54: sensor;
- 55a, 55b: tension spring;
- 56: cam mechanism;
- 60: grip;
- 20 80: control device;
- M: care receiver

Claims

1. An assistance robot comprising:

a base;

a moving member configured to move at least up and down with respect to the base;

a holding member configured to hold a portion of a body of a care receiver, the holding member being provided on the moving member; and

a control section configured to control the moving of the moving member so as to perform standing assistance of the care receiver held by the holding member from a sitting posture to a standing posture and sitting assistance of the care receiver held by the holding member from a standing posture to a sitting posture,

wherein the holding member is provided on the moving member so as to be freely inclinable between a lower usage position and an upper retract position by an external force without being controlled by the control section, such that a lower end of the holding member is movable upwards away from a body part of the care receiver.

2. The assistance robot according to claim 1, wherein the holding member is provided to be freely inclinable when the external force of a specified size or greater is applied to the holding member.

3. The assistance robot according to claim 1, wherein the holding member is positioned at the usage position or the retract position by a biasing force of a biasing member.

4. The assistance robot according to claim 2, wherein the holding member is positioned at the usage position or the retract position by a biasing force of a biasing member.

5. The assistance robot according to any one of the claims 1 to 4, wherein the control device is provided with a detecting means configured to detect that the holding member is positioned at the usage position.

6. An assistance robot comprising:

a base;

a control device configured to perform standing or sitting assistance of a care receiver;

a moving member controllably operable by the control device to move at least up and down with respect to the base; and

a holding member configured to hold a portion of a body of the care receiver, the holding member having a lower end, and the holding member being provided on the moving member such that the lower end of the holding member is freely inclinable independently of the control device relative to the moving member, wherein the lower end of the holding member is freely inclinable between a lower usage position and an upper retract position by an external force without being controlled by the control device so as to increase a clearance between the base and the lower end of the holding member.

7. The assistance robot according to claim 6, wherein the holding member is freely inclinable about a rotation shaft center, the rotation shaft center being substantially normal to a movement of the moving member.

8. The assistance robot according to claim 7, wherein the holding member is freely inclinable between a lower usage position and an upper retract position, the holding member being biased by its own weight towards the lower usage position.

9. The assistance robot according to claim 7 further comprising a biasing member, wherein the holding member is freely inclinable between a lower usage position and an upper retract position, the holding member being biased by a biasing member at the lower usage position or the upper retract position.

10. The assistance robot according to any one of claims 6 to 9, wherein the control device is provided with a detecting means configured to detect that the holding member is positioned at the lower usage position.