

Aid Device

Technical Field

[0001]

- 5 The present specification relates to an aid device for assisting the transfer of a care receiver.

Background Art

[0002]

- 10 The need for aid devices has increased with the aging of society. Aid devices are generally driven by an actuator for moving a support portion which supports a part of a care receiver's body. The introduction of aid devices reduce the physical burden on caregivers and care receivers, and also mitigates the shortage of caregivers. As an example of an aid device, there is a device for
- 15 assisting the transfer of a care receiver from a sitting posture. An example of a technique relating to this type of aid device is disclosed in Patent Literature 1.

[0003]

- The human body transfer device of Patent Literature 1 includes a traveling portion equipped with wheels, a human body support portion positioned above
- 20 the traveling portion for supporting a care receiver, and a driving portion for driving the human body support portion in the height direction. Further, a combination of an extensible actuator, corresponding to a driving portion, and a linking mechanism is used, and the expanding operation of the extensible

actuator is converted into the arc-shaped swinging operation of the support portion. With this configuration, a caregiver, while preventing injury to his/her back, can easily and quickly carry out the transfer of the care receiver.

[0004]

- 5 Further, the assistance robot of Patent Literature 2 includes a lifting and lowering portion that moves in an up-down direction with respect to a base, an arm that is swingably provided in the lifting and lowering portion, and a support portion that is provided to the distal end of the arm. The lifting and lowering portion and the arm are driven by separate actuators in a two-stage operation.
- 10 With this configuration, the lifting and lowering portion and the arm can be operated in coordination with each other, and discomfort to the care receiver can be suppressed.

Patent Literature

- 15 [0005]

Patent Literature 1: JP-A-2016-165313

Patent Literature 2: WO 2017/060964

Summary of the Invention

- 20 Technical Problem

[0006]

In Patent Literature 1, since the support portion only swings in an arc, it is not always possible for the care receiver to use it comfortably. On the other hand, in

Patent Literature 2, since the lifting and lowering portion and the arm are operated by using two actuators, transferring the care receiver becomes smooth and more comfortable to use. However, the use of two actuators leads to increased costs.

5 [0007]

For this reason, it is desirable to make use of a single actuator to operate multiple members. However, in order to drive multiple members with a single actuator, some kind of linking mechanism is required. Further, in consideration of the convenience for a care receiver to use the device, a configuration such
10 that the human body support portion can freely swing has also been put into practical use. As a result of combining these techniques, however, a movement that is difficult for the care receiver to predict may occur if a degree of freedom remains in the operation of the aid device. As a result, the care receiver may have insecure feeling or may be surprised by an unexpected movement, which
15 ends up decreasing the comfort of use for the care receiver.

[0008]

As a problem to be solved in the present specification, there is provided an aid device capable of suppressing progress of unpredictable movement, which is unforeseeable for the care receiver, due to a degree of freedom remaining in
20 the operation of the device, and ensuring comfortable use for the care receiver, even in a case such unpredictable movement occurs.

Solution to Problem

[0009]

The present specification discloses an aid device, configured to assist a transfer operation of a care receiver, the aid device comprising: a base, on which the
5 care receiver places his or her feet; a support arm portion, being provided on the base, which is configured to support a part of the care receiver's body and is operable in an upright direction to make the care receiver stand or in a seating direction for seating the care receiver; an actuator configured to drive the support arm portion; a linking mechanism configured to transmit a driving force
10 of the actuator to the support arm portion and allow the position of the support arm portion driven by the actuator to change independently of the driving state of the actuator; and a damping mechanism configured to generate a resistive force for an operation on at least one operating direction of the support arm portion.

15

Advantageous Effect of the Invention

[0010]

In the aid device disclosed in this specification, a degree of freedom in the operation of the device remains, and the present position of the support arm
20 portion may change independently of the driving state of the actuator, which makes it difficult for the care receiver to predict the behavior of the device. Even such a case, the damping mechanism generates a resistive force on the unexpected movement given on at least one side of the support arm portion,

thereby suppressing the progress of the movement of the support arm portion.
This slows the unpredictable movement so that the care receiver does not feel anxiety and does not feel a sense of surprise. In this way, comfortable use by the care receiver is ensured.

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Brief Description of Drawings

[0011]

[Fig. 1] A cross-sectional side view showing an initial state of the aid device assisting a transfer operation of a care receiver.

10 [Fig. 2] A cross-sectional side view showing an intermediate state of the aid device assisting the transfer operation of the care receiver.

[Fig. 3] A cross-sectional side view showing a final state of the aid device assisting the transfer operation of the care receiver.

[Fig. 4] A side view showing the structure of a damping mechanism.

15 [Fig. 5] A diagram showing a state after the current position of the arm shown in Fig. 2 has changed to an upright direction without depending on the driving state of an actuator.

[Fig. 6] A diagram showing an operating state of the damping mechanism corresponding to the state of Fig. 5.

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Description of Embodiments

[0012]

1. Configuration of aid device 1 of the embodiment

Aid device 1 of the embodiment will be described with reference to Figs. 1 to 6.

Figs. 1 to 3 are partial cross-sectional side views showing the progress of the operation in which assisting device 1 assists care receiver M from a sitting posture to an in-transit position.

5 [0013]

Aid device 1 assists the transfer of care receiver M between two different locations, for example, the transfer between a bed and a wheelchair, or the transfer between a wheelchair and a toilet seat. Aid device 1 supports the trunk of care receiver M and assists a transfer operation from a sitting posture to an

10 in-transit posture and a seating operation from the in-transit posture to the sitting posture. The in-transit posture is a posture in which the buttocks are separated from a seat surface and includes a standing posture and a stooping posture. That is, the in-transit posture includes a state in which the upper body stands upright, a state in which the body is bent forward, and the like. Further,
15 aid device 1 can transfer care receiver M in the in-transit posture in cases where the two locations between which transferring is to occur are separated from each other.

[0014]

Aid device 1 includes base 2, arm 3, support portion 4, actuator 5, linking

20 mechanism 6, damping mechanism 7, control section (not shown), and the like.

In Fig. 1, the position of damping mechanism 7 is indicated by a broken line. In

Figs. 2 and 3, damping mechanism 7 is not indicated.

[0015]

Base 2 is composed of footrest 21, rear wheels 23, base rods 24, lower leg contact 25, mounting plates 26, front wheels 28, and the like. Footrest 21 is positioned in a substantially horizontal manner near floor F. Footrest 21 is a portion on which care receiver M places his/her feet. Actuator support portion 22 is provided in an upward orientation at the center, in the left-right direction, near the front of the top face of footrest 21. The pair of left and right rear wheels 23 are provided on the left and right at the rear of footrest 21.

[0016]

- 10 The pair of left and right base rods 24 are provided from the left and right sides of the front face of footrest 21 so as to face forward. Base rods 24 are bent upward from the front and then extended so as to be inclined backward. Lower leg contact 25 is provided on the upper portion of the two base rods 24 so as to face backward. Lower leg contact 25 is positioned above the front of footrest 21.
- 15 Lower leg contact 25 is made of a cushion material and designed to come in contact with the lower leg vicinity of care receiver M.

[0017]

- The pair of right and left mounting plates 26 are fixed at positions slightly upward along the bent portions which bend upward from the front of each base rod 24 and are each disposed facing each other. Each mounting plate 26 extends forward from base rod 24. Arm support fitting 27 is provided on the upper portions of the pair of right and left mounting plates 26. A pair of left and right front wheels 28 are provided at the lower front portion of the pair of left and

right mounting plates 26. Steering functions of front wheels 28 and rear wheels 23 allow aid device 1 to not only move straight and turn but also move sideways and spin in place. Further, front wheels 28 have a locking function for restricting movement.

5 [0018]

Arm 3 is formed from rod-shaped member 31, front cover 36, upper cover 38, various structural materials (not shown), and the like. Rod-shaped member 31 is a substantially U-shaped rod-shaped member having an open lower side. The lower ends 32 on both sides of rod-shaped member 31 are swingably supported
10 by arm support fitting 27 of mounting plate 26. As a result, arm 3 swings in the front-rear direction with respect to base 2 in an operation direction. The forward swinging motion of arm 3 corresponds to the upright direction in which care receiver M is made to stand, and the rearward swinging motion corresponds to the seating direction in which care receiver M is seated.

15 [0019]

In order to restrict the swing angle of arm 3, a stopper mechanism (not shown) is provided in the vicinity of arm support fitting 27. Rod-shaped member 31 extends upward from the left and right lower ends 32, bends backward and upward in the middle, and merges at the upper portion in the rear. The overall
20 shape of arm 3 includes arm front portion 34, extending upward from arm support fitting 27, and arm upper portion 35, connected to arm front portion 34, extending obliquely upward toward the rear.

[0020]

Front cover 36 constitutes arm front portion 34. Front cover 36 is disposed at a distance from the front of rod-shaped member 31. Front cover 36 is formed by folding both sides backward, thereby defining an inner space. A battery (not
5 shown) is accommodated in the inner space of front cover 36. The battery serves as a power source for actuator 5 and the control section.

[0021]

Upper cover 38 is formed so as to be continuous with front cover 36 and constitutes arm upper portion 35. Upper cover 38 is disposed close to the upper
10 side of rod-shaped member 31. Upper cover 38 is formed by bending both side surfaces downward, thereby defining an inner space. Linking mechanism 6 is provided in the front-lower side of the inner space of upper cover 38. Further, support portion mounting fitting 33 is provided in the rear upper side of the internal space.

15 [0022]

Support portion 4 is composed of trunk support portion 41 and a pair of right and left underarm support portions 45. Trunk support portion 41 is swingably supported by support portion mounting fitting 33 of arm upper portion 35. As a result, support portion 4 swings in the front-rear direction with respect to arm 3
20 in the operation direction. The forward swinging of support 4 corresponds to the upright direction in which care receiver M is made to stand, and the rearward swinging corresponds to the seating direction in which care receiver M is seated. Trunk support portion 41 has handle 42. Handle 42 has a substantially

rectangular frame shape. Handle 42 is a part grasped by care receiver M and is also a part grasped by the caregiver to move aid device 1.

[0023]

Trunk support section 41 consists of base plate 43, trunk contact member 44,
5 and the like. Base plate 43 is formed in a substantially rectangular shape using a plate material made of metal or resin and having high rigidity. Base plate 43 is provided with handle 42, a part to be attached to support portion mounting fitting 33 and second linking member 62, which will be described later.

[0024]

10 Trunk contact member 44, made of a flexible material, is larger than base plate 43 and is attached to the upper face of base plate 43. Trunk contact member 44 may have, for example, a two-layer structure including a surface layer and a base layer. Examples of a material for forming the surface layer include a polyurethane foam having low resilience, and examples of a material for forming
15 the base layer include a polyurethane foam having low combustibility. Trunk support portion 41 supports the area from the chest to the abdomen of the trunk which is a part of the body of care receiver M.

[0025]

The pair of right and left underarm support portions 45 are attached to the right
20 and left chest areas of trunk support portion 41. Each underarm support portion 45 has an L-shape that bends at an obtuse angle. Underarm support portion 45 is composed of core member 46 (see Fig. 4) and outer peripheral member 47. Core member 46 is formed by bending a round bar or pipe made of metal or

hard resin, for example.

[0026]

Outer peripheral member 47 is formed with a cushion material in a cylindrical shape covering the outer periphery of core member 46. The short straight portion from the proximal end of each underarm support portion 45, which is the attachment side, to the bending point becomes a shoulder receiving portion, and the long straight portion from the bending point to the distal end becomes a side entry portion. The shoulder receiving portion supports the front surface of the shoulder of care receiver M. The side entry portions enter both sides of the trunk of care receiver M. Trunk support portion 41 and underarm support portions 45 may be provided with a detachable cover made of cloth or leather.

[0027]

Actuator 5 is an extensible actuator, and includes main body portion 51, movable portion 52, motor 53, and the like. Main body portion 51 is a large-diameter cylindrical member that is long in the up-down direction and has an opening that opens in the upward direction. The lower end of main body portion 51 is supported by actuator support portion 22 of base 2. Movable portion 52 is a small-diameter rod-shaped member that is long in the up-down direction. The upper end of movable portion 52 is connected to first linking member 61 of linking mechanism 6. The lower portion of movable portion 52 is fitted into the opening of main body portion 51.

[0028]

Motor 53 is attached to the front of the lower portion of main body portion 51.

Motor 53, with the direction of the current being controlled by the control section (not shown), drives the expansion and contraction operations of movable portion 52. Movable portion 52 expands and contracts with respect to main body portion 51 by the driving of motor 53. Instead of motor 53, actuator 5 may
5 be a different type of driving source such as a pressure driving source using oil pressure or air pressure.

[0029]

Actuator 5 performs a first expansion operation that extends from a contracted length to a predetermined intermediate length, a second expansion operation
10 that extends from the intermediate length to an extended length, and a contraction operation that contracts from the extended length to the contracted length via the intermediate length. The stroke length of the first extending operation can be 30mm and the stroke length of the second extending operation can be 60mm.

15 [0030]

Linking mechanism 6 includes first linking member 61, second linking member 62, restricting member 63, and the like. First linking member 61 is an elongated member having support point 611, forearm portion 612, and posterior arm portion 616. Support point 611 is disposed near the center of arm upper portion
20 35. Support point 611 is supported by a structural member of arm 3 so as to be swingable. As a result, first linking member 61 swings about support point 611.

[0031]

Forearm portion 612 extends forward from support point 611. Connecting pin

613 is provided at a lower portion of forearm portion 612 near the front.

Connecting pin 613 connects forearm portion 612 and the upper end of movable portion 52 of actuator 5. Restricting protrusion 614 is formed on the top of forearm portion 612 toward the front. Damper engagement portion 615 is provided at the distal end of forearm portion 612. Damping mechanism 7 is provided between damper engagement portion 615 and arm 3.

[0032]

Rear arm portion 616 extends rearward from support point 611. Engagement pin 617 is provided at the rear of rear arm portion 616 so as to extend in the left-right direction. As shown in Figs. 1 to 3, engagement pin 617 engages with second linking member 62 from the counterclockwise direction and pushes second linking member 62 downward to swing second linking member 62.

[0033]

Second linking member 62 is fixed to base plate 43 of support portion 4 and extends forward. As a result, support portion 4 and second linking member 62 swing together about support portion mounting fitting 33. Restricting member 63 is fixed to a structural member in front of arm upper portion 35. Restricting protrusion 614 of first linking member 61 abuts against restricting member 63.

[0034]

The control section (not shown) is composed of an operating device, a control main body, and the like. The operating device has an up button and a down button for operating actuator 5. The operating device is operated by a caregiver. The control main body is configured with a computer device having a CPU and

is operated by software. The control main body controls the presence or absence of current flowing through motor 53 of actuator 5 and the direction of the current in accordance with the operation information of the up button and the down button.

5 [0035]

2. Configuration of damping mechanism 7

Next, the configuration of damping mechanism 7 will be described with reference to Fig. 4. Fig. 4 shows the original state before damping mechanism 7 operates. In Fig. 4 and Fig. 6, which is described later, a part of arm 3 is
10 omitted. Damper support fitting 39 is provided near the lower portion of rod-shaped member 31 constituting arm 3. As described above, first linking member 61 constituting linking mechanism 6 is provided with damper engagement portion 615. Damping mechanism 7 is provided so as to extend between arm 3 and first linking member 61.

15 [0036]

More specifically, damping mechanism 7 is an extensible mechanism having main body portion 71 and movable portion 72. Main body portion 71 has a large-diameter cylindrical shape. Main body portion 71 consists of a cylinder that opens upward and an oil chamber. The cylinder and the oil chamber are oil-
20 tight and filled with hydraulic oil. The cylinder and the oil chamber communicate with each other through an oil passage, and hydraulic oil flows in and out. Since the cross-sectional area of the oil passage is narrow, a resistive force is generated by the flowing in and out of the hydraulic oil. The lower end of main

body portion 71 is rotatably supported by damper support seat 39.

[0037]

Movable portion 72 is rod-shaped with a small diameter. The upper end of movable portion 72 is rotatably engaged with damper engagement portion 615

- 5 of first linking member 61. The lower portion of movable portion 72 is fitted into the cylinder of main body portion 71. As a result, while the oil-tightness of the cylinder of main body portion 71 is maintained, an extensible operation in which movable portion 72 moves in and out of the cylinder is enabled.

[0038]

- 10 When movable portion 72 extends from main body portion 71, hydraulic oil flows into the cylinder from the oil chamber, and a resistive force is generated. Conversely, when movable portion 72 is contracted, the hydraulic oil flows out of the cylinder into the oil chamber, and a resistive force is generated. That is, damping mechanism 7 is of a bidirectional type in which a resistive force is
- 15 generated in both directions of expansion and contraction. Further, the magnitude of the resistive force changes in accordance with the operating speed of movable portion 72 and is substantially proportional to the operation speed of movable portion 72.

[0039]

- 20 Also, in the normal assistance operation, damping mechanism 7 can be a load of actuator 5. However, since the normal assistance operation is slow, damping mechanism 7 is only a small load. Therefore, actuator 5 does not need to be upgraded in terms of performance and may be the same as in the case of the

configuration without damping mechanism 7.

[0040]

3. Assistance operation of aid device 1 of the embodiment

Next, the assistance operation of aid device 1 of the embodiment will be

5 described. Hereinafter, the operation of assisting care receiver M from the sitting posture to the in-transit posture will be mainly described. The caregiver first returns actuator 5 to its contracted length, assuming the initial state shown in Fig. 1. First linking member 61 swings clockwise, and second linking member 62 swings counterclockwise. There is a gap between restricting protrusion 614
10 of first linking member 61 and restricting member 63.

[0041]

Subsequently, the caregiver grasps handle 42 and moves aid device 1 close to care receiver M in the sitting posture. Care receiver M causes his/her lower body to enter the region below support portion 4 and places both feet on

15 footrest 21. Care receiver M can obtain a stable posture by bringing a part of his/her lower legs in contact with lower leg contact 25. Second linking member 62 can swing clockwise away from engagement pin 617 of first linking member 61. That is, support portion 4 swings forward freely. Therefore, it is possible to increase the size of the space below support portion 4, and care receiver M can
20 easily enter with his/her lower body and does not feel cramped.

[0042]

Subsequently, care receiver M tilts his/her trunk forward to bring his/her trunk in surface contact with trunk support portion 41 and rests both of his/her sides on

underarm support portions 45. At this time, since trunk support portion 41 is tilted upright (the counterclockwise direction in Fig. 1), the forward inclination angle of the body can be small. Further, since underarm support portions 45 are substantially horizontal or slightly lowered in the rearward direction, care receiver M can easily rest on underarm support portions 45. At this time, the posture of care receiver M is the initial posture. The series of operations of care receiver M described above may be assisted by a caregiver. In the initial posture, the buttocks of care receiver M rest on a seat surface. Therefore, care receiver M is in a comfortable posture because the weight-induced load is supported by the buttocks.

[0043]

Subsequently, the caregiver presses the up button of the operating device to proceed with the assistance operation. Actuator 5, which has started the first extension operation, pushes forearm 612 of first linking member 61 upward via connecting pin 613. As a result, first linking member 61 swings counterclockwise (see arrow A1 in Fig. 1). By the counterclockwise swinging of first linking member 61, engagement pin 617 pushes and swings second linking member 62.

[0044]

Second linking member 62 swings in the clockwise direction, and support portion 4 swings in the forward direction (upright direction) (see arrow A2 in Fig. 1). This operation is continued until actuator 5 extends to a predetermined intermediate length and reaches the state shown in Fig. 2. At this time, since

underarm support portions 45 are lowered in the forward direction, care receiver M is restricted from moving backward and does not fall off from support portion 4. In the state shown in Fig. 2, restricting protrusion 614 comes in contact with restricting member 63, and the swinging of first linking member 61 is completed.

5 Thus, the swinging of support portion 4 is also completed. The buttocks of care receiver M are then momentarily separated from the seat surface.

[0045]

Further, when actuator 5 starts the second extension operation, first linking member 61 is pressed against arm 3 without swinging. Arm 3 is driven by
10 actuator 5 to swing forward in a clockwise direction (upright direction) (see arrow A3 in Fig. 2). At the same time, actuator 5 tilts forward. In addition, support portion 4 maintains a constant orientation with respect to arm 3. This operation continues until the final state of Fig. 3. This causes care receiver M to tilt further forward while moving his/her upper body obliquely upward and
15 forward. Care receiver M assumes the in-transit posture in which the buttocks are greatly elevated from the seat surface and the legs are extended.

[0046]

4. Operation and action of damping mechanism 7

Next, the operation and action of damping mechanism 7 will be described. In
20 aid device 1 of the embodiment, base 2, arm 3, actuator 5, and first linking member 61 constitute a four-jointed link with a degree of operational freedom remaining. Even so, in the normal state, since this contact state is maintained after restricting protrusion 614 comes in contact with restricting member 63, the

shape of the four-jointed link is maintained in a stable manner. However, when an external force is applied in the forward swinging direction of arm 3, arm 3 freely swings forward (upright direction) and the shape of the four-jointed link changes. Fig. 5 is a diagram showing a state after the position of arm 3 shown in Fig. 2 has changed to the upright direction without depending on the driving state of actuator 5.

[0047]

The phenomenon in which the shape of the four-jointed link changes occurs, for example, when care receiver M vigorously boards support portion 4. In other words, arm 3 may freely swing to the upright direction in accordance with the direction and magnitude of the external force from care receiver M. At this time, as shown in Fig. 5, restricting protrusion 614 and restricting member 63 are no longer in contact with each other. Since second linking member 62 only engages with engagement pin 617 of first linking member 61 from one direction, the current position of the arm 3 is allowed to assume the upright direction without being restrained.

[0048]

As can be seen from comparing Fig. 2 and Fig. 5, the swinging position of arm 3 changes to the upright direction by swing angle α without depending on the driving state of actuator 5. If damping mechanism 7 is not provided, arm 3 swings rapidly from the state of Fig. 2 to the state of Fig. 5. The rapid swinging motion of arm 3 is difficult for care receiver M to anticipate. Therefore, care receiver M will feel anxious from or surprised by the unexpected swinging

motion of arm 3 and feel less comfortable.

[0049]

Here, Fig. 4 shows the original state of damping mechanism 7 corresponding to the state of Fig. 2. Fig. 6 shows the operation state of damping mechanism 7
5 corresponding to the state of Fig. 5. In the process of changing from the state shown in Fig. 4 to the state shown in Fig. 6, movable portion 72 of damping mechanism 7 is contracted. Therefore, damping mechanism 7 exerts a resistive force on the swinging motion of arm 3 which changes from the state of Fig. 2 to the state of Fig. 5. As a result, the progress of the swinging motion of arm 3 to
10 the upright direction is suppressed, in other words, the swinging motion of arm 3 progresses slowly.

[0050]

When assisting care receiver M in the reverse direction of the assistance operation of aid device 1, that is, when assisting care receiver M from the in-
15 transit posture to the sitting posture, aid device 1 generally shifts from the state of Fig. 3 to the state of Fig. 1 via the state of Fig. 2. In this case, if care receiver M tries to maintain the in-transit posture by standing firm on his/her feet regardless of the contraction operation of actuator 5, the state shown in Fig. 5 is obtained. Thereafter, when care receiver M becomes unable to stand firm on
20 his/her feet, the state changes to the state shown in Fig. 2. If damping mechanism 7 were not provided, arm 3 would swing rapidly in the seating direction from the state shown in Fig. 5 to the state shown in Fig. 2.

[0051]

In the case of this embodiment, damping mechanism 7 suppresses the progression of the swinging motion of arm 3. That is, damping mechanism 7 applies a resistive force to the swinging motion of arm 3 which changes from the state of Fig. 5 to the state of Fig. 2. As a result, the progression of the swinging motion of arm 3 in the seating direction is suppressed, and the swinging motion of arm 3 progresses slowly. That is, damping mechanism 7 generates a resistive force against the rapid swinging motion in both operational directions of arm 3.

[0052]

- 10 Without being limited thereto, damping mechanism 7 may be a unidirectional type mechanism that generates a resistive force in one of the extending or contracting directions. The unidirectional damping mechanism generates a resistive force against the rapid swinging motion in one operational direction of arm 3 having high importance. Another measure can be implemented or a
- 15 measure can be omitted for the operation in the other operational direction of arm 3.

[0053]

- In aid device 1 of the embodiment, a degree of freedom in the operation of the device remains, and the position of arm 3 may vary independently of the driving
- 20 state of actuator 5, making it difficult for care receiver M to anticipate the behavior of the device. Even so, damping mechanism 7 generates a resistive force on the unexpected motion on at least one side of arm 3, thereby suppressing the progress of motion of arm 3. This slows the unpredictable

movement so that care receiver M does not feel anxiety and does not feel a sense of surprise. In this way, comfortable use of aid device 1 is ensured.

[0054]

5. Modification and application of the embodiment

- 5 Damping mechanism 7 of the bidirectional type is expensive compared to the unidirectional damping mechanism. For this reason, a modification may be adopted in which the unidirectional damping mechanism for generating a resistive force in the extension direction and a unidirectional damping mechanism for generating a resistive force in the contraction direction are
- 10 provided in parallel. The cost of a unidirectional damping mechanism is less than half the cost of the bidirectional damping mechanism 7. Therefore, cost reduction becomes possible with the modification.

[0055]

- Further, the damping mechanism may be a rotary type mechanism interposed
- 15 in a swinging shaft portion in which arm 3 supports first linking member 61 in a swingable manner. The rotary damping mechanism is configured such that, for example, a resistive force is generated by friction between two members that rotate relative to each other. The rotary damping mechanism generates a resistive force against the swinging motion of first linking member 61 with
- 20 respect to arm 3.

[0056]

Furthermore, damping mechanism 7 can also be provided in a configuration in which arm 3 and support portion 4 of the embodiment are integrated into a

support arm portion, and the support arm portion performs a lifting and lowering operation or a forward-rearward swinging operation. Actuator 5 is not limited to an extensible actuator, and may be a rotary drive type actuator. Further, the configuration of linking mechanism 6 can be appropriately modified. Further, various modifications and applications of the present embodiment are possible.

Reference Signs List

[0057]

1: Aid device, 2: Base, 3: Arm, 39: Damper support seat, 4: Support portion, 5: Actuator, 51: Main body portion, 52: Movable portion, 53: Motor, 6: Linking mechanism, 61: First linking member, 614: Restricting protrusion, 615: Damper engagement portion, 617: Engagement pin, 62: Second linking member, 63: Restricting member, 7: Damping mechanism, 71: Main body portion, 72: Movable portion, M: Care receiver

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Claims

1. An aid device configured to assist a transfer operation of a care receiver, the aid device comprising:

- 5 a base, on which the care receiver places his or her feet;
 a support arm portion, being provided on the base, which is configured to support a part of the care receiver's body and is operable in an upright direction to make the care receiver stand or in a seating direction for seating the care receiver;
- 10 an actuator configured to drive the support arm portion;
 a linking mechanism configured to transmit a driving force of the actuator to the support arm portion and allow the position of the support arm portion driven by the actuator to change independently of the driving state of the actuator; and
- 15 a damping mechanism configured to generate a resistive force for an operation on at least one operating direction of the support arm portion,
 wherein the support arm portion comprises an arm, being swingably provided on the base in the front-rear direction, and a support portion, being swingably provided on the arm in the front-rear direction, which is capable of
- 20 supporting a part of the care receiver's body;
 wherein the actuator is an extensible actuator configured to perform a first expansion operation extending from a contracted length to a predetermined intermediate length and a second expansion operation extending from the intermediate length to an extended length; and
- 25 wherein the linking mechanism further comprises:
 a first linking member, being swingably provided on the arm, which is configured to swing in the upright direction in accordance with the first expansion operation of the extensible actuator and is pressed against the arm without swinging in accordance with the second expansion operation of the
- 30 extensible actuator, and
 a second linking member, fixed to the support portion, configured to

swing in the upright direction by being pushed by the first linking member and separate from the first linking member in response to an external force from the care receiver, thereby allowing the current position of the arm to change to the upright direction,

5 wherein the damping mechanism has a main body portion and a movable portion partially fitted into the main body portion, the damping mechanism is installed between the arm and the first link member such that the movable portion is extendable and contractable relative to the main body portion, and generates a resistive force corresponding to the operating speed of
10 the movable portion of the damping mechanism when the movable portion of the damping mechanism is extended from the main body portion or contracted into the main body portion.

2. The aid device of claim 1, wherein the damping mechanism generates the
15 resistive force in both operational directions of the support arm portion.

3. An aid device configured to assist a transfer operation of a care receiver, the aid device comprising:

 a base, on which the care receiver places his or her feet;
20 a support arm portion, being provided on the base, which is configured to support a part of the care receiver's body and is operable in an upright direction to make the care receiver stand or in a seating direction for seating the care receiver;

 an actuator configured to drive the support arm portion;
25 a linking mechanism configured to transmit a driving force of the actuator to the support arm portion and allow the position of the support arm portion driven by the actuator to change independently of the driving state of the actuator; and

 a damping mechanism configured to generate a resistive force for an
30 operation on at least one operating direction of the support arm portion,
 wherein the support arm portion comprises an arm, being swingably

provided on the base in the front-rear direction, and a support portion, being swingably provided on the arm in the front-rear direction, which is capable of supporting a part of the care receiver's body;

5 wherein the actuator is an extensible actuator configured to perform a first expansion operation extending from a contracted length to a predetermined intermediate length and a second expansion operation extending from the intermediate length to an extended length; and

wherein the linking mechanism further comprises:

10 a first linking member, being swingably provided on the arm, which is configured to swing in the upright direction in accordance with the first expansion operation of the extensible actuator and is pressed against the arm without swinging in accordance with the second expansion operation of the extensible actuator, and

15 a second linking member, fixed to the support portion, configured to swing in the upright direction by being pushed by the first linking member and separate from the first linking member in response to an external force from the care receiver, thereby allowing the current position of the arm to change to the upright direction,

20 wherein the damping mechanism is a rotary type mechanism interposed in a swinging shaft portion in which the arm supports the first linking member in a swingable manner, and generates a resistive force in swinging of the first linking member with respect to the arm.