

SPECIFICATION

Title of the Invention: Transfer Device

FIELD OF THE INVENTION

[0001] The present invention relates to a transfer device for transferring persons in need of nursing care, such as the elderly, disabled persons, or the like, to wheelchairs or the like.

BACKGROUND

[0002] There has been proposed a transfer device for transferring a person in need of nursing care to a wheelchair or the like. The transfer device includes a turntable, a column standing upright from the turntable, a body-support member attached to an end of the column, a tilting device for tilting the column, and a driving motor for driving the tilting device (see Patent Document 1). In order to transfer a transferee (a person in need of nursing care) with this transfer device, the column is tilted by the tilting device to set the body-support member into a tilting condition, and then the upper body of the transferee is placed on the body-support member in the tilting condition to overhang the same. After the column is returned to an original upright condition by the tilting device, the turntable is turned to a predetermined angular position while the transferee's body is supported. Then, the column is tilted again, and the transferee supported on the body-support member is put on a wheelchair or the like. In this manner, the transferee is transferred from a bed to the wheelchair, for example.

Prior Art Document

[0003] Patent Document 1 : Japanese Patent-Application Publication No. H10-192346

SUMMARY

Problems to be Solved by the Invention

[0004] However, the above-described transfer device has following problems. Firstly, the transferee overhangs the body-support member at the end of the column, and the turntable is rotated in order to change directions after the column is returned to the upright condition. Thus, the transferee is forced to have an uncomfortable posture on the body-support

member. Also, it is highly unstable to ride the body-support member. Therefore, it is desired to improve the usability.

[0005] Secondly, because it is highly unstably to ride the body-support member, it is difficult for the transferee to operate by himself/herself, requiring caretaker's help. This does not help the transferee to be self-reliance.

[0006] It is an object of the invention to provide a transfer device capable of transferring a transferee as needed without forcing the transferee to have an uncomfortable posture.

[0007] It is another object of the invention to provide a transfer device capable of helping a transferee to be self-reliance.

Means to solve the Problems

[0008] A transfer device according to claim 1 of the invention includes a support structure placed on a floor surface, a support arm mounted on the support structure so as to be pivotable between a receiving angular position for receiving an upper body of a transferee and an uplifted angular position to uplift the upper body, and an upper-body support attached to an end of the support arm. An upper part of the support arm is tilting toward a receiving side with respect to a lower part thereof. In order to transfer, the support arm is positioned at the receiving angular position, and the upper body of the transferee is received onto the upper-body support of the support arm at the receiving angular position, and then the support arm is pivoted from the receiving angular position to the uplifted angular position to lift up the transferee.

[0009] Also, in the transfer device according to claim 2 of the invention, the support structure includes a support main body to be placed on a floor surface and a support turntable rotatable relative to the support main body, and the support arm is pivotably mounted on the support turntable. Both feet of the transferee are placed on the support turntable.

[0010] Also, in the transfer device according to claim 3 of the invention, the support turntable is movable between a first rotation angular position 90 degrees away in a predetermined direction from a home angular position having a predetermined positional relationship with the support turntable and a second rotation angular position 90 degrees away from the home angular position in a direction opposite to the predetermined direction.

[0011] Also, in the transfer device according to claim 4 of the invention,

an expansion mechanism is disposed between the support turntable and the support arm for driving the support arm. When the expansion mechanism is in an extending state, the support arm is maintained at the receiving angular position. When the expansion mechanism is brought to a retract condition, then the support arm is brought into the uplifted angular position.

[0012] Also, in the transfer device according to claim 5 of the invention, an elastic bias means for elastically biasing the support arm toward the uplifted angular position is located between the support turntable and the support arm.

[0013] Also, in the transfer device according to claim 6 of the invention, knee supports are disposed on both sides of the support arm for supporting knees of the transferee. When transfer, the upper body of the transferee is received on the upper-body support of the support arm while both knees of the transferee are in abutment with the knee supports.

[0014] Also, in the transfer device according to claim 7 of the invention, the upper-body support includes a main support for supporting the upper body of the transferee. The main support is maintained to extend in an upper front direction tilting at 50 to 60 degrees with respect to the horizontal direction when the support arm is at the receiving angular position and to extend in an upper front direction tilting at 15 to 25 degrees with respect to the horizontal direction when the support arm is at the uplifted angular position. The support arm is pivoted in a range of a tilt angular difference between a tilt angle of the main support at the receiving angular position and another tilt angle of the main support at the uplifted angular position.

[0015] Also, in the transfer device according to claim 8 of the invention, support protrusions are disposed at both sides of the main support of the upper-body support for supporting both arms of the transferee. The support protrusions protrude upward.

[0016] Also, in the transfer device according to claim 9 of the invention, the support turntable is attached with a housing for covering a front section of the support structure. The housing has an upper surface formed with an opening corresponding to a pivoting range of the support arm. The support arm is attached with a long thin safety cover for covering the opening. The safety cover moves along the opening on inside of the housing together with pivotal movement of the support arm.

[0017] Also, in the transfer device according to claim 10 of the invention,

a moving caster is provided at the front section of the support turntable for moving the support structure, and the moving caster is movable between a protruding position where the moving caster protrudes downward beyond the support main body to act on a floor surface and an accommodated position retracted upward from the floor surface.

[0018] Also, in the transfer device according to claim 11 of the invention, the support arm is provided with an operation lever, and a push member is pivotably provided in relation to the operation lever. The moving rod is movably provided to the support turntable for positioning the moving caster to the protruding position, the moving caster being attached to a pivot attachment member that is pivoted by the moving rod, wherein when the operation lever is pulled, then the push member is brought to an acting position. When the support arm is pivoted from the receiving angular position to the uplifted angular position in this condition, then the push member acts on the pivot attachment member through the moving rod, pivoting the pivot attachment member downward to bring the moving caster from the accommodated position to the protruding position.

[0019] Also, in the transfer device according to claim 12 of the invention, an operation unit for controlling the expansion mechanism is provided to the upper-body support.

Effects of the Invention

[0020] Because the transfer device of claim 1 of the invention includes a support structure placed on a floor surface, a support arm pivotably mounted on the support structure, and an upper-body support attached to an end of the support arm, the upper-body support is supported by the support arm having a single pivot fulcrum / single joint point, making it possible to support the upper-body support with a relatively simple structure. Also, by positioning the support arm to the receiving angular position, it is possible to receive the upper body of the transferee onto the upper-body support. Also, by positioning the support arm to the uplifted angular position, the transferee can be uplifted and transferred as needed. Also, because the upper part of the support arm is tilting toward the receiving side with respect to the lower part thereof, the upper-body support faces the transferee side at the receiving angular position. This makes it easier to receive the transferee onto the upper-body support, enabling even a person in need of nursing care to use by himself/herself.

[0021] Also, according to the transfer device of claim 2 of the invention, the support structure includes a support main body to be placed on a floor surface and a support turntable rotatable relative to the support main body, and the support arm is pivotably mounted on the support turntable. Thus, the transferee can be stably transferred as needed with both feet placed on the support turntable by positioning to a predetermined angular position.

[0022] Also, according to the transfer device of claim 3 of the invention, the support turntable is movable between the first rotation angular position 90 degrees away from the home angular position in the predetermined direction and the second rotation angular position 90 degrees away from the home angular position in the direction opposite to the predetermined direction. Thus, the transfer device may be used with a bed being set corresponding to the home angular position, for example, a portable toilet being set corresponding to the first rotation angular position, for example, and a wheelchair being set corresponding to the second rotation angular position, for example. In this case, a person in need of nursing care can use the portable toilet or the wheelchair by using the transfer device by himself/herself.

[0023] Also, according to the transfer device of claim 4 of the invention, the expansion mechanism is disposed between the support turntable and the support arm. Thus, expansion or contraction movement of the expansion mechanism can pivot the support arm between the receiving angular position and the uplifted angular position.

[0024] Also, according to the transfer device of claim 5 of the invention, the elastic bias means is located between the support turntable and the support arm. Thus, the elastic bias means assists the pivotal movement of the support arm to the uplifted angular position, enabling to pivot the support arm with relatively small power.

[0025] Also, according to the transfer device of claim 6 of the invention, the knee supports are disposed on both sides of the support arm. Thus, the upper body of the transferee is received onto the upper-body support with both knees abutting the knee supports. Then, the support arm is pivoted from the receiving angular position to the uplifted angular position in this condition. Thus, the transferee P is lifted with both feet on the support turntable, and the transfer device can be used highly stably. Also, because both legs are positioned by the knee supports, the legs can be returned to

initial position when the rotation-transfer is completed, ensuring a stable seating posture.

[0026] Also, according to the transfer device of claim 7 of the invention, the upper-body support includes the main support, and the main support is maintained to extend in an upper front direction tilting at 50 to 60 degrees with respect to the horizontal direction when the support arm is at the receiving angular position. Thus, the upper body can be easily received onto the main support. Also, the upper-body support is maintained to extend in an upper front direction tilting at 15 to 25 degrees with respect to the horizontal direction when the support arm is at the uplifted angular position. Thus, the transferee can use the transfer device in a stable posture without feeling a fear of falling forward in the lifted condition. With this condition, the pivot angle of the support arm is the same as the tilting angular difference between the tilt angle of the main support at the receiving angular position and the tilt angle of the main support at the uplifted angular position.

[0027] Also, according to the transfer device of claim 8 of the invention, the support protrusions are disposed at both sides of the main support of the upper-body support. Thus, by supporting both arms of the transferee onto the support protrusions, the transferee can be supported on the upper-body support in highly stable manner.

[0028] Also, according to the transfer device of claim 9 of the invention, the support arm is attached with the long thin safety cover for covering the opening of the housing, the safety cover moves along the opening inside of the housing together with the pivotal movement of the support arm and covers the opening. Thus, a finger or the like can be prevented from being caught inside the opening.

[0029] Also, according to the transfer device of claim 10 of the invention, the moving caster is provided at the front section of the support turntable. Thus, by positioning the moving caster to the protruding position, the support main body of the support structure floats from the floor surface, making it possible to easily move the transfer device.

[0030] Also, according to the transfer device of claim 11, the support arm is provided with the operation lever, and a push member is pivotably provided in relation to the operation lever. Also, the moving rod is movably provided to the support turntable, and the moving caster is attached to the

pivot attachment member that is pivoted by the moving rod. Therefore, when the operation lever is pulled, then the push member is brought to the acting position. When the support arm is pivoted from the receiving angular position to the uplifted angular position in this condition, then the pivot attachment member is pivoted downward through the push member and the moving rod to position the moving caster to the protruding position. By pivoting the support arm to the uplifted angular position through operation on the operation lever, the transfer device can be easily moved.

[0031] Further, according to the transfer device of claim 12, because the operation unit is provided to the upper-body support. The transferee can move the support arm between the receiving angular position and the uplifted angular position by operating the operation unit being supported on the upper-body support.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] Fig. 1 is a perspective view of a transfer device according to an embodiment of the invention.

Fig. 2 is a view showing a support arm and configurations relating thereto of the transfer device of Fig. 1.

Fig. 3 is a partially cross-sectional view of the transfer device of Fig. 1 as viewed from the above.

Fig. 4 is a cross-sectional view of a rotation mechanism of a support turntable of the transfer device of Fig. 1.

Fig. 5 is a cross-sectional view of the support arm, a safety cover, and configurations relating thereto of the transfer device of Fig. 1.

Fig. 6 is a schematic view showing an example of usage of the transfer device of Fig. 1.

Fig. 7 is a partially cross-sectional view showing a moving caster and configurations relating thereto of a transfer device according to another embodiment.

Fig. 8 is a partially cross-sectional view showing the transfer device of Fig. 7 with an operation lever being pulled.

Fig. 9 is a partially cross-sectional view showing the transfer device of Fig. 7 with a support arm at an uplifted angular position.

EMBODIMENT

[0033] Next, further description will be provided with reference to the accompanying drawings. First, with reference to Figs. 1 to 6, a transfer device according to a first embodiment of the invention will be described.

[0034] In Figs. 1 to 3, a transfer device 2 shown in the drawings (a housing to be described later is omitted in Figs. 2 and 3) includes a support structure 6 placed on a floor surface 4, a support arm 8 swingably supported on the support structure 6, and an upper-body support 10 attached to a front end of the support arm 8.

[0035] The support structure 6 shown in the drawings includes a support main body 12 placed stationary on the floor surface and a support turntable 14 rotatably supported by the support main body 12. The support turntable 14 has a front part extending frontward (leftward in Figs. 2 and 3) beyond the support main body 12 and a rear part extending rearward (rightward in Figs. 2 and 3) beyond the support main body 12 by the amount greater than the front part.

[0036] The support main body 12 is formed of a plate-shaped member into an octagon shape in this embodiment, but may be formed into a circular shape, a rectangular shape, a hexagon shape, or the like. The support main body 12 is provided with a plurality of support members 16 on a bottom surface thereof. The support members 16 are made of rubber, for example, and are placed stationary on the floor surface 4.

[0037] The support turntable 14 is formed of a rectangular-shaped plate member and rotatably supported by the support main body 12 as shown in Fig. 4. The support main body 12 is attached at its center with an attaching member 18. The attaching member 18 supports a bottom section of a fixed axis 22 through a sleeve 20. The fixed axis 22 and the sleeve 20 are fixed to the attaching member 18 by a fixing bolt 24. Also, the support turntable 14 is attached with a support-attaching sleeve 26, which is rotatably supported by the fixed axis 22 through a pair of bearings 28. The support turntable 14 is attached on its bottom surface with a plurality of support casters 30 (in this embodiment, eight casters corresponding to corners of the octagon) spaced apart from each other in a circumferential direction. The support casters 30 are rotatable in any direction. The support turntable 14 is supported at its front section by the support main body 12 through the support casters 30.

[0038] In this embodiment, a pair of rear support casters 32 is provided at

the rear part of the support turntable 14. The rear support casters 32 are rotatable in any direction as the support casters 30. With this configuration, the front section of the support turntable 14 is supported by the floor surface 4 through the support casters 30 and the support main body 12, and the rear section of the support turntable 14 is supported by the floor surface 4 through the rear support casters 32.

[0039] In this embodiment, there is provided a drive source 34 for rotating the support turntable 14. The drive source 34 is formed of an electric motor capable of rotating in forward and reverse directions, for example. Driving force from the drive source 34 is transmitted to the support-attaching sleeve 26 through a driving-force transmitting mechanism 36. In this embodiment, the driving-force transmitting mechanism 36 includes a worm gear 38 driven to rotate by the drive source 34 and a worm wheel 40. The worm wheel 40 engages with the worm gear 38 and is attached to the support-attaching sleeve 26. With this configuration, when the drive source 34 is driven to rotate in a predetermined direction, then the support turntable 14 is rotated in a direction indicated by an arrow 42 (see Fig. 6), for example, through the driving-force transmitting mechanism 36. When the drive source 34 is driven to rotate in a direction opposite to the predetermined direction, then the support turntable 14 is rotated in a direction indicated by an arrow 44 (see Fig. 6), for example, through the driving-force transmitting mechanism 36. In this embodiment, the support turntable 14 is normally positioned at a home angular position indicated by a solid line in Fig. 6 and capable of rotate between a first rotation angular position 90 degrees away from the home angular position in the direction indicated by the arrow 42 (a clockwise direction in Fig. 6) and a second rotation angular position 90 degrees away from the home angular position in the direction indicated by the arrow 44 (a counterclockwise direction in Fig. 6).

[0040] The support arm 8 is mounted at the substantial center of the support turntable 14 so as to be pivotable in the front-rear direction (right-left direction in Figs. 2 and 3). The support turntable 14 is attached with a pair of attaching brackets 46. The bottom section of the support arm 8 is located between and pivotably connected to the attaching brackets 46 by a support shaft 48. The support arm 8 has a lower part 8a extending straight and an upper part 8b extending in a tilting direction with respect to

the lower part 8a by a predetermined angle toward a receiving side (right side in Figs. 2 and 3). The tilting angle α is preferably about 30 to 40 degrees, and more preferably 33 to 37 degrees. This tilting angle makes it possible to stably transfer a transferee P as described later with a single joint point (that is, the support shaft 48).

[0041] The upper-body support 10 is provided at the end of the support arm 8. The upper-body support 10 shown in the drawings includes a flat main support part 50 having an upper surface for receiving and supporting the upper body of the transferee P. The main support part 50 is provided at both ends with support protrusions 52 protruding upward. The pair of support protrusions 52 supports from the sides to the arms of the transferee P from the both sides. In this embodiment, the main support part 50 is further provided at its front end with a front support part 54 extending in a substantially letter-L shape. The front support part 54 has a front section 56 for supporting sections of the both arms below the elbows. The upper-body support 10 having this configuration makes it possible to stably support the transferee P, removing the fear from the transferee P being transferred.

[0042] The support arm 8 is provided with a pair of knee supports 58 to abut and support both knees of the transferee P. In this embodiment, the support arm 8 is penetrated through by an attaching shaft 60. One of the knee supports 58 is attached to one end of the attaching shaft 60 by an attaching member 62, and the another one of the knee supports 58 is attached to the another end by an attaching member 62. The attaching members 62 have an adjustable length, and the position of the knee supports 58 in the front-rear direction (the right-left direction in Figs. 2 and 3) can be adjusted according to the body frame of the transferee P and the like. It is preferable that soft materials be disposed on sections where the transferee P contacts, that is, the surfaces of the knee supports 58, the surface of the main support part 50 of the upper-body support 10, the surfaces of the support protrusions 52, and the surface of the front support part 54.

[0043] In the transfer device 2, an expansion mechanism 64 is disposed between the support turntable 14 and the support arm 8 for pivoting the support arm 8. The expansion mechanism 64 has a main part 66 linked to the support turntable 14 side (more specifically, to a link racket 67 attached to the support turntable 14) by a link pin 68 and an output part 70 linked to

the support arm 8 side by a link pin 72. The expansion mechanism 64 shown in the drawings utilizes an electric motor (not shown). When the electric motor drives in a predetermined direction, then the output part 70 protrudes relative to the main part 66. When the electric motor drives in a direction opposite to the predetermined direction, then the output part 70 retracts relative to the main part 66. Instead of the electric motor, the expansion mechanism 64 may utilize a pneumatic ram using compressed air, for example.

[0044] In this embodiment, as shown in Fig. 2, when expansion mechanism 64 is expanded, then the support arm 8 pivots rearward as indicated by an arrow 75 (in the clockwise direction in Fig. 2) to the receiving angular position indicated by the solid line in Fig. 2. The upper body of the transferee P is received by the upper-body support 10 at this receiving angular position as described later. Also, when the expansion mechanism 64 contracts, then the support arm 8 pivots frontward as indicated by an arrow 76 (in the counterclockwise direction in Fig. 2) to the uplifted angular position indicated by a two-dot chain line in Fig. 2, thereby lifting up the upper body of the transferee P received and supported on the upper-body support 10.

[0045] In relation to the above-described pivotal movement of the support arm 8, it is preferable to configure the main support part 50 of the upper-body support 10 as described next. As shown in Fig. 2, when the support arm 8 is maintained at the above-described receiving angular position, a tilt angle β_1 of the main support part 50 (an angle of an upper front direction relative to the horizontal direction) is preferably about 50 to 60 degrees, and more preferably about 52 to 58 degrees. This angle makes it easier to receive the upper body of the transferee P onto the upper-body support 10, enabling even a person in need of nursing care to ride the upper-body support 10 by himself/herself. Also, when the support arm 8 is at the above-described uplifted angular position, a tilt angle β_2 of the main support part 50 of the upper-body support 10 (an angle of an upper front direction relative to the horizontal direction) is preferably about 15 to 25 degrees, and more preferably about 17 to 23 degrees. This angle makes it possible to lift the transferee P without causing a sense of insecurity. With this configuration, the pivotal angle of support arm 8 (the angle between the receiving angular position and the uplifted angular position) is equal to a tilt

difference between the tilt angle β_1 of the main support part 50 at the receiving angular position and the tilt angle β_2 of the main support part 50 at the uplifted angular position ($\beta_1 - \beta_2$), and the support arm 8 pivots within this angular range.

[0046] In this embodiment, a coil spring 74 as an elastic bias means is disposed between the support turntable 14 side (more specifically, the link racket 67) and the support arm 8 side. The coil spring 74 has at one side an engaging part 76 engaged with an engaging part 78 of the link racket 67 and at the other side an engaging part 80 engaged with an engaging bracket 82 of the support arm 8. The coil spring 74 elastically biases the support arm 8 toward the uplifted angular position. Providing the coil spring 74 in this manner reduces load on the expansion mechanism 64 when pivoting the support arm 8 toward the uplifted angular position with the transferee P supported thereon, making it possible to pivot the support arm 8 as desired with the expansion mechanism 64 having small size and power. It should be noted that the elastic bias means (the coil spring 74) can be dispensed with when the load on the expansion mechanism 64 does not matter.

[0047] As shown in Fig. 1, the transfer device 2 includes a housing 86 for covering the front part of the support turntable 14, the lower part 8b of the support arm 8, the coil spring 74 of the expansion mechanism 64, and the like (that is, the front part of the support structure 6). The housing 86 is attached to the support turntable 14 and rotates together with the support turntable 14.

[0048] In relation to the housing 86, it is configured as follows. With reference to Figs. 1 to 5, the housing 86 is formed with a thin long opening 88 at the widthwise center of the housing 86 to stretch from the upper surface to the rear surface. The upper part 8b of the support arm 8 extends upward through the opening 88. The support arm 8 at the uplifted angular position locates at one end of the opening 88 of the housing 86. The support arm 8 at the receiving angular position locates at the other end of the opening 88 (in this embodiment, an opening between the upper surface and the rear surface of the housing 86). The support arm 8 pivots in a range of the opening 88.

[0049] In this embodiment, a safety cover 90 is attached to the front surface side of the support arm 8 by an attaching screw 92. The safety cover 90 is made of elastic plate such as a spring steel, for example, and extends frontward along the opening 88 at the inside of an upper wall of the

housing 86 (that is, inside of the opening 88) through a gap between the upper wall of the housing 86 and bosses 94 for interlocking right and left housings.

[0050] With this configuration, the safety cover 90 covers the opening 88 from the inside of the housing 86 (part of the opening 88 in front of the support arm 8) and moves along with the pivotal movement of the support arm 8 while covering the opening 88, thereby preventing fingers or the like from entering the opening 88 and being caught between the housing 86 and the support arm 8, securing the safety in use.

[0051] The transfer device 2 is used as follows, for example. With reference to mainly Figs. 1, 2, and 6, the transfer device 2 is set by a bed 102 and used to transfer from the bed 102 to a portable toilet 104 (located by the bed 102 and on one side of the transfer device 2, for example), or from the bed 102 to a wheelchair 106 (located by the bed 102 and on the other side of the transfer device 2, for example). When transferring from the bed 102 to the portable toilet 104 (or to the wheelchair 106), for example, the transferee P rides the transfer device 2, changes the direction, and then sits down on the portable toilet 104 (or the wheelchair 106).

[0052] For example, when transferring from the bed 102 to the transfer device 2, the support arm 8 is maintained at the receiving angular position indicated by the solid line in Fig. 2. In this condition, the transferee P places both feet on the rear section of the support turntable 14 (the section extending rearward beyond the housing 86), places both knees in abutment with the knee supports 58, and then as shown in Fig. 2, places the upper body onto the upper-body support 10 and the main support part 50. At this time, the transferee P can place the upper body onto the upper-body support 10 at ease because the tilt angle $\beta 1$ of the main support part 50 is 50 to 60 degrees.

[0053] Then, the support arm 8 is pivoted upward to the uplifted angular position to lift up the upper body. That is, the expansion mechanism 64 contracts to move the support arm 8 from the above-described receiving angular position to the uplifted angular position indicated by the two-dot chain line in Fig. 2, thereby uplifting the upper body of the transferee P mounted and supported on the upper-body support 10. At this time, because it is lifted while both knees are in abutment with the knee supports 58, it is lifted while both feet are placed on the support turntable 14. Thus,

both feet would not separate or float up from the support turntable 14, making it possible to lift up while maintaining the posture of the transferee P. During this pivotal movement toward the uplifted angular position, the coil spring 74 elastically biases the support arm 8. Thus, load on the expansion mechanism 64 can be reduced when uplifting.

[0054] When the support arm 8 is maintained at the uplifted angular position, the tilt angle β_2 of the main support part 50 of the upper-body support 10 is 15 to 25 degrees. Thus, the transferee P can maintain the condition without feeling a fear of falling forward.

[0055] Next, the drive source 34 is driven to rotate and change the direction of the support turntable 14 of the transfer device 2 so as to locate the transferee P on the portable toilet 104 side (or the wheelchair 106 side), for example. When the drive source 34 drives in the predetermined direction (or the direction opposite to the predetermined direction), the driving force from the drive source 34 is transmitted to the support turntable 14 through the driving-force transmitting mechanism 36, thereby rotating the support turntable 14 with the transferee P supported thereby in the direction indicated by the arrow 42 (or the arrow 44) from the home angular position indicated by the solid line in Fig. 6 to the first rotation angular position (or the second rotation angular position) indicated by the two-dot chain line 2A (or 2B) in Fig. 6. At this time, the front section of the support turntable 14 is supported by the plurality of support casters 30, and the rear section thereof is supported by the pair of rear support casters 32. Thus, support turntable 14 can rotate smoothly and stably.

[0056] Then, the support arm 8 is pivoted downward toward the receiving angular position to lower the upper body toward the portable toilet 104 (or the wheelchair 106). That is, the expansion mechanism 64 is extended to pivot the support arm 8 downward from the above-described uplifted angular position to the above-described receiving angular position. As a result, the upper body of the transferee P supported on the upper-body support 10 is lowered, and the transferee P is located in front of the upper-body support 10 (or the wheelchair 106).

[0057] After this movement, the transferee P removes the upper body from the upper-body support 10, removes both feet from the support turntable 14, and sits down on the portable toilet 104 (or the wheelchair 106). In this manner, even a person in need of nursing care can easily transfer

from the bed 102 to the portable toilet 104 (or the wheelchair 106) by himself/herself.

[0058] The transfer device 2 uses the expansion mechanism 64 for pivoting the support arm 8 and the drive source 34 for rotating the support turntable 14. Thus, it may be configured such that the transferee P can operate an operation unit (not shown) to conduct the above-described transfer procedure by himself/herself. In this case, the operation unit may be disposed on the upper-body support 10. With this configuration, the transferee P can easily perform the operation and easily transfer from the bed 102 to the portable toilet 104 (or the wheelchair 106), for example, by himself/herself.

[0059] This transfer device is used while stationary set on a floor surface. However, its location may be changed. In this case, it is preferable that the transfer device be configured as shown in Figs. 7 to 9, for example, to make it easy to move. This transfer device according to another embodiment is provided with a moving caster for moving the transfer device. Note that in this another embodiment, parts substantially the same as those in the above-described embodiment are assigned with the same numeral references, and description thereof will be omitted.

[0060] In Figs. 7 to 9, in this another embodiment, the transfer device includes a moving caster 122 disposed at the front section of the support turntable 14. The moving caster 122 is movable between a protruding position where the moving caster 122 protrudes downward beyond the support main body 12 of the support structure 6 and contacts the floor surface 4 (position shown in Fig. 9) and a retract position retracted upward from the floor surface 4 (position shown in Figs. 7 and 8). In this embodiment, the support turntable 14 is attached with a pivot attachment member 124 by a support pin 126 such that the pivot attachment member 124 is freely pivotable. The moving caster 122 is attached to a lower surface of a front section of the pivot attachment member 124. Also, a coil spring 125 as an elastic bias means is disposed between the pivot attachment member 124 and the support turntable 14. The coil spring 125 has one end engaged with an engaging pin 127 of the pivot attachment member 124 and the other end engaged with an engaging rod 129 of the support turntable 14. The coil spring 125 elastically biases the moving caster 122 toward the above-described retract position, thereby normally maintaining the moving

caster 122 at the above-described retract position. Note that single moving caster 122 may be provided as shown in Figs. 7 to 9, or a plurality of moving casters 122 may be provided.

[0061] In relation to the moving caster 122, there are provided an operation lever 128 for switching conditions of the moving caster 122 and an input operation transmission mechanism 130 for transmitting switching operations on the operation lever 128 to the moving caster 122. The operation lever 128 is movably supported by a support sleeve 132 mounted on the lower part 8a of the support arm 8 and is movable between an insert position shown in Fig. 7 and a withdrawn position shown in Figs. 8 and 9.

[0062] The input operation transmission mechanism 130 includes a push member 138 rotatably linked by a pin 136 to an attaching bracket 134 mounted on the support arm 8 and a moving rod 142 movably supported by a support bracket 140 attached to the front section of the support turntable 14. The push member 138 is formed with a semicircular shaped push part 139 in one end, and is pivotably linked to an intermediate link 144 by a pin 142 at the other end. The intermediate link 144 is pivotably linked to the end of the operation lever 128 by a pin 146.

[0063] With this configuration, when the operation lever 128 is pushed into the above-described insert position, then the push member 138 is pivoted downward about the pin 136 (in the counterclockwise direction in Fig. 7) through the intermediate link 144 and maintained at a non-acting position. At this non-acting position, the push member 138 extends along the support arm 8, and the push part 139 of the push member 138 does not act on the moving rod 142 even when the support arm 8 is pivoted from the receiving angular position (the angular position indicated by the solid line in Fig. 7) to the uplifted angular position (the angular position indicated by the two-dot chain line in Fig. 7). On the other hand, when the operation lever 128 is pulled to the above-mentioned withdrawn position, then as shown in Fig. 8, the push member 138 is pivoted upward about the pin 136 (in the clockwise direction in Figs. 7 and 8) through the intermediate link 144 and maintained at an acting position. The push member 138 at this acting position protrudes frontward beyond the support arm 8. When the support arm 8 is pivoted from the receiving angular position (the angular position shown in Fig. 8) to the uplifted angular position (the angular position shown in Fig. 9) in this condition, then the push part 139 of the push member 138

acts on the moving rod 142 as described later.

[0064] A support shaft 148 is mounted on one end of the moving rod 142, and a first collar 150 is rotatably attached to the support shaft 148. Also, a support shaft 152 is mounted on the other end of the moving rod 142, and a second collar 154 is rotatably attached to the support shaft 152. The push part 139 of the push member 138 acts on the second collar 154 to press the same.

[0065] The moving rod 142 is mounted with an engaging ring 156 at one end and a receiving ring 158 at the other end. A coil spring 160 is wound around the moving rod 142 between the support bracket 140 and the receiving ring 158. The coil spring 160 elastically biases the receiving ring 158 toward the support arm 8 side, thereby maintaining the moving rod 142 at an uplift position (a position shown in Figs. 7 and 8) where the engaging ring 156 contacts the support bracket 140. At this uplift position, the moving rod 142 is maintained at an upper position, so the first collar 150 of the moving rod 142 does not act on a protrusion 162 provided to the pivot attachment member 124 and is maintained away the protrusion 162. The rest of the configuration in this another embodiment is substantially the same as that of the embodiment shown in Figs. 1 to 6.

[0066] In order to move the transfer device to a different location, an operation part 128G of the operation lever 128 is pulled to the withdrawn position, and then in this condition the support arm 8 is pivoted from the receiving angular position to the uplifted angular position. When the operation lever 128 is pulled to the above-described withdrawn position, then the push member 138 is maintained at the acting position as shown in Fig. 8 through the intermediate link 144.

[0067] When the support arm 8 is pivoted from the receiving angular position to the uplifted angular position in this condition, then as shown in Fig. 9 the push part 139 of the push member 138 acts on the second collar 154 of the moving rod 142, and the moving rod 142 is pressed and moved toward the front (toward the lower left in Fig. 9) against the elastic bias force of the coil spring 160. When the moving rod 142 is moved in this manner, then the first collar 150 of the moving rod 142 acts on the protrusion 162 of the pivot attachment member 124, and the pivot attachment member 124 and the moving caster 122 are pivoted downward against the elastic bias force of the coil spring 125 and brought to the protruding position.

[0068] As shown in Fig. 9, the moving caster 122 maintained at the protruding position protrudes downward beyond the support main body 12. The moving caster 122 on the front acts on the floor surface 4, and the pair of rear support casters on the rear (the rear support casters 32 in Figs. 2, 3, and 5) acts on the floor surface 4. Thus, it is possible to easily move the transfer device by using the moving caster 122 and the rear support casters.

[0069] In order to accommodate the moving caster 122, the support arm 8 is pivoted from the uplifted angular position to the receiving angular position, and then the operation lever 128 is operated. When the support arm 8 is pivoted to the receiving angular position, then as will be understood from Fig. 8, the pressing condition between the push member 138 on the support arm 8 side and the second collar 154 of the moving rod 142 is released, and the pivot attachment member 124 and the moving caster 122 are pivoted upward by the elastic bias force of the coil spring 125 and maintained at the retract position. Also, the moving rod 142 is moved toward the support arm 8 side by the elastic bias force of the coil spring 160 and brought to the uplift position.

[0070] Then, when the operation lever 128 is pushed, then the operation lever 128 is brought to the insert position, and the push member 138 is maintained at the non-acting position. In this manner, the moving caster 122 can be accommodated.

[0071] While the transfer devices according to the embodiments of the invention have been described, the invention is not limited to these embodiments, and various changes and modifications may be made therein without departing from the spirit of the invention.

DESCRIPTION OF THE NUMBERINGS

[0072]	2	transfer device
	6	support structure
	8	support arm
	10	upper-body support
	12	support main body
	14	support turntable
	58	knee supports
	64	expansion mechanism
	74	coil spring (elastic bias means)

90 safety cover
102 bed
104 portable toilet
106 wheelchair
122 moving caster
128 operation lever
130 input operation transmission mechanism
138 push member
142 moving rod
P transferee

CLAIMS

1. A transfer device comprising:
 - a support structure placed on a floor surface;
 - a support arm mounted on the support structure so as to be pivotable between a receiving angular position for receiving an upper body of a transferee and an uplifted angular position to uplift the upper body; and
 - an upper-body support attached to an end of the support arm,wherein:
 - an upper part of the support arm is tilting toward a receiving side with respect to a lower part thereof;
 - in order to transfer, the support arm is positioned at the receiving angular position, and the upper body of the transferee is received onto the upper-body support of the support arm at the receiving angular position, and then the support arm is pivoted from the receiving angular position to the uplifted angular position to lift up the transferee.
2. The transfer device according to claim 1, wherein: the support structure includes a support main body to be placed on a floor surface and a support turntable rotatable relative to the support main body; the support arm is pivotably mounted on the support turntable; and both feet of the transferee are placed on the support turntable.
3. The transfer device according to claim 2, wherein the support turntable is movable between a first rotation angular position 90 degrees away in a predetermined direction from a home angular position having a predetermined positional relationship with the support turntable and a second rotation angular position 90 degrees away from the home angular position in a direction opposite to the predetermined direction.
4. The transfer device according to claim 2 or 3, wherein: an expansion mechanism is disposed between the support turntable and the support arm for driving the support arm; when the expansion mechanism is in an extending state, the support arm is maintained at the receiving angular position; and when the expansion mechanism is brought to a retract condition, then the support arm is brought into the uplifted angular position.
5. The transfer device according to any of claims 2 to 4, wherein an elastic bias means for elastically biasing the support arm toward the

uplifted angular position is located between the support turntable and the support arm.

6. The transfer device according to any of claims 1 to 5, wherein knee supports are disposed on both sides of the support arm for supporting knees of the transferee; and when transfer, the upper body of the transferee is received on the upper-body support of the support arm while both knees of the transferee are in abutment with the knee supports.

7. The transfer device according to any of claims 1 to 6, wherein the upper-body support includes a main support for supporting the upper body of the transferee, the main support being maintained to extend in an upper front direction tilting at 50 to 60 degrees with respect to the horizontal direction when the support arm is at the receiving angular position and to extend in an upper front direction tilting at 15 to 25 degrees with respect to the horizontal direction when the support arm is at the uplifted angular position, and the support arm is pivoted in a range of a tilt angular difference between a tilt angle of the main support at the receiving angular position and an another tilt angle of the main support at the uplifted angular position.

8. The transfer device according to claim 7, wherein support protrusions are disposed at both sides of the main support of the upper-body support for supporting both arms of the transferee, the support protrusions protruding upward.

9. The transfer device according to any of claims 1 to 7, wherein: the support turntable is attached with a housing for covering a front section of the support structure, the housing having an upper surface formed with an opening corresponding to an pivoting range of the support arm; and the support arm is attached with a long thin safety cover for covering the opening, the safety cover moving along the opening on inside of the housing together with pivotal movement of the support arm.

10. The transfer device according to claim 2, wherein a moving caster is provided at the front section of the support turntable for moving the support structure, the moving caster being movable between a protruding position where the moving caster protrudes downward beyond the support main body to act on a floor surface and an accommodated position retracted upward from the floor surface.

11. The transfer device according to claim 10, wherein:

the support arm is provided with an operation lever;
a push member is pivotably provided in relation to the operation lever;

a moving rod is movably provided to the support turntable for positioning the moving caster to the protruding position, the moving caster being attached to a pivot attachment member that is pivoted by the moving rod, wherein when the operation lever is pulled, then the push member is brought to an acting position, and when the support arm is pivoted from the receiving angular position to the uplifted angular position in this condition, then the push member acts on the pivot attachment member through the moving rod, pivoting the pivot attachment member downward to bring the moving caster from the accommodated position to the protruding position.

12. The transfer device according to claim 4, wherein an operation unit for controlling the expansion mechanism is provided to the upper-body support.